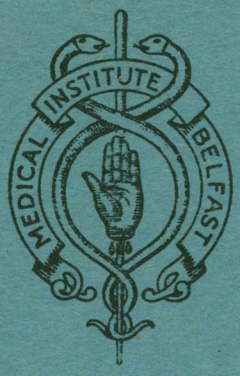
DECEMBER, 1962

THE ULSTER MEDICAL JOURNAL



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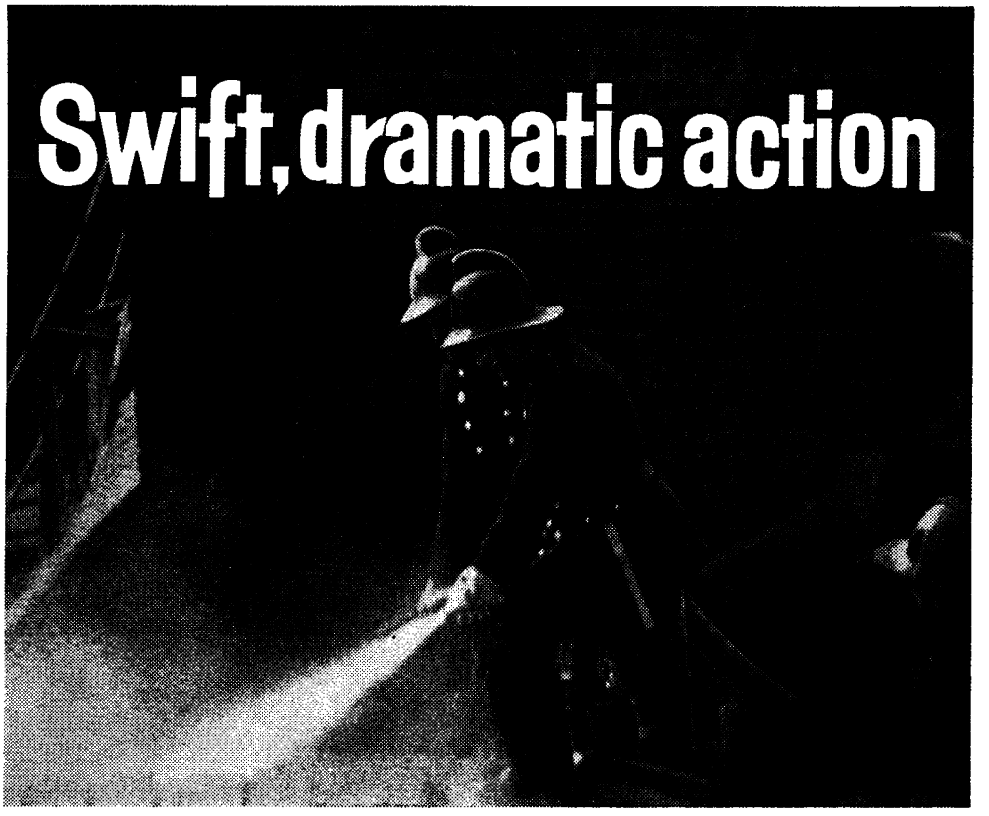

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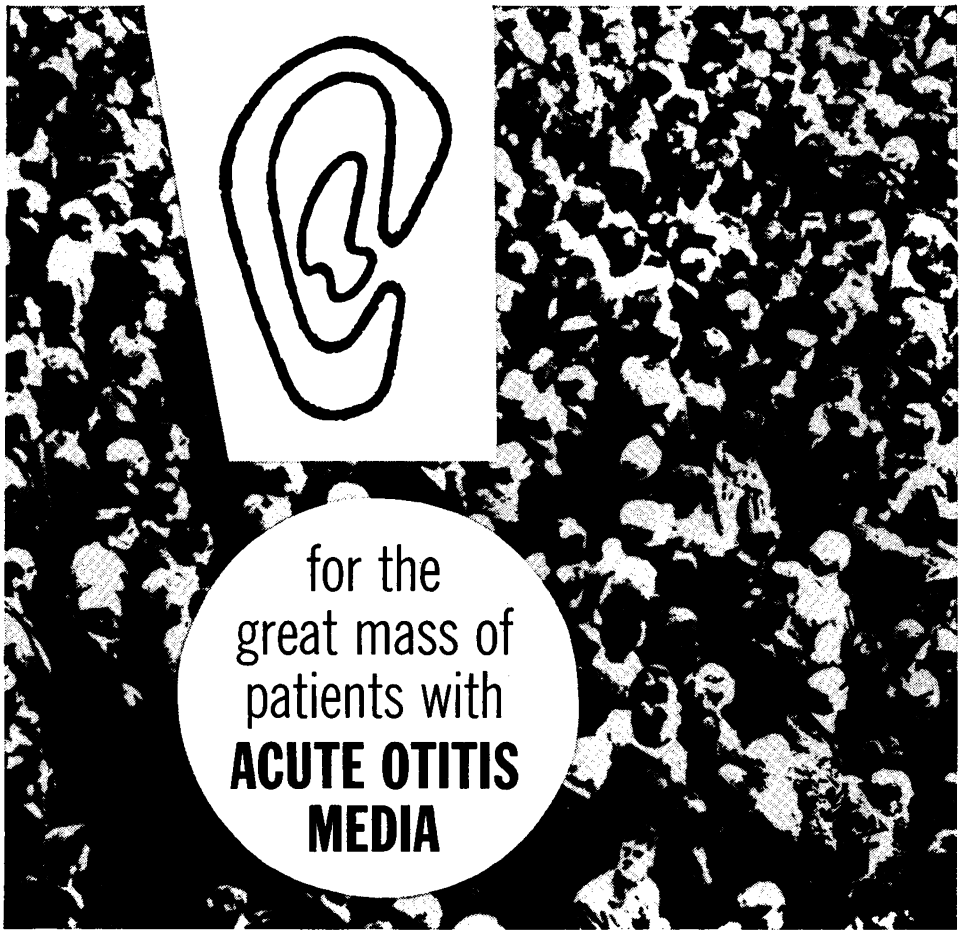

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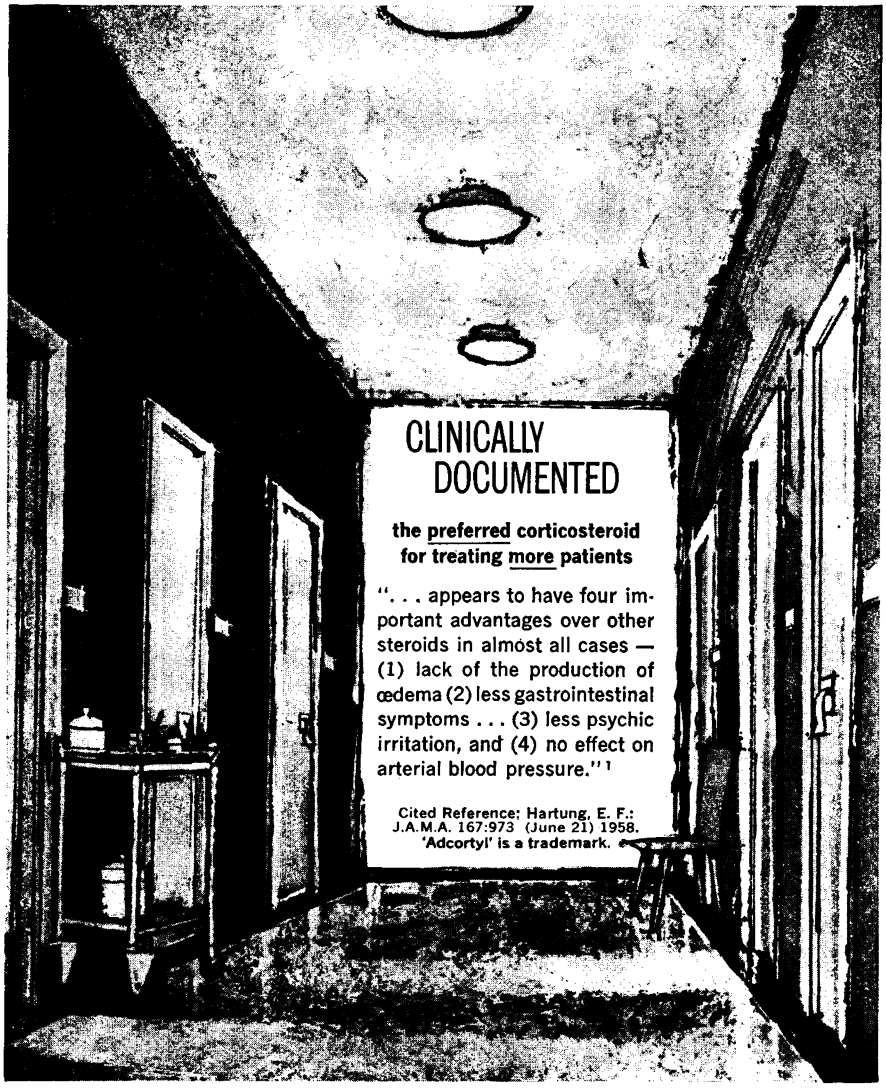

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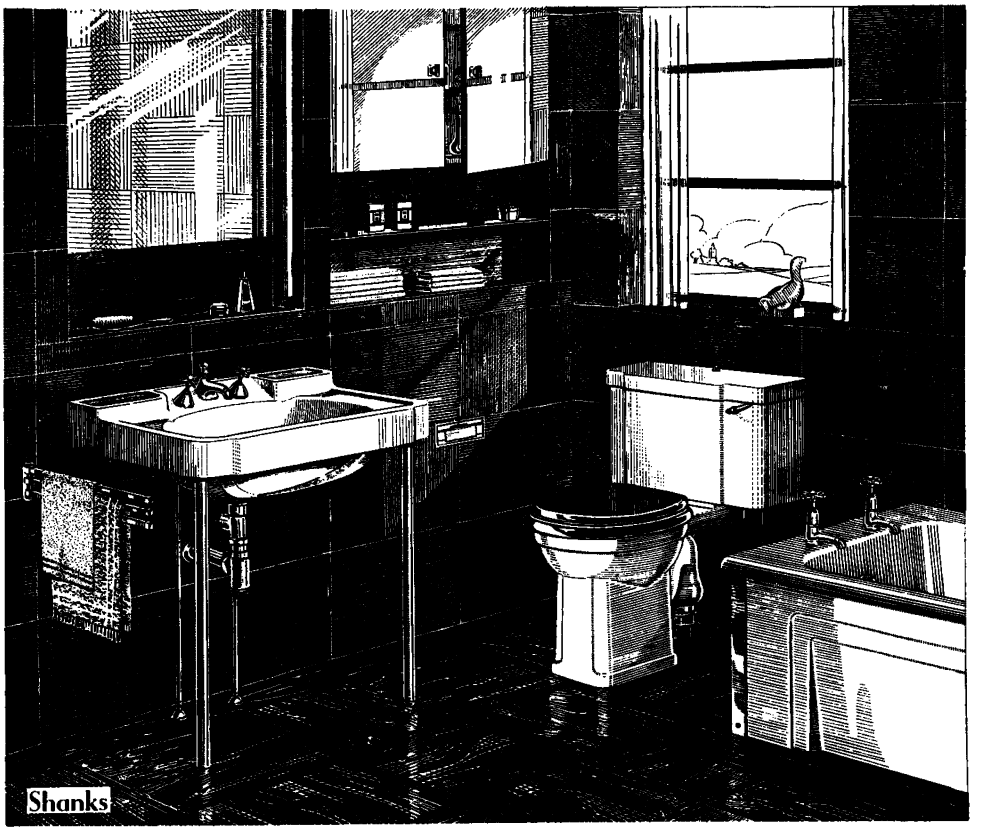

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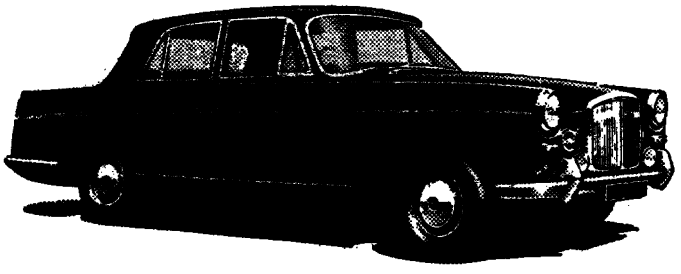

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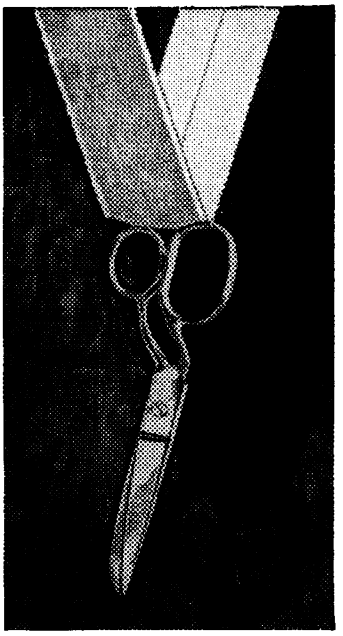

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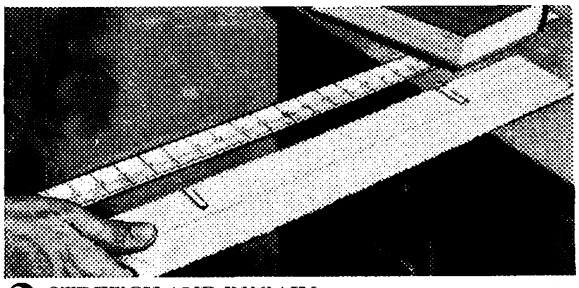

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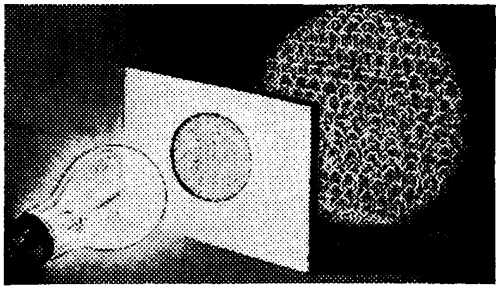

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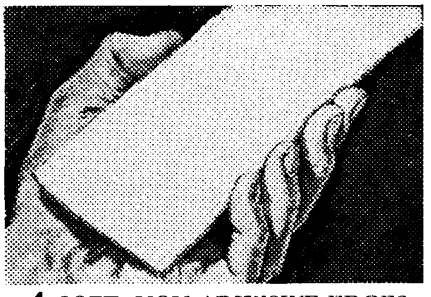

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THE
ULSTER MEDICAL JOURNAL

PUBLISHED ON BEHALF OF THE ULSTER MEDICAL SOCIETY

Vol. XXXI 1st DECEMBER, 1962 No. 2

SIR WILLIAM WHITLA

PROFILE OF A BENEFACTOR

By **CECIL W. KIDD, O.B.E., M.D., Ph.D., F.R.C.P.Ed., D.P.H.**

PRESIDENTIAL ADDRESS
to Ulster Medical Society, 18th October, 1962

IT is written in the Bible that we should take time "to praise famous men and our fathers that begat us." This year—the centenary year of the Ulster Medical Society—seemed an appropriate point of time for such remembrance and reflection. I chose, therefore, the name of one, William Whitla, a past President and benefactor of our Society, as the subject of my address.

On 11th December, 1933, Sir William Whitla died at his home at Lennoxvale. He was in his eighty-third year and had been confined to his room for some four years following a "stroke."

From being a dominant figure, in the forefront of medical, university, and civic occasions, he had almost disappeared in the last decade of his long life from the contemporary life and social scene of the city. It was indeed almost with a sense of shock that one realised that this extraordinary figure had passed on. In his latter years, when visited by his medical friends, it was clear to them that, always a religious man, he had become absorbed in theological matters. I am told that he was surrounded by books concerned with Holy Writ—in particular with the prophet Daniel—and with works relating to miracles and Biblical prophecy, and on these, rather than on medical subjects, he was always anxious for discussion.

On 13th December, a miserable winter's day, he was accorded a civic funeral with much pomp and circumstance, attended en route to the City Cemetery with a service at University Road Methodist Church by representatives of Government, university, the medical profession, and many religious organisations.

So ended the long lifetime of an outstanding personality and a most distinguished member of our medical school in his time.

In what follows I will attempt to present to you an outline or profile of his life: first, and quite briefly, as a continuing theme, following, still briefly, with a few episodic considerations relating to particular facets of his life, and finally I will venture on some assessment of his personality. In the time available to me on this occasion I will not attempt to touch upon the history, local or social, of the times in which he lived. It will remain for a better man than myself, and one with greater knowledge and literary ability, to provide a more worthy and complete biography.

William Whitla was born on 13th September, 1851, at the family home in the Diamond, Monaghan. He was the fourth son of his parents, Robert and Annie Whitla, and was one of a large family, fashionable in those days, of five sons and seven daughters. His father, a man of some affluence in the town, was a pawnbroker and woollen draper who carried on his business in his home in the Diamond and came of a family with roots of over two hundred years' residence in that locality. His mother, Annie Whitla, was the daughter of Alexander Williams of Dublin.

Monaghan was then, as now, a rather undistinguished county town of some three thousand inhabitants, with agriculture as its main economy. As a community it was recovering slowly, like the rest of Ireland, from the decimating effects of the famine and associated epidemics of the hungry forties. Here William spent his childhood and early youth. He attended the Model School—still an excellent educational establishment. I had hoped to find that he had had a modest scholastic career, but it is a fact that he was a bright boy, distinguishing himself by being awarded a silver medal by the Intermediate Schools Inspector.

On leaving school in 1866, at the age of 15, he was apprenticed to his eldest brother, James, who was already well established as a pharmaceutical chemist with a shop on the Dublin Road, Monaghan—still a chemist's shop. Here he served his time, as it is called, and learned the rudiments of his profession. It is said that while at this time he was keen and interested in his work he was also restless and unsettled, evidently conscious of the limited horizon presented by this rather dreary country town. It is not surprising, therefore, that two years later he moved to Belfast, where he continued his apprenticeship with the leading firm of dispensing chemists in the city—Messrs. Wheeler & Whittaker, of 37 High Street.

It is evident that around this time he decided to make medicine his career, and in 1870, while still employed by Wheeler & Whittaker, he matriculated and embarked on his medical curriculum at Queen's College, Belfast. This transition from pharmacy to medicine was very common in those days, and indeed it continued to be fashionable until relatively recent times. We have had, and still have, many eminent doctors in Northern Ireland who started their professional lives as pharmaceutical chemists. In William Whitla's case there can be no doubt that the impress of his early training never left him, and indeed it clearly influenced his subsequent medical and literary career.

In 1873 he graduated, obtaining the Licentiate of the Royal College of Physicians and Surgeons of Edinburgh. Obviously the medical curriculum of those days was appreciably shorter than in the present time. Indeed it is of

interest that, despite the Medical Act of 1858, it was not until 1886 that it became compulsory for anyone wishing to register as a docor to pass an examination in all three main subjects—medicine, surgery, and obstetrics.

William was now 22 years of age. He had had a successful undergraduate career at Queen's College, being awarded a scholarship in 1872. He was appointed for the year 1873-74 Resident Medical Officer at the Belfast General Hospital, Frederick Street (which received Royal Charter in 1875), and it is said that "he practically revolutionised the work of that Institution." He was apparently at this time attracted to surgery, and for some years assisted Professor Alexander Gordon in his private operations.

It is of interest here to pause briefly to look at the social and hospital situation in Belfast at this period of time.

The town was developing rapidly and the move of population from the land to urban industry had become well established. The population of 87,000 in 1851, the year of Whitla's birth, had more than doubled in twenty years—to 174,412. It is not surprising that the needs of the community for accommodation in the General Hospital were inadequately met with 100 beds, and in 1865 the bed state was increased to 186 by the addition of the Charters and Mulholland Wings. When William Whitla was Resident Medical Officer there were students in attendance and annual admissions of patients were about 1,500. It is of interest too (and it keeps us in perspective) that in this year—1874—there is no record of any abdominal surgery. Indeed the first such record is of two abdominal operations in 1893 with 100 per cent. mortality. The era of Pasteur and, with consequential effects, of Lister was still to come.

Now back to Dr. William Whitla. On completing his year in the General Hospital he apparently sought, like his modern counterparts, to extend his medical education and experience. It would be idle to disguise the fact that there are occasional lacunæ in records now available of this part of his life, and his movements in this particular year are shrouded in some mystery. However, I believe he went to England and attended in some capacity St. Thomas' Hospital—then, as now, in the forefront of London medical schools. Here he met Miss Ada Bourne, a daughter of Mr. G. Bourne of Drakenage, Kingsbury, Staffordshire, a well-known farmer of that county. Miss Bourne was herself a remarkable young woman, five years older than William, a friend of Florence Nightingale, and a member—rather to the consternation of her family—of the Salvation Army. She was a Ward Sister in St. Thomas' Hospital and in 1876 she married William Whitla.

They set up house at 41 Great Victoria Street, and commenced general practice. Despite all my efforts I have been unable to obtain a photograph of this house. It was one of a terrace of houses just south of the Great Northern Railway and they were knocked down at the turn of the century to make way for a large factory and a row of shops. However, I *did* find that in his early years in practice he made use of what was called at earlier times Turnpike Cottage and later the Tollhouse, at the end of the Lisburn Road. Here he had a branch surgery, where he saw country folk and others on their way into town.

In the following year—1877—William obtained his higher qualification—M.D., Queen's University of Ireland, with gold medal and first-class honours and commendation—a veritable M.D. jackpot.

We are told by Dr. Strain that in the same year—1877—William was appointed Assistant Physician to the Belfast Charitable Society, which at that time held an important place among the few institutions which provided medical care in the city. This was not a very lucrative appointment, even for those days. He was required to provide all medicines to the house, as well as his medical services, for £40 per annum. He continued to hold this post until 1882, when he became a consultant physician.

About this time he was also appointed to the Ulster Hospital for Children and Women, then in premises in Fisherwick Place, where the Ritz Cinema now stands. R. Marshall (1959) writes, "This was William Whitla's first honorary appointment on a hospital staff, for he had not long completed his term of duty as houseman in Frederick Street, and one can imagine the tornado of energy and enthusiasm that swept into Fisherwick Place."

During the next five years he was engaged in a rapidly developing and successful general practice, numbering among his patients many important and influential families, and he soon became an active and dynamic member of the medical community of the city. In this period it became clear to him—and here his pharmaceutical background must have had its influence—that there was no adequate textbook which met the joint needs of medical students, dispensing chemists, and medical practitioners. And so in his spare time he tried his hand at medical authorship and his best selling classic, "Elements of Pharmacy, Materia Medica and Therapeutics," published in 1882, was the result. Of this more anon.

In the same year—1882—at the age of 31, he achieved the ambition of many young doctors when he was appointed Physician to the Belfast Royal Hospital, Frederick Street. He was to remain a full member of the visiting staff of this hospital, and later of the Royal Victoria Hospital, until 1918—thirty-six years in all—eighteen years in both nineteenth and twentieth centuries.

He rapidly and deservedly achieved success as a physician in the hospital. He was an excellent if somewhat dramatic clinical teacher and he attracted large classes of students. However, R. J. Johnston (1940) throws some doubt on his popularity with the students when he writes of the choice of clinical teachers with which he was confronted in the nineties. "In the medical wards we encountered Professor Cuming, the high priest of philosophic doubt who had long since lost any faith he may have ever had in any form of therapeutics, medical or surgical, and who seemed to question whether diagnosis was possible and if possible whether it was convenient. Whitla, on the other hand, was absolute, almost infallible, epigrammatic, paradoxical, sometimes oracular, . . . so the earnest student of clinical medicine usually found his way to the bedside where Jimmy Lindsay taught his students how to use their eyes, their ears, and their fingers. . . ."

He also developed a large and superior consultant practice, and in 1884 he moved from Great Victoria Street to a more appropriate dwelling at 8 College

Square North (a short distance from this institute). This locality could be described as the Harley Street of Belfast at this period, and this large Victorian terrace house provided him with an appropriate if gloomy consulting suite, together with suitable rooms for the entertainment of his guests and the essential coach houses and stabling in the rear—greatly improved accommodation and address for a young and ambitious consultant.

The resignation from the Chair of Materia Medica of Professor Seaton Reid paved the way for Whitla's appointment in 1890 as Professor in Queen's College. It is said that he soon breathed new life into the teaching of this hitherto dry and dull subject. His book was naturally an asset to his teaching and his appointment to the Chair did nothing to diminish its increasing circulation.

In the midst of his busy professional life he was involved in many other important issues at this time, of which I briefly mention two: first, he was active and interested in the idea of an independent Ulster university, and he and his fellow-professors in the medical school lost no opportunity of pressing this point; secondly, he was closely involved with his colleagues, from 1896 on, in the movement to plan and build a general hospital of adequate size and modern facilities for the city. It is of interest too that William, in 1897, expressed marked preference for the Grosvenor Road site rather than the portion of surplus ground in Ormeau Park which was suggested. He had strong views against single-story planning and was many years before his time in appreciating the feasibility of multi-storied hospitals.

Professionally and academically, William Whitla was now on the crest of the wave, and the turn of the century and its opening years see him in the forefront of his profession. For him perhaps no distinction award Bentley car, but, socially and financially, he had proceeded to the opulent carriage class of his day. In a few years' time—1906—he was to acquire the delightful place at Lennoxvale, still retaining his professional house at College Square North.

In 1902 he was knighted in the Coronation Honours List—rather unexpectedly to some of his colleagues.

He was now 51 years old—active and energetic, and with a wide variety of extra-curricular interests, some of which I will refer to later. He bore himself with dignity and aplomb, and indeed he was almost the inevitable selection of the profession for the presidency of the British Medical Association for the Annual Meeting held in Belfast in 1909. His hospitality on this occasion was notable and he presented each member attending with his recent volumes—"The Theory and Practice of Medicine."

He was extern examiner at Glasgow, National, and Dublin Universities for many years and degrees were conferred—M.A., M.D., LL.D., and D.Sc.—honoris causa by these universities and by his alma mater.

In 1919, the year of his retirement from his chair in the university, he was appointed Honorary Physician to the King in Ireland and subsequently Pro-Chancellor of the University. In the previous year—1918—he had retired from his wards in the Royal Victoria Hospital, being appointed consulting physician.

This severed his active connection with the hospital of thirty-six years—he was now 67 years old—and he retired too from active practice, giving up his house in College Square North.

All that has gone before has been in the nature of a catalogue of the basic activities and achievements in the professional life of this interesting man. In finalising my profile I will content myself with some brief descriptions of special matters lifted, as it were, out of the sequential chronicle of his life.

I must now touch on the personal, social, and domestic life of William Whitla.

In appearance he was impressive. Stoutly built and bearded, he was 5 ft. 8 in. in height, walked with a limp from osteo-arthritis of a hip, and was striking in his habitual appearance in frock coat and top hat, the professional attire of his day: altogether a distinguished figure of a man, as is apparent in the cartoon by Spy.

Many say he was a simple, kindly man with a saving sense of humour. Others have described him to me as pompous—certainly he had a high opinion of his capabilities. He was skilled in dramatic narrative and had a florid manner of delivery, qualities which he used to great advantage in his clinical teaching, and in addressing meetings, religious, social or political. If he had not taken up medicine he would probably have gone into the Church or on to the dramatic stage. His family were Presbyterians, but early in his married life he and his wife were attracted to the evangelism of the Methodist Church. He was indeed a pillar of Methodism, often preaching in their churches. For many years he was President of the Y.M.C.A. and he was also closely interested in Jewry, numbering rabbis among his friends.

He and Lady Whitla were essentially hospitable, public-spirited, and philanthropic. They were close friends of General Booth, who frequently stayed with them on visits to Belfast. Both were ardent Shakespearians and were personal friends of Sir Frank and Lady Benson, who on many occasions were their guests at College Square North or Lennoxvale when appearing in Belfast.

I referred earlier to his wife, Ada, who also lived to a ripe old age, predeceasing her husband by eighteen months. All her life she was intensely religious, holding strong evangelical views, and she was a writer of versatility and distinction. I am told by her family (who speak of her as eccentric) that her allegiance to the Salvation Army was such that she wore a scarlet nightgown throughout her life. On the occasion of her attendance with her recently knighted husband at a garden party at Buckingham Palace she resurrected for the occasion her Salvation Army uniform—an implied rebuke or admonition to the reigning sovereign, Edward VII.

Whitla the Traveller.

For his time—in days before study leave, with or without pay and whole or half travelling expenses, had descended on the profession—he was a great traveller. The World Fair at Niztiz-Novgorod (no iron curtain), Palestine, Italy, Sicily, France, and Canada were among the visits he made, and on his adventures he took much pleasure in lecturing to both medical and lay audiences.

In the course of his travels he was an inveterate collector of bric-a-brac and objets d'art, as was the fashion of his day. He filled his houses with pictures, some good and some not so good, and some very ornate statuary. A number of these pieces were over-large to be housed either in his home or in the Medical Institute, and we find an example in the foyer of the Museum and Art Gallery, Stranmillis. This large representation of Galileo in white marble by Pio Fedi shows him seated in contemplation. It is a beautiful piece of statuary, and it was given by Whitla to the Ulster Medical Society. Finding it over-large and weighty to accommodate in the institute, they presented it to the Museum and Art Gallery.

His Political Life.

From early times Whitla was obviously a useful addition to any political platform. He was surprisingly a strong Unionist. One might have imagined him as a Liberal Home Ruler, but no. He signed covenants and he was a member of the abortive Irish Convention of 1917-18.

In December, 1918, he was elected as the first representative of Queen's University in the Imperial Parliament, Westminster, with a large majority. His re-election in November, 1922, was unopposed and he retired in 1923.

His family say that his contributions from the floor of the House were rare and infrequent—indeed some doubt if he made his maiden speech. In his defence one could say that then, as now, the opportunities for useful intervention by Northern Ireland representatives in that House are few. However, it is said that he attended well and was often to be seen in the smoke-room, surrounded by his friends.

Whitla the Medical Author.

I made mention earlier of Whitla's proverbial energy and the wide variety of interests in his busy professional life. It is said by colleagues that when engaged in writing his books he often worked eighteen hours per day for long periods.

In 1882 his "Elements of Pharmacy, Materia Medica, and Therapeutics" was published, and it rapidly became a best seller. It was indeed a classic, one of a select group of medical text books, and it had a readymade public—doctors, pharmacists, and medical students. The style now appears to us old fashioned—even the illustrations of the pharmacist's tools, pestle and mortar and the like—and the writing seems florid and pompous, but it was in tune with its period.

This book had a considerable and continuing sale, went to twelve editions, and appeared in several languages. The last edition appeared in 1939, revised by Whitla's old friend, Professor Gunn. It was a notable financial success among medical books of this or any other time.

Next, in 1891, was published the "Dictionary of Treatment," which too became one of the outstanding medical text books of its time. It was an immediate success—another best seller—and was published in many languages; and it had an American and a Chinese edition. In a way this dictionary type of a book was a natural sequel to Whitla's first book, and he often said he was pressed into writing it by his friends and colleagues.

The first three editions were entirely the product of his fluent pen, and for the next four he obtained the direct collaboration of a variety of his colleagues, including A. B. Mitchell, Cecil Shaw, and R. J. Johnston.

In 1923 was published the seventh edition—Whitla's last—and happily this work has remained with our medical school. Before his death Sir William sought out Dr. Sydney Allison and entrusted him with the task of continuing the book, and so, in 1938, five years after his death, the eighth edition was published. In the formidable task of rewriting and rearranging the text, Dr. Allison had Mr. Cecil Calvert as surgical author, and they had ten colleagues as special contributors.

In the ninth edition, published in 1957, Dr. Allison was joined by Dr. Howard Crozier and they enlisted some twenty-six contributors, all members of the Belfast Medical School.

Whitla used to tell the story of how he put the first manuscript of this book aside during a busy period in his practice; when later he looked over it he thought so badly of both style and material that he instructed his servant to burn the lot in the furnace of a factory behind his house. By chance the factory happened to be closed on that day, so the papers were stacked in the coach house where Whitla later found them. He re-read his script, felt this time that it was good, and so resumed his labours with enthusiasm.

Finally, in the medical field, Whitla published, in 1908, "The Theory and Practice of Medicine," in two volumes. This text book of medicine was an early example of the synopsis type, providing in condensed form a series of independent articles on a wide variety of medical conditions. Reviewers considered it to be a valuable source of reference, though it was noted that there was a certain amount of repetition from his other two text books.

It is sad to relate that, by comparison with his earlier successes, this book was a flop. However, two best sellers in the lifetime of one man is a great achievement. While he cannot, as some people over the years have surmised, have made a fortune from his books, he certainly laid the foundations to his undoubted wealth by the steady, virtually untaxed income from this source from 1882 onwards.

This note on his writings would be incomplete without mention of his excursion into another field. In 1922 he published the result of many years' Biblical study —a volume on Sir Isaac Newton's "Daniel and the Apocalypse." Biblical prophecy and miracles held a great fascination for him, and in this volume he contributed much original thought and even translated Newton's Latin quotations into English.

Whitla the Benefactor.

First we must accept that for a doctor living in his times he was a wealthy man. From his early days he displayed shrewdness and business acumen uncommon in members of our profession. The income from his books, his practice, and from private sources made him probably the wealthiest professor at Queen's, and much of his wealth ultimately came to the University. His stockbroker was quick to appreciate that he had almost uncanny foresight in his Stock Exchange

activities. Many are the stories of the "killing" he made in oil shares when most of his contemporaries were cautiously buying Consuls or Co. Down Railway shares. In his case success led to success, and by the turn of the century he was comfortably off; by the time of his retirement he was wealthy by any standards.

On his death he bequeathed his pleasant house at Lennoxvale and its extensive grounds to the University as an official residence for the Vice-Chancellor. After many personal and private bequests he made the University his residuary legatee and in his will suggested that about £35,000 should be used to provide either an assembly hall or a men's hostel. After much delay the Senate decided in 1935 to build an assembly hall in the south-west corner of the grounds. It was not until 1939 that the foundation stone was laid by the Marquis of Londonderry, then Chancellor of the University. In 1942 the building was completed except for internal fittings, and it was immediately requisitioned by the Ministry of Commerce. At length, in 1949, the Sir William Whitla Hall, finally completed and furnished, was opened by Sir Henry Dale. It is of passing interest to note how well this simple functional style building blends with Lanyon's Tudor Gothic, and how well and surprisingly the new physics building integrates into the red brick picture. This is William Whitla's outstanding monument. It is worth noting that financial help in the form of private benefactions has never been forthcoming on any large scale in the history of the college or University. The Musgrave and White bequests are outstanding exceptions—the only other bequest on a similar scale is William Whitla's. The landed gentry and industrialists of our Province, unlike their counterparts in Great Britain, have done little for the University.

Next, the Whitla Hall at Methodist College, Belfast. This fine building was built as an assembly hall and was opened by Lord Craigavon in December, 1935. Sir William had been a governor of the college for twenty-seven years at the time of his death and he bequeathed £10,000, free of duty, for this specific purpose.

Finally, we come nearer home and look briefly at his benefactions to our profession.

The earliest gift I can find is his presentation of the Good Samaritan stained-glass window to the old Royal Hospital, Frederick Street, in 1887. This beautiful window was removed to the out-patients' waiting hall of the Royal Victoria Hospital of 1903, and much more recently was transferred to its present site at the end of the hospital corridor.

Next I must refer to the Ulster Medical Society, whose story, in this century, is so closely linked to this building. It was formed one hundred years ago—in April, 1862—by the amalgamation of two earlier bodies: the Belfast Medical Society and the Belfast Clinical and Pathological Society; and the first president was Professor J. C. Ferguson, who held the Chair of Medicine in Queen's College. Meetings were held in a variety of suitable and unsuitable places—rented rooms in High Street and Lombard Street, the General Hospital and the Museum in College Square North, next door to Whitla's house. I may say that Whitla was an enthusiastic member of the Society from his early days in the profession and

he was Honorary Secretary in 1876, Honorary Treasurer in 1883, and President first in 1886 and later in 1901. It was clear to him that if the Ulster Medical Society was to prosper it must have a permanent home. And so, on a site of fifty feet frontage, at an annual ground rent of £60 from the Royal Belfast Academical Institution, this building was erected. The foundation stone was laid by Dr. Peter Redfern in April, 1902, and the building was declared open by the Earl of Dudley, Lord Lieutenant of Ireland, on 26th November, 1902. It was handed over by the donor, furnished and equipped, including billiards table, to seven Fellows of the Society as trustees. The cost was in excess of £6,000 (some say £8,000), which was high in those days when the Samaritan and Benn Hospitals had been built for around £3,000 each.

This building was not unnaturally William Whitla's pride and joy—his busts, oil paintings, well-carved heads representing Redfern, Gordon, Andrews, and McCormick, the stained-glass window in the library commemorating the bravery of Dr. William Smyth and Brendan McCarthy, and the staircase window from his own home in College Square North, representing a scene from "As You Like It," in which William himself appears as Corin—all this is part of the history of our profession and perhaps a last bastion of Victorian medicine.

It would be idle to disguise the fact that the Society, in relation to its home—this institute, has not been without its financial crises. Indeed I may say we are involved in one at the present time. For my part—and I am sure I must speak for many of my age—I regard this building as part of our professional heritage. Nevertheless, realism and common sense and an appreciation of the changing scene must be our guide and our responsibility to those who succeed us.

Lastly, as I said earlier, Sir William was President of the British Medical Association for the year of its visit to Belfast in 1909. For this occasion he was presented by his friends with a Presidential Badge and chain of office in gold and enamel. This he subsequently entrusted to the annual care of the President of your Society.

And so as we started with this chain of office so do I end this inadequate and incomplete chronicle of William Whitla, but not before I have attempted to make some assessment of his personality.

Robert Louis Stevenson writes—"There are men and classes of men who stand above the common herd"—certainly William Whitla did. I think he was a product of his day and age—a successful Victorian physician, pompous and self-opinionated with a good conceit of himself, dramatic, eloquent, of considerable histrionic ability and power, an opportunist, a very able business man, and a truly prolific worker. He denounced tobacco and alcohol in his writings, but enjoyed his pipe and his wines, and was an excellent host. All these are impressions I have gained from his friends still alive. Truth to tell, I have literally lived with him for some months past.

I am dismayed to find that, even now, I am unable to offer a definitive opinion, but then my target was a profile of the man.

Dr. Robert Marshall was asked—and with his great gifts he is so often turned to on such occasions—to suggest a suitable and adequate inscription for a memorial

tablet to Sir William in his old wards in the Royal Victoria Hospital. He suggested words from the fourth verse of the first chapter of the Book of Daniel, and they are to be found on the tablet in the entrance to Ward 2:

"Skilful in all wisdom, cunning in knowledge
and understanding science."

I am convinced now, at the end of my journey, that William Whitla, the apothecary's apprentice from Monaghan, who achieved fame and fortune in our medical community, watching from the shades as he has indeed watched over my shoulder all evening, would have accepted this quotation with his benign approval.

Acknowledgments.

I am grateful to many of my colleagues for their interest and help in the preparation of this paper, and in particular Dr. Robert Marshall.

I am indebted to Dr. Benson Swain and Mr. H. Bryans, Ulster Museum, for assistance with photography, and to Mr. Black, pharmaceutical chemist, Monaghan, for local background on my subject.

Miss Webster, University Library, Institute of Clinical Science, produced a collection of Sir Wm. Whitla's books in many editions, and I gratefully acknowledge her help and co-operation. She has prepared the list of Whitlaiana appended.

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THE NEW PHOTOGRAPHY

By **D. C. PORTER, M.D., D.M.R.**

OPENING ADDRESS OF THE WINTER SESSION

Royal Victoria Hospital, 9th October, 1962

WHAT I have to do this morning has been described by many as an honour and a pleasure. For me too it is both, and may I say that the honour of being chosen as your orator today is not in any way lessened by the fact that, with the passage of time, alarmingly rapid in the past few years, my turn on the rota of orators has inexorably come round. Nor is the pleasure diminished by the sense of my inadequacy for the task, though I assure you I am fully aware of this.

My first duty is to welcome our students at the opening of the new hospital session, beginning officially this morning. I do this on behalf of the entire medical and dental staff. In particular may I welcome those of you who are in your first hospital term and who are still strangers in what has become to many of us over the years a familiar and well-loved community.

Research into your records shows that of one hundred and four students in the first hospital year, eighty-six are medical and eighteen dental. Almost all the dental students are of Ulster stock, but the medicals hail from far and near. Approximately one-third have come to us from overseas; nineteen from Commonwealth countries, including Nigeria, Ghana, Rhodesia, Kenya, Malaya, Trinidad, British Guiana, and Mauritius. Other nations represented are America, Persia, India, Thailand, Goa, the Republic of Ireland, and Pakistan. This picture is in striking contrast to that of my own student days. As a resident pupil thirty years ago I had the privilege of sharing a room in the East Wing with the only overseas student in that year.

In bidding you welcome I know that you will have much to contribute to the life and work of this great hospital, and I know too that you will find here every opportunity and facility to equip yourselves for your life's work. I hope that, after not too many years when you qualify and go out from this school, you will take into whatever work you may choose and to whatever country you may go or return something of the atmosphere of the Royal, something of the devotion and dedication to patient, not only of doctor and nurse but of entire staff, which I believe you will find here and which is so essential a part of the career which you have chosen.

You will now recognize that all the world is divided into only two classes. On the one hand doctors—or dentists—and on the other patients. Furthermore, all patients to you will now appear alike. On the operating table, the X-ray

table, the examination table or chair, a patient is a patient, be he rich or poor and irrespective of class, creed or race, origin or ideology: all are basically human with the same ills and problems, the same stresses and fears.

The relationship of doctor and patient, we are told, is changing, and the patient today may be cured of a once fatal illness by an expert, whose name he didn't quite catch, instead of dying with his old family doctor sitting loyally at the bedside. I suggest to you that you will find here the expert who will be not only known by name to the patient but whose loyalty and sympathy will contribute much to his reassurance and recovery.

You are starting your hospital work at a peculiarly interesting and exciting stage in the development of teaching hospitals in the United Kingdom, and not since the opening of the present main hospital building in 1903 have we had such an extensive programme of rebuilding and new building to accommodate the ever-expanding needs of investigation and treatment for the patient and the ever-lengthening syllabus for the student.

On this site an ophthalmic and ear, nose and throat hospital, an out-patient block, operating theatres, a radiology department, and a dental school are but part of a vast development scheme costing several millions, and much of the work on these buildings will be completed during your student days. The ophthalmic hospital and the theatre and radiology block are already familiar outlines against the diminishing landscape of the Black Mountain and Cavehill. The loss of our mountains is an item on the debit side—for I believe successive generations of students, doctors, nurses, and patients have looked away to these hills to find refreshment and strength. Later building projects include multi-storey ward blocks, a new central laboratory, and a medical staff residence. These facilities with the present university and clinical science accommodation, providing always that staffing is adequate, will ensure that this hospital will remain, as it has stood for more than a century in the forefront of British teaching hospitals.

The opening of the new X-ray block will mark an epoch in the history of radiology in this school. I have chosen as the subject of my address to you this morning "The New Photography," and in thumbing through the pages of the story of this relatively young branch of medicine I hope to tell you a little of its history in our own school.

Brief mention must first be made of some of the great experimental scientists whose work made available an ancillary to diagnosis and treatment of disease of which it has been said, "Only the discovery of anæsthesia is reckoned to have been a greater boon to mankind."

Wilhelm Conrad Röntgen is, of course, the first name you will expect me to mention, and rightly so. But, as Sir Isaac Newton has so modestly said of his own work, "If I have seen further than others it is because I stood on the shoulders of giants." Röntgen was very much aware too that he stood on the shoulders of others and that his discovery was the culminating triumph of more than two centuries of patient scientific research.

Who were these giants who laid the foundations on which Röntgen was later to build, and what did they achieve?

William Gilbert, physician to Queen Elizabeth in the latter half of the sixteenth century, has been called the father of electric and magnetic science. Galileo, in the University of Pisa, a little later was evolving the principle of the air-pump. In these two lines of scientific research the production of electricity and the reduction of the pressure of a gas in a vessel by the air-pump, lie the beginnings of X-ray technology.

In the year 1650 Von Guericke, of Magdeburg, devised both the first frictional electrical machine and the first mechanical air-pump; but it was Francis Hauksbee in England, more than a half a century later, who first combined these two aspects of Von Guericke's work, by his experiments on electrical discharges in vacuo. Robert Boyle, youngest son of the first Earl of Cork—often referred to as the Father of Chemistry, and Isaac Newton were both active in these fields of scientific research at that time.

A little later Sir Humphrey Davy, West Country chemist and metallurgist, not only gave us the miner's safety lamp and described the effects of the inhalation of laughing gas, he deserves a place in our radiological gallery as the first scientist to use an electric current for the decomposition of gases. He was also the discoverer of several metals, including barium and strontium.

Now Humphrey Davy, whilst Professor of Chemistry at the Royal Institution, had a technician or lab. boy called Michael Faraday. He was the son of a London blacksmith and eventually succeeded his chief in the Chair of Chemistry in the Royal Institution. Faraday's great interest lay in the close relationship between moving electricity and moving magnetism, and he laid the foundation of modern electrical engineering by his monumental discovery of electro-magnetic induction. An early development of this was the induction coil of Ruhmkorff which soon replaced the frictional electrical machines as a more convenient means of producing high tension current. The transformer and the electric motor and generator followed quickly and naturally.

The phenomena associated with the discharge of electricity through rarefied gases, though defying explanation, were quite well known in the early nineteenth century. It was found that as the gas pressure in the vessel was reduced, the length of spark produced by a given strength of current became greater till eventually the discharge became silent and brightly coloured.

At this stage a skilful German glass-blower—Geissler, in 1835, became famous for the Geissler or vacuum tubes containing traces of different gases which gave beautiful luminous discharges. These we know today as neon lights, and they enliven our great cities at night. In these the positive column of light fills the tube which can be bent into letters or fantastic shapes. Red neon light is extremely bright and will pierce fog or mist. It is used for beacons at aerodromes and was particularly valuable before the introduction of Decca navigation. But at even lower gas pressures the positive column of light disappears and a dark space around the cathode extends to fill the whole tube. This dark space was first

described by Sir William Crookes about 1870 and is known as the Crookes' dark space. Crookes was a London scientist of vigorous imagination, who, with the advantage of more efficient vacuum pumps, contributed much to the development of the cathode-ray tube to which his name is attached and which we know so well today.

Many of the modern electronic devices with which we are familiar, the X-ray tube, television, radar, and much of Telstar's electronic equipment have their origin in the fundamental work carried out by Crookes in this period. Indeed it has been said quite recently that perhaps the finest monument to Crookes' work is the radio-telescope at Jodrell Bank.

It is obvious that Crookes on occasion must have generated X-rays in abundance and he, with other workers in this field in Europe and America, recorded the inexplicable fogging of wrapped photographic plates, a mystery which was cleared up only by Röntgen's discovery several years later.

The Crookes' dark space led to much research in Germany, and the work of Hittorf, Goldstein, Hertz, and Lenard should be mentioned. Goldstein referred to that remarkable motion which radiates from the cathode in rarefied gases. Although the tube was dark, something was present which caused the wall of the tube to fluoresce and furthermore an object, for example mica, if placed between the cathode and the glass wall of the tube, cast a shadow in the fluorescence. The German workers thought this something was an invisible ray and Goldstein, in 1876, called it the cathode ray—a name we retain to this day. It was Crookes, however, who hazarded the guess that the ray consisted of fast-moving particles, smaller than atoms or molecules of the gas—a fourth state of matter or radiant matter. This shrewd speculation was prophetic in the light of the discovery of the electron in 1897 by J. J. Thomson, Cavendish Professor at Cambridge.

Thomson's work on the nature of the cathode ray and on the conduction of electricity through gases was contemporary with that of Röntgen in Germany, but it was not until two years after Röntgen's discovery that Thomson isolated the electron. Writing of these two great men, Thomson and Röntgen, Lord Rayleigh says, "Their work ultimately coalesced, mutually fertilizing one another." Later work by Thomson and his brilliant team, including Lord Rutherford, on the positive rays of the cathode tube was to prove of immense value in the study of new atomic groupings and in isotope chemistry.

But it was left to Röntgen to stumble on the all-important truth that the impact of the cathode rays on the glass wall of the tube gave rise to another ray—something quite new and different, which he called the X-ray. Röntgen made his momentous discovery by the chance observation of fluorescence of a sheet of paper painted with barium platino-cyanide, a compound well known for its property of emitting light with cathode rays and still widely used in the manufacture of fluorescent screens. The phenomenon was noted, however, at some little distance from the cathode ray tube and was obviously different from the fluorescence on the wall of the tube itself. In the sense that most discoveries

are accidental, this one may be regarded as such, but the only accidental circumstance connected with the discovery of X-rays was the fact that their detection had been missed for so many years by so many workers.

The historic date was Friday, 8th November, 1895. Röntgen was in his fiftieth year and held the position of Director of the Physical Institute of the University of Wurzburg, Bavaria. He kept his own counsel for several weeks, telling neither his staff nor his wife of his startling discovery. About six weeks later, on the 28th December, he submitted his paper, "On a New Kind of Rays," to the Physical Medical Society of Wurzburg. With characteristic thoroughness he set out quite clearly the source of the rays, their penetration of an object depending on its density and thickness, their properties of exciting fluorescence and affecting a photographic plate. Also the absence of reflection, refraction, deflection, and focusing of the rays. The paper was supplemented by shadow pictures of many objects, including the bones of the hand. To these basic observations little of fundamental value has been added over the years.

Röntgen had taken the trouble to have his paper printed and circulated to the leading physicists in Germany, Britain, and America, before reading it to the Physical Medical Society of his own university, and it was probably this rapid dissemination of his discovery which made such a tremendous impact on the world. One of the British physicists to whom Röntgen sent his paper was Lord Kelvin of Glasgow. Kelvin, formerly Sir William Thomson, was born in Belfast and educated for a time at Inst., where his father, James Thomson, was Professor of Mathematics. This Thomson is not to be confused with Sir Joseph, always referred to as Sir J. J. Thomson, of the Cavendish Laboratory, Cambridge, about whom I have been speaking. Both made outstanding contributions to the early physics of radiology.

The story of Röntgen's life and work by Otto Glasser is one of the great scientific biographies of this century, and is, I imagine, familiar to many of you. In it Glasser writes, "Within a few days after the discovery of the rays Röntgen's name suddenly had become known in the most distant outposts of human culture. The modest scientist in his simple Wurzburg Institute could scarcely understand that he was being surrounded with a glory such as no man of science had experienced previously. Yet he well appreciated the significance of his discovery and when submitting his communication for publication he said to his wife, 'Now the devil will be to pay.' "

Röntgen's outlook on physics remained thoroughly classical and this is surprising as his basic training was, to say the least, irregular, if not completely lacking. Born at Lennep in the German Rhineland in 1845, his youth was spent in Holland, to which his parents emigrated when he, an only child, was 3 years old. He had a chequered school life at Utrecht. Expelled from school because of loyalty to a fellow-student in a harmless prank, he had the greatest difficulty in continuing his education. He failed to matriculate at Utrecht University, where later he was offered the Chair of Physics, which he perhaps understandably refused. After much disappointment he eventually entered the Polytechnical

School in Zurich at the age of 20, where, three years later, he qualified—not as a physicist but as a mechanical engineer. During his years in Zurich, he was greatly influenced by August Kundt, the young Professor of Physics, who persuaded him to spend a further year working in his laboratories observing the effects of gases on conductivity. At the end of that year he published his thesis on "Studies on Gases," and for this he obtained a Doctorate of Philosophy. There were many setbacks in his early life, and again and again the fact that he had failed to matriculate blocked his progress. He possessed, however, a great love of experimental physics and an aptitude for careful and accurate observation, and these, together with sheer industry, overcame for him these tremendous early obstacles.

Further details of this remarkable career, I must omit, as also the story of his love of mountaineering in the Swiss Alps, and of his marriage to the Swiss innkeeper's daughter, Bertha Ludwig. It was undoubtedly the happiest of marriages, but long years of scientific bachelorhood inevitably led to minor domestic troubles from time to time. For these emergencies, however, the great man developed a technique, and we read that when he and Bertha disagreed in the city he simply hailed a cab, bundled her in, paid the fare, and sent her home.

The notoriety which followed Röntgen's discovery was perhaps largely due to the lay press which, finding that science had a news value, devoted much space to the invisible light which could penetrate the stoutest clothing. Public response was magnificent. Morality brigades were formed overnight to resist to the death the destruction of all decency and privacy. A London firm rose to the occasion and made a fortune from the sale of X-ray proof underwear. New York was also in the van with a determined attempt to obtain legislation against the use of X-rays in opera-glasses in the theatres. Harvey Graham writes, "Slowly and with some disapopintment the general public realized that an X-ray picture was not pornographic nor ever likely to be." New York and London grinned a little shamefacedly, and thereafter left the X-rays to physicians and surgeons who seemed to find an unaccountable delight in the disappointingly moral shadow pictures.

Congratulations and honours were literally heaped upon Röntgen. Among these was the first Nobel Prize for Physics in 1901. Essentially shy and modest, he declined endless invitations to lecture. He would not consent to address either the Reichstag or the British Association. He declined the title 'Von' and the offer of the Presidency of the Reichanstalt. He refused to derive any financial advantage from his discovery and strongly opposed all attempts to name the new rays the Röntgen rays. In his will he left his Nobel Prize to the University of Wurzburg, but this, with his entire personal fortune, became valueless as a result of deflation after the First World War.

But Röntgen's reward was great. Before his death in his seventy-eighth year on 10th February, 1923, he had ample proof of the tremendous benefits his work had brought to medicine and industry and he derived great consolation from the knowledge that his discovery had done so much to relieve the suffering of wounded—both friend and foe—during the war years.

The first fifteen years of radiology were notable for the rapid expansion and acceptance of this new method in medicine and there were few hospitals which did not establish an X-ray department. Boards of management and hospital committes then, as now, played a valuable part in the evolution of radiology and again and again the early records tell of the enlightened support given by them to the physician in charge of electrical treatment or as he was in some cases referred to as the medical electrician. The early simple radiographs were quickly improved upon by the introduction of contrast media to various parts of the body before or during radiography. Bismuth, in 1900, and later barium, added greatly to the diagnostic value of X-rays in the gastro-intestinal tract. Air, as a contrast, was introduced into the cerebral ventricles as early as 1918. But it was the halogens and in particular iodine, also first introduced in 1918, which contributed most to the improvement of X-ray techniques. Selective iodine compounds of low toxicity and rapid absorption and excretion can now with safety be used to demonstrate almost every hollow viscus, duct, and vessel of the body.

Progress on the clinical side has been possible only because our men of science and technology have continued to give us equipment with which to do better and safer work. All improvements have aimed at clearer diagnostic pictures with less radiation to patient and operator.

Let me hark back to the early days. In the records of St. Thomas's Hospital we find that, in 1896, a chest plate of a girl aged 10 years had an exposure of thirty minutes. A picture was taken of the wrist of a man of 40 in twenty minutes and of a finger in five minutes. A hip joint had an exposure of one hour. A 45-minute exposure to the skull resulted ten days later in complete epilation over the temporal region. This, however, soon passed, and in three months the hair had grown again. Later another skull radiograph produced temporal epilation, followed by a blister and an ulcer two inches square. This took three weeks to heal. In spite of these appalling hazards the number of cases coming for examination increased. And so it has continued to increase ever since. With modern techniques, however, exposures seldom exceed a few seconds and with filtration of the more harmful soft radiation, few, if any, in this audience can have seen an X-ray burn from diagnostic radiation.

The technical achievements which have led to this happy change are many and complex, but a few should be mentioned. The first real advance was the hot cathode tube, invented by Coolidge in 1913. With this the quantity and quality of X-rays produced could be accurately determined, and this tube, modified and improved, has not yet been superseded. Once the tube had been perfected, power units soon improved, the transformer replaced the coil and valves replaced mechanical rectifiers. Doctors Potter and Bucky, in 1916, introduced the lead strip diaphragm which, by cutting out secondary radiation, improved out of all recognition the detail on the film. Meantime photographic film was being improved and, in 1918, the double-coated film was introduced, and with it the double intensifying screens which together have cut down exposure times very considerably.

Screen examination had been carried out from the earliest days and it is interesting to learn of the localisation of foreign bodies entirely by screen examination and careful note-making during the First World War. Radiation dosage received by patient and staff in these sessions must have been enormous. But with research on the electronics of the screen image and in close association with advances in television, came the idea of image intensification. By means of the modern image intensifier it is possible with the same amount of radiant energy from the X-ray tube to produce a fluoroscopic image about one thousand times brighter than can be obtained by the orthodox method. This allows more prolonged screening without radiation damage to the patient and with a greatly improved screen image and perhaps best of all—in subdued daylight, rather than in total darkness.

Prolongation of the screen image has made cineradiography possible and this is now being used increasingly in the study of the function of the gastro-intestinal tract, the cardiovascular, and other systems of the body.

Closed circuit television, as you already know, has great potential value in clinical teaching, and in radiology too it is being used increasingly in conjunction with the image intensifier, either for viewing beside the patient or by a system of monitors for teaching in classroom or remote viewing in the operating theatre.

One of the latest applications of electronic development to radiology is that of the Videotape, already widely used in commercial television. With this a simultaneous recording of the television screen image of the patient can be made without even the small additional radiation required for cine recording and without the relatively elaborate and time-consuming processing of cine film.

These modern techniques of image amplification, cine radiography, television, and Videotape recording, while retaining much of the value of conventional still film techniques in outlining anatomy and pathology, will lead to a much greater emphasis on the study of physiology and disturbance of function and must therefore increase tremendously the value of our diagnostic work.

As I have already said, before you qualify you will see completed, thanks to those committees, authorities, and ministries which plan and provide for us, a department of radiodiagnosis in which these modern facilities will be available.

In this hospital the importance of the new photography was quickly realized. At the Medical Staff Meeting of the old Belfast Royal Hospital—in Frederick Street—on 9th July, 1896, only six months after Röntgen's announcement, Doctors Mitchell and Caldwell, with the Registrar, were appointed to investigate the best means and apparatus for the use of the Röntgen rays and to report to the staff. At this time X-ray pictures were already being taken in the firm of John Clarke & Co., by one whose name I have been unable to trace. After negotiations with this pioneer radiographer Dr. Caldwell eventually received a letter dated 23rd November, 1896, from the firm of John Clarke & Co., then of Corporation Street. It stated:

"We can let you have an Apps' Rhum Korff Coil giving an eight-inch spark, an accumulator to suit, a best quality Crookes' vacuum tube, and a fluorescent screen, as well as an operator, as often as may be agreed upon—say one day in the fortnight—but not more frequently than one day a week at the hospital.

"We shall also be prepared to attend to all cases coming to our premises (68 Victoria Street) and supply photographs if required, not exceeding two in each case—extra copies one shilling each—for the sum of £1 per month."

This letter was forwarded as the first staff recommendation on radiology, to the Board of Management. It was done quite simply by a note scribbled across the top in pencil saying: "A good arrangement, try for a year," and signed by the then Chairman of Staff, T. K. Wheeler—father of our present Chairman.

After the year's trial we find a further recommendation from the Medical Staff to the Board of Management:

"Referring to the use of the Röntgen Ray Photography during the past year in your hospital, the Staff have to report that Messrs. John Clarke & Co. have made use of the radiograph fifty times. They think, however, the results obtained might be improved upon and would suggest that during the coming year Messrs. Lizars should be invited to undertake the work."

This was not surprising because Messrs. Lizars in Wellington Place had on their staff a veritable genius in electronics whose name will be known to some of you, the late Mr. J. C. Carson. He was taking successful radiographs and later giving X-ray treatments at their premises and was also (with his jaunting car) carrying on a domiciliary X-ray service at 10/- a time.

Another early radiographer was a young man then serving his apprenticeship in his grand-uncle's firm of manufacturing chemists, Thomas Frederick Storey—still well known to many of us. Such young men with their 'magic' shadows were in great demand not only in the downtown music halls but in more respectable and fashionable gatherings in the neighbourhood of the Botanic Gardens. These conversaziones, as they were called, have been described to me most colourfully by Prof. P. T. Crymble.

Radiography at the Royal continued in the hands of Mr. Carson for the next few years. Meantime, however, on the 24th June, 1899, a Mr. Rankin had been elected as one of four resident pupils. John Campbell Rankin was to become one of the most brilliant and beloved physicians ever to hold an appointment on this hospital staff. He had many medical interests and was an early bacteriologist of repute. His greatest interests, however, were to be in electrical medicine, both treatment and diagnosis, and in venereology. In those early days Dr. Rankin spent several months in Copenhagen to acquire a knowledge of electrical therapy, particularly of the Finsen light treatment for lupus. He also worked for six months in Vienna in 1903, where he learned much about X-rays and dermatology. Soon after this the staff recommended that the services of a young medical man be obtained to take charge of the electrical department, and in November, 1903, Dr. Rankin was appointed "electrician."

Miss Rankin, his sister, has given me a charming description of her drawing-room in their home at that time, at the corner of Mount Charles. The ceiling was literally festooned with wires and behind a screen her brother happily examined and X-rayed his patients.

Radiologists have acquired a reputation for expansion and expenditure. Dr. Rankin was no exception. On 13th September, 1904, he reported to the staff that he was greatly cramped for want of space in the electrical department and that he required a new tube value £3.

In our Medical Library you will find a most interesting little Atlas of Skiagrams, illustrating the development of the teeth. This was published in 1908 by Johnston Symington, then Professor of Anatomy, and J. C. Rankin. The excellent radiographs are of anatomical dissections, carefully and beautifully made by Dr. P. T. Crymble. Professor Crymble is still energetically teaching us radiological anatomy in the university.

In 1911 Dr. Rankin was appointed to the visiting staff of the hospital and a year later new diagnostic X-ray equipment was purchased and placed under his care. The total cost of this new installation, including the darkroom equipment, was a little over £400.

The volume of diagnostic X-ray work was still small, and in 1914 only one hundred plates were taken. Like most medical and surgical techniques, radiology developed rapidly during the First World War, and by 1919-1920 over three thousand patients per year were being X-rayed. It was then clear that this new aid to diagnosis was to be used increasingly and that more radiologists would be required.

In 1919 Dr. Maitland Beath was appointed Clinical Assistant to Dr. Rankin. This was a fortunate choice. Robert Maitland Beath will be remembered, not only as a radiologist, but as one of the most outstanding students and graduates of this medical school. Well known in London and internationally, he was a tremendous asset to British radiology in those comparatively early days. He was one of the first Presidents of the Faculty of Radiologists. His death in 1940 was an immeasurable loss to our medical community, a loss felt particularly by his partner, Sir Frank Montgomery, for the inseparable names of Beath and Montgomery were synonymous with radiology as we know it in this hospital today.

On the technical side also we have been no less fortunate. In 1919 Mr. R. M. Leman was appointed radiographer to the hospital. I need not tell you what radiography in the Royal, in Northern Ireland, and indeed in Britain, owes to R. M. Leman, whose name over the past forty years has become legendary in our Ulster X-ray departments.

To continue the story of radiology in our own school would lead me further from the realm of history. The dominant note of the past quarter-century has been the anticipation of a department of radiodiagnosis for which the original plans were drawn and approved in 1937. World War II, however, altered the entire conception of hospital development, and only now is this dream coming

true. You will have read in your newspaper that the cost of the X-ray equipment alone for our new department will be almost half as much again as the original cost of the entire hospital when built in 1903. The Press commentator continued: "I am sure this shows us something but I am not sure what it is. . . ." What does this enormous expenditure on X-ray equipment show us? One thing among many which I believe it teaches is that there is a direct relationship between cost of equipment, accuracy of diagnosis, and control of radiological hazard to both patient and staff. It has been said that ultimate perfection in any field entails infinite expenditure and this truth is surely reflected in the high cost and excellence of our new X-ray equipment. One thing is not shown us: that which the Americans refer to as "Built in obsolescence," but I am confident that with the careful planning and provision of equipment in our new department this will not be a feature of radiodiagnosis in this hospital for many years to come.

I have tried to tell you a little about the birth and growth of radiology and about the man to whom more than anyone else we owe the discovery of X-rays. If we can learn anything from all this I believe it is simply that in our work meticulous attention to detail and careful observation with correct interpretation of findings, without necessarily great brilliance, and perhaps with a little luck, may and can result in that step forward for which the world may have waited for years and without which further progress in a given direction cannot be made.

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CARCINOMA OF THE STOMACH

By **JAMES T. PRIESTLEY, M.D.**

Section of Surgery, Mayo Clinic and Mayo Foundation
Rochester, Minnesota, U.S.A.

THE SIR THOMAS AND LADY EDITH DIXON MEMORIAL LECTURE
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MANY renowned surgeons have directed attention to the subject of gastric carcinoma since Billroth performed the first successful partial gastrectomy for this lesion in 1881 (Billroth, 1881) and Schlatter accomplished the first total gastrectomy in 1897. Although advances have been made in the diagnosis and treatment of gastric cancer since the work of these pioneers, I am sure we would all agree that even our most competent efforts of today leave much to be desired. It is natural that the names of surgeons are prominent in the literature relating to gastric malignant disease, since no patient, to my knowledge, has ever been cured of gastric carcinoma except by surgical removal of the growth. Although a review of past work is always of interest, no historical account will be given at this time, as I would prefer to discuss some current controversial phases and to report on experiences which my associates and I have had in the recognition and management of patients who have gastric cancer.

Etiologic factors that might be responsible for development of various types of malignant lesions have been the object of many detailed and specific studies. Certain general data also stimulate thought and might possibly provide clues regarding etiology if they could be properly studied and evaluated. For example, there has been much comment during recent years about the increased incidence of pulmonary cancer. Equally intriguing is the great difference in relative incidence of gastric carcinoma in various countries. Interesting also, and possibly presenting easier investigative possibilities, is the difference noted in relative incidence of gastric carcinoma in various parts of the same country (Haenszel, 1958). The age-adjusted death rate from cancer of the stomach is highest in Japan, Finland, and Chile. In fact, it was found that during the years 1951 to 1954 it was between two to three times higher in these countries than it was in Ireland, England, or the United States. An undoubtedly significant but unexplained fact is that age-adjusted death rates for cancer of the stomach have decreased significantly in some countries but not in others (Moore, 1962; Segi, 1960) (see figure). This decrease started in the United States thirty or more years ago and has been rather pronounced. In contrast, the same change has not occurred in Northern Ireland or England (Segi, 1960). Many theories have been advanced to explain the geographic and national differences in the relative

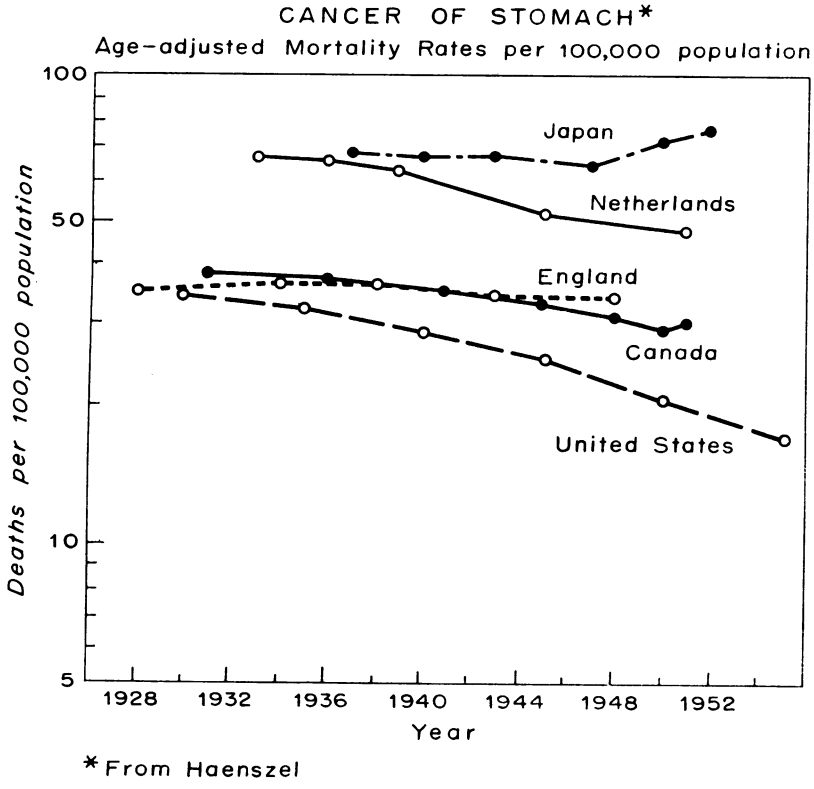

Figure. Incidence of and trends in frequency of gastric cancer in certain countries (from Haenszel, 1958).

frequency and changing incidence of deaths from cancer of the stomach, but no well-substantiated explanation has been forthcoming. As might be expected, the role played by diet and dietary habits has been the source of much speculation.

That many patients have been cured of gastric carcinoma for five, ten, fifteen years or longer by appropriate surgical treatment is well attested by the literature (Brown et al., 1961; Eker and Efskind, 1960; Fly et al., 1958; Gage et al., 1956; Lewin, 1960; Merlo et al., 1960; Pack and McNeer, 1948; Walters et al., 1942; Welch and Wilkins, 1958). This is an important fact to remember since a defeatist attitude concerning gastric carcinoma is sometimes expressed. Some authors state that "biologic predeterminism" rather than the time or type of operation governs end results in gastric carcinoma (McDonald and Kotin, 1954). While the balance between host resistance and tumour aggression is an admittedly important factor in the outcome of any patient who has a malignant lesion, it is not, I believe, the only factor which influences prognosis. The surgeon's viewpoint in this matter

is of some importance, since it may significantly influence his entire approach to a patient who might have carcinoma of the stomach.

Duration of Symptoms in Relation to Surgical Treatment and Survival Rates after Resection of Gastric Cancer.

The theory of "biologic predeterminism" in regard to patients having gastric carcinoma has been supported repeatedly in the literature by statements that a long preoperative history affords as good or better chance for five-year survival after surgical removal of the lesion than does a short preoperative history (Blalock and Ochsner, 1957; Brown et al., 1961; McDonald and Kotin, 1954; McNeer et al., 1958). It might be added that other reports of this type have been made which have not been limited to gastric malignant lesions (Cabot and Berkson, 1939). Observations of this type obviously conflict with the long-accepted view that early diagnosis and treatment are important in prognosis for the patient who has a malignant lesion.

Further study of the significance of duration of symptoms prior to surgical treatment for gastric carcinoma was undertaken recently (Barber et al., 1961) and led to some interesting findings. The records of all patients having a diagnosis of gastric carcinoma and seen initially at the Mayo Clinic during the years 1950 through 1953 were reviewed. There were 1,121 patients in all; 928 (82.8 per cent.) were operated on, and gastric resection was performed in 572, which was 61.6 per cent. of those operated on and 51 per cent. of the total group.

It was found, as in previous studies, that the percentage of patients considered clinically to have an inoperable lesion and who therefore were not subjected to operation (17.2 per cent. of the total group of 1,121 patients) was virtually the same, whether symptoms had been present for two months or less prior to operation, or for three to five months, six to eleven months or one year or longer. The same was true for patients who had undergone gastric resection, some palliative surgical procedure, or only abdominal exploration. Obviously such findings do not suggest that early diagnosis is important in the outlook for the patient with gastric cancer. Likewise, when patients who had undergone gastric resection for gastric carcinoma were divided into groups according to duration of preoperative symptoms, it was found that those who had a short history prior to operation had no better five-year survival rate than those who had a long history.

In further search of some explanation for these findings, earlier studies on patients who had small gastric cancers were recalled (Comfort et al., 1957; Gage et al., 1956). In these studies it was noted that approximately 25 per cent. of 1,541 gastric adenocarcinomas removed during a ten-year period measured 4 cm. or less in their greatest diameter. It was also noted that the postoperative five-year survival rate for patients who had gastric carcinomas that measured 4 cm. or smaller was definitely higher than that for patients whose lesions were larger than 4 cm. It is known that many patients with small gastric carcinomas (4 cm. or less in diameter) have a long history suggestive of gastric ulcer, a diagnosis which has been made previously in many of these patients. When five-year

survival rates are determined separately for patients who are found to have small (4 cm. or less in diameter) gastric cancers and those who have larger lesions, a significant difference is noted, depending on the duration of symptoms prior to operation.

Thus, it was found that the five-year survival rate was 24.3 per cent. for 305 patients who had symptoms of less than twelve months' duration prior to operation and who had carcinomatous lesions that were more than 4 cm. in diameter. In contrast, the five-year survival rate was only 11.9 per cent. for 101 patients who underwent removal of lesions of the same size but who had preoperative symptoms for twelve months or longer. This is in contrast with those patients who had gastric carcinomas 4 cm. or less in diameter. In this group it was found that only 28.6 per cent. of those who had symptoms of two months' duration or less survived five years after removal of the lesion, whereas 59.6 per cent. of those who had symptoms for three months or longer prior to operation survived five years or more. In this study it was also found that the entire group of patients with small gastric cancers (4 cm. or less in diameter) had a five-year survival rate of 54.2 per cent. after removal of the lesion in contrast to a five-year survival rate of only 21.2 per cent. for those who had larger carcinomas resected. Forty-five per cent. of patients with small lesions had symptoms for more than one year prior to operation in contrast with only 25 per cent. of those who had larger lesions.

Consideration of these data affords some clarification of the numerous reports referred to previously which indicate that a short preoperative history does not improve the outlook for the patient with gastric cancer. Without going into detail, it might be added that although in our experience only 25 per cent. of the patients who have had gastric cancer resected have had a lesion that measured 4 cm. or less in diameter, a relatively large percentage (43 per cent.) of all so-called five-year cures of gastric carcinoma, regardless of size, have come from this group. Patients with these small lesions, as a group, present a definitely longer history of symptoms than those patients who have larger lesions. Without endeavouring to be specific, it seems obvious that certain fundamental differences exist between the small gastric cancer and the larger lesion. It is also known that the duration of symptoms is not necessarily synonymous with the duration of the malignant process. It appears likely that many patients found to have a small gastric cancer at the time of operation may have had symptoms caused by benign gastric ulcer prior to development of gastric cancer.

Much evidence, accumulated over many years, indicates that removal of gastric cancer before extension to the serosa, lymph nodes, or adjacent structures has occurred provides a better prognosis than operation performed after spread to these regions. Detection of gastric cancer in a truly early stage probably requires its discovery before symptoms occur, which poses a large problem. Even though considered desirable, which is highly doubtful, it is not feasible to perform rœntgenologic examination of the stomach periodically on all adults. On the other hand, such studies on selected persons have yielded some interesting results.

Rœntgenologic examination of the stomach is carried out at the Cancer Detection Centre of the University of Minnesota on persons 50 years of age or older who have achlorhydria or pronounced hypochlorhydria after stimulation with histamine. A study from 1948 to 1956 showed some gastric abnormality in 5.6 per cent. of all patients in whom rœntgenologic examination of the stomach was performed (Hitchcock, 1957). An actual gastric malignant lesion was discovered in 20 per cent. of the persons whose rœntgenograms showed evidence of a gastric abnormality or 1.1 per cent. of the entire group. The commonest lesions found were gastric polyps, gastric ulcers, gastric malignant lesions and a "suspicious area" in the stomach. As this entire group of patients is followed longer, it seems likely that additional abnormal findings will occur. Of the patients in whom gastric malignant lesions were found and removed surgically, only 10 per cent. had involvement of the lymph nodes. This is in sharp contrast with those in whom operation had been performed after the existence of symptoms for variable periods. The relatively frequent association of pernicious anæmia and gastric cancer is adequate reason for all patients with pernicious anæmia to have periodic rœntgenologic examinations of the stomach. I believe the evidence suggests that early diagnosis and surgical treatment are of value for the patient who has gastric cancer.

Gastric Ulcer and Other Presumed Benign Conditions.

Another broad subject which has received much attention for years concerns the differential diagnosis of benign gastric ulcer, the relationship which this lesion may have to gastric cancer, and appropriate management of the patient who is found to have gastric ulcers. Without going into detail, I might say that it is my opinion that surgical treatment usually is advisable for the patient who has a chronic gastric ulcer. This view is held (1) because long-range results of medical treatment for gastric ulcer leave much to be desired, (2) because of the possibility that a malignant lesion is being overlooked, (3) because of the low risk of operation, and (4) because favourable results are obtained by surgical treatment.

In a careful study of 664 patients treated medically for presumed benign gastric ulcer and followed for five to eleven years after institution of medical treatment, it was found by Larson, Cain, and Bartholomew (1961) that only 21.7 per cent. had complete symptomatic relief with permanent healing of the ulcer. Operation became necessary in 43 per cent. of the 664 patients, and gastric cancer was found subsequently in 8.9 per cent. of the entire group. In a smaller group of 391 patients who were treated medically for gastric ulcer and who were followed for ten to nineteen years, the rate of incidence of gastric cancer was 12.2 per cent. (Larson et al., 1961). Surgical treatment of patients with chronic gastric ulcer not only affords lasting relief of symptoms in a high percentage of patients but also permits removal of a lesion which might subsequently prove to be malignant. If a malignant lesion actually is found at operation, its removal is accomplished at a time that offers a more favourable prognosis than could be offered if operation were postponed for months or longer.

In thinking of detection of gastric malignant disease in its early stages, before a serious and extensive lesion has developed, the gastric polyp probably has not received adequate attention. One study on gastric polyps indicated that of three hundred patients in whom the rœntgenologic diagnosis of gastric polyp or polyps was made and operation subsequently was performed, approximately 60 per cent. were found to have polyps, 20 per cent. other benign lesions, and 20 per cent. a malignant lesion (Huppler et al., 1960). It is apparent from this study that the rœntgenologic diagnosis of gastric polyp includes some patients who actually have malignant lesions. There were 206 of the three hundred patients in this study who were found to have gastric polyps at the time of operation and in twenty-five of these (12 per cent.) the polyps showed evidence of malignant change. The rate of incidence of malignant disease was found to be 14 per cent. when multiple polyps were present, in contrast with 9 per cent. when there was only a single polyp. In ninety-four of the three hundred patients, benign or malignant lesions other than gastric polyps were found at operation.

In attempting to establish a correct differential diagnosis of a gastric lesion there are other findings which should always arouse suspicion regarding the possible existence of a malignant lesion. These include any recurrent gastric ulceration, gastric (in distinction from gastrojejunal) ulceration after previous gastrœnterostomy or gastric resection, or significant change in the nature of symptoms experienced by a patient in whom the diagnosis of a benign gastric lesion, usually an ulcer, has been made previously. The rœntgenologist is of greatest help in establishing a diagnosis of gastric cancer, but he is not infallible any more than anyone else, and it should be considered that there is at least a 10 per cent. chance of error in his differential diagnosis of benign or malignant gastric ulcer. In addition, rœntgenologic diagnosis should be viewed with suspicion when "persistent narrowing" is reported in the stomach and when duodenal ulcer or "pyloric obstruction" is reported in the presence of achlorhydria or definite hypochlorhydria. It hardly seems necessary to state that no patient should be treated medically for symptoms presumably caused by benign peptic ulceration without the benefit of rœntgenologic examination of the stomach and duodenum.

Cytologic Study of Gastric Washings.

A diagnostic procedure which has received increasing attention during recent years is that of cytologic study of the gastric content. Various techniques have been employed to obtain specimens of gastric content which are suitable for microscopic examination and most likely to permit an accurate diagnosis. Experiences reported in the literature vary with the type of patient studied, the methods and procedures employed, and the experience of the cytologist. Seppälä (1961) summarized thirty-six different reports, including the more significant studies made from 1947 to 1961. The largest series is that of Schade (1960), who reported a total of 3,280 examinations. He used the saline lavage technique, and reported that 90.5 per cent. of 258 cases of gastric carcinoma were correctly diagnosed. False positive cytologic reports were made in 5 per cent. of the non-malignant cases. Seppälä (1961) reported in his own study of 736 patients that

cytologic examination gave findings indicative of malignant disease in 80.5 per cent. of patients with gastric cancer and a false positive rate of 1.9 per cent. Our experience (Rovelstad, unpublished), last reviewed in 1960, is more modest and does not reveal so high a degree of accuracy. A correct positive diagnosis of gastric cancer was made in 17 of 25 patients (68 per cent.). No false positive reports were obtained in a larger control group. Actually, in our entire group of 142 patients, we found only one or possibly two patients in whom cytologic study made a significant contribution to diagnosis and management. Perhaps, as our experience grows and methods improve, this type of study will prove to be of greater value, although in 370 patients studied to date and admittedly incompletely reviewed, we have seen little to offer promise of greater expectations from this procedure (Rovelstad, 1960).

Surgical Treatment.

When exploration shows gastric carcinoma, the surgeon must decide the procedure of choice. This decision will be based not only on the findings, such as local extension of the growth or the presence of metastasis, but also on his experience with and philosophy of the surgical treatment of cancer. While it is difficult to be dogmatic regarding surgical indications, because of the numerous factors that must be considered in individual patients, my associates and I have followed certain general principles which I will mention before results of treatment are reviewed.

If the lesion is confined to the stomach, except perhaps for extension to regional lymph nodes, operation with hope of cure is undertaken. If the lesion can be completely removed by subtotal gastric resection, leaving at least a portion of the stomach attached to the œsophagus, this is done. Such a procedure routinely involves removal of the greater omentum and dissection of all areas of regional lymphatic drainage. The spleen has not always been removed when the lesion involves only the distal portion of the stomach, although there is evidence to suggest that removal is advisable (Fly et al., 1956). For lesions in the proximal portion of the stomach the spleen is routinely removed. Total gastrectomy, which always includes splenectomy, is reserved for the patient in whom subtotal gastrectomy will not remove all areas of malignant involvement. Over the years my associates and I have performed total gastrectomy in 18 to 20 per cent. of patients in whom gastric malignant lesions have been resected. Total gastrectomy is not employed when it is apparent that, at most, it would be only a palliative procedure. No portion of the pancreas is removed unless findings at operation suggest extension to this region.

More difficult surgical decisions may be required when the growth has extended beyond the stomach and perhaps has involved the transverse colon, pancreas, liver, retroperitoneal tissues, or other near-by structures. It has been our practice to remove the growth en masse under these circumstances when, in the opinion of the surgeon, this can be done in a complete manner. In some patients it is difficult or impossible to be sure of this point until some mobilization of the lesion has been accomplished. Local extension may be responsible for considering

a lesion inoperable, but this is not often the case. Although it seems unlikely that more and more radical operations will be responsible for great increase in survival rates, it is our belief that whenever a malignant gastric lesion can be completely removed, by any reasonable procedure, this should be done.

When abdominal exploration reveals multiple hepatic or other distant metastasis, the opportunity for cure probably has passed. Under these circumstances, it is not our practice to proceed with a radical operation. Palliative partial gastric resection is performed if the nature and extent of the growth permit this procedure to be done in a reasonable manner and without the necessity of total gastrectomy. Removal of an obstructing or bleeding carcinoma situated in the distal part of the stomach may afford considerable palliation. Gastroenterostomy may be used in other cases if resection of the lesion does not seem reasonable and if some degree of obstruction exists; however, the amount of palliation obtained by this operation is less than that obtained if the growth is removed.

Other procedures such as gastrostomy, jejunostomy, or insertion of a plastic tube through the site of an obstructing gastric growth are seldom employed. In patients in whom the growth is not removed, irradiation or the use of anti-cancer drugs may be employed. While these modalities of therapy have provided significant palliation for some patients, to date this has not been true for the majority. In our experience, use of 5-fluorouracil has given temporary subjective improvement in approximately half of the patients with carcinoma of the stomach in whom it has been used and objective evidence of improvement in about a fourth of them (Reitemeier and Moertel, unpublished). Reactions to this treatment may be unfavourable, and it is not recommended indiscriminately. It is hoped that more effective drugs may become available.

In operation for gastric cancer it is important to resect portions well above and below any extension of the malignant process in the stomach or duodenum and to remove regions of possible lymphatic involvement. Except for patients in whom there is an unusual degree of mucosal or submucosal spread of gastric carcinoma, the surgeon usually can form a fairly reliable opinion of the upper limit of extension of the growth by careful palpation and inspection of the stomach. As additional help in this regard, the surgical pathologist routinely makes multiple frozen sections of the upper and lower lines of resection to determine whether there is any microscopic evidence of malignancy. While information provided by this means may not be completely reliable, it has been our experience that it is seldom in error. Multiple areas of neoplastic involvement in the stomach may occur, but this is uncommon in the absence of gross evidence of neoplasm.

It is difficult to say specifically how far above or below a growth the line of resection should be placed. In this regard a study by ReMine and associates (1953) is of interest. In this work an effort was made to determine any differences in the surgical specimens which were removed from two different groups of patients. All patients in both groups had gastric resection performed for gastric carcinoma with metastatic involvement of regional lymph nodes. All patients in one group lived five or more years after operation, and all patients in the other group survived operation but died within one year. Measurements made between

the line of resection and the nearest edge of the lesion both above and below the growth, although virtually identical in both groups, averaged slightly longer for those patients who survived less than a year than for those who survived five years or more. From these data it would appear that removal of excessive amounts of uninvolved stomach does not improve prognosis for the patient with gastric cancer.

TABLE 1.

LOCATION OF METASTATIC LYMPH NODES IN PATIENTS WITH SHORT-TERM AND LONG-TERM SURVIVAL AFTER GASTRIC RESECTION.

LOCATION OF INVOLVED NODES	SURVIVAL OF PATIENTS, PER CENT.	
	Long-term*	Short-term†
Lesser curvature only - - -	64.6 ...	38.3
Greater curvature only - - -	14.8 ...	2.9
Both curvatures - - - -	20.6 ...	58.8
Subpyloric region - - - -	5.9 ...	70.6

*All patients lived five or more years after operation.
†All patients survived operation but died within one year

Of particular interest in this study were the findings in reference to involvement of lymph nodes (Table 1). The number of lymph nodes involved and their location proved to be significant in relation to length of postoperative survival. Involvement of lymph nodes along only the lesser or greater gastric curvature was noted more frequently in the group of long-term survivors than among the short-term survivors. The opposite was true when nodes along both curvatures were involved. Of particular significance was the finding that subpyloric nodes were involved in only 5.9 per cent. of the long-term survivors whereas this finding was present in 70.6 per cent. of the short-term survivors. Since this study we have given more attention to complete removal of all lymph nodes in the subpyloric area.

Other studies of importance to the surgeon include those which have demonstrated the frequency of spread of gastric cancer into the duodenum (Coller et al., 1941; Castleman, 1936). Marvin (1947) studied surgical specimens removed from one hundred patients in whom gastric resection had been performed for gastric carcinoma which involved the prepyloric portion of the stomach. Microscopic evidence of extension into the duodenum was found in 38 per cent. of this entire group. This extension was not always apparent grossly. The need to remove several centimetres of duodenum whenever the prepyloric portion of the stomach is involved with carcinoma is apparent. Spread from a gastric cancer to splenic hilar nodes has been reported to occur in 17.5 to 36.9 per cent. of cases.

An appropriate operation for gastric cancer obviously requires appreciation of the pathologic characteristics and the methods of spread of the lesion to be removed. Details of surgical technique will not be reviewed, but it might be emphasized that proper routine operation for cancer of the stomach includes complete removal not only of the lesion itself but also of all areas of primary lymphatic drainage, especially those around the origin of the left gastric arteries and those in the duodenohepatic area, the region of the head of the pancreas, the hilus of the spleen, and the omentum.

For partial gastrectomy I prefer the posterior Hofmeister-Polya type of anastomosis with attachment of the distal limb of the jejunum to the greater curvature of the stomach. When high subtotal gastrectomy is performed, a posterior anastomosis may not be feasible, and the jejunal loops are then brought anterior to the transverse colon. Adequate removal of the proximal portion of the duodenum and subpyloric lymph nodes does not usually permit a Billroth I type of anastomosis under favourable circumstances. Operative mortality rates associated with subtotal gastrectomy performed for cancer have averaged about 6 to 7 per cent. during recent years.

When total gastrectomy is performed, end-to-side œsophagojejunostomy with an entero-anastomosis is the routine procedure. It is varied only under special circumstances. The anastomosis between the jejunal limbs, in addition to providing drainage of the proximal limb, is helpful in preventing reflux of duodenal content into the œsophagus, which might produce œsophagitis. A Roux-Y type of end-to-end œsophagojejunostomy is employed if the mesentery of the jejunum is short and does not permit establishment of an end-to-side œsophagojejunostomy without tension on the anastomosis. End-to-end œsophagoduodenostomy is used infrequently because adequate removal of the duodenum usually does not make such an anastomosis feasible, and, in addition, œsophagitis may result from reflux of duodenal content under these circumstances. We have had practically no experience with use of a segment of colon or jejunum interposed between the œsophagus and duodenum.

Inasmuch as no patient with cancer of the stomach has been cured except by removal of the lesion, so far as I know, it is important that every patient with cancer of the stomach be considered a prospect for operation unless definite objective findings, such as distant metastasis, indicate the virtual impossibility of total surgical removal of the malignant process. "Operability rate" may be defined as the ratio (expressed in per cent.) of the number of patients subjected to laparotomy to the total number of patients with the diagnosis of cancer whose lesion was considered too far advanced to warrant even surgical exploration. A review of our experience in this regard indicates operability rates of 60, 80, and 90 per cent. for the years 1907 through 1939, 1940 through 1949, and 1950 through 1959, respectively. Thus, in recent years, only about 10 per cent. of patients with gastric cancer are not afforded the possible benefits of abdominal exploration.

Obviously, the surgeon always endeavours to resect the lesion at operation, if this seems to be a reasonable procedure. The "resectability rate," as used in

these data, may be defined as the ratio of patients (expressed as per cent.) in whom gastric cancer is resected to the total number of patients in whom operation is performed. It is noted that this rate has increased from 45.5 per cent. during the years 1930 through 1939 to 60.8 per cent. during the years 1950 through 1959 (Table 2). Unfortunately, the reason for this increase in proportion of

TABLE 2.

RESECTABILITY RATE OF GASTRIC CANCER IN SUCCESSIVE PERIODS

PERIOD	TOTAL OPERATIONS PERFORMED	RESECTIONS	
		Number	Per Cent.
1907-1919	1902	760	40.0
1920-1929	2456	1146	46.7
1930-1939	2301	1048	45.5
1940-1949	2945	1638	55.6
1950-1959	2213	1345	60.8
TOTAL	11817	5937	50.2

patients for whom resection is performed is not that less-advanced lesions have been seen. This is evidenced by the fact that the percentage of cases with lymph node involvement is greater at present than it was in the earlier years. This is important in relation to interpretation of reported survival rates after operation for these years.

OPERATIVE MORTALITY.

Although the risk of operation for a patient with gastric cancer has been lowered significantly during the past fifty years, this decline in operative mortality has been much less marked in the last two decades than it was in the previous three decades. This is no doubt true of many surgical procedures which have been performed during the same period. For example, for the period 1907 through 1939 the operative mortality rate (all hospital deaths) for partial gastrectomy for cancer was 16.0 per cent. and that for total gastrectomy was 65.6 per cent. In contrast, from 1940 through 1959 the operative mortality rate for partial gastrectomy dropped to 6.6 per cent. and that for total gastrectomy to 18.6 per cent. During the years 1950 to 1960 the operative mortality rates for partial and total gastrectomy were 6.7 per cent. and 15.4 per cent. respectively. Some surgeons have reported rather low operative rates for total gastrectomy

in relatively small series of cases. In our experience the risk of this operation has always remained definitely higher than that for partial gastrectomy.

Other factors which influence operative mortality for patients with cancer of the stomach, but which are not limited to patients with cancer of the stomach, include age and sex. Operative risk increases with age and has always been lower for women than for men. Thus, from 1950 through 1959 the risk for all forms of gastric resection for cancer was 6.2 per cent. for females and 8.2 per cent. for males. Operative risk increases somewhat as the size of the lesion increases and is higher when the lesion is in the cardia than when it is in the more distal part of the stomach. The operative risk is also higher for patients who have type C lesions (Dukes' classification) than for those with types A or B. A persisting observation over the years has been that operative mortality is higher among patients with achlorhydria than among those who have free hydrochloric acid in the gastric content. Thus, for the years 1940 through 1959 it was found that the operative mortality rate for gastric resection in patients with achlorhydria was 9.1 per cent.; for patients who had free hydrochloric acid up to thirty clinical units the mortality rate was 6.8 per cent., and for those who had more than thirty units the mortality rate was 2.1 per cent. There are no doubt many reasons for the variations in mortality rates which have been mentioned, many of which involve the realm of speculation or assumption but all of which have interesting connotations.

Survival Rates.

In our experience the two most important factors which influence survival rates after resection for gastric cancer are (1) the grade of the lesion and (2) the presence or absence of lymph node involvement. Thus, for 1950 through 1954 it was found that 57.9 per cent. of patients without metastasis to the lymph nodes survived five or more years after gastric resection in contrast with only 14.2 per cent. of those with metastasis to the lymph nodes. The influence of the grade of the lesion on survival rates is evidenced by the fact that for the same period, 1940 through 1954, 53 per cent. of patients with lesions of grade 1 or 2 survived five or more years after operation in contrast with only 26 per cent. of those with lesions of grade 3 or 4. The poorest prognosis occurs when there is a high-grade lesion with associated involvement of lymph nodes. Thus, only 12.1 per cent. of 692 patients who had resection, in the years 1940 through 1954, of a grade-4 lesion with lymph node involvement survived five years or more after operation. It is important, however, to realize that at least a few patients with this type of lesion survive for an appreciable time after operation. The situation is not a hopeless one.

Certain other factors such as the size and location of the lesion influence the survival rate after resection but to less degree than the grade and presence or absence of lymph node involvement. Thus, the five-year survival rate decreases as the size of the lesion increases. It was found to be higher when the lesion was situated on the lesser curvature of the stomach, in contrast with other areas in the stomach. It has also been observed that the five-year survival rate decreases as the gastric secretory level decreases.

TABLE 3.

FIVE-YEAR SURVIVAL RATES AFTER GASTRIC RESECTION IN DIFFERENT PERIODS.

PERIOD	PATIENTS TRACED	LIVED FIVE OR MORE YEARS AFTER LEAVING HOSPITAL	
		Number	Per Cent.
1907-1919 ...	636 ...	174 ...	27.4
1920-1929 ...	970 ...	299 ...	30.8
1930-1939 ...	854 ...	258 ...	30.2
1940-1944 ...	678 ...	253 ...	37.3
1945-1949 ...	808 ...	255 ...	31.6
1950-1954 ...	701 ...	207 ...	29.5

Survival rates according to various periods are shown in Table 3. With the exception of one five-year period (1940 through 1944), a remarkable similarity in survival rates for all other periods is apparent. One should keep in mind the facts, however, that operability and resectability rates have been increased as time has passed, and that operative mortality rates have been lowered. Thus, a higher percentage of patients with gastric cancer has undergone resection in later years than in earlier years. This is true despite the fact that the incidence of high-grade lesions and the presence of metastasis to the lymph nodes have increased. It is not surprising that the five-year survival rate, which is calculated on the basis of those patients who survived gastric resection, has not increased over the years. The fact remains, however, that of one hundred patients in whom the diagnosis of gastric cancer is made today, fifteen are expected to be alive at least five years from now. This number represents only a slight increase, the number being fourteen for the decade of 1940 through 1949. Although the survival rate after resection has declined, the proportion of the total patients with the diagnosis of gastric cancer who have survived for five years actually has increased a bit. This apparent paradox is explained by the fact that a considerably larger proportion of the total patients undergo resection than did in former years.

The data as presented on survival rates include all patients who had a gastric cancer resected, whether by subtotal or total gastrectomy. In a recent study of 275 patients who underwent total gastrectomy for gastric cancer and survived the operation, it was found that 14.9 per cent. were alive three years later, 9.9 per cent. five years later, and 7.9 per cent. ten years later. These data are similar to those reported in earlier studies (Fly et al., 1958; ReMine and Priestley, 1952).

SUMMARY.

National differences in the incidence and trends of incidence of gastric carcinoma might offer some clues regarding ætiologic factors of this disease if they could be properly evaluated. Although the relationship between "tumour

aggression" and lost resistance is an important factor in determining the prognosis for the patient who has cancer of the stomach, it is not the only factor to be considered. Early diagnosis and treatment also may influence prognosis. Principles of surgical treatment for gastric cancer are reviewed as are factors which influence operative mortality and survival rates. During recent years it has been found that of one hundred patients in whom the diagnosis of cancer is made, fifteen may be expected to be alive five years later if appropriate surgical treatment is carried out.

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EDITORIAL

It has been decided to have a contributed editorial from a member of the Editorial Committee on a subject of interest to the whole profession. Professor Biggart, Dean of the Faculty of Medicine in the Queen's University of Belfast, has very kindly agreed to contribute a series on medical education. He will describe how this medical school has changed, and is changing, to adopt to the requirements of medical practice today.

MEDICAL EDUCATION

I—The Problem

THINGS are not what they used to be. The medical education of today is different and therefore in the opinion of many graduates inferior. The system that produced "us" was obviously good. By virtue of it we have attained platforms from which we may thunder at those who dare to vary it. Yet we are the first to realise that the practice of medicine has changed. Good nursing was more effective than medical knowledge in the outcome of pneumonia forty years ago. Bacterial endocarditis had a 100 per cent. mortality. The diseases of old age were of little importance because few people survived to old age, and "heart attacks," "strokes," and "cancer" carried them off. The laity accepted the prognosis so professionally propounded, and medicine, particularly in the person of the consultant, reached its acme. Emphasis was on bedside diagnosis, and bedside observation of symptoms and signs was extremely accurate. With so few ancillary aids to diagnosis, bedside teaching constituted the most important method of education of the medical student. It was, in fact, an empirical system—a system of clinical apprenticeship —and some students must have wondered what purpose their scientific studies in physiology and pharmacology were supposed to serve. Therapeusis in the wards was not based on pharmacologic study but rather on experience. "In my clinical experience" was a phrase difficult to combat and often promulgated. Students were adherents of this or that clinical chief, and the popularity of ward rounds depended not only on the efficacy of the teacher, but at least to some extent on the variable of whether or not the ward chief was or was not a clinical examiner. This was even more marked in post-graduate education and few were successful in obtaining the M.R.C.P. in either Edinburgh or London who were not familiar with the clinical foibles of their examiners. Good work was done. The 'vis mediatrix naturæ' was given its maximal opportunity. Specific remedies were few. '606' or N.A.B. were almost the only remedies with a specific scientific background, though experience had shown the efficacy of morphia, digitalis, the salicylates, and some other medicaments. A pseudo-science of vaccine therapy was all too readily accepted. Text-books of medicine were as heavy as those of today—due partly to the hypotheses of pathogenesis and to the theories of empirical therapeusis.

With the development of medical science in the last thirty years the picture and the necessities of medical education have changed. This has been well recognised by the General Medical Council, which has greatly modified its recommendations. Thirty years ago these were extremely detailed and the time and content of courses was laid down. Medical schools were apt to take these recommendations as regulations and few dared to experiment. Today the recommendations encourage experiment, and if experiment is lacking it is the fault of the medical schools. By the 1951 Act the General Medical Council now has the right to inspect the courses and the facilities for teaching, but its main interest is to ensure that the final product of the school is worthy of registration. Inside the broad framework the medical school can experiment as much as it wishes.

The advances have been advances in medical science, which have been translated into advances in medical therapeusis. The drugs available are potent, but must be used with understanding. Their abuse can create medical and sociological problems. Their scientific use can bring medical success once undreamt of.

Anæsthesia today bears little resemblance to the old "rag and bottle" days. Its pharmacology becomes more complicated.

So medical education has to change. Its content must be more scientific. The factual equipment of the practitioner has to be much greater. Yet much remains the same. The student must still be able to recognise the sick patient—still be able to apply his scientific knowledge with the art which is as old as time. To those who maintain that medical education is not what it used to be, we would retort that it is a necessity of medical advance that methods of education and content of courses should change Not only so, but the graduate must be so equipped that he can relatively easily understand and apply the advances expected during his professional life.

The complete doctor is adept in the science, proficient in the art, sincere in the ethic, and embellished with the culture of medicine. How, inside the framework of a relatively fixed curriculum and within a fixed period of time is this ideal to be attained?

THE EVALUATION OF SERUM PSEUDOCHOLINESTERASE AS A LIVER FUNCTION TEST

By **M. G. KHAN, M.B., B.Ch.**

From the Royal Victoria Hospital, Belfast, and the Department of Medicine, Queen's University of Belfast

DESPITE numerous tests used in the diagnosis of liver disease, in many cases it is still difficult to decide whether there is liver damage, and if so, how much.

This study was done to evaluate serum pseudocholinesterase estimation as a routine test of liver function, and to compare it with certain commonly used tests, viz., serum bilirubin, zinc sulphate flocculation test, thymol turbidity test, alkaline phosphatase, and blood transaminase levels. Also to show if it is of any value in distinguishing between intrahepatic and extrahepatic jaundice.

METHODS.

The subjects studied were divided into three groups.

Group 1.

Fifty patients with suspected liver disease were examined. In thirty of these, cirrhosis was confirmed by liver biopsy, and in five at autopsy. In fifteen others the diagnosis was accepted as cirrhosis because of positive clinical evidence—consistently positive liver function tests, and a plasma protein electrophoretic pattern consistent with cirrhosis.

Controls:—Estimations were made on fifty patients with absence of clinical evidence of liver disease; most of these were suffering from chest infections, herniæ, appendicitis, and duodenal ulcers; five were medical students.

Group 2.

Pseudocholinesterase estimations were also carried out in sixteen patients with secondary carcinoma in the liver, ten with acute appendicitis, and four with appendix abscess, also in twelve patients with severe congestive heart failure.

Group 3.

A separate study was made on fifty patients with obstructive jaundice.

The diagnoses are shown in Table 1.

Chemical Methods.

Zinc flocculation, Kunkel (1947). Normal range 0 to 12 units.

Thymol turbidity, Maclagan (1944(b)). Normal range 0 to 4 units.

Serum bilirubin, King and Coxon (1950). Normal range 0 to 1 mg. per cent.

The serum glutamic oxalacetic transaminase and serum glutamic pyruvic transaminase were estimated by the method described by King (1960). Normal range for both taken as under 45 units.

Bromsulphthalein, Mateer et al. (1942). Normal values taken as less than 7 per cent. retention in 45 minutes.

The alkaline phosphatase was estimated in King Armstrong units by the autoanalyser method.

TABLE 1.

No. of Cases		Diagnosis
14	...	Stone in the common bile duct.
2	...	Cholecystitis and pancreatitis.
2	...	Carcinoma of the Ampulla of Vater.
5	...	Carcinoma of the head of pancreas.
1	...	Carcinoma of the bile duct.
1	...	Stricture of the common bile duct.
25	...	Extrahepatic (surgical jaundice).
10	...	Acute hepatitis.
6	...	Progressive hepatitis.
9	...	Severe cirrhosis.
25	...	Intrahepatic (medical jaundice).

Pseudocholinesterase estimations (Michel, 1949; Aldridge and Davies, 1952). Briefly, estimations depend on the amount of acetic acid liberated from acetyl choline, and observing the fall in pH of a barbitone phosphate buffered system in a given time. The change in pH was read by a pH meter. Readings are expressed in Delta pH units per hour, times 100. Normal range 60 to 130 units. The pseudocholinesterase will be denoted by the abbreviation "PCHE" in the remaining discussion.

In eighteen patients, six each from the control, cirrhotics, and jaundiced groups respectively, 8 mls. of blood were taken from the patient, put into two separate tubes, with different names, to determine the accuracy of the test; results differed by ± 4 units.

The plasma albumin electrophoresis and PCHE were estimated in thirty-eight patients.

Group 1. Results.

Table 2 shows the results of zinc sulphate flocculation in fifty patients with cirrhosis. In ten patients with severe cirrhosis the zinc flocculation was in the normal range.

TABLE 2.

Zinc Flocculation in Fifty Patients with Cirrhosis.

No. of Patients		Range Zinc Flocculation Units		Remarks
26	...	12 to 28 units	...	52% (+ve)
24	...	0 to 12 units	...	

Results of the thymol turbidity test, alkaline phosphatase, and serum bilirubin are shown in Table 3. Note that the thymol turbidity was raised above four units in only two of the fifty cases of cirrhosis.

TABLE 3.

Test	No. of Cases of Cirrhosis	Results	Remarks
Thymol Turbidity	48	0-4 units	Normal
	2	4-8 units	Abnormal
Alkaline Phosphatase	40	O – 20 KA Units	No Significance
Serum Bilirubin	10	1 to 4 mg.%	
	40	1 mg.%	Normal

Results of PCHE estimations are shown in Fig. 1 and summarised in Table 4.

TABLE 4.

No. of Patients	Pseudocholinesterase Delta pH Units/Hr. x 100
50 normal controls	60 to 130 units
26 mild to moderate cirrhotics	30 to 55 units
24 severe cirrhotics	10 to 35 units

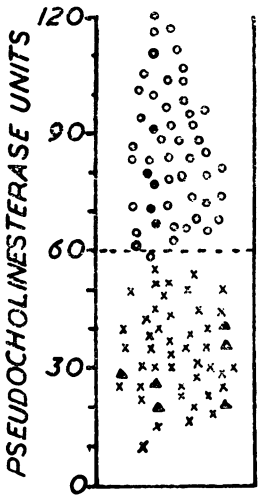

Fig. 1.

Pseudocholinesterase expressed in delta pH units per hour x (times) 100 in 50 cases of cirrhosis and 50 normal controls. Cases of cirrhosis indicated by crosses. Those who died, by triangles. Normal controls, by circles, and normal liver biopsy by black dots.

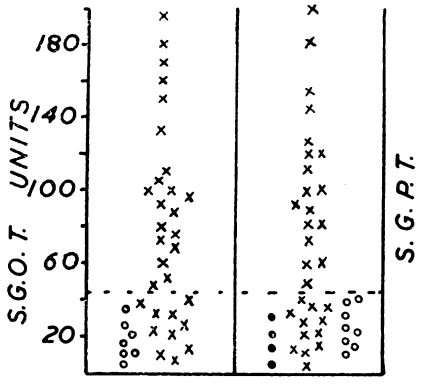

Fig. 2.

S.G.P.T. and S.G.O.T. in 30 patients with cirrhosis. Conventions as in Fig. 1.

Most of the patients with severe cirrhosis had values under 35 units, and six of these patients died. Repeated etimations showed a progressive fall in PCHE as the condition of these patients deteriorated.

Table 5 and Fig. 2 show the results of the S.G.O.T. and S.G.P.T. in thirty patients with cirrhosis.

TABLE 5.

Tests	Results	No. of Cases	Remarks
S.G.O.T. ...	Under 45 units ...	10 ...	Normal
	> 45 units ...	20 ...	Elevated
S.G.P.T. ...	Under 45 units ...	12 ...	Normal
	> 45 units ...	18 ...	Elevated

The results of bromsulphthalein estimations in twenty patients with cirrhosis are shown in Table 6. The PCHE in these patients is also shown for comparison.

TABLE 6.

No. of Patients	Brom-sulph. Retention	Pseudocholinesterase
5 ...	Less than 7% retention ...	28 to 45 units
9 ...	7 to 25% retention ...	28 to 55 units
6 ...	25 to 55% retention ...	20 to 45 units

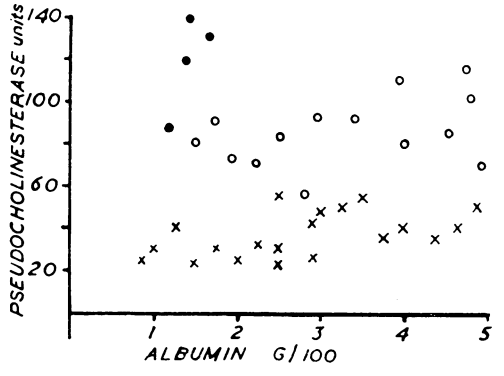

Fig. 3.

Relation of pseudocholinesterase to albumin. Black dots represent cases of the nephrotic syndrome. Note that the PCHE is low only when the albumin is low due to liver disease.

Figure 3 shows the relation of PCHE and serum albumin.

Group 2.

Figure 4 shows the results of patients in Group 2. Eleven out of sixteen patients with liver metastases had low values of serum PCHE.

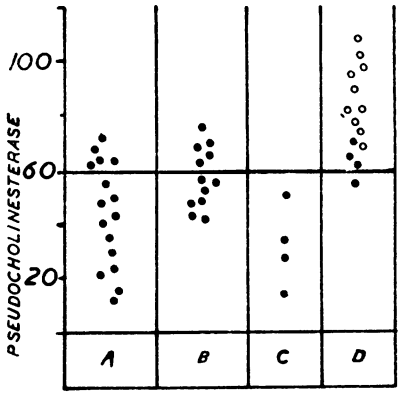

Fig. 4.

PCHE levels in

A. 16 patients with secondaries in the liver.

B. 12 patients with severe congestive cardiac failure.

C. 4 patients with subphrenic abscesses.

D. 10 patients with appendicitis (open circles).
4 patients with appendix abscess (black dots).

Group 3.

Figure 5 shows the results of PCHE estimations in fifty patients with jaundice.

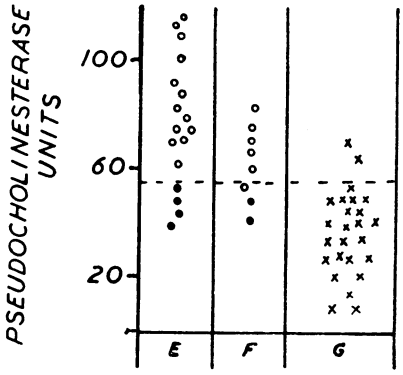

Fig. 5.

Pseudocholinesterase in jaundice

E. Due to stone in the common bile duct.

F. Carcinoma of the head of the pancreas.

G. Hepatocellular jaundice.

Circles represent cases of extrahepatic obstruction. Closed circles represent complications. Hepatocellular jaundice by crosses.

In twenty-five patients with jaundice due to various extrahepatic obstructive lesions shown in Table 1, the PCHE was above 55 units in 18 (72 per cent.). In seven patients unexpectedly low values ranging from 35 to 55 units were obtained; there were added complications of severe cholangitis in three, and biliary cirrhosis in one. In two patients with carcinoma of the head of the pancreas low values were obtained when there were secondaries in the liver.

In twenty-five patients with hepatocellular jaundice, the PCHE was under 55 units in twenty-three cases. In one case the value was 70 units, while the zinc flocculation was 13 units and S.G.P.T. 120 units. The patient's condition was in the phase of recovery at this time. The PCHE here reflects in advance of the other tests the phase of recovery.

Results of alkaline phosphatase compared with PCHE are shown in Fig. 6.

In the extrahepatic group only seven of the twenty-five cases (28 per cent.) had alkaline phosphatase over 30 KA units.

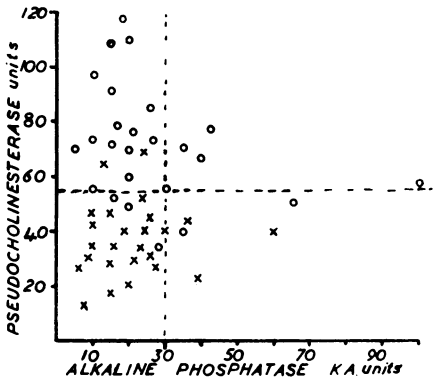

Fig. 6.

Results of PCHE compared with alkaline phosphatase. Conventions as in Fig. 5.

Twenty-two out of twenty-five patients with hepatocellular jaundice had alkaline phosphatase under 30 KA units.

Discussion.

The thymol turbidity and alkaline phosphatase estimations as shown are not very useful in the diagnosis of cirrhosis.

The zinc sulphate flocculation was positive in only 50 per cent. of patients with cirrhosis, and was of little value in judging the severity of the cirrhosis or the prognosis. Other flocculation tests, e.g., the cephalin cholesterol, are more expensive and of no advantage.

Transaminases: In this series approximately 60 per cent. of patients with cirrhosis showed abnormal or high transaminase levels. Many patients with moderate or severe cirrhosis had normal transaminases. These results agree with Hunt and Lehmann (Gut, 1960).

The Bromsulphthalein is a well-established test in the diagnosis of cirrhosis. In this series 75 per cent. of patients with cirrhosis had positive results (i.e., more than 7 per cent. retention in forty-five minutes). The bromsulphthalein is probably the most sensitive of the commonly used tests, but it is not so frequently used in busy outpatient departments because the method is involved.

Pseudocholinesterase is an enzyme manufactured by the liver cells in close relation to albumin (Faber, 1943; Kunkel and Ward, 1947; Vorhaus and Kark, 1953). In hepatocellular disease a fall in the enzyme concentration in the serum is, therefore, expected.

In this series, 100 per cent. of patients with cirrhosis had PCHE under 60 units. There was a close relation between the severity of cirrhosis and the level of PCHE. Four patients who died had PCHE under 30 units. It is noteworthy that three of these had zinc flocculation and transaminases in the normal range. These findings support the view of Hunt and Lehmann (Gut, 1960), that PCHE

estimations are useful in the diagnosis of cirrhosis, and that repeated estimations are useful in judging prognosis.

If the PCHE is consistently over 65 units we can be almost certain that there is no hepatocellular disease, and that liver function is good. The same degree of certainty cannot be entertained when a normal flocculation or transaminase level is obtained.

Relation of PCHE and major operations: There is a definite hazard of scoline apnœa if suxamethonium is used during anæsthesia in a patient with a low PCHE (Argent, Dinnick, and Hobbiger, 1955; Johnston, 1954).

Quite apart from this relation, in patients with PCHE under 35 units, mortality is high with any major operation, a feature which is shown in a series by Hunt and Lehmann (1960).

Six patients with PCHE under 35 units had major operations and four of these died. In three patients hepatic failure developed within twenty-four hours of operation.

The usual choice of patients for porto-caval or other shunt operations is those with albumin over 3.2 G. per 100 ml. and preferably without ascites. Where the PCHE is over 45 units, an albumin under 3 G. per 100 ml. does not necessarily indicate poor liver function. One would also expect such a patient's albumin level to rise with adequate intake.

It is desirable to do PCHE estimations on alternate days for at least one week before a shunt operation. If values are consistently over 45 units, the prognosis is more likely to be good with operation.

The value of PCHE in the differential diagnosis of obstructive jaundice is not well established. A PCHE value consistently over 55 units favours extrahepatic obstruction. Values under 50 units are more commonly seen in hepatocellular jaundice.

In a few cases the PCHE may be low, transaminases elevated and alkaline phosphatase under 30 KA units, all suggestive of hepatitis.

Such findings are also seen in some cases of extrahepatic obstruction with ascending cholangitis. The clinical course, intermittent pyrexia, and leucocytosis will then support a diagnosis of cholangitis.

In this series the PCHE was only helpful in about 50 per cent. of cases in deciding if the jaundice was hepatic (medical) or extrahepatic (surgical). But as shown in Fig. 6, it is more helpful than the alkaline phosphatase.

In only seven out of twenty-five patients (28 per cent.) of extrahepatic jaundice was the alkaline phosphatase raised above 30 KA units. Seventy-two per cent. had values ranging from 5 to 30 units, the range which suggests hepatocellular jaundice.

Where unexpectedly low values of PCHE are obtained, one must exclude the presence of metastases in the liver; in a case with pyrexia, cholangitis, and subphrenic abscess. Low values have been reported due to a very rare genetic lack of the enzyme (Lehmann and Ryan, 1956), severe malnutrition, some severe anæmias and in poisoning by organo-phosphorous compounds (Lehmann, Liddell, and Silk, 1961).

From the study it is suggested that the following be used as routine liver function tests: (1) Bilirubin; (2) Zinc flocculation; (3) PCHE; (4) S.G.P.T. If there is doubt as to a diagnosis of cirrhosis, the bromsulphthalein test can then be carried out.

If a patient is jaundiced, the alkaline phosphatase with the above four are the most helpful tests.

(1) If the PCHE is over 55 units, alkaline phosphatase over 30 units, and S.G.P.T. under 50 units, the case is most likely one of extrahepatic obstruction, although in some cases with extrahepatic obstruction the S.G.P.T. may be moderately elevated (e.g., 50-120 units).

(2) If the PCHE is under 55 units, the alkaline phosphatase under 30 units, and S.G.P.T. over 50 units the case is most likely one of hepatocellular jaundice.

Summary.

Analysis of results of plasma pseudocholinesterase estimations, thymol turbidity test, zinc flocculation, transaminases, bromsulphthalein, alkaline phosphatase, and serum albumin as tests of liver function are presented.

1. Plasma pseudocholinesterase estimations are helpful in deciding if there is liver disease, and is especially useful in the diagnosis of cirrhosis and in judging prognosis. If the PCHE on repeated examination is over 65 units, it is almost certain that there is no hepatocellular disease.

   The thymol turbidity test and alkaline phosphatase estimations are not useful in assessing liver function in cases of suspected cirrhosis.

   The zinc flocculation and transaminases only give from 50 to 60 per cent. positive results in cases of cirrhosis and give little indication of prognosis.

2. Pseudocholinesterase estimations are of limited use in the differential diagnosis of jaundice, though helpful in prognosis. The alkaline phosphatase is not as helpful as might be expected. The combination of pseudocholinesterase, alkaline phosphatase, and S.G.P.T. may be more helpful in jaundiced patients.

Acknowledgments.

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NEW EYES FOR OLD

By ERIC C. COWAN, F.R.C.S.

Belfast Ophthalmic Hospital and Royal Victoria Hospital, Belfast

"To look into happiness through another man's eyes."—*Shakespeare.*

In the last decade corneal grafting has come very much into its own and is now a recognised ophthalmic surgical procedure, practised in every ophthalmic centre throughout the world. Requirements for grafting are very precise and in each region one centre specialises more and more in this operation, and round that centre has been organised propaganda, facilities for collecting donor eyes, for supplying information to donors, and keeping constantly available to other centres a supply of donor material. We in Northern Ireland have not lagged behind in this matter, and recently more and more donor eyes have become available through intense propaganda, and through the public feeling of our medical associates and the lay public.

Modern keratoplasty is not a new concept but arose from deep thinking in the nineteenth century, and evolved with the development of modern surgical principles, the conception of homoplasty, and came into its own with the sound ideas of antisepsis, asepsis, and the provision of fine and wonderful instruments which are now available. The antibiotic control of infection has opened the door wide to allow us to practise these procedures, and with these things we can now offer sight to those people previously who were left alone to a life of blindness.

Many problems must be solved before the operation of corneal grafting becomes a routine trouble-free procedure. Apart from the skill of the surgeon, many of the problems with which we are concerned deal with the immunological reactions of any homograft, and the preservation of donor material, so making this material available if and when it is required. These two points, the biological reaction and the preservation of donor material, therefore receive special emphasis from both the practising surgeon and the research worker, not only in the realm of eyes, but in the realm of surgery in general where one tissue must be transplanted from one person into another.

Corneal grafting must not be looked upon as an isolated manœuvre requiring considerable surgical dexterity, but it must always be studied with the general problems of grafting elsewhere in the human body. It is allied to grafting of organs, skin, bone, and other tissues, but its requirements are more acute and the procedure must be carried forward with the aim not only of providing an organ with function but an organ of clarity. The ultimate judgment as to whether a corneal graft has taken or not must be the picture of a disc sewn properly into place, a clear window through which the patient can see, and with which the patient can redevelop his interest in life. Grafting of the cornea is concerned only with the replacement of an opaque tissue, and if it is to be a success the

rest of the eye must be perfectly normal, especially the retina and optic nerve. Cataract is not a contra-indication, as after the opaque cornea has been replaced the cataract can be removed.

The removal of corneal nebulæ has been attempted over the last two or three centuries, an early English reference to superficial keratectomy being made in the middle of the eighteenth century. Towards the end of the eighteenth century Darwin wrote: "After ulcers of the cornea which have been large, the inequalities and opacity of the cicatrix obscure the sight. In this case could not a small piece of cornea be cut out by a kind of trephine about the size of a thick bristle, or a small crow quill, and would it not heal with a transparent scar?"

In the nineteenth century treatment of corneal scars by the transplantation of tissue had two phases. For most of the time heteroplasty was the more popular, since the natural tendency with any new approach to surgery was first of all to try animal experiments, and then later to apply them to human beings. It must be remembered that at this time anæsthesia was a thing of the future, and to attempt any surgical procedure on the eye was hazardous and well-nigh impossible, so leading to fruitless and frustrating results. The second half of the century brought the influence of antisepsis, improvements of technique, and ultimately the introduction of some degree of anæsthesia. As time went on the introduction of ether and chloroform in the 1840s made speed less urgent, and Lister, in the 1860s, evolved the concept of antisepsis. Cocaine as a local anæsthetic was used in the 1880s, and towards the end of the nineteenth century was introduced the idea of infiltration anæsthesia. In 1888 Von Hipple performed the first successful corneal transplantation on a human being, and two years before this he showed a Heidelberg Congress of Ophthalmology a girl whose vision had been improved from counting fingers to 6/60 by a full-thickness rabbit graft, which he had implanted as a lamella into her cornea. At the beginning of the twentieth century the stage was set for our normal procedure. Anæsthesia was in general use, instruments were good, and there was some control of infection. The twentieth century was the period of homoplasty, and surgeons now turned their attention to the grafting of the human cornea into humans.

The cornea itself is a transparent tissue and resembles a small watch glass. Its curvature is a little greater than the rest of the globe and a slight furrow separates it from the sclera or white of the eye. In size it is eleven millimetres in diameter and varies in thickness from one millimetre at the periphery to 0.7 millimetres in the centre. It is absolutely avascular, having no blood vessels whatsoever. This is very important, and two main things should be emphasised. One is the avascularity, and the other the relatively low cellular content of the structure. These two points are thought to explain in part the reason why homographs of the cornea can be a surgical proposition, and why antigenic reactions are relatively rare.

Modern Keratoplasty.

General Principles of Grafting.

1. The human cornea only should be used for the graft, and the older the cornea the better. There is less tissue reaction, the material is easier handled, the curvature of the older cornea is very different to that of the young, and so a better optical result can be obtained.
2. Only fine, accurately made, sharp instruments with delicate silk sutures will give good apposition.
3. Adequate anæsthesia is necessary, and general anæsthesia is preferred. The avoiding of coughing, straining, and movement during operation is all important and it is not a subject for the occasional anæsthetist.
4. Strict asepsis.
5. The avoiding of irritants in or near the eye or the graft are, of course, generally accepted surgical principles.

Types of Graft.

There are two types of corneal graft—

(*a*) Full thickness.

(*b*) Partial thickness (lamellar).

With the former a disc of cornea is cut through the full thickness of the donor and host and the two pieces transferred. Any scar at any depth in the tissue is so replaced.

In the latter a shaving is taken from the host to remove the diseased tissues and the hiatus filled with a similar sliver from the donor.

These two types of graft can be used to achieve different ends—

1. *Optical.* When the operation is used to replace old opacities leaving a clear tissue through which light can pass, so restoring sight.
2. *Therapeutic.* This type is used to remove and replace an active disease as, e.g., recurrent dendritic ulcers or malignant disease. When this aim is achieved an optical graft can be done later and full function restored.

The Operation of Keratoplasty.

For full thickness grafting the patient is given general anæsthesia by an anæsthetist experienced in ocular surgery. If one thinks that half-way through the operation a hole has been bored in the eye, and nothing whatsoever is present to prevent the vitreous and lens being expelled by violent coughing of the patient, one can see the importance of experience on the part of the anæsthetist. The slightest squeezing of the lids or movement of the patient can bring disaster to the eye. Under general anæsthesia the eye is uncovered, fixed with sutures, and

the cornea kept continuously moist. The area of the scar is measured with calipers, and the size of the graft decided upon. With this, and with the knowledge gained beforehand by examining the eye with a corneal microscope, the lids are closed, and attention is turned to the donor material. This is removed from the refrigerator, and in this centre for an hour previous to operation the eyes are immersed in 1 per cent. soframycin solution. This antibiotic is used because of its potency and its relatively rare use in common practice, and as yet no bacterium resistant to the drug has been found. The eye is removed from the jar, held in a light gauze swab, examined carefully in a powerful light for any blemishes, and a trephine of suitable diameter is then placed on the cornea and centred carefully by both surgeon and assistants. The disc of corneal material is then cut and placed on a watch glass. Having been washed and freed from foreign material, two fine sutures are placed at opposite points through half the thickness of the graft. It is important to remember that the disc is usually five or six millimetres in diameter, and approximately three-quarters of a millimetre thick. It is a very fine structure and the sutures must not pass completely through it, otherwise epithelium will track down the suture, go inside the eye, and result in a secondary glaucoma. Having so prepared the graft the recipient eye is again turned to, and the same trephine, which has been washed, is used to remove the corneal disc from the patient's eye. The graft is then lifted on to the eye and placed in position, so filling the hole in the cornea and the two preplaced sutures are passed through the recipient cornea and tied in place. Other sutures are now used to fix the graft firmly in position, and often round a disc six millimetres in diameter one will have eighteen to twenty sutures. The time and precision required to place these can well be imagined, and they are only possible with the fine ultra-sharp instruments and suture materials now available. The eye is reconstituted by injecting air behind the graft and with the application of atropine the operation is finished. Both eyes are bandaged firmly with a crepe bandage and the patient transferred back to bed, where he is given systemic antibiotics, and the eyes left untouched for five days. Then at first dressing the eye is looked at and a general inspection made to assess absence of infection, position of graft, etc. Twelve days after operation the sutures are removed and the patient can be gradually got up, having the operated eye alone covered. Convalescence in hospital lasts for a further week, and approximately three weeks after operation the patient can go home. Sight is improved very considerably at this time, but as the graft settles and the eye recovers fully from the operation sight further improves, and this can be very dramatic. As to the pain of the operation one would think such trauma to the cornea, which is one of the most sensitive parts of the body, would produce excruciating pain, but this, surprisingly enough, is never found. The pain experienced by the patient is never more than a feeling of grit in the eye, and often very little or none is complained of at all.

Complications of Operation.

Infection and displacement of the graft, persistent œdema caused by poor surgery, graft host reaction, and vascularisation are all points which arise and cause failure. These, to a great extent, can be avoided by use of antibiotics, and the use of early application of local steroids.

Reasons for Failure of Graft.

1. *Inadequate technique.* This is usually due to inadequate training and absence of frequent opportunities to practise the operation. Corneal grafts are better done in centres where greater numbers are gathered and where there is adequate supply of donor material. This is one of the most delicate of operations and not one to be undertaken lightly.

2. *Imperfect Instruments.* Nowadays we place great importance on the perfection of the cutting edges of needles and trephines. These instruments are all hand-made, and hand-sharpened, and the cutting edge is perfect. The suture material is extremely fine, and it is often made up of three or four strands of natural silk, braided together, and sterilised suitably.

3. *Nursing Difficulties.* Corneal graft cases require special nursing, and when it is remembered that many of these patients are also deaf and old, the complications associated with a long stay in hospital and considerable recumbency show the importance of nursing care.

4. *Donor Supply.* If corneal grafts have to be done at isolated intervals in a general eye hospital, there is always the risk that a case will be admitted and require operation when donor material is not available. This is an additional reason why it is better that these cases should be treated in special centres, where there can be orderly and routine facilities available, and where everything is done in a routine manner. An important thing also is that the concentration in one centre of these cases tends to improve research thinking and research facilities.

5. *Donor-Host Relationships.* Here we come to the most difficult of the problems to be faced. The operation itself, with practice, can be straightforward, and the selection of patients is a matter of experience, but the antigen antibody reaction of homographs is a problem which has not yet been overcome. If such a reaction or "sickness" of the graft arises application of cortisone can be a considerable help.

6. *Other Causes of Failure.* These include active vascularisation, irregular corneal thickness, the presence of glaucoma, and the absence of accurate retinal function.

Lens changes can be removed afterwards, but should be noted before operation. No eye is operated upon for corneal graft where vision is better than 6/36, and a contact lens trial is invariably done before operation. The general condition

of the recipient is also important when one remembers that a case of full thickness keratoplasty may have to remain in bed for up to three weeks.

With all this it can be seen that we have now established the operation of corneal grafting beyond the experimental stage. To establish it firmly in a routine we require suitable patients, an adequate supply of donor material, and adequately trained surgeons. The patients are there, many having waited years for operation. Our main hold up is a supply of donor eyes, and this is a thing in which all medical practitioners, whether in hospital or in general practice, can help by their understanding and co-operation.

Last year we performed fifteen full thickness corneal grafts. In all cases vision was such that patients were unable to see to get about, to read, or lead even partially independent lives. Four of these also had cataracts, and two of these have already had these cataracts removed four months after being operated upon for full thickness corneal graft. One of the fifteen had the antigen antibody reaction and still has œdema of the graft, the sight, as yet, being little improved. Another, despite an uncomplicated operation and convalescence, developed an ulcer on the graft. All other cases have greatly improved sight. Many have again useful sight after years of blindness, a few who had bad sight since childhood are now for the first time able to see relatives and children clearly. All this is possible only with the supply of donor material, and with the co-operation of our colleagues in general and other hospitals this has increased greatly within the last year. Talks have been given to clubs in the Belfast region to try to bring to the lay public the thought of donating eyes and, what is more important, to condition them to allowing the eyes of a dead relative to be taken and used.

Eye Donation.

The procedure in donating eyes is as follows:—

Under the terms of the Corneal Grafting Act (1952) it is legal for ophthalmic surgeons to remove the eyes of deceased persons for therapeutic purposes. The donation procedure is simple in that the donor, either in writing or orally in the presence of two or more witnesses during his last illness, can express a request that his eyes be used for therapeutic purposes after death. If at any time a person so desires to bequeath his eyes many forms can be obtained from eye hospitals, and these forms are themselves self-explanatory, require only the insertion of the name of the person, and his signature in two places. One part of the form is sent to us in the Corneo Plastic Unit and Regional Eye Bank, the other is kept by the person and given to the next of kin. Little effort is required and very little in the way of trouble is given to any person wishing to fulfil his desire, and bequeath his eyes to us. The important thing is that we must be informed within a few hours of the donor's death to enable us to put our machinery into operation, and remove the material. If a person donates his eyes, and his relatives and next of kin after death allow the procedure to be carried out and are in agreement with the donation, those eyes must be removed, otherwise I think relatives feel that the wish of the deceased has not been carried out and feel the

trouble taken both by them, their own doctor, and the patient himself has been ignored by the hospital staff. For this very reason at the moment, with shortage of staff, we can only collect eyes within a radius of ten miles of Belfast, and further than this would be absolutely impracticable. In the near future, and with the advent of our new Eye Department at the Royal Victoria Hospital, we hope to be able to extend this service further afield. On the death of the donor the eye hospital should be informed as soon as possible, and as I have said before, one of us will at once proceed to where the body is lying and with the least trouble to those connected with the patient will remove the eyes and leave everything as before. We are very conscious of the great mental trauma and feelings of the relatives at the thought of the eyes being removed, and do our utmost to go about this procedure in an as unobtrusive way as possible, and also to make clear to relatives that we appreciate what has been done, and will use the material to attempt to give sight to a blind person. Only an experienced person is sent out to collect these eyes, and the whole procedure is kept in as efficient and considerate atmosphere as possible. I never inform the relatives as to which patient has received the eyes because it is often impossible to use all the eyes donated, but I make a point of writing to the relatives again a few days after the donation, and thanking them personally for their co-operation. As can be seen, the co-operation of all doctors, no matter in what way they are occupied, is called for in this matter, both to explain to people what is meant by corneal grafting and what the procedure is when the person desires to donate eyes, and only by this can our supply increase, and can our patients be satisfied. The supply of donor material is required for operative purposes, but eyes which cannot be used in this way can be used to great purposes in our research work.

Donor Material.

Thanks to well-informed publicity, public opinion has changed towards donating of eyes. Parliament in England considered and passed the Corneal Grafting Act in 1952. In Northern Ireland shortly after this the late Sir Samuel Irwin presented a bill in the Commons, which Senator Herbert Quin subsequently piloted through the Senate. It is along the same lines as the English Act, and is known as the Corneal Grafting Act (Northern Ireland, 1952). The technical advice on this was supplied by Mr. Wheeler, F.R.C.S.

An eye must be removed from the body six hours after death and this requires considerable organisation. After a telephone call to the Belfast Ophthalic Hospital saying that donor eyes are available the member of the team collecting the eyes calls at the hospital. There he collects a sterile enucleation set and a small sterile tightly capped bottle. He goes to where the body is lying, removes the eyes aseptically, places them into the bottle, and as quickly as possible this is placed in an ordinary domestic refrigerator and kept there at 4° Centigrade. The whole eye is removed, but with the socket suitably padded with cotton wool, and the lids closed, there is absolutely no disfiguration whatsoever. Often, as one knows, eyes sink after death and the padding produced by the cotton wool gives a more natural appearance to the body. This point of disfiguration must be carefully

considered and it is a point I feel very strongly must be looked to by whomsoever is performing the operation. In a special list we have the patients waiting for corneal graft, and on receipt of the donor material telegrams and telephone calls are made and a patient is asked to be in hospital within six hours. This is necessary because swabs have to be sent, the patient's eyes suitably sterilised with antibiotics in preparation for the operation, and the operation itself must be done within twenty-four, or at the very most thirty-six hours of the eyes being enucleated. It can be seen that this requires considerable trouble, effort, and intensive organisation to get the material and then the patient. Patients, before being put on the waiting list, are asked if they are prepared to comply with these requirements, and invariably are only too pleased to subject themselves to any regulations whatsoever if sight can be offered to them.

Conclusion.

This paper is not a detailed treatise on corneal grafting. It is hoped to explain the operation and procedure to those of my colleagues not acquainted with it. Then they may become interested, and attempt to help us by explaining to the lay public what is meant by corneal grafting and what can be done, and, more important, what the public can do to help us. This will allow us greater scope in the helping of patients. It is impossible to go into the reasons and hypotheses as to why the cornea is the only tissue of the body which can be transplanted from one person to another with a high percentage of success, why the allergic reaction is thankfully relatively rare, and such other problems which must be faced by us, and by anyone concerned in transplantation of tissues. As was said by Sir Benjamin Rycroft at the conclusion of a paper: "The corneal grafting operation has become an essential component in modern ophthalmic surgery. It represents a major advance along with the surgery of retinal detachment, in the treatment of blindness in our century." This fortunate state is due to the initiative of surgical pioneers, the antibiotics of the biochemist, the skill of the instrument makers, investigations of biologists, and the faith and trust of the patient.

Appendix.

The following are the essential parts of 'The Corneal Grafting Act' (Northern Ireland, 1952). This will be repealed on the passing of 'The Human Tissues Bill' at present before the Senate, but the legal position will remain the same.

Removal of eyes of deceased persons.

(1) If any person, either in writing at any time, or orally in the presence of two or more witnesses during his last illness, has expressed a request that his eyes be used for therapeutic purposes after his death, the party lawfully in possession of his body after his death may, unless he has reason to believe that the request was subsequently withdrawn, authorise the removal of the eyes from the body for use for those purposes.

(2) Without prejudice to the foregoing subsection the party lawfully in possession of the body of a deceased person may authorise the removal

of the eyes from the body for the purpose aforesaid unless that party has reason to believe:

(*a*) That the deceased had expressed an objection to his eyes been so dealt with after his death, and had not withdrawn it, or

(*b*) That the surviving spouse, or any surviving relative of the deceased objects to the deceased's eyes been so dealt with.

(3) An authority given under this section in respect of any deceased person shall be sufficient warrant for the removal of the eyes from the body and their use for the purposes aforesaid, but no such removal shall be effected, except by a registered medical practitioner, who must have satisfied himself by personal examination of the body that life is extinct.

(4) Authority for removal of eyes will not be given under this section if the party empowered to give such authority has reason to believe that an inquest may be required to be held on the body.

(5) No authority shall be given under this section in respect of the body of a deceased person by a person entrusted by another person with the body for the purpose only of its interment or cremation.

(6) In the case of a body lying in a hospital. Any authority under this section may be given on behalf of the person having the control and management of the hospital, by any officer or person designated in that behalf by the first-mentioned person.

(7) Nothing in this section shall be construed as rendering unlawful any dealing with, or with any part of the body of a deceased person, which would have been lawful if this Act had not passed.

THE VASCULAR PHENOMENA OF THE EAR, NOSE, AND THROAT

By **H. W. H. SHEPPERD, M.B., F.R.C.S., D.L.O.**
Ards and Down Hospitals, Co. Down

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DURING the last few years an increasing number of authors has postulated that a vascular mechanism is responsible for a number of the diseases of the ears, nose, and throat. It may be useful to consider the relationship of these diseases to one another and to see if the treatment used for one could be of any use for the others. The conditions to be discussed include:

1. Migraine.
2. Meniere's syndrome, in which is included not only Meniere's triad, but also allied conditions such as sudden perceptive deafness or vertigo without deafness, at present classified as vestibular neuronitis.
3. Atrophic rhinitis.
4. Vasomotor rhinitis.
5. Bell's palsy.
6. Basilar artery insufficiency.

The differential diagnosis of these conditions need not be described and it is assumed that all other possibilities have been excluded before making a diagnosis of any one of them. Each of these conditions can now be described in some detail.

Migraine.

It has been included, as many patients with this disease are referred as having sinusitis but may require other treatment. It has long been accepted as a stress disease with a vascular mechanism, and changes in the calibre of groups of vessels have been observed during attacks, namely in the retinal vessels and also intracranial vessels following head injuries which have resulted in craniostomy. The prodromal symptoms are caused by vaso-constriction, the symptoms varying according to which vessels are involved. They are often visual and may involve the vessels of the retina or optic nerve, thereby involving only one eye, or the vessels of the optic chiasma causing a bitemporal upset, or the vessels anywhere along the visual pathways from the optic tract to the occipital cortex, causing homonymous symptoms. Other sensory phenomena are common such as paræsthesiæ and the well-named Alice in Wonderland phenomenon.

The headache is due to subsequent vasodilatation and is sometimes associated with nasal obstruction. The site of the ache varies with the site of the dilatation. If the dilatation is well forward the pain is frontal and if at the occipital region

the pain is in the neck or up the back of the head. In passing, this may well explain the so-called vacuum headache often described in nasal conditions.

Meniere's Syndrome.

It has been stated by many writers that Meniere's syndrome has a vascular mechanism; chief amongst these are Lermoyez (1919), Passe and Seymour (1948), Seymour (1954a), Wilmot (1957), and Golding-Wood (1960a). Their findings are well documented and convincing.

Seymour based his beliefs on his experimental findings. He believed that symptoms are produced by spasm of the branches of the internal auditory artery, occurring either singly or together, that this causes a reduction in the volume of endolymph. That subsequently there is an accumulation of metabolites in the endolymph and therefore an increase in its volume, resulting in the typical hydrops. That with repeated attacks organic changes occur in the vessels of the stria vascularis and that each attack causes further damage to the organ of Corti.

Seymour's work has not yet been widely accepted, largely because of the disappointing results of sympathectomy. However, these results cannot invalidate his experimental findings, for not only has sympathectomy been disappointing in the treatment of most conditions for which it has been advocated, but also many of the cases of Meniere's syndrome in which it has been done have been at a stage of the disease so advanced that organic changes in the strial vessels have already occurred and considerable damage has already been done to the organ of Corti. Seymour's work has received further support from the success of vasodilator drugs, particularly buphenine hydrochloride (perdilatal). Seymour (1960a).

The other point of importance is the presence of emotional tension in these cases, and attacks are frequently precipitated either by an increase in this tension or by some physical factor, such as sudden noise or exposure to cold.

Atrophic Rhinitis.

This disease is still classified as of unknown ætiology, but it seems likely that it too has a vascular mechanism. Malcolmson (1959) showed that stimulation of the cervical sympathetic in the cat produced a vasoconstriction and shrinkage of the nasal mucosa. He subsequently performed a pre-ganglionic superior cervical sympathectomy on a number of patients with atrophic rhinitis and states that, provided permanent organic vascular changes have not occurred, then excellent immediate results ensue, the crusting stops and the mucous membrane regains its normal appearance. Wilmot (1961b) had a case of early unilateral atrophic rhinitis in which the nose returned to normal after sympathectomy.

More recently success has been claimed by the use of vasodilator drugs (De Vincentees and Lucara, 1960).

Taylor and Young (1961) suggested that there were two types of this condition. One in which the terminal arterioles showed endarteritis and peri-arteritis and one in which they did not. This could equally well be interpreted as different stages of the same (vascular) process, the changes in the second type being reversible.

Vasomotor Rhinitis.

This condition has been so named for many years, but the term has become synonymous with allergic rhinitis. There is no doubt about the allergic nature of hay fever but Golding-Wood (1961) has shown that many non-allergic noses not only look and behave like allergic ones but also that smears of the nasal secretions show large numbers of eosinophils. Skin sensitivity tests carried out in patients with such noses have usually given non-specific results, and response to anti-allergic treatment has usually been disappointing. He postulates that this change is due to over-action of the parasympathetic rather than an antigen-antibody reaction.

Malcolmson (1959) has shown that in the cat, nasal mucosal swelling and sneezing are produced by stimulation of the nasal parasympathetic supply. He then treated a number of patients with what he called non-specific vasomotor rhinitis by neurectomy. First of all section of the greater superficial petrosal nerve and subsequently Vidian's nerve. The immediate results were satisfactory.

Golding-Wood quite independently had reached similar conclusions and showed that stimulation of the greater superficial petrosal nerve in the human produced marked sneezing. He too treated a number of patients by section of the nasal parasympathetic supply, at first by dividing the greater superficial petrosal nerve and later Vidian's nerve. The immediate results were dramatic. The longest follow-up period was five years and the improvement was maintained throughout.

There is still further evidence of the vascular nature of this condition, for swelling of the turbinates has been observed in humans, not only after stellate ganglionectomy but also during the treatment of essential hypertension by the use of vasodilator drugs such as reserpine, especially in high dosage.

Wilmot (1961b) has performed a sympathetic block in a number of patients with vasomotor rhinitis. He found that the nasal mucosa returned to normal size and colour and that the effect lasted for about an hour. It is therefore obvious that the condition is not due solely to parasympathetic overactivity and that until we know more about the neuromuscular mechanism controlling the nasal vascular bed we can only postulate an autonomic imbalance.

That such different conditions as vasomotor rhinitis and atrophic rhinitis should be due to autonomic imbalance is not as absurd as would at first appear. The evidence suggests that in one the imbalance occurs mainly at the arterial end of the vascular bed and in the other at the venous end.

That emotional stress is an important factor in vasomotor rhinitis was confirmed by O'Neill and Malcolmson (1954). In their small group of patients the co-operation of psychiatrist and rhinologist proved most successful.

Bell's Palsy.

That this condition has a vascular mechanism has been fairly widely accepted for some time. Of recent years Kettel (1959) has been one of the most active supporters of this theory. Whether the ischæmia is produced solely by vaso-constriction as he believes or to a combination of vasoconstriction plus the pressure caused by the subsequent swelling of the nerve in its narrow canal as advocated by Blunt (1956) is not relevant here.

Boyes Korkis (1961) treated his cases of Bell's palsy by cervical sympathetic block repeated every two or three days. He did not use vasodilator drugs, as he considered that these would have obscured his results. His figures showed that, provided the patient is young and seen within seven days of the onset (the earlier the better), the prognosis is improved by treatment. If there is no response within four weeks he advocates decompression of the nerve, a procedure with which most authors agree.

Many cases of Bell's palsy seem to have been triggered by exposure to cold, but there is still a large number in which this has not happened. Emotional tension has not been invoked in the ætiology of this condition, but a more careful history might be rewarding.

Basilar Artery Insufficiency (Williams, 1957).

This condition is seen more often by the neurologist than the otologist. As the name implies, insufficient blood reaches the basilar artery either because it has gone into spasm or because insufficient blood is reaching it from one or both vetrebral arteries. This, in turn, may be due to spasm, hæmodynamics, or be purely mechanical and produced by movements of the head. The symptoms are of dramatic onset, and the patient notices bilateral visual disturbance of varying degree from slight up to complete blindness, and severe vertigo with nausea and vomiting. Other symptoms may also occur such as ataxia, dysarthria, occasional tinnitus, and paræsthesiæ, or even complete loss of consciousness.

These usually pass off rapidly, the time taken varying from about two to forty-five minutes, and the patient is left with a severe headache involving the occipital region and back of the neck. The vertigo in these cases is probably largely central.

Again the condition is usually associated with emotional tension and in one series of cases this was frequently pre-menstrual and occurred soon after the onset of the menarche (Bickerstaff, 1961).

It now appears that some of these conditions have a number of points in common.

1. Each has been attributed to vasoconstriction. This, in turn, is attributed to autonomic imbalance. In all the conditions, except in vasomotor rhinitis, this imbalance favours the sympathetic nervous system. In vasomotor rhinitis it favours the parasympathetic nervous system.
2. The autonomic imbalance in four of the six conditions is thought to be due to emotional tension, the two exceptions being atrophic rhinitis and Bell's palsy, in which an emotional factor does not appear to have been considered.
3. In some of the six conditions there is a strong familial tendency, e.g., migraine and vasomotor rhinitis.
4. The precipitating factor in all except atrophic rhinitis, in which no factor has been recorded, is either an increase in emotional tension or is physical, such as a sudden change in temperature, light or noise, or the presence of dust; or possibly a combination of both.

5. Each condition falls into two groups:—
   (a) In the young and due only to vasoconstriction. This group is normo- or even hypotensive.
   (b) In the more elderly, in which arteriosclerosis plays an increasing part.
6. There is frequently a remarkable overlap of these conditions, for instance:
   Migraine with Meniere's syndrome.
   Migraine with vasomotor rhinitis.
   Migraine with Bell's palsy.
   Deafness with vasomotor rhinitis.
   Bell's palsy with transient atrophic rhinitis.
   Bell's palsy with ipsilateral facial œdema (Melkersson's syndrome).
   Migraine with Melkersson's syndrome.
   Bell's palsy with Meniere's syndrome.

Usually one symptom dominates but the overlap confirms that these conditions are not due to local disease but are manifestations of a more central upset mediated by the autonomic nervous system.

A stage has now been reached in the treatment of these conditions which was reached in the treatment of essential hypertension some years ago. First came the realisation that the end organ (the arterioles) was affected by an autonomic imbalance.

This led to an outbreak of sympathectomy. The immediate results were encouraging, but soon relapses occurred. The reason for these is not clear, but there are three possibilities:—

1. All the sympathetic fibres were not destroyed.
2. Regeneration of fibres had occurred.
3. The sensitivity of denervated muscle to circulating substances such as adrenaline was increased.

These failures led to a search for drugs which would produce the same effect indefinitely. The first group, the ganglion blocking agents, of which hexamethonium is an example, proved to be of considerable value, but search continued for a drug which would act more centrally, and of these the Rauwolfia compounds, especially reserpine, proved most successful. Many other drugs now loosely labelled as tranquillizers, have been used, such as chlorpromazine (Largactil) and prochlorperazine (Stemetil). Their site of action has not yet been settled, but it is probably at the hypothalamic centres, although some may have an action higher still.

The pendulum has now swung back to a peripherally acting drug, guanethidine (Ismelin) which blocks conduction in post-ganglionic sympathetic fibres only.

As drugs become more efficient they are replacing sympathectomy, not only in the treatment of hypertension but also Raynaud's disease and allied conditions.

Treatment.

If the premise is accepted that these conditions have a vascular mechanism, then several lines of treatment would be rational.

Sympathectomy. Both pre- and post-ganglionic sympathectomy have been used for several of the conditions, but there is no evidence to suggest that it will

have any more long-term success in the head and neck than elsewhere. It is probable that as the drugs available become more efficient, or even as those already available are used with greater understanding, the number of cases subjected to sympathectomy will decline. At present there would seem to be a case for sympathectomy in Meniere's syndrome in those patients who have failed to respond to intensive drug therapy.

Sympathetic block. It would seem rational to use this for the treatment of the acute phase of Meniere's syndrome and also in Bell's palsy, for in both conditions the sooner the vasoconstriction is relieved the better. It is also of help as a diagnostic procedure in Meniere's syndrome and possibly in atrophic rhinitis.

Parasympathectomy. In vasomotor rhinitis this has proved of great success (certainly short term) in the otherwise intractable case. However, division of the parasympathetic elsewhere has proved disappointing (e.g., vagotomy for peptic ulcer) and only a few patients have sufficient upset to warrant operation, but at present there is nothing else to offer them.

Drugs. (a) Vasodilators. The use of vasodilator drugs sets a problem much larger than arises in the treatment of hypertension. A generalised vasodilatation is not wanted, for with it there will be a fall in the venous return to the heart, a fall in the cardiac output and consequent fall in blood pressure, so that the end result is a reduction in the amount of blood reaching the part.

Perdilatal (buphenine hydrochloride) is the outstanding drug available at present. It acts peripherally on smooth muscle producing a dilatation of the terminal arterioles. It sometimes produces flushing, headache or slight postural hypotension, but usually provides adequate local vasodilatation if taken in sufficient dosage (up to 48 mgms. daily) without side effects. Its value in Meniere's syndrome is undoubted, and in Bell's palsy it may well prove of greater value than the repeated stellate blocks advocated by Boyes-Korkis. In atrophic rhinitis it is at least as effective as most other remedies. In migraine the headache is due to the vasodilatation which follows the initial vasoconstriction, so we would expect an attack to be made worse if the drug is taken once the vasodilatation has begun. This has proved to be so, but some success in preventing attacks has been achieved by a course of perdilatal. However, it is not clear whether this is due to the drug or to the fact that someone is taking an interest in the patient and "selling" him a new treatment.

Ilidar (azapetine phosphate), which is also a vasodilator acting peripherally, has proved of some success in atrophic rhinitis.

(b) Tranquillizers. Various groups are included in what has become rather an omnibus term.

(i) The phenothiazine group, which not only includes largactil and stemetil, but also drugs known to us for other purposes, such as phenergan and avomine.

(ii) The group containing meprobamate (equanil).

The tranquillizers act more centrally, all by reducing anxiety and turmoil without putting the patient to sleep, and some also by an action on the autonomic centres.

To combine a tranquillizer with a drug acting peripherally would seem rational, thereby not only reducing emotional tension but also blocking the path to the target organ.

The beneficial effect of some of the antihistamine drugs such as phenergan in vasomotor rhinitis may well be due to their central sedative effect rather than their antihistamine properties.

(c) Sedatives of which phenobarbitone remains supreme.

Diet. For years diet has been used in the treatment of Meniere's syndrome in the form of restriction of salt and water intake. This was based on the belief that the symptoms were produced by hydrops of the labyrinth, but Seymour has shown that this is a secondary effect. The regime seldom had much effect and is now losing favour.

A reducing diet, however, in those overweight patients in the older age group may be of benefit, for if there are atheromatous changes around the circle of Willis or even more proximally in the carotid or vertebral systems, then, provided the degeneration is in its early stages, the process may be halted or even reversed for a time.

Pyschotherapy. By this is meant the treatment which the otologist can carry out in his consulting room. By careful history taking, examination, and explanation as to how the symptoms are produced the patient can be made to feel that an interest is being taken in him and helped to come to terms with the stresses to which he is subjected.

Treatment must be for the whole individual and not just the organ affected.

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REGIONAL VARIATIONS IN MORBIDITY IN THE INSURED POPULATION OF NORTHERN IRELAND

By C. W. KIDD, O.B.E., M.D., Ph.D., M.R.C.P.Ed.
Ministry of Health and Local Government

and A. T. PARK, Ph.D.
Ministry of Finance

For many years those concerned with the task of assessing community health have relied mainly on the Registrar General's mortality records and while they are undoubtedly of value and interest they do not represent the amount of sickness in our population.

It is ironical that in our Welfare State, with its mass of protective and supportive social agencies, there does not seem to be any notable reduction in sickness—the increase in the expectation of life and the influence of medicated survival no doubt play their part. However, sickness absence figures in Northern Ireland, as in Great Britain, as a whole, do little to reflect our affluent society.

If sickness claims on our National Insurance Fund can be regarded as a fair index of community health, then we have indeed substantially more sickness in Northern Ireland than in other parts of the United Kingdom. It has been suggested that the monetary differential is in the region of £1,500,000 per annum pro rata excess cost to the National Insurance Fund. During 1960 about 9.6 million working days or 1.6 million man-weeks were lost in Northern Ireland because of sickness. This represents an average of just over three weeks per insured person. On past experience this would be about 50 per cent. higher than in Great Britain. Detailed comparison with Great Britain is difficult, but it is clear that the concentration of claims in Northern Ireland occurs in spells of two to thirteen weeks' duration, whereas in Great Britain the weight lies in one- to four-week spells. This situation has stimulated several studies into what we can broadly call morbidity in the insured population of Northern Ireland.

Each year the Ministry of Pensions and National Insurance issues a large Digest of Statistics analysing certificates of incapacity, showing under fifty main diagnostic headings the causes and durations of incapacity for work for virtually the entire working population of Great Britain, including both employed and self-employed persons—some 20,000,000 people. This information is based on doctors' certificates issued for sickness benefit purposes. Separate and similar analyses are carried out in Northern Ireland by the Ministry of Labour and National Insurance for a much smaller population at risk, approximately 500,000 males and females between the ages of 15 and 65 years.

Making use of these data, one is able to compare experience in Northern Ireland with Scotland and England and Wales. Scotland has perhaps greater physical and economic similarities to Northern Ireland than England and Wales, and therefore their statistics are commonly used for purposes of comparison.

In a general study on morbidity in the insured population of Northern Ireland, Kidd and Park (1958) showed that the pattern of sickness is different from that

of Great Britain. In comparison with Scotland, for example, it was shown that, although new claims to sickness benefit are made less frequently in Northern Ireland, the duration of sickness spells is, on average, longer in Northern Ireland and there is relatively much more long-term sickness than in Scotland. In other reports Kidd and Park (1959 and 1960) have indicated that bronchitis, arthritis, and rheumatism make a substantial contribution to this long-term sickness problem.

In this report the variation in morbidity within Northern Ireland is discussed. For convenience, the areas chosen are the local office areas of the Ministry of Labour and National Insurance, the two smallest areas—Ballyclare and Ballynahinch—being merged with contiguous areas. It is emphasised that the numbers do not represent the numbers sick in the towns named but, especially at offices in the country towns, include large numbers from the surrounding countryside and from other towns in the area covered by the local office. Apart from Belfast (416,000) and Londonderry (54,000), the local office areas are based on small towns with populations ranging from 5,000 to 25,000 persons. The analysis is based on the spells of sickness, reckonable for sickness benefit, completed in the year ended 31st May, 1961, for a random 20 per cent. sample of insured persons.

Some difficulty arises in estimating the number of persons exposed to risk, that is, insured persons in a particular local office area. The local office distribution is based on the insurance cards exchanged at each local office of the Ministry and it is open to an insured person or to an employer to exchange cards at whatever local office is most convenient to him. (For example, all the Ulster Transport Authority cards are exchanged in Belfast, although the employees live and work at various places throughout the Province.) The bias due to this factor has been eliminated as far as possible by allocating the insurance cards to the local office corresponding to the address on the national insurance card.

In Table 1 the number of completed spells per 1,000 insured persons (hereafter called the sickness rate) is given for each area for men, married women and other women (i.e., single, widowed, and divorced) separately. For ease of reference the sickness rates are ranked from 1 to 25, the highest rate ranking as 1.

For Northern Ireland, as a whole, the sickness rate for men in 1960-61 was 316, for married women 659, and for other women 375; this sort of pattern, with the rate for married women being appreciably higher than for the other two groups, was common to the majority of local office areas.

The areas with the highest rates among men were Omagh, Cookstown, Dungannon, Antrim, Newry, and Armagh; for married women—Strabane, Ballymena, Dungannon, Newry, Antrim, and Downpatrick; and for single women—Dungannon, Ballymena, Omagh, Armagh, Antrim, and Newry. Thus Dungannon, Antrim, and Newry were ranked in the first six for all three sex and marital status groups. Belfast ranked twenty for both men and married women and ten for other women.

When a sample of this nature is subdivided by sex, local office area, and diagnosis, the figures in many places are small and subject to random fluctuations so that little reliability can be placed on them. In the circumstances sickness rates

TABLE 1.

NUMBER OF SPELLS OF SICKNESS COMPLETED DURING THE YEAR ENDED 31/5/61 PER 1,000 PERSONS EXPOSED TO RISK WITH RANKING BY SEX AND LOCAL OFFICE AREA.

LOCAL OFFICE AREA	MEN		MARRIED WOMEN		OTHER WOMEN	
	Per 1,000 insured	Ranking	Per 1,000 insured	Ranking	Per 1,000 insured	Ranking
Antrim	423	4	882	5	470	5
Armagh	414	6	806	9	517	4
Ballymena	384	8	1,172	2	638	2
Ballymoney	234	24	696	14	280	21
Banbridge	298	18	625	17	270	22
Bangor	265	23	589	21	243	25
Belfast	288	20	607	20	385	10
Carrickfergus	304	16	663	16	432	8
Coleraine	266	22	524	23	309	19
Cookstown	433	2	734	11	448	7
Downpatrick	336	14	857	6	257	24
Dungannon	429	3	1,000	3	648	1
Enniskillen	388	7	426	25	365	13
Larne	371	10	526	22	369	12
Limavady	351	12	607	19	351	14
Lisburn	278	21	721	13	261	23
Londonderry	302	17	489	24	312	18
Lurgan	353	11	839	7	377	11
Magherafelt	375	9	734	12	421	9
Newcastle	292	19	675	15	322	17
Newry	418	5	955	4	452	6
Newtownards	223	25	623	18	304	20
Omagh	462	1	737	10	569	3
Portadown	347	13	815	8	337	15
Strabane	306	15	1,196	1	324	16
N. Ireland	316	—	659	—	375	—

by diagnosis for men were calculated only for the four diagnostic groups with the greatest frequency of spells in the year—influenza, bronchitis, arthritis, and rheumatism, and diseases of stomach and duodenum. The sickness rates for men for each of these diagnosis are given by area, with rankings, in Table 2. The areas with the highest rates for men for influenza were Cookstown, Magherafelt, Lurgan, Dungannon, and Antrim. For bronchitis, the highest rates were in Larne,

TABLE 2.

NUMBER OF SPELLS OF SICKNESS COMPLETED DURING THE YEAR ENDED 31/5/61 PER 1,000 EXPOSED TO RISK WITH RANKING FOR CERTAIN DIAGNOSES FOR MEN BY LOCAL OFFICE AREA.

Local Office Area	Bronchitis		Arthritis and Rheumatism		Influenza		Diseases of Stomach and Duodenum	
	Per 1,000 insured	Ranking	Per 1,000 insured	Ranking	Per 1,000 insured	Ranking	Per 1,000 insured	Ranking
Antrim	26.7	8	37.6	9	110.3	5	29.1	10
Armagh	29.6	6	42.7	6	97.9	8	35.8	3
Ballymena	25.0	10	32.6	11	71.4	20	34.4	4
Ballymoney	13.0	24	19.1	19	48.1	25	18.5	21
Banbridge	10.5	25	22.8	17	88.4	14	12.5	24
Bangor	25.3	9	10.1	25	70.9	21	12.0	25
Belfast	30.5	5	18.0	21	82.1	17	19.2	19
Carrickfergus	27.2	7	14.7	22	73.3	19	19.9	17
Coleraine	19.7	16	25.7	15	55.2	24	18.6	20
Cookstown	23.6	13	38.6	8	140.5	1	53.5	1
Downpatrick	14.6	22	14.6	23	95.7	9	26.6	13
Dungannon	19.6	17	47.8	3	115.8	4	34.0	7
Enniskillen	33.6	3	45.5	5	90.9	12	34.4	5
Larne	48.2	1	23.1	16	80.0	18	27.0	12
Limavady	14.7	21	40.3	7	92.9	11	31.8	8
Lisburn	16.1	20	13.9	24	84.4	16	18.3	22
Londonderry	22.7	14	32.7	10	61.2	22	30.5	9
Lurgan	20.6	15	27.9	13	119.9	3	19.4	18
Magherafelt	24.7	11	50.9	1	120.4	2	27.7	11
Newcastle	13.6	23	22.0	18	90.1	13	25.1	14
Newry	39.2	2	50.5	2	94.0	10	34.0	6
Newtownards	17.6	19	19.1	20	55.4	23	14.1	23
Omagh	24.1	12	47.6	4	100.5	6	37.5	2
Portadown	33.1	4	30.2	12	99.4	7	21.5	16
Strabane	18.4	18	26.3	14	84.8	15	25.0	15
N. Ireland	26.7	—	25.4	—	84.3	—	23.1	—

Newry, Enniskillen, Portadown, and Belfast. Arthritis and rheumatism was most prevalent in Magherafelt, Newry, Dungannon, Omagh, and Enniskillen, while diseases of the stomach ranked high in Cookstown, Omagh, Armagh, Ballymena, and Enniskillen. The numbers in the sample were too small for a regional breakdown by diagnosis for married women. Amongst other women, the sickness rates by areas were calculated only for influenza and tonsillitis and are given in

TABLE 3.

NUMBER OF SPELLS OF SICKNESS COMPLETED DURING THE YEAR ENDED 31/5/61 PER 1,000 EXPOSED TO RISK WITH RANKING FOR CERTAIN DIAGNOSES FOR SINGLE, WIDOWED, AND DIVORCED WOMEN BY LOCAL OFFICE AREA.

LOCAL OFFICE AREA	INFLUENZA		TONSILLITIS	
	Per 1,000 insured	Ranking	Per 1,000 insured	Ranking
Antrim	87.0	12	77.4	1
Armagh	136.8	3	38.5	9
Ballymena	114.6	7	63.2	4
Ballymoney	66.2	19	27.8	12
Banbridge	76.9	15	18.1	22
Bangor	68.0	18	19.7	21
Belfast	96.0	10	25.1	13
Carrickfergus	65.9	21	58.6	6
Coleraine	58.5	24	23.0	18
Cookstown	171.6	1	29.9	11
Downpatrick	60.3	22	22.2	19
Dungannon	113.3	8	70.0	2
Enniskillen	93.2	11	23.3	16
Larne	55.2	25	61.0	5
Limavady	116.9	6	17.3	23
Lisburn	71.7	17	17.0	24
Londonderry	60.3	23	12.4	25
Lurgan	128.2	4	39.7	8
Magherafelt	122.2	5	57.9	7
Newcastle	74.3	16	24.8	14
Newry	106.4	9	23.5	15
Newtownards	78.2	14	21.3	20
Omagh	158.4	2	64.5	3
Portadown	82.0	13	31.0	10
Strabane	66.0	20	23.3	17
N. Ireland	92.3	—	31.0	—

Table 3. The areas with the highest rates for influenza were Cookstown, Omagh, Armagh, Lurgan, and Magherafelt; three of these areas were also highly ranked for influenza among men. Tonsillitis was most prevalent in Antrim, Dungannon, Omagh, Ballymena, and Larne.

Influenza, of course, can vary appreciably from place to place and from year to year, so that one year's experience can tell little more than whether there were any epidemics and where they occurred. In 1960-61 Cookstown appeared to be the worst hit area in this respect.

The other diagnosis quoted in the tables are not subject to such fluctuations and one year's experience is more likely to reflect the usual distribution of the diagnosis throughout the Province than in the case of influenza; even then, however, only general remarks can be made from the data.

It is interesting to note, for instance, that of the diagnoses studied, only for bronchitis was the Belfast rate higher than the average for Northern Ireland, and was ranked five compared with about twenty for other diagnosis. The incidence of arthritis and rheumatism seems to be greater in the country areas than in the area around Belfast.

The relatively high sickness rates for women in the Ballymena and Dungannon areas would appear to warrant further research.

Comment.

This study gives a broad indication of regional variations in the incidence of sickness in the insured population of Northern Ireland, with particular reference to some of the common diagnoses.

It must be remembered, of course, that before any conclusions could be drawn about the regional variation of morbidity, regard would have to be paid to two of the other factors involved—age and occupation. Both of these items are available for persons who claim sickness benefit, but difficulty arises about those exposed to risk as neither age nor occupation is inserted on the national insurance card. The insured person's age can be obtained by cross reference to other insurance records; this is a difficult operation and the allocation of the insured person to the area of abode rather than of place of work further complicates the issue. Occupation is not available in any records for all insured persons—industry is, but this is not the same thing—and employers would have to be approached for this type of information.

Even if these two items were available, the difficulty would then be that the 20 per cent. sample would be inadequate to deal with a subdivision by age, sex, diagnosis, area, and occupation, and a larger sample, probably all cases, would be required for a reliable investigation.

Alternatively the local office areas could be grouped to cut the regional breakdown to three or four groups or the analysis could be confined to specific diagnoses and/or occupations on a 100 per cent. basis.

It is hoped that this preliminary survey of regional variations of sickness within the Province will encourage further research in this field. Such research would also help to throw some light on the reasons for the different pattern of sickness here compared with other parts of the United Kingdom.

Acknowledgment.

We are grateful to Dr. F. F. Main, Chief Medical Officer, for permission to publish this paper.

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DIABETES MELLITUS AND ADDISON'S DISEASE

By **EDWARD W. KNOX, M.D., M.R.C.P.(I.)**
Senior Registrar, Belfast City Hospital

DIABETES mellitus and Addison's disease in one patient is rare. Only in the past twelve years has it been well recognised in medical literature. The following case history is the sixty-ninth reported in the world and the third from Ireland. It is presented to produce a greater awareness to the likelihood of this combination of diseases, which modern therapy will make more common.

CASE HISTORY.

P. B., a female, now aged 43 years, has no family history of diabetes. A childhood bronchitis cleared at adolescence. From leaving school until marriage she worked as a shop assistant.

In 1947, when aged 28 years, during the sixth month of her third pregnancy, she became comatose and was diagnosed as having diabetes mellitus. The disease was of the juvenile type and difficult to control. During the six years following diagnosis she was in hospital on four occasions for stabilization. In October, 1953, she was discharged from hospital on a 2,200 calorie diet with a daily dose of twenty units of soluble insulin and thirty-two units of protamine zinc insulin.

For the next six years, from 1953 to 1959, she apparently remained well, failed to attend the diabetic clinic for supervision, and self-adjusted her dose of insulin according to how she felt.

She was admitted to the Belfast City Hospital on the 11th April, 1960, having had several attacks of nausea and general confusion during the previous two weeks. She had reduced her insulin dosage from fifty-two units to thirty-two units daily, but had produced no improvement in her condition. She was drowsy and dehydrated with a blood pressure of 110 mms. Hg. systolic and 70 mms. diastolic. Pigmentation of exposed skin areas was noted but not regarded as significant at this stage. Her urine gave a red-brown reaction with Benedict's Test, but contained no acetone.

A 1,500 calorie diet and forty units of Lente insulin daily produced a temporary clearing of the glycosuria. However, it became obvious over the following week that her diabetes was most unstable. Hypoglycæmic episodes followed bouts of glycosuria in a completely irregular manner. On the 21st April her general condition deteriorated with nausea, vomiting, and weakness. Clinically she appeared to be developing a hyperglycæmic coma. Although the blood sugars were moderately high, her urine was free from acetone. Electrolyte block on the 25th April showed marked dehydration with salt loss. Two days later her condition was critical. Although serum potassium levels were raised, electrocardiographic changes were in keeping with hypokalæmia. At this time the possibility of her dehydration not being diabetic was considered. Although the high potassium level and salt depletion of the blood could have been due to diabetic coma, it was thought her degree of drowsiness could not be produced without ketosis. As her coma deepened it was decided to give her corticoid therapy as there was the possibility of adrenal failure. An initial dose of 100 mgs. of hydrocortisone was given intravenously followed by a daily intramuscular

injection of 5 mgs. of D.O.C.A. Cortisone was administered orally in six hourly doses of 50 mgs., later being reduced to 25 mgs. three times daily. Over the next few days there was an immediate improvement and she continued to keep well.

In spite of her response to corticoids, there was still much controversy as to the cause of her illness. One view was that she had had a diabetic coma with osmotic diuresis, loss of sodium chloride and peripheral circulatory failure; the other that the patient had had adrenal failure. Corticoid treatment was gradually discontinued and the patient was discharged on the 17th May for observation on a trial of 1,500 calorie diet with thirty units of soluble and thirty-six units of protamine zinc insulin daily.

On the 28th May she was re-admitted in a severe hypoglycæmic coma. This was controlled by routine treatment. Adrenal failure was again reconsidered. Straight X-ray abdomen showed no calcification. X-ray skull was normal. Levels of 17 keto-steroids in twenty-four hour samples of urine were 1.9 mgs. and 2.3 mgs. Seventeen ketogenic steroid level was 2.4 mgs. in twenty-four hour urine. She again developed peripheral circulatory failure on the 15th June. It was not felt to be justifiable to withhold therapy to prove the diagnosis by an A.C.T.H. stimulation test. She was again commenced on corticoid therapy, responded, and was finally controlled by cortisone 25 mgs. orally three times per day and fluorohydrocortisone 0.1 mg. orally daily. Her diabetes was satisfactorily stabilized on a daily dose of ten units of soluble insulin and twenty-four units of protamine zinc insulin.

She went home on the 4th July, 1960. Since then the pigmentation has disappeared, except for patches on her neck and knees, and her blood pressure has been maintained at 140 mms. Hg. systolic and 90 mms. Hg. diastolic. Blood sugar levels are controlled within reasonable limits by visits to the clinic at two-monthly intervals. She has gained a stone in weight and has been able to live an active full life.

Discussion.

Modern therapy has improved the prognosis in both diabetes mellitus and Addison's disease. The increased life expectancy has rendered the opportunity of their association more likely. A growing awareness of this association may be a factor in the increased frequency of reports in recent years.

In this patient the diagnosis of Addison's disease was accepted on the following findings:—

(1) Generalised body pigmentation, more marked on the neck and dorsum of hands and forearms. A small patch of buccal pigmentation. The pigmentation disappeared on corticoid therapy.

(2) Hypotension. The mean of blood pressure readings recorded twice daily following first admission was 100 mms. Hg. systolic and 60 mms. Hg. diastolic.

(3) Two acute hypotensive episodes of twelve hours' duration associated with peripheral circulatory failure. These responded to intravenous hydrocortisone.

(4) The recent onset of an unusual sensitivity to insulin.

(5) Reduced levels of urinary excretion of 17 keto-steroids and 17 ketogenic steroids.

(6) Serum electrolyte levels (see figure).

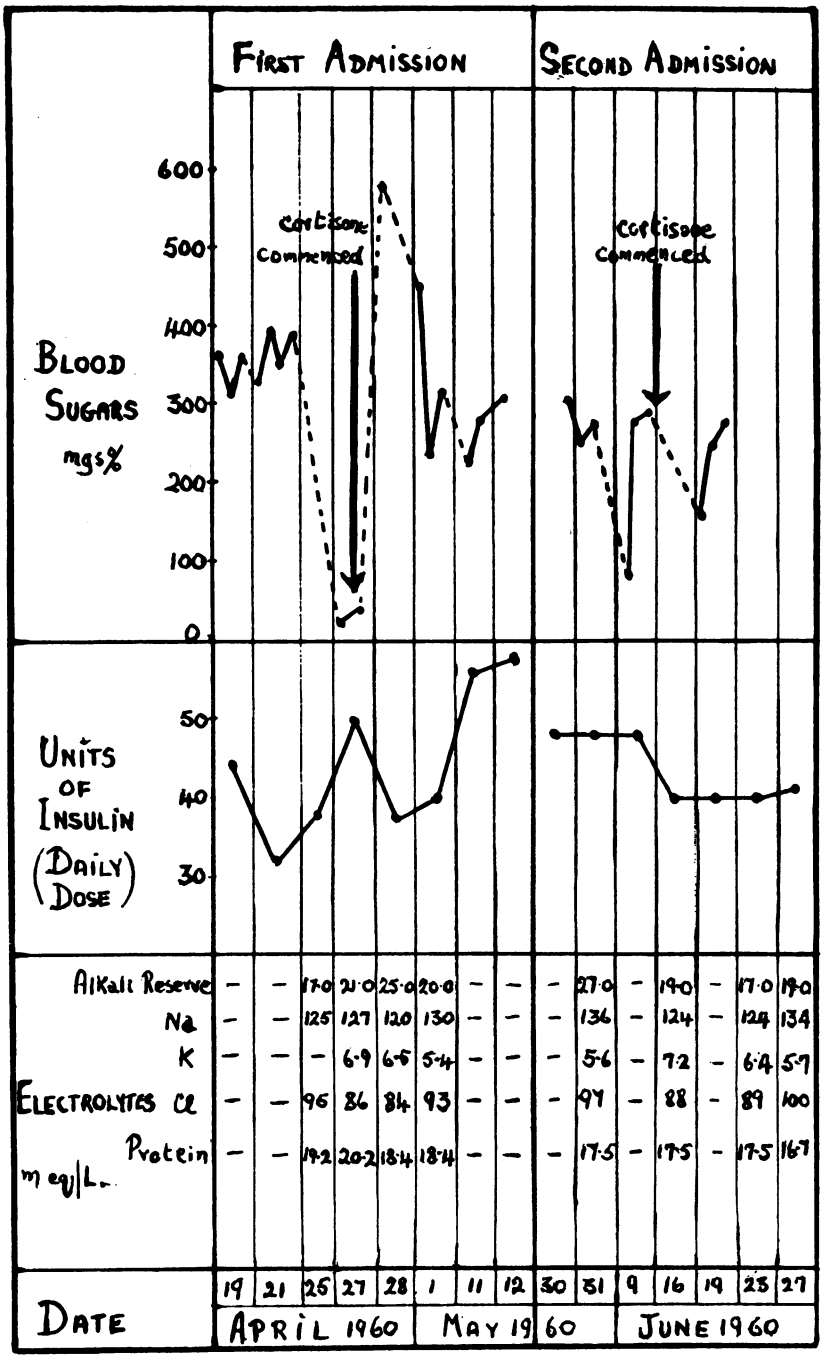

Figure. Insulin Dosage, Blood Sugar, and Serum Electrolyte Results.

During both attacks of circulatory failure the patient had salt depletion and hyperkalæmia. This electrolyte imbalance may present in either hyperglycæmia or Addisonian crisis.

In the former the increased concentration of glucose produces an osmotic diuresis which inhibits the reabsorption of sodium. The fall in blood and extracellular volume causes a withdrawal of fluid from cells carrying potassium into the blood. Lack of insulin also inhibits glucose utilisation and prevents movement of serum potassium into the cell. A high blood potassium level results but may co-exist with a cellular deficiency.

In the latter the deficiency of adrenal cortical hormones causes a derangement of the mechanisms concerned with the reabsorption of sodium, potassium, and chloride by the renal tubular epithelium. There is a decreased reabsorption of sodium and chloride with an increased reabsorption of potassium.

The reduced glomerular filtrate rate in peripheral circulatory failure may produce little effect on potassium levels. Filtered potassium does not constitute any large part of the potassium ultimately excreted, potassium in urine being excreted by a process of tubular secretion.

That the electrolyte imbalance in the present patient was due to adrenal insufficiency was based on the absence of acetonuria. Blood sugar levels alone were not elevated enough to produce such a degree of dehydration.

It is difficult to give an explanation for the patient's raised serum potassium level coinciding with hypokalæmic electrocardiographic changes. The various E.C.G. abnormalities of hypokalæmia, e.g., ST depression with prolonged QT and prominent U waves have all been described in association with low serum potassium levels. Little is known of the influence of intracellular potassium.

Diabetes mellitus and Addison's disease exert opposite effects on carbohydrate metabolism. The absence of hydrocortisone in Addison's disease decreases glucose formation from protein precursors and increases peripheral utilisation of glucose (Conn and Fajans, 1956). In diabetes glycogen formation in liver and muscles, carbohydrate utilisation and dissimulation by the tissues, and the conversion of glucose to long chain fatty acids are all decreased (Samson Wright, 1961). Thus in diabetes mellitus complicated by Addison's disease there is an apparent improvement in carbohydrate metabolism, a tendency to hypoglycæmia and a reduction in insulin requirement. This patient finally required only thirty-four units of insulin daily, in spite of taking cortisone, compared with fifty-two units daily which previously had controlled her satisfactorily for some years. The well-controlled Addison's disease developing diabetes has an exacerbation of adrenal insufficiency. Gittler, Fajans, and Conn (1959) suggest this is due to the osmotic diuresis provoked by the glycosuria causing a secondary renal loss of salt and water.

Beaven, Nelson, Renold, and Thorn (1959) reviewed sixty-three reported cases of Addison's disease and diabetes mellitus dividing them, according to their onset, into three groups. Twenty-one had an initial diagnosis of Addison's disease later complicated by diabetes, thirty-seven developed the diabetes primarily, and five had a simultaneous onset of both conditions. The present reported case

history is typical of the second group in which all but eight required a reduction in insulin dosage with the onset of Addison's disease. Twenty-one of the thirty-seven had insulin hypoglycæmia as one of the presenting symptoms.

Simpson (1949) suggests the co-existence of adrenal and islet cell atrophy may be due to a common infective lesion. If this is so, the infecting agent is unlikely to be the tubercle bacillus. Only in a very small minority of the published cases has a tuberculous ætiology been suggested. During recent years, when the frequency of reports of this dual pathology has increased, tuberculosis in diabetes has shown a steady decrease. The present patient had a normal chest radiograph and no evidence of adrenal calcification on straight X-ray of abdomen, although her husband had had tuberculosis.

Many of the reported cases of Addison's disease and diabetes have been diagnosed only at post-mortem. The onset of Addison's disease should be suspected when there is an improvement in the diabetic syndrome with reduced insulin requirements and hypoglycæmic aattacks. This must be differentiated from the following conditions which have also been reported as producing amelioration in diabetes—hypopituitarism (Martin and Pond, 1954), hypothyroidism (Rupp, George, and Paschkis, 1955), Kimmelstiel-Wilson's syndrome (Zubrod, Eversole, and Dang, 1951), insulinogenic tumour of the pancreatic islets (Gittler, Zucker, Eisenger, and Stoller, 1958), hæmochromatosis (Simpson, 1949), and liver cirrhosis (Bordley, 1930).

In treatment, earlier reports have advised caution both in the use of steroids and insulin, in the former due to the danger of producing uncontrollable hyperglycæmia and ketosis, and in the latter due to the insulin sensitivity of the Addisonian patient. Leahy (1959) advises the immediate use of hydrocortisone in amounts large enough to control the Addisonian state or crisis followed by an early introduction of insulin as soon as the hyperglycæmic effect of the hydrocortisone becomes apparent. In maintenance therapy fluorohydrocortisone is now standard treatment, the advantage being its reduced glucogenic effect relative to cortisone.

With the present advances in therapy it is difficult to give a prognosis in these patients. Faber and Gronboek, surveying fifty-six cases previous to 1956, give the average duration of life after diagnosis as five years. Simpson (1949) states death does not occur from diabetic coma but from adrenal insufficiency or possibly hypoglycæmic coma. However, in one of two cases reported by Markovitz (1954) diabetic acidosis occurred three times in relation to exacerbations of otitis media. He remarks on the interesting fact that this patient was on a fixed dose of cortisone and questions the accepted view that the metabolic upset with stress in the uncomplicated diabetic is due to increased secretion of adrenocortical hormones.

SUMMARY.

A further case of Addison's disease complicating diabetes mellitus has been described. This dual pathology, although being more frequently recognised, is still rare. The condition has been briefly reviewed in relation to diagnosis, treatment, and prognosis.

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This case was under the care of Dr. Alan P. Grant, to whom I am greatly indebted not only for permission to publish, but also for his helpful and stimulating criticism.

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REVIEW

CLAYTON'S ELECTROTHERAPY AND ACTINOTHERAPY. By Pauline M. Scott, M.C.S.P., T.E.T., T.M.M.G. (Pp. 384; figs. 200. 30s.) London: Baillière, Tindall & Cox, 1962.

THIS fourth edition in fourteen years confirms the value and demand of this well-recognised standard text book for physiotherapy students during their training for the M.C.S.P. qualification. It is also of great value in reading for the Diploma in Physical Medicine. The general layout is excellent and makes for easy reference, pleasant reading, and is very adequate in the identification of the various modalities of low and high frequencies currents, ultra-violet radiation, ultra-sonic therapy; with application, necessary precautions, and contra-indication clearly defined.

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G. G.

CHLORPHENTERMINE

A NEW "APPETITE SUPPRESSANT"
A CROSS-OVER DOUBLE-BLIND TRIAL

By **CONN LUCEY, M.D., M.R.C.P.(I.), D.C.H.**
Senior Registrar and Tutor

and **DAVID R. HADDEN, M.B., B.Ch., M.R.C.P.(Ed.)**
Clinical Research Fellow
The Sir George E. Clark Metabolic Clinic, Royal Victoria Hospital, Belfast

CHLORPHENTERMINE ("Lucofen") is 1-(p-chlorophenyl)-2-methyl-2-aminopropane hydrochloride. It is a synthetic amphetamine derivate claimed to have none of the excitatory effects of the parent substance. The chemical relationship to amphetamine may be seen by a comparison of their formulæ:

Chlorphentermine $Cl\langle\bigcirc\rangle CH_2 - C(CH_3)_2 - NH_2HCl$.

Amphetamine $\langle\bigcirc\rangle CH_2 - CH(CH_3) - NH_2$.

Initial trials suggested that it was an effective appetite suppressant both in animals and man (Holm et al., 1960; Mune et al., 1960; Erlendsson et al., 1960; Nordlander, 1961). In this paper we report a double-blind cross-over trial of chlorphentermine in ambulant obese patients on a restricted diet.

METHODS.

A double-blind cross-over technique was used. The procedure followed was the same as that previously used in a similar trial (Hadden and Lucey, 1961). Patients were given a standard 1,100 calorie diet, containing 100 gm. of carbohydrate, or told to continue with their existing diet if this was of a lower calorie value. They were divided into two groups according to a sequence obtained from a table of random numbers. Patients were instructed to take one tablet three times daily before meals (either chlorphentermine 25 mgm. or placebo). After four weeks on one type each patient received the alternative tablets for the second four-week period. They were reviewed by one of us after four and eight weeks. No direct enquiries were made about the patients' subjective impressions of the drug or possible side effects. Only spontaneous complaints were noted. Neither the patients, doctors, dietitians, nor the nursing staff knew which tablets contained the active preparation.

THE PATIENTS.

The criteria for admission to the trial were as previously reported, all patients being more than 15 per cent. above their standard weight. Eighteen completed the trial out of the thirty-two who were initially accepted. The remainder (44 per cent.) failed to attend on one or more occasions and therefore could not be included. The two groups are compared in Table 1. There is no significant difference between Group A and Group B as regards age, height, initial weight or percentage overweight. The two groups are therefore statistically comparable.

TABLE 1.

COMPARISON OF THE TWO GROUPS.

	GROUP A		GROUP B		
Number - - - -	9	...	9	...	
Age (years) - - -	35.7 ± 22.4	...	32.1 ± 9.8	...	t = 0.449
	(13 – 75)		(19 – 46)		0.7 > p > 0.6
Height (inches) - - -	63 ± 3.1	...	63 ± 3.8	...	t = 0.120
	(59 – 69)		(60 – 72)		p > 0.9
Initial weight (in lbs.) -	196.4 ± 30.8	...	199.2 ± 24.0	...	t = 0.052
	(158 – 261)		(169 – 241)		p > 0.9
*Standard weight (in lbs.) -	139.8 ± 17.5	...	144 ± 17	...	t = 0.516
	(104 – 154)		(132 – 182)		0.7 > p > 0.6
Overweight (percentage) -	41.3 ± 24.0	...	39.9 ± 14.6	...	t = 0.150
	(17 – 47.9)		(16.1 – 61.8)		0.9 > p > 0.8
Obesity of over 10 years' duration	5	...	6	...	
Previously in similar trial -	8	...	6	...	
Males - - - -	1	...	2	...	

Values in columns 1 and 2 are means, standard deviations, and ranges. Column 3 applies the "t" test of significance to the difference of the means.

*Tables of the Life Extension Institute of New York.

Eight patients of Group A and six of Group B had taken part in a double-blind trial of diethylpropion immediately preceding the present trial. Of these eight Group A patients, five lost weight, two gained, and one remained unchanged. Five of the six patients in Group B had lost weight and one had remained unchanged. Five patients in Group A and six in Group B had a history of obesity exceeding ten years' duration.

Two patients in each group had mild diabetes mellitus, being managed by dietary carbohydrate restriction alone. Two patients had had myocardial infarction in the past and another had angina of effort. Four of the fifteen women had oligomenorrhœa. Two female patients had a troublesome degree of hirsutism with a male type of body hair distribution, and two others were partners of infertile marriages. On the other hand, the heaviest patient in the series, a woman of 18 st. 9 lb., had a family of eleven.

RESULTS.

The results are recorded in Table 2. It will be seen that the mean weight change for the two groups together while on chlorphentermine (−4.8 lb.), exceeds the mean weight change of the two groups while on placebo (−0.08 lb.). The difference between these two means is significant (0.02 > P > 0.01). Chlorphentermine is therefore an effective aid to weight loss; the results are significant in spite of the small numbers taking part in the trial. Taking each

TABLE 2.

RESULTS.

No. of Patients	Mean Weight Changes in Lbs.		
9	First month Placebo	Second month Chlorphentermine	First and second months combined
Group A ...	+0.44 ...	−2.83 ...	−2.38
9	First month Chlorphentermine	Second month Placebo	First and second months combined
Group B ...	−6.77 ...	−0.61 ...	−7.38

group separately, the weight loss on chlorphentermine exceeded the weight change on placebo to an extent which is also statistically significant ($P>0.001$ in each case). Thus, chlorphentermine is effective even when treatment is preceded by a month on placebo therapy. The difference between the total weight change of the two groups over the two-month period of the trial is not significant ($0.3>P>0.2$).

The best individual result was achieved in a 19-year-old male who lost 15 lb. in four weeks while on chlorphentermine. Only one out of the total series failed to lose weight during the period on chlorphentermine. Eleven gained weight while on the placebo. There was no correlation between loss of weight and age, height, sex, initial weight or the percentage by which the standard weight was exceeded. The patients placed little emphasis on the effects of the drug on their appetite but six volunteered that they felt less hungry while taking chlorphentermine. Three of these were amongst those who had originally complained of excessive appetite.

SIDE EFFECTS.

Only spontaneous statements by the patients were recorded. There were no complaints of insomnia. On the contrary, one patient felt more sleepy while on chlorphentermine. There were no complaints of restlessness or irritability and there was no evidence of the development of psychotic symptoms. There was no instance of any tendency to addiction during the period on chlorphentermine and no patient experienced withdrawal symptoms. Three patients complained of individual symptoms of nausea, heartburn, and lack of energy respectively. Neither the patients with ischæmic heart disease nor those with diabetes mellitus showed any deterioration.

DISCUSSION.

To lose weight one must eat less food than the body requires for energy expenditure. Dietary restriction alone is often adequate, but there remains a residue of cases who for one reason or another fail to lose weight while on an allegedly low calorie intake. It is these cases of "refractory obesity" (Seaton et al., 1961) who present the main challenge. Initial enthusiasm in the use of amphetamine as an appetite suppressant was lessened when it was found that a

very high proportion of patients developed unpleasant and even dangerous side effects. Insomnia and irritability were common while many cases became addicted and developed a clinical picture indistinguishable from paranoid schizophrenia. Connell (1958) found withdrawal symptoms in twelve out of forty-two cases of amphetamine psychosis. He stressed the danger of psychotic effects when using amphetamine derivatives for weight reduction. No significant side effects in eighteen patients were found during one month's treatment with chlorphentermine in the present trial.

These results show that chlorphentermine is an effective aid in the treatment of obesity when combined with moderate dietary restriction. The mean weight loss for the eighteen patients over four weeks was 4.8 lb. The results might have been better were it not for the fact that fourteen of our patients had taken part in a similar trial of diethylpropion in the three months preceding the present trial, as the four who were not in the previous trial showed a mean weight loss of 7.8 lb. Chlorphentermine appears to be less effective when given after four weeks placebo therapy than when given at the commencement of the trial, although the difference is not statistically significant. A similar phenomenon in an earlier trial, using diethylpropion, was more marked. This is in keeping with the findings of Seaton et al., using diethylpropion and is a frequent finding in similar trials of appetite suppressant agents, irrespective of the drug used. Our results compare favourably with the early reports on chlorphentermine (Erlendsson, V. and F., 1960, mean weight loss over four weeks 3.5 lb.; Mune et al., 1960, mean weight loss over four weeks 4.8 lb.; General Practitioner Clinical Trial, 1961, mean loss over four weeks, 4.5 lb.).

The retail cost of one month's treatment with chlorphentermine is 9s. 8d.

Summary.

A double-blind cross-over trial using chlorphentermine in conjunction with dietary restriction is described. Chlorphentermine is shown to be an effective aid in the treatment of obesity. All patients with one exception lost weight while on the drug. There was no evidence of central nervous system stimulation and no serious side effects developed during a four-week period on chlorphentermine.

Acknowledgments.

We wish to thank Dr. D. A. D. Montgomery, Physician-in-Charge, and Dr. J. A. Weaver, Physician, Metabolic Unit, Royal Victoria Hospital, Belfast, for their encouragement and criticism. Our thanks are also due to Dr. D. D. H. Craig (William R. Warner & Co. Ltd.) for supplying the chlorphentermine ("Lucofen") and placebo tablets; and to Miss J. A. Reid for her help in preparing the manuscript.

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FRACTURE OF THE FIBULAR ASPECT OF THE LOWER TIBIAL EPIPHYSIS

By **D. J. McWILLIAMS, F.R.C.S.**

Senior Orthopædic Registrar, Royal Victoria Hospital, Belfast

THIS paper deals with all fractures of the fibular aspect of the lower tibial epiphysis which have been seen at the Fracture Department of The Royal Victoria Hospital—since 1946—that is thirty cases in all. It will immediately be obvious, therefore, that this is a rare injury and it is for that reason that it was considered advisable to record the following results.

INCIDENCE.

Approximately 3,500 new fractures are seen annually at The Royal Victoria Hospital. Of these approximately 10 per cent., or three hundred, are fractures of the ankle. Since 1946 only thirty cases of this particular fracture have been recorded, giving an occurrence of 1 : 1750 or .005 per cent. of all fractures, or 1 : 150, that is .65 per cent. of ankle injuries.

Age: All occurred between the ages of 13 and 19 years, with a mean age of 15½ years.

Sex: There were nineteen females and eleven males.

MODE OF INJURY.

From case history record it is impossible to get an accurate description of the mode of injury. The notes simply record "twisted ankle" or "went over on ankle." In no instance was there any history of direct trauma. The mechanism of the injury will be discussed later.

CLINICAL FINDINGS.

All notes refer to swelling over the ankle and in particular swelling over the lateral malleolus. The one recent case which I have had the opportunity of examining had swelling particularly over the anterolateral aspect of the ankle and marked tenderness over the anterior inferior tibio-fibular ligament. All ankle movements were grossly restricted, particularly plantar flexion. There was no tenderness, swelling over the attachment of the fibular collateral, or deltoid ligaments.

X-RAY APPEARANCES.

A portion of the anterolateral aspect of the lower tibial epiphysis is broken from the remainder of the epiphysis. It is roughly square in shape, its depth being almost that of the epiphysis, so that the epiphyseal plate is partially involved. Displacement, when it occurs, is in an anterolateral direction (see Plate, A and B).

Treatment.

Treatment fell into two main groups—conservative and operative.

(a) *Conservative:*

(1) The displacement was slight and the ankle was immobilised in a short leg plaster-of-Paris.

(2) An attempt, generally only partially successful, to reduce the displacement was made, and the ankle immobilised in a short leg plaster-of-Paris.

(b) *Operative:*

In three patients the displacement was so gross that operative treatment was required. In one this was carried out as a primary procedure and in the other two only after closed reduction had failed. In two instances the fragment was easily replaced and held in position with catgut sutures, in the other the fragment was removed.

The treatment of cases at the beginning of the series consisted of two weeks' immobilisation in an non-walking plaster, followed by four weeks in a walking cast. Active exercises were encouraged after the plaster was removed. More recently the tendency has been to apply a short leg walking plaster immediately and to retain this for four weeks. This was followed by active exercises.

Results.

Twenty-three patients were reviewed, seven patients were lost to review, and this, unfortunately, includes the one patient who had the free fragment removed.

(a) *Patient's Assessment:*

In nineteen instances the patient reported "one ankle is as good as the other." Three females complained of a tendency to go over on the ankle when wearing high heels. One female who had operative replacement complained of slight numbness and swelling related to her operation scar. All patients reported full movement and none were in any way hindered by the ankle.

(b) *Clinical Examination:*

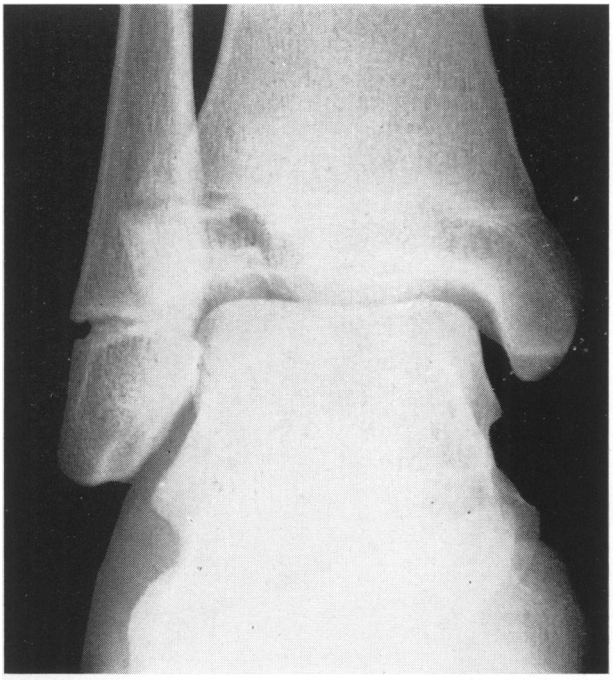
All patients had full movement.

Apart from the one patient who had some tenderness over the operation site there was no pain even on forced inversion and eversion.

In no case was there any varus or valgus deformity.

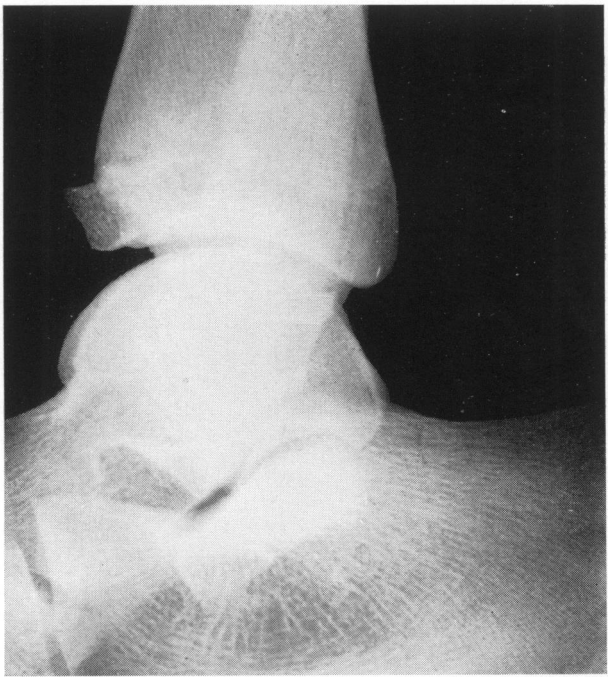
(c) *X-rays:*

No abnormality was detected either on routine views or on forced inversion views. In particular there was no instance of osteochondritis dissecans, avascular necrosis or loose body formation. Unfortunately no X-rays are available of the one patient who had the fragment removed.



(A)

(B)



Original injury showing anterolateral displacement.

Discussion.

(1) The concept of the mechanism of injuries to the ankle now emphasises the importance of external rotation strain—whether this be actual external rotation of the foot or forcible internal rotation of the tibia on the fixed foot—and the part played by the anterior inferior tibio-fibular ligament. As early as 1872 Tillaux emphasised that injury of this ligament could cause avulsion of a tibial fragment. This has been emphasised in all the literature on the subject, and in particular by Bonin (1950), Watson Jones (1955), and Menelaus (1961). As far as I can find, in no instance has any reference been made in the English literature to an injury of the epiphysis as a result of external rotation strain. However, Bishop (1932) described two cases of a similar epiphyseal injury, accompanied by a fracture of the fibula. He considered that this was due to fibular pressure during an adduction strain.

It is considered here that the epiphyseal injury as described is the result of a similar external rotation force which causes, not a tearing of the extremely strong ligament, but avulsion of part of the epiphysis. This is substantiated by the typical anterolateral displacement of the fragment.

(2) It is worthy of note that the fracture unites soundly without premature fusion of the epiphysis and without interference with growth at the site. The probability is, however, that in view of the small percentage of growth which takes place at the lower end of the tibia and in view of the age at which the injury is generally sustained that premature fusion would cause little disturbance.

(3) In no instance is there any evidence of osteochondritis dissecans or loose body formation.

Summary.

(1) A particular type of epiphyseal injury is described.
(2) This is a rare injury—only thirty cases occurring in 4,500 fractures of the ankle.
(3) The probable mechanism of injury is described.
(4) Clinical results are excellent.
(5) There is no incidence of premature fusion, avascular necrosis, osteochondritis dissecans, or loose body formation.

Acknowledgment.

I wish to thank Mr. R. J. W. Withers and Mr. R. I. Wilson for their permission to review their cases, and Mr. Wilson for his kind help in the preparation of this report.

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RUPTURE OF THE BICEPS BRACHII AT THE LOWER MUSCULO TENDINOUS JUNCTION

By **D. J. McWILLIAMS, F.R.C.S.**

Senior Orthopædic Registrar, Royal Victoria Hospital, Belfast

GILCREEST, in 1934, analysed one hundred cases of rupture of the biceps brachii and reviewed the literature. Only two of these are recorded as being ruptures at the lower musculo tendinous junction, and one of the lower tendon itself. Three were described as rupture at the insertion, though Dobbie (1941) comments that these were probably instances of avulsion of the tendon from its radial attachment. He also added fifty cases to the literature, not one of which was a rupture at the lower musculo tendinous junction. More recently Meherin and Kilgore (1960) reviewed twenty-two patients, all of whom had avulsion of the tendon at its radial attachment.

It would seem, therefore, that rupture at the lower musculo tendinous junction is an extremely rare finding; for this reason the following case is recorded:—

CASE HISTORY.

On 11th August, 1961, the patient, J. H., aged 28 years, was laying concrete sewer pipes. These were 3 feet long, 2 feet 6 inches in diameter, and 1¼ inches thick, and weighed 6 cwts. approximately. A pipe was standing on end. A workmate inclined towards the patient, but slipped, so that the patient took the full weight on his flexed forearms.

He actually heard a sound 'like paper tearing,' and immediately felt pain in his left antecubital fossa, which very quickly became swollen. He noted that he was still able to bend the elbow, but only weakly.

He was taken to the Casualty Department of this hospital, where he was told that he had torn a muscle and was treated in a sling. During the next week the elbow and forearm became discoloured. He noted that he was still able to flex the elbow, though weakly, and when he did so he was able to see a lump travelling up the front of his arm and he 'felt as if something was crawling up the inside.' He also volunteered that this occurred on turning his hand to the left, i.e., on supination. The only other complaint was of some tingling and numbness on the dorsum of his hand.

He was referred to the Orthopædic Clinic on 8th September, 1961, where the condition was diagnosed and it was decided to attempt surgical repair.

At operation on 13th September, 1961, through an anterolateral incision, it was seen that the natural efforts at repair had resulted in gross thickening of the paratenon, giving rise to a considerably thickened gelatinous mass, such as is seen in old ruptures of the tendo achilles. This structure was divided by a long "Z" shaped incision, and at this stage the remnants of the tendon, fibrillated and wavy in appearance, were seen lying in the lower end of the mass. The whole structure, i.e., the tendon plus the thickened mass, was shortened and repaired with interrupted catgut sutures. Plaster-of-Paris back slab was applied with the elbow at a right angle. This was removed on 10th October, 1961, and activation begun.

By 31st October, 1961, extension was almost full. Active flexion was improving and there was definite contraction of the biceps. By 21st November, 1961, there was full recovery of elbow movement and of muscle power, and he was discharged.

Summary.

(1) A case of rupture of the tendon of the biceps brachii at the lower musculo tendinous junction is described.

(2) Full functional recovery was obtained, although operative repair was delayed for thirty-three days.

(3) Attention is drawn to the paucity of the literature on this particular injury.

Acknowledgment.

I wish to thank Mr. R. I. Wilson, F.R.C.S., not only for his permission to report this case, but also for his helpful criticisms in the preparation of this report.

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REVIEW

CLINICAL CHEMISTRY IN PRACTICAL MEDICINE. By C. P. Stewart, D.Sc., Ph.D., and Sir Derrick Dunlop, B.A.(Oxon), M.D., F.R.C.P.(Edin.), F.R.C.P.(Lond.). Sixth Edition. (Pp. vii + 359. 27s. 6d.) Edinburgh and London: E. & S. Livingstone, 1962.

This is a simple, concise book written for the senior student, house physician, and practitioner to enable them appreciate the rationale of chemical pathology in its application to practical medicine. It does, in fact, go further, and provides an excellent bird's eye view of the scientific basis and understanding of clinical biochemistry.

Although this is primarily intended for those who have had limited experience in ordering and interpreting laboratory tests, this book gives a lucid review of the whole subject and could be read with benefit by most practitioners looking for a sound foundation on which to build a knowledge of the scientific side of medical practice. In this respect it could be particularly useful to the post-graduate who is about to embark on his studies for membership.

The clinical pathologist must pray that books of this type will be widely read by hospital resident staff and that they may some day reduce the volume of uninspired long-shot and blunderbuss investigations which swell patients' charts to encylcopædic proportions.

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REVIEWS

HANDBOOK OF FIRST AID. By Arthur D. Belilios, M.B., B.S., Desmond K. Mulvany, M.S., F.R.C.S., Katherine F. Armstrong, S.R.N., S.C.M. (Pp. 482; figs. 195. 12s. 6d.) London: Baillière, Tindall & Cox, 1962.

THE last edition of this book was in 1955. The chapter on Shock and Resuscitation has been rewritten, and a new chapter on First Aid and Nuclear Warfare added. Other items have been revised and brought up to date.

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In its present edition it can be thoroughly recommended both for training and reference.

W. H. E.

CLEFT PALATE AND SPEECH. By Muriel E. Morley, D.Sc., F.C.S.T. Fifth Edition. (Pp. xx + 279; figs. 88. 27s. 6d.) Edinburgh and London: E. & S. Livingstone, 1962.

THIS is the fifth edition of a book published in 1945. It is written by a speech therapist of wide experience who has had the opportunity to observe, and work with surgeons, eminent in the field of cleft palate surgery.

Miss Morley surveys cleft palates from all aspects, stressing the team work of the surgeon, orthodontist, and speech therapist.

As the anatomical results continue to improve so impressively she describes the speech therapists altered role in this team.

The first four sections of her book deal with:

Congenital Clefts of Lip and Palate
The Normal Palate and the Palato-Pharyngeal Sphincter
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The second four sections describe the assessment of speech and treatment of defects.

She ends with thirty case histories illustrating various aspects of her text, and demonstrating that good results without speech therapy follow if operative treatment is undertaken early enough. However, speech therapy is required to help eradicate faulty speech habits which are allowed to develop before an anatomically sound result is available. The book ends with a bibliography.

This revised edition should continue to prove a useful reference book.

B. K.

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THIS is an attractive book well and copiously illustrated. It could be said that perhaps too much has been attempted within the scope of three hundred pages but the subject overlaps a great many other fields of medicine. The authors have wisely taken advantage of the help of specialists in these related fields and the accounts given of such topics as development, endocrinology, male infertility, vaginal cytology are all treated in an apparently condensed manner so that they do not outweigh the essential element of the book. This latter is a presentation of the problems and prospects in subfertility based mainly on the long experience of the authors. Therein lies its main merits. In particular all will find the discussions of tubal insufflation of great interest. The reviewer was a little disappointed that after an inconclusive paragraph on the meaning of the so-called peristaltic waves seen on the kymograph it was thereafter lightly assumed in the text that these are in fact due to tubal peristalsis. There is a useful section on gynaecography as a natural extension of the CO_2 gas technique.

The authors are rightly adamant that the proper and complete study of any case of impaired fertility must include hysterosalpingography and the discussion of this together with very excellent X-ray pictures is first class. Here the accumulated experience of some 12,000 hysterosalpingograms really shows up. The radiological diagnosis of genital tuberculosis is discussed and illustrated in a most instructive manner.

The opinion is strongly held that with greater care in the use of hysterosalpingograms tubal tuberculosis can be detected in its early stages, particularly with the use of fluid media which show up early dilation of the ampulla with swelling of the mucosal folds and slow spill from the fimbriæ. Many good points are made about the general investigation of this condition. Emphasis is laid on the necessity of carrying out endometrial biopsy or currettage and culture at the end of the menstrual cycle to allow time for the formation of fresh tubercles to replace those lost at menstruation. This common belief may yet be proven fallacious as it is much to be doubted if tubercles could possibly form so quickly. They seem just as likely to persist in the basal endometrium from cycle to cycle.

Another lucid chapter is that on the surgery of the Fallopian tubes. Here one feels the authors are sustained by enthusiasm and optimism. Percentages are flung about with what seems to the ordinary worker in this field almost recklessness. The sources of these figures seem somewhat inaccessible. That, however, must not detract from the contribution the writers have made to this difficult subject. The newer ideas of hydrotubation in association with surgery may bring hope to some.

Throughout the book there are many throw-away items of interest, instruction and entertainment for workers in this fascinating field. W. R. S.

TYPHOID FEVER AND OTHER SALMONELLA INFECTIONS. By R. L. Huckstep, M.A., M.D.(Cantab.), F.R.C.S.(Edin.), F.R.C.S.(Eng.). (Pp. 334; figs. 66. 42s.). Edinburgh and London: E. & S. Livingstone Ltd., 1962.

THIS is probably the only comprehensive book published on typhoid fever for over thirty years. The author has had enormous experience of the condition during his service in Kenya, and his book is the outcome.

To the reviewer it does not savour sufficiently of the author's personal experiences with typhoid. Rather is it an attempt to collect an enormous bibliography of the subject. As such it is of immediate value.

The mortality from typhoid perforation has always been terrifyingly high. The reasons for this are multiple and appreciable. It is courageous of the author to claim a mortality as low as 22 per cent. in twenty-three patients treated conservatively. Many would reasonably doubt the perforation.

There is inconsistency in the use of T.A.B. vaccine. It is acceptable that it is not a major factor in the prophylaxis of typhoid. If it is correct to say that "once the disease has been contracted T.A.B. appears of negligible value in affecting its subsequent course" it is hard to reconcile the justification for giving T.A.B. on the third afebrile day to prevent relapse.

The book is of value to public health workers, and will provide a modern view of the subject with comprehensive bibliography. F. F. K.

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THIS is "Rep. mist." of the 1st edition and is once again rather weak medicine. Its only value is as an aid to identify proprietary preparations: the need for this would disappear if "approved names" were used, and it is a criticism of the pharmaceutical industry that so many proprietary names are of so little help in identifying the nature of preparations—quite at random from page 85 I took the following five consecutive names: Dermogesic, Desbutal, Descleran, Desibyl, and Desogen—this makes my point clear. O. L. W.

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It is unfortunate that the author did not take advantage of this new edition to eliminate material which can be found in established textbooks of medicine and physiology. This includes clinical details for carrying out test meals and glucose tolerance curves, and for the control of diabetes and diabetic comas. Descriptions of colorimeters and flame photometers also duplicate information which can be obtained from the manufacturers of these instruments. A number of the methods given for the more common biochemical estimations have largely fallen into disuse and could have been removed. Of the eight methods described for blood sugar, only two or three are worth describing in detail, and brief references would be sufficient for the remainder.

In place of the subjects referred to above, the enzyme chapter could have been expanded to include iso-citric dehydrogenase, leucine aminopeptidase and exopeptidase. These enzymes may be of uncertain clinical value, but they have received considerable attention in recent years. A method for the estimation of aldosterone would have been useful, and a recently published method for ketogenic steroid oxidation using periodate could have been described. Considering the widespread use of the Technicon Autoanalyzer, it is surprising that some reference was not made to its place in clinical biochemistry.

In spite of these deficiencies, however, this remains the best book available on practical clinical biochemistry. It has been highly valued by workers in this field, and the additional information contained in this enlarged edition will be very welcome. S. G. W.

ELECTRON MICROSCOPY. By Gilbert Causey, M.B., F.R.C.S. (Pp. vii + 238; figs. 160. 48s.) Edinburgh and London: E. & S. Livingstone, 1962.

THE past decade has seen a great expansion in the study of normal and pathologic tissues with the electron microscope and a vast amount of information has been documented. As yet, however, little attempt has been made to gather together and distil what has been learned, for the benefit of those not intimately connected with this field. Professor Causey's book, which presents an uncomplicated digest of the basic work which has been done on normal tissue, is, therefore, a timely contribution.

After two very brief technical chapters on the electron microscope and specimen preparation, the author deals systematically and in a well-balanced fashion with the ultrastructural anatomy of the various organs and tissues. The text is clear and is illustrated by close on 140 electron micrographs, most of which are good. A recent reference is given to each major subject so that the interested reader has a lead into the literature. The quality of the paper and type are excellent and it is very much to the credit of Messrs. Livingstone that the price is so reasonable.

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CIRCULATION. VOLUME 1 OF THE SECOND SECTION OF THE HANDBOOK OF PHYSIOLOGY. Edited by W. F. Hamilton and P. Dow for the American Physiological Society. (Pp. vii + 758. Illustrated. £9. 12s.) London: Baillière, Tindall & Cox, 1962.

THIS is the first of three volumes on the circulation which will make up the second section of the Handbook of Physiology. It follows the first section of three volumes on neurophysiology and will be followed by further sections covering respiration, renal physiology, endocrine physiology, etc. The concept of the Handbook is a very important landmark in the development of physiological literature and other disciplines may well copy it. By the time the last volumes are printed, if not before, the earlier volumes will need rewriting. This is where the Handbook is in a stronger position than its spiritual ancestors, the great German Handbücher. Because of its sponsorship by the American Physiological Society, the Handbook can reasonably be expected to outlive the relatively short time span of competence of a single editor.

The object of the Handbook is to have the main aspects of physiology covered in chapters by distinguished authors who have international stature in their fields. Authorship is not therefore restricted to those working in North America; the present volume includes contributions from Switzerland, Germany, Sweden, England, Canada and the U.S.A. Each chapter covers a limited field in considerably greater depth than a textbook, but the chapters are not merely review articles on current work. Old ideas which help in the understanding of a subject are given greater emphasis than current controversies which seem likely to be of ephemeral interest. It is hoped that the material will meet the needs of three groups of readers, the graduate student who wishes to pursue a subject further than is possible using standard textbooks, the teacher who wishes to increase his understanding of current concepts outside his own speciality and the research worker who requires references and current concepts in the field that he is beginning to explore.

The present volume tries to cover the physiology of the heart and its controls in health and disease along with certain material about the volume of the blood and the biophysical background of the organs of the circulation. Though the material will mainly be of interest to physiologists and biophysicists, clinicians will have difficulty in finding more lucid and modern expression of the fundamentals of electrocardiography, phonocardiography and the physiological consequences of congenital heart disease and valvular insufficiency than is given in these chapters.

With multiple authorship, it is difficult for any editor, however strong, to impose absolute uniformity on the different contributions. Perhaps it is not even desirable. Certainly some chapters are better written than others but it would be invidious to make comparisons which, in any case, would be coloured by the interests and prejudices of the reviewer. The editors of the Handbook, by the careful selection of authors, have been quite successful in maintaining a high standard of presentation throughout the volume.

One can really only complain about the price. Costing about £30 per section, the Handbook is not likely to be seen in the private libraries of many individuals. However, it is a "must" for any library serving people who are interested in modern views of medical biology. It should be readily available and clearly marked "for consultation only" since the demand to read these volumes will certainly exceed their supply. They comprise the new bible of physiology. I. C. R.

ANATOMICAL EPONYMS. By Jessie Dobson, B.A., M.Sc. Second Edition. (Pp. 235. 30s.) Edinburgh and London: E. & S. Livingstone, 1962.

A FASCINATING book to read, dip into, or consult, and an essential one to use if eponymous anatomical terms are to be attributed correctly. A total of 728 names are recorded, with, where possible, a short biographical sketch and dates of birth and death of the individual, together with associated anatomical structures. It is interesting to note that each letter of the alphabet, with the excepion of "X," is represented starting with "Abernethy" and ending with "Zuckerkandl." The names are of European origin (including Russia and Great Britain and Ireland within that term), with the one exception of "Tawara" from Japan. Historically the period covered ranges from antiquity to modern times. Few doctors will associate the tendo Achillis—tendo calcaneus, with the name of Hippocrates (460-367 B.C.). Aristotle (384-322 B.C.), the great comparative anatomist and embryologist, has not a single anatomical structure named after him, and so is not included in the book. The wine press of Herophilus (335-280 B.C.) will no doubt be familiar to most medical men. It is a matter perhaps for local pride that Symington (A.D. 1851-1924) is commemorated by association with the ano-coccygeal body. The most recent writers whose names are noted are Keith (A.D. 1866-1955), who shares with Flack (A.D. 1882-1931) in English anatomical literature, and Walter Koch (b. A.D. 1880) in the German literature the attribution of the sino-atrial node. This is not the only instance of a single structure having more than one attribution. Another source of confusion is that occasionally several structures are named after a single individual, and again different individuals of the same name have been confused by other writers. Incorrect attributions by previous authors are here corrected, and a very high level of accuracy has been aimed at and attained throughout the book. Two minor misprints seem to be the only flaws of this nature; on page seventeen, under the name "Balbiani," *nucleus* is spelt *nucleur*, and on page one hundred and fifty-one, under the name of "Nansen," the famous explorer, *neurones* are spelt *meurones*.

A good case can be made out for the retention of some eponymous anatomical terms, as for example, the Eustachian tube, the Wolffian and Müllerian ducts, where there is a long standing and world-wide use of such terms. Perhaps the names of physicians like Thomas Wharton and Francis Glisson, who remained on duty in London during the Great Plague, deserve to be retained in everyday use. It is however quite unrealistic to expect that each and every structure which at one time or another has been named after one individual or another, can be used in anatomical terminology which aims to be understood throughout the world. Nor could medical students be expected to remember such names if they were recorded. The comparison of anatomical usage with botanical and zoological usage, where personal names are often incorporated into the designation of a species, as for example "Burchell's zebra," is a false one. Individual body structures cannot be equated with whole species of plants or animals. No matter what is said against the use of eponymous terms they continue to be used, especially by clinical teachers. This book will help all who have an interest in the historical side of medicine to add to their store of knowledge, and in the wider field should be of interest to most graduate and undergraduate students who are intrigued by the uncommon eponym. It can be strongly recommended for its intrinsic interest alone.

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Dr. Lindsay's book was written with the object of supplying the necessary information. It covers a very wide field, ranging from a classification and description of micro-organisms, enzymology, cultural and other techniques, correlated activities of micro-organisms and microbiological estimation of natural products. The information given is necessarily selected and condensed since it is contained in a volume of 227 pages.

Hospital engineers do not seem to be catered for as the section on sterilisation is brief and incomplete, and although there is a description of an autoclave, there is no mention of the necessity of the proper method of using it or of testing its efficiency.

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The third section is of more general interest. A chapter on scientific method in field surveys and a reprint of the 1953 Cutter lecture, "Observations and Experiments," are followed by three well known papers by the author and Richard Doll; two are about the association between cancer of the lung and tobacco smoking and the third is their second report on lung cancer and other causes of death in relation to smoking. It will be remembered that the last was based on doctors' smoking habits in 1951 and their subsequent cause of death. Other reports in this section, by the author alone or with colleagues, include a study of poliomyelitis in England and Wales between the wars, a large scale investigation into the possible association between inoculation and paralytic poliomyelitis, studies of the possible associations between virus diseases in pregnancy and congenital malformations, Asian influenza in pregnancy and congenital defects, and X-rays in utero and leukæmia, and studies of cancer in a factory where inorganic compouds of arsenic were used. A fitting conclusion to the book is the appreciation of John Snow written for the Royal Society of Medicine on the occasion of the centenary of the publication of his second epidemiological study on cholera.

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The contemporary story of the spending of millions upon millions of pounds, rising yearly in a steeply ascending spiral of expenditure, shows how this has arisen and how little of this aspect was foreseen by the various Governments in the United Kingdom, political colour of either side being no more prescient than the other.

The author has much to say about the difficulties of general practice and of the hospital service. There is a thread running through the book of criticism of the attitude of the B.M.A., but the author, like many other critics, does not seem to have taken a very active part in the activities of the Association in relation to the National Health Service.

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The usefulness of this second edition has been enhanced by the addition of an excellent chapter on maxillo-facial injuries and the opportunity has been taken to exclude some of the more complicated eyelid reconstructive procedures which were described in the first edition.

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ONE of the great qualities of the Belfast Medical School is the emphasis laid on the practical aspects of medicine and the formation of competent clinicians. This handbook carries on that tradition, for it eliminates much that is no longer current practice and selects from recent research what is of real value in the actual care of infants and sick children. It is not merely an examination aid, but a lasting help to the practitioner, whether family doctor or junior paediatrician.

It is indeeed quite remarkable how much has been packed into what is still quite a convenient pocket book. To select only a few examples from the new material presented :—

There is an account of partial thoracic stomach (a subject which Dr. Carré has made particularly his own). There is an excellent summary of the major varieties of congenital heart disease and the methods by which they are investigated. In the section on endocrine and metabolic disorders the account of adrenal dysfunction is particularly good, and though compressed into only five pages, the outline given of the hereditary biochemical disorders suffices for all general purposes. The new chapter on joint and bone disease includes a brief description of infantile cortical hyperostosis, only lately recognised in this region; the management of micrognathia, and the technique of Ortolani's sign in diagnosis of congenital dislocation of the hip joint.

Special problems of the new-born are well treated. These include, among new items, the clinical aspects of hyaline membrane formation and of cold injury. The risks to be guarded against in the use of intratracheal oxygen as a resuscitative measure are emphasised. The account of haemolytic disease of the new-born is admirably simplified and yet contains all that is needed for the intelligent management of the problem in practice.

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Sufficient space is devoted to the management of breast feeding to impress on the reader that the authors really do believe in its superiority. The section on artificial feeding effects a neat compromise between the detailed calculations required for examination purposes, and the basic practical principle that "whenever an infant appears unsatisfied, it is a good policy to offer more." Later, under the heading of "Behaviour Problems," refusal of food is discussed rather too optimistically. A day's starvation rarely suffices to remove a difficulty which has much deeper roots than mere capriciousness, and while it cannot be expected that emotional disturbances can be dealt with fully in the tiny space available, this particular trouble is one that every doctor meets so certainly that he should be forewarned of the demands it will make on his—and the mother's—patience.

It is not possible to go into the details of the excellent accounts given of a host of infective and other conditions. The section on blood diseases, however, and especially that part which deals with coagulation defects, deserves special mention. So does Dr. Beare's admirable chapter on Skin Diseases, which, incidentally, contains the liveliest writing in the book, as, for example, "when dealing with symptomless warts one should not be too enthusiastic and should remember that there is a 50 per cent. cure rate on a three-month waiting list."

The eminently practical character of the book is enhanced by clear and precise indications of dosage for all drugs mentioned. The Appendices, besides diets suitable for most metabolic disorders and a comprehensive table of antibiotic and chemotherapeutic agents and their indications, contain a wealth of data of as much value to the senior, whose memory is not what it once was, as to the junior who still has to satisfy the examiners.

Seventy years have now passed since the publication of the first edition of this volume of the "Aids" series. Prof. Allen, Dr. Carré and their collaborators may be well content that, thanks to them, even at this ripe age it has lost nothing of its vigour and is more useful than ever.

M. J. L. F.

AN INTRODUCTION TO DIAGNOSTIC NEUROLOGY: A COURSE OF INSTRUCTION FOR STUDENTS. By Stewart Renfrew. Vol. I (pp. viii + 188; illustrated. 12s. 6d.) Vol. II (pp. vii + 215; illustrated. 12s. 6d.) Edinburgh and London: E. & S. Livingstone, 1962.

THESE two small volumes are designed to serve as a guide for students in their early clinical years. They are to the classical textbook of neurology as a manual of dissection would be to the anatomical tome. The student is assumed to have some knowledge of Anatomy, Physiology and Pathology and Dr. Renfrew leads him through the wards casting pearls of clinical experience. The neurological examination is dealt with in three parts (each part is anticipated to occupy the work of an academic term). These are :—

(1) Motor signs and diseases which are purely motor;
(2) Sensory signs and diseases which are partly sensory;
(3) Cerebral signs and intracranial diseases.

The first chapter to each part deals with the language of empirical science and one detects in them an overwhelming desire to clarify which at times defeats its own purpose by being confusing, and this tendency runs through all the book.

Early on is encountered one of the main themes, that of the clinical distinction between long-tract (L.T.) and segmental tract (S.T.) motor signs. (The abbreviations L.T. and S.T. appear in the introduction but it is only in the fourth chapter that one finds their explanation). Certain virtual clinical mnemonics are given which will not find favour with everyone, i.e. (from fig. 19) "If L.T. weakness and increased jerks are present but unconvincing, test for clonus . . ."

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Sufficient space is devoted to the management of breast feeding to impress on the reader that the authors really do believe in its superiority. The section on artificial feeding effects a neat compromise between the detailed calculations required for examination purposes, and the basic practical principle that "whenever an infant appears unsatisfied, it is a good policy to offer more." Later, under the heading of "Behaviour Problems," refusal of food is discussed rather too optimistically. A day's starvation rarely suffices to remove a difficulty which has much deeper roots than mere capriciousness, and while it cannot be expected that emotional disturbances can be dealt with fully in the tiny space available, this particular trouble is one that every doctor meets so certainly that he should be forewarned of the demands it will make on his—and the mother's—patience.

It is not possible to go into the details of the excellent accounts given of a host of infective and other conditions. The section on blood diseases, however, and especially that part which deals with coagulation defects, deserves special mention. So does Dr. Beare's admirable chapter on Skin Diseases, which, incidentally, contains the liveliest writing in the book, as, for example, "when dealing with symptomless warts one should not be too enthusiastic and should remember that there is a 50 per cent. cure rate on a three-month waiting list."

The eminently practical character of the book is enhanced by clear and precise indications of dosage for all drugs mentioned. The Appendices, besides diets suitable for most metabolic disorders and a comprehensive table of antibiotic and chemotherapeutic agents and their indications, contain a wealth of data of as much value to the senior, whose memory is not what it once was, as to the junior who still has to satisfy the examiners.

Seventy years have now passed since the publication of the first edition of this volume of the "Aids" series. Prof. Allen, Dr. Carré and their collaborators may be well content that, thanks to them, even at this ripe age it has lost nothing of its vigour and is more useful than ever.

M. J. L. F.

AN INTRODUCTION TO DIAGNOSTIC NEUROLOGY: A COURSE OF INSTRUCTION FOR STUDENTS. By Stewart Renfrew. Vol. I (pp. viii + 188; illustrated. 12s. 6d.) Vol. II (pp. vii + 215; illustrated. 12s. 6d.) Edinburgh and London: E. & S. Livingstone, 1962.

THESE two small volumes are designed to serve as a guide for students in their early clinical years. They are to the classical textbook of neurology as a manual of dissection would be to the anatomical tome. The student is assumed to have some knowledge of Anatomy, Physiology and Pathology and Dr. Renfrew leads him through the wards casting pearls of clinical experience. The neurological examination is dealt with in three parts (each part is anticipated to occupy the work of an academic term). These are :—

(1) Motor signs and diseases which are purely motor;
(2) Sensory signs and diseases which are partly sensory;
(3) Cerebral signs and intracranial diseases.

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THIS is an excellent little book for students entering surgical wards for the first time. It contains useful and pithy comments about many of the basic aspects of surgery and provides a good guide to the examination of most parts of the body with which surgeons are primarily concerned. There is, however, no account of the heart, chest or central nervous system (apart from a short chapter on injury to the head). As might be expected of an orthopædic surgeon, the sections on the skeleton, joints, bones, muscles and peripheral nerves are the longest and the best. Perhaps only an orthopædic surgeon could have coined the wonderfully descriptive term "breast mouse" for a mammary fibro-adenoma! R. B. W.

ATLAS OF HISTOPATHOLOGY OF THE SKIN. By C. H. Percival, M.D., Ph.D., F.R.C.P.E., D.P.H., G. L. Montgomery, C.B.E., T.D., M.D., Ph.D., F.R.S.E., F.R.F.P.S.(G.), F.R.C.P.E., and T. G. Dodds, F.I.M.L.T., F.I.B.P., F.R.P.S. Second Edition. (Pp. xi + 491; figs. 525. 130s.) Edinburgh and London: E. & S. Livingstone, 1962.

THERE is no doubt that this is a very great improvement on the 1947 edition. In general the illustrations are good and the fields and magnifications are well chosen. If colour rendering is still somewhat dense and lacking in luminosity and crispness it is satisfactory for illustrative purposes and represents as high a level of commercial blockmaking as could be expected at an economic price. The descriptive text is concise and the features of the individual conditions are clearly presented. To facilitate differential diagnosis the subject matter has been arranged in groups according to the component part of the skin which shows the most significant structural alteration. Nevertheless the differential diagnosis of some conditions is not always given the detailed consideration which the pathologist would find helpful. However, the book is for the dermatologist anxious to know the tissue changes in disease rather than for the histopathologist whose main interest is likely to be restricted more to those conditions where a biopsy may assist with the diagnosis. There are no references.

This is an atlas with a text and not a textbook of dermatological pathology, but the pathologist as well as the post-graduate student of dermatology should possess it. J. E. M.

HEART DISEASE: SOME WAYS TO PREVENT IT. By A. R. Southwood, M.D., M.S., M.R.C.P. (Pp. xv + 153. 17s. 6d.) London: Heinemann, 1962.

THIS small book of 140 pages reviews the various factors believed to be important in causation of organic disease of the heart. It includes well documented references and its content is remarkably comprehensive for those Physicians requiring a complete synopsis of important aspects of cardiology. At times the text is rather discoursive and contains an element of philosophy rather than factual observations, but perhaps this is only to be expected when so little is known at present about the fundamental aspects of such diseases as rheumatic and arterial degeneration. Readers will find the book interesting and it can be recommended particularly to physicians concerned with the problems of the heart as a whole. E. F.

ADVANCES IN BIOLOGY OF SKIN. Vol. III: ECCRINE SWEAT GLANDS AND ECCRINE SWEATING. Proceedings of the Brown University Symposium on the Biology of Skin, 1961. Edited by William Montagna, Richard A. Ellis, and Alene F. Silver. (Pp. xiii + 266; illustrated. $10.) Oxford: Pergamon Press, 1962.

THIS book is a collection of twelve papers read at a symposium on the biology of skin at the Brown University in 1961. The subjects discussed include histological, histochemical and anatomical aspects of sweat gland secretion and there is an excellent article on the eccrine sweat defect in cystic fibrosis of the pancreas. One is fascinated by the amount of detail which appears in this book, particularly in the article by Ellis entitled, "The Fine Structure of the Eccrine Sweat Glands." Some of the photographs are superb, especially in Montagna's section on anatomy of the sweat gland.

This book will be of value to anyone engaged in investigative procedures relating to sweat gland structure and/or function and is an excellent reference book on any aspect of sweat gland disturbance. The printing and binding are excellent. J. M. B.

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