JULY, 1933

THE ULSTER MEDICAL JOURNAL

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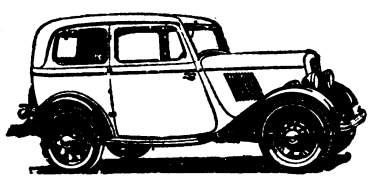

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THE
ULSTER MEDICAL JOURNAL

PUBLISHED QUARTERLY ON BEHALF OF THE ULSTER MEDICAL SOCIETY

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QUEEN'S UNIVERSITY INSTITUTE OF PATHOLOGY

THE general tendency among medical schools is the centralization of the various departments around a general hospital. The medical school of Queen's University, Belfast, is following this tendency with the transference of its Pathological and Bacteriological Departments to the newly-erected Institute near the Royal Victoria Hospital. This policy is a wise one. The place of the pathologist and the bacteriologist is at the source of the material which is necessary for teaching students, and which is the inspiration of his research. The standard whereby a medical school is judged is on the quality and quantity of the researches made in it, and the contributions which it makes to the advancement of knowledge. The Belfast Medical School, with the exception of a few enthusiasts, in past years has not taken its rightful place in this work. This was not due to lack of interest or ability, but because the necessary resources were not available. The new Pathological Institute changes this position, and with its resources and its able director, Professor J. S. Young, to assist and guide lines of research, it is hoped that Belfast will soon take its rightful place among other medical schools.

The Institute is situated on the Grosvenor Road close to the Royal Victoria Hospital, and close co-operation between laboratory and hospital is ensured by a covered passage connecting the two buildings. There are three floors in the Institute, each of which is devoted to a specific study. The lower ground floor is devoted to bacteriology, with Dr. N. C. Graham, the University lecturer in bacteriology, in charge. There are large classrooms and laboratory equipment for teaching eighty students at one time; there is also suitable preparation accommodation, and what is of even more greater importance, there are several private rooms available for research workers. On this floor is the Institute library, the furnishing of which was paid from a grant from Queen's University Guild.

The upper ground floor is devoted to pathology. Here are similar laboratories and research rooms as for bacteriology. There is, in addition, a large area set aside for a museum. Professor Young hopes to make the museum a study centre. Island show-cases will be installed, and special cabinets for microscopic preparations will be fitted. By a special system of numbers and cross-indexing, it will be

possible to study the microscopic appearances of any individual microscopic specimen, a point of inestimable value to serious students. A large and well-lighted lecture theatre, capable of seating over one hundred students, completes this floor.

The top floor is set aside for clinical work alone. Clinical bacteriological, pathological, biochemical, and hæmatological examinations will be made here, under the general supervision of Sir Thomas Houston, of all materials sent from the wards and from the out-patient departments of the Royal Victoria Hospital. The furnishings and equipment of the clinical laboratories were paid from a grant kindly given for this purpose by the family of the late Mr. and Mrs. McWatters.

Other gifts to the Institute are as follows: Equipment for the lecture theatre by Mrs. Bryson; research equipment by Messrs. F. B. McKee & Co., Ltd., as a memorial to their late senior director, Mr. F. B. McKee; research microscopes by Mrs. Stirling, of Mount Randal, from a fund presented by her to form a memorial to her late husband, Mr. J. H. Stirling, who was for many years the honorary treasurer of the University. The museum equipment was purchased by the funds from a bequest of the late Mr. Robert Harkness, of Craigs, Co. Antrim.

The official opening of this great new Institute will take place on 7th July. The Right Hon. the Prime Minister of Northern Ireland will perform the ceremony.

—R. H. H.

REVIEW

PHYSICAL SIGNS IN CLINICAL SURGERY. By Hamilton Bailey, F.R.C.S. 1933. Bristol and London: John Wright & Sons. Fourth Edition. pp. 287; 335 illustrations, many in colour. Price 21s. net.

The growing tendency among clinicians to depend upon laboratory and other auxiliary reports for diagnosis, makes one almost despair for the future of clinical examination. But the publication of Mr. Hamilton Bailey's book, "Physical Signs in Clinical Surgery," would seem to be a good corrective for such despondent thoughts. The fact too that this book has passed into its fourth edition since its publication in 1927 shows its usefulness and that students appreciate its value. It is impossible to find anything but praise for it; the simple language with which it is written, the profusion of admirable illustrations so excellently produced, and the comprehensiveness of the clinical signs described, make it a work beyond criticism. After reading it over from cover to cover we are definitely of the opinion that it should be in the hands of every student attending hospital, and might usefully be on the shelves of every young practitioner. It opens up a true appreciaton of clinical examination, and of its value in leading towards a diagnosis based, not on theory, but on observable face.

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—R. H. H.

A Clinical Study of Primary Cancer of the Bronchi

By W. W. D. THOMSON, B.A., B.SC., M.D., F.R.C.P.

Professor of Medicine in the Queen's University of Belfast

PRESIDENTIAL ADDRESS

Ulster Branch of the British Medical Association

SESSION 1932-33

THE mountain range which separates Saxony and Bohemia is famed for its mineral wealth. Indeed, the name, Erzgebirge, signifies "Ore Mountains." In the fifteenth and sixteenth centuries its mines supplied Europe with silver. The most famous were the Schneeberg mine, on the Saxon slopes, and the Joachimstal, in one of the deep valleys on the Bohemian side. When the rich veins of silver were exhausted, the mines continued to be worked as a source of cobalt, nickel, and bismuth, which are found there combined with arsenic. For Joachimstal a new era of prosperity dawned when Madame Curie, in 1898, made this mine world-famous by the discovery of radium in the pitch-blende supplied to her from its depths. A fashionable spa, Jachymov, has sprung up around the mine, attracting invalids thither by the fame of its radio-active waters.

Writing in the sixteenth century, Agricola described a strange malady of the lungs which attacked and killed in the prime of life the workers in these mines. He ascribed the disease to the inhalation of dust, and it was only some four hundred years later that Harding and Hesse recognized that this "Bergkrankheit," or "Disease of the Mines," unaltered in type during the course of the centuries, was primary cancer of the lung. This is the first historical reference to pulmonary carcinoma. Huguenin, quoting from Zimmermann's "Traité de l'Experience," published in 1763, gives a vivid description of the mysterious illness of the Marquis de St. Alban. The marquis is described as a man vigorous and well built, of sportive humour, one who loved the chase, but was moderate in his eating and in his drinking. A persistent pain in his chest and a continual cough began to mar his previous splendid health. As time went on his breathing became difficult, he could not lie, but was forced to sit up to get breath. With pain tearing at the inside of his breast, he could get no rest night or day. In despair his physician sought the services of Boerhaave, the most famous physician at that time in Europe. The story of the first recorded consultation on cancer of the lung has been handed down. The family physician recited all the peculiarities of the case and the treatment he had used without avail. He hazarded a tentative diagnosis of abscess of the chest. Boerhaave candidly avowed he knew neither the seat nor the nature of the disease. He put aside the suggestion of abscess owing to the lack of constitutional symptoms, but seems to have offered no alternative diagnosis. Despite the poultices

and soothing draughts prescribed by Boerhaave, the patient got rapidly worse, and, ten months after the onset of symptoms, having passed a night of the cruellest agony, black in the face with his struggle against suffocation, he succumbed. Permission for an autopsy being obtained, Boerhaave again comes on the scene. "Let us," he says, "before we open the body, go over all the circumstances of this strange case and try to predict the finding of the dissection." But he, usually so far-sighted, was absolutely befogged. The body was that of a healthy man, and showed no evidence of emaciation. On opening the chest, a white mass was perceived which filled the thorax from throat to diaphragm, and the record ends with the words: "Boerhaave remained stupefied at the sight of this singular phenomenon."

The scene changes to the Meath Hospital in Dublin. It is July, 1833, and Graves and Stokes are present at the post-mortem on the body of John Keating, a printer, aged 36. They had watched the course of Keating's illness since the previous February, when he entered the Meath Hospital under the care of Stokes. His symptoms were pains in the right side of the chest, followed by cough, dyspnœa, hoarseness, and slight expectorations, at first mucous, afterwards a little tinged with blood. The right side of the face and neck were œdematous. He remained about six weeks in hospital, during which time, after most careful and repeated examinations, Stokes remained undecided as to the nature of the disease. He left the hospital without any change in the physical signs, which were, in the words of Stokes, "The whole side sounded dull, yet without the accompanying physical signs of a great empyema on the one hand, or of pneumonia or tubercular solidity on the other." On 1st May Keating returned to the Meath under the care of Graves. His chief distress was now excessive dyspnœa, with some difficulty in swallowing. His face was bloated, and looked as if it were œdematous, the balls of the eyes were somewhat protruded from the sockets, and his countenance wore an expression of distress and suffering. The veins of his neck, chest, and abdomen were turgid and distended. The right side of the chest during respiration obviously moved less than the left, and the vibrations caused by the voice were feebler. Universally, over every part the percussion-note was as full as possible, and the breathing was bronchial. No râles were audible. The liver was enlarged far beyond its normal limits, and the patient was jaundiced. Three tumours appeared on his body immediately under the skin, which when first noted were the size of walnuts, but at the time of his death, in July, had become nearly as large as oranges. At autopsy the right lung was found a solid mass, extending beyond the meridian line, enveloping and nearly concealing from view the pericardium, great vessels, and trachea. The solid mass was everywhere homogenous, of a white colour, tolerably firm and consistent in its structure, which resembled a brain partly hardened by artificial means. The right bronchial tube could be traced for a short distance into the substance of the mass, but was considerably diminished in calibre. "Such are," says Graves, "the most important particulars of this remarkable case, which during the patient's life proved an opprobrium to the science of diagnosis, for both myself and my colleagues were completely mistaken as to its

nature. I became quite tired of the difficulty of attempting to explain the phenomena observed, and I publish this case to induce others to report similar cases, so that the diagnosis of encephaloid tumours of the lung, which a few years ago was completely impossible, may be arrived at ere long with some degree of certainty." This pious hope was realized by the labours of his distingushed colleague, Stokes.

No one better fitted for this investigation could have been found than Stokes, the ardent disciple of Laennec and the apostle of the new doctrine of auscultation in Britain. Applying these new principles to the problem of cancerous degeneration of the lung, Stokes was enabled to lay down some simple clinical rules which enabled him to arrive at a direct diagnosis. Subsequent writers did not add materially to his clinical work until new methods of diagnosis were again available. Histological technique, radiological diagnosis, thoracic surgery, and bronchoscopy have all thrown further light on this problem.

This paper is based on sixty-two cases of primary cancer of the lung. These were collected from the records of the Royal Victoria Hospital, supplemented by others from the Forster Green Sanatorium and from my own practice and that of a few colleagues. I have included only cases satisfactorily proven to be primary cancer of the lung either by autopsy or biopsy; by convincing radiological evidence or by an absolutely typical clinical course.

PATHOLOGY.—The vast majority of intrathoracic tumours are carcinomata, either obvious carcinomata of bronchi or the oat-cell carcinomata, formerly called lympho-sarcomata, but since the publication of Barnard's investigations regarded as medullary cancers of the bronchi. In this series of cases the commonest macroscopic characteristics were found to agree closely with the description given by Barnard, on which the following account is based.

A mass of growth in the hilum of the lung surrounds a main bronchus a few centimetres below the bifurcation of the trachea, and often involves and blocks the lumen of the main bronchi or some of its main collateral branches (fig. 1). Generally continuous with this there is a mass of growth replacing the lymphatic glands of the mediastinum, which may cause pressure on the trachea and œsophagus. On the left side the recurrent laryngeal nerve is often involved. There is a direct spread to and infiltration of the pericardium, and frequently of the auricles, superior vena cava, and pulmonary veins. The aorta and its branches and pulmonary artery may be compressed, but often escape in a striking fashion. The tumour growth flows around and surrounds the aorta as the incoming tide surrounds a projecting rock. Widespread lymphatic and general dissemination is the rule. The pulmonary veins being infiltrated by the growth, cancer cells are carried broadcast throughout the body, and the usual sieve or barricade action of the lungs does not apply. Metastases in the central nervous system and in the bones are common, and form pitfalls in clinical diagnosis. Not infrequently the larger mass of tumour-growth invades the mediastinum, whilst a relatively small mass occupies the hilum of one lung, involving a bronchus (fig. 2). In other cases the growth may transform the lung into a nearly homogenous mass of cancer without serious involvement of the mediastinum (fig. 3). The lesion with the most far-reaching results and gravest

consequences is the obstruction of an important bronchus. Collapse ensues. The airless aveoli are filled with exudate, and the so-called "drowned lung" is produced. This is a suitable nidus for inflammatory changes, hence pneumonic consolidation and abscess formation are frequent complications. The constriction or partial obstruction of a bronchus often leads to retention of septic material and dilatation of the bronchi, typical bronchiectatic cavities resulting (fig. 1). The pleura is involved in practically every case; either the pleural cavity is obliterated with dense adhesions or contains an effusion, serous, hæmorrhagic, or purulent. The pleura itself may be greatly thickened by tumour growth.

CLINICAL SYMPTOMS AND SIGNS.

ONSET.—In the fight against malignant disease, early diagnosis is all-important. In the case of cancer of the bronchus, pathological changes are well advanced before clinical evidence shows itself. This latent period, during which the disease is developing its strangleho'd on a bronchus or is creeping stealthily towards some vital mediastinal organ, may be practically without symptoms. Many cases have been reported in which advanced cancer of the lung has been found unexpectedly at autopsy; death having been due to an entirely different cause, and the lung trouble being unsuspected during life.

The earliest clinical symptoms are often commonplace and unobtrusive—cough and sputum, slight pain in the chest, and shortness of breath on exertion. Such, at first, receive but scant attention until by their importunity or aggravation they excite alarm. But on the other hand, the onset of symptoms in cancer of the lung may be rapid, especially when the mediastinum is involved.

A veterinary surgeon, aged 35 years, was dressing a wound in a horse's mouth. His arms were held high above his head, and he was exerting considerable effort. He was suddenly attacked with a severe paroxysm of breathlessness, and his face became livid. It was the first evidence of a bronchial cancer, chiefly mediastinal in position, occurring in a man in apparent ruddy and robust health.

A man, while in his bath, observed his arms becoming swollen, and felt his neck and face becoming turgid with blood, due evidently to a sudden diminution of the calibre of the superior vena cava. An onset simulating a coronary thrombosis was described by an engineer, aged 52, who, after dragging the chassis of a motor-car across the garage floor, was seized with violent substernal pain and had to lie down for two minutes. It was agonizing for the first ten minutes, and then eased somewhat. The pain did not radiate. From this time until death five months later a dull substernal ache persisted, which was worse on exertion, and eased by lying down. Even turning in bed brought on exquisite pain.

The first indication is often given by the onset of one of the numerous pulmonary complications, as pleural effusion or symptoms simulating pneumonic consolidation or broncho-pneumonia, or the patient attributes his condition to an influenza which did not clear up.

SYMPTOMS.—Disorders of respiration are striking features of the disease. In early stages oppression of breathing may appear only on exertion, and at this stage its association with persistent thoracic pain is very significant. Dyspnœa may

occur in paroxysms, attended with cyanosis, and these paroxysms may be strongly reminiscent of whooping-cough, or asthma may be closely simulated. Weller reports the case of a man brought unconscious into hospital. In the pockets of his jacket stramonium leaves were found. His relations stated that he was in the habit of smoking these to relieve his "asthma." His disease, however, was carcinoma of the lung. Inspiration and expiration may be accompanied by an audible and characteristic whistling and wheezing, best heard at the mouth, but on examination of the lung in such cases few physical signs may be found. Any disparity between the violence of the dyspnœa and the paucity of physical signs should excite at once the suspicion of intra-thoracic new growth. As the disease progresses, dyspnœa gradually becomes excessive. The patient finds it impossible to lie down without precipitating an attack of suffocative dyspnœa, and spends the last weeks of his life, in the words of Graves, "sitting upright day and night, leaning forward as far as possible, and supporting his head by means of a pillow placed on his knees or on a table. A state more piteous could be scarcely imagined."

The cough of cancer of the lung generally occurs early, but may be a late manifestation, and sometimes never appears at all. Often it differs in no way from the cough found in ordinary catarrhal conditions. "Short," "Dry," "Something sticking that I cannot get up," are common descriptions. On the other hand, with pressure on the larger bronchi, the cough may be paroxysmal; with pressure on the trachea paroxysmal and brassy; with paralysis of the recurrent laryngeal, "bovine," a loud, hoarse expiratory effort without the initial explosion of an ordinary cough. Here again, as with dyspnœa, lying down may precipitate an attack of coughing. Although the cough may be a dry and useless one, expectoration of some kind is present in the majority of cases. It may vary from mucoid to purulent and fœtid, according to the complications present. Of great diagnostic importance is the presence of blood. In nearly half of the cases of this series in which the presence of sputum is recorded, it was blood-stained. The sputum is generally only streaked, or small quantities of pure blood are expectorated. Fatal hæmoptyses are recorded, but are rare. In one of this series the spitting of blood was among the earliest recorded signs of trouble. Its persistence is a striking feature. Stokes described one of his cases as having "expectoration similar in appearance to currant jelly," and suggested that such a finding was important as indicative of this disease. This has been copied from textbook to textbook as a characteristic feature, whereas it is a rare sign of cancer of the lung. In fig. 1 the bronchiectatic cavities are filled with jelly-like material. Bleeding not infrequently accompanies bronchiectasis. Had bleeding occurred in this case, the stage would have been set perfectly for the production of "red-currant jelly." One case in this series is reported as having "prune juice" sputum.

On rare occasions portions of the growth have been coughed up, and section of this material has established the nature of the disease. Various types of cells in the sputum have been described as being pathognomonic of the malignant lung, but the majority of pathologists regard the diagnosis of cancer from such evidence as unjustifiable.

An onset with thoracic pain is not an uncommon one. The early involvement of the pleura accounts for this symptom. The site of the pain is frequently in the region of the scapulæ or shoulders, in the lower axillary region or costal margin. It may be substernal, and radiate down the arms, imitating the pain of a coronary thrombosis or of a brachial neuritis.

As secondary growths are frequently found in bones, especially in the skull, ribs, and vertebræ, various types of neuralgia, lumbago, and sciatica may all be closely imitated. In one remarkable case the pain in the limbs produced by hypertrophic pulmonary osteoarthropathy was the first symptom complained of. To accentuate the importance of pain as a feature, Aaron Arkin has suggested a "rheumatoid type" of the disease.

I have pointed out that the severer types of cough and dyspnœa are associated with mediastinal pressure. Stridor is due to pressure on the trachea, while hoarseness, aphonia, and bovine cough all point to pressure on the recurrent laryngeal nerve, generally the left. In two cases this was actually the first symptom. Dysphagia due to pressure on the gullet is a late symptom, and other evidence of pressure will be probably present. The great veins and the auricles are liable to obstruction and actual infiltration. This prevents the return of blood from the head, neck, and upper extremities, and produces the bloated, cyanosed face, with protuberant eyeballs, and swollen neck with its engorged and non-pulsating jugulars so typical of the condition. As a compensatory venous circulation becomes established, dilated, varicose, and tortuous veins appear on the surface of the trunk.

Trustworthy evidence of paralysis of the sympathetic is lacking in this series of cases. Bulging of the eyeballs, however, is a striking feature in severe mediastinal pressure. Difference in the radial pulses is only mentioned once. I have already pointed out that arteries seem to enjoy a relative immunity, and difference in pressure or volume between the pulses is strongly suggestive of aneurysm.

Pressure symptoms were manifested in twenty-nine out of the sixty-two cases in this series; pressure on the trachea or main bronchi in eighteen; on the superior vena cava in thirteen; recurrent laryngeal paralysis in eight; and dysphagia in six. Cyanosis, as a rule, was associated with pressure on the superior vena cava, and œdema of the neck and arms from the same cause was found in six cases.

Constitutional Symptoms.—I deplore the all-prevailing association of thought between malignant disease and loss of weight. Nothing militates more against the early diagnosis of cancer. This applies with special force to cancer of the lung. Laennec noted that "sufferers from this condition do not lose much weight until near the end, and then the loss of weight increases rapidly." In case-records one is struck with the description of the patient as "healthy," or "well nourished." Again and again an increase of weight is noted. On the other hand, loss of weight, increasing weakness, and loss of appetite may cause a patient to seek advice before chest symptoms appear. Loss of weight, if present, is confirmatory evidence, but a stationary weight or even increase of weight should never be urged as a valid argument against the presence of cancer of the lung.

Cancer of the lung is not an afebrile disease. While under careful observation,

sixty per cent. showed some degree of pyrexia, which varied, as a rule, with the inflammatory complications in the affected lung. These also accounted for the polymorphonuclear leucocytosis so often observed.

Tachycardia was also a striking feature. In seventy-three per cent. the pulse-rate was over one hundred, even when at rest. In many cases this symptom is probably related to the frequent invasion of the pericardium and of the auricles by the new growth.

Clubbing of the fingers was not infrequent, and was recorded in eleven per cent. of the series. I believe this condition often escapes observation. One case was a perfect example of hypertrophic pulmonary osteoarthropathy. In this patient the growth was a round-celled carcinoma of pleomorphic type, which chiefly involved the mediastinum and almost occluded the superior vena cava. The lungs were free from gross suppurative changes (fig. 2).

Physical Examination of the Chest.—The position of the apex is so variable in cancer of the lung as to be of little value in diagnosis. Even with large effusions its position may not be altered, as the heart may be anchored by a mass of growth which has invaded the pericardium, or it may be bound in its place by adhesions. If pleural effusion is an early symptom, the heart is displaced to the opposite side; with the collapse which follows stenosis of a main bronchus, it is displaced towards the affected side. The tumour mass may actually force the heart to the opposite side.

Stokes has stressed the great difficulty in diagnosis presented by those cases in which the lung is converted into cancerous tissue, and in which actual pressure effects, indicating an intrathoracic new growth, are absent. He considered that the principal physical signs are the gradual diminution of the vesicular murmur without râle; its ultimate extinction, and the signs of perfect solidification. Nearly a century later Chevalier Jackson demonstrated this sequence of events from actual bronchoscopic observations correlated with physical examination. As the disease advances and the lower lobe becomes infiltrated or becomes the seat of secondary changes, all the signs of pleural effusion may be present. The exploring needle, however, fails to find fluid, and may give the impression of entering a solid, resisting mass. Often the heart sounds can be heard over this dull area, probably due to the continuity of growth and pericardium. This is described by Adler, whose monograph on cancer of the lung is a classic, as the most typical condition to be found in cancer of the lung, and he calls it "the pleuritic type without effusion." In this type of lung the exploring needle, passing through the obliterated pleural cavity, may enter an abscess or bronchiectatic cavity, and, withdrawing pus, may lead to an error in diagnosis. On the other hand, pleurisy with effusion, serous, hæmorrhagic, or purulent, may be found. "You never know what may be at the bottom of a pleural effusion, especially when chronic," wrote that wise clinician, Samuel Gee, and Lord Horder amplifies this: "Pleural effusion discovered to have been latent or to be much smaller in amount than the physical signs led the observer to anticipate, or the withdrawal of which affects the physical signs and symptoms but little, consider the possibility of new growth in association with the effusion." If in addition the fluid is hæmorrhagic, suspicion becomes probability, and any

pressure symptoms, say paralysis of the left recurrent laryngeal with a left-sided effusion, makes the diagnosis almost a certainty. After paracentesis the physical signs persist, the opacity on the screen remains, and the fluid quickly re-accumulates. Enormous quantities of fluid may be removed; from a woman, aged 31, twenty-one pints of blood-stained fluid were removed in seventeen days, and the operation had been previously carried out six times by her doctor before admission to hospital. "The pleura is the theatre," as Darolles says, "of an intense struggle between the physician and the secretory activity of the pleura, but the physician is conquered, for at autopsy fluid is still found in the pleural cavity." A very helpful aid in diagnosis is to replace the fluid with air, and on X-ray examination the tumour mass may be better shown and its position defined.

When purulent fluid is withdrawn, the diagnosis of empyema is a natural one, as in the case of J. M., a farm labourer of 37 years. Early in February, 1930, he had an attack of so-called influenza, which kept him in bed for a week. Resuming work about a fortnight later, he was seized with a severe pain on the left side of the chest. He was coughing up foul green sputum, had an evening temperature of 100 and a pulse-rate varying between 100 and 120. Signs of fluid were found at the left base, and on exploration purulent fluid containing a hæmolytic streptococcus was obtained. On operation a pint of thick pus was evacuated. He was in hospital six weeks, and left with his wound healed and no evidence of fluid, the persisting dullness being attributed both clinically and by X-ray to thickened pleura. He kept well, to use his own phrase, for five weeks, and then returned to hospital, short of breath and again coughing up a foul sputum. He died shortly afterwards, and post-mortem examination revealed a new growth. Operation was performed on six cases in whom the diagnosis of empyema or abscess had been made. "But it is better to operate on a hopeless growth than to neglect a treatable abscess," as Chandler stated when discussing similar cases. Pleural effusions were discovered in twenty-nine cases—forty-seven per cent. Of these, fourteen were hæmorrhagic, six serous, four purulent, and five were purulent and hæmorrhagic.

Secondary Growths.—Metastases are not only of frequent occurrence in cancer of the lung, but are also of great clinical importance. Their discovery may assist in the diagnosis, but, on the other hand, by altering the whole evolution of the disease or by withdrawing attention from the chest, secondary growths often confuse the clinical picture.

Enlargement of the supraclavicular or axillary glands is most helpful in diagnosis. These glands were affected in nearly a quarter of this series, sometimes occurring shortly after the onset of symptoms. Indeed, in one case the axillary glands were enlarged more than a year before any other evidence of the disease was present. In the majority of patients, however, the disease is far advanced before the glands above the clavicle or in the axilla are palpable. Removal of one of these glands for histological examination is free from risk and puts the diagnosis beyond cavil. In two cases secondary malignant nodules developed in the subcutaneous tissue; one in the skin of the abdomen near the umbilicus; the second in the scalp, and this was in direct continuity with one involving the occipital bone, the underlying dura

mater and occipital lobe of the brain. Metastases in the central nervous system and in bones are of remarkable frequency in cancer of the lung. The pitfalls thus introduced into the clinical diagnosis, especially if the chest signs have been few and unobtrusive, have been stressed by several observers. The following cases illustrate this difficulty.

Mrs. A., aged 38, was returning home after a shopping expedition, when the left side of her face became violently convulsed. Her dental plate became loose and hurt her mouth, but she was unable to ask her companion to remove it, as she found she could not speak. She did not lose consciousness, nor did she fall. Speech improved, but some dysarthria remained and a severe headache developed. A month later she had two similar fits. Gradually she lost power in her right arm and leg. It was only on close inquiry into her past history that she stated that in the summer she had had pain in the back of her left lung, cough, purulent expectoration with some fever, and had been a fortnight in bed, and since then had had a cough and spit. The left apex was found dull, with absent breath-sounds. However, the convulsions, aphasia, and hemiplegia chiefly engrossed our attention; a cerebral tumour in the left precentral gyrus was diagnosed. Mr. Purce found and drained a cystic tumour in that area. She died shortly afterwards, and dissection revealed the left lung largely converted into a cancerous mass (fig. 3). In this case the probability of cancer of the lung was carefully considered, yet the cerebral symptoms were so pressing that I felt justified in having the intra-cerebral pressure relieved. Fried, from Harvey Cushing's clinic, has reported some measure of success in operation for cerebral metastases, and has recorded a case which lived for several years.

The next case was even more puzzling. J. L., a man of 68, a successful and self-made business man, early in January, 1932, "got a chill which settled in his chest." He had a cough, and spat up some blood-stained sputum. He was thought to be suffering from influenzal broncho-pneumonia. On the morning of 1st February he found that he could not move his legs or pass urine. Examination demonstrated râles and rhonchi in his chest, and complete loss of power and sensation below the level of the umbilicus. He died on 19th February, and a small primary bronchial cancer was found with many secondary growths in the liver, pancreas, ribs and vertebræ, which had produced the pressure paraplegia. This man had been for the past year "not up to his usual form." He had been putting on weight, and to reduce himself had been taking Turkish baths. He had been subject to winter coughs, but this winter for the first time blood had at times streaked his expectoration.

In the following case, for a considerable period, there was no evidence pointing to a primary pulmonary lesion. R. B., a man of 46, developed a chill with a sore throat on 13th July, after the Twelfth celebrations. Severe sacro-iliac pain radiating down the left leg followed. This "sciatica" resisted all methods of treatment, and became bilateral. The first symptom of lung trouble was whistling respiration, which came on ten weeks after the onset of pain. A pleural effusion, latent and hæmorrhagic, was found in the left pleural cavity, and radiological examination of

the chest showed a large mass on the left side of the mediastinum, but failed to demonstrate secondary deposits in the vertebræ or pelvis; although these were undoubtedly present, as later he developed objective signs of spinal pressure and became completely paraplegic. He died seven months after the onset of pain.

Accessory Methods of Diagnosis.—This paper is meant to be a survey of cancer of the lung from the bedside point of view. But to give a true picture of modern methods of attack on intra-thoracic new growths, it is necessary to sketch, however briefly and inadequately, the great part played therein by radiologist and surgeon. The development of radiology in connection with diseases of the chest has thrown a flood of light on obscure intra-thoracic ailments. Many cases formerly diagnosed as phthisis or fibrosis of the lung, as unresolved pneumonia or thickened pleura, have been shown to be cancer of the bronchus. The X-ray has helped to dispel the myth of the rarity of cancer of the lung. Although the evidence afforded by X-ray examination is the most valuable single means of determining the presence and localization of a pulmonary tumour, yet the odds are against a positive diagnosis of new growth of the lung by radiological evidence alone, as secondary changes, collapse, consolidation, abscess, and bronchiectasis, may complicate the radiological picture just as they do the clinical one, while a pleural effusion often entirely masks the pulmonary lesion. A second series of skiagrams should be carried out after the induction of artificial pneumothorax or gas replacement of any effusion present. I should like to plead for a closer co-operation between physician and radiologist in an attempt at the earliest possible recognition of this scourge. As the most frequent lesion is the obstruction of a bronchus, it was natural to try to map out the bronchial tree by a substance opaque to X-rays. For this purpose lipiodol is injected into the trachea. This is a most valuable method of demonstrating a block in a main bronchus or narrowing of the bronchus with irregularity in the outline of its walls may be obtained (fig. 4). Bronchoscopy may demonstrate the actual growth, or a compression stenosis, or displacement, fixity and rigidity of the affected bronchus. This method of examination offers the best hope of early diagnosis. The diagnosis in fig. 4 was rendered certain by the removal of a small portion of the growth seen on bronchoscopic examination. On histological examination, this proved to be a spheroidal-celled carcinoma.

A proportion of cases will remain in which exact diagnosis is impossible, and in these exploratory thoracotomy should be seriously considered. By this means certain tumours originally thought malignant have proved to be benign, and have been successfully removed, and others definitely malignant have been found circumscribed and capable of removal. This operation affords an opportunity of obtaining tissue for histological examination. No chance of securing an exact pathological diagnosis should be lost. Frequently an available gland is present in the neck or axilla. Radium, in the form of radon seeds, has been shown to have had beneficial results on some growths of the lung; on others, none. There is urgent need of co-operation between pathologist and clinician in the investigation required to discover the type likely to benefit. I agree with Dr. Maurice Davidson when he says: "The use of radium in the treatment of pulmonary or mediastinal tumours,

either alone or in combination with surgical measures, is to be encouraged, since no one can yet say the last word as to its possibilities or its limitations." Deep X-ray therapy is often palliative. If the growth is principally mediastinal, symptoms are often markedly relieved; paroxysmal dyspnœa, swelling of the neck, and cyanosis may all, temporarily at least, decrease. If pain is a prominent symptom, it is often relieved. In some cases deep Röntgen-ray therapy has a marked retarding influence. As has been pointed out by various writers, the variation in the response of the intra-thoracic tumour may be used for the purpose of differential diagnosis. Mediastinal lymphadenomata and sarcomata react rapidly, and the cellular cancers more appreciably than the scirrhous types.

DURATION.—It is impossible to state the actual duration of cancer of the lung, as the onset of symptoms does not correspond to the actual commencement of the disease. In the previous history of some patients, attacks of pleurisy were reported years previously. Who can say that the pleural lesion was not due to a cancer present even then? In this series of cases the interval between the onset of symptoms and death varied between eight weeks and three years; the average period was about nine months. The cause of death was generally due to pulmonary infections, to massive mediastinal pressure, to metastatic deposits, especially the central nervous system, and, more rarely, to cachexia. Rare causes of death in the series were cerebral abscess and uræmia due to lardaceous disease.

DIFFERENTIAL DIAGNOSIS.—The difficulties introduced into the diagnosis of primary cancer of the lung by the pulmonary complications inherent in the disease, or by metastases elsewhere in the body, have been briefly considered. Apart from these, in actual practice four conditions deserve consideration.

Pulmonary Tuberculosis.—A patient with cough, blood-stained sputum, pyrexia, perhaps with loss of weight and night sweats, and with dullness on percussion at one apex, certainly presents a close resemblance to phthisis. The sputum from such a case is examined for tubercle bacilli with a negative result. Surprised, the physician has the sputum re-examined again and again, and with the same negative finding. The persistent absence of tubercle bacilli in the expectoration of such a patient practically excludes pulmonary tuberculosis, and should excite the suspicion of bronchial carcinoma. Most of the failures to differentiate these two conditions are due to failure to make repeated bacteriological examinations of the sputum. It must be remembered that error is possible in the reverse direction, as the presence of tubercle bacilli in the sputum does not exclude the possibility of cancer of the lung, the two conditions being occasionally co-existent.

Fibrosis of Lung.—The diagnosis between fibrosis and carcinoma of the lung is often very difficult, especially if the fibrosis be unilateral. Dyspnœa of effort, cough, sputum, retraction of the chest, evidence of consolidation, displacement of the heart and symptoms of bronchiectasis may be present in both. The patient's preceding history may assist, and lipiodol injection will fail in fibrosis to demonstrate occlusion of a bronchus, and will demonstrate the bronchiectatic cavities. Exploratory thoracotomy may be required to solve the problem.

Aneurysm of the Aorta.—The differential diagnosis is discussed in all textbooks

of medicine. The evidence of a positive Wassermann reaction must be taken with caution. Five cases in this series were found with a positive reaction. Definite cardiac or aortic signs, inequality of the pulses or of the pupils and tracheal tugging point to aneurysm rather than new growth, while venous obstruction is in favour of new growth. Involvement of the thoracic parietes is rare in cancer of the bronchi, and common in aneurysm or sarcoma. Radiological evidence obtained by screening the patient is often decisive.

Hodgkin's Disease often involves the mediastinal glands, producing evidence of mediastinal pressure, but other groups of glands are generally affected at the same time. Biopsy of a gland from the neck or axilla will, in most cases, settle the diagnosis, and the quick response to X-ray treatment is also suggestive.

INCIDENCE.—The general opinion among pathologists and clinicians at the present time is that there has been a decided increase in the incidence of primary cancer of the lung during the present century. An excellent résumé of this important aspect of the subject is to be found in Maurice Davidson's recent monograph, "Cancer of the Lung and Other Intra-Thoracic Tumours." I have obtained the following figures from the post-mortem records in the Royal Victoria Hospital, which certainly show the same tendency, though the figures are too small to be of much statistical value.

Years	Total Autopsies	Carcinoma of Lung	Percentage based on Total Autopsies
1906-1925	905 ...	10 ...	1.1
1926-1930	993 ...	17 ...	1.7
1931-Nov. 1932 ...	399 ...	10 ...	2.5

During the period 1921-1925 cancer of the lung constituted 1.3 per cent. of all cancers admitted to the hospital; during 1926-1930, 2.7 per cent.; and in 1931 the percentage was 3.8. This increase may be explained partly by improved methods of diagnosis, and partly by the interest which has been excited in recent years in cancer of the lung. The knowledge that it is not an uncommon disease and that it may be met with in many guises makes the physician consider cancer in his differential diagnosis of any chest case which is atypical and puzzling in its features, and he has enthusiastically called to his assistance the modern and improved methods for investigation of the chest. Yet even granting more frequent clinical diagnosis, the increased post-mortem rate remains unexplained, and there can be little doubt that in Northern Ireland this type of cancer is on the increase, constituting at present nearly four per cent. of all cancers.

The facts as to sex incidence and age agree c'osely with other observers. Of the sixty-two patients, fifty-one were males and eleven females. Seven of the patients were between 25 and 35 years of age, nineteen between 35 and 45, nineteen between 45 and 55, thirteen between 55 and 65, and four over 65. The high incidence between 35 and 45 is noteworthy. The right and left lungs were almost equally affected, the right in thirty, the left in thirty-two.

Many suggestions have been made to account for the increased incidence of bronchial cancer. Excessive cigarette smoking; pollution of the air with petrol and exhaust fumes; inhalation of tar particles from macadamised roads; irritant

gases, such as poison-gas during the war; these have all been accused of causing irritation by inhalation and so producing cancer of the bronchus. These suggestions are unsupported by any authoritative or convincing scientific or statistical evidence.

Previous respiratory disease must be more seriously considered. Great stress has been laid on the fact that the increased incidence appeared to start from the time of the great influenza epidemic of 1918-19, but on the other hand, the increase had been noted in some areas prior to the influenza epidemic. A previous history of influenza in cases of carcinoma of the lung was not common in this series, occurring in only fourteen per cent. The onset of symptoms in cancer of the lung is not infrequently acute, and the preceding so-called influenza may be really the first evidence of a pre-existing but latent cancer. The association between cancer of the lung and tuberculosis has given rise to much discussion, and tuberculosis has been cited by some authors as an important causative factor. That the two conditions are found to co-exist there is no doubt. Calcified glands were found post-mortem in quite a number of the cases under discussion, but no evidence of active tuberculous lesions was found in the parenchyma of the lung. Cancer of the lung has been reported in association with interstitial pneumonia, with bronchitis, and arising in the wall of a bronchiectatic cavity. In forty-five per cent. of this series no history of any previous illness could be elicited. Thirty-five per cent. gave a history of previous respiratory trouble, including influenza. These varied in severity from frequent colds to pleurisy and pneumonia, but often it is difficult to decide if the ailment in question is not really the manifestation of a pulmonary complication of bronchial carcinoma.

Attempts to associate bronchial carcinoma with occupations associated with dust, noxious fumes, or exposure have failed, with the one exception that the miners in the Schneeberg and Joachimstal mines die of cancer of the lung. Special commissions have investigated the conditions in both of these mines, and have shown that in the Schneeberg nearly three-quarters of its workers, and in the Joachimstal over half, die of cancer of the lung. The air of the mines contains two notoriously cancerogenic agents—arsenic and radio-active emanations. The average radio-activity is not especially high, and might be tolerated for some time without injury. But when we remember that the miners spend about seven hours daily, day after day, in this atmosphere, it is not surprising that the enormous quantities of emanation inhaled in the course of a number of years should end by injuring the organism. It has been estimated that in fifteen years a miner would inhale fifty-five milligrammes of radium chloride. Which of these, arsenic or radium emanations, is the active agent, is still unsolved.

The earliest symptoms are caused by a pneumokoniosis, which often lasts many years before the onset of the graver symptoms attributable to cancer. The early troubles are slight, the sufferers pay hardly any attention to them, although they recognize them as the first onslaughts of the malady of the mine, but they do not seem to care—they regard it as inevitable. The majority continue to descend the mine until there comes on suddenly an aggravation of all the symptoms, which renders them "Bergfertig"—finished with the mine. What a setting for the tragic

dramatist! The mine producing radium for the alleviation and possible cure of the very disease with which it kills the workers.

I am reminded of the riddle which Samson put to the Philistines: "Out of the eater came forth meat and out of the strong came forth sweetness," to which these latter days have supplied a solution, "Out of the Joachimstal comes forth radium and out of the suffering of its workers comes forth health for others."

Without the willing aid of many of my colleagues the preparation of this paper would have been impossible. I should like to acknowledge my indebtedness to Professor J. S. Young and Dr. G. P. McCullagh, for their ever-ready assistance on the pathological side; to Doctors R. M. Beath, F. P. Montgomery, and R. McCulloch, from the radiological aspect; to Mr. G. R. B. Purce for his surgical work; to my colleagues on the medical staff of the Royal Victoria Hospital, and to Doctors B. R. Clarke, D. R. Taylor, and H. W. Black, for allowing me to incorporate in this series their clinical notes of cases under their care; and finally to Dr. Violet Reilly and Dr. Rex Kennedy, my house-physicians, for their search through the records of the hospital.

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Tuberculous Laryngitis

By J. R. WHEELER, M.B., D.O.M.S., F.R.C.S.EDIN

from the Forster Green Hospital, Belfast

A RECENT number of THE ULSTER MEDICAL JOURNAL was composed almost entirely of papers on tuberculous infection of various organs of the body, but no reference was made to laryngeal tuberculosis. I should like, therefore, to draw your attention to some aspects of the disease as it affects the larynx.

My notes are based on a series of 168 cases treated in the Forster Green Hospital between the year 1926 and the present date. All these cases were suffering from tuberculosis of the lung on admission, and therefore the question of a differential diagnosis as regards the throat condition rarely arose. In the ordinary way, one must differentiate the laryngeal lesion caused by tuberculosis from the laryngeal lesion found in—(1) syphilis; (2) chronic laryngitis due to catarrhal infection of the upper respiratory organs, i.e., the nose and throat; (3) epithelioma.

In syphilis the voice is harsh. The inflammation is more apt to attack the anterior part of the cords. Ulcers, if present, are deep and crater-like. There is remarkable absence of pain in relation to the extent of the disease, and of course the Wassermann reaction is positive. There may also be signs of the disease in other parts of the body.

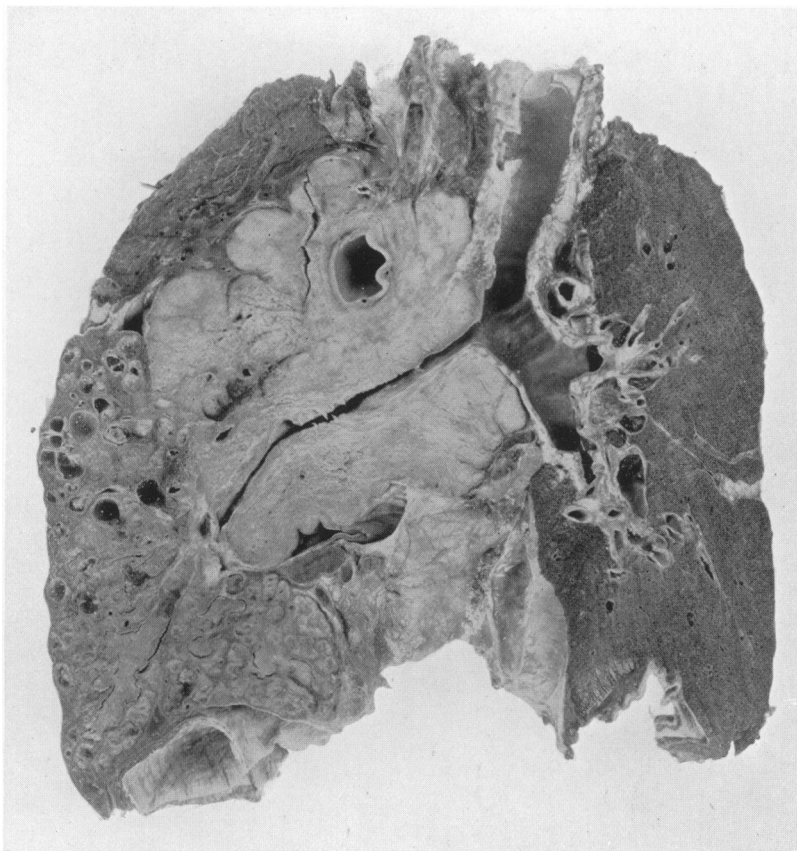

FIG. 1.

Coronal section of thoracic viscera viewed from behind. The growth is seen constricting left bronchus. The arch of the aorta is seen patent surrounded by tumour tissue. The growth has invaded the mediastinal glands and pericardium. The upper lobe of the left lung is collapsed; the lower lobe contains numerous small abscesses and bronchiectatic cavities filled with coagulated mucus. This growth was a small round-celled carcinoma.

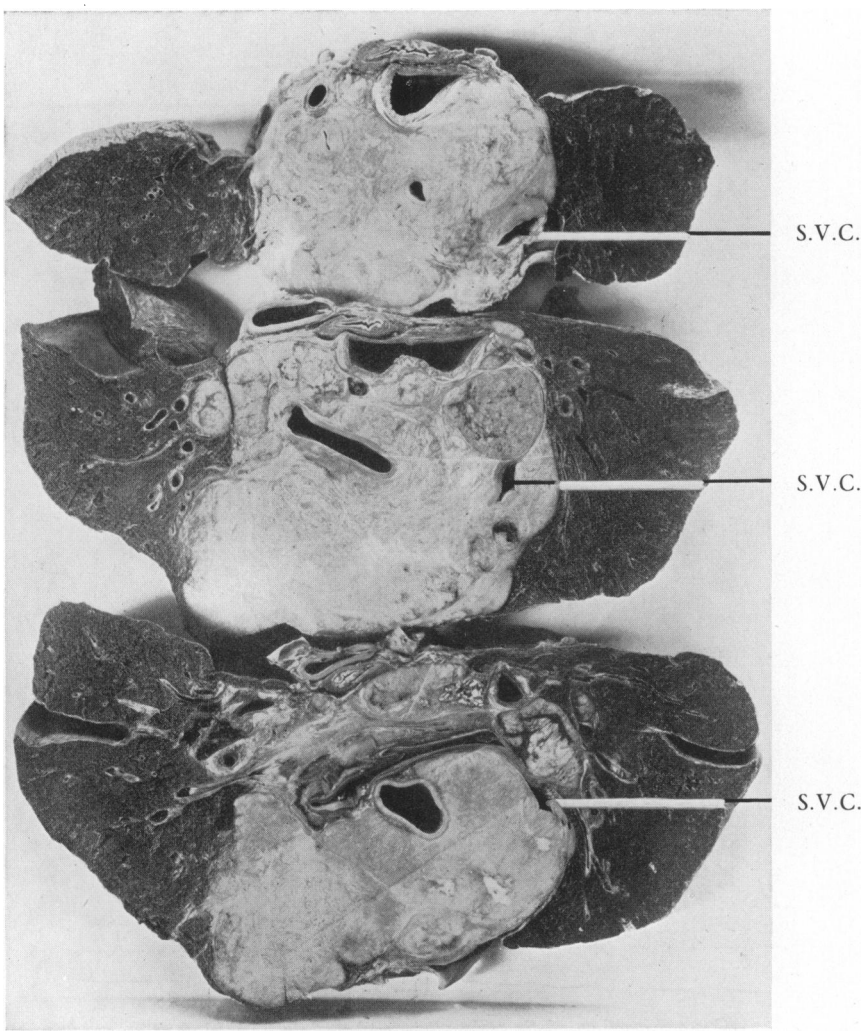

FIG. 2.

Horizontal sections through a round-celled carcinoma chiefly involving mediastinum. The great narrowing of the lumen of the superior vena cava as contrasted with the patent arteries is noteworthy. Glass rods point to the superior vena cava.

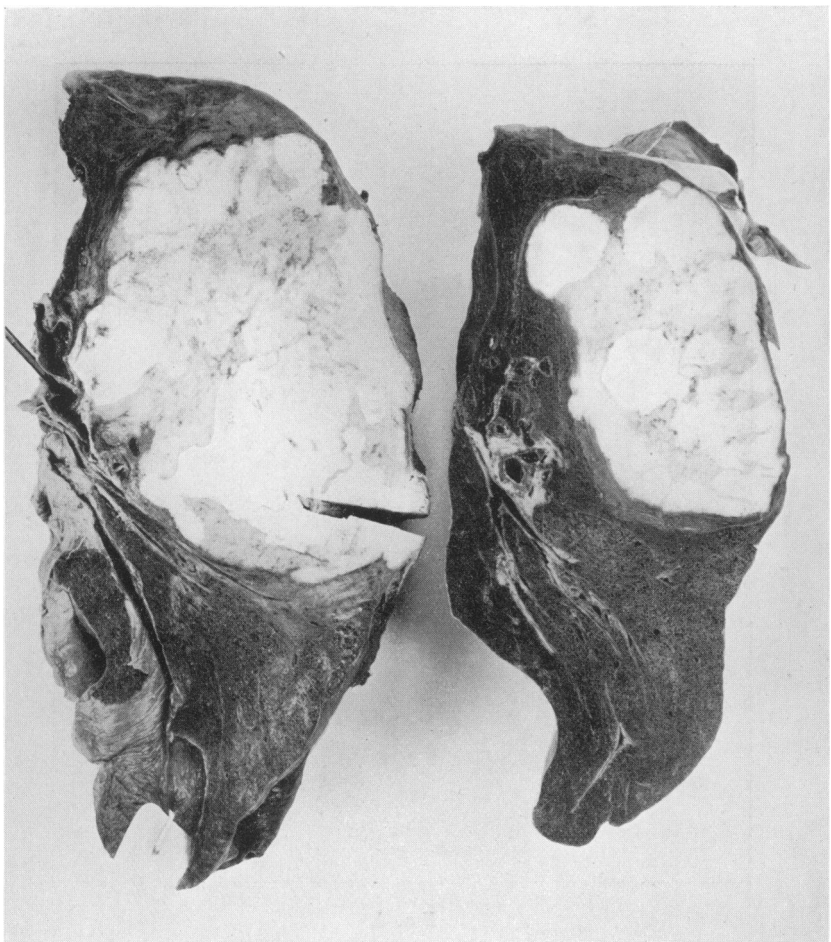

FIG. 3.

Sagittal section of oat-celled carcinoma of the left lung without involvement of mediastinum.

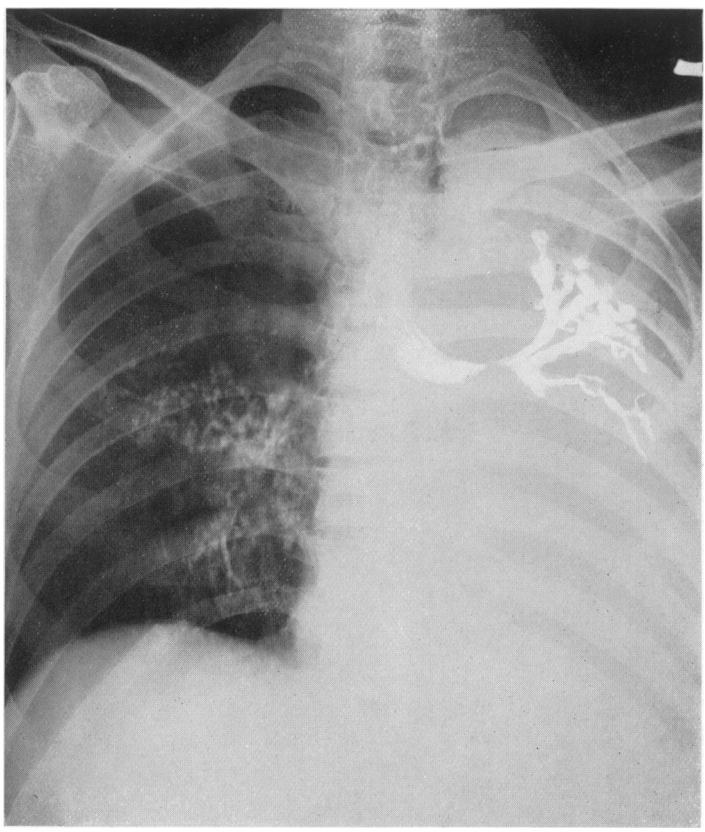

FIG. 4.

X-ray after injection of lipiodol into trachea showing filling defect in left bronchus with bronchiectatic cavities in left upper lobe and occlusion of left descending bronchus.

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In syphilis the voice is harsh. The inflammation is more apt to attack the anterior part of the cords. Ulcers, if present, are deep and crater-like. There is remarkable absence of pain in relation to the extent of the disease, and of course the Wassermann reaction is positive. There may also be signs of the disease in other parts of the body.

Chronic laryngitis due to upper respiratory catarrh may be caused by a chronic inflammatory infection of the faucial tonsil, by chronic post-nasal catarrh resulting from chronic infection of some of the nasal sinuses, or nasal obstruction caused by a deviated septum. It may also be caused by chronic infection of the mucosa, which is usually streptococcal in origin.

In epithelioma the voice is hoarse. There is frequently a papillomatous involvement of one cord alone, with sluggish movement of that cord. The patients are over middle age. The absence of tubercle bacilli in the sputum, a negative Wassermann, together with the microscopic examination of the growth, confirm the diagnosis.

Turning to the question of tuberculous laryngitis, apart from a few cases due to lupus, which show obvious evidence in the nose and skin, the great majority of all cases are secondary to phthisis. The evidence at my disposal goes to show that tubercular laryngitis is rarely seen in the incipient stage of phthisis, sometimes seen in the moderate stage, and most frequently seen in the advanced stage.

The method of invasion of the tubercle bacillus into the laryngeal structures is, in the great majority of cases, through the laryngeal mucosa from the secretions coughed up from the lung. The sputum coughed up is most likely to collect and stagnate at the posterior part of the larynx, and thus the parts first and most frequently involved are the inter-arytenoid folds, the posterior part of the vocal chords, the arytenoids, the ventricular bands, and the epiglottis.

Sometimes the infection may be by the blood-stream or the lymphatic channels, but this is extremely rare.

The bacilli having reached the submucous layer, either directly or through the surface epithelium and mucous glands, an infiltration of the region by leucocytes occurs, and the typical small nodule is formed under the surface. If the disease progresses, more nodules form and coalesce; these may rupture and form ulcers. Also, masses of granulation tissue may form tubercular tumours.

For clinical purposes one may divide the disease into four stages :—

1. Stage of hyperæmia and mild congestion.
2. Stage of nodular formation and acute congestion.
3. Stage of infiltration and ulceration.
4. Terminal stage of pericondritis and necrosis.

In the first stage of hyperæmia and mild congestion, one finds a mild chronic inflammation of the laryngeal mucosa and a slight adductor paresis of the true cords. It may be impossible at this stage to differentiate this condition from chronic laryngitis due to upper respiratory catarrh. One must always remember that a phthisical patient may have chronic laryngitis due to upper respiratory infection, and not necessarily of tubercular origin.

In the second stage—that of nodular formation—one sees the typical inter-arytenoid thickening and nodular formation, and frequently there is some acute congestion in the region of the arytenoids or false cords, and some hyperæmia of the true cords. This stage progresses into the third stage, with the formation of the small shallow ulcers on the posterior third of the vocal cords.

The final and terminal stage of pericondritis and necrosis is very rarely seen, as mercifully before this stage is reached the patient has succumbed to the ravages of the disease.

In a phthisical patient one may have a paralysis or paresis of the right vocal cord, causing hoarseness, without any laryngeal inflammation being present; this is due to the recurrent laryngeal nerve—the nerve which supplies the intrinsic muscles of the larynx—becoming involved in the scar tissue at a fibrous apex of a right lung. In the 168 patients I examined, I saw only one case in which this condition was present.

As tuberculous patients are so often optimistic about themselves, it is always a wise precaution to examine the larynx of the patient who has a cough and occasional attacks of hoarseness, as this may be the first indication to the doctor that there is any serious trouble present. In all my series of cases, one could trace a history of occasional attacks of hoarseness.

SYMPTOMS.—In the early stages there may be no symptoms, but the most typical symptom is a weak voice with intermittent hoarseness, with or without a cough. Later the voice becomes definitely hoarse, and there is usually a troublesome cough. Also, there may be pain on swallowing, especially fluids. In the final stage, constant pain is a troublesome feature, the voice is almost completely gone, the cough is incessant; there is dysphagia, and often progressive dyspnœa.

TREATMENT.—The treatment of all cases of laryngeal tuberculosis is twofold—first, the treatment of the chest condition, and, secondly, the treatment of the larynx. As an American writer states, one might as well try to bail a leaking boat without plugging up the hole, as try to treat a tuberculous larynx without treating the chest.

With improved methods for early diagnosis and more effective treatment of the lung condition, the treatment of the local laryngeal lesion has been rendered more satisfactory. As will be pointed out, most cases with laryngeal tuberculosis have cavities in the lungs, and with the modern methods of treating these cavities by collapse of the lung by means of pneumothorax, phrenic avulsion, or thoracoplasty, etc., the disease tends to be arrested, and so constant reinfection of the larynx from below is prevented.

Sanocrysin is also a valuable aid to treatment, and, of course, the older methods of treatment, i.e., general rest, fresh air, good food, etc., must always be carried out.

LOCAL TREATMENT.—With the larynx, as in all other forms of tuberculosis, the first essential of the treatment is rest of the affected part. The vocal cords can be rested to a point if the patient just speaks in a whisper, but the only satisfactory way to get complete rest of the cords is to forbid the patient to speak at all, and also to prevent coughing, if at all possible, if not voluntarily, then with the aid of drugs. In order to achieve this rest, sanatorium treatment is almost essential, where, as Kipling would say, "Neither foes nor loving friends can hurt you."

While absolute silence is necessary in advanced cases, it need not always be enforced in milder cases, as it is apt to be very depressing, especially in temperamental patients.

In a certain percentage of cases there is a large amount of muco-purulent discharge loaded with tubercle bacilli coughed up from the lung; this lies in the inter-arytenoid space, and may be got rid of by washing it away with a mild, non-irritating antiseptic wash, after first cocanizing the pharynx and larynx. Granted this causes a certain amount of irritation, but this is a lesser evil than allowing the infective secretion to remain there. After removing this stagnant secretion, it has been found beneficial to spray the larynx with ten per cent. menthol and parolene.

The electro-cautery has quite a distinct part to play in the treatment of laryngeal tuberculosis, and the results attending its proper use have been very satisfactory. The object of the cauterization is the production of fibrous tissue rather than the destruction of all the tuberculous tissue. The production of the scar is followed in about three days by the formation of a separating zone of granulation tissue, which is necessary for the sloughing off of the heat-destroyed zone. The development of this granulation tissue is attended by the formation of new blood-vessels, which grow from the periphery through the previously avuscular tubercle. This brings nutrition to the fixed connective tissue elements, and enables them to withstand the action of the tuberculous toxin, and probably also causes the epitheloid cells themselves to develop into fibroblasts.

Application can be by the indirect or the direct method, under local anæsthesia. The technique employed varies according to the site and character of the lesion. In the pyriform swelling of the arytenoids, igni-punctures are remarkably efficient, and the rapid reduction of the swelling is sometimes astonishing. The punctures are made in rows about one-eighth to one-quarter of an inch apart. For true intrinsic lesions it is best to use a wire loop, as the object is to destroy the exuberant tissue down to the level of the normal structures.

If cauterization has been done under careful visual control, violent reaction rarely follows, though it is wise in the beginning of the treatment of a case to do very little at the first sitting, in case there is any idiosyncrasy to this form of treatment.

The resulting soreness may cause slight discomfort for the first day or so, but it is rarely marked. The repetition of the cauterization in any case should not be undertaken until the previous burn is healed. The benefit from cauterization cannot be determined fully until three or four weeks have elapsed, during which time the slow process of cicatrization is going on.

CURETTING.—This is a method which has been advocated, but of which I have had no experience. It does not seem to me justifiable, as one is bound to create a large ulcerating surface which is liable to become re-infected before healing can take place.

INHALATIONS.—Steam inhalations should as a rule be avoided, as they are apt to cause irritation. The best method I have found is to use an inhaler of the type made by Messrs. Oppenheimer & Co.; by this means suitable drugs can be inhaled in a form pleasant to the patient, and which will afford some soothing effect to an irritable and painful lesion.

Some American writers claim good results from the use of local applications of chaulmoogra oil to the affected part. While this oil is not irritating to the larynx,

it is highly irritating to the stomach. To the best of my knowledge this drug has not been tried out in this country.

ARTIFICIAL SUNLIGHT.—This so-called method of treatment has been advocated for many diseases in recent years, and certainly I have seen it give excellent results in some cases. Some advocates claim it to be almost specific for bone tuberculosis.

In laryngeal tuberculosis, some Continental authorities claimed excellent results from direct application of the rays to the affected parts—a claim about which I was always doubtful. In a recent number of "The British Medical Journal," Sir Sinclair Thompson states how he took excessive trouble to master the technique of this method, and that he now finds it to be greatly wanting in the claims made for it. Perhaps Professor John Frazer is correct when he states that artificial sunlight is the best tonic we have to-day—nothing more.

PAIN.—In the more advanced state of laryngeal tuberculosis, pain can be a very distressing complication. On account of the laryngo-pharynx becoming involved, disphagia is not an uncommon symptom. In the early stage these symptoms will frequently subside under vocal rest and suitable diet. Sometimes a laryngeal insufflation of orthoform or anæsthetin powder, given about one hour before the chief meal of the day, will furnish twenty-four hours' comfort. In a recent case this method of treatment gave complete relief from pain and dysphagia in spite of an advancing chest lesion.

Injection of the superior laryngeal nerve with alcohol has been tried, and gives quite good results in some cases.

Trachyotomy as a curative remedy is rarely employed nowadays, as strict silence will secure almost as complete rest to the larynx. It may be required for increasing or established stenosis. I have only had experience of one case in which it was tried, and the result was very satisfactory.

Chronic laryngitis in phthisical patients is occasionally due to chronic tonsillitis or chronic post-nasal catarrh. I have removed the offending tonsils in about half a dozen patients with beneficial results. If a general anæsthetic is contra-indicated, the tonsils can be dissected out under local anæsthesia. Following the technique of Dr. J. S. Fraser of Edinburgh, who performs almost all his tonsillectomies under local anæthesia, this method presents no real difficulties, and can be done almost painlessly and bloodlessly.

PROGNOSIS.—As all these cases were suffering from phthisis, it is obvious that the prognosis of the laryngeal condition is closely related to the stages and prognosis of the chest condition.

Sir St. Clair Thompson states: "Improvement very commonly proceeds along parallel lines in lungs and larynx—but not always. A laryngeal lesion may heal while tuberculosis advances in the chest. The contrary never occurs, i.e., if the laryngeal lesion is advancing, the pulmonary disease cannot be arrested."

Out of a total of 173 patients discharged in 1931, which may be taken as an average year, 150 had no laryngeal trouble. Of these normal laryngeal patients, seventy per cent. had tubercle bacilli in the sputum, twenty-four per cent. had a cavity

which could be demonstrated clinically, while thirty-nine per cent. showed a cavity on X-ray examination.

Turning to the patients with laryngitis, those with definite tuberculous laryngitis and those with chronic laryngitis probably tuberculous in origin, in only one case could we not find tubercle bacillus in the sputum; i.e., in practically every case the tubercle bacillus was being coughed up through the laryngeal aperture. Cavities were demonstrated clinically in forty-four per cent. of these cases; with the aid of X-rays this figure rose to no less than eighty-three per cent. Surely these figures show that in tuberculous laryngitis the tubercle bacillus is always present in the sputum, and the disease is in a fairly advanced state.

Notwithstanding these facts, I think that while the disease is certainly very serious, it is by no means hopeless. The results from cases seen in 1928-30—now approximately one and a half to three and a half years after discharge—show that quite a fair percentage of cases with tuberculous laryngitis are still alive. Of those who had no laryngeal lesion at all, of the cases that can be traced sixty-five per cent. are still alive. Of the cases with a mild laryngitis, which is probably tuberculous in origin, seventy per cent. of the traced cases are alive; while of the cases with a very definite tuberculous laryngitis, fifty-six per cent. are still alive.

The following notes are of cases of even longer duration :—

1. G. H., aged 23, a book-keeper. First seen eight years ago. Chronic laryngitis in the early stage; tubercle bacilli were present in the sputum, but no cavity. Tonsillectomy was performed five years ago. Last report: patient is alive and keeping well. This is possibly a case of laryngitis of upper respiratory origin in a phthisical patient.

2. J. M., aged 23, carpenter. First seen five years ago; had severe degree of hoarseness and considerable laryngeal involvement of undoubtedly tubercular origin. Tubercle bacilli were present in the sputum, and there was a cavity in the lung. Last report: patient is alive and well.

3. Wm. McC., aged 28. First seen six years ago, when classified as advanced tuberculosis. Cavity in chest. Early laryngeal lesion. Had sanocrysin, and also artificial pneumothorax performed. Patient is now alive and well.

4. M. T., aged 20. First seen six years ago with advanced phthisis and definite tuberculous laryngitis. Had artificial pneumothorax, sanocrysin, and phrenic avulsion, and tonsillectomy. Last report: patient was alive and well.

I will conclude by giving a few figures from a special report of the King Edward VII Sanatorium, Midhurst, dealing with cases seen there from 1906 till 1928 :—Of 3,819 cases admitted, 14.7 per cent. were found to have laryngeal disease—of these 57.8 per cent. were males and 42.2 per cent. females. The results show that whereas 31.9 per cent. of non-laryngeal cases obtained arrest, only 5.5 per cent. of those with laryngeal complication were discharged in this condition. By arrest is meant general health completely restored in every respect, without any sign of disease of the lung, except such as is compatible with the completely healed lesion. Sputum, if still present, was free from the tubercle bacillus. On the other hand, it is gratifying to find that 63.9 per cent. cases with laryngeal disease were improved during their residence in the sanatorium. Improved

means physical signs of disease in lung still present, though less marked than on admission. General health improved, but not restored.

In the 1930-1 report, Sir St. Clair Thompson states :— "Out of thirteen cases with laryngeal tuberculosis, approximately thirty per cent. were "arrested," while sixty-six per cent. of the remainder were "improved." These figures suggest that with more modern methods of diagnosis and treatment there is a very much better prognosis.

Pink Disease

By F. M. B. ALLEN, M.D., M.R.C.P.LOND.,
from the Belfast Hospital for Sick Children

CASES of pink disease have been observed at infrequent intervals in Northern Ireland until the last six months; since then the condition appears to have become much more common. As the disease is somewhat unique in its manifestations, and therefore liable to be puzzling to the uninitiated, this short account with three illustrative cases is given. Few, except the most modern textbooks on pædiatrics, contain an account of the condition.

Other names given to the disease include erythrœdema-polyneuritis, and acrodynia. It has been studied in the Antipodes, having been first described by Swift in Australia in 1914, and subsequently in England and America. Accounts originating from England would suggest that the disease was endemic in various areas, and, in view of the number of cases under observation at present, it is possible that a mild epidemic is developing in Northern Ireland.

The cause is unknown. It has been suggested that the condition is a deficiency disease, but this is not borne out on account of the negative response to dietary regulation. That a virus is responsible would appear more probable, as the disease is mildly contagious, there being some support for the belief that the condition is related to "toxic polyneuritis."

The disease affects infants and young children, more commonly those who are well cared for in the middle and upper classes. It is characterized by œdema and erythema of the extremities, and mothers notice particularly refusal of food and persistent crying, this latter being of especial significance in infants. The disease is essentially chronic, and the characteristic erythema and œdema of the hands and feet may not be present for some weeks. A mild infection occurs in the early stages of the disease, sometimes with vomiting and diarrhœa, an illness commonly passed off as a "cold" or "influenza." About this time the infant begins to refuse food, and is wakeful at night with persistent crying, and lapses into an attitude of general and complete miserableness which does not respond to any comforting agent. Such a picture is liable to be confused with pyelitis or blamed upon teething, or even be suggestive of chronic catarrh of the middle ear. The temperature is usually normal. In the early stages there is often a miliarial type of rash referred to as a "sweat rash," as in the following case :—

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N. K., aged 9 months, was seen because of a rash which involved particularly the groins, the back of the neck, and folds of skin around the shoulders and waist. He refused all food, cried incessantly at night, and could not be pacified even with luminal grain i. He lost weight, and after three weeks developed the typical œdema and erythema of the hands and feet. Seven months later he was normal, taking his feeds well, gaining weight, and sleeping well.

This early rash undergoes desquamation after a variable interval. The anorexia, fretfulness, and insomnia increase, muscular hypotonia becomes marked and increases rapidly, mental depression is apparent, and photophobia is often present. At some period during the active stages of the disease there is characteristic redness and swelling of the hands and feet; these remain cold in contrast to the suggestion of warmth conveyed by the pink or "raw beef" appearance of the skin. There is no pitting on pressure.

J. E., aged 11 months, had a history of chronic otitis media three months previously, but this had cleared up. One month later he had a temperature for a few days, during which he was drowsy and slept all the time; two weeks later he refused his feeds, and his mother could not persuade him to take food of any kind by any possible amount of coaxing, and he lost three pounds in six weeks. When first seen he was sleeping practically none at all, and only for short intervals, waking up with a scream. He had the two types of rash, both the fine milarial type, over the areas where sweat accumulates, and also the typical erythema of the hands and feet, which, the mother said, she could not keep warm. Six months later he was decidedly better, but still had a considerable amount of hypotonia.

Older children complain of a feeling like "pins and needles," and it seems probable that all the subjects of this disease so suffer, and that the insomnia and miserableness are due to this constant unpleasant sensation. The infant cannot be amused, it is continually rubbing its hands and feet or picking at its extremities. In bed there is a constant moving from one position to another, and young infants often bang their heads unmercifully. On account of this restlessness, the child cannot be kept covered with bedclothes, and persistently throws them aside. Hypotonia of the muscles becomes well marked and increases, so that even the facial muscles become involved, giving an expression which is easily recognized. Some observers refer to the expression as being that of a gosling, on account of the lack of tone of the masseters, so that the mouth hangs open. Such an expression is also suggestive of mental deficiency.

It has been found that the red and white cells are usually increased, and that the hæmoglobin also may be raised. The calcium in the blood is increased, and the sedimentation rate of the red blood-cells is accelerated.

The course of the disease is essentially a long one, and slowly progressive for some weeks, there being no abrupt onset, but rather a mild infection characterized by slight transient pyrexia, vomiting, or diarrhœa. There may be an interval of six weeks before the characteristic swelling and redness of the hands occurs, insomnia and anorexia usually preceding it. The mortality during the early stages is about twenty-five per cent., death occurring as a result of broncho-pneumonia, gastro-enteritis, or miliary tuberculosis.

A. B., aged 9 months, had a history of excessive perspiration three months previously, followed two weeks later by a "sweat rash." She became very fretful, refused her food, and did not sleep. There was marked photophobia. She was admitted to hospital, and kept on sedatives to procure sleep. She took her feeds better, but began to have a temperature; loose motions followed, and eventually she died of gastro-enteritis.

In a few cases the body rash may become infected with staphylococci and give rise either to localized impetigo or furunculosis. The disease lasts from six to nine months, with the prospect of a slow but gradual improvement and complete recovery in those cases which are not fatal in the early stages.

The treatment is most difficult. The anorexia requires careful nursing, and it requires a good mother or nurse to persuade the infant to take sufficient nourishment. Variety in the dietary is essential, and spoon-feeding or even the stomach tube may have to be resorted to. The insomnia is very intractable, and the common hypnotics may be ineffectual, but bromide, chloral, medinal, trional, and luminal should be tried. Recently the intraperitoneal injection of 10 c.c. of four per cent. sodium citrate has been advised, and I have found this to give valuable immediate but temporary relief, and so procure sleep. This may be repeated daily. Light socks and gloves should be worn to protect the hands and feet from injury. The body should be covered with cellular linen or cotton garments, and then woollen clothing sufficient to keep the child warm without the use of bedclothes, which are always thrown to one side. The sides of the cot should be padded with pillows to allow the child to move as much as it wishes without the risk of injury. Vitamines have been recommended, on the assumption that the disease is a deficiency one, but for this there is no support. Braithwaite recommends filtering the rays from the violet end of the spectrum by means of ruby glass, in the belief that ultra-violet radiation actually aggravates the condition. A Sollux lamp with ruby glass inserted is a valuable means of administering infra-red rays, and in my experience has been beneficial in procuring sleep without drugs.

Toxic Goitre

By J. A. Smyth, B.Sc., M.D., D.P.H.
from the Royal Victoria Hospital, Belfast

Probably the greatest step in the advance of knowledge of hyperthyroidism was taken by Plummer in 1913, when he made an outstanding contribution in differentiating between exophthalmic goitre and toxic adenoma, at the same time establishing the principles for the administration of iodine in the former condition. A steady controversy has circled round these two questions. Many people deny that there is any real difference between toxic adenoma and exophthalmic goitre, and hold that what are apparently distinctions are only due to differences in degree and the age of onset. As a corollary they hold that iodine can be as advantageously administered in the one as in the other. Then, again, some believe that iodine should only be

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used for a week or two before operation, and that any extended administration of it is harmful, whereas the majority prescribe it over long periods, with the full assurance of continued benefit.

Toxic goitre was first recognized as a separate entity by Parry in 1786, when he accurately described several cases in which exophthalmos was well marked. He gave a most graphic account of one very severe case, describing how each systole of the heart shook the whole thorax; how the beats were irregular as to strength and length; how compensation had begun to fail, with spitting of small quantities of blood, and violent stitches of pain about the lower part of the sternum; how the eyes protruded from the sockets, and the countenance exhibited an appearance of agitation and distress which he had rarely seen equalled; how the thyroid gland had become massively enlarged, and diarrhœa and vomiting of bilious material were present. The treatment which he prescribed was repeated bleeding and the administration of pills containing squill, quicksilver, and manna. In spite of these medicaments the patient deteriorated, and he ends his account with the statement: "From this time no further application was made to me respecting this patient, who, probably, soon paid her debt to nature."

One case described by Parry had no exophthalmos, and would apparently have come into the group of toxic adenoma.

Graves gave a much less perfect account of three cases in 1835, nearly fifty years later, but Basedow, whose name is also so often associated with the disease, handed down perhaps the most exact description, when he published in 1840 four cases which had come under his notice.

Except for the one patient suffering from toxic adenoma, described by Parry, all the cases recorded by these three were of typical exophthalmic goitre. Parry, however, although he was the first writer to describe the two varieties of toxic goitre, did not differentiate between them.

Exophthalmic Goitre is a constitutional disease, apparently due to an excessive, probably an abnormal, secretion of an enlarged thyroid gland, showing pathological diffuse, parenchymatous hypertrophy, and hyperplasia. It is characterized by a peculiar nervous syndrome manifested by excitability, nervousness, sweating, and tremor, usually by exophthalmos, tachycardia, and a tendency to gastro-intestinal crises of vomiting and diarrhœa, and by an increased metabolic rate. The onset of the disease may be gradual, frequently it is abrupt, and its course from the beginning may be one of overwhelming intensity, terminating fatally in a few months. More often, however, the period of severity will be followed by one of partial remission, which may last for months, only to be superseded again by waves of varying intensity.

Toxic Adenoma presents a different picture. The patient has generally had a simple goitre for several years—simple in the sense that it gives rise to no constitutional symptoms. Then slowly and insidiously she becomes nervous, begins to suffer from a little palpitation, and to lose weight. Gradually and progressively the symptoms develop without much fluctuation, but with steadily increasing intensity. When the patient ultimately consults a doctor, he may find little on physical examination to make him think of hyperthyroidism—a little tremor of the hands

and tongue, a rapid pulse, auricular fibrillation perhaps, and an enlarged heart. There is the goitre, of course, but then that has been present for many years, and there is no visible alteration in its outward appearance. The signs are often suggestive of nothing more than a myocardial insufficiency in a rather nervous patient, and a basal metabolic rate determination is often necessary to elucidate the true state of affairs.

It will be seen that in extreme cases there will be no difficulty in deciding into which of the two groups a patient falls, but there are many intermediate ones which have to be studied very carefully before a decision can be made. A table will show some of the main points which are of help.

Exophthalmic Goitre.	Toxic Adenoma.
Onset generally rapid. Sometimes very acute.	Onset generally insidious, but occasionally acute (rare).
Young adults usually affected.	Middle-aged usually affected.
Thyroid usually normal previously.	Thyroid usually goitrous previously.
Goitre generally uniform hyperplasia.	Goitre generally nodular.
Exophthalmos or "shiny" eyes generally present.	Exophthalmos and "shininess" absent.
Psychic phenomena prominent.	Psychic phenomena not so marked.
Myocardial changes only in later stages.	Myocardial changes early and marked.
Gastro-intestinal crises common.	Gastro-intestinal crises uncommon.
Basal metabolic rate often very high (often over +70 per cent.).	Basal metabolic rate rarely over +50 per cent.
Periodic remissions and exacerbations the rule.	Slowly progressive without remissions.
Deterioration may be rapid, and death in delirium and coma supervene.	Death generally due to myocardial failure.
Iodine generally produces a remission.	Iodine often produces an exacerbation.
Danger of post-operative hyperthyroid crises.	No post-operative crises.

The Basal Metabolic Rate is a very important determination both in the diagnosis and treatment of toxic goitre. In an untreated case it is invariably raised, and its height gives an index of the severity of the case. The lower it can be brought by treatment before operation, the safer will that operation be. Its nearness to normal when the patient has resumed her ordinary life after treatment or operation is the best test of the degree of cure.

The basal metabolic rate may be defined as the energy expenditure of an individual at complete physical and mental rest. It is an indication of the degree of economy exercised by the body and all its systems in performing their duties. One person may require to use a certain amount of energy to carry on the vital functions or

make a certain physical effort, another may require a great deal more. In an exophthalmic it may be more than double. The amount depends on the person's age and sex, young people requiring more than old and males more than females, and also on the area of body surface. *When you have allowed for these variables,* the other factors influencing it are the endocrine glands. Much the most important is the thyroid. Over-action by it causes a more and more wasteful functioning of the body-cells, and we have hyperthyroidism. Under-action causes excessive economy, which may become too great for their efficient working, when we get the clinical condition of myxœdema.

The basal metabolic rate is determined by measuring how much oxygen the patient is burning up to form carbon dioxide over a known period of time. This must be while she is under basal conditions, i.e., at the absolute maximum of physical and mental rest. Its determination, briefly, is as follows:—

It is carried out first thing in the morning, and the patient stays in bed, resting quietly, and having nothing to eat or drink so as to avoid any unnecessary energy being utilized in digestion and intestinal movements. She breathes through the special mouthpiece, by means of which air is inspired from the atmosphere and expired into a special airtight bag, for a certain fixed period, usually ten minutes. This expired air is then measured, and its oxygen and carbon dioxide content determined. From the figures obtained, the amount of oxygen converted to carbon dioxide and the number of calories this represents, can be calculated. Knowing the patient's weight and height, the body surface area can be obtained and the number of calories used per hour per square metre of body surface easily worked out. This is compared with the normal for the patient's age and sex, and the final result expressed as a percentage above or below that normal. In this way the figures given are fully comparable from one patient and time to any other.

EXOPHTHALMIC GOITRE.

It is not desired to give any detailed account of the condition, but only to touch on a few special points which are of importance in connection with diagnosis, treatment, and prognosis.

Etiology is of importance in the ultimate prognosis.

The real cause of the disease is unknown, but there are three important factors, one fundamental and two accidental.

First there is the fundamental, which is a constitutional factor, probably some peculiar instability of the vegetative nervous system. Examples of two or more generations being affected, and of two or more members of one generation, are commonly seen, and suggest that this factor is inborn. Some patients seem to have it very strongly, so that no other is required to produce the disease, but in others in whom it is not so strong some additional factor is necessary. The prognosis is worse, and recovery, even after subtotal thyroidectomy, will be less complete in proportion as the constitutional factor is strong. Probably all cases of exophthalmic goitre have the constitutional factor to some extent, but, as a rule, it occasions no disturbance until an additional factor comes into play. There are two of these, and they are more or less accidental—(1) mental or, possibly, physical strain, and (2)

infection. All of us have known the occurrence of exophthalmic goitre suddenly following on some severe mental strain. Air raids on London and political shootings in Belfast have provided the exciting factor for many such. More prolonged mental strain of a lesser severity will produce the disease more slowly, though none the less certainly, in one who has the fundamental predisposition.

The second or accidental factor is acute infection and sepsis, especially of the tonsils. Where septic tonsils have determined the onset, and the disease is of mild degree, and where treatment is instituted early, tonsillectomy often produces a cure. On the other hand, if the hyperthyroidism is severe, this operation may prove a very risky one, and should rarely be undertaken until the thyroid gland has first been dealt with.

In the cases of exophthalmic goitre observed the main signs in order of frequency of their occurrence have been :—Goitre, tachycardia and palpitation, cardiac enlargement, tremor, restlessness, sweating, exophthalmos.

GOITRE.—As a rule the thyroid enlargement is of a smooth, more or less uniform nature, and not of high degree. One lobe may be bigger than the other, but there is generally some enlargement of both. Nodules are not as a rule present. In most cases the goitre is coincident with the toxic symptoms, and of late there has been an inclination to separate off those cases of exophthalmic goitre where there has been a preceding enlargement, especially if adenomata are present, into a sub-group which has been named *secondary exophthalmic goitre,* the previously goitre-free constituting the sub-group of *primary exophthalmic goitre.* These cases where exophthalmic symptoms supervene with a previously damaged gland do not respond so well to iodine medication, and have some features in common with toxic adenoma.

A peculiar to-and-fro murmur is frequently heard on auscultation over the gland, and a thrill may very occasionally be felt.

The *tachycardia* is generally considerable, showing about fifty to a hundred per cent. increase on the normal rate. Auricular fibrillation is a common complication, but does not imply the same serious prognosis which must often be attached to it in the absence of hyperthyroidism, though its presence causes a considerable limitation of physical effort. It may appear post-operatively for the first time. When well established before operation, the rhythm is unlikely to become regular afterwards.

Palpitation is a very constant and often the earliest symptom, and does not always run parallel with the tachycardia. It is often worst at night after going to bed, and inquiry should always be made for this feature.

Cardiac enlargement to the left is present in the great majority of cases, though the exact location of the apex is often difficult, owing to the diffuse nature of the impulse. The enlargement is probably due to dilatation, the result of myocardial exhaustion.

Tremor is of the very fine variety, but may be coarse. Hand tremor is best elicited by extending both arms forward from the shoulders and spreading the fingers fanwise. Fine tremor of the tongue is probably of greater importance. To demonstrate it, the tongue should be fully projected forwards. Many normal people

have tremor of the eyelids, but its absence in a doubtful hyperthyroid is of great importance.

Restlessness.—The patient cannot remain quiet, but keeps moving about, touching and fidgeting with things. The movements are not purposeless, but intentional, though unnecessary.

There is also a marked mental restlessness and irritability often seen, which makes the patient "gey ill to live with," and may precipitate her into actual insanity.

Sweating is a very common and often distressing complaint with these cases. The skin is constantly rosy red and moist, warm if the perspiration is moderate, sometimes clammy if profuse. Some years ago the late Professor McIlwaine pointed out the peculiar thickening and velvety feel of the skin, probably due to hyperæmia.

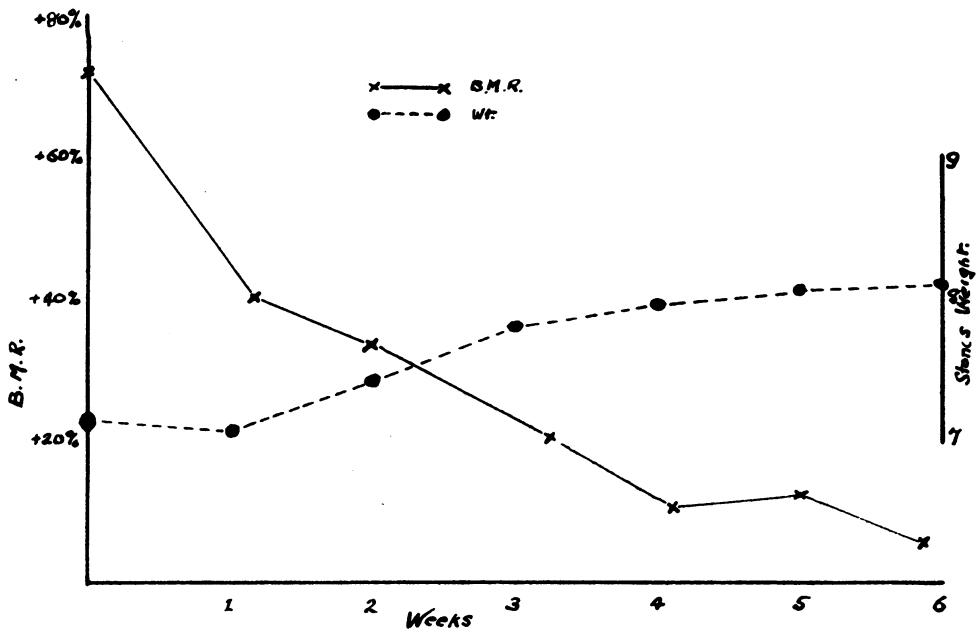
Exophthalmos.—Many theories to explain the exophthalmos have been advanced, but as yet the cause is not clear. It was present to some extent in about sixty per cent. of our cases, sometimes being so marked that the patient's eyes remained wide open even when sleeping. It is generally most severe where the thyrotoxicosis is of long standing, and in these cases corneal ulceration is sometimes troublesome. In two cases seen it was quite unilateral, but probably there was no special significance to be attached. Even when exophthalmos is absent, there is generally a peculiar brightness of the eyes, best described as a shininess, which is very characteristic, although it does not seem to have been often mentioned.

Treatment of Exophthalmic Goitre.—The medical treatment of exophthalmic goitre is often an unsatisfactory proposition by the time the case reaches the consultant. Patients suffering from the disease are of a nervous and apprehensive disposition, and are very averse to having any more acquaintance with doctors than they can avoid, and especially with a doctor whom they have not previously known. Consequently they are generally seen when the trouble has already been in progress for many months and well developed. Some of them do yield to careful measures, and for this reason every fresh case should have some months of rigid medical treatment before operation is contemplated. A note of warning must be sounded. This treatment should not go on indefinitely in the hope that sooner or later improvement will come about, especially if it is not of the rigid variety. It is true that in many cases the hyperthyroid flames will ultimately die down if long enough time be given, but to what advantage if they leave burnt-out viscera. The tale of the cured exophthalmic left a permanent cardiac invalid is a sad one, whose sadness is not diminished by the thought that timely surgery might instead have left a useful member of society. The possibility of diabetic and nephritic complications and sequelæ cannot lightly be put aside either, and when medical treatment has been carefully carried out for a period of six months or so from the onset of the disease, and there is not a marked improvement progressing steadily towards cure, I think surgery should be considered.

When it has become no longer safe to allow the hyperthyroidism to continue, owing to the danger of death or permanent invalidism, and recourse is had to surgery, one must take steps to minimise risk of a fatal outcome. This risk is often very great unless a period of intensive medical treatment precede any operative measure. Important features of this preparatory treatment are as follows :—

The patient must be kept mentally and physically as much at rest as is possible. She is put to bed in a comfortable, airy room, and largely shut off from the outside world. Visitors should be restricted, and those who are admitted should be of sensible, encouraging temperament, sympathetic but not sympathizing. If the patient is restive and over-active mentally, bromide or luminal may be used. Bromide is not without risk, owing to its cumulative action. Its effect seems to depend on the percentage present in the blood. When this rises to a certain height, the patient is benefited, but when the level mounts up to about 200 mg. per cent., toxic effects become apparent; the patient becomes somnolent, somewhat disorientated and peculiar mentally, and, if administration be continued, delirium, coma, and death may supervene. Generally speaking, a dose of gr. xv t.i.d. should not be exceeded for long, and even this may sometimes prove too much.

The sheet anchor is iodine, and though it has been used in the treatment of goitre of one kind or another for over seven hundred years, its method of action is not yet clearly understood. For many years before 1922 it had fallen into disrepute, owing to its indiscriminate use in every form of goitre, whereby many simple cases were rendered toxic, but in that year Plummer of the Mayo Clinic made an intensive study of its effect in exophthalmic goitre, and the results he produced were so conclusive as to admit of no real doubt as to its value. The observation of cases of exophthalmic goitre under iodine treatment in a hospital or nursing-home leaves little room for disagreement with his claim.



The micropathology of the gland is altered in a most striking fashion by the action of iodine. In untreated exophthalmic goitre, the gland is surprisingly uniform in its characteristic diffuse parenchymatous hypertrophy, hyperplasia, and increased vascularity. The number of cells lining the acini is increased

markedly, giving rise to projections into the acini, and showing a change in type from rather flat or cuboidal to columnar. The cells show active mitosis, and the colloid material normally present in the acini is less than in the normal gland, and often may be almost entirely absent. It is found that when iodine is administered it causes a reversion in the hyperplastic gland to the colloid type after a few weeks : there is an increase in the amount of colloid, an increase in the connective tissue, a decrease in vascularity, an increase in the size and regularity of the acini, with a decrease in the height of the epithelium. The mitosis in the cells is markedly diminished. With these changes the friable, vascular, bloody gland, so difficult of removal, becomes lobulated and reddish, with a characteristic meaty surface. It has lost its fragility and much of its vascularity, and becomes much more easily handled by the surgeon.

Food is of considerable importance. A high calorie diet should be given, in which, owing to its stimulating action, protein should take a minor place. For success it is almost essential that the patient should be gaining weight.

Preliminary treatment generally runs more or less smoothly, but there frequently arise complications which greatly increase its difficulties and length. Gastro-intestinal crises with vomiting and diarrhœa are often of great seriousness, and if the vomiting be protracted and jaundice supervenes, the immediate outlook may be very bad indeed. Some form of opium is generally the best drug to bring about control, and, if used in adequate doses in the earlier stages, is generally quite successful. Tonsillitis and milder tonsillar infections are a regular bugbear with these patients in the wards of a hospital. They almost all have very unhealthy pharynges and septic tonsils, which seem to be specially prone to infection with hæmolytic streptococcus. During an attack of this kind the patient may become acutely hyperthyroid, even to death, and at the least undergo a considerable setback.

Many patients are intolerant of Lugol's mixture, the form in which iodine is generally administered, developing skin rashes and pustules. In some of these it is the potassium iodide present which causes the trouble, and if the French tincture, which contains no iodide, be substituted, the rash may disappear. On the other hand, it may still persist, and then recourse is had to an organic preparation of iodine, such as alphidine.

Bromide also produces rashes frequently, but luminal is a very good substitute. Should the least symptoms of *toxic* bromism appear, the administration of bromide must be stopped immediately. It is sometimes difficult to decide whether symptoms of this type be due to the disease or to this drug, but the question is easily settled by the determination of the bromide content of the blood.

These are some of the difficulties which are liable to come in our path towards getting the patient fit. We will take it that we have surmounted them all, and that we have come to a time when operation might be feasible. What are the criteria by which it may be adjudged safe?

The patient must have made definite clinical improvement. She must have become less anxious and excitable, sweating must be diminished, the pulse must have slowed and the heart become quieter. The basal rate must be on the down grade,

and, if possible, should be below + 40 per cent. Any figure higher than this would make one very wary, and perhaps indicate some smaller step, such as ligature of a thyroid artery, as a preliminary to ablation.

Probably a *sine qua non* is that the patient be actually increasing in weight at the time of the operation, and one takes a great risk in doing any operation on a hyperthyroid patient who is actually losing weight at the time.

It is not always possible to produce such a satisfactory remission with iodine, and one must not delay too long. The ordinary course of the disease is one of remissions and exacerbations, and all the preliminary treatment does is to produce an artificial remission, generally much more marked, of course, than would occur naturally. Sooner or later this remission will inevitably be followed by an exacerbation, and if there be too great delay it may have set in. If it is realized that it has begun, and patience is exercised, it is not so serious, although in general one does not seem able to get an equal remission on a second occasion. On the other hand, if operation be carried out at the beginning of an exacerbation, an acute post-operative hyperthyroid crisis is likely to develop, with great danger of death.

The preliminary treatment may take anything from about three weeks to a couple of months, depending on the severity of the case and any special difficulties encountered. During this time it is essential to have the patient under the strict regime described. The giving of iodine, alone is practically useless.

When the patient is as well as possible, the type of operation must be considered. Subtotal thyroidectomy, which is the excision of both lobes and a part of the isthmus, is the degree of removal aimed at in most cases. In a few it can be safely carried out at one sitting, but in the majority it must be done in two stages—two lobectomies—at each of which part of the isthmus is also taken. Quite occasionally even a lobectomy would entail too great risk to the patient's life, and in that case an attempt is made to diminish the vascularity of the gland by ligaturing one of the superior thyroid arteries. Very rarely this may have to be followed by the ligature of the second before any actual removal can be safely done.

The patient should never be informed beforehand of the actual day of operation. Otherwise she may spend a sleepless, fearful night, and come to the table already in a state of acute exacerbation. So severe may this be that patients have been known to die in acute hyperthyroid crises, although sent back to bed without any operation having been performed. Fear militates to an almost unbelievable extent against safe surgery, and for this reason every effort should be made to save the patient mental trauma.

As regards anæsthetic, gas and oxygen is undoubtedly in our experience much the best. The patient becomes anæsthetized without much distress; there is generally no post-anæsthetic sickness and no after-excitement. She returns to consciousness feeling fairly well, and she is able to take fluids almost at once. Ether, on the contrary, is a most unsuitable anæsthetic. It generally produces vomiting—often severe—makes the patient feel ill, and its stimulating action often causes a marked post-operative excitement which easily passes into hyperthyroid crisis, frequently leading to death. The introduction of nembutal as a basal anæsthetic has proved useful. When it acts satisfactorily the patient comes to the table sleeping soundly,

and is spared any mental strain. She often remains asleep or drowsy for some time after the operation—another very helpful result.

Post-operatively there is always danger of an acute hyperthyroid crisis in which the patient becomes restless and excited, tossing about the bed, with sweating skin, a high temperature, and a pulse fibrillating and uncountable. Delirium supervenes, and death soon follows. Every case must be regarded as potentially of this kind until it is quite certainly not, and active measures should be taken for the first twelve to twenty-four hours to prevent it. Iodine is again the sheet-anchor, and so that it may act quickly it is well to administer it intravenously. Crooks' collosol iodine has been found to be a convenient preparation, and can be usefully injected in 20-c.c. or larger doses every few hours. Morphia in rather big doses is also of help in controlling a crisis, especially when used early. Digitalis is given as a routine intravenously and subcutaneously, and hypertonic glucose solution often has its uses.

If all goes well the patient is quite stable at the end of twelve hours, and active treatment can be practically dropped.

Some of the cases which were lost post-operatively died from this acute crisis, and on looking back, the factors which seem to have led to these deaths have been error in judging the optimum time for operation, fear before operation, ether anæsthesia, and loss of blood at and after operation.

TOXIC ADENOMA.

Plummer has pointed out that a patient who, in her thirtieth year, develops an adenoma of the thyroid gland, has a very good chance of developing hyperthyroidism in her forty-fifth year. The symptoms usually occur spontaneously with insidious onset, and increase gradually but progressively, though they are sometimes produced abruptly by the administration of iodine to a patient with an adenoma without hyperthyroidism. On account of the insidious onset and mildly progressive course, many such patients do not appreciate any great difference in their condition until symptoms of marked cardiac change appear. Consequently, owing to the delay in coming for treatment, visceral degeneration has often developed, adding considerably to operative risk and diminishing the chances of complete cure.

As a rule, the patient complains of nervousness and symptoms referable to the heart. On examination, the patient has a worried, anxious look, but there is none of the appearance of terror or excitement so often seen in the exophthalmic type. An old-standing goitre is found, often hard and nodular, sometimes of considerable size. Tremor is generally present, though not to a marked degree. There is, as a rule, no sweating, and the skin is often rather dry and pale. Tachycardia is marked, and auricular fibrillation is frequently found. No exophthalmos or other eye sign is present, and there is not the same psychic disturbance as in exophthalmic goitre. The basal metabolic rate is increased, but not to so high a level as in that disease.

The disease runs a steady course, not much influenced by any medical means, and only surgery is successful. As medical treatment does not produce much

decrease in activity, long preparation is not helpful, and after a short rest in bed as large an operation as is thought safe should be performed.

It is sufficient to remove the so-called adenomatous masses, but owing to their number this often necessitates an extensive resection of the gland.

Digitalis is probably better not used before operation, unless there is failing compensation. After operation there is no danger of acute hyperthyroidism, and the patients are treated on general lines. No iodine should be used by the surgeon or given post-operatively.

These patients come to the maximum improvement they will derive from the operation very quickly—in a few weeks or at most months. Its degree is inversely proportional to the amount of visceral degeneration which has taken place.

As already stated, in many patients the septic condition of the tonsils plays an important part in the causation of hyperthyroidism, and this is true especially in the case of exophthalmic goitre. The causes of the primary trouble should be removed in so far as is possible, so that recurrences may be avoided, and for this reason tonsillectomy should be carried out in many of the patients after the thyroid has been treated.

The Operative Treatment of Prostatic Obstruction

By ANDREW FULLERTON, C.B., C.M.G., M.CH., F.R.C.S.I., HON.F.A.C.S.
Professor of Surgery, Queen's University, Belfast

AFTER an experience of twenty-seven years of the operation of suprapubic prostatectomy, I have adopted certain rules for the performance of the operation and the after-treatment which, as the result of much trial and many disappointments, have given me the best results in my own practice. I am legislating for the average case referred to me, which seems to be in a more advanced stage than that seen by those who advise, as a routine, difficult and complicated operations. These rules are :—

1. The minimum amount of anæsthetic.
2. The simplest and shortest operation that will rid the patient of his obstruction.
3. The least possible trauma to the abdominal wall, the bladder, and the perivesical space.
4. The immediate arrest of hæmorrhage.
5. The protection of the perivesical space from infiltration by infected urine.
6. Irrigation of the prostatic bed and the bladder until all sloughs have separated and the urine is clear.
7. The provision of a safety-valve, in the shape of a suprapublic tube, to prevent the forcing of infected fluid through the ureters into the kidneys during irrigation.
8. Much more prolonged drainage than that usually advocated.

Space will not permit me to deal fully with all the points I have raised, but there are one or two details in technique which in my practice have afforded great comfort to the patient and great satisfaction to the operator, his assistants, and nurses.

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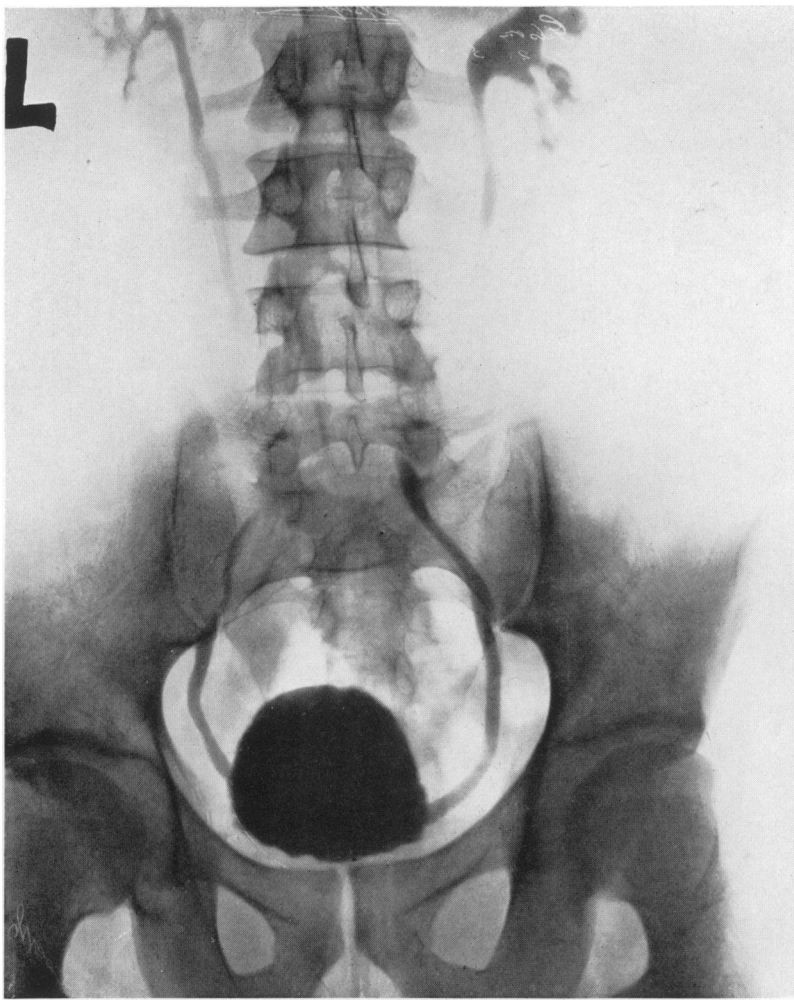

FIG. 2.

Demonstrating a method of extension of infection from the bladder to the kidneys. Cystogram of a man aged 28 years suffering from vesical calculus. The opaque fluid has passed up both ureters and has reached the pelves of both kidneys.

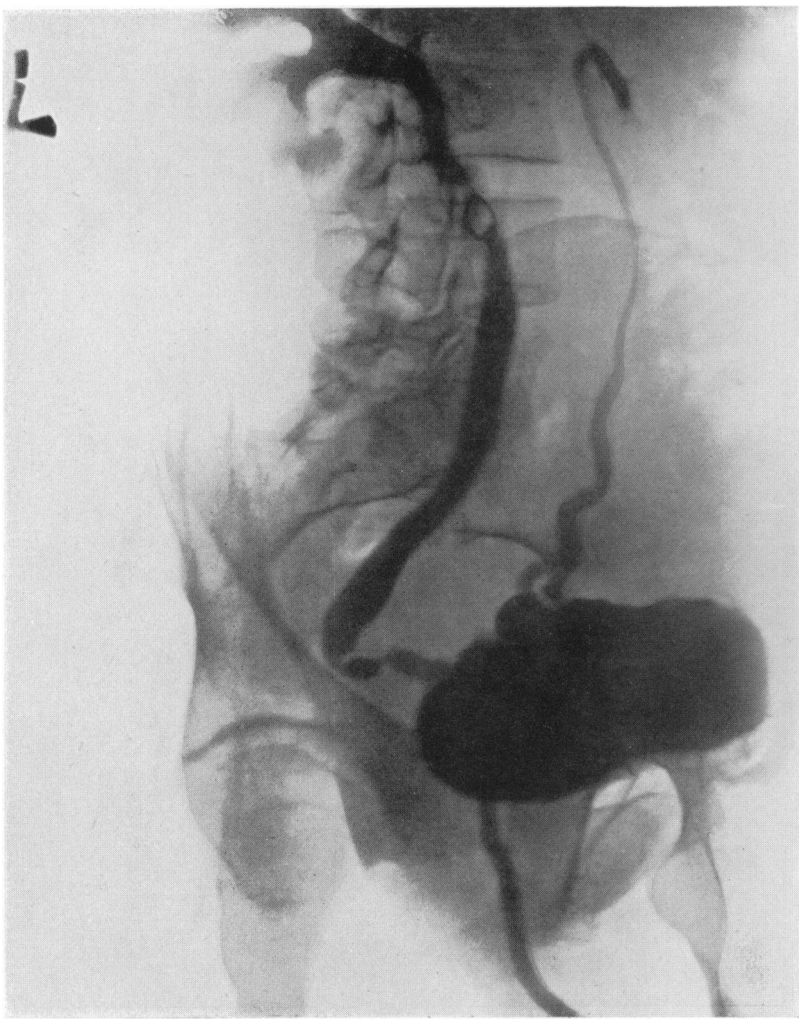

FIG. 3.

Demonstrating a method of infection from the bladder to the kidneys. Effect of filling the bladder with iodide of sodium solution, seven weeks after removal of a large diverticulum. The fluid has passed up both ureters and has reached the pelves of both kidneys.

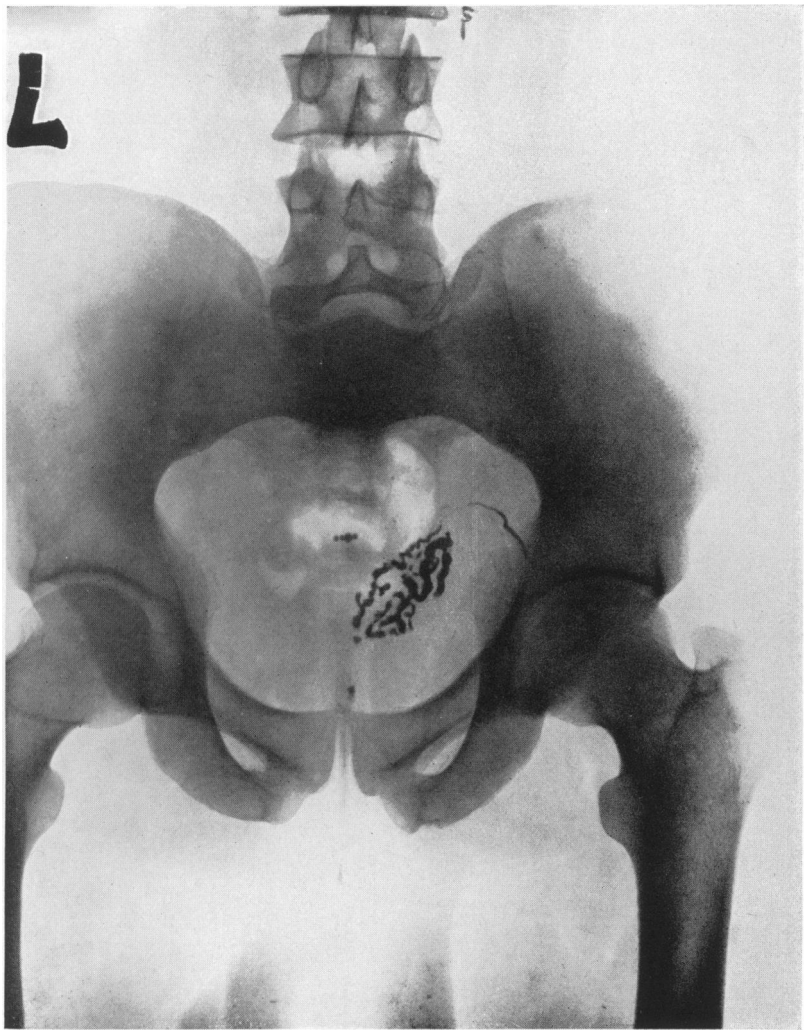

FIG. 4.

Showing method of extension of infection through ejaculatory duct to seminal tract. X-ray shadow of right seminal vesicle and vas deferens, obtained by catheterizing right ejaculatory duct through urethroscope and injecting lipiodol.

bladder for the enucleation and removal of the prostrate. A small transverse puncture is made into the bladder, which has been only partially distended to avoid tension and the forcing of fluid up the ureters. This opening is stretched sufficiently to allow of the entrance of two fingers and of the exit of the prostate after enucleation. This stretching of the small opening in the bladder has proved a real advance in my hands. The aperture so made contracts rapidly, and when a de Pezzer catheter of large bore is placed in the bladder on the second day, the opening in the bladder grips it like a sphincter, leakage soon ceases, and the patient is dry or almost dry during the remainder of his convalescence. The catheter is connected with a urinal, and in a few days the patient is allowed to leave his bed. Further, the urethra, prostatic cavity, and the bladder can be flushed out with the minimum of disturbance by placing the nozzle of an enema syringe in the meatus, and driving fluid through the urethra, the prostatic cavity, and the bladder, to escape by the suprapubic tube into a vessel by the bedside (see fig. 1). This tube is kept in position until all sloughs have separated and the urine is free from foreign material. It may be retained with advantage for twenty days or more. If all goes well, granulations spring up round it, and when it is taken out the granulations fall together and the wound is dry in a few days. On removal of the tube, a catheter may be passed per urethram and tied in. This hastens closure of the suprapubic wound and keeps the patient dry. Several objections may be raised against this method, but in my hands it has proved of the greatest service. I have long been satisfied that many of the complications following prostatectomy are due to insufficient drainage, and for some time I practised drainage through a perineal wound. This was satisfactory only when combined with open operation, and I have now replaced it by the simple method I have described.

After removal of the prostate, or what we call the prostate, which at any rate is the obstructing factor, the two outstanding complications to be feared are hæmorrhage and sepsis.

HÆMORRHAGE.

The continual oozing after Freyer's operation was one of the bugbears which the surgeon had to face, and it required much judgment to determine at what stage this slight but persistent loss of blood became a menace to the safety of the patient and demanded active measures for its arrest.

I have found packing the cavity an unsatisfactory and uncertain measure. For this reason I now, in every case, anticipate and prevent even the slightest loss of blood by the insertion for forty-eight hours of a hæmostatic bag—not the pear-shaped bag of Pilcher, but a globular one, specially designed to fit snugly into the prostatic cavity when the bag is distended with water. Coated with a thick layer of vaseline, it is introduced and removed with the greatest ease. After its introduction, all hæmorrhage is arrested at once. The bag may be allowed to collapse in twenty-four hours, and is removed in forty-eight hours and replaced by a funnel ended suprapubic tube as described. I have not noticed in any of my cases that infection has been encouraged by the use of this bag, if suitable precautions have been taken. These will be described later.

INFECTION.

The second great complication is infection, which may extend in three chief directions, to the kidneys, to the perivesical space, and to the vesiculæ and epididymides. The danger of this complication remains until all sloughs have separated from the bed of the prostate and its margins, and healthy granulations have covered the raw surfaces of the bladder; indeed, the patient is not out of danger until these raw surfaces have completely healed. A rise of temperature during convalescence is an indication that infection has spread, probably in one or other of the directions I have mentioned. A rigor generally denotes pyelonephritis, and, if repeated, is of the worst augury.

The best method of controlling infection is, in my opinion, prolonged drainage of the bladder, protection of the perivesical space, and irrigation of the prostatic bed and the bladder, taking care not to distend the latter.

(*a*) Ascending Infection. In my earlier operations I had many cases in which rigors occurred, due possibly to over-distention of the bladder. The large drainage tube inserted at the operation was removed, as recommended by Freyer, in four days, and when the bladder was irrigated through the urethra, fluid accumulated until it burst through the valve-like opening which the various layers of the abdominal wound now presented. Tension in the bladder is likely to force fluid up the ureters into the kidneys. That this occurrence is not infrequent is shown by two cases recently under my care.

A man aged twenty-eight years was admitted with a vesical calculus (see fig. 2). A cystogram was taken, using iodide of sodium solution. The shadow showed an irregular contracted bladder and opaque fluid in the pelvis of both kidneys. Incidentally, litholapaxy was considered unsuitable, and the stone was removed by suprapubic cystotomy.

A few months ago I removed a large diverticulum from the posterior aspect of the bladder in a man aged forty-five years (see fig. 3). A cystogram was taken seven weeks later. The shadow showed not only the bladder, but the ureters and renal pelves on both sides. Next day the patient had a temperature of 103.8°F, and was acutely ill for a few days.

These and other cases have taught me that distention of the infected bladder, especially if there has been obstruction, is fraught with danger of pyelitis or pyelonephritis. Hence the prolonged retention of the suprapubic tube, which acts as a safety-valve.

(*b*) Perivesical Infection.—The perivesical space is a continuation of the space of Retzius round the sides and base of the bladder to the posterior part of the rectum. Infection may limit itself to the space of Retzius, but in rare cases it may extend round the bladder, so that the latter is floated in a bed of pus. The following case is an example. In July, 1919, I removed the prostate in the usual way in a man aged sixty-four years. Ten days after operation a large ischiorectal abscess was found on the left side. The abscess extended all round the bladder and rectum, and had evidently originated in the space of Retzius. Eight inches of the rectum sloughed, and the patient died of sepsis.

To prevent infection of the perivesical space, steps must be taken to limit the overflow of infected urine into the space of Retzius by keeping the suprapubic wound as dry as possible. This may be accomplished without the aid of complicated suction or other apparatus by the simple technique I have described.

(*c*) INFECTION OF THE SEMINAL TRACT.—The orifices of the ejaculatory ducts are in direct continuity with the cavity left after the removal of the prostate, so that it is not surprising that infection frequently spreads to the vesiculæ and the epididymides. Very little has been written about involvement of the vesicles, but a glance at a vesiculogram (see fig. 4) will show that it is hardly likely that epididymitis should occur without involvement of the corresponding vesicle. I am satisfied from the examination of patients, months or even years after prostatectomy, that this is not infrequent. Ligature of the vas deferens will prevent infection reaching the epididymis, but is there no risk that infected material, if not already present in the vesicle, may be encouraged by ligature of the vas to regurgitate into that receptacle? Infection in the seminal vesicle may not be so dramatic in its effects as epididymitis, but it may be even more important and the cause of obscure rises of temperature during convalescence, and persistent pyuria and frequency of micturition long after operation. Ligature of the vas will not protect the vesicle, and it seems to me that we should concentrate on sterilizing the prostatic bed, so as to prevent infection at its source, rather than rest content with blocking it halfway down the vas. I have endeavoured to prevent infection of of the ejaculatory ducts and their prolongations by the method of irrigation I have described, combined with the instillation of some such substance as Dakin's fluid into the depths of the bladder through a catheter or the suprapubic tube. I am told by those who practise ligature of the vas, that it is not unusual for an abscess to develop at the site of ligature, so that one complication is replaced by another.

In the treatment of vesiculitis following prostatectomy, I have, after the lapse of some weeks, used massage per rectum, but I do not think it would be wise to advocate this treatment in the early days of the patient's convalescence, for two reasons: first, the risk of dislodging a clot from the prostatic plexus of veins; and, secondly, lest massage in the vicinity of an admittedly septic wound should disseminate the infection.

(*d*) INFECTION OF THE URETHRA LEADING TO PERIURETHRAL ABSCESS AND URETHRAL FISTULA.—One of the disadvantages of the indwelling catheter is the urethritis it produces. This can be controlled to some extent by irrigating the urethra between the catheter and the mucous membrane. The nozzle of a suitable urethral syringe is inserted by the side of the catheter at the meatus, and the urethra is washed out with weak permanganate of potash or nitrate of silver solution. The same method may be used to prevent infection of the urethra while the hæmostatic bag is in position. I have seen two cases of urethral fistula, both involving the penile portion, following the use of the indwelling catheter in the treatment of enlarged prostate. One of these healed up quite readily. The other is still under treatment.

SECONDARY HÆMORRHAGE.

The interval between the tenth and the fifteenth day is a critical time in

convalescence from prostatectomy. During this period sloughs are separating, the urine has a tendency to become foul, and hæmorrhage is likely to take place. I have, however, seen secondary hæmorrhage as early as the sixth day, and it may occur later than the fifteenth. On the first appearance of bleeding, the hæmostatic bag should be inserted. To do this, the suprapubic drain should be removed, a catheter passed and seized with a light forceps, such as is used for the bile ducts, and brought out through the suprapublic wound. In this way it is easy to insert the bag without removing the patient from his bed or inflicting upon him anything but discomfort. This is the most efficient way I have yet discovered of controlling secondary hæmorrhage.

CALCULUS FORMATION.

Stone in the bladder following prostatectomy is an indication, as a rule, that the drainage and cleansing of the bladder after operation has been insufficient. Calculi may form around nuclei composed of ligatures, necrotic tissue, particles of pus, etc., and can be prevented by attention during convalescence to the details I have described, followed by lavage of the bladder after the suprapubic wound has closed, until the urine is clear.

INCONTINENCE FOLLOWING OPERATION.

Incontinence of urine after suprapubic prostatectomy is a rare occurrence. A temporary loss of control is not infrequent, but it soon passes off. It must be remembered that the compressor urethræ muscle, which now controls micturition, requires time to become sufficiently strong to withstand the contractions of the hypertrophied muscular wall of the bladder. The pear-shaped hæmostatic bag is likely to stretch the external sphincter, and should give place to the globular one, which with due care ought not to produce such an untoward result. In the temporary cases, the patient may be taught to restrain micturition by voluntary contraction of the anal and vesical sphincteric apparatus, and in due time he will succeed.

Permanent incontinence is due to overstretching or injury of the urethral sphincters. I have not had sufficient experience of this complication to lay down rules for the management of such a case. Young's method of repair of the sphincters seems to offer the best chance of relief.

PULMONARY EMBOLISM.

It is a curious fact that, though I have had my share of deaths from pulmonary embolism in other departments of surgery, I have only had one after prostatectomy, and that was in 1912. Just recently, I had a mild case, twenty days after operation, which recovered. I cannot explain this immunity, except perhaps that it may be attributed to minimal disturbance of the parts concerned and the short time spent by the patient on the operation table.*

The remarks I have made are intended for the ear of the general surgeon who is called upon to operate on these anxious cases. The expert urologist is justified in elaborating the operation according to his wisdom and skill, but I can promise

* Since this was written I have had a second death from pulmonary embolism.

that if the rules I have laid down are followed, the operator will find that he can approach these cases with the hope and confidence I have myself experienced since I adopted my present technique. Most of his abdominal wounds will heal by first intention, except for the track of the drainage tube, and his complications will be reduced to the minimum.

My thanks are due to Dr. Strain, a former house-surgeon in my wards, for fig. 1.

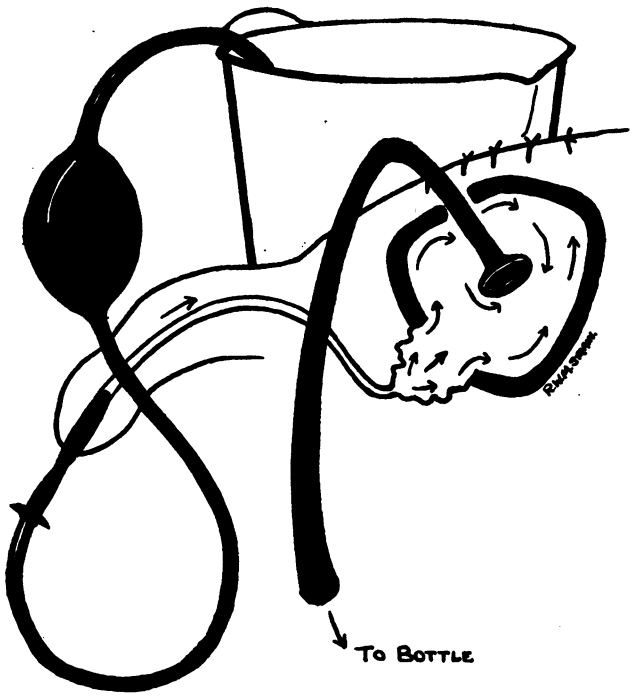

FIG. 2.

To illustrate the method of drainage and irrigation employed after prostatectomy.

REVIEW

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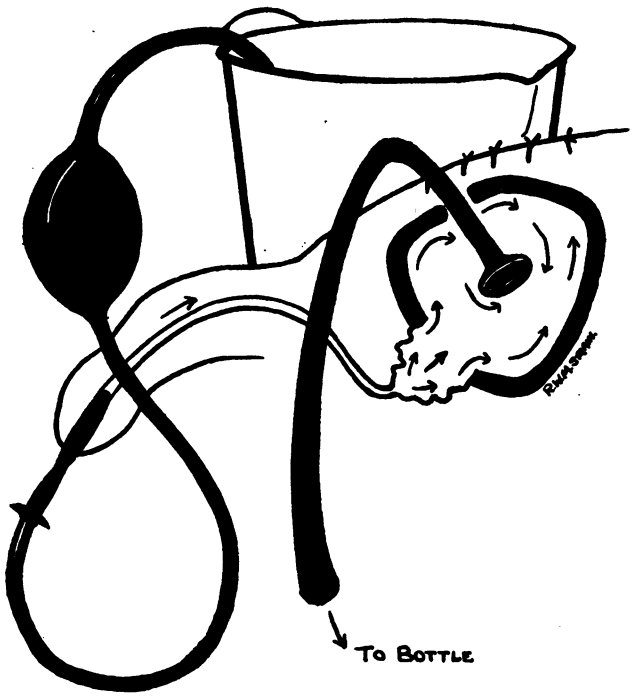

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Achondroplasia

By Richard H. Hunter, M.D., M.Ch. Ph.D.

from the Department of Anatomy, Queen's University, Belfast

The condition known as achondroplasia is a developmental anomaly of the newborn, in which there is defective endochondral ossification. The fœtus is commonly still-born, and it presents a characteristic appearance. The legs and arms are much shorter than normal, and in them there is a thick deposit of fatty tissue below a lax, almost redundant, skin. The trunk is generally normal in size, but the head appears somewhat larger than is usual, and there is a very characteristic depression at the base of the nose, with a peculiar flattening of the facies. Sporadic cases occur, but the condition is often inherited, and may attack several members of the same family (1). It appears also to occur more frequently in females than males. Kassowitz (2) studied a series of twenty-nine cases of achondroplasia, and found that twenty-five of them were girls, and that only four of them were boys. The condition is, however, uncommon, and a short account of the pathological states found on post-mortem examination of two such fœtuses may be of general interest. They were both sporadic cases.

Case No. 1 (Female).—The pregnancy had been a normal one, and the fœtus was expelled from the maternal passages without the aid of forceps. A live child was, therefore, to have been expected, yet after a few spasmodic respiratory efforts, the infant died.

Case No. 2 (Male).—The pregnancy in this case had also been apparently normal. But at the confinement, owing to the large size of the fœtal head, instrumental interference was needed to remove the fœtus from the mother.

On opening the abdominal and thoracic cavities of both fœtuses, nothing abnormal was found. The thyroid gland, thymus, supra-renals, ovaries or testes, all appeared normal in size, shape, and weight. The pituitary gland, in both cases, was flattened from before backwards, by the bony walls of a small pituitary fossa, and the parathyroids could not be detected. There was nothing unusual to be seen in the cerebrum, but the cerebellum protruded through the Pacchinian foramen above the level of the margins of the tentorium cerebelli; while the medulla and pons, instead of being directed upwards and forwards, were in Case No. 1 directed upwards and backwards, and in Case No. 2 they were directed almost vertically upwards. In both cases the medulla was markedly constricted at the foramen magnum. In Case No. 2 the constriction was so great that it was almost divided in half. The long bones of the limbs were short and curved; their epiphyses were large in proportion to diaphyses, and they were together almost half the total length of each individual bone. The base of each skull, in sagittal section, instead of showing the three separate ossific centres for the pre- and post-sphenoids and basi-occipital normally found at birth, presented one large bony centre representing

all three. The basi-cranial axis was shorter than in the skull of a normally developed new-born infant. In Case No. 1 it measured 2.3 cm., and in Case No. 2 it measured 2.5 cm., instead of the normal 3.6 cm. The antero-posterior diameter of the foramen magnum in Case No. 1 measured 0.75 cm., and in Case No. 2 it measured 0.7 cm. instead of the normal 2.2 cm. The basi-occipital bone was fused, in both cases, with the ex-occipitals, and these in turn were partly fused with the supra-occipital.

Histological sections were made of the osteo-cartilaginous junctions of the long bones. These revealed a complete absence of the palisade-like line of provisional calcification, which is the characteristic feature of normal developing bone. The usual zone of growing cartilage cells was narrow, and the cells were not arranged in the characteristic columns seen, but were crowded together in an irregular mass (figs. 1 and 2). There was, too, a sudden transition from cartilage to osseous trabeculæ, instead of a general transition from cartilage to bone.

Histological examination was also made of the ductless glands. Of these, the thyroid showed the most marked changes from the normal. There was a thick fibrous capsule around it, from which stout strands passed into the deeper parts of the gland, separating it into irregular-shaped patches of glandular tissue. The latter was characterized by an almost complete absence of vesicular formation, and it was only near the surface of the gland that a few small vesicles containing colloid could be seen. These vesicles were bounded by a single row of small cubical-shaped cells, each with a deeply stained nucleus. The parathyroid glands could not be distinguished by the naked eye. Serial sections were cut and stained to search for them, and they were discovered microscopically as irregular nodules of closely-packed cells, which under low power resembled lymph-glandular tissue. They were, however, embedded on the deep aspect of the thyroid gland, and each was enclosed in a definite capsule, continuous with that of the thyroid. Under higher-power magnification the tissue presented all the characteristics of a young parathyroid gland as described by Hadfield (3), i.e., a compactly arranged mass of deeply staining basiphil cells with clusters of acidophil cells. The cells bordering the sinusoids were arranged in close formation and presented large, clear nuclei. The thymus gland closely resembled the normal, with the exception of the Hassall's corpuscles, which did not present the usual "whorled" character. In their appearance they were suggestive of degenerating blood-vessels. The anterior lobe of the pituitary was very vascular, and in its general microscopic structure closely resembled the normal, except that there was a marked deficiency in the number of eosinophilic cells present. The pars intermedia and the posterior lobe of the pituitary did not present any unusual characters. The supra-renal glands appeared to be normal. The cortex showed the usual differentiation into an outer basiphil "adult" zone, and an inner well developed eosinophil "fœtal" zone. The medullary part of the gland was highly vascular, but its constituent cells presented the usual characters found in the supra-renal gland at the time of birth.

DISCUSSION.

Achondroplasia is a disease of the skeleton, which manifests itself by defective endochondral ossification. The lesion, as far as the skull is concerned, falls on the basi-cranial axis, and the bones which surround the foramen magnum. In the human embryo the basi-cranial axis is laid down first in cartilage, in which three separate ossific centres are normally present at birth. Two of these centres represent the pre- and post-sphenoids, and they fuse at the end of the first year to form a single bone. This bone in turn fuses with the remaining centre, which represents the basi-occipital, at the end of the twenty-fifth year (4). These three ossific centres, in the achondroplasiac fœtus, fuse to form a single bone some time before birth, and as a result growth in length of this part of the skull is inhibited. The basi-cranial axis is thus shorter than normal, and the parts of the skull in front of it, which are concerned with the development of the naso-maxillary region, are not pushed sufficiently forward. The result is the deep depression at the base of the nose and the flattening of the face so characteristic of the condition. Another anomaly of development is found in the early fusion of the ex-occipitals with the basi- and the supra-occipital bones. Normally the ex-occipitals are separated at birth from the basi- and supra-occipitals by plates of cartilage, and fusion of these bony elements is not complete until the end of the fifth year. In the achondroplasiac fœtus these parts, basi-, ex-, and supra-occipitals, may fuse, either completely or in part, during intra-uterine life. As a result of this fusion the foramen magnum cannot increase in size *pari passu* with the growth of the medulla oblongata, which is passing through it (5). If complete fusion occur at an early period, the diameter of the foramen magnum will not be large enough for the free passage of the medulla, and, being constricted by the bony margins, the transmission of respiratory impulses along the nerve-tracts is inhibited, and the infant is still-born. In those cases of achondroplasia in which the basi-occipital does not completely fuse with the ex-occipitals until after birth, growth of the bony boundaries of the foramen can proceed to a point sufficiently large to permit the passage of the medulla without constriction, and the infant is enabled to live.

The cartilage cells which form the framework of the primitive long bones of the normal fœtus, by their proliferation become arranged in vertical columns at the plane where ossification is proceeding. Between adjacent columns are parallel bands of "interstitial substance," in which granules of calcium phosphate and other salts are precipited. The cartilage cells then undergo degeneration, and are replaced by a new type of tissue derived from the embryonic connective tissue of the marrow. This tissue consists of rapidly multiplying spindle- or star-shaped undifferentiated connective tissue-cells. This tissue also contains isolated wandering cells, multi-nucleated giant cells, and blood capillaries. The endothelium of the capillaries, as well as the surrounding elements, produces histolytic ferments which dissolve the calcified substance (6). Osteoblasts now appear, and these produce an "osteoid" substance, which by calcification forms the central trabecular portion of the definitive bone. In the achondroplasiac fœtus, the development of the limb-bones is characterized by a greatly diminished proliferation of the cartilage cells, and there

is therefore only a narrow zone of them. There is also a complete absence of the column arrangement of these cells, as found in normal development. Neither is there any provisional calcification of the interstitial substance. In the narrow zone of proliferating cartilage, the cells are densely packed, but without any attempt at arrangement.

It has been suggested that this disturbance of bone-growth may be due to maldevelopment of one or other of the ductless glands, with resulting functional disturbance. In the cases described here, differences were found in the thyroid gland and in the anterior lobe of the pituitary. In the classical specimen described by Symington and Thomson (7), it is stated that there was "acute desquamative catarrh discovered in the thyroid." West (8) described a case in which he found that the thyroid gland presented in the deeper parts "a complete absence of vesicles," and in the superficial part "only small vesicles with hardly any lumen." Hughes (9) also described a case of achondroplasia in which the thyroid gland consisted of "solid masses of very plentiful cells, rounded, small, and staining well," which contained no vesicles and no colloid. The parathyroids were not distinguished, and there was a great increase in the eosinophil cells of the pituitary. It is, however, doubtful if defective thyroid secretion could alone be responsible for the failure of normal endochondral ossification. Hogben and Crew (10) showed that there is no evidence of active secretion in the normal thyroid earlier than four months in the ox, and as the so-called "bulldog" fœtus, which corresponds in the calf to achondroplasia in man, begins to manifest itself at an earlier date, the thyroid alone cannot be the causative factor.

A functional disturbance of the pituitary gland has also been suggested as the origin of achondroplasia. Keith (11) claimed to show that this gland is smaller in the anchondroplasiac fœtus than in the normal new-born infant, and that there is a "deficiency of those cells with large cell-bodies picked out by eosin," a similar condition to that found in the pituitary body of the cases here described. The work of Crew (12) would seem, indirectly, to support Keith's view. He showed that the pituitary becomes functionally active in the normal fœtus just about the time when ossification begins in long bones. Keith, however, states that, in his opinion, the thyroid gland of the achondroplasiac fœtus always "shows a departure from the normal," and concludes that "such indications as are available point to a hormone such as we may expect to arise in the pituitary, thyroid, parathyroid, supra-renal, or genital glands, or by an inter-action of the secretion of all of them"; a view that the study of these two cases would appear in endorse.

In conclusion, the ingenious theory advanced by Jansen (13) may be mentioned. This worker claimed to show that achondroplasia occurs only in cases of hydramnios. The hydramnios, he said, causes an increased intra-amniotic pressure, and this in turn an ischæmia of the limbs, and, in consequence thereof, an inhibition of their normal growth. The theory is not supported by the present cases. In Case No. 1 the "waters" were reported "normal in amount," and in Case No. 2 the midwife stated that perhaps the "waters" were a little in excess, but not much.

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(1) Rischbieth, H., and Barrington, A., 1912, *Francis Galton Eugenics Laboratory Memoirs,* vol. 15, p. 385.
(2) Kassowitz, Max, 1889, *Weiner Med. Woch.,* vol. 39, p. 1439.
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(4) Jamieson, E. B., 1932, "Cunningham's Textbook of Anatomy," fifth edition, p. 195. Oxford.
(5) Knaggs, L. R., 1927, *Brit. Journ. of Surg.,* vol. 15, p. 24.
(6) Maximow, A. A., 1930, "Textbook of Histology," p. 180. Philadelphia.
(7) Symington, J., and Thomson, H. A., 1890, *Proc. Roy. Soc. Edin.,* vol. 17, p. 271.
(8) West, C. McL., 1923, *Journ. of Anat.,* vol. 62, p. 272.
(9) Hughes, E. W. A., 1932, *Journ. of Anat.,* vol. 71, p. 567.
(10) Hogben, L., and Crew, F. A. E., 1923, *Brit. Journ. Exp. Biol.,* vol. 1, p. 1.
(11) Keith, Sir A., 1913, *Journ. of Anat.,* vol. 47, p. 189.
(12) Crew, F. A. E., 1924, *Proc. Roy. Soc.,* Series B, vol. 95, p. 228.
(13) Jansen, M., 1912, "Achondroplasia: Its Nature and Cause." London.

REVIEW

LIST OF CURRENT PERIODICALS AND SERIALS IN BELFAST LIBRARIES. 1933. Belfast: Compiled and Duplicated in the University Library. pp. 24 + iii.

The inadequate resources of local libraries, and the distance of Belfast from other centres of research, are serious handicaps to scientific workers in every field. The problem is beyond the scope of individual institutions or professional groups, and we heartily welcome a concerted effort by the principal libraries to deal with the important aspect of it. No one will deny that duplication of purchases by neighbouring libraries is theoretically wasteful, but the most ardent seeker after knowledge tends to cool off in his appreciation of this economic truth if every fresh set of references involves a voyage of discovery. This carefully compiled and well produced list contains the title of about 1,200 periodicals and serials of all kinds taken by local libraries. No information is given beyond the initials of libraries appended to each title; particulars of the volume-number or date at which each set begins would have added considerably to its usefulness. But nothing short of a complete and detailed list of periodicals, current, discontinued, and extinct, on the lines of the Dublin catalogue, will really meet the case, and it is to be hoped that co-operative enterprise will one day attain to this. The Ulster Medical Society might well consider the possibility of sponsoring such a catalogue of medical literature, if a comprehensive one is out of the question.

The value of this compilation goes beyond its mere utility as a finding-list. It tells us what we have, and we are better off than depreciators of local facilities would sometimes have us believe. It enables us, more surely than personal experience or vague impressions, to take stock of real deficiencies. In "The Journal of the American Medical Association" for 1931 (vol. 97, p. 608), Dr. R. L. Jenkins published a list of the fifty periodicals most useful in a small clinical library, based on a tabulation of more than six thousand references in recent volumes of "The British Medical Journal," "The Journal of the American Medical Association," and "Klinische Wochenschrift." The method of evaluation seems to be a very reasonable one, and we have been at the pains of comparing the result with the present list. Twenty-seven out of Dr. Jenkins's fifty periodicals are not available in Belfast libraries. Though we are not so devoted to statistics as to believe that every one of them is a crying need, we are quite certain that at least a dozen of these deficiencies would not be tolerated if our readers were more fully convinced of the advantages of central ownership. The remedy for this state of things is obvious. The provision of a library is one of the chief responsibilities of the Ulster Medical Society, and increased membership is the best means of improving the common stock of medical literature.

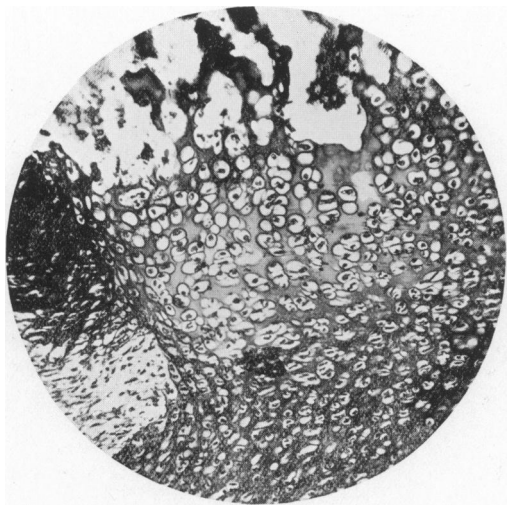

FIG. 1.
T.S. epiphyseal line of achondroplasia.

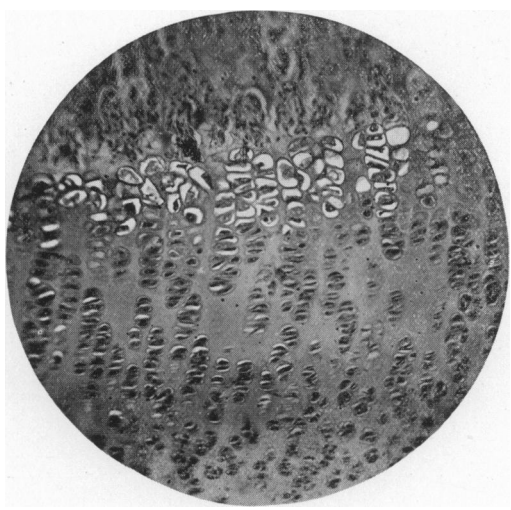

FIG. 2.
T.S. epiphyseal line of normal new-born infant.

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(1) Rischbieth, H., and Barrington, A., 1912, *Francis Galton Eugenics Laboratory Memoirs,* vol. 15, p. 385.
(2) Kassowitz, Max, 1889, *Weiner Med. Woch.,* vol. 39, p. 1439.
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The Interpretation of the Early Stages of Acute Appendicitis

By GEORGE D. F. McFADDEN, M.B., M.CH., F.R.C.S.ENG.
from the Ulster Hospital for Children and Women, Belfast

IN 1842 Genzmer wrote a treatise on how pain in inflammation of the appendix must vary with the anatomical variations in the position of the appendix. Unfortunately, the protean aspects of the disease were not fully understood. Typhlitis, perityphlitis, and inflammation of the vermiform appendix were considered separate diseases. It remained for Fitz to make his celebrated pronouncement in 1886, "That for all practical purposes, typhlitis, perityphlitis, and perityphlitic abscess mean inflammation of the vermiform appendix." Fitz made another statement at that meeting of equal importance: "That variations in the length, position, and patency, whether congenital or acquired, are of obvious importance in explaining many of the apparent differences in the clinical histories." This statement would appear to have been overshadowed by the brilliance of his other suggestion. It is my intention to place this statement in the light again, and to show that it is of great value, and, rightly used, should help to lower the mortality of the disease.

The numerous papers and discussions on the subject of acute appendicitis are due to the disquietingly high mortality of the disease. Undoubtedly the mortality has dropped in the last thirty years, but the disturbing feature is that there has been little decrease in the last decade, and a general death-rate of five cases per hundred operated upon is too high. Graphs 1 and 2 show the decline in the death-rate the last thirty years. They also show that this decline is coincident with a marked drop in the mortality of acute general peritonitis, and that it is inversely related to the number of cases seen in the first twenty-four hours. The first is due to treatment, the latter to better diagnosis.

The average death-rate for the large hospitals, for cases operated upon within the first twenty-four hours, is 1.2 per cent., and for cases upon whom the operation was done after the first twenty-four hours, 6.2 per cent. So that, if the medical attendant is tempted to postpone a decision in a suspected case of appendicitis, or to wait to see if the attack will resolve itself without operation, he must realize that he is multiplying by five the chances of death of that particular patient.

Unfortunately, all cases do not present the classical signs and symptoms of the textbooks. Rendle Short, in a paper published in 1925, stated: "That the cases which one has seen, in which the appendix has been allowed to perforate and become really dangerous, have all been due to either an abnormal position of the appendix or to the coincidence of diarrhœa." Black states that fifty per cent. of all deaths in his series of acute appendicitis occurred with the appendix in the pelvis, a position which frequently gives rise to signs and symptoms far removed from those given in textbooks. Colt and Berry have drawn attention to the increase in mortality that may ensue from an ill-placed incision at operation. Thus, if the mortality of the

disease is to be lowered, the diagnostician must have an accurate mental picture of the position and condition of the appendix; the symptoms can then only be accurately interpreted, and the best incision for each individual case adopted.

The position of the cæcum is not constant, and the appendix has many different relations to the cæcum and terminal ileum (see figs. 3-10), and it bears different relations to the structures of the posterior abdominal wall. It may lie against the psoas muscle, the genito-femoral nerve, the ureter, or the spermatic vessels, causing symptoms to be referred to these structures. Wherever the diseased appendix lies, from gall-bladder to urinary bladder, inflammation will extend from it to the neighbouring tissues and thereby cause secondary signs.

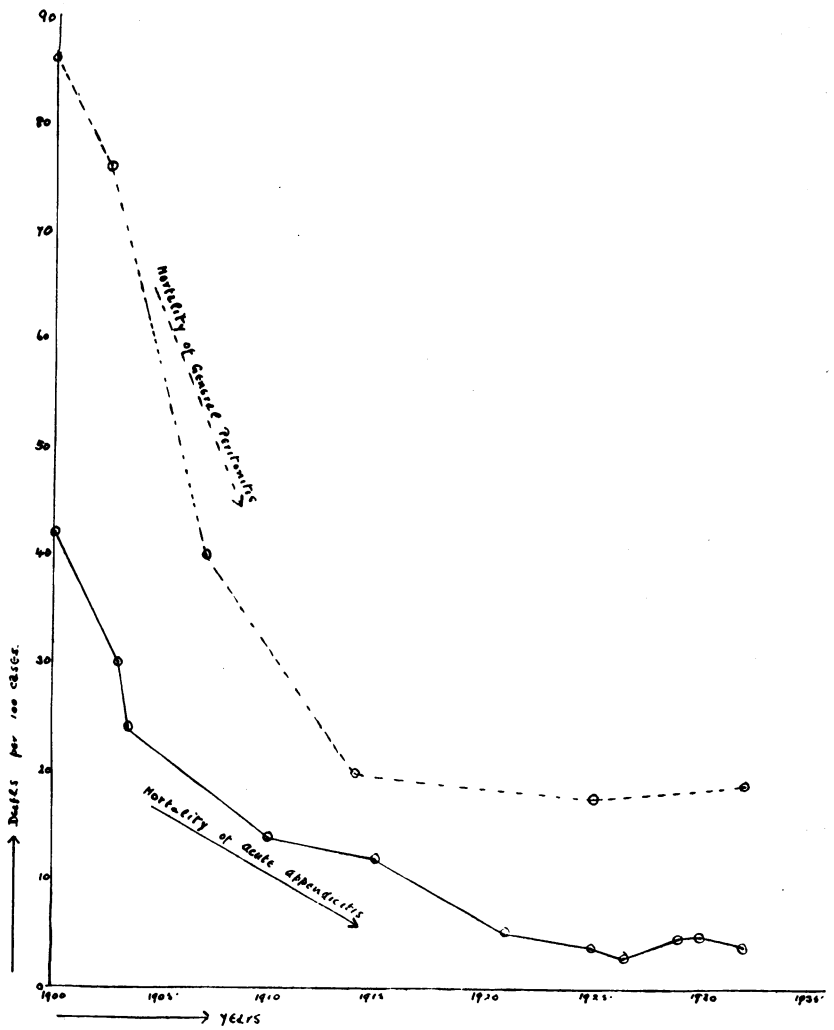

FIG. 1.

The appendix may have been the seat of a previous inflammation to such an extent that it may be bound down with adhesions to the parietal peritoneum, or its wall be fibrosed, leading to a stricture or complete obliteration of its lumen.

The angle at which the appendix comes off from the cæcum and its motility is one of the factors that determine whether gas or contents from the cæcum can enter the appendix. The occlusion of the lumen of the appendix is another factor whereby gas or cæcal contents are prevented from entering the appendix. This explains why such signs as Bastedo's, where gas is forced from the colon towards the cæcum, is frequently negative in cases of acute appendicitis.

The subjective signs of the diseased appendix must follow definite anatomical pathways. In the abdomen there are two pathways of conduction, the sympathetic and the somatic. These latter are confined to the parietes. Morley suggests that these somatic nerves reach the edge of the gut, because, on tearing through the transverse mesocolon, his patient complained of pain. But this being a pulling stimulus, it was probably sufficient to produce pain through the sympathetic pathway. It would appear more probable that the somatic nerves stop about the root of the mesentery.

If the abdomen were divided roughly into three areas by two horizontal lines, one midway between the umbilicus and the ziphisternum, and the other at the level of the iliac crests, each area would correspond to the nerve segments of each embryological part of the gut; the upper area representing the fore-gut, the mid area the mid-gut, and the lowest area the hind-gut. The appendix belongs to the mid-gut area. Pain referred from it through the mesenteric nerves will be vaguely localized in the middle area. This pain is difficult for the patient to describe. He speaks of it as a dull crampy or heavy pain. The appropriate stimulus for it is distension of the appendix or pulling on its mesentery. In the somatic nerve system the type of pain can be minutely described, and it is accurately localized. These two types of pain, the sympathetic and the somatic, may both be present in cases of acute appendicitis.

Stimulation of the sympathetic nerves causes dilatation of gut and contraction of the sphincter. Learmouth has shown that these nerve twigs exert a definite tonal action. Complete paralysis of the sympathetic is followed by a resulting dilatation of gut and a loss of co-ordinate movements. The loss of tone interferes with the absorption of gases, which further increase the distension. If there is interference with the blood supply of the gut, there is also distension of the gut, but in this instance due to the non-absorption of gases and to the diffusion of gases out of the vessels. With these facts in mind, it will be understood how an appendix acutely inflamed, lying against the mesentery in the ileo-colic angle, stimulating the mesenteric nerves and interfering with the blood-vessels, will be followed by distension of the gut. In the latter stages paralysis of the nerves is produced, hence the picture of paralytic ileus with its distended gut.

A wave of intestinal peristalsis is most easily produced by the natural stimulus of swallowing food. When the pylorus opens, the lower ileum contracts, and the

ileo-cæcal sphincter relaxes; coincident with this the appendix contracts, and the appendico-cæcal sphincter relaxes.

If a piece of gut is strongly and freely stimulated, it contracts, but after repeated stimuli it ceases to respond. If it is allowed to rest, it recovers and becomes as on a hair-trigger, and a very small stimulus will cause it to contract vigorously. Inflammation increases the tone of smooth muscle and its adaptability to a stimulus, and, as is to be expected, the inflamed gut becomes refractory more rapidly than healthy muscle.

The appendix has the same anatomical muscular walls as the gut, and it has been shown to exhibit peristaltic waves of contraction and relaxation like the gut. It is therefore subject to these physiological laws.

I think it was Murphy who crystallized the signs and symptoms of acute appendicitis into—Pain around the umbilicus; vomiting; pain settling in the right iliac fossa, associated with muscular rigidity; constipation and fever. Undoubtedly he helped to make the symptoms more easily remembered; but if we are to look only upon those cases as appendicitis where the symptoms correspond accurately with the sides of the crystal, then we shall miss many true cases of appendicitis, and acclaim as appendicitis cases in which the appendix is normal. Unfortunately, most textbooks have copied these signs and symptoms as the criterion of appendicitis without any qualifying statements or explanatory notes.

The Pain of Onset.—An appendix with inflamed walls will only need the slightest stimulus to cause it to contract. If it is obstructed this peristalsis will be more marked. The resultant increase in the intra-appendicular tension will cause pain. This pain in an appendix lying free in the peritoneal cavity will be referred along its mesenteric nerves, and will be experienced by the patient as an indefinite dull, crampy pain. It can only be roughly localized in the mid-umbilical area. It is made worse by swallowing food. After a time the muscle becomes refractory, the crampy pain is less marked, there is a lull. If the appendix that has become inflamed is not free in the peritoneal cavity, but placed congenitally behind the peritoneum, as is not uncommon, the first attempts at distension and peristalsis pull on the covering peritoneum. This pull and the spreading of inflammation to the peritoneum cause pain. Now, the peritoneum is richly supplied by somatic nerves, and the pain is now transmitted by them. This pain is sharp, well defined, and accurately localized over the part affected, usually the right side. In these cases there may be no afferent stimulus along the sympathetic fibres, as the coverings have prevented sufficient distension to affect the sympathetic fibres, and the central crampy pain is not felt. During a peristaltic wave in the intestine, this somatic sharp pain in the side will be exaggerated on account of the inflammatory adhesions between the inflamed peritoneum and the gut. If the patient has had previous attacks of appendicitis, the appendix may be bound down to the parietal peritoneum and behave as a retroperitoneal appendix. In this case the initial pain will be a definitely localized somatic pain in the side, and the ill-defined crampy sympathetic umbilical pain of the former attacks will be absent. In a case, then, where the patient has had several

attacks of appendicitis, it will be found that the history of the first attack approaches most closely to the classical type.

If the appendix is bound down to the pelvic mesocolon through the results of previous inflammatory attacks, then the first effort of the diseased appendix will be to irritate the nerves in the pelvic mesocolon; the disease will set in with symptoms suggesting colic in the sigmoid colon. If an appendix that is free becomes inflamed, and later in the attack becomes adherent to the pelvic mesocolon, the patient will first complain of crampy pains in the umbilical area, and later of crampy pains in the lower abdomen, and the pain will not shift to the right side. In these cases the inflamed appendix stimulates the nerves in the pelvic mesocolon, and the patient has the sensation of the lower bowel being affected. If the appendix becomes adherent to the parietal peritoneum on the left side, the pain will become definitely localized in the left side. When the central ill-defined crampy pain starts in the umbilical area and shifts to the right side, it denotes that the parietal peritoneum, posteriorly, laterally, or anteriorly, to the righ side of the middle line, has become affected by the inflammation. The pain is now a definitely localized pain, and is due to stimulation of the somatic nerves.

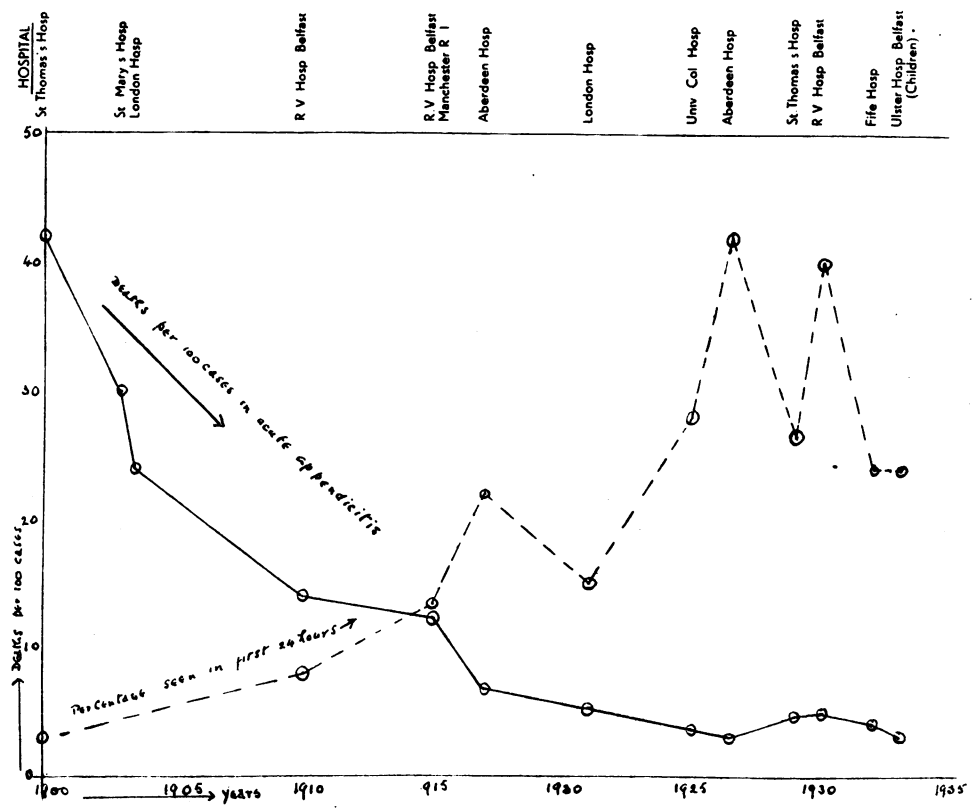

FIG. 2.

The pain denotes accurately the piece of parietal peritoneum affected and the site of the appendix. If the appendix lies in the flank running up to the right kidney, pain will be felt in the right renal area. If the appendix is lying against the parietal peritoneum to the left side, the pain will be felt on the left side.

Sokolava described a case where the attack seemed to him typical of a right-sided appendix. At operation the appendix could at first not be found, but it was finally located on the left side. Its tip ran towards and was bound down to the right side, hence the reference of the pain to the right side.

If the diseased appendix is separated by mesentery or gut from the parietal peritoneum, so that the inflammation cannot extend to the parietal peritoneum, the shifting of pain to the right side cannot occur. A patient whose appendix is so surrounded by small intestine as to separate it from parietal peritoneum, will complain of ill-defined crampy heavy abdominal sympathetic pains, with their treacherous lull in the symptoms; later in the disease the pain may become localized (somatic) in the side, but it is now the consequence of a tracking abscess or of general peritonitis. An appendix lying in the pelvis may in like manner be so surrounded that it is separated from the parietal peritoneum. In this case there will be no localization of the pain.

One sees the statement frequently in medical literature that pain starting round the umbilicus and settling in the right iliac fossa is appendicitis, and appendicitis alone. This sequence in pain denotes only a change from a sympathetic pain in mid-gut to the somatic pain in the side. Any inflammatory lesion of the mid-gut area that extends to the parietal peritoneum in the right side will produce these symptoms. As an example of this sequence of pain, it occurs in inflammation of the glands in the ileo-cæcal area. The glands as they become inflamed irritate the sympathetic nerves in the ileo-colic angle, and cause crampy abdominal pains. This shifting of the pain to the right side in inflamed glands is due to the local peritoneum being affected. The differential diagnosis between inflamed mesenteric glands and acute appendicitis has been discussed elsewhere.

Rigidity.—Rigidity of the muscles of the anterior abdominal wall is a common but not universal occurrence in cases of appendicitis. Sir James MacKenzie did not think that the parietal peritoneum had any somatic nerve supply, and, to explain the phenomena of muscular rigidity in these cases, advanced the theory of a viscero-muscular reflex. He thought that the nerves running from the inflamed appendix raised their segment in the spinal cord to a hyperæsthetic state, and that the motor-nerves passing through this area were rendered hyperæsthetic, and so increased the tonus of the muscles they supplied. If this theory were correct, the area of muscular rigidity in appendicitis would be constant, irrespective of the position of the appendix. This is contrary to clinical findings, for the area of rigidity varies, and in many cases of acute appendicitis is absent. It is now firmly believed that the parietal peritoneum is rich in somatic nerve-fibres. Stimulation of the parietal peritoneum causes a contraction of the overlying muscles. Morley called this reflex the parieto-muscular reflex. Rigidity of the muscles of the abdominal wall will therefore occur in a case of appendicitis if the peritoneum underneath the muscles

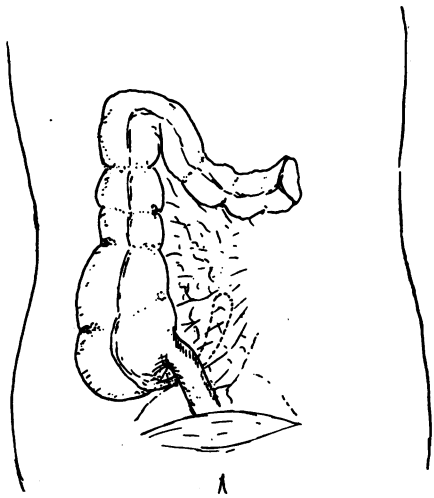

FIG. 3.

Appendix lying behind mesentery and terminal ileum.

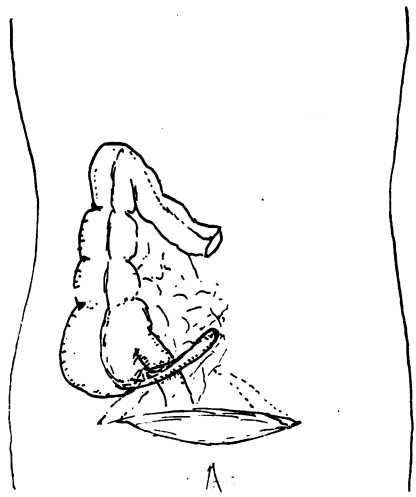

FIG. 4.

Appendix lying anterior to the mesentery and terminal ileum.

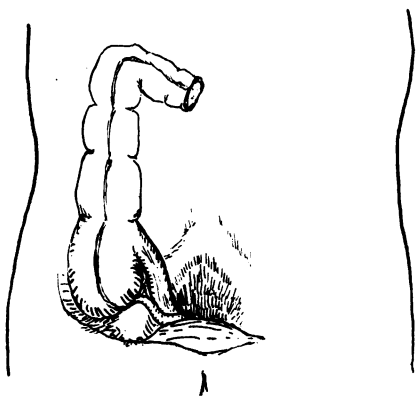

FIG. 5.

Pelvic appendix; the appendix lies in front of the terminal ileum.

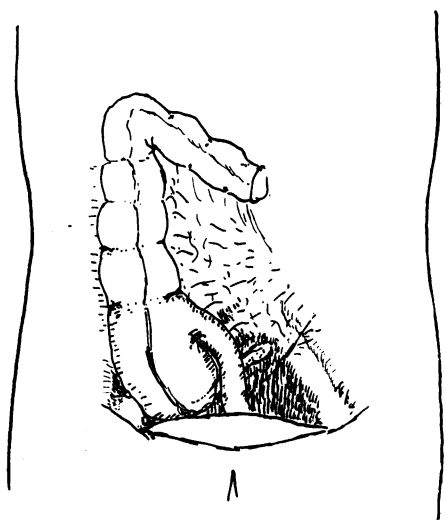

FIG. 6.

Appendix lying posteriorly below the promontory, with the mesentery and lower ileum lying in front of it.

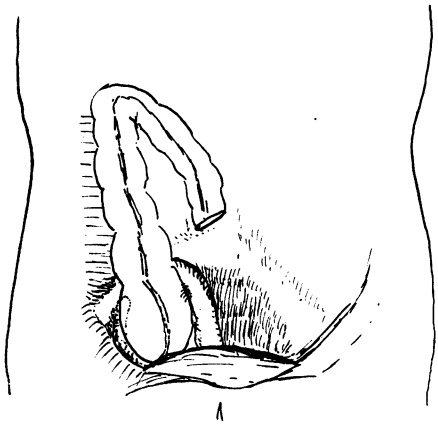

FIG. 7.

Pelvic appendix; here the appendix lies to the lateral side of the cæcum and away from the ileo-colic angle.

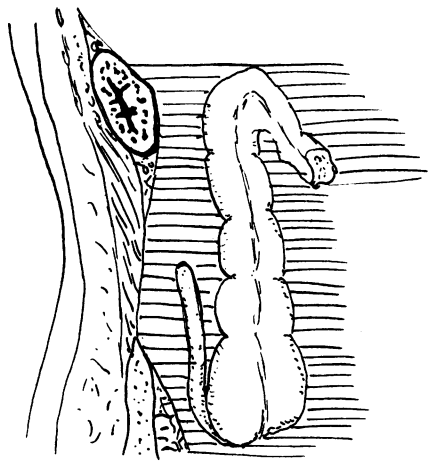

FIG. 8.

Lateral cæcal appendix, free in the peritoneal cavity.

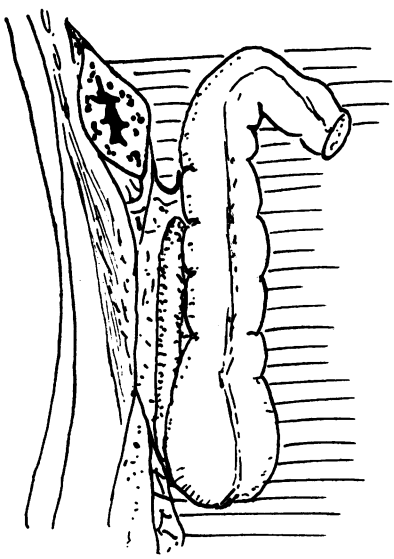

FIG. 9.

Lateral cæcal appendix, retro-peritoneal and adherent to the cæcum.

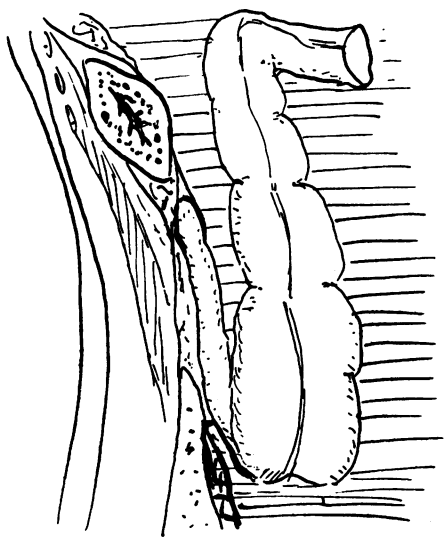

FIG. 10.

Lateral cæcal appendix, retro-peritoneal.

is affected by the inflammation. If the appendix lies well out in the flank, the rigidity will affect the muscles in the flank without the muscles in the anterior abdominal wall being affected, although in the co-ordinated movement of breathing the patient may show a diminished respiratory excursion of a segment of the anterior abdominal wall. If the appendix in its normal state lies touching the peritoneum underneath the anterior abdominal wall, then when the appendix becomes affected by disease, rigidity of these muscles will be early. If the appendix lies against the posterior abdominal wall, these posterior muscles will be affected by an inflammation of the organ, but the muscles of the anterior wall will remain soft. This affection of the posterior muscles may show itself by flexion of the hip, or, if the limb be laid flat on the bed, by a lumbar lordosis. In these cases on making an attempt to hyper-extend the thigh, the patient complains of abdominal pain. If the appendix lies in the pelvis, the anterior parietal peritoneum will not come into contact wih the appendix, and again rigidity of the muscles of the anterior abdominal wall will be absent. Zachary Cope has drawn attention to the pelvic appendix sometimes lying against the obturater internus, and causing interference with the movements of rotation of the thigh. In the late stages of a pelvic appendicitis, rigidity may occur in the muscles over the hypo-gastrium, but this rigidity is due to spreading peritonitis.

VOMITING.—The symptoms of vomiting in appendicitis are not constant. It may be due to toxins acting centrally, or due to a local reflex. The fact that it occurs with suddenness in the beginning of the disease, and not later when the toxæmia is greatest, favours a local reflex theory.

Physiologists have had difficulty in analysing the different phases of the act, but the essentials are a closed pylorus and a strong reverse peristaltic wave. This reverse peristaltic wave has been seen to start in the small gut, and vomiting can occur in the absence of a stomach. If a piece of gut is obstructed, the peristaltic waves sweep down on the obstruction till finally, like a rebound from the site of obstruction, there is a strong reverse peristaltic wave. If, with this in mind, the intimate connection between the ileo-cæcal area and the pylorus is considered, the ileo-colic sphincter relaxes with relaxation of the pyloric sphincter—and the reverse has been demonstrated : spasm of the ileo-colic sphincter associated with spasm of the pyloric sphincter—it will be seen that continued irritation of the smooth muscle at the ileo-colic sphincter and of the nerves supplying the area will cause a prolonged ileo-cæcal and pyloric spasm, and produce all the requirements for reflex vomiting. It will also be seen that with pylorus spasm the vomited matter from this irritation should be only contents found in the stomach. This is what occurs in appendicitis with vomiting. The vomitus is only stomach contents, and it is irritated by any fresh stimulus to peristalsis. Patients frequently say that they vomited every time they swallowed anything. In appendicitis, vomiting may be a marked symptom, or it may be completely absent. It depends to a slight extent on the age and type of the patient, but to the greatest extent upon the position of the appendix. In children the reflexes are brisker, the metabolic rate higher, and the gut proportionally shorter. Hence vomiting in them is more commonly present. In a series of

over one hundred consecutive cases of acute appendicitis in children at the Ulster Hospital, one hundred per cent. vomited. In another series it occurred in ninety-four per cent. of cases. Royster also remarked upon the frequency of vomiting in children with acute appendicitis. An adult with a high metabolic rate will vomit more easily than an old person with an old-low metabolic rate. Woodside noted that about sixty-eight per cent. of his cases vomited. I have noted how stimulation of the nerves in ileo-colic angle will give rise to vomiting. An acutely inflamed appendix lying behind the lower ileum in the splenic position (fig. 3) against the nerves going to the ileo-colic angle, will give rise to spasm of the ileo-colic sphincter, pylorus-spasm, reverse, peristalsis, nausea, and vomiting. If the irritation persists, the bowel, through the action of the sympathetic, becomes atonic and dilates, hence distention of the gut. If there is interference with the mesenteric blood-vessels, the absorption of gases will not take place, and distention will become more marked. If the appendix lies in the pelvis, the loop of lower ileum is frequently lying anterior to it (fig. 6), so that the appendix occupies a position similar to the retro-ileac splenic position, and vomiting is a frequent and marked symptom. If on the other hand, the appendix lies below the cæcum, away from the ileo-colic angle, the sympathetic fibres to the lower ileum are not interfered with, and vomiting is absent; also in the case of a pelvic appendix, where the appendix lies lateral to the cæcum and in which the cæcum has prolapsed into the bottom of the pelvis (fig. 7), vomiting is not to be expected. In an appendix the subject of acute inflammation lying lateral to the cæcum (fig. 9), away from the ileo-colic sympathetic fibres, vomiting is absent.

In an effort to solve the question as to whether distention of an obstructed appendix was the cause of vomiting, I operated upon four patients with acute appendicitis, under local anæsthesia. In one patient the appendix was found so completely obstructed that the intra-appendicular tension had produced a pseudo diverticulum. Yet he had never been nauseated and had never vomited. The appendix lay below the cæcum and away from the ileo-colic angle. On separating an adhesion between the appendix and the peritoneum of the right iliac fossa, the patient complained of pain in the right iliac fossa. When the appendix was clamped at the base, it caused a temporary indefinite pain up in the umbilical area. The appendix was then further distended by puncturing the wall with a fine needle, and distending the lumen with normal saline from a record syringe. This distention again caused an indefinite pain above the umbilicus, but it did not cause any nausea or vomiting. Tying the mesentery caused a para-umbilical pain; pulling on the mesentery made him feel somewhat nauseated, but he did not vomit. In another case the same procedure was adopted. In this girl there were some fibrous adhesions between the appendix and the parietal peritoneum, which were not disturbed till after the appendix had been distended. In this case, while distending the appendix, the patient complained of pain in the right iliac fossa. The appendix was now freed from adhesions, and further distended. This time the patient complained of crampy pain up in the para-umbilical area, but she did not feel nauseated, or vomit. As these patients had been subject to operation when their stomachs were empty, it

was felt that the absence of vomiting might have been due to the empty stomach. In a fourth patient a cup of tea was given twenty minutes before operation. In this patient, pushing a pair of forceps through the mesentery produced pain above the umbilicus. On clamping the base of the appendix and distending the appendix with saline, the patient again complained of pain in the umbilical area, but she had no nausea or vomiting. On rubbing a pair of forceps too and fro against the mesentery in the ileo-colic angle, she complained of nausea, and, on further irritation of the ileo-colic area, vomited.

I think we can reasonably conclude that the sensation of the mesenteric nerves are referred about and above the umbilicus, that pain at the actual site of the appendix means that the parietal peritoneum is here affected, that distention of the appendix is not the cause of vomiting, but that vomiting is due to irritaton of the nerves in the ileo-colic angle.

TENDERNESS.—Tenderness, in my experience, is always present over the diseased organ in a case of acute appendicitis. When the appendix lies below the promontory of the sacrum (fig. 6), it may be difficult to elicit it on abdominal examination or even rectal examination. Morley is of the opinion that the viscera themselves are not tender, but that deep pressure pressed the sensitive parietal peritoneum against the inflamed area, and the parietal peritoneum registered pain. This teaching seems against our basic principles that an acutely inflamed structure is tender. Also, tenderness can be elicited by pressure over the inflamed appendix, even when the parietal peritoneum is separated by omentum, mesentery, and small gut from the inflamed organ. According to Morley's view, the pain should always be felt under the pressing finger, whereas, on pressing directly over the appendix, pain is frequently felt above the umbilicus. Another point is that pressure on an inflamed appendix is bound to raise the intramural tension and provoke the necessary sympathetic stimulus for reducing pain. To test Morley's theory, in one of the patients upon whom I operated under local anæsthesia, the appendix, before being disturbed, was grasped between the finger and thumb, so that it did not touch the parietal peritoneum. On squeezing the inflamed organ, the patient complained of pain above the umbilicus. It is justifiable to conclude that an inflamed appendix is tender.

If the inflammation has spread from the appendix to the local parietal peritoneum, this membrane is then sensitive, and pain will be felt under the palpating finger. Pressure on the colon at a distance produces pain in cases of acute appendicitis, if there is no valvular obstruction between the cæcum and the appendix and if the lumen of the appendix is not completely obstructed. If the appendix has a free mesentery, pain is referred to the umbilical area; but if the appendix is firmly attached to or lying behind the peritoneum, pain is felt over the appendix. Pressure from the left side of the pelvis towards the right will cause pain over the appendix, if there are ileo-cæcal inflammatory adhesions.

DYSURIA.—Dysuria is a frequent and valuable symptom. Bryan speaks of appendicitis as being the most common cause of the sudden onset of dysuria in a child. In the Ulster Hospital, Children's Department, in a series covering the last

three years, a history of dysuria was obtained in forty per cent. of all cases of acute appendicitis. This is to be expected, seeing the bladder is an abdominal organ in a child, and does not reach its adult position till after puberty (figs. 11, 12). The pain or interference with micturition is due to the inflamed appendix coming into contact with the bladder, and is a comparatively early sign in children. The symptom is not uncommon in the pelvic appendix in the adult. In the late stages, when a pelvic abscess is present, micturition is commonly affected.

CONSTIPATION.—Alvarez has likened the colonic movements to a railway siding with three wagons. Every day a new one arrives and bumps off the end one. Occasionally one arrives with such force that all three are bumped off, and then three days have to elapse before the siding is full enough for a car arriving to push one off at the other end. If the third wagon does not arrive, there is no movement. In patients with an inflamed appendix in certain positions, there is spasm of the ileo-colic sphincter and no emptying of ileal contents into the cæcum, hence constipation is to be expected. But if there is no ileo-colic sphincter spasm, constipation need not be expected. In fact, an appendix that lies behind the cæcum and adherent to its wall will hasten the third wagon across the colon. Many people will admit that their bowels have moved more regularly since the onset of the attack. If the wall of the sigmoid colon is irritated, there is a rapid emptying into the rectum and a call to defæcation. Patients with an appendix adherent to the sigmoid colon will complain of diarrhœa. A pelvic appendix may be adherent to the rectum and cause tenesmus, or this symptom may follow on a pelvic abscess later in the disease.

FEVER.—A rise in temperature is not a constant finding when one examines a case of acute appendicitis, although it is probably present during some time of the illness. A normal temperature is uncommon in children with an acute appendix. At the Ulster Hospital for Children it was found in only eight per cent of cases. In the years 1930-1, at the Royal Victoria Hospital (adult cases), a normal temperature occurred in twenty-four per cent. of the cases. The temperature is more likely to be normal in the first twenty-four hours of the attack, in the adult series, in forty-two per cent. of the cases. This normal temperature is no guide to the severity of the illness, for of those patients seen in the first twenty-four hours, and who had perforated, forty-six per cent. had a normal temperature. A temperature taken soon after a perforation, with the shock and lowering of tension, would be inclined to be lowered. A normal temperature it also to be expected in those cases of a mild nature where the patient is recovering.

Deolindo thought that he could tell the state and position of the appendix by comparing the axillary temperature against the rectal temperature. I have endeavoured to test these findings. At the Ulster Hospital the axillary and rectal temperatures were noted in sixty-six cases of acute appendicitis. The difference between axillary and rectal temperatures in these cases varied from .4 degree to as much as five degrees. The average difference in temperature was .8 degrees. The amount of difference bore no relation to the position of the appendix or to the seriousness of the lesion. A child with a perforated appendix and a pelvic peritonitis

did not show a greater difference of temperature than one with a retro-cæcal non-perforated appendix. To determine if this difference in axillary and rectal temperature was greater in children suffering from appendicitis, than in children who had no abdominal disturbance, the rectal and axillary temperatures of some fifty children who were not suffering from abdominal disease were taken as a comparison. In these cases the axillary and rectal temperatures bore the same relation as in cases of acute appendicitis. In some of these latter non-abdominal cases, the difference was as high as 1.6 degree.

I think that we can conclude that a comparison between rectal and axillary temperatures is of no value in the diagnosis of acute appendicitis, nor as a help as to its gravity or to the position of the appendix, and that a normal temperature does not exclude the diagnosis of appendicitis.

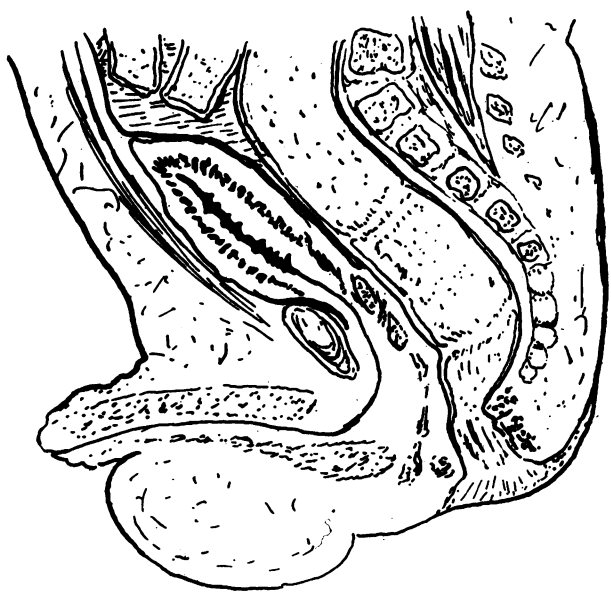

FIG. 11.

Section of full-term child (after J. Symington). Bladder is situated above the pubic symphisis.

THE TONGUE.—The contracted, dry, furred tongue with prominent red papillæ is one of the most constant and valuable signs in acute appendicitis. It is associated with a heavy, foul breath. Alvarez attributes the tongue condition to reverse peristalsis, and the heavy breath would favour this opinion.

Of late years clinicians have been inclined to look for two distinct trains of signs and symptoms in disease of the appendix—one signifying obstruction of the lumen of the appendix, and the other inflammation of its walls. It must be remembered that the majority of, if not all, diseased appendices have some obstruc-

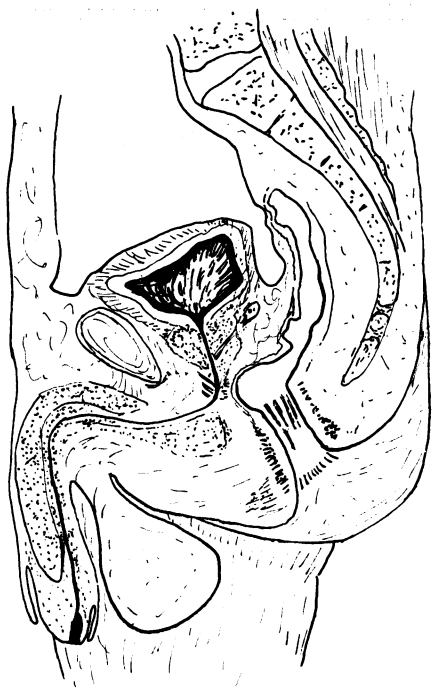

FIG. 12.

Section of adult male (J. Symington). Bladder is in the pelvis.

tion of the lumen. Robert Campbell, who first drew attention to the prevalence of the diseased obstructed appendix, stated that eighty-two per cent. of his cases were obstructed. Woodside pointed out the frequency of obstruction in his series, and he remarks that these obstructions were found in the amputated portion, whereas at least a quarter-inch of the appendix and its base must be left unexamined. Black, in a recent series, found some obstruction in ninety-eight per cent. of his cases. So that, if on certain signs and symptoms a patient is diagnosed as having an obstructed appendix, the chance of error is negligible. Yet it would be an error to conclude that the signs and symptoms of the patients were due to the obstruction. From anatomical, physiological, experimental, and clinical findings outlined in previous paragraphs, it would appear that, if there is a small number of purely inflamed appendices without obstruction, they cannot produce a different train of symptoms, with the possible exception of the severity of the initial crampy pain, from an appendix that is obstructed. The experimental distention of the appendix does not produce any symptom other than pain. A patient with an obstructed appendix in the retro-iliac splenic position has a different train of symptoms from a patient with an obstructed appendix lying below the cæcum. Undoubtedly the greater the obstruction the greater the risk of perforation. But the danger of perforation depends to a great extent on the position of the appendix at the time of

perforation. The position is a greater menace than the obstruction. This has one small crumb of comfort, in that the obstruction does not give rise to definite signs and symptoms, whereas each position of the appendix gives a train of signs and symptoms that are capable of interpretation.

Every anatomical condition of the appendix and its surroundings has then a definite bearing on the symptoms when the appendix becomes diseased. When a suspected case of appendicitis is approached, the diagnostician should ask himself what is the probable anatomical condition present, and are the signs and symptoms of the patient coincident with such a condition. If the anatomical conditions agree with the signs and symptoms, the diagnosis is correct. Knowing the anatomical conditions, the diagnostician can with greater confidence determine the next step to be taken. An appendix in the splenic position brooks no delay, neither does a pelvic one. On the other hand, if there is reasonable doubt about a lateral cæcal appendix, a few hours' delay for the examination of the urine, or an X-ray examination of the urinary tract, will not lower appreciably the chances of the patient. For the surgeon the position of the appendix will determine the incision to be used, his great aim being to deliver the appendix with least disturbance to the peritoneal cavity and to the abdominal wall.

In conclusion, I should like to thank my colleagues at the Ulster Hospital for Children, Templemore Avenue, for permission to include some of their cases in the figures, and also to the house-surgeon, Dr. Christie, and the sisters, for their help in getting the histories of the patients and the care they have taken over the temperatures. I am also greatly indebted to Mr. S. T. Irwin for his generosity in allowing me to operate under local anæsthesia upon patients in his ward, and to the staff of the Royal Victoria Hospital for permission to examine their case-sheets in the Royal Victoria Hospital.

IRISH MASTERS OF MEDICINE

No. 7—SIR WILLIAM MacCORMAC, K.B., M.A., M.D., F.R.C.S.I. & Eng.

THE Hippocratic view that "war is the only proper school for the surgeon" receives strong support in the professional life of Sir William MacCormac, who served in no less than three wars: the Franco-German War of 1870, the Turko-Serbian War of 1876, and the South African War of 1899. MacCormac was born in Belfast on 17th January, 1836, the son of Dr. Henry MacCormac, the pioneer of the open-air treatment of tuberculosis. He was educated at the Royal Academical Institution, and at Queen's College, Belfast, where he graduated M.A., and later M.D. with gold medal. As a student he appears to have taken a leading part in undergraduate activities, and he was elected president of the Literary and Scientific Society for the session 1857-8. For a few years MacCormac practised as a surgeon in the old General Hospital, Belfast, but the call for adventure carried him away to serve with the French Army during the war of 1870. He spent a short time serving at

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Metz, and meeting the American surgeon, James M. Sims, he joined and helped to organize the Anglo-American Ambulance, with Sims at its head. Sims soon retired from this position, and MacCormac was left in command of the complete unit, which included sixteen qualified surgeons. The experience obtained during this time was later of invaluable service to him when he settled in London. Here he was soon recognized as a surgeon of great ability, and he was elected to the staff of St. Thomas's Hospital as assistant surgeon. Three years later he was raised to the rank of full surgeon, and lecturer in surgery. But again the call for adventure seized him, and in 1876 he accepted an appointment with the National Aid Society as surgeon-in-chief to the Ambulance Corps which was being sent for service to the Turko-Serbian War.

On MacCormac's return to London from this war, he addressed a meeting of the British Medical Society on "Antiseptic Surgery," a subject at that time of violent dispute. His address, together with the views expressed by surgeons who took part in the discussion which followed, were published by MacCormac in 1880. This book represents a landmark in the introduction of the Listerian principles from which modern aseptic surgery emerged. It was translated into French and Italian.

An International Medical Congress was to be held in London in 1881, and MacCormac was entrusted with the task of its organization. This he did successfully, and at the conclusion of the Congress he edited and published its proceedings, in three languages. A knighthood was conferred upon him for this work.

MacCormac published many papers and books, but his claim to fame rests on his pioneer efforts in the operative treatment for rupture of the urinary bladder. He was the first surgeon to perform abdominal section for this condition, to wash out the peritoneal cavity, and to stitch the ruptured viscus. A paper published by him in the "Lancet" of 1886 on this method of treatment may be read with advantage by surgeons even to-day.

MacCormac obtained the Fellowship of the Royal College of Surgeons in 1871. He was elected to its council in 1883, and in 1896 he had the honour to be elected to its presidential chair, a position to which he was re-elected four times in succession. He was created a baronet in 1897, and in the following year he was appointed surgeon-in-ordinary to the Prince of Wales (afterwards Edward VII). His career would now seem to have settled into that of a successful surgeon. But the call for adventure once more claimed him, and on the outbreak of the South African War in 1899, he sailed with the South African Force as a consulting surgeon. In this capacity he served for only four months. Dysentery claimed him as a victim, and he died of its effects in Bath on 4th December, 1901.

—R. H. H.

No. 8—ALEXANDER GORDON, M.D.

"Few men have succeeded in so impressing their fellows with a sense of such striking originality, such practical sagacity, such contempt for the show and glitter of worldly honours, as Alexander Gordon, who for thirty years filled the Chair of Surgery in Belfast." Thus begins the tribute to the memory of Professor Gordon in

"The British Medical Journal" of 1887. Dr. Gordon was born at Saintfield, County Down, in 1818, and he received his medical education at Edinburgh University, where he graduated M.D. in 1841. He then began the practice of his profession in Belfast. The excellence of his work soon drew the attention of his senior colleagues, and he was appointed Demonstrator of Anatomy, and subsequently Professor of Surgery, to the Medical School of the Royal Academical Institution, Belfast. And when this school was transferred to the newly-founded Queen's College in 1849, he was appointed its first Professor of Surgery. This position he held until failing health and impaired eyesight compelled him to resign in 1886. Gordon had a unique personality of fiery temper, and gruff to a degree, yet he possessed the simplest mind. It is said of him that he spent his short annual holiday working as a labourer in the fields of his brother's farm, near Saintfield. As an operator he showed "neither brilliancy nor dash, and the careless spectator might even have pronounced him slovenly, but somehow his patients recovered, and his merit shone out in the statistical returns."

Gordon's contributions to surgical knowledge were mainly confined to injuries and diseases of bones and joints. His methods of treatment of these conditions earned for him worldwide fame. When he began the practice of surgery he found the etiology, pathology, and treatment of fractures in a condition of chaos, and it is largely due to his observations that the pathological problems and clinical signs of fractures have been reduced to order, and their treatment placed on a purely scientific foundation. The collection of fractures in the Medical Museum at Queen's University, Belfast, prepared by him from post-mortem studies, is a monument to his industry. It is probably the most complete collection of fractures in existence. A remarkable tribute to the accuracy of Gordon's observations is afforded by the use of the X-rays, which corroborate in many details the views which he so strongly maintained against a host of hostile critics. His book, "The Treatment of Fractures of the Lower End of the Radius," was universally known, and it is only within the last few years that the splint which bears his name, and which he devised for the treatment of fractures of this part of the radius, was supplanted by another. Alexander Gordon was for many years a visiting surgeon on the staff of the General Hospital, Belfast. He died on 29th July, 1887, of a cerebral hæmorrhage.

—R. H. H.

No. 9—JAMES CUMING, M.A., M.D., F.R.C.P.I.

Professor James Cuming, who occupied the Chair of Medicine in Queen's College, Belfast, from 1865 till 1899, was much more than an erudite and accomplished physician. He was an accomplished scholar, and a man of universal attainment. He was born in 1833 in Markethill, Co. Armagh, and received his early education at the Royal School, Armagh. He was one of the earliest students of Queen's College, Belfast, which he entered in 1849. He graduated M.D. in 1855, and M.A. in 1858. He then travelled abroad, and studied in Paris and Vienna before returning to Belfast to begin the practice of his profession. While actively engaged in practice, Cuming found time to make contributions to medical literature, some of

which are of considerable value. The most important of them are : "Contributions to the Study of Some Thoracic Diseases," published in 1869; "The Sphymograph," in 1868; "Treatise on the Pathology of Delirium Tremens," in 1868. But the subject which gave him an international reputation was his compilation of that gastric sedative known to thousands as "Cuming's Powder" (sod. bicarb., bismuth carb., and mag. carb. pond.). This powder was almost universally used for the relief of dyspepsia and the pain of gastric ulcer, until Dr. Maclean of London introduced another formula which contains bismuth oxy-carb. instead of bismuth carb., with soda bicarb., mag. carb. pond., and cal. carb.

The study of mental disease was one of Cuming's greatest interests, and although he did not make any great contribution to our knowledge of this subject, he undoubtedly influenced reforms in the treatment of patients suffering from it. He was for many years an energetic member of the visiting staff of the old General Hospital, and he was the staff representative on the committee which was responsible for the design and the building of the Royal Hospital. When the British Medical Association visited Belfast in 1884, he was unanimously elected its president.

Professor Cuming was an accomplished linguist, and spoke several modern languages fluently; he had a profound knowledge of Heine and Goethe, he had a remarkable knowledge of the ancient classics, and was a recognized authority on "Horace." He placed a high value upon general culture, and disapproved strongly of the tendency to make medical education concern itself too exclusively to the physical sciences. He died suddenly of "cardiac asthma" on 27th August, 1899.

—R. H. H.

No. 10—WILLIAM STOKES, M.D.

William Stokes is one of a line of distinguished Irishmen. His father and grandfather were Fellows of Trinity College, Dublin, and his grandson was Adrian Stokes, the young pathologist who so recently died in West Africa, while investigating yellow fever. William Stokes was born in Dublin in 1804, but his father sent him to study medicine in Edinburgh, where he graduated M.D. in 1825. Little is known of his life as a student, but it must have been an unusually brilliant one, as he published, while still an undergraduate, a book entitled "The Use of the Stethoscope." This was the first work to attempt to correlate the physical signs detected by the stethoscope, with the pathological condition in the viscera. He sold the publishing rights for £70.

After graduation, Stokes returned to Dublin, where he was appointed physician to the Meath Street Hospital. His great opportunity for the clinical study of disease came a few years later, when, owing to the failure of the potato crop in 1826, the hospital was filled with the poor people who crowded into Dublin from the stricken country. The great majority of these patients suffered from diseases of the heart and lungs, and the studies which he made, during this time, of physical signs, and which he correlated by post-mortem findings, laid the foundations of two great and original works, "Diseases of the Chest," and "Diseases of the Heart." His work on the heart alone assures him enduring fame. In it, for the first time in medical

history, he differentiates between functional and organic cardiac disease, and he stresses the view that the condition of the heart-muscle is of much greater importance than the impaired function of diseased valves. He writes: "It is in the vital and anatomical conditions of the muscular fibres that we find the key of the cardiac pathology, for no matter what the affection may be, its symptoms mainly depend on the strength or weakness, the irritability or paralysis, the anatomical health or disease, of the cardiac muscle."

"We are justified in laying down a golden rule in practice, that in any case of valvular disease the determination of the condition of the auricles and ventricles is more important than that of the seat or nature of the valvular affection."

If this work of Stokes had not been allowed to fall into oblivion after his death, Sir James MacKenzie would have been spared the years of struggle which passed before he came to the same conclusion, which is the basis of cardiac treatment and prognosis to-day. In this work he also describes accurately the phenomena of auricular fibrillation, although this name was not applied to the condition until half a century later. In it he also gives the classical description of two conditions to which his name is attached—Stokes-Adams disease, and Cheyne-Stokes respiration.

Stokes's work, "Diseases of the Chest," is almost as important as his work on the heart. In it he discusses bronchitis, pneumonia, pleurisy, tuberculosis, and cancer of the lung. Up to his time almost nothing had been done in establishing the diagnosis of the latter disease. Laennec had stated that "the stethoscope ought to detect its existence," but this is the only reference to its clinical diagnosis. Stokes writes: "Cancerous disease of the lung is met with in two forms. In the first, a degeneration of the lung occurs, and the organ is transformed into a cancerous mass without the production of any tumour. In the second, the scirrhous or encephaloid matter forms a tumour, at first external to, and ultimately displacing, the lung. In neither case can we apply any direct diagnosis; and I do not know how the first could be determined with certainty. The symptoms are always obscure, and the physical signs being merely those of solidity, more or less extensive." The clinical condition of a patient is then given: "A man, aged thirty-six, about a year previous to his final admission into Meath Hospital was attacked with occasional stitches of the right side, followed by cough, hoarseness, dyspnœa, and scanty mucous expectoration . . . after some time a little tinged with blood. The face and neck became œdematous, and the swelling was observed to be greater on the right side. He came under my care in the spring of 1832, and remained about six weeks in hospital, during which time, after most careful and repeated examinations, I remained undecided as to the nature of the disease. He left hospital somewhat relieved, but without any change in the physical signs, which were that the whole side sounded dull, yet without the accompanying physical signs of a great empyema on the one hand, or pneumonia or tubercular solidity on the other.

"Soon after he came under Dr. Graves's care, suffering from extreme dyspnœa. He could only lie on the right side; he had a cough, with occasional scanty expectoration, slightly tinged with blood, pain of the right shoulder and slight stitches of the side. He experienced some difficulty of swallowing, referred the

obstruction to the lower part of the throat. . . . The right jugular vein was much distended, as were the veins in the right axilla; but this symptom was chiefly remarkable on the surface of the belly, where two veins, corresponding to the position of the superior epigastric artery, pursued a remarkably tortuous course along each side of the linea alba, being turgid and dilated to the size of seven quills."

The post-mortem findings of this case are next discussed, and an excellent description is given of the condition known as lymphosarcoma.

These two works are acknowledged to be the most acute, graphic, and complete accounts of the clinical aspects of cardiac and thoracic disease ever written. They form a brilliant contribution to medical knowledge, and have earned for their author permanent fame. William Stokes died in 1878.

—R. H. H.

BRITISH MEDICAL ASSOCIATION

ARRANGEMENTS are now complete for the one hundred and first annual meeting of the British Medical Association, to be held in Dublin during the last week of July. The president is to be Professor T. G. Moorehead, P.R.C.P.I., Regius Professor of Physic in Trinity College. It is now some twenty years since the B.M.A. last met in Ireland. Sir William Whitla was the president. Members of the profession travelled from all parts of Ireland to Belfast to help make that meeting a success, and it is hoped that the medical profession of Northern Ireland will travel in representative numbers to assist their Southern brethren to make this meeting equally successful. Professor T. H. Milroy is to be the president of the Section of Physiology and Biochemistry; Professor W. W. D. Thomson is to be a vice-president of the Section of Medicine; and Mr. S. T. Irwin a vice-president of the Section of Orthopædics.

The importance of membership to the B.M.A. cannot be overestimated, as it is essential to have a representative body to protect the interests of the profession in these days when State medicine is casting its shadow over medical practice in greater and greater degrees. The Association has many activities. Not the least of these is the Medical Bureau, which it maintains for the convenience of its members. Since the introduction of the Panel system into Northern Ireland, every medical practice here has a saleable value, as in England and Scotland, and it is important both to the buyer and seller of a practice that a trusted intermediary should be available. The British Medical Bureau is such a trusted intermediary. The Bureau since its inception in 1927 started with the advantage of commanding the experience of the Scholastic, Clerical, and Medical Association, established in 1880, and well known to the profession as a trustworthy and successful agency for the transaction of all medical business. The arrangement was brought about as a result of negotiations conducted by the Council of the B.M.A., with the approval of the Representative Body, whereby a considerable share in the capital of the Scholastic, Clerical, and Medical Association was acquired by the B.M.A., four representative members of which now act as directors of this old-established company.

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For the sake of reference, the business of the British Medical Bureau is divided under the following heads :—

1. TRANSFER OF PRACTICES, PARTNERSHIPS, ETC.
2. PROVISION OF RELIABLE ASSISTANTS AND LOCUMS TENENS.
3. ACCOUNTANCY : Investigation of Practices; Income Tax; Auditing Books and Accounts, etc.
4. FINANCE : Financial assistance arranged for the purchase of Practices and Partnership shares.

The head office of the Bureau is in London, with branch offices in Manchester, Liverpool, Leeds, and Belfast. The local secretaries for Northern Ireland are Messrs. J. Baird & Co., Imperial Buildings, 72 High Street, Belfast.

From much experience of the work of the Scholastic, Clerical, and Medical Association, and of its straightforward method of doing business, the B.M.A. commends the Bureau to its members with every confidence, and a number of practices have already been transferred in Northern Ireland.

Members of the B.M.A. have the advantage of a reduced scale of charges applicable to them. —R. H. H.

BRITISH MEDICAL ASSOCIATION NORTH-EAST ULSTER DIVISION

THE Division met in The Café, Coleraine, on Friday, 24th March. The chairman, Dr. S. J. Bolton, presided over an attendance of nineteen members.

It was decided to hold the annual golf meeting at Castlerock in May.

Professor W. W. D. Thomson read a paper on "Primary Carcinoma of the Bronchus." The speaker described a number of his own cases, and drew attention to the puzzling and unexpected symptoms which sometimes arise. Many specimens from actual cases were shown. A very full account of the subject from all aspects was given. The thanks of the meeting were expressed to Professor Thomson for a most interesting and helpful paper. The usual silver collection for medical charities was taken. Dr. Evans was thanked for kindly providing tea at the opening.

The annual dinner of the Division was held at Kane's Hotel, Giants' Causeway, on Thursday, 30th March. There were sixty-five members and guests present. After the toast of "The King," the chairman, Dr. S. J. Bolton, referred briefly to the recent death of Dr. Creery, and the company stood in silent respect for a few moments. Major White, headmaster of the Coleraine Academical Institution, proposed the toast of "The British Medical Association." He referred to the great work the Association had done to raise the profession to the high position it now held before the public. Dr. McLaughlin, honorary secretary of the Londonderry Division, replied.

Dr. Boylan then proposed the health of "Our Guests," and pointed out that a social meeting of doctors might degenerate into an orgy of "talking shop." Dr. R. H. Hunter, Queen's University, in replying, paid a tribute to the members of

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such a scattered division for their enthusiasm. Major J. Kirkland, London, and Alderman D. H. Christie, Mayor of Coleraine, also replied. The chairman's health was proposed by Dr. T. Adams, and Dr. S. J. Bolton replied. The toast of "The Musical Guests" was in the hands of Dr. Ross Thomson.

During the evening all present were delighted with the songs sung by Mr. A. Belford, B.L., Mr. Hugh Carson, and Dr. T. Adams, also selections on the ocarina by Mr. A. J. W. Christie from his repertoire.

Mr. D. McLaughlin and Mr. R. O'Neill gave several amusing recitations. The singing of "Auld Lang Syne" brought a most enjoyable evening to a close.

The Division met in the Cottage Hospital, Coleraine, on Friday, 15th May. The following office-bearers were elected for session 1933-4:—Chairman, Dr. W. F. Evans; Vice-Chairman, Dr. R. Allison; Representative at the Annual Meeting, Dr. Huey; Representative to Branch Council, Dr. Belford; Honorary Secretary and Treasurer, Dr. J. M. Hunter; Assistant Honorary Secretary, Dr. Sloan Bolton.

The following Kodak medical films were then shown: The Acute Appendicitis Operation; The Treatment of Fracture of Lower Leg.

The annual golf meeting was held at Castlerock on Thursday, 1st June. Dr. J. P. Thomson was the winner, and Dr. Sloan Bolton was the runner-up.

J. M. HUNTER, *Hon. Secretary.*

36 Eglinton Terrace, Portrush.

BRITISH MEDICAL ASSOCIATION NORTHERN IRELAND BRANCH

ON 27th April, Professor Alexander Fleming, of St. Mary's Hospital, London, gave an address on "Some Problems in Connection with Septic Wounds."

The president, Professor W. W. D. Thomson, was in the chair, and over one hundred members were present.

Professor Fleming stressed the fact that antiseptics, when used in the treatment of wounds, only destroyed the natural defences against infection, and demonstrated that bacteria grew better when the wound discharges were mixed with them. Intravenous administration of antiseptics was equally ineffective, although certain mercurials and arsenicals acted specifically against streptococci of the hæmolytic variety, probably by activating the leucocytes. The paper aroused great interest and provoked considerable discussion.

The annual meeting was held at the Royal Victoria Hospital on 17th May. A large selection of cases and specimens were shewn, and members attended from all over the six counties. Professor Thomson entertained the visitors to lunch after the meeting.

Dr. Armstrong, of Ballymena, becomes president in November, and Mr. P. T. Crymble is president-elect. Dr. Mea Fraser is vice-president.

C. J. A. WOODSIDE, *Hon. Secretary.*

8 Elmwood Avenue, Belfast.

THE ULSTER MEDICAL SOCIETY

THE ninth meeting of the Society was held in the Medical Institute, Belfast, on Thursday, 9th March. The president, Professor C. G. Lowry, was in the chair. Mr. Wheeler read a paper on "Tuberculous Laryngitis." This was an account of the work done by Mr. Wheeler at the Forster Green Hospital, and the results which he had obtained. It is published on another page in this number of the Journal. Professor Fullerton then gave an exhibition of cinematograph films, taken of himself performing the operation of prostatectomy, and that of nephrotomy, also a film showing his methods of dilating the urethra. These films were of extraordinary great interest. The details of the operative technique were presented with remarkable clarity in close-up view. The absence of hæmorrhage during the operation of prostatectomy, and the rapidity with which the prostate was secured, were noteworthy features. The value of Professor Fullerton's hæmostatic bag was clearly demonstrated, and the extreme ease of introduction commended it to the surgeons present. These films were taken on behalf of the Kodak Medical Library, to which they will form a valuable addition. They should have a wide circulation, as Professor Fullerton's reputation as a urologist extends far beyond the limits of Northern Ireland.

The tenth meeting of the session was held on Thursday, 16th March. The president, Professor Lowry, was in the chair. Dr. H. C. Crichton Miller, of London, gave an address entitled "Fears and Fancies in Clinical Medicine." Dr. Miller began with the statement that life was a process of adaptation to the surroundings in which the individual was placed, and that psychological medicine was the application of this adaptation to medicine : that it was a study of the efforts of individuals to adapt themselves to their surroundings. Formerly it was thought to be a subject confined to asylum patients, but that is not so. Patients in asylums are there because they have failed to adapt themselves to their surroundings. Psychological medicine deals with the minor aberrations of life, and is a prophylactic system of medicine rather than a healing one. Dr. Miller then discussed cases which he had treated, and used these to illustrate his methods of analysing the patient's mind, and in probing into the mental states which produced, or at least influenced, the illness of the patient. He pointed out the influence which the mental state of the patient held over the processes of organic healing. As an example he mentioned the broken femur. He said that calcium metabolism was controlled by the parathyroids, that these in turn were intimately incorporated in the thyroid, and that these influenced in their functional activities by the sympathetic nerves. He then said that if the patient was suffering from an unbalanced mind, that this would cause a disturbance of the thyroid activity, and this in turn interfere with calcium metabolism and thus interfere with the healing of the fractured femur. Professor Thomson moved a vote of thanks. Dr. Norman Graham seconded.

The eleventh meeting of the Society was held on 23rd March, 1933. Professor C. G. Lowry, the president, was in the chair. Dr. Heney read a paper of unusual

interest entitled "Pre-medication as an Aid to Anæsthesia." At the very beginning he laid great emphasis on the necessity for allaying fears which naturally beset the patient at the thought of the operation, and of not causing any unnecessary new ones. Fear was, he considered, a great antagonist to good anæsthesia, because of the manner in which it interfered with smooth induction. In support of his belief he instanced the ease with which a perfect anæsthesia was obtained in obstetrical practice and in operations in cases of acute abdomen, in both of which conditions there was mental quiescence, and the patient looked forward to the relief from pain. Pre-medication had done a great deal in minimising pre-operative anxiety, and in this way had done much towards improving anæsthesia in general. Dr. Heney considered that basal narcosis should only be pushed to give sleep or absence of apprehension, but never so far as to produce complete anæsthesia. Dr. Heney discussed the various drugs which were in use for basal anæsthesia, and dealt at some length with avertin. He considered it unsuitable for the aged, patients suffering from one or other extreme of thyroid dysfunction, and those who were greatly shocked or who had suffered severe loss of blood. For the supplementary anæsthetic, gas and oxygen was probably best, though ether was also generally suitable. In conclusion, Dr. Heney emphasized the necessity of making use of the best method of anæsthesia available.

The president then called on Mr. Ian Fraser, who read a paper on "The Diverticula of the Small Intestine." This communication showed that Mr. Fraser had made a very careful study of the condition, and had exercised considerable ingenuity in its investigation. Having given a classification of the various diverticula which might be found in the small intestine, and having dealt shortly with the others, he proceeded to describe at length the condition of multiple false diverticula, which was rare, but of which he had encountered a case. The diverticula were produced by distention of the jejunum with herniation of the mucous membrane through the muscular coat at points of entry of the arteries along the mesenteric border. Cases were very difficult to diagnose, and X-ray findings were generally negative. Sometimes, however, a very characteristic appearance was produced, and was then diagnostic. Mr. Fraser showed in the course of his lecture, by means of slides, a large number of direct photographs, X-ray pictures, and diagrams of the conditions mentioned. Among them were some beautiful radiograms taken of his case, and showing the typical appearances.

The twelfth meeting of the Society was held on Thursday, 30th March, in the Medical Institute. Professor Lowry, the president, was in the chair. Professor Young read a paper on the diagnosis of cancer in the early stages. This paper was illustrated by a wealth of lantern slides prepared from Professor Young's own specimens. He indicated the types which were best treated by radical removal of the tumour, and those in which a serious outcome might be expected. Mr. Calvert read a paper on the end-results of two hundred cases of carcinoma of the breast on which the radical operation had been performed. These results show that the surgical operation holds the best outlook for early cases of the disease. We hope to publish this paper in another number of the Journal.