VOLUME 39 1970 PART I

THE ULSTER MEDICAL JOURNAL

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CONTENTS

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THE ULSTER MEDICAL SOCIETY

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THE
ULSTER MEDICAL JOURNAL

PUBLISHED ON BEHALF OF THE ULSTER MEDICAL SOCIETY

VOLUME 39 1970 PART I

THE PARIETAL LOBES: CLINICAL AND PATHOLOGICAL ASPECTS OF THEIR DYSFUNCTION

By R. S. ALLISON, *V.R.D.*, M.D., D.P.M., F.R.C.P.

Presidential Address delivered before the Ulster Medical Society on 23rd October, 1969

"The middle third of the cerebral hemispheres, strategically situated between the frontal, occipital and temporal lobes, is closely related in function to each of these regions of the brain. Partly as a result of this, a greater variety of clinical manifestations is likely to result from disease of the parietal lobe than from disturbance of any other part of the hemispheres. It must be emphasised, however, that these phenomena require special techniques for their elicitation, otherwise they may be easily overlooked or discounted in a routine clinical examination"[3].

SOME years ago Dr. Hurwitz and I had the chance opportunity of visiting an alligator farm in Florida. The monsters were kept in huge open pens and presented a lifeless appearance as they lay sprawled, partly on top of each other, in the hot sun. There was no blinking of their wide-open, staring eyes, no evidence of respiratory movements in their flanks – they might have been dummies, made out of pasteboard.

Two irresponsible, young servicemen, spectators of the scene as we were, after vainly trying to stir the creatures into activity by waving pocket handkerchiefs in front of their snouts and clapping their hands, poked a stick into one of them. The sensation produced must have been one more of increased pressure than of pain, but the result was dramatic for instantly the movement made in response to the stimulus had communicated itself to the other 20–30 reptiles in the pen so that they were transformed into one writhing, fearsome mêlée of thrashing tails and snapping jaws. And it was not until this welter of mass movement had subsided that the creatures lapsed once more into their natural posture of immobility.

It was a striking demonstration of the part played by proprioceptive sensory

stimuli in initiating movement. In man, as in the reptiles, awareness of posture and of the different body parts is effected involuntarily through the sensory flow emanating from spindles and other deeply-placed end organs in tendons, muscles and joints. These, as we know, are conveyed by the posterior columns of the cord to the lower brain stem where they excite appropriate motor responses through the nuclei of the extrapyramidal system. Thus, at any given moment in time, posture is determined not by deliberate thought, but automatically. Only novel or confusing combinations of stimuli are transmitted to the highest sensory level in the parietal cortex, there to be synthetized and identified after comparison with the other sensory data already stored in the brain from past experience.

And this is the probable reason why, in man, pathological disturbances affecting the parietal region give rise to so little obvious effects as compared to those involving the motor cortex, the speech area in the fronto-temporal region of the dominant hemisphere, and the occipital lobes. The probability is that under terrestrial conditions the functions of the parietal cortex are largely dormant and its potentialities still under-developed, but it is conceivable in this year, with the arrival of the first human beings on the surface of the moon (Fig. 1)[12], that we may be entering upon a new era of cerebral physiology. Apparently the astronauts found that even the act of moving the head on the neck was difficult and they were uncertain as to the relation of their feet to the ground. As Edwin Aldrin said: ". . . you have to take 2–3 paces before you can be sure your feet are underneath you." In walking, as was seen on television, they adopted a slow, prancing type of gait.

Thus, just as the capacity for speech and language developed in the human brain from the need for men to communicate with one another, so it is possible in the future that the parietal lobes may undergo further physiological development in respect to the new problem with which man will be confronted by his journeys into outer space, more frequent experiences of bodily weightlessness and the need to adjust his fixed, terrestrial, proprioceptive mechanism to the changing effects of gravitation on other planets.

This is the first reason – albeit a purely hypothetical one – which has prompted me to choose the parietal region as subject for the Presidential Address this year. I hope it may have some interest for the members of this old-established society, which has ever been representative of most if not all the discipines in medicine and surgery.

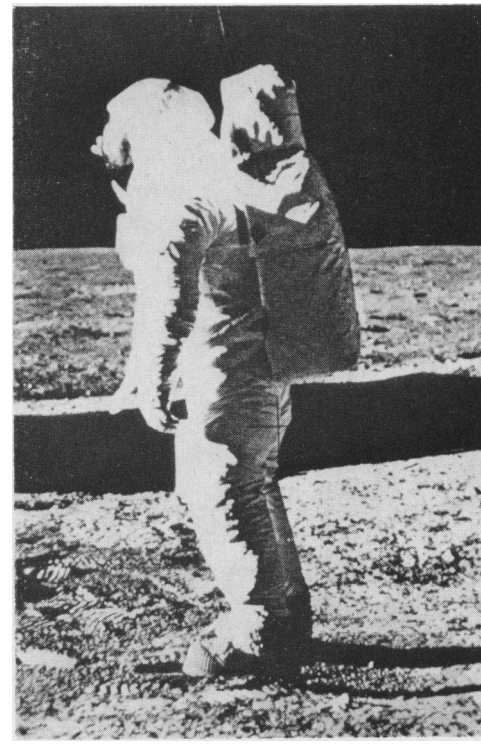
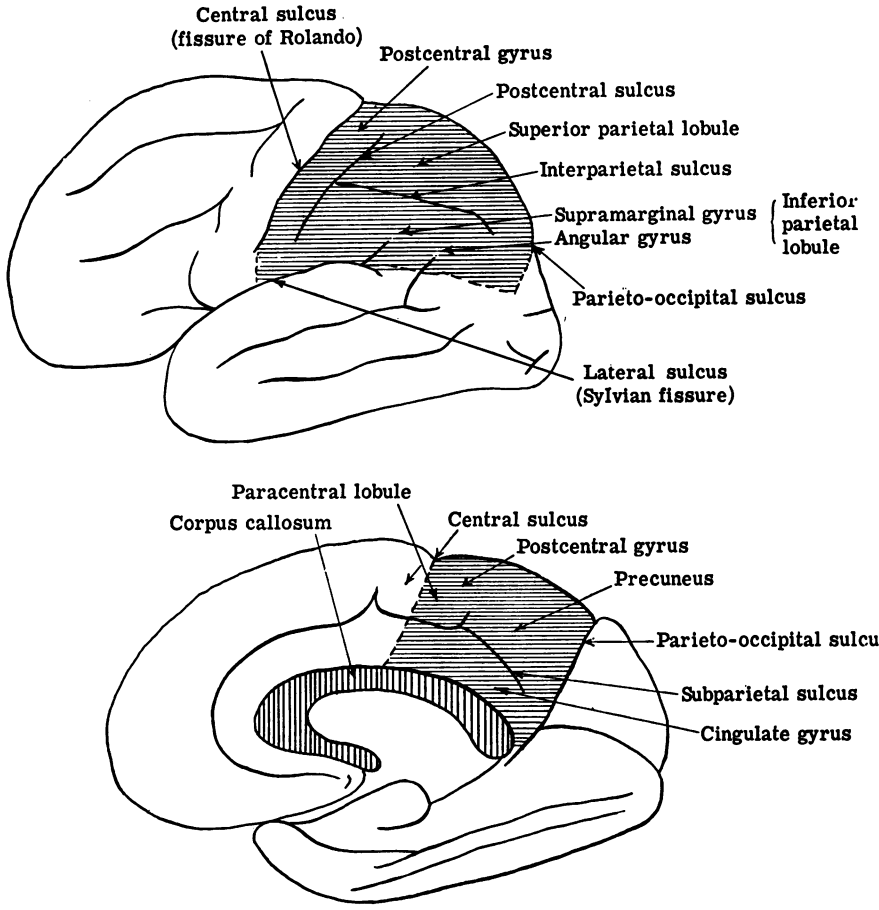


FIG. 1. *By kind permission of National Aeronautic and Space Administration*

The parietal lobes are an artificial or man-made convention; as it has been said [5] "a topographic convenience pegged out upon the surface of the brain." Until the beginning of the nineteenth century the cerebral cortex was not partitioned into lobes. The term "parietal" only came into usage about 1850, after Burdach and other anatomists began to speak of lobes and the tendency was to correlate the different regions of the cortex with the skull bones overlying them. Figures 2 and 3 illustrate the extent of the parietal lobe: on the lateral surface it is roughly quadrilateral in shape; anteriorally the central sulcus forms its boundary, as does the lateral sulcus inferiorally; the posterior margin is formed by an arbitrary line drawn downwards and slightly forward from its parieto-occipital sulcus to its junction with the line of the lateral sulcus as extended



FIGS. 2 & 3. *The lateral (above) and the mesial (below) aspect of the parietal lobe are shown by horizontal shading.*
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posteriorally. The interparietal sulcus divides the superior parietal lobule from the inferior, and other features on the lateral surface are the post-central gyrus, the angular and supramarginal gyri. On the medial side the parieto-occipital sulcus marks its posterior margin as does the imaginary extension of the central sulcus over the paracentral lobule, behind which is the precuneus. Part of the subjacent cingulate gyrus is also included.

A second reason for choosing the parietal area is because of the many interesting syndromes to which disorders of its blood supply can give rise. Placed as it is at one of the chief watersheds between the opposing streams of the carotid and basilar-vertebral systems, the parietal cortex and its underlying white matter may be likened geographically to a tableland or sort of "high veldt". Blood supply on its lateral surface is derived from the third and fourth terminal branches of the middle cerebral artery, which ends in the artery to the angular gyrus. The medial part of the lobe is supplied by branches of the anterior and posterior cerebral arteries. A not uncommon anomaly of the circle of Willis is a rudimentary or absent posterior cerebral artery on one side. This may not matter in health but, when occlusion has occurred in one or other of the carotid or vertebral arteries so that cerebral circulatory efficiency is being maintained by three main trunks only, any additional disadvantage makes it all the more likely that the parietal area will be the first part of the cortex to suffer the consequence of ischaemia.

The concept of cerebral circulatory insufficiency has only been developed in the past fifteen years and with it has come realization that additional occlusion of main vessels is not always necessary to provoke it. Cerebral circulatory insufficiency can be induced by such differing aetiological factors as hypoxia, hyperglycaemia, hypoglycaemia, cervical spondylosis, the onset of cardiac arrhythmia to name only a few of its many precipitating causes[10]. When cerebral ischaemia is prolonged, areas of necrosis (ischaemic infarction) result, but there are plentiful anastomotic connections between the four major vessels supplying the brain, and their intracranial branches also anastomose freely before entering the brain substance. In case of blocking of one middle cerebral artery, a collateral circulation can be established by opening up of communications between lepto-meningeal branches and terminal branches of the anterior and posterior cerebral arteries so that the territory may again be adequately supplied with blood. Time, however, is an indispensable factor if an efficient collateral circulation is to be established. Ross Russell and Symon[11] have shown in experimental work with baboons that, when one carotid is ligated, there is a marked fall of intracranial perfusion pressure. The same occurs after the second carotid and, following that, a vertebral artery is ligated. But, if 6 weeks to 3 months are allowed to elapse between the ligation of each main vessel, when all three are tied, the animal is left with an intracranial circulatory pressure, stabilized at about 50 per cent of which it was in the intact animal.

The clinical implications to be drawn from these observations are especially relevant to man because the sudden onset of mental confusion may be the only obvious expression of cerebral circulatory failure at the parietal watershed. There will be no hemiplegia, no aphasia, none indeed of the classic signposts upon which we are accustomed to rely in making the diagnosis of an acute cerebral vascular lesion. Mental symptoms predominate and the mistake is easily made of assuming

that these are of purely psychological origin, if not due to some toxic cause such as drugs. The parietal region is often spoken of as one of the "silent" regions of the brain – silent, that is, because lesions of it give rise to no gross physical signs – but, if steps be taken to examine such patients closely, evidence will usually be found that intellectual function has been impaired. This is my second point: to draw attention to the frequency, in middle and later life, of minor vascular disturbances affecting this region, and to remind you that the clinical effects are often reversible. When a patient recovers his former mental health, therefore, it does not follow, *ipso facto*, that this can be attributed to the "treatment" given.

The third point is one which will also be familiar to the psychiatrist: the frequency with which the primary, cerebral cortical atrophies, e.g., Alzheimer and Pick's diseases, can be simulated by brain tumours, and especially, meningiomata. These tumours are relatively frequent in later life[12] and are most eminently suitable for operation, but they can, and often do, grow quietly in the parietal region and remain unsuspected for years. The same is true of chronic subdural haematoma, although here a shorter history is usually obtained and there are recurring periods of drowsiness and other signs of flunctuating intracranial pressure to guide one.

The older textbooks stressed the tendency of meningiomats, when situated on the convexity of the hemisphere, to cause fits. But, if fits occur with parietal tumours, they are usually so transient or so psychial in their content as to pass unnoticed, and in none of my own personal cases were fits a prominent feature although, as in presenile dementia, gross impairment of memory was often seen. Curious aurae, described as "jamais vue" and "dêja vue" can also occur with parietal lesions, and it is probable that specific impairment of topographic memory is related to disturbances of function in this region.

One recognizes the enormous strides which have been made in the diagnosis of intracranial tumours and focal vascular lesions by instrumental means: echoencephalography, studies of cerebral circulation time, and brain scanning with isotopes. These tests can be done in a single day and have an even more important advantage over lumbar encephalography and angiography in that they give rise to no ill-effects to the patient. Dr. Swallow has recently conducted a trial to appraise their diagnostic value in 107 selected patients – 67 suspected of harbouring an intracranial tumour, 17 thought to have cerebral vascular disease, and 11 suspected of presenile dementia. In 83 out of the 107 cases, or over 77 per cent, a correct diagnosis was reached through their use[17].

There is, of course, the expense of these refined methods of investigation to be considered but the clinician need not despair; a place still exists for simple, bedside techniques of examination, which cost only time and patience. So I propose to devote the remainder of this hour to consideration of the signs and symptoms one may expect to find in patients with parietal disease. The clinical approach demands some appreciation of both physiological and psychological mechanisms because in many respects the symptoms belong to that border-line area or "No-man's Land" which lies between neurology and psychiatry. It is, however, a fascinating field which any interested doctor may explore with profit and with only his senses to guide him. Far from contracting, as has happened in some other clinical fields in which instrumental methods are now taking precedence over

purely clinical methods, the field of clinical neuropsychology is expanding, many aspects of it still awaiting elucidation.

First it must be emphasized that the subjects of organic brain disease are more suggestible than are normal, healthy persons. Their responses to tests vary from day to day and are influenced to some extent by the degree of rapport it is possible to establish with them. They tend to conceal rather than to flaunt their disabilities and, especially in parietal disease, have difficulty in grasping what is required of them. This is not due to stupidity or lack of co-operation on their part but to the peculiarities of their mental disturbances.

For many years in the approach to such patients, I have abandoned traditional methods of case-taking and simply invited the patient to tell me about himself or to say in what direction his difficulties lie. He is encouraged to talk, leading questions being avoided, and his spontaneous utterances, lucid or garbled, brief or long, as the case may be, are taken down as far as possible verbatim; and during the recital as much attention is paid to his behaviour as to what he actually says[1]. The notes are then supplemented by responsible relatives and friends upon whom one relies for details of past illnesses, the work record, family history, possible exciting causes and duration of symptoms.

Physical Signs in Focal Parietal Disease

A. Sensory Disabilities

(1) Impaired joint-position sense in fingers.
(2) Loss or impairment of two-point discrimination.
(3) Defective tactile localization of stimuli.
(4) Sensory neglect or "inattention".
(5) Astereognosis.

B. Motor Disabilities

(1) Some degree of inco-ordination.
(2) Diminished muscular resistance to passive stretching.
(3) Muscular wasting.
(4) Poverty of voluntary movements.
(5) Manual dyspraxia.

Sensory Disabilities in Parietal Disease

The sensory disabilities were first clearly defined in 1911 by Head and Holmes and more recently have been reviewed very fully by Macdonald Critchley[5]. Crude or common sensation is unaffected, the patient being capable of appreciating touch, pain, temperature changes, vibration and the position of joints, like any normal person. This is the general belief, but it has been my experience, when sufficient care is taken, that *defects in position sense in the distal joints of the fingers and toes,* on the side contralateral to the lesion, can often be demonstrated. Such tests involve the making of judgements and it is important, I think, to have a trial first with the patient's eyes open so that he can both watch and feel passive movements being made and demonstrate by his answers, when the joint is moved passively "up" or "down" that he comprehends what is expected of him and that any hesitancy he shows is not due to an associated expressive speech difficulty. The interphalangeal or terminal phalalgeal joints are selected and, with the rest of the limb immobilized,

passive movements are made abruptly, a pause being given between each test, during which the joint is held still and the patient gives his answer. In patients with more obvious expressive aphasia, spoken answers should not be sought but the subject directed instead to copy the direction of the movements being made by the examiner with the thumb of his disengaged hand.

Loss or impairment of two-point discrimination over the finger pads on the side contralateral to the lesion is one of the most reliable signs of parietal disease. One can use a standard aesthesiometer, but pointed wooden sticks will do very well. Less important than the actual measurement of the distance apart two tactile stimuli must be placed before they are perceived separately is the repeated demonstration that this difference is much greater on one side than it is on the other, e.g., 1–2 mms. on the right finger pads as compared to 7–10 mms. on the left.

Another valuable sign of parietal dysfunction which is not tested for as often as it should be is *defective tactile localization.* With the patient's arms extended, wrists pronated and completely relaxed, points on the skin over the palms of the hands, forearms and arms are touched with the point of a marking pencil. The point should be retained in position for a few seconds before it is withdrawn and the patient then invited to indicate with his finger the place where he has been touched (Figs. 4 and 5). As before, testing is done first with his eyes open and then closed. The points he indicates are marked with a cross and the distances between the actual and judged sites compared on the two sides; only big differences, e.g., 2 centimetres or more, over the back of the hand or 5–10 centimetres over the forearm, are significant. Trifling differences can be ignored. The whole point of the test is to show a consistent discrepancy between the two sides.

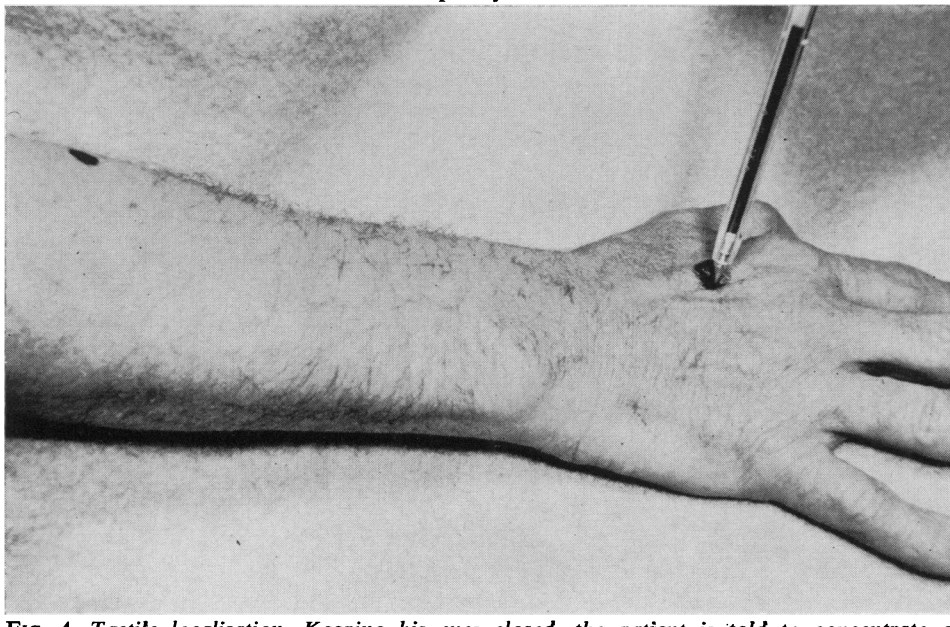


FIG. 4. *Tactile localisation. Keeping his eyes closed, the patient is told to concentrate on where he feels the pencil touching him. The point of the pencil is held in position for a few seconds and then withdrawn.*

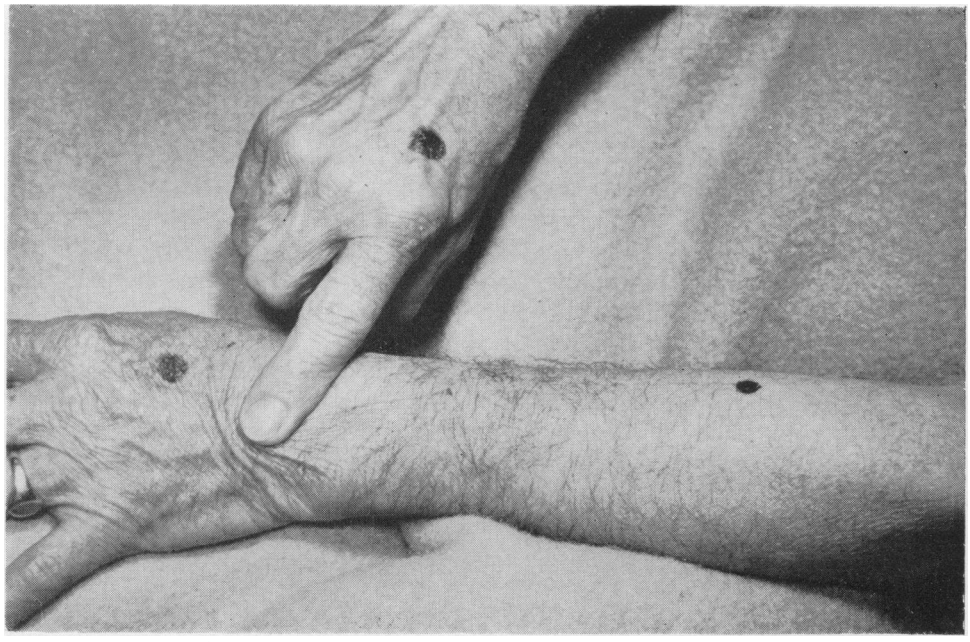


FIG. 5. *Tactile localisation. The patient then points with the forefinger of his other hand to the supposed point of touch. The distance between the actual and supposed points of touch are measured and compared on the two upper extremities.*

In some instances of parietal disease, position sense in the contralateral limbs is so defective, especially in the upper limb, that the patient has difficulty, with the eyes closed, in finding the affected limb in space when it is held away from the body and he is told to grasp the thumb with his other hand. He gropes about in space until the hand comes into contact with some part of the limb, usually in the region of the elbow, after which he works his way down with his hand until he comes to the thumb.

When the above signs can be elicited they provide strong evidence for a parietal lesion. But, as always in making a diagnosis of organic brain disease on the basis of subjective findings, confirmatory proof is required in the patient's behaviour of some sensory disability and this is usually forthcoming when tactile or painful stimuli are applied simultaneously to the two sides (Fig. 6). Typical is the finding that, although single stimuli are perceived on either side, when they are applied simultaneously the stimulus over the affected side is ignored. Varying the intensity of the stimulus does not affect this result for a patient may repeatedly deny a pin prick applied to his affected arm when a light touch is made simultaneously to the same point on the opposite limb. The same applies to the face, but, to a lesser extent to the trunk where the phenomenon is usually not demonstrable except in association with gross sensory loss, when it obviously ceases to have significance *per se.*

Sensory inattention or neglect affects a subject's day to day activities in different and often bizarre ways: One man, who later was successfully operated on for a

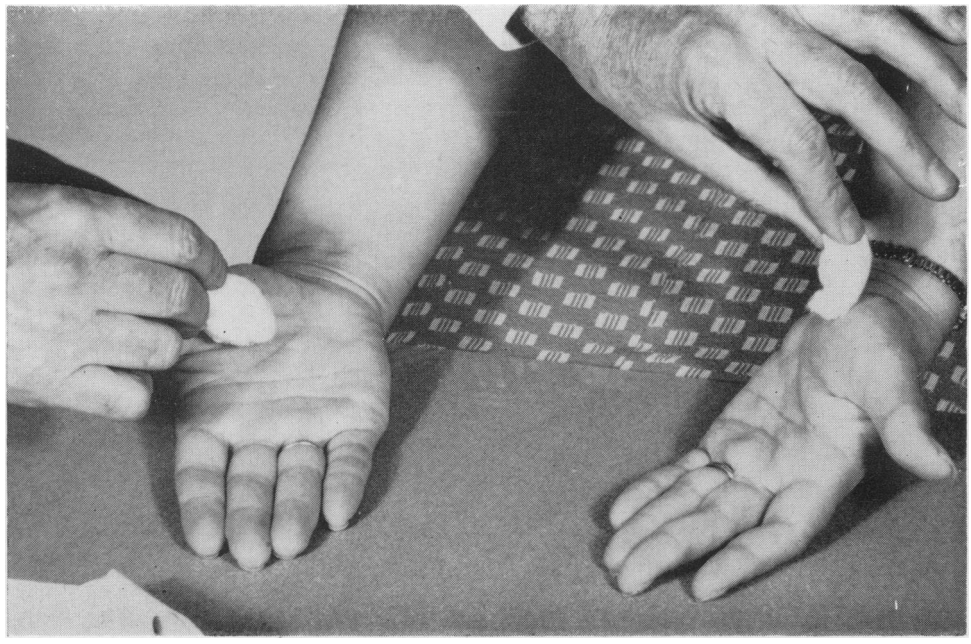


FIG. 6. *Application of simultaneous tactile stimuli to the same points on both sides for demonstration of sensory neglect or inattention. (Actually on the illustration the points are not quite identical. Coarse stimuli are being applied purposefully).*

large, right, parietal meningioma, has been a semi-invalid for some years. Following a transient spell of weakness in the left arm, attributed to a minor vascular accident, he found that although power had returned to the limb it did not feel normal. And one day, rummaging about in a drawer for some object, when he found it and went to close the drawer, he left his arm in it, injury resulting through its not being automatically withdrawn along with its fellow. Another instance which may be cited had even more misleading consequences :

The patient, the foreman of a gang of shipwrights in Harland & Wolff's, aged 58, had been admitted to hospital under the suspicion that he was suffering from syringomyelia. This was because there was an extensive third-degree burn (? from a cigarette) on the back of his left hand, which he could not account for. His relatives were more concerned at the confusion of mind he had shown for some weeks and which had reached its climax one night when he appeared in the street, clad only in his night attire.

General and neurological examination was negative. When tested with single pin pricks and touches he responded naturally although not so promptly over the left arm as on the right. There was no dissociated sensory loss, but when pin pricks were applied to the two sides simultaneously, he invariably ignored the stimulus on the left.

His mood was euphoric and talk free and uninhibited. There was defective memory for recent events and he was disorientated in time, but not for place or for persons.

Despite the evidence of dementia it was felt that the repeated demonstration of unilateral sensory inattention justified further action and, thanks to Mr. Gleadhill, a ventriculogram was done: it showed a chronic subdural haematoma lying over the right parietal cortex. This was evacuated, the sensory inattention on the left arm disappeared, and the patient returned to his work in the Yard, although still exhibiting some signs of cerebral deterioration.

Astereognosis. Failure to recognize by touch alone the nature of an object is probably the best known and most widely tested sign in parietal disease. Absolute failure, however, usually denotes the co-existence of some crude sensory loss as occurs, for example, in disseminated or multiple sclerosis, when there is a plaque in the cervical cord, lying astride the posterior root entry zone coming from the ipsilateral upper extremity. The parietal patient's common sensation is virtually intact. His disability may be compared to that of a man who, whilst fully capable of selecting a shilling or ten shilling piece from among other loose change in his pocket, would be at a loss if required to identify the coins of any other system of currency. All such acts of identification depend on past experience and upon the integrity of the storage system for such memories within the brain and of the connecting neutral pathways.

Stereognostic disabilities, of course, only have significance in indicating a focal parietal lesion when it can be demonstrated that they are present only on the contralateral side. Varying degrees of bilateral dystereognosis are in keeping with global, cerebral cortical affections, or they may be due to an expressive speech defect with particular naming difficulty. So as before, when in doubt, the patient should first be shown the objects with which he is to be tested and invited to name them. A duplicate set of the same should be left exposed to view whilst, with his gaze averted, the same objects in turn are placed in the hand to be tested; all he has to do then is to point with the free hand to its fellow on the table before him.

Another method is to observe his performance when identical objects are placed simultaneously in his upturned palms. Thus, if two-shilling pieces are used, the object lying in the unaffected hand is identified promptly by the patient's pronating his wrist and bringing the coin swiftly into apposition between the pads of the thumb and forefinger or middle finger. One or two stroking movements are then made and he announces what it is. Meanwhile, on the affected side, no notice may be taken of the coin until his attention is drawn to it and then, if he pronates the wrist, his attempts to manipulate it into apposition with the finger pads are clumsily effected, the fingers bunching together and the coin being held loosely between three or four of them with one of its edges protruding, if it does not drop to the ground. These dyspraxic features are frequent accompaniments of dystereognosis although, when the examiner himself deftly manipulates the patient's fingers over an object, reproducing the same motor pattern as is employed in identification, the subject of parietal disease will still be unable to say what the object is.

A feature common to all such patients is their tendency to guess at the nature of objects, without first submitting them to careful tactile scrutiny, or to perseverate, naming the first one or two objects correctly, e.g., a toothbrush, cork, and then when a comb is placed in their hands, to declare that it is a toothbrush. This reflects the natural mode of perception in health whereby it is necessary only to recognize one or other distinctive feature of an object to enable an appropriate "gestalt"* to be formed of the whole. All brain-damaged subjects are defective in their ability to separate the relevant from the irrelevant; to distinguish between

*Gestalt (German)=form, shape, figure. The gestalt school of psychology's views succeeded those of older psychologists who held that perception occurred chiefly by transcortical association: A+B+C+D etc., so-called "apperception".

the central feature in a set and background objects. But this does not mean they are incapable of re-learning former skills. Provided its underlying pathological cause is no longer active, this can be effected to some extent with the help of an occupational therapist who is prepared to devote her time and patience to instructing the patient not to guess but to fall back on the more tedious method of apperception, that is, the amassing of as much information as possible of the different qualities of an object before coming to a conclusion as to its nature.

This view was supported by a case, seen some years ago, in which there was a prolonged follow-up period. He was an intelligent man in his late fifties who had sustained a left cerebral thrombosis, causing hemiparesis and some receptive and expressive dysphasia. After three months these signs disappeared and, although there was no gross sensory impairment, he was left with a residual, severe degree of dystereognosis in the right hand.

Limiting the number of objects and selecting only such as were big and had many distinctive qualities – e.g., a pair of scissors, glove, toothbrush, pipe, comb – attempts were made to familiarize him with them by repeated usage and testing. But, despite all efforts, the tendency to guess wildly or to perseverate went on until the patient became exasperated by his repeated failures. Smooth-surfaced, plane and spherical wooden shapes were then prepared and presented to him, his attention being drawn to the three edges possessed by the triangle, the four by the square and the absence of angles in the circle; and, within 1–2 weeks he was making swift progress in their recognition, ultimately passing on to more elaborate articles such as those which had first been used. It was also observed that, whereas before he had made little or no attempt to bring his right hand into use for bimanual tasks, he was now employing the affected arm more naturally. Fig. 7 and Fig. 8 are taken from samples of his answers whilst undergoing tests.

Fig. 7. *Dystereognosis of Right Hand following Cerebral Thrombosis.*

(A HANDKERCHIEF)

Q. What shape is it ?
A. "It does not seem to have any shape."

Q. Is it hard ?
A. "No, it is soft; I can crush it with my fingers."

Q. Is it rough to the feel ?
A. "No, it's smooth."

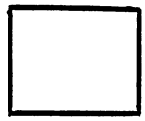
Q. Is it heavy ?
A. "No, it's light."

Q. What do you think it could be ? It is something you use every day; it has no shape and is soft, smooth and light.
A. ". . . it could be a piece of cloth."

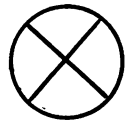
Q. Yes, that's very good. A piece of cloth for doing what ?
A. "Well, you might wash you face with it."

Q. Are there any other uses for a piece of cloth, that is soft and that you can crush, and has no shape ?
A. " . . (suddenly) it could be a handkerchief."

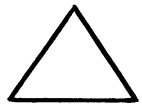
Fig. 8. *Dystereognosis. Limited Number of Test Objects.*



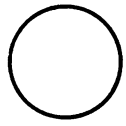
= "That's the square piece of wood because it has four corners and is flat."



= "That's the ball . . . I can't squeeze it."
Examiner: Is it flat ?
Patient: "No, it's not flat, it's round and the full of my hand."



= "There's three sides to it . . . I'm not sure about it . . . it's smooth and flat . . . it's a triangle."



= "That's flat, round and smooth . . . it's the circle."

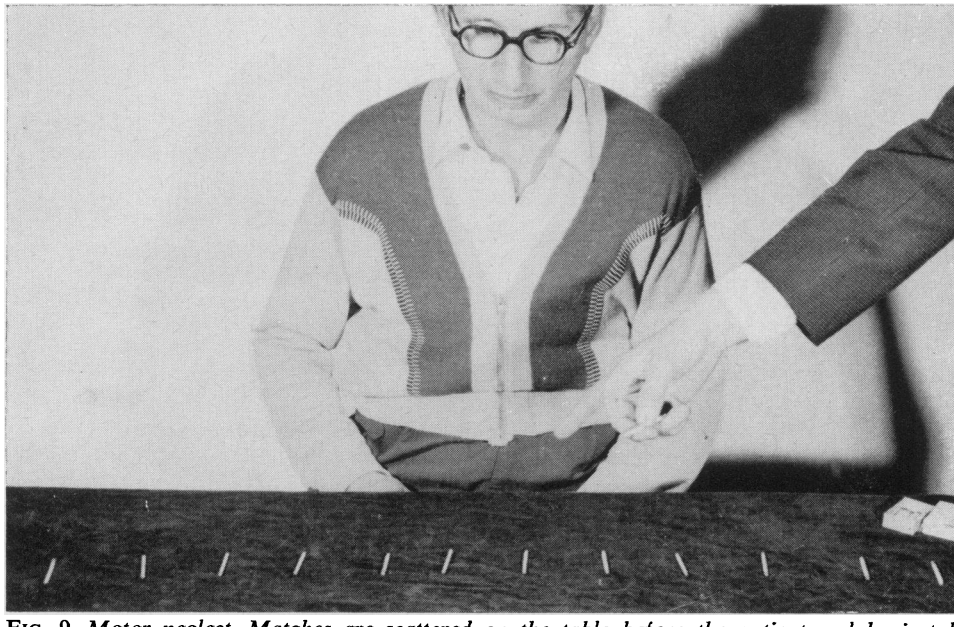


FIG. 9. *Motor neglect. Matches are scattered on the table before the patient and he is told to pick them up as quickly as possible. This man had a right posterior parietal tumour and although there was no evidence of contralateral weakness he used only his right hand to replace the matches in the box.*

Motor Disabilities in Parietal Disease

Provided the parietal lesion does not encroach upon or compress neighbouring cortical and subcortical motor areas, there is no paralysis. But nearly always it is possible to demonstrate some degree of inco-ordination together with diminished muscular resistance to passive movements in the limbs on the side opposite to the lesion. Muscular wasting, or rather some loss of substance in muscle, is seen occasionally in the small muscles of the hand and in the shoulder girdle, but its absence should not invalidate the diagnosis of parietal disease for it is by no means always demonstrable. By far the most common expression of motor disability is hypokinesia or poverty of voluntary movement, the arm remaining idle in common activities, which would normally require the use of both hands (Fig. 9. The motor dyspraxia often seen in patients with stereognostic defects has already been referred to.

Intellectual Defects in Parietal Disease

1. Dystereognosis.
2. Visual Spatial Disorientation and Simultanagnosia.
*3. Constructional Apraxia and Picture Agnosia.
*4. Disturbances of the body image or schema: autotopagnosia.
*5. The Gerstmann syndrome: finger agnosia, agraphia, acalculia and right-left disorientation.

Of specific intellectual defects to which focal parietal lesions may give rise disturbances of the stereognostic sense have already been considered. *Visual spatial disorientation and simultanagnosia* is a rare combination which is seen only when there are bilaterally placed lesions of the parieto-occipital cortex. In Balint's[3] original case bilateral softening was found. Holmes' cases [9] occurred in soldiers with bullet wounds of the head. In a case of Hécaen and Ajuriaguerra[8] a bilateral parieto-occipital astrocytoma was present and in another case, seen more recently at Claremont Street Hospital by Allison, Hurwitz and others[2] the symptoms followed decompression for an Arnold-Chiari type of malformation.

During the operation there had been a profound fall of blood pressure and this and anoxia were thought to be the cause. No anatomical confirmation of the site of the lesion was possible, but the visual field defects suggested biparieto-occipital lesions. This patient still attends hospital regularly and has succeeded in making a fair amount of adjustment to his disabilities.

Originally his visual spatial disorientation made it impossible for him to relate the position of objects to himself in space. In groping his way across a room, he would bump into things, not because he could not see them but because he could not tell how far away or how near they were. He could not shake hands without first groping at random for the other person's proffered hand (Fig.10); sit down on a chair unaided, or pour liquid from a bottle into a glass (Fig. 11). When a series of objects was set on a table before him he was unable to indicate by sight which were nearer and which further away, although he had no such difficulty in

*Denotes that these symptoms are often found in association with general clouding of consciousness and tend to disappear as "full" consciousness is regained. They have only localising, disgnostic value when they persist or occur at a time when a patient shows no other signs of clouding of consciousness.

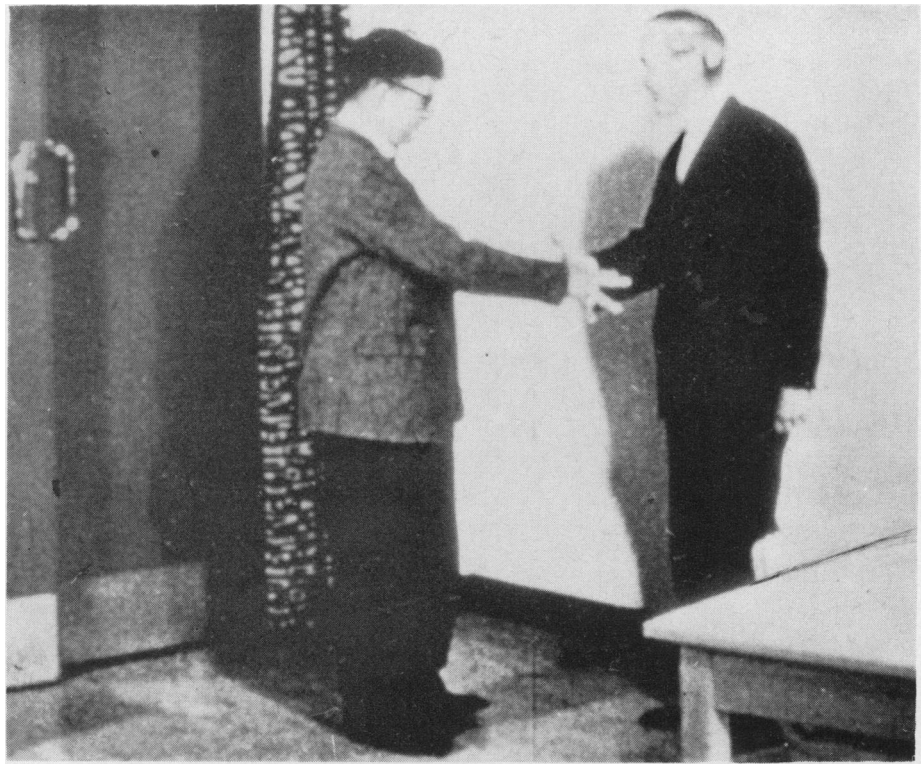


FIG. 10. *Balint's syndrome. Shaking hands. The patient, John G., aged 33 years, an electrician, has his back to the door and is being greeted by Dr. Graham White.*

locating the site and relative distance away of sounds. Now after 4½ years, his concentration on visual clues in moving about is still very obvious but he can reach out correctly towards objects, shake hands naturally, and sit down on a bench unaided.

His other great defect – inability to perceive more than one object at a time (simultanagnosia) – was very pronounced at the start. Wandering eye movements and locking of the eyeballs in fixation on an object were seen only in the first six months of the recovery period but defective scanning movements of the eyes persisted much longer. He could read single words with ease, provided they were shown one at a time against a plain background, and he understood their meaning, but he was totally at a loss to comprehend the printed instruction: "Put out your tongue!" although if the words were shown to him separately and consecutively they made sense and he complied.

To compensate for the reading difficulty it was necessary to improvise and he was provided with a wooden frame, especially constructed for the purpose. The frame, 18 inches square, had raised wooden strips as sides and was crossed horizontally at regular intervals by similar wooden strips.

FIG. 11. *Balint's syndrome. Pouring liquid from bottle into a glass (at 6th month after onset symptoms).*

FIG. 11. *Balint's syndrome. Pouring liquid from bottle into a glass (6 months after onset symptoms).*

Between these strips was inserted simple reading material, for example, newspaper headlines, transcribed in bold script, the words spaced at first not less than 2 cms. apart and with a pencilled line between each word. The patient had to place his index finger on the topmost horizontal strip (that is, top left corner of frame), and direct his gaze to his finger and thence to the word above it. When he came to the end of each line he was taught to guide his finger back again along the raised strip to the starting point where it met the edge of the frame, and then to lower it down the frame until he could feel the next strip below. Reading improved as he became familiar with the device and after two years he passed on to the use of mechanically run typescript on a drum, with the words set out in bold type and 5 mms. apart, the patient rotating the drum at his own speed. At the end of 4 years, he could read aloud Schonell's Simple Prose Reading Test, "My Dog", almost perfectly and with fair comprehension (Fig. 12).

Constructional Apraxia, as its name implies, refers to inability or defective ability to bring together into appropriate relationships with each other the component parts of a thing so as to form a whole. The act of laying a table for dinner, cutting out a dress from paper patterns or assembling the parts of a mechanical carpet sweeper are examples of constructional activities common to women just as are working in a machine shop from blueprints, wiring up an electrical circuit or erecting scaffolding equivalent tasks for men. Constructional apraxia is a common and often early symptom of generalised brain disturbance. Like picture agnosia, its perceptual counterpart, in which the different objects in a picture are recognised, but its meaning not understood, it is probably representative of failure to formulate appropriate gestalts. If looked for specially it can be observed in previously healthy subjects recovering from exposure to anoxia, after electric convulsion therapy and in epileptics regaining consciousness after a fit. It is seen too, in the early stages of dementia before the relentless advance of cerebral cortical atrophy has reduced its victim to vegetativeness. With purely focal brain lesions causing no disturbance of general consciousness, it is much less common. However, its frequent association with one or more of the features of the Gerstmann syndrome has prompted the belief that parietal disease is especially prone to induce the development of constructional difficulties and I have seen two patients, both with tumours involving the non-dominant hemisphere, in whom it was one of the earliest defects noted, the constructional dyspraxia being demonstrable for some time before their condition worsened with signs of general and increasing clouding of consciousness.

FIG. 12. *Balint's syndrome. Patient reading with aid of wooden frame.*

The most convenient and reliable way of testing for it is by the use of match sticks or Kohs' blocks. In the former method one assembles 2–3 matches or more in a geometric pattern and invites the patient to copy the design (Fig. 13).

For purely clinical diagnostic purposes it is not a matter of finding out what complicated designs the patient can reproduce because even with 3 or 4 matches it will be obvious, if the defect is present, that he is having difficulty in aligning the match sticks into the required relation with each other. And, if he succeeds in completing the first two designs he may perseverate when he comes to the third, reverting to the first or second pattern (Fig. 14). The use of Kohs' blocks as test materials presupposes that the patient has no defect in colour vision so it is

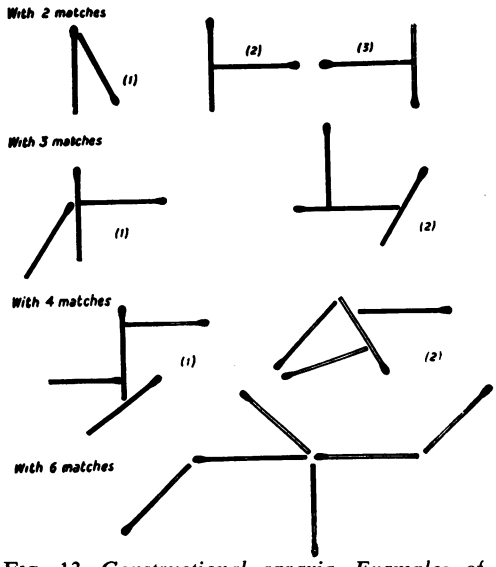


FIG. 13. *Constructional apraxia. Examples of simple designs made with mttch sticks, used for testing.*

No. of Test	Arranging of sticks	Patient's copy
1.		
2.		
3.		
4.		

FIG. 14. *Constructing designs with match sticks. The patient does the first two correctly but perseverates over the third design, repeating the previous one and when a fourth is set up does the same.*

advisable to let him familiarize himself with the different colour arrangement before setting up the simplest of the many test patterns available and inviting him to copy it. Usually, as is the case with match sticks it is seldom necessary to proceed far because constructional difficulty often declares itself by inability to bring four blocks together so as to form a square. In other instances an apraxic patient, obviously perplexed, will work away conscientiously but always failing to insert the last block correctly into the design. At this stage he gives up in disgust, declaring that it is a "child's game" and it is a long time since he left school, or, he may proceed to undo the design and begin all over again, a sequence suggeestive of perseveration but which the classically-minded Pineas [15] dubbed very aptly the "Penelope syndrome".

Disturbance of Body Awareness or of the *body schema* so that a patient denies that his leg or arm belongs to him are observed only with posteriorally extending (chiefly vascular) lesions involving the parietal region of the non-dominant hemisphere and causing left-sided hemiplegia and hemianaesthesia – the so-called autotopagnosia. In a more bizarre form in which visual field defects are often superadded, the patient may stoutly deny his hemiplegia and other defects and declare he is perfectly fit (anosognosia).

A good illustration was seen some years ago in a woman of 76 years who for some weeks after a stroke, during which there was persistent light clouding of consciousness, denied repeatedly that her left arm and leg belonged to her. When the left arm was held up and her gaze directed to it she still persisted in her denial and even confabulated making out that the arm was a baby which someone had placed in bed beside her.

The combination of *finger agnosia,* inability to form the shape of the symbols used in *writing*; loss of understanding of arithmetical symbols and of the place value

of digits, *acalculia,* and *right-left bodily disorientation,* like constructional apraxia, can all be demonstrated in patients showing general clouding of consciousness and it is only when the patient is otherwise lucid that the persistence of these disabilities has diagnostic value in pointing to a parietal lesion. In my own series of 18 cases the lesion responsible was found in the left parietal lobe more often than in the right, but two of the patients had tumours confined to the frontal region. Originally when Gerstmann[6], [7] first described inability to name or to identify the fingers, R–L disorientation, agraphia and acalculia, he concluded on the basis of anatomical pathological studies that the tetrad of symptoms was distinctive of a lesion affecting the dominant parietal lobe in the region of the angular gyrus but this view is no longer held[4]. What can be said with confidence, however, is that when two or more of the symptoms are present this does point to organic brain disease and that, when there is no associated general clouding of consciousness, the dominant parietal lobe is likely to be the site of the disturbance.

* * *

And now to conclude, because time, even on this privileged occasion, does not license me to dwell longer on a favourite topic. Little new has been added but you will have discerned that moving from alligators to spacemen and using the parietal cortex as a sounding-board, my chief purpose has been to stimulate interest in this comparatively new branch of the neurological sciences.

I am old, but not too old, to recognise that neurophychology is still too encumbered by complex and strange sounding terms, most of which possess only descriptive value and belong to an age when the neurologist, the psychiatrist and the psychologist each led his own blinkered and separate existence. Neurosurgery acted as the catalyst which drew them together and our concepts are well summed-up by one of its chief apostles, Dr. Wilder Penfield[14].

"Sensation and movement and speech and perception are not located in special areas of the cerebral cortex. But there are cortical areas that can be delineated with increasing exactness for each of these functions. . . . In each of them one may identify the neurone transactions without which the corresponding mental phenomena are impossible.

"The actions of each mechanism depends upon the cortical area, together with its connexions to underlying thalamus and other parts of the higher brain stem. Interfering with brain stem action results in unconsciousness.

"Cortical removals deprive a man only of one or more of his functional capacities. These are facts, not theories."

To-day, with so much technical aid available, the field should have an increasing appeal to many young men, already versed in orthodox clinical neurology. For those whose paths lie in the broader tracts of medicine and surgery, one can say without exaggeration that some acquaintance with neuropsychology is indispensable if the error is not to be made of assuming that bizarre and diverse symptoms, such as I have described, must necessarily be interpreted as evidence of widespread and irreversible brain disease.

I began life as a physician and will never depart from its discipline. If in later years I became especially interested in the topics we have been discussing, this can only be explained by the encouragement offered to me initially by two of my former chiefs, both Past Presidents of this Society, William Calwell and W. W. D. Thomson, and by my former colleagues, Cecil Calvert and Hilton Stewart, with whom I enjoyed so many happy hours. It has been a long road since the moment

in 1930 when I came back to Belfast and paid a visit to Professor Tom Milroy in the old Physiology Department at Queen's. He wanted to know what I had been doing and when I told him: "Medicine with a special interest in neurology," he looked at me in disapproval, but not unkindly, before commenting: "Neurology is a subject in which it is not enough to be interested, one must be engrossed in it."

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VALVE REPLACEMENT OR REPAIR IN MITRAL AND AORTIC HEART DISEASE

By P. MORTON, S. BEKHEIT and *J. G. MURTAGH
from The Cardiovascular Unit, Belfast City Hospital

This paper formed the basis of a communication to the Ulster Society of Internal Medicine in April 1969

INTRODUCTION

Among the advances in medical science of the last decade is the repair or replacement of the mitral, aortic or tricuspid valve. Progress in this field was made after the introduction of the extracorporeal circulation and perfusion techniques (Key et al 1958). Under direct vision, evaluation of valve dysfunction can be accurately determined and so adequate correction is achieved (Morris et al, 1962; Kay et al, 1960; Lellehei et al, 1958; Scott et al, 1958; Logan et al, 1967). Operations of this kind it is now no exaggeration to state have become a commonplace event and they must be considered amongst the important recent developments in the management of valvular disease of the heart.

This paper deals with the evaluation of the results of surgical treatment in eighteen patients attending the Cardio-Vascular Unit of the Belfast City Hospital. These patients underwent repair or replacement of one or more heart valves in surgical centres outside Northern Ireland in the years between 1963 and 1968.

PRE-OPERATIVE FINDINGS

The age and sex distribution of the patients is shown in Table I. There were ten females and eight males in the series and their ages ranged between 20 and 57 years with a mean of 41.2 years. Table II shows the distribution of the patients into three main groups. Group I comprised ten patients with dominant mitral incompetence with or without tricuspid insufficiency. Five patients in Group II had combined mitral and aortic valve disease of sufficient severity to necessitate replacement of both valves. In Group III there were three patients with aortic valve disease alone.

TABLE 1
The Age and Sex Distribution

Age	*Female*	*Male*	*Total*
20+	1	2	3
30+	2	2	4
40+	5	2	7
50+	2	2	4
Total	10	8	18

Duration of Symptoms. As might be expected those patients with mitral valve disease alone were symptomatic for a much longer period prior to surgery than those with pure aortic disease. The mean duration of symptoms being 7.7 years for

*In receipt of a British Heart Foundation Research Fellowship.

TABLE II — *The Three Main Groups*

Group	*Anatomical diagnosis*	*Female*	*Male*	*Total*
I	Mitral valve disease (±Tricuspid valve disease)	5	5	10
II	Mitral and aortic valve disease	2	3	5
III	Aortic valve disease	3	0	3

patients in Group I compared with 6.2 years and 3.3 years respectively for patients in Groups II and III.

Dyspnoea. All patients complainted of undue dyspnoea on effort. Of the fifteen patients in Groups I and II, all had at least Grade III/IV incapacity (New York Heart Association 1953), that is they were breathless on minimal exertion and seven were dyspnoeic even at rest.

Angina. Five out of eight patients with aortic valve disease experienced anginal pain. This was usually brought on by effort but in two cases it occurred at rest and produced total incapacity.

Cardiac Decompensation. All eighteen patients were considered to have failure of one or other or both ventricles as judged clinically. In several cases, especially in Group I, this was severe and unresponsive to medical treatment. In no patient was the decompensation attributable to any known reversible cause and therefore had to be presumed to be associated with myocardial impairment often of gross degree.

Atrial Fibrillation. This was present in all patients in Groups I and II but as might be expected in those with pure aortic valve disease sinus rhythm was universally present.

Cardiac Murmurs. A mitral pansystolic murmur of at least Grade III/VI intensity at the apex was audible in each of the ten patients in Group I in which mitral incompetence was the dominant lesion. Two patients in this group had long mitral mid-diastolic murmurs and were considered to have significant mitral stenosis in addition. The five patients in Group II all had mitral incompetence and in each of them aortic diastolic murmurs indicative of aortic insufficiency were also present.

Additional Sounds. A third heart sound of rapid ventricular filling was noted in seven of the ten patients in Group I. In the two patients in this group considered to have significant but not dominant mitral stenosis the additional sound was recorded on the phonocardiogram as an opening snap.

Electrocardiography. The electrocardiograms were consistent with left ventricular enlargement in fourteen patients. In the remaining four, all in Group I, right axis deviation and right ventricular dominance were present.

Radiography. The cardio-thoracic ratio was measured for each patient as an index of generalised cardiac enlargement. Figure I shows cardiac enlargement in a patient in Group I. In every patient the ratio exceeded fifty per cent. In fifteen out of seventeen patients it was greater than sixty per cent, and in seven of these the cardio-thoracic ratio exceeded seventy per cent. All patients in this series had radiographic evidence of left atrial enlargement which varied in size from moderate to aneurysmal.

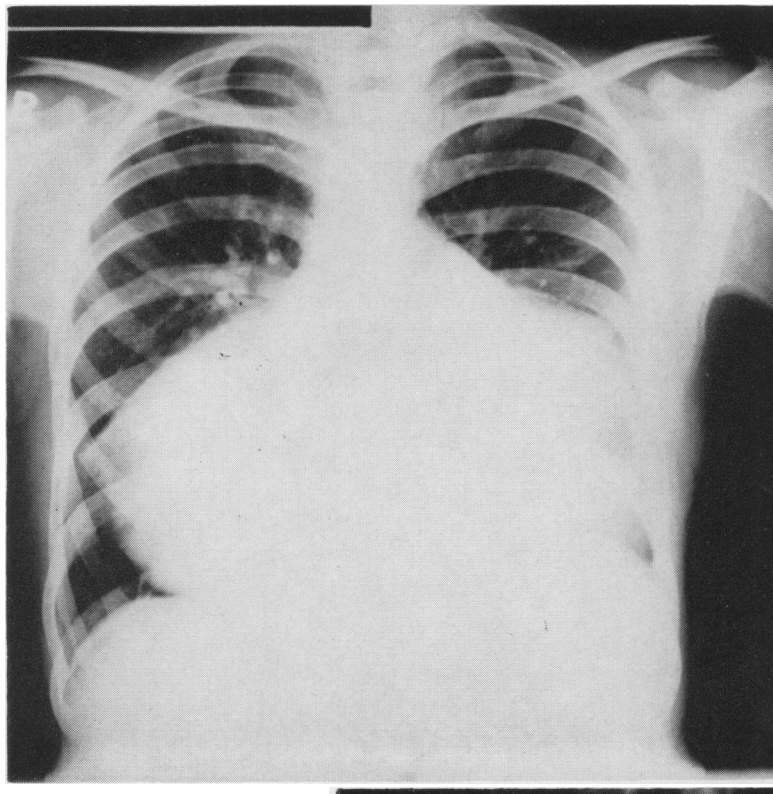


FIGURE 1
Aneurysmal dilatation of the left atrium.

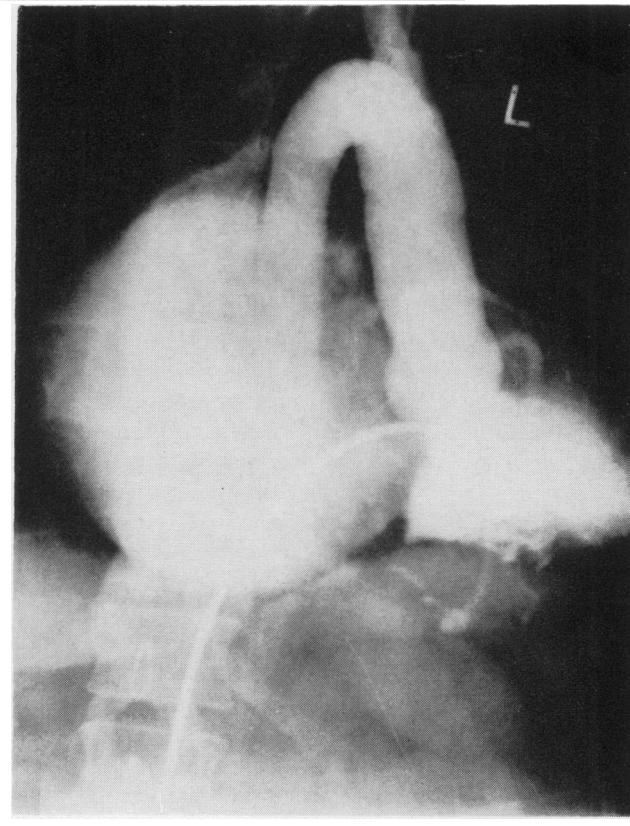


FIGURE 2
Left ventircular angiogram (trans-septal route) showing gross mitral regurgitation.

Mitral incompetence or aortic insufficiency were assessed by left ventricular angiogram or aortogram. Angiograms and/or aortograms were available in eight patients in all of whom the mitral or aortic insufficiency was considered to be at least Grade III out of IV. Figure 2 illustrates a left ventricular angiogram in a patient with gross mitral insufficiency.

Haemodynamic Data. The results of pre-operative haemodynamic investigations were available in twelve patients. Six of these were in Group I and pulmonary hypertension was present in all. In two, this was considered to be mild (P.A. systolic pressure less than 40 mm. Hg). Three patients had moderately severe pulmonary hypertension (P.A. systolic pressure between 40 and 60 mm. Hg). In one patient with tight mitral stenosis as well as incompetence the pulmonary artery systolic pressure exceeded 100 mm. Hg. Four out of five patients with mixed aortic and mitral valve disease had mild pulmonary hypertension, and in one it was moderately severe.

Operative Results

Table III summarises the results of operative treatment for the eighteen patients. Eight patients underwent mitral replacement or repair alone. Four patients required tricuspid valve replacement or repair in addition to mitral valve surgery. Four patients had their aortic valves replaced by Starr-Edwards prostheses, and two

Table III — *The Operative Mortality.*

Operative treatment	*No. of patients*	*No. of deaths*
Mitral valve replacement	4	0
Mitral annuloplasty	4	0
Mitral and tricuspid valve replacement or repair	4	1
Mitral and aortic replacement	2	1
Aortic valve replacement	4	1
Total	18	3 (16.6%)

required combined mitral and aortic valve replacement. Only three patients died during or immediately after operation so the overall mortality was only 16.6 per cent. The cause of death was cerebral embolism in one patient and the syndrome of low cardiac output accompanied by peripheral circulatory failure in the remaining two.

Complications in the Survivors

One patient aged 44 years who had a successful aortic valve replacement with marked improvement in exercise tolerance post-operatively, died suddenly and unexpectedly at home twelve months after operation. A post-mortem was carried out, and demonstrated a fresh myocardial infarction due to coronary occlusion.

Three patients in Group I and one in Group II sustained systemic emboli at one day, six weeks, eight weeks and fifteen months respectively after operation. One patient initially appeared to have severe cerebral damage but in the course of the succeeding few weeks she made a steady recovery and has only mimimal residual disability. The other three patients suffered only transient hemiparesis without dysphasia and all made a rapid and complete recovery. All patients were maintained on long term anticoagulants and with the exception of the incident at one

TABLE IV — *The longterm results in fifteen patients.*

Longterm results	*No. of patients*	
Late death (Myocardial infarction)	1	
Not improved (persistent M.I.)	1	
Improved:	13	
Moderately good		(10)
Fair		(3)
Total	15	

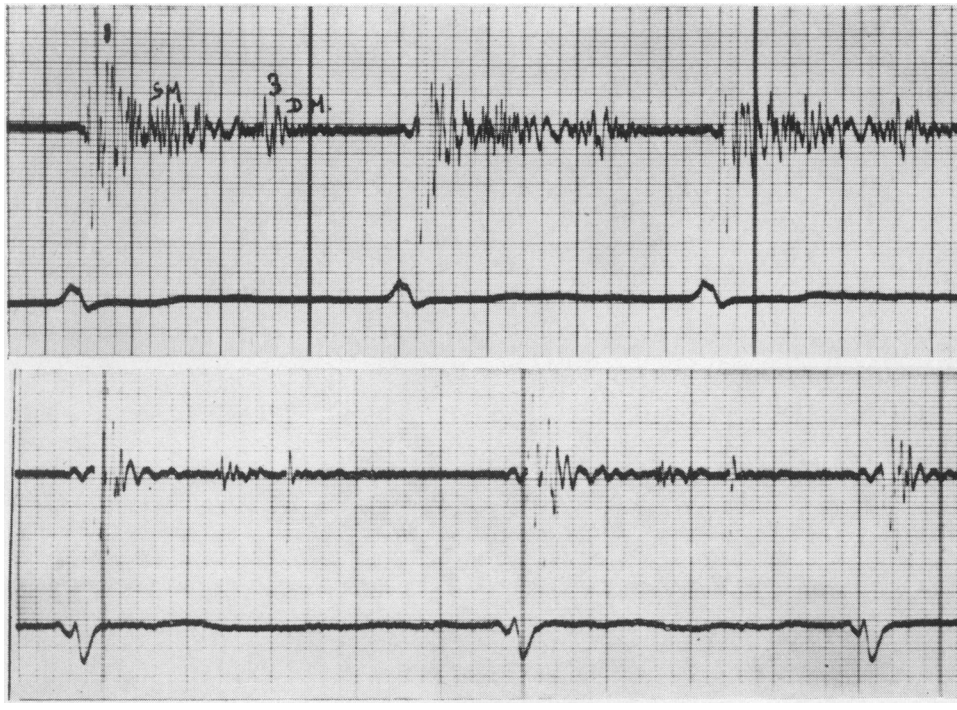
day, the prothrombin times were all at the lower end of the therapeutic scale at the time of the embolic episodes.

Table IV shows long-term results in fifteen patients. Of the fifteen patients who survived operation only one has since died. Amongst the remaining fourteen all except one have benefitted from operative treatment. Ten have had remarkably good results and have returned to work or normal household duties. Three patients have had a fairly good result, but the improvement has not been sufficient to permit them to resume normal activities. Amongst the nine survivors in Group I the initial systolic murmur was abolished in four, reduced in intensity in four, and unchanged in one. In two out of four patients in whom the murmur was reduced in intensity a mitral Starr-Edwards prosthesis had been inserted and following this systolic murmurs of little or no functional significance commonly occur. Seven patients in Group I were noted to have a third heart sound pre-operatively but in only two was this sign present at post-operative follow-up. Amongst the six surviving patients in Groups II and III five had aortic Starr-Edwards prostheses inserted for the treatment of aortic incompetence, and in all but one a short aortic systolic ejection murmur was noted post-operatively. Figure 3 shows pre- and post-operative phonocardiograms in one patient who had mitral incompetence.

All patients prior to operation had cardiac decompensation whereas post-operatively this was present in only three of the fifteen survivors.

The electrocardiogram especially in patients in Groups I and II provided little objective evidence by which to assess improvement post-operatively. However, the electrocardiogram of one patient with calcific aortic valve stenosis demonstrated a remarkable reduction in the degree of left venticular hypertrophy in the months following surgery. Of the thirteen patients with atrial fibrillation who survived operation only one returned to sinus rhythm post-operatively. This was achieved by D.C. shock thirteen months after operation and now twenty-three months later this patient remains in sinus rhythm with an almost normal electrocardiogram.

Table V compares the pre- and post-operative cardiothoracic ratios. In eight cases there was a reduction in heart size ranging from as little as 1.6 per cent up to 14.5 per cent. Six patients showed a small increase in C.T.R. varying from 0.4 per cent to 4.2 per cent despite considerable functional improvement in most instances. Figures 4 and 5 show the cardiothoracic ratios in a patient before and after mitral annuloplasty in whom there was an overall reduction in cardiac size of ten per cent after operation. Figure 6 illustrates Starr-Edwards prostheses replacing the mitral and aortic valves.



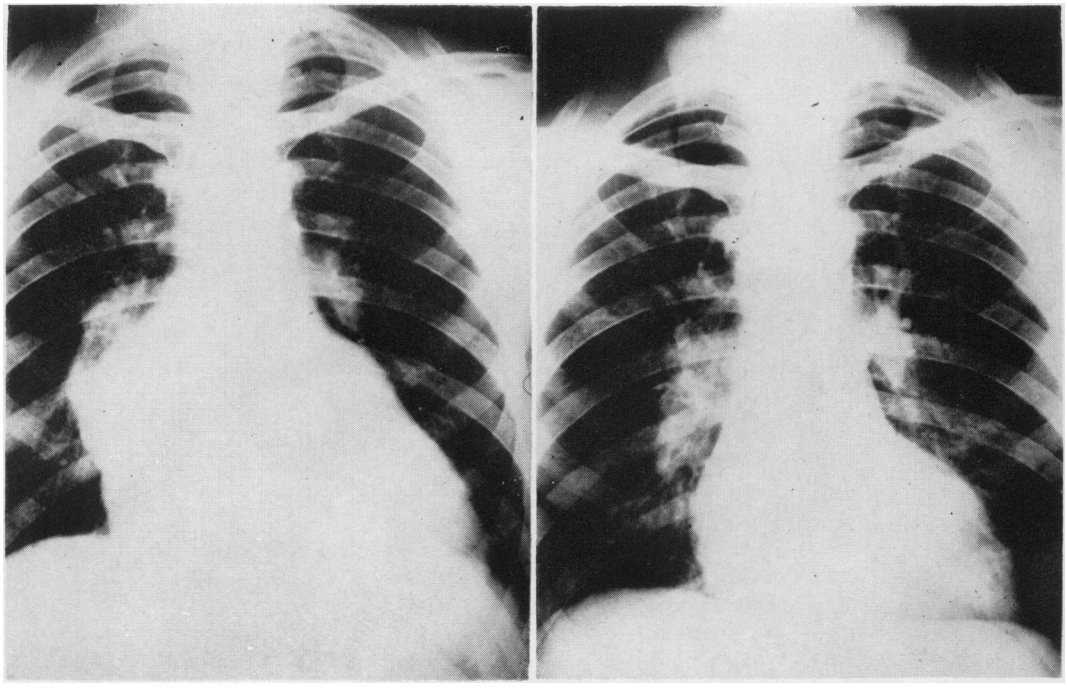
FIGURES 3A and B

Pre- and post-operative phonocardiograms of a patient with mitral insufficiency.

TABLE V

The Percentage Change in Cardio-thoracic Ratio Post-operatively

Patient	*Operative Treatment*	*Pre-op*	*C.T.R. Post-op.*	*Percentage change C.T.R. Post-op.*
1	Mitral valve replacement	84.4	88.6	+ 4.2
2	Mitral and tricuspid replacement	90.2	88.6	— 1.6
4	Mitral annuloplasty	74.0	59.5	—14.5
5	Mitral annuloplasty	77.7	71.5	— 6.2
7	Mitral valve replacement	76.3	78.8	+ 2.5
8	Mitral annuloplasty	55.1	64.7	— 9.7
9	Mitral and tricuspid replacement	85.0	82.5	— 2.5
10	Mitral annuloplasty	64.5	55.4	— 9.1
11	Mitral valve replacement	60.6	61.4	+ 0.8
13	Aortic valve replacement	63.3	54.7	— 8.6
14	Mitral valve replacement	78.1	78.5	+ 0.4
15	Mitral and aortic valve replacement	59.8	61.5	+ 1.7
17	Aortic valve replacement	62.2	62.5	+ 0.3
18	Aortic valve replacement	60.6	57.5	— 3.1
	Mean	70.7	68.9	



FIGURES 4 and 5

Pre- and post-operative chest X-rays of a patient with mitral valve disease.

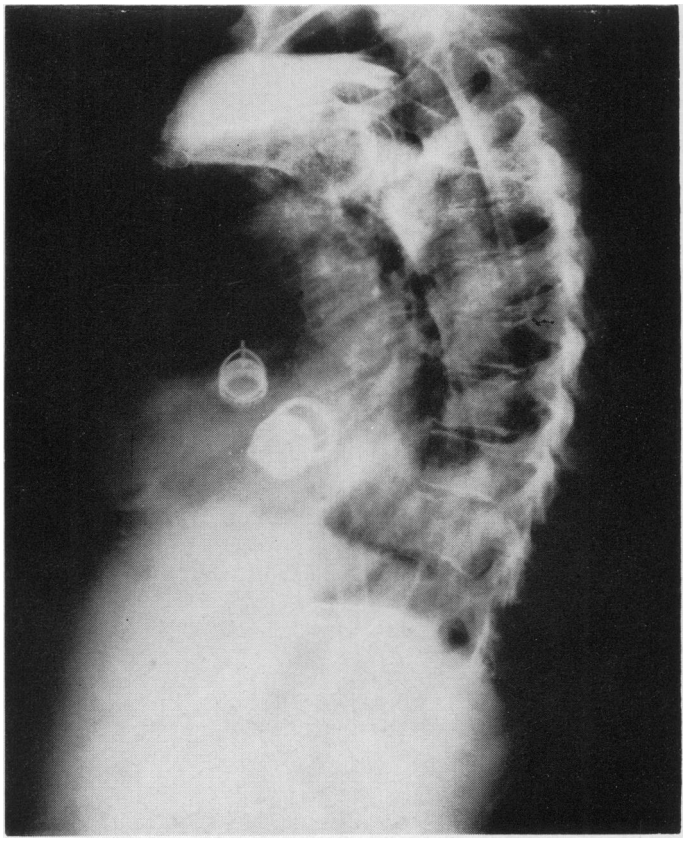


FIGURE 6

Starr-Edwards prostheses replacing the mitral and aortic valves.

Discussion

It is obvious from the clinical, electrocardiographic, radiological and haemodynamic data presented that the eighteen patients in this series had by any standard advanced valvular heart disease. Every individual had at least Grade III out of IV dyspnoea and cardiac decompensation pre-operatively. Further the mean cardiothoracic ratio before operation in these patients was seventy-one per cent. Half of the patients in Group I with dominant mitral insufficiency had in addition tricuspid insufficiency due to stretching and dilatation of the right ventricle and tricuspid ring. Taking all these factors into account, a relative quantitative assessment of the clinical state of each patient was attempted by arbitarily awarding points for the presence of each one and so the total pre-operative score was calculated. Thus points were awarded according to the degree of dyspnoea and cardiomegaly, for the presence of tricuspid insufficiency and cardiac decompensation. A similar calculation was made for each patient after operation and the results of this comparative study are presented in the histogram (Figure 7).

In all cases, except one patient who had persistent mitral insufficiency there was a considerable reduction in the post-operative score. This was brought about almost entirely by the disappearance of cardiac decompensation and tricuspid

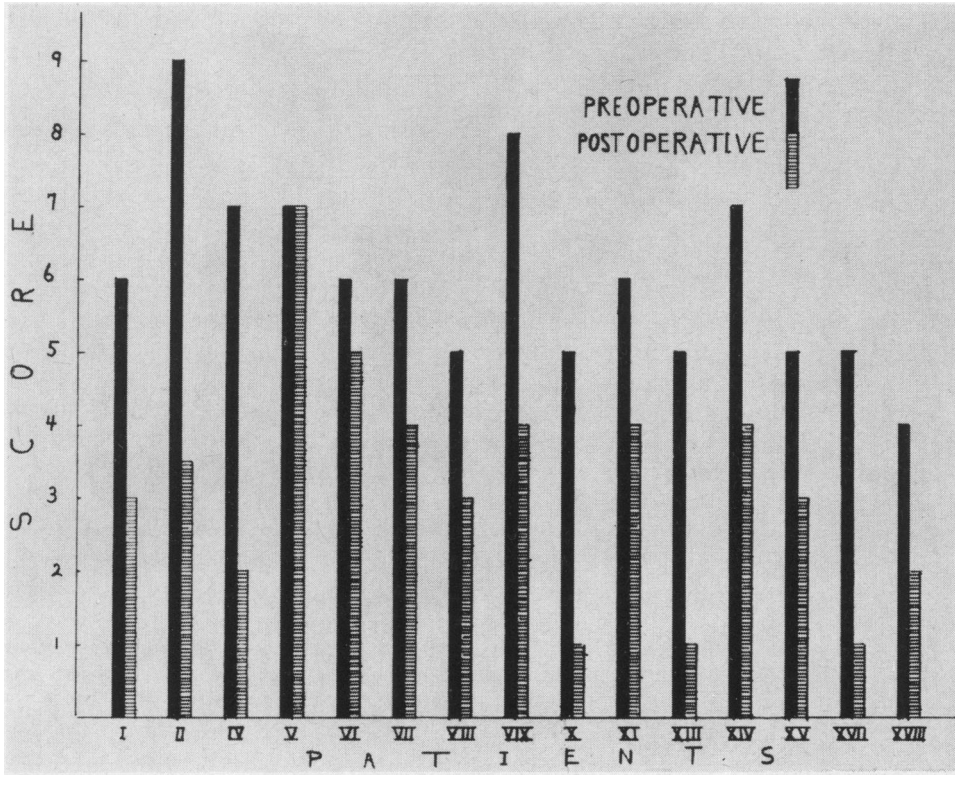


FIGURE 7
Histogram illustrating pre- and post-operative scores.

insufficiency coupled with a considerable reduction in the grade of dyspnoea after operation. The high cardiothoracic ratio for this series with little reduction in heart size post-operatively (mean ratio sixty-nine per cent compared with seventy-one per cent pre-operatively) suggests that in many patients in addition to valvular disease, there must have been considerable rheumatic myocardial damage. This could result from long standing atrial and ventricular dilatation with consequent loss of elasticity. Nevertheless the majority of patients showed considerable improvement, sufficient in thirteen cases to allow a return to near normal living. It is therefore a reasonable assumption that earlier operative intervention might well have produced still better results by preventing irreversible myocardial damage and progressive increase in the size of the heart. This might have produced a much better long-term prognosis for the patients in this series, the outlook for whom in the last analysis must rest on the degree of irreversible myocardial damage prior to operation. This conclusion is in agreement with the findings of Morris (1962) and Logan et al (1967).

Clearly in the majority of our patients the optimum time for surgery had passed by the time treatment was carried out, yet in spite of this the operative mortality was remarkably low (16.6 per cent) and only one of the survivors failed to benefit. The encouraging results in this series concur with the experience of Emanuel (1968) who reported a successful outcome in three patients with advanced rheumatic heart disease.

Summary and Conclusion

The results of valve replacement or repair in eighteen patients with advanced mitral, aortic, and mitral and aortic heart disease have been described. Three patients died either during operation or in the immediate post-operative period. Another death occurred from unrelated disease twelve months after operation. The survivors have been followed for a mean period of two years and two months. Ten patients have had a moderately good result, and three a fair result from surgical treatment.

Despite the considerable functional improvement in all but one patient, there has been little reduction in heart size post-operatively. It is assumed that this indicates irreversible myocardial damage and on this factor the ultimate result of operation will depend. Nevertheless it is considered reasonable to recommend operative correction in suitable patients, even when the disease is advanced, in the expectation of achieving a return to more normal living at least in the short-term follow-up period.

Recent advances in open valve surgery and cardio-pulmonary bypass techniques mean that many patients with severe valve damage who formerly were rejected as unsuitable for operation must now be considered candidates for cardiac surgery.

The authors wish to express their indebtedness to the Cardiac Physicians and Surgeons of the Western General Hospital, Edinburgh, for their kind co-operation in arranging the medical and surgical treatment of most of the patients reported in this paper, at a time when such facilities were not available in Northern Ireland.

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CRUDE CRAFTSMEN

By ERNEST MORRISON, M.B., B.Ch., F.R.C.S.

Opening Address of the Winter Session, Royal Victoria Hospital, 9th October, 1969

THIS MORNING, ladies and gentlemen, I have the honour and pleasure of addressing you on behalf of the consultant medical staff of this great hospital. A task approached with some diffidence for unlike so many of my illustrious predecessors I am neither orator, historian, scientist or philosopher, but simply one of a long line of crude craftsmen – the title of my address – who have endeavoured since time immemorial to relieve suffering humanity by cutting and in particular cutting for stone.

Advance in any branch of medicine is related to contemporary progress in every branch of science and its strength lies in the number and vigour of its allies. Modern operative techniques are more successful than in the past, not due so much to improved surgical skill, but to advances in the para-surgical subjects. On 8th May, 1967, I carried out an operation that had never been intentionally performed previously in this hospital, that of nephrectomy, knowing that the kidney to be removed was the only one the patient possessed. Prior to operation I knew through the help of my colleagues in the hospital laboratories and X-ray departments, the nature of the disease process affecting the kidney and how that disease was affecting renal function and the patient's health. I not only knew the position, size and shape of the kidney but had before me in the operating theatre beautifully clear pictures of all its blood vessels large and small. With the best anaesthesia in the world available the operation under such circumstances was a simple anatomical exercise and so I could assure my patient, a woman of 37 years, beforehand that there was no danger to her life. Also I could tell her that life could be adequately maintained post operatively by renal dialysis and later renal transplantation.

Like so many of the life saving measures now employed by the medical profession, transplantation of the kidney has taken its place in the therapeutic armament only after a stormy passage. For many years the utilisation and so the development of blood transfusion was declared illegal and prohibited by all the influential professional bodies in Europe. The Faculté de Medicine and the Royal Society opposed its use. Rome condemned it as completely inexcusable. The introduction of anaesthesia was similarly condemned by many of the medical profession as a dangerous experiment and by divines as a violation of the law of God. Renal transplantation, in spite of opposition from medical and laymen, church and state is now generally accepted as a definitive line of treatment and can I hope be left in the capable hands of those medical men and women specially trained in that science and art, remembering that our profession has continued to work for centuries under a code of conduct formulated long before the Mother of Parliaments was established.

The science of urology has achieved a position of enviable importance in the realm of medical science for the outstanding progress it has made within a comparatively short period of time. As the oldest surgical speciality it stems from a single operation; that of removal of stone from the urinary bladder. "Cutting for stone" has been claimed as one of the first empirical operations to be practised by man. Circumcision and trephination of the skull are probably of comparable antiquity but they were carried out for religious or superstitious reasons. Stone in the bladder has been known since earliest times, the oldest so far discovered in man was found at El Amara in the skeleton of a mummy, dating from about 4700 B.C., it consisted like so many of today, of uric acid, oxalates and phosphates. Operative urology was practised by the Hindus, early Egyptians, Greeks and Romans, but it was not until 1886 that modern scientific urology had its inception with the perfection of the cystoscope by Max Nitze and Joseph Leiter.

Prosper Alpinus related that there was a practice in Egypt of ancient origin and extensive employment for the removal of stones from the bladder, which consisted in distending the urethra by blowing into it with a tube and then urging the calculus to descend by pressing on it with the fingers introduced into the rectum; a procedure highly unlikely to have much success.

Lithotomy

The operation of lithotomy was obviously well known before Hippocrates' time for in his oath he stipulates that he will not cut for stone. He may have thought that the operation should be performed by others better equipped than himself or that the operation was being carried out by unscrupulous and irresponsible men. For the learned and unpractical physician of the day the operation of lithotomy was considered too menial a task. Sufferers from stone had to turn to the working craftsmen – the itinerant lithotomist. We today are all too familiar with the discomfort that urinary calculi can produce, how much worse must the agony have been in the absence of analgesics and anaesthetics. The patient who today has little fear in seeking relief from his symptoms was often faced with the choice of continuing suffering ending perhaps in death or with the still greater torture of an operation – it is extraordinary that the latter course was so often chosen.

Although Ammonius of Alexandria, surnamed Lithotomus, practised lithotomy 200 years B.C., it was not until the Roman Celsus published his "De Medicina" that we find a detailed description of the operation. The operation was only possible when the stone was of considerable size and could be felt per rectum, the procedure involved cutting through the perineum in the midline down to the stone after it had been manoeuvred into the neck of the bladder by rectal and abdominal palpation.

Lee's description reads as follows :

> "Precipitation in this operation would be incompatible with the dangers inseparable from it. Neither is it to be tried at all seasons, nor in every age, nor in every case but in Spring alone and only between the ages of 9 and 14 years. And also when the cause is urgent, that it can neither be overcome by medicine nor protracted and that the patient must die if the operation is prolonged. The body should be prepared by a proper regimen for some days previous, i.e., food in moderation, he must drink nothing but water. In the meantime the patient must take exercise by walking in order to facilitate the descent of the stone to the neck of the bladder."

The method is as follows :

> "A strong and intelligent person being seated on a high stool, lays hold of the patient in a supine position, with his back towards him and his hips being flexed on his knees, with his legs drawn backwards he orders the patient to seize his own hams with his hands and to draw them towards his body with all his power and at the same time he secures them in that position, but if the patient be rather powerful two able men must sit beside him. Then the physician having carefully pared his nails introduces his index and middle fingers of the left hand, first the one gently, then the other into the anus and places the fingers of his right hand lightly on the lower part of the abdomen. First the stone must be sought about the neck of the bladder and when brought into that position a lunated incision is made over and extending to the neck of the bladder, the stone comes to view, the colour of which is not of any consequence. The stone if small may be propelled forward by the fingers or if of considerable dimensions, a crochet expressly made for the purpose is introduced. This instrument is smooth on the outside when it comes in contact with the body, rough on the inside when it touches the stone, when it is evident that the stone is grasped a triple motion is employed to disengage it. When the stone is extracted, if the patient be strong and not much affected we may permit the haemorrhage, in order that the inflammation may be less and it is not improper for the patient even to walk a little, that any coagulated blood within would fall out. But if it should not cease spontaneously, it must be suppressed lest the strength be entirely exhausted. To obviate this the patient should sit in strong vinegar to which a little salt has been added, by which means both the haemorrhage is arrested and the bladder contracted and the inflammation abated."

Only a knife and a hook were used in this operation. It became known as the lesser operation or the operation of the Apparatus Minor. No mention is made of anaesthesia, either none was used or what is more likely alcohol in some form in excessive amounts, perhaps in the form of mandragora wine was poured into the wretched patient until he was at least partially benumbed. It was not until the 13th century that we read of Theodoric producing the so-called soporific sponge, the medieval substitute of anaesthesia. This sponge was steeped in a mixture of opium, hyocyamus, mulberry juice, lettuce, hemlock, mandragora and ivy; the sponge when impregnated with the mixture was dried and then moistened before being inhaled by the patient. Patients were kept without sleep as long as possible before operation so that soporific would take greater effect.

The operation described by Celsus was employed for roughly 1400 years, the only modification being in the location of the incision and the introduction of new instruments. Paul of Aegina, in the Byzantine period (167–732 A.D.) described an operation closely following that of Celsus, he recommended that the patient be shaken or made to jump from a height to favour the precipitation of the stone into the neck of the bladder. He used a lateral incision. During the eighth to the twelfth centuries medicine chiefly in the hands of the Arabians contributed nothing to lithotomy nor for that matter to surgery in general, partly because of the Arabians belief that to touch the human body under certain circumstances was both unholy and unclean, operative surgery was considered by them as unworthy of a man of honour and was left to the despised lithotomists. The medieval period (1096–1438) is also characterised by a dreary lack of progress in surgery, lithotomy continued to be practised by these wandering lithotomists, described by William Clowes as "no better than runagates or vagabonds, shameless in countenance, lewd in disposition, brutish in judgment and understanding." Certain families became famous as lithotomists, the nature of some of the procedures they carried out were

often carefully guarded secrets, and handed down as such from one generation to another so that little is known of the actual methods employed. Certain cities became renowned for the operation, the most famous in England being Norwich, a town still famous as being the one to produce most stones in England.

It was during the Renaissance (1453–1600) that the first great improvement in the technique of perineal lithotomy since the time of Celsus appeared. The method, first published by Marianus Sanctus Barolitanus in 1524, became known as the Marion operation. It consisted in the introduction of a grooved staff into the bladder upon which the urethra was opened in its membranous part. Gorgets and dilators of various kinds were then passed along the groove into the bladder, the posterior urethra and vesical neck were sufficiently dilated and torn to permit introduction of forceps to remove the calculus. On account of the great number of instruments devised and used in this technique the procedure became known as the method of the "great apparatus". Although this operation was a great improvement over the old method of Celsus, yet in many cases parts of the bladder and prostate were often removed with the stone, it still carried a very high mortality rate and post operative complications, such as haemorrhage, extravasation of urine, abscesses, fistulae and incontinence of urine were common. The bad results were naturally not all recorded. Children frequently recovered from the operation, but adults seldom.

The Marion operation remained in vogue until the end of the seventeenth century. Travelling lithotomists were at this time often in charge of an extensive and well managed organisation, one is reported as having 14 assistants. Their visits to cities were timed to coincide with annual fairs, patients were attracted by side show features, such as buffoonery, rope dancing, theatricals and even dancing bears, their departure was, no doubt, timed with equal care and forethought. One of them, Pierre Franco, wrote : "Physicians and surgeons can defend themselves when unfortunate but if we lithotomists have a mishap we must run for our lives." On reaching a city the lithotomists were obliged to secure a licence from the Guild of Physicians before operating. Physicians then and still the aristocracy of the medical profession, were only in special cases called in, they prescribed diets, purged and bled, they attended to pre- and post-operative care of the bowels as this simple task was considered beyond the capability of the surgeon. Towards the end of the seventeenth and in the early part of the eighteenth century a number of lithotomists in England, France and Germany began to improve on the Marion operation, the outstanding character amongst which was Frere Jacques. Jacques de Beaulieu (1651–1714) started his career as a trooper in a cavalry regiment, then joined a travelling stone cutter called Palloni learning what he could. At first his technique was crude and his mortality high, he was quite ignorant of anatomy, he operated quickly and recklessly and although provided with very imperfect instruments he extracted the stone with such invariable facility and dispatch that though many of his patients died and comparatively few made complete recoveries he acquired great reputation as well as the friendship of some of the most distinguished French surgeons. By one successful operation he gained the favour of the Royal Court in Paris and was given the opportunity to perform 50 lithotomies in Paris hospitals. Some reports state that he was so successful that the jealous Parisian surgeons chased him out forcing him to resume his travels, others that his results were so bad that he was ordered to go off and learn his anatomy before

continuing to practice. It is reported that, though insensible to the dangers that attended his mistakes, he was a man of great benevolence and accepted only sufficient fees for his services to live modestly, he became so interested in lithotomy that he put on a monk's robes and devoted his life to cutting for stone. He travelled to Holland, operated on hundreds and was there held in such high repute that he was presented with a set of gold sounds which he had immediately melted down for charitable purposes. Crowds of up to 200 came to watch him, tickets were issued and guards posted. Although his reported mortality and morbidity rates were disastrously high (7 died in one day at the Charité) his notices in travelling claimed that his operations never endangered life and that there were no complications. "Your operation is done, God heal you" was his parting comment to his patients. He is credited with having operated upon 5,000 patients in his life time.

Cutting for stone was in invitation to the charlatans; it was so easy for an unprincipled surgeon to "palm" a stone, to perform a bungling operation and show the palmed stone to the patient. Sentences for such deceit were, however, severe, and in France where the laws were strictest two surgeons are reported to have been executed for such an offence.

One of the famous patients of this heroic era was Samuel Pepys who had a stone the size of a tennis ball successfully removed from his bladder in 1658 and celebrated the event annually. Auto-lithotomy like any other operation carried out by a surgeon on his own body must be extremely uncommon. Yet such is claimed by Jan de Doot, a Dutch blacksmith, who in 1651 removed a four-ounce stone from his own bladder with a knife.

The suprapubic operation was first performed in 1556 by Franco of Lusanne. Franco who had no medical training performed this operation in despair. The patient was a child of 10 years and the parents desired that the child should die rather than live in agony. The task was accomplished by putting two fingers into the rectum pushing the stone forwards on to the abdominal wall, and cutting down on the stone. A stone the size of a hen's egg was withdrawn and though the child recovered Franco wrote afterwards: "However, I do not advise resorting to this means, rather employing the method we have invented previously." It must be remembered that though lithotomists were possessed of daring qualities few would ever show themselves more daring than to adopt the mode of treatment which had been originally described. The edicts of Hippocrates and of Galen uttered centuries before had been so deeply stamped upon the surgeon of the day that few were bold enough to go against them, to do so the surgeon would not only risk his reputation but his life. It is scarcely possible for the modern surgeon brought up in the immaculate theatres of today with their rigid ritual of asepsis to visualise the situation that prevailed even 100 years ago. The abdominal cavity was never opened, to do so was almost tantamount to signing the patient's death warrant. In the suprapubic method the peritoneal cavity was always at risk, the difficulties induced by a straining conscious patient and an infected peritoneum were unsurmountable.

Occasional operations are mentioned in the seventeenth and eighteenth centuries as using the suprapublic route, but it was not generally adopted; few were willing or so daring as to repeat Franco's operation. And so almost 200 years were to pass before Rousset proposed that the suprapublic route was far superior and more

practical than the perineal. Well aware of the difficulties and dangers of the perineal route he wrote :

> "The most dexterous operators know well that they have often been constrained to leave their work imperfectly performed and to grab, tear away and bring along with their instruments a good portion of the bladder with the calculus, why then should one submit to this danger of incision without need."

Rousset was one of the most ardent partisans of the caesarian operation and perceiving that the latter was easy to perform, he was of the opinion that the bladder could be reached by the abdominal route without danger. Although Rousset clearly demonstrated the advantages and possibilities of this method it was attempted only in occasional cases, and Rousset himself as far as one can ascertain never used the method in a living person.

John Douglas, an Englishman and brother of James whose name is perpetuated in the famous "pouch" and "fold" was the first to make a successful trial of the suprapubic method. James, an expert anatomist, had made a special study of the approach to the bladder, he presented his anatomical preparations before the Royal Society in 1717–18, and it is almost certain that it was from these studies that John conceived the idea of removing a stone by the abdominal route. His first four operations were carried out on December 23rd 1719, March 23rd 1720, May 12th 1720 and August 20th 1720. All except the third did well and John Douglas became famous. He now offered his services to the Westminster Hospital and was appointed to the staff. He showed the three living patients before the Royal Society and was elected Fellow of the Royal Society and given the Freedom of the City of London. He was even permitted to advertise in the newspapers that any poor person who wished to be cut for the stone could be admitted to the Westminster Hospital under his care and undergo the operationt without charge. He also offered in true Hippocratic fashion to teach other surgeons his technique. They all with one exception rejected his offer with scorn; that exception was Cheselden, whose name had already been closely linked with the operation of lateral lithotomy and whose skill and dexterity had never been equalled not to say surpassed. Cheselden studied the anatomical specimens of James Douglas and himself made experiments on the cadaver before trying his technique on the living subject. He soon surpassed John Douglas his teacher and performed the suprapubic operation eight times in 1723. "All of which operations succeeded to the entire satisfaction of several of the most eminent physicians and surgeons in town." He published his early results in a "Treatise on the High Operation" in which he gives credit to John Douglas for the revival of the operation. Unexpectedly, however, his enthusiasm for the suprapubic operation soon passed. Following his initial success many surgeons tried the method but the peritoneum was often opened with disastrous results, Cheselden admitting that this had happened in some of his own cases. Controversy and doubt still held the stage and soon the operation which to all of us seems the logical and practical method came into universal discredit and Cheselden, unhappy about his own results, proceeded to devise a better method of perineal lithotomy, in which he distended the bladder with warm barley water prior to cutting and in which he used a grooved steel catheter as a guide. James Douglas writing of this improved technique in 1726 says : "When no accident happens, he has seldom been above a minute, sometimes less between the beginning of the first incision and extraction of the stone."

A swift and gentle operator, Cheselden's record time for removal of a stone was 45 seconds. William Dease, the elder, founder of the Royal College of Surgeons in Ireland, was a great exponent of lithotomy in the latter half of the eighteenth century; his work is said to have been on a par with that of Cheselden. By the middle of the eighteenth century most surgeons had at last learned of the advantages of the suprapubic method; it became the method of choice even in France where Francois Colot had for so long condemned it. In 1758 Frère Côme defying Colot's teaching practised the method, he devised new instruments for the operation and published detailed histories of 100 cases, finally placing the operation in the position where it belongs.

Lithotrity

The heavy mortality and morbidity associated with lithotomy drove surgeons to seek less fatal methods of getting the stone out of the bladder, and so the opening of the nineteenth century saw the birth of yet another method of dealing with bladder stone. Crushing of stone was said to have been known to Ammonius of Alexandria about 230 B.C. It was certainly spoken of in the writings of the Byzantine physicians. General Martin of Lucknow claimed in 1783 to have broken up a stone in his own bladder by means of a small curved metal sound with its end slightly roughened. But it is to Jean Civiale of Paris to whom credit for putting the operation of lithotrity on a sound basis is generally ascribed. He became interested in stone when still an impecunious medical student and spent his entire career fighting for the acceptance of his methods. Civiale performed his first public demonstration of lithotrity on a living patient in 1824 with an instrument which he called a litholabe. This consisted of two straight tubes, one fitting inside the other, the inner terminating in three curved spreading arms which closed by retraction of the inner into the outer tube. When seized by these prongs the stone was held firmly by pushing forward the outer sheath on to the inner tube, it was then forcibly bored and crushed by an iron rod with a screw tip. To prepare for the introduction of the lithotrite the urethra was dilated by passing wax bougies of increasing size over a period of a week or more, itself a painful enough procedure.

Surgery in the nineteenth century was to progress further than it had done in the preceding 1,000 years due to the introduction of the routine use of surgical anaesthesia to antiseptic and later aseptic methods, yet Civiale even after the introduction of anaesthesia would never employ it in lithotrity, arguing that its use tended to make the surgeon less careful and delicate in his manipulations. Lithotrity was brought to England by Baron Heurteloop from France. Of the early English lithotomists practising this method the most famous was Sir Henry Thompson. He had an enormous practice and gained a great European reputation operating successfully in 1866 on Leopold I, King of the Belgians, 18 months after Civiale had failed. Ten years later he operated on Napoleon III, but this patient died after the second sitting. Thompson confined his operating time to two minutes, the whole procedure might take as many as 25 sessions altogether. Morbidity and mortality figures for lithotrity were at first little published. Thompson had much better results than his contemporaries, but the overall mortality showed little to chose between lithotrity and lithotomy.

Having crushed the stone, there remained the real problem of evacuating the fragments. Surgeons had for years realised what an advantage would be secured by the immediate and complete evacuation of all the particles from the bladder. Sir Philip Crampton who introduced lithotrity to Ireland in March 1834 invented a suction apparatus consisting of a glass bottle, from which the air was withdrawn by a syringe, and connected to the bladder catheter by a rubber tube and stop cock; the idea was a good one but the instrument crude and ineffective and it was left to Bigelow of Boston to perfect the method of litholapaxy. To secure removal of the stone fragments large calibre straight and curved metal evacuating tubes were provided with an aperture at the top end so that the bladder could not be drawn in by suction. To the outer end of the evacuating tube was attached a large and powerful rubber bulb evacuator with a glass container below into which the fragments were received and seen.

Bigelow, one of the foremost advocates of anaesthesia after witnessing its first administration by Morton in Massachusetts General Hospital in 1846, published his method in 1878 after an experience of 14 cases and claimed that the operation performed under ether anaesthesia could be extended to one or two hours or even longer without detriment to the patient. This produced a great sensation in England where the famous Thompson was limiting his sessions to two minutes and naturally surgeons were for a time loath to accept the method and give credit to the inventor. Nevertheless it was soon generally adopted all over Europe. Bigelow was invited to London in 1881 where he demonstrated his instruments and was made a member of the exclusive London Clinical Society. He was honoured in like fashion by the French National Academy of Medicine. This new method of litholapaxy greatly lowered the mortality in all age groups. Bigelow's instrument slightly modified is still in everyday use throughout the world.

Operations on the Kidney

The most fascinating chapter of surgery is that devoted to the development of operative intervention on the kidney. Early procedures dating from 400 years before Christ consisted of simple drainage of tuberculous and non-tuberculous infected kidneys, the opening of peri-nephritic abscesses and incisions into swellings in the loin due to renal stone. Hippocrates, Celsus and Galen wrote extensively and accurately on the symptoms associated with renal stone, but all three were opposed to surgical intervention on the kidney because it led to fatal consequences. Ten centuries later Serapion and Avicenna wrote that although the operation was practised by certain disreputable people it was extremely dangerous, liable to be followed by death and, therefore, advised against its performance by a physician. There are numerous accounts of the removal of stones from the kidney in France, Germany and England in the fifteen century, but in all of these there was a distinct external swelling or the stone could be palpated in a sinus.

The first recorded attempt of nephrolithotomy was that of the celebrated French archer of Bagnolet in 1474. Unfortunately the Physicians of the Faculty of Medicine of Paris, who performed the experiment on a living patient, failed to record their observations and the exact nature of what was done or the technique employed varies with the historian. One account is as follows :

"The doctors of the Faculty of Medicine of Paris, having learned that an archer from Bagnolet, who had been affected a long time by stone had been condemned to death for his crime, petitioned the king and the magistrates to kindly deliver him into their hands in order to prove on him if the kidneys could be opened for removal of the stone without depriving him of his life. The operation was so successful that the man survived for many years afterwards in excellent health."

The first authentic account of operation for stone in the kidney is given by Cardan, a surgeon of Milan in the early sixteenth century. He deliberately opened a lumbar abscess and removed eighteen stones. The story of the operation on the British Consul of Venice in 1633 is of special interest. Charles Barnard gives the following graphic account :

> "Mr. Hobson, who was consul for the English at Venice having long been affected with stone in the kidney was at length attacked with a fit of such duration and violence that he was reduced almost to desperation. Finding no relief from any means that he had used, he addressed himself to Dominicus de Marchetti, a famed and experienced physician at Padua, imploring him to cut the stone from his kidney. He added that he was not insensible to the danger, but that death itself would be infinitely preferable to life and the misery under which he had long groaned. Marchetti seemed very desirous of declining not to operate, since the operation represented the extreme hazard, was impracticable and one he had never attempted, and that to proceed to it was in effect to destroy him (i.e., Hobson). But Mr. Hobson persisting, said that if he refused he would not desist until he had found someone who could do the operation. His resolution and importunity at length prevailed upon Marchetti to undertake the operation.
>
> "Having prepared his patient as he thought convenient he began with his knife cutting gradually upon the region of the kidney affected, until blood disturbed and blinded his work he could not finish the operation at one attempt. Wherefore dressing up the wound till the next day he then repeated the operation and accomplished it by cutting into the body of the kidney and taking thence three or four stones. He dressed it up again. From this instant Mr. Hobson was freed from the severity of his pain and in a remarkably short time was able to walk about his chamber having been in no danger either from the flow of blood or fever. Marchetti continued to dress the wound for a considerable time, but he was not able to close it up. It soon became fistulous from the continued flow of urine through the sinus. Being in other respects restored to his former health and vigour and the matter discharged being little, Mr. Hobson took leave of the professor and returned to Venice under the care and management of his wife. One morning she was dressing the wound she fancied she felt something hard and rugged as she wiped and, upon examining it a little more closely with her bodkin, which served her instead of a probe she found it to be a stone of the shape and size of a date stone, which being removed Hobson never afterwards complained of the least uneasiness in that part."
>
> "About ten years later Hobson returned to London, he was without complaint but a sound could be passed deep into the sinus which persisted. The matter discharged was little but smelt strongly of urine. The orifice closed for 3 or 4 days and then broke down again. Hobson was able to perform the functions of life and to undergo fatigue as any man of his years, was able to ride post 40 or 50 miles a day."

The scientific development of modern renal surgery began with the physiological experiments of Zambecarri and Etienne Blancard. The former in 1670, the latter 20 years later, reported the results of their experiments in which a kidney was successfully removed from a dog, they established the fact that animals could live in perfect health after the removal of one kidney. They went on to suggest that in man a kidney destroyed by stone or infection might be removed as a definite line of treatment. The idea containing so much wisdom and foresight was ridiculed,

deemed impractical and of too great danger by contemporary surgeons. In 1757 Havin in a critical review of nephrectomy stated that unfortunately the animal experiments were inconclusive and were likely to lead young surgeons into ways that would be dangerous to the lives of their patients. As late as 1801 Benjamin Bell concluded :

> "That the operation of nephrectomy will probably never be received in general practice however much it may be recommended by some, who in order to raise a reputation which they might not otherwise obtain will sometimes step forward and propose with confidence that which no practitioner of character would think right to attempt."

Removal of a stone from the sound kidney unaffected by abscess formation was, therefore, considered absurd and dangerous.

In 1841 Rayer, the father of renal pathology, published his "Traité des maladies of Reins". This work was the foundation of modern knowledge of the pathological processes which noted that stones usually occurred in the renal pelvis leading to the formation of renal and peri-renal abscesses and to fistulae which could open into the extra-peritoneal tissues, the skin of the lumbar region, the inguinal region, into the colon, duodenum, peritoneal cavity or lung. With better knowledge of the pathological processes surgeons became more daring and were encouraged not only to operate on cases with palpable stones and abscesses but on patients with symptoms suggestive of kidney stones. Annadale in 1869 and 1875 and Gunn and Denham in 1870 made incisions into the kidneys of patients suffering from the symptoms of stone, but in which there was no supperation or tumour. In none of these four cases was a calculus found, but curiously enough the patients were all relieved of their symptoms. Pyelotomy and nephrolithotomy were nevertheless on the way and Bryant in his "Manual of the Practice of Surgery" in 1881 suggested the plan for incising the undilated kidney through an incision in the loin for the purpose of removing renal calculi before the kidney had become greatly disorganised by suppuration. And to Henry Morris must be given the credit of first removing a stone from the healthy kidney by nephrolithotomy. He demonstrated that it was possible to remove calculi from the kidney by operation and that the danger of haemorrhage was unimportant because the great vessels in the forepart of the hilus were not severed in incising the pelvis from behind.

The discovery of X-rays by Roëntgen in 1895 aided greatly in the diagnosis of renal stones, and by its use McIntyre of Glasgow in the following year demonstrated films with stone in five cases which were later confirmed at operation. On 2nd August, 1869, i.e., exactly 100 years ago, the first epoch-making, successful and deliberate nephrectomy was carried out by Gustave Simon in Heidelberg. Simon, unlike many of his colleagues, was most impressed by the experimental work of the physiologists. He repeated their experiments on dogs noting that they lived in perfect health after nephrectomy. He also noted compensatory hypertrophy of the remaining kidney. Until Simon's operation it had never been clearly established that a single kidney was adequate for the needs of the body and compatible with a normal life. The successful performance of ovariotomy by the American surgeon Ephriam McDowell as far back as December 1809 had led the way to surgical intervention in the abdomen and ironically enough kidneys were soon being removed in place of ovaries. In these cases it was noted that though the patient often died

afterwards of sepsis urine was copiously secreted from the remaining kidney. Nine of the first 20 recorded nephrectomies were performed accidentally, the kidney being removed usually for an abdominal tumour. Within a decade of Simon's successful nephrectomy the operation was second in frequency to oophrectomy, and with the development and perfection of antisepsis and later asepsis the operation mortality was soon reduced from 80 per cent in the first ten cases to less than 8 per cent.

The modern surgeon consulted by a patient suffering from stone can not only offer him immediate relief of his pain, but can within a few hours tell its situation, size and whether it is adversely affecting renal function, and advise accordingly. But in spite of centuries of experience and more recent exhaustive research there is still no unanimity of opinion regarding the mechanism of renal stone formation. In urology as in every other branch of medicine there is still a lot to be done. The words of Percival Pott are as apt today as they were when spoken 200 years ago :

> "Many and great are the improvements which the cirurgical art has received in the past 50 years, and many thanks are due to those who have contributed to them, but when we reflect how much still remains to be done it should rather excite our industry than influence our vanity."

What matters most is the future and what remains to be done. The future lies with the young people in my audience, and it is up to them to do at least some of what remains to be done; it is to the students in particular that I address my final remarks.

You have come I hope to this hospital and medical school not simply in search of a medical qualification, but to prepare yourself for a life in medicine. Your immediate task, to become familiar with the common ailments affecting your fellow man from the moment of conception to the grave, is a formidable, indeed, an impossible one; nowhere is there a richer challenge. The deeper you delve into this most interesting of tasks the more you will be conscious of your inability to master and achieve all your aims, but do not shrink from it. "The man of character," writes Charles de Gaulle, "finds a special attractiveness in difficulty, since it is only by coming to grips with difficulty that he can realise his potentialities." And take comfort from Lord Monynihan : "The happiness of life lies in its responsibilities, the true joy in the quest for what may after a weary journey prove unattainable."

Your teachers, who are after all only students in a different grade, realise your difficulties. They know that the medical curriculum is bursting at the seams, that medicine is now far too extensive for any one doctor to grasp even the elementary aspects of the whole field. In this, as in every other medical school, committees have been working almost constantly since World War II with a view to improving and remoulding the curriculum, but when we reflect on what has been accomplished so far you may feel, as I do, that there is too much intellect around and not enough commonsense.

Reading through centuries of medical history – a pastime which I strongly recommend to all of you – one finds that the habit of relying too much on ancient authority has remained entrenched in medicine ever since early Egyptian times, when doctors were obliged to practise only according to the sacred books. Sanctions

enforcing the practice were rigorous even to the death penalty. Galenical dogma completely dominated medical thinking and teaching for over 1000 years. So men even of original mind find it difficult to loosen the shackles of tradition and disregard the authority and teaching of their respected predecessors. At the risk of engendering a good deal of opposition and unpopularity, may I suggest we break some of these traditionally binding chains?

Early in my address I mentioned how the Father of Medicine advised about cutting for stone. "I will not use the knife either on sufferers from stone, but I will give place to such as are craftsmen therein." If he were speaking to you today I believe he would say: "Do not attempt to treat any patient whose illness you do not fully understand." In essence this means that I am asking you all to aim at perfection in medicine, but as one man's share of recorded medical knowledge must be either superficial or narrow, perfection must surely mean specialisation in a particular field, the narrow road may be more difficult but infinitely more satisfying.

Most young people who wish to read medicine do so because they simply want to be good doctors and few know what branch they wish to follow before the end of their first year as house surgeon. During these early formative years the student should be introduced to the widest possible experience in all branches of medicine, but his studies need only be in outline and not exhaustive. With knowledge accumulating at a terrifying pace we cannot expect you to learn it all in a few years, so limits must be set as Sir Charles Illingworth has put it: "If we cannot enlarge the curricular pint pot we must condense the quart of dogma to be poured in, we must choose some of the ingredients more carefully and get rid of the windy diluent."

Lord Platt writes: "Human diseases leave no time for the humanities; the only culture we know is the bacteriologist's broth." If we are to enjoy our work and our rightful share of culture then we must organise our studies and our practice to allow of the time to do so.

History has shown that most advances come from the young; so let us give our young colleagues more voice in the shaping of their studies and future. For the enthusiastic and idealistic young entrants to the medical faculty who have gained sufficiently high passes in the requisite subjects, the first year of medicine is not only a waste of time but highly frustrating. In your own magazine you have rightly labelled it "Boredom" in capital letters. The advantages claimed that can be gained by medical students spending their early days with other faculty students are over emphasised, so let us get rid of the first year; it is a luxury no student or parent can afford.

As a keen anatomist I join with those who have already criticised the amount of time given to the basic sciences, particularly anatomy; undue emphasis in detail is neither necessary nor desirable. The long laborious hours spent in the dissecting room at this stage are mainly wasteful, particularly in these days with so many beautifully illustrated atlases and models available for study.

Students at all stages spend far too much time preparing for, worrying about and sitting examinations, cramming with facts for such occasions is not learning. One can say of so many of our successful candidates with Thomas Huxley: "They

work to pass, not to know; and outraged science takes her revenge, they do pass and they don't know."

The time devoted to much of our clinical teaching can also be faulted. Why, for example, do we spend hours arguing about the clinical appearances of a breast lump when histology is all important as far as the patient is concerned?

With realistic and determined pruning of the curriculum you ought to be able to qualify on broad principles in less than five years, thereafter you must study in depth. Before World War II, the great majority of doctors in these islands were general practitioners accustomed to dealing with a wide variety of ailments. Social modes change and today there is an increasing demand for specialist care, specialisation in its turn demands the need to modify our medical institutions. It has long been argued, for example, that for undergraduate teaching there are great advantages in having general wards staffed by general physicians and general surgeons. Our elders have often used this argument as an excuse to discourage the development of many of the specialities. In 1860, a surgeon appointed to the staff of St. Mary's Hospital, London, was forced to resign for simultaneously accepting an appointment at St. Peter's Hospital for stone. "He knows" said the Medical Committee in condemning his action, "that special hospitals in general and special hospitals for stone in particular are not only useless but worse than useless." The attitude lingers on. Yet Sir William Lawrence, writing in 1825 of Moorfields, London, the very first specialist hospital founded by J. C. Saunders in 1804: "You may see more diseases of the eye in this institution in three months than in the largest hospital in 50 years."

The patient's foremost need is to be under the care of whoever has most knowledge of his kind of illness; isn't it likewise desirable that medical students be taught only by the highest possible standards. Beside medicine can be quickly acquired if intensively taught by the right people. The modern practice of medicine demands teams of physicians, physiologists, radiologists, surgeons and pathologists working in close harmony in large units. One man, however intelligent, conscientious and well trained cannot fail to deteriorate in isolation; he needs repeated transfusions of new ideas, and to be able to discuss his clinical and other problems with his colleagues. If this great hospital is to continue to serve this city and province as it has so efficiently done in the past, then it must become fully departmentalised, the generals if and where they exist must go. To the already existing special departments we require to have gastro-intestinal, cardiac and peripheral vascular, endocrine and urological departments staffed by teams such as I have already mentioned, and providing not only exemplary care for the sick, but exemplary teaching in the undergraduate and postgraduate fields. Each should have an active research department. Such re-organisation may not at first appeal to student, house-surgeon or budding specialist, and certainly not to many of my colleagues. It is, however, my prescription for greater efficiency and excellence in the art and practice of medicine in the "Royal" of the future.

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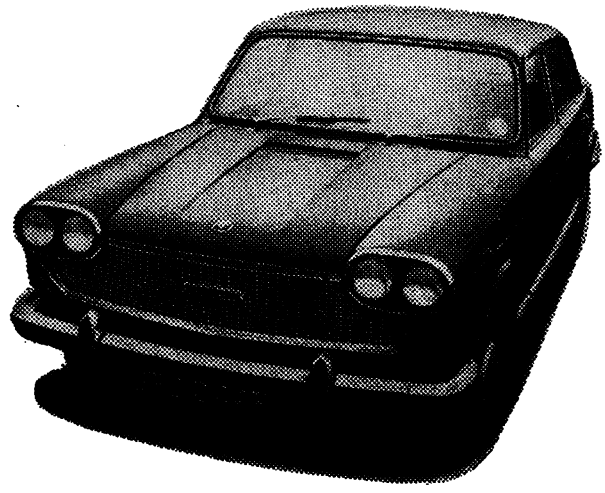

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ECHO TYPE 6 VIRUS OUTBREAK IN N. IRELAND

By J. H. CONNOLLY, M.D., M.R.C.P.I., M.R.C.Path. and H. J. O'NEILL, F.I.M.L.T.
Department of Microbiology, Grosvenor Road, Belfast

DURING 1968 there was an outbreak of ECHO type 6 virus infection which was unusual in its extent and the fact that the epidemic developed in N. Ireland before other parts of the United Kingdom.

Materials and Methods

Faeces, CSF, a throat swab and acute and convalescent blood samples were obtained from aseptic meningitis cases, while faeces were obtained from gastro-enteritis and other cases.

Primary rhesus monkey kidney cell cultures were used for virus isolation and isolated viruses were typed with ECHO virus diagnostic serum pools supplied by the Standards Laboratory, Central Public Health Laboratory, London, and also with an ECHO type 6 neutralizing antiserum.

Acute and convalescent sera from 51 aseptic meningitis cases from whom virus was not isolated and who were negative when screened serologically in the complement fixation test against mumps, measles, herpes simplex, lymphocytic choriomeningitis and louping ill viral antigens were tested for ECHO type 6 virus neutralizing antibody. Sera were inactivated at 56°C. for 30 minutes then serial dilutions were mixed with 100 TCD_{50} of ECHO type 6 virus which was isolated from a patient in the current outbreak. The virus-serum mixtures were left for 2 hours at 37°C. before inoculation.

Results

The number of patients from whom ECHO type 6 virus was isolated or a rising titre of ECHO type 6 antibody was found and the month of their illness are shown in Table 1.

It will be seen that the outbreak began in February and that 81 out of 95 cases (85 per cent.) occurred between May and September with a peak incidence during July. Before this outbreak the last time ECHO type 6 virus was isolated from a

Table I

	Month												
Illness	J	F	M	A	M	J	J	A	S	O	N	D	*Total*
Aseptic meningitis	—	1	1	3	12	10	25	12	8	3	2	1	78
Gastro-enteritis	—	—	—	—	1	1	4	4	2	—	—	—	12
Respiratory	—	—	3	—	—	—	—	—	—	—	—	—	3
Pyrexia & myalgia	—	—	—	—	—	—	1	1	—	—	—	—	2
Total	—	1	4	3	13	11	30	17	10	3	2	1	95

N. Ireland patient was in November 1965 and after the outbreak the first isolation made was in July 1969. The predominant illness was aseptic meningitis which was associated with 82 per cent of all ECHO type 6 virus infections.

There were 172 proven cases of aseptic meningitis in N. Ireland during 1968 as shown by examination of the CSF and this included 4 deaths. Seventy-eight cases (45 per cent) were associated with ECHO type 6 virus infections and a virological diagnosis was made in 143 patients (83 per cent). In the aseptic meningitis group ECHO type 6 virus was isolated from the faeces of 58 patients, and from the throat of 20 patients but from the CSF of only 3 patients. Of the 51 aseptic meningitis cases from whom virus was not isolated and who were investigated serologically for ECHO type 6 neutralizing antibody ten patients had a four fold or greater rise in antibody which indicated recent infection. A further 26 patients had stationary titres of ECHO type 6 neutralizing antibody in their acute and convalescent sera which indicated infection with this virus at some time in the past. In this group of 26 patients, ten were adults and 8 were children over the age of ten years. In the aseptic meningitis group are included an 8 months old girl who had an ECHO type 6 virus infection associated with "salaam" attacks and ECHO type 6 virus was also isolated from the brain of a 9 year old girl who died after a very short illness. Outside N. Ireland a 15 year old boy in Co. Galway was investigated. He had been fully immunized against poliomyelitis but had developed extensive paralysis of both arms and legs and this was associated with an ECHO type 6 virus infection.

During 1968 in N. Ireland there were several outbreaks of gastro-enteritis in infants including outbreaks in hospitals. Faecal samples were obtained from 443 affected children and viruses were isolated from 99 (22 per cent). ECHO type 6 virus was only isolated from 12 cases (2.7 per cent). A 13 day old boy with enteritis and jaundice died. At post-mortem there were haemorrhages in his lungs and intestine and ECHO type 6 virus was isolated from his kidney. Another 3 months old boy had a rash in addition to his gastro-enteritis.

Three adult males had respiratory symptoms associated with ECHO type 6 virus infections. One had pharyngitis, joint pains and a rash, another had pneumonia and a third patient had a syndrome like Bornholm disease. Two other patients had an influenza-like illness. A boy of 4 years had pyrexia and limb pains and a female of 21 years had severe abdominal pain and pyrexia.

The age and sex of the patients who had ECHO type 6 virus infections are shown in Table 2.

TABLE II

	Age in years								
Illness	<1	1–4	5–9	10–14	15–19	20+	*Male*	*Female*	*Total*
Aseptic meningitis	2	13	28	14	10	11	44	34	78
Gastro-enteritis	11	1	—	—	—	—	9	3	12
Respiratory	—	—	—	—	1	2	3	—	3
Pyrexia & myalgia	—	1	—	—	—	1	1	1	2
Total	13	15	28	14	11	14	57	38	95

The majority of ECHO type 6 virus infections were in males and over half the cases were in children under the age of 10 years. It will be seen that the majority of aseptic meningitis cases were in males and the 5–9 year old age group was affected most. The youngest patient in the aseptic meningitis group was 2 months old and the oldest was 55 years. In the gastro-enteritis group the youngest patient was 13 days old and the oldest was 20 months.

Although the first three patients in the N. Ireland outbreak came from Banbridge, Co. Down, there was no subsequent localization to this area, The geographical distribution of the patients was as follows:

County	*No. of patients*	*Clinical attack rate/ 100,000 population*
Belfast Borough	57	14.3
Antrim	12	3.8
Down	13	4.5
Armagh	6	4.8
Tyrone	7	5.1

It will be seen that 82 patients (86 per cent) out of the 95 came from the eastern half of the Province (Belfast, Co. Antrim and Co. Down) while Belfast County Borough had the highest clinical attack rate of 14.3/100,000. The ECHO type 6 virus clinical attack rate/100,000 population was 6.4 in N. Ireland as a whole but only 1.2 in the rest of the United Kingdom.

The distribution of cases within towns and households was of interest. There were 6 families in which 2 children in each family had aseptic meningitis associated with ECHO type 6 virus infection. Five of the families lived in Belfast and one in Stewartstown, Co. Tyrone. In each family the two children became ill within a few days of each other. A further 11 children and 3 adults had ECHO type 6 aseptic meningitis who lived in 3 widely separate streets in Belfast and one street in Ballynahinch, Carrickfergus and Newtownabbey respectively. The patients in each street became ill at approximately the same time.

Weather During 1968

In Northern Ireland from June to October inclusive the cumulative daily maximum temperature was above average and there was above average sunshine in June, July and August. Rainfall during July and August was only 41 per cent and 73 per cent of average respectively.

In S.E. England on the other hand, the daily maximum temperature was below average from April until July inclusive while from August to November inclusive the temperature was above average. Sunshine from May to December was below average while rainfall in April, May, June and September was above average with about average values in July and August.

The mean of monthly values taken over a 30 year period for temperature, sunshine and rainfall is the average referred to above.

Discussion

The ECHO viruses (enteric cytopathogenic human orphan viruses) comprise a sub-group of the human enteroviruses. They are obligatory human commensals whose survival depends on successful implantation in susceptible cells of the

alimentary tract. Man is the only known natural host. The epidemiology is like poliomyelitis where the virus may be recovered from the pharynx for about a week and in the faeces for longer intervals. Spread is by direct person to person oral transfer of human excrement or occasionally by the respiratory route. Family infections are therefore common with young children being the main source of infection. ECHO virus infections are worldwide and in temperate climate epidemics occur during the warm months.

In the United Kingdom a total of 731 ECHO type 6 virus infections was reported during 1968 (Private communication Public Health Laboratory Service). An excess of cases was first detected in N. Ireland where infections with the virus began to increase from mid-May and reached a peak incidence in mid-July (see Table 1). In London and the S.E. of England the increase began about 2 months later and the peak of the epidemic was in early October (Private communication Public Health Laboratory Service). The clinical attack rate was 5 times higher in N. Ireland than in the rest of the United Kingdom if one assumes that comparable laboratory facilities existed everywhere. It is interesting that Belfast County Borough had a clinical attack rate about 3 times higher than Counties Antrim, Down, Armagh and Tyrone and this may reflect the effect of greater crowding in an urban area. Although there were small foci of illness involving 6 families and a further 6 streets there was little evidence of spread of infection with high clinical attack rates in local communities in N. Ireland. Infection in each street could have occurred amongst children at play or at school.

In N. Ireland as in the rest of the United Kingdom, meningitis or encephalitis was the main clinical feature in both children and adults while gastro-enteritis, influenza-like and respiratory infections were less commonly associated. Meningitis or encephalitis accounted for 82 per cent of all cases in Northern Ireland while in the United Kingdom as a whole it accounted for 60 per cent of all cases (Private communication Public Health Laboratory Service).

It should be remembered that the 95 patients investigated during this outbreak were in hospital and although aseptic meningitis was the commonest illness seen, it may be that in the community at large, mild symptoms or asymptomatic infections were more common, since enteroviruses are known to cause a high percentage of subclinical infections.

The gastro-enteritis survey in N. Ireland suggested, in view of the variety of viruses isolated and the low isolation rate, that excretion of virus only reflected the overall virus infections in the community. It was noteworthy that the ECHO type 6 gastro-enteritis cases were the only cases which were clustered in time and there was a close correlation of these cases with the peak of ECHO type 6 aseptic meningitis cases (see Table I). It is difficult to know if the isolated viruses caused gastro-enteritis in some cases since other surveys have shown that the isolation rates in healthy children are not significantly different.

Rashes indistinguishable from exanthem subitum, rubella, measles, glandular fever, meningococcaemia or scarlet fever may occur during infection with several ECHO viruses but in this outbreak only two patients were observed to have a rash.

Since the majority of cases were in children under the age of 10 years it suggests that the older age groups may have had previous experience with ECHO type 6

virus and this was supported by finding stationary titres of antibody in 18 patients (44 per cent) over the age of ten years, but in only 8 patients (19 per cent) under the age of ten years.

From the meteorological data it is obvious that N. Ireland had a warmer, sunnier and drier summer than usual while the S.E. of England had cooler, less sunny and wetter weather. The warm weather in N. Ireland began in June which was about two months earlier than the S.E. of England where a four month colder spell ended in July. It is interesting that there was a two month interval between the onset of above average warm weather in N. Ireland and in the S.E. of England which may be of significance since there was an approximate two month gap between the peaks of the ECHO type 6 epidemic in N. Ireland during July and in the S.E. of England during early October.

The abnormally warm, sunny and dry weather in N. Ireland may also have been associated with the higher ECHO type 6 clinical attack rate in the area. There was widespread water shortage in N. Ireland during this period and alternative emergency sources of supply such as Lough Neagh had to be used.

Summary

During 1968 there was a widespread outbreak of ECHO type 6 virus infection which developed in N. Ireland before other parts of the United Kingdom. The clinical attack rate was five times higher in N. Ireland than the rest of the United Kingdom. Ninety-five patients in hospital were diagnosed and two died. Eighty-two per cent of patients had aseptic meningitis and the majority of patients were children.

Acknowledgements

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PAROTID TUMOURS

By MILLAR BELL and JOHN J. O'NEILL
Belfast City Hospital

TUMOURS of the salivary glands are relatively uncommon. From 1958 through 1968 a total of 77 lesions of all the salivary glands were seen by one of us (M.B.) and 67 involved the parotid, 8 the submaxillary, one the sublingual and one an ectopic gland. In this paper we present our experience with the 'partoid' lesions, which comprise the largest group in the series, 67 out of a total of 77, as enumerated in Table I.

Clinical Features

The classical and frequently the only symptom and sign of a parotid tumour is a swelling. Only occasionally is slight pain or discomfort noted. Very often there is a long delay from the time the swelling is first noticed until the patient is referred to hospital, and in this series it varied from six weeks to 38 years.

Of the 7 patients with carcinoma of the parotid, 5 had local pain. Some degree of facial paresis is often mentioned as an early sign, but in this series 5 out of 7 cases had no facial paresis when first seen. So far as could be ascertained, 4 patients had no pre-existing tumour, while in the remaining three there had been a pre-existing tumour, presumably benign, for several years. In one instance a tumour had been present for about 30 years, but two months before referral to hospital it began to increase in size, the patient developed pain and there was weakness of the facial nerve.

Difficulty in Diagnosis

Accurate pre-operative diagnosis of a swelling in the parotid gland is difficult. Patey (1968) quoted Bland Sutton, who said that swellings in the parotid were "interesting lumps that required removal." In some cases the history is helpful, and in a few the diagnosis is comparatively easy. Of the lesions listed in Table I, acute non-purulent parotitis, chronic parotitis and calculus are fairly readily diagnosed. Also cystic hygroma and branchial cyst should be suspected from the clinical features. In all the other lesions seen diagnosis was not possible from the

TABLE I — *Parotid Tumours* – 67

Cystic Hygroma	1	Acute (non-purulent parotitis	2
Bronchial Cyst	2	Chronic Parotitis	16
Lipoma	4	Calculus	2
Boeck's Sarcoidosis	1	Mixed Salivary Tumours	24
Hodgkin's	1	Adenoma	2
Sec. Carcinoma	1	Adeno-Lymphoma	2
		Carcinoma	7
		Carcoma	2

history and clinical examination, with the possible exception of the one case of secondary carcinoma. The frequency of wrong clinical diagnosis is high and in a study carried out some years ago it amounted to 40 per cent (Patey and Hand, 1952).

Sialography has not been found of any help in diagnosis. The question therefore of biopsy has to be considered. It is well known that mixed salivary tumours (pleomorphic salivary adenoma) have a very thin capsule which is easily ruptured with resultant spillage of tumour cells into adjacent normal tissue. This can result in the production of multiple tumours in the parotid, or indeed, in the overlying skin. The danger of implantation is less with needle biopsy but has occurred (Eneroth, 1964). Interpretation of such limited material is difficult on histological examination.

Wide excisional biopsy is therefore necessary. That is, removing a wide margin of normal tissue with the tumour. This raises special problems in tumours of the parotid because of the intimate relationship of the trunk and branches of the facial nerve to the parotid. Excisional biopsy therefore involves exposure of the trunk of the facial nerve and subsequent identification of its main and subsidiary branches. At least 90 per cent of tumours of the parotid gland arise in the superficial lobe and therefore excisional biopsy essentially means superficial parotidectomy. There should be no resultant paresis of the facial nerve.

Treatment

The main principles of treatment of tumours of the parotid gland can be summed up as – wide surgical exposure by a cervico-facial (Y-shaped incision), early identification of the trunk of the facial nerve and removal of the tumour together with such surrounding tissues as the pathology demands (Patey, 1966).

It is generally agreed that it is better in the majority to expose the facial nerve as it emerges from the stylomastoid foramen than to trace back one of its branches from the anterior border of the parotid. This latter method results in a high incidence of residual permanent paralysis of the facial nerve. The nerve runs outwards and forwards from the stylomastoid foramen and at the isthmus of the parotid gland divides into two main branches which subsequently divide into the terminal branches of the nerve (pes anserinus). Removal of the gland superficial to the facial nerve is known as superficial parotidectomy. Removal of the whole of the parotid, sparing the facial nerve is termed total parotidectomy. Radical parotidectomy means total parotidectomy with sacrifice of the facial nerve.

The importance of the venous plexus lying immediately deep to the facial nerve has been emphasised (Patey and Ranger, 1957). Troublesome venous bleeding can occur from one of these small veins and anaesthesia with induced hypotension has been found to be of help in what can sometimes be a difficult dissection, particularly in cases of chronic parotitis.

Local excision of a small peripheral tumour is possible because, in such a situation the tumour can be excised with a margin of normal parotid tissue without the risk of significant damage to the facial nerve. In treating malignant tumours, radical parotidectomy is necessary in the majority of cases. In a very small lesion it may be possible to preserve one of the main divisions of the facial nerve. Where there is involvement of lymph glands in the neck block dissection is indicated with

radical parotidectomy. Most malignant tumours are not sensitive to radiation but it has been employed following one or two difficult dissections where it was considered that there was spillage of the tumour during operation. The various methods of treatment are indicated in Table II, and more specific reference will be made to pre-operative regional intra-arterial infusion.

TABLE II — *Method of Treatment*

Benign Tumours	(a) Superfacial Parotidectomy ? ? Local Excision
	(b) Total Parotidectomy
Malignant Tumours	(a) Radical Parotidectomy
	(b) Parotidectomy with partial preservation of facial nerve
	(c) Radical Parotidectomy and Block Dissection
	(d) Pre-operative regional intra-arterial infusion and radical parotidectomy
	(e) Radical Parotidectomy and Deep X-ray Therapy

Mixed Parotid Tumours (Pleomorphic Salivary Adenomas)

In the series superfacial parotidectomy was performed in 16 cases. Total parotidectomy with conservation of the facial nerve was carried out in one case. This was necessary because the tumour involved the deep part of the gland. Local excision was performed in 3 cases. In 4 cases the tumour was recurrent following operation elsewhere. The recurrences were 1 year, 4 years, 16 years and 33 years respectively after the primary operation. Three of these were treated by superficial parotidectomy and one by local incision.

In the series radiotherapy was given post-operatively in two cases where spillage occurred during the operation.

Malignant lesions of the Parotid

There were 7 cases of carcinoma and two cases of sarcoma, as detailed in Table III. In the carcinoma group, two cases with mucoepidermoid tumours were seen at a comparatively late stage when they had involvement of glands in the neck, and were treated by radical parotidectomy with ipsilateral block dissection of the cervical glands. Likewise, one patient with an acinic cell tumour required radical

TABLE III — *Malignant Group*

Carcinoma		*Sarcoma*	
Mucoepidermoid	2	Reticulum Cell	1
Acini Cell	1	Myosarcoma	1
Squamous	2		
Adenocarcinoma	1		
Undifferentiated	1		

parotidectomy with ipsilateral block dissection of the cervical glands and one of the cases had post-operative radiotherapy. Of the two cases of squamous carcinoma, one had a very small tumour and was treated by superfacial parotidectomy, the other case had had a biopsy done elsewhere and the tumour seemed to be growing very rapidly, with a very marked inflammatory reaction, so that surgical treatment was not considered possible. We had recently treated an elderly patient with an inoperable recurrent squamous carcinoma of cheek by regional intra-arterial retrograde infusion of methotraxate via the superfacial temporal artery, and were greatly encouraged by an initial dramatic response. Although this was not maintained it did encourage us to try the same treatment, in this case of carcinoma of the parotid. There was a most encouraging response as evidenced by regression in size of the tumour and disappearance of all the inflammatory reaction, at which stage we proceeded to do a parotidectomy. This patient did not have facial paresis pre-operatively but at operation it was found impossible to preserve the trunk and upper branches of the facial nerve. The case of undifferentiated carcinoma was treated by superficial parotidectomy in the first instance, because the tumour was small and there was no involvement of the facial nerve. Subsequently, when we received the histological report this patient was referred for post-operative radiotherapy.

There were two cases of sarcoma of the parotid, the case of reticulum cell sarcoma had a small tumour and was treated as though he had a pleomorphic salivary adenoma. When the histo-pathology was subsequently revealed he was referred to for post-operative x-ray therapy. The case of myosarcoma had had one or two biopsies done elsewhere and had a most extensive tumour with involvement of the cervical glands on the affected side. He was treated by radical parotidectomy and ipsilateral block dissection of the cervical glands.

Complications

Complications are not frequently encountered and are as detailed in Table IV. Infection has been noted in several cases but has never been severe or persistent, with one exception, a case of intractable chronic parotitis. The patient inexplicably developed thrombosis in the vessels in the lobe of his ear which subsequently proceeded to a state of dry gangrene and separated.

Table IV — *Complications of Operation*

Infection	Mild in four cases
Haematoma	Two cases
Sensory loss	In lobe of ear in all cases
Facial paresis	Partial and temporary in 8 cases
	Total and permanent in 3 cases.
	Total and permanent in 3 cases of carcinoma and one case of sarcoma
	Residual weakness in 2 cases of recurrent mixed salivary tumour
Auriculo-temporal syndrome	2 cases
Parotid Fistula	None

In this series it was not found possible to preserve those branches of the great auricular nerve going to the lobe of the ear, and thus there is a loss of sensation in the lobe of the ear in all cases. Patey states that it is possible to preserve these branches in some cases but to date it has not been found possible by us. The loss of sensation in the lobe of the ear has been commented upon by many of the patients, but has not otherwise been a problem.

Regarding facial paresis, the importance of identification of the trunk and branches of the facial nerve must be stressed. It will be noted that in three cases there was temporary and total facial paralysis, but when the operator has seen the facial nerve, he can with confidence reassure the patient and, in our three cases, there was subsequent complete restoration of function. The interval was 1 month, 2 months and 3 months respectively. The branch of the facial nerve which is most often involved is perhaps the longest branch, that is, the one supplying the angle of the mouth and the lower lip. Paresis involving this branch of the nerve has only persisted in two cases who had recurrent mixed salivary tumours.

The auriculo-temporal syndrome did appear in two cases, and it is interesting to note that in one case it did not appear for approximately one year following superfacial parotidectomy, and in the other, several months after operation. It has not been severe in either case and in the first case it has clear up almost completely.

Results

All cases have had complete follow-up to date. Table V summarises the results in the mixed parotid and recurrent mixed parotid tumours. Table VI shows the

Table V — *Mixed Tumours*

		Follow-up in years		
Type	*No. of cases*	1	4	8
Primary	20	10	4	1
Recurrent	4	3	1	–
Total	24	13	5	1

There have been no recurrences in the follow-up periods.

Table VI — *Carcinoma*

		Follow-up in years		
Type	*No. of cases*	6/12	1 *year*	2 *years*
Squamous	2	(1)	–	(1)*
Adenocarcinoma	1	–	(1)	–
Undifferentiated	1	–	1	–
Mucoepidermoid	2	(2)	–	–
Acinic Cell	1	–	–	1

Parenthesis show recurrences and death from metastasis.
*Died at 2 years from heart attack – no evidence of disease.

results in seven cases of carcinoma broken down into histological types. The two cases with adenolymphoma show no evidence of recurrence 7½ years and nine months post-operatively.

Discussion

Tumours of the parotid are uncommon and as has been pointed out accurate pre-operative diagnosis as to the nature of the pathology is difficult. With the wider acceptance of the principles of parotid surgery treatment is becoming more standardised. For mixed tumours superfacial parotidectomy is the treatment of choice. Radiotherapy has little or no effect on the primary tumour but can be used post-operatively where spillage has occurred in an attempt to destroy microscopic tumour deposits. Evidence for this is that in the past, when surgical treatment was more conservative and tumours were simply shelled out, the implantation of radium was found to reduce the incidence of recurrence (Ahlbom, 1935).

Van Meirt, Dawes and Harkness (1968) recommended simple enucleation followed by radiotherapy in the treatment for mixed parotid tumours. Over a period of twenty-six years a total of 167 patients were treated by enucleation and radiotherapy and recurrence rate was stated to be 2.74 per cent, but this method of treatment is not generally accepted.

Follow up of these cases has to be long as late recurrence is a characteristic (Patey, 1967). Recurrent mixed tumours are more difficult to treat because although clinically they may appear to be a single nodule, there is often widespread diffusion of tumour in the operation area. The risk of damage to the facial nerve is greater and in the present series two cases have residual weakness of the lower part of the facial nerve.

In most series the percentage of tumours classified as malignant is in the order of 15 to 25 per cent (Patey et al, 1965; Eneroth, 1964; Sharp and Helsper, 1960), but an incidence of 34 per cent was reported by Foote and Frazell (1954). In the present series it was 16.3 per cent. The results of treatment of carcinoma are bad, most patients dying of the disease irrespective of the treatment given. One case in this series who had an inoperable squamous carcinoma when first seen and to which reference has already been made (*vide supra*) had a dramatic response to regional intra-arterial retrograde infusion of methrotraxate. This produced a situation in which surgery was possible, and the patient lived for two years and died from a heart attack.

Chemotherapy in the treatment of malignant disease has most often been used for late cases when other methods of treatment have failed. The head and neck is one area where regional infusion is anatomically feasible, and while one cannot draw conclusions from encouragement in one case it does, nevertheless, suggest that pre-operative infusion of a chemotherapeutic agent should be tried in an area where our present methods of treatment give unsatisfactory results.

Summary

All cases of parotid tumours occurring over a ten year period are reviewed with particular reference to clinical features, difficulty in diagnoses, treatment, complications and results.

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BOOK REVIEW

SOME INHERITED DISORDERS OF BRAIN AND MUSCLE. Edited by J. D. Allan and D. N. Raine. (Pp. viii+154; figs. 53. 40s). Edinburgh and London: E. & S. Livingstone, 1969.

THIS volume is the published proceedings of the fifth symposium of the Society for the Study of Inborn Errors of Metabolism held in Newcastle in 1968. Previous symposia in this series have been valuable collections of papers in a rapidly expanding, multi-disciplinary field and this volume is no exception. Walton's discussion of the classification of muscular dystrophy is a fair summary of a difficult subject. Some of the papers are of specialist interest e.g. McArdle's on skeletal muscle glycogenosis, but because of the combined clinical and biochemical discussion even these are of general importance. The cerebral lipidoses feature prominently in the papers on disorders of brain metalolism, presumably because other abnormalities have been discussed in previous symposia, but Walshe's combined genetic and biochemical study in Wilson's disease helps to balance this part of the back.

Obviously this volume has a restricted appeal but it contains information of great interest to many medical specialists and can be recommended to the biochemist, the morbid anatomist and the paediatric neurologist. To those contemplating postgraduate examinations it provides valuable information on some of the rare disorders which seem to interest some examiners.

I.V.A.

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I.V.A.

MULTIPLE SCLEROSIS IN NORTHERN IRELAND

A study of the date and place of birth of patients

By

G. AMARH ASHITEY, M.D., D.P.H., D.Obst., R.C.O.G.

Research Fellow, Department of Social and Preventive Medicine,
The Queen's University of Belfast,
and

J. H. D. MILLAR, M.D., F.R.C.P.,

Consultant Neurologist, Royal Victoria and Claremont Street Hospitals, Belfast

SUMMARY

1,418 multiple sclerosis cases, 1,238 of whom were born in Northern Ireland, were analysed. A detailed study was made of the 783 cases born in Northern Ireland from 1901 to 1925. These cases were studied in relation to all live births that occurred in the administrative areas of the province during the period. The results showed a constant *case-rate over the years studied, and a remarkable deficiency of cases born in the city of Belfast.

It was concluded that the risk of developing multiple sclerosis is not independent of the place of birth, but is independent of the year of birth of patients.

INTRODUCTION

Circumstantial evidence from varied sources (Schapira, Poskanzer and Miller, 1963; Acheson, 1965; Millar, 1966; Dean, 1967; Kurtzke, 1968) suggests that multiple sclerosis is acquired in early life, probably in infancy, although its clinical manifestations appear much later.

However, most of the previous studies of the geographical distribution of the disease have dealt with the location of patients following the onset of the disease. There appears to be only one reported study (Acheson and Bachrach, 1960) which has dealt exclusively with the place of birth of multiple sclerosis patients, and there is none which deals with the date and place of birth together. If multiple sclerosis has a long latent period running into decades, then in view of the mobility of population as well as the rapid environmental changes which are occurring, it becomes clear that the circumstances of a patient at or immediately before the onset of the clinical manifestations of the disease might have no relevance to the aetiological factors of the disease.

AIM OF THE PRESENT STUDY

The aim of the present study was to use ascertained multiple sclerosis cases born in Northern Ireland to investigate the following null hypotheses:

1. The risk of developing multiple sclerosis is independent of the year of birth.
2. The risk of developing multiple sclerosis is independent of the place of birth.

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*Case rate is used here to represent the number of persons born in a particular year who were subsequently ascertained as multiple sclerosis cases per 1,000 live births during their year of birth.

Population Studied

Northern Ireland is particularly suitable for such a study because it is a small administrative unit, and its compact and isolated geographical position reduces the number of extrinsic variables which have to be standardised in comparative studies. It is also easier with a population of the size of Northern Ireland (1,480,000) to carry out studies involving the whole population, than is possible in other parts of the United Kingdom. Multiple sclerosis cases have been ascertained from all over the province since 1948, mainly by Dr. R. S. Allison and Dr. J. H. D. Millar. The advantage of this in terms of uniformity of diagnosis is clear. A central register of all the ascertained cases (living or dead) has been compiled. On 1st October, 1968, there were 1,418 cases on this register. Most of these cases were ascertained through a countrywide prevalence survey (Allison and Millar, 1954). The rest have been ascertained since the survey, through consultant clinics, hospital records and post-mortem reports. In the absence of any specific diagnositic test it is impossible to estimate the degree of ascertainment represented by this register, but the structure and administrative arrangements of the National Health Service in Northern Ireland are such that using the combination of methods listed above, and the diagnostic criteria of Allison and Millar, 1954 (which were adopted by the World Federation of Neurologists for epidemiological studies – Allison, 1960) very few cases are likely to have been missed.

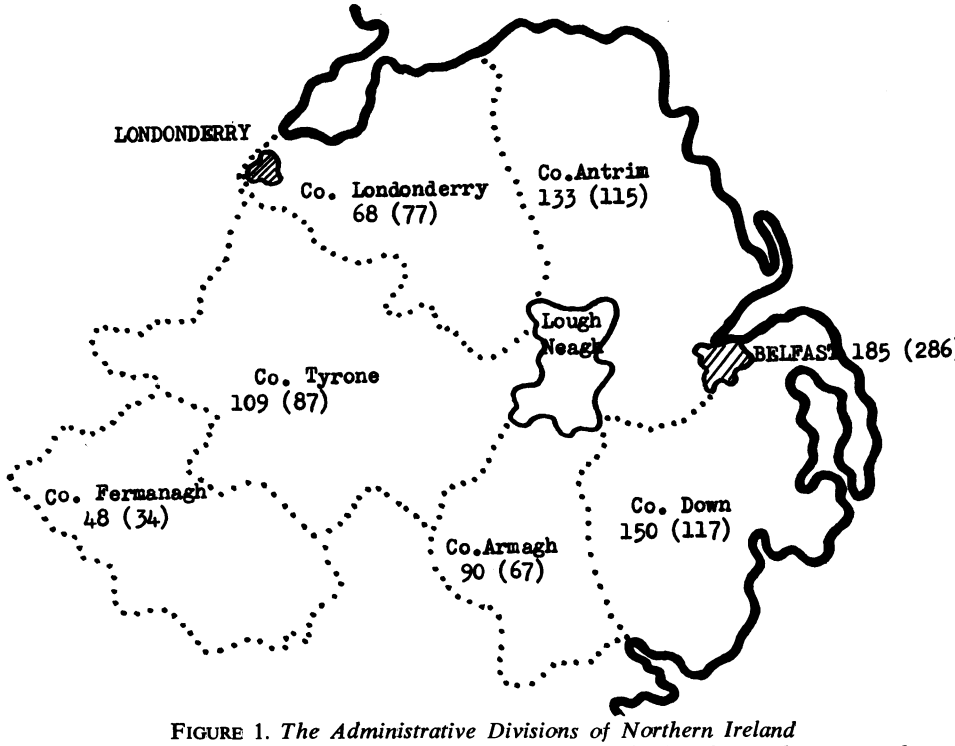

FIGURE 1. *The Administrative Divisions of Northern Ireland*
The figures show the distribution of ascertained cases of multiple sclerosis born in each area (1901-1925). The figures in brackets are the expected, the others the observed.

Of the total 1,418 cases, 1,238 were born in Northern Ireland of whom 783 were born during the period 1901 to 1925. These 783 cases formed the study population. It was thought that since the mean age of onset of clinical symptoms was 31 years, many of those born after 1925 and destined to develop the disease, might not have developed the disease by the time the study was undertaken; on the other hand, it is very likely that many patients who were born before 1901 were dead by the time ascertainment began in 1948.

Method

All the 783 cases were assigned to their year and administrative area of birth and studied in relation to all registered live births that occurred in these areas during the appropriate years. Using this approach (a historical prospective study, Clark and Hopkins, 1967) it was possible to estimate individual chances of developing the disease among the 1901–1925 five-year cohorts in Northern Ireland.

Table I

The number of persons born in Northern Ireland annually from 1901 *to* 1925 *who subsequently developed multiple sclerosis and the corresponding rates per* 1,000 *registered live births.*

Year of Birth	*Multiple Sclerosis Cases*			*Rate* 1,000
	Male	*Female*	*Total*	*Live Births*
1901	8	10	18	.58
1902	17	15	32	1.03
1903	11	22	33	1.06
1904	15	21	36	1.13
1905	13	17	30	0.97
1906	11	19	30	0.97
1907	11	18	29	0.94
1908	24	17	41	1.32
1909	12	24	36	1.16
1910	17	23	40	1.33
1911	12	20	32	1.03
1912	12	16	28	0.93
1913	14	20	34	1.13
1914	14	21	35	1.17
1915	15	14	29	1.04
1916	15	20	35	1.30
1917	10	13	23	0.92
1918	12	15	27	1.04
1919	10	20	30	1.10
1920	17	21	38	1.15
1921	20	15	35	1.17
1922	13	20	33	1.10
1923	15	14	29	0.97
1924	7	16	23	0.82
1925	10	17	27	0.96
Total	335	448	783	1.06

Administratively Northern Ireland comprised six counties – Antrim, Armagh, Down, Fermanagh, Londonderry, Tyrone and the two county boroughs of Belfast and Londonderry. (Fig. 1).

However, the vital statistics for county Londonderry for the period before 1922 also included those of Londonderry county borough. Therefore, for this study Londonderry county and county borough were combined. Belfast's population for the period of study was about 387,000, which was about ten times that of the next largest town, Londonderry.

Results

Year of Birth of Patients

Table I shows the number of ascertained multiple sclerosis cases born each year in Northern Ireland and the corresponding case rates per 1,000 live births. The average number was 31 and the case-rate of 1.1 per 1,000 was remarkably constant for the 25 years studied.

Table II shows the case rates for the administrative areas of Northern Ireland. Due to the small number of cases born yearly in each administrative area, the rates were calculated for quinquennial periods. Apart from one or two figures these rates are also practically constant for each area during the five quinquennia studied. It is, therefore, concluded, that there are no grounds for rejecting the null hypothesis that the risk of developing multiple sclerosis is independent of the year of birth of a patient.

Place of Birth of Patients

The overall case rates (for the period 1901–25) were Belfast 0.7, Londonderry 0.8, Antrim 1.2, Down 1.4, Armagh 1.4, Fermanagh 1.5, Tyrone 1.5. When Belfast's rate was compared to the others using the approximation of standard error employed by the Registrar General (England and Wales) when comparing local death rates, significant differences were found in all instances except Londonderry – Table III. This exception of Londonderry may be due to the fact that Londonderry County Borough was studied with the Londonderry County as a single unit for reasons already given. Londonderry County Borough has about one-third of the total population of the two.

Table IV shows the comparison of the observed distribution of cases by administrative area of birth with the expected, based on the null hypothesis that all live births in Northern Ireland have an equal risk of developing multiple sclerosis. (The expected figures were calculated from the rate for the whole of Northern Ireland and the number of live births in each area during each quinquennium). The difference between the observed and the expected is highly significant ($x^2=124.8$, D.F.$=34$, $P<.001$). Again these figures show that fewer than expected cases were born in Belfast. The hypothesis that the risk of developing multiple sclerosis is independent of the place of birth is, therefore, rejected.

Discussion and Conclusions

In a previous study of the distribution of multiple sclerosis in Northern Ireland no significant differences were found in the distribution by administrative areas when the patients were studied by their addresses at the onset of the disease or at the time of ascertainment (Allison and Millar, 1954). The present study shows that a significantly smaller than expected number of cases were born in Belfast

and a corresponding excess of cases were born in the other administrative areas of Northern Ireland. This finding was consistent over 25 years and could not be explained by any obvious bias in the material. It could not have been due to a greater availability of medical care, or to more accessibility of diagnostic facilities; on the contrary the deficiency of cases was in Belfast, which is the principal medical centre of Northern Ireland. Neither could it have been due to handicapped multiple sclerosis patients being left behind in the countryside while their more able-bodied contemporaries migrated to Belfast or abroad for work, because the analysis of cases was based on the date and place of birth, long before the patients developed their symptoms.

TABLE II

The number of persons born in the administrative areas of Northern Ireland from 1901 to 1025 who subsequently developed multiple sclerosis and the corresponding rates per 1,000 registered live births.

(Analysis for quinquennial periods)

1=Number of cases.
2=Live births 000s.
3=Cases per 1,000 births.

Administrative Area		1901–05	1906–10	1911–15	1916–20	1921–25	Overall Rate 1901–25
Belfast	1	42	43	35	30	35	185
County Borough	2	56	56	54	51	54	271
	3	.8	.8	.7	.6	.6	.7
	1	25	34	31	24	19	133
Antrim County	2	23	23	22	20	21	109
	3	1.1	1.5	1.4	1.2	.9	1.2
	1	16	17	21	16	20	90
Armagh County	2	14	14	13	11	12	64
	3	1.1	1.2	1.6	1.5	1.7	1.4
	1	34	34	35	33	14	150
Down County	2	24	23	22	20	22	111
	3	1.4	1.5	1.6	1.7	.7	1.4
Fermanagh	1	8	8	13	10	9	48
County	2	7	7	6	6	6	32
	3	1.1	1.1	2.2	1.7	1.5	1.5
Londonderry	1	9	18	8	17	16	68
County & Co. Bor.	2	17	17	16	15	17	82
	3	.5	1.1	.5	1.1	.9	.8
	1	15	22	15	23	34	109
Tyrone County	2	15	15	15	14	14	73
	3	1.0	1.4	1.0	1.6	2.4	1.5
	1	149	176	158	153	147	783
N. Ireland	2	156	155	148	137	146	742
	3	1.0	1.2	1.1	1.1	1.1	1.1

This indicates that in Northern Ireland multiple sclerosis was due to a factor which operated less strongly in Belfast than in the other administrative areas of Northern Ireland during the first quarter of this century. Conversely, it could have been that a protective factor operated more strongly in Belfast.

It is concluded that the risk of developing multiple sclerosis in the population studied was independent of the year of birth, but was not independent of the place of birth.

The findings of this study provide only partial support to some of the aetiological factors which have been suggested in the literature.

1. Multiple sclerosis as an inherited disease:
   Evidence in favour:
   (i) The constant case rate of 1.1 per 1,000 live births in Northern Ireland during the years 1901 to 1925.
   (ii) From the only reported study of consanguineous marriages in the general population of Northern Ireland (Kilpatrick et al, 1955), areas of high cousin marriage rates correspond to the areas with high risk of developing multiple sclerosis.

TABLE III

Comparison of the overall case rate for Belfast with the case rates of the other administrative areas of Northern Ireland

	$m_2 - m_1$	$2\sqrt{\frac{m_1^2}{d_1} + \frac{m_2^2}{d_2}}$	Comment
ANTRIM	0.5	0.23	Significant
ARMAGH	0.7	0.31	"
DOWN	0.7	0.25	"
FERMANAGH	0.8	0.44	"
LONDONDERRY (including county borough)	0.1	0.22	Not Significant
TYRONE	0.8	0.30	Significant

Where m is the case rate and d the number of ascertained cases m_1 and d_1 refer to Belfast and m_2 and d_2 to the other areas in Northern Ireland.

TABLE IV

Comparison of the observed and expected distributions of multiple sclerosis cases born in the administrative areas of Northern Ireland on the null hypothesis that all live births had an equal risk of developing multiple sclerosis.

Year of Birth	*Belfast Co. Bo.*	*Co. Antrim*	*Co. Armagh*	*Co. Down*	*Co. Fermanagh*	*L'derry (inc. Co. Bo.)*	*Co. Tyrone*	*Total*
1901–05	42 (59.09)	25 (24.27)	16 (14.77)	34 (25.34)	8 (7.39)	9 (17.94)	15 (15.83)	149
1906–10	43 (59.09)	34 (24.27)	17 (14.77)	34 (24.27)	8 (7.39)	18 (17.94)	22 (15.83)	176
1911–15	35 (56.98)	31 (23.21)	21 (13.72)	35 (23.21)	13 (6.33)	8 (16.88)	15 (15.83)	158
1916–20	30 (53.82)	24 (21.10)	16 (11.61)	33 (21.10)	10 (6.33)	17 (15.83)	23 (14.77)	153
1921–25	35 (56.98)	19 (22.16)	20 (12.66)	14 (23.21)	9 (6.33)	16 (17.94)	34 (14.77)	147
Total (observed)	185	133	90	150	48	68	109	783

Overall rate 1.055 *cases*/1,000 *registered live births.* D.F.=34 X_2=124.8 P<0.001 (*highly significant*)

Evidence against:

The evidence presented here in favour of a genetic basis of multiple sclerosis is indirect. The question can only be settled by the examination and analysis of all sibships of all the propositi, and the data required for such analysis was not available for this study.

2. Multiple sclerosis as a disease caused by an infectious agent, probably a virus:

Evidence in favour:

(i) Areas of high risk in Northern Ireland were found to coincide with areas of inadequate piped water supply and poor sanitation.

Evidence against:

(i) Year of birth of patients in Northern Ireland showed no epidemic pattern.

(ii) No seasonal incidence in the date of birth of patients was found (G. A. Ashitey, 1969).

(iii) No evidence of clustering of cases by date and place of birth together was obtained (G. A. Ashitey and G. MacKenzie, to be published).

Dean (1967) has suggested that multiple sclerosis is normally an infection of infancy, probably a gastrointestinal infection and those who escape because of high level of domestic hygiene may, if predisposed, develop the adult form of the disease. This hypothesis was based on Dean's own findings in South Africa (1967), and the findings of other workers in different parts of the world (Alter et al, 1962; Westlund and Kurland, 1953; Okinaka et al, 1960).

It should be pointed out that all the above and other studies of multiple sclerosis have indicated so far is a higher prevalence of the disease in the developed western countries and a lower prevalence in the developing countries of Africa and Asia. There are many other differences between the above groups of countries besides domestic hygiene. Infant mortality rates (for which there are many causes) are widely different. Here it is interesting to note that from the data available (Registrar General, N.I., 1922) the infant mortality rate in Belfast (where fewer than expected cases were born) was higher than that in the other parts of Northern Ireland (where more cases of multiple sclerosis than expected were born); but it was also known that Belfast had a better sanitation and water supply than the rest of Northern Ireland (Adams and Cheeseman, 1951). What this "apparent" geographical distribution of multiple sclerosis therefore means in terms of aetiology is not clear, except perhaps in supporting the hypothesis that the "critical period" in the aetiology of multiple sclerosis is during infancy. The disease is less prevalent among people born in places of high infant mortality, and vice versa.

3. Multiple sclerosis and mineral deficiency or excess:

Evidence in favour:

(i) The constant case rate during the period 1901 to 1925.

(ii) One of the main differences between Belfast (low risk area) and the rest of Northern Ireland (high risk area) during 1901 to 1925 was in the water supply. Belfast had a piped water supply, while for most of the other parts of Northern Ireland the water used came from wells and streams. Stocks (1947), Morris et al (1961) and others have shown that local differences do exist in the mineral element composition of

drinking water, and that these can sometimes be correlated with the mortality and morbidity of certain diseases like cancer and cardiovascular diseases. Warren (1959) and others have suggested that a high prevalence of multiple sclerosis is associated with excess lead in the soil.

Evidence against:

Although Northern Ireland is known to have a varied geology within its small area, no chemical data have been obtained to show that the mineral composition of the water supply or the soil of the different administrative areas of the province are different.

4. Relationship between latitude and climate and multiple sclerosis:

Evidence in favour: Nil.

Evidence against:

There was a significant variation in risk of developing the disease between the administrative areas of Northern Ireland. The whole province lies within one degree latitude, and the climate is not very variable in the different areas of the province.

We thank Dr. R. S. Allison for his interest and permission to study the records of his cases; the Registrar General (N.I.) and his staff for giving us access to their records; Dr. R. P. Maybin, Medical Adviser to the General Health Services Board (N.I.) for information. Professor J. Pemberton and Professor P. Froggatt of the Department of Social and Preventive Medicine, the Queen's University of Belfast, for advice and encouragement. G.A.A. was in receipt of a research grant from the Stuart Friar Fund of Queen's University, Belfast.

Requests for reprints to be sent to Dr. J. H. D. Millar.

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LYMPHADENOPATHY DUE TO TOXOPLASMOSIS

By DOROTHY M. HAYES, M.D., M.R.C.Path.
Department of Histopathology, The Central Laboratories, Belfast City Hospital

MANY SEROLOGICAL surveys using the dye test of Sabin and Feldman (1948) have shown infection with *Toxoplasma gondii* to be widespread. It occurs with various degrees of frequency in different geographic areas and antibodies have been found in man and many species of animals (Feldman and Miller, 1956; Beattie, 1957; Jacobs, Remington and Melton, 1960; Ludlam and Beattie, 1963).

As an infection producing clinical symptoms the disease appears to be rare and the best known and longest recognised form in man in the congenital disease to which attention was drawn in 1939 by Wolf, Cowan and Paige. The acquired infection is rarely severe but a manifestation recognised with increasing frequency is lymphadenopathy, which may or may not be associated with mild constitutional symptoms. It is not unusual for the lymphadenopathy to persist for several months and this may raise the suspicion of disease of a more serious nature and result in lymph node biopsy.

The histological appearances in the lymph nodes are distinctive, although the specificity of the morphology is at present uncertain (Harrison, 1966). However, Saxen, Saxen and Gronroos (1958), Saxen and Saxen (1959) and Saxen, Saxen and Tenhunen (1962) have reported several series in Finland and stressed the diagnostic significance of the changes, and Tenhunen (1964) wrote that the histology of the lymph nodes established the correct diagnosis in over 90 per cent of cases. The importance of diagnosis lies in the differentiation of toxoplasmic lymphadenitis from malignant reticuloses, especially Hodkin's disease (Saxen et al, 1962) and specific infections. The histology does appear to be uniform and will often allow of a provisional diagnosis which may be confirmed by serological testing for antibodies.

The present series of 6 cases has been collected on a histological basis from a routine biopsy service over a fifteen-month period. During this time a total of 340 lymph node biopsies was received giving an incidence of 1.8 per cent. They were drawn from both urban and rural populations in Northern Ireland. The biopsies were undertaken for persistent, unexplained lymphadenopathy and in only one case was toxoplasmosis considered.

Histology

The histological changes in all six lymph nodes are very similar, although they vary in degree and the cases have been collected on the basis of the morphology.

The lymph nodes are moderately enlarged, but the architecture is preserved. There is a striking degree of follicular hyperplasia and the large follicles with active germinal centres are scattered throughout the node and vary considerably in size. The follicles are well demarcated except where the margins are interrupted by small clusters of histiocytic cells. In the reaction centres there are numerous mitotic figures and macrophages containing nuclear debris are usually abundant. There is often a marked degree of periadenitis associated with fibrous thickening of the

capsule. Many of these features, however, are common to non-specific reactive changes in lymph nodes. The more distinctive morphology is the presence of small clusters of histiocytic cells with abundant eosinophilic cytoplasm. These are scattered throughout the node both in the medulla and also in the reaction centres of the follicles (Fig. 1). These cells resemble those seen in the granulomata of Boeck's sarcoidosis and tuberculosis. There is, however, no caseation and the cell clusters

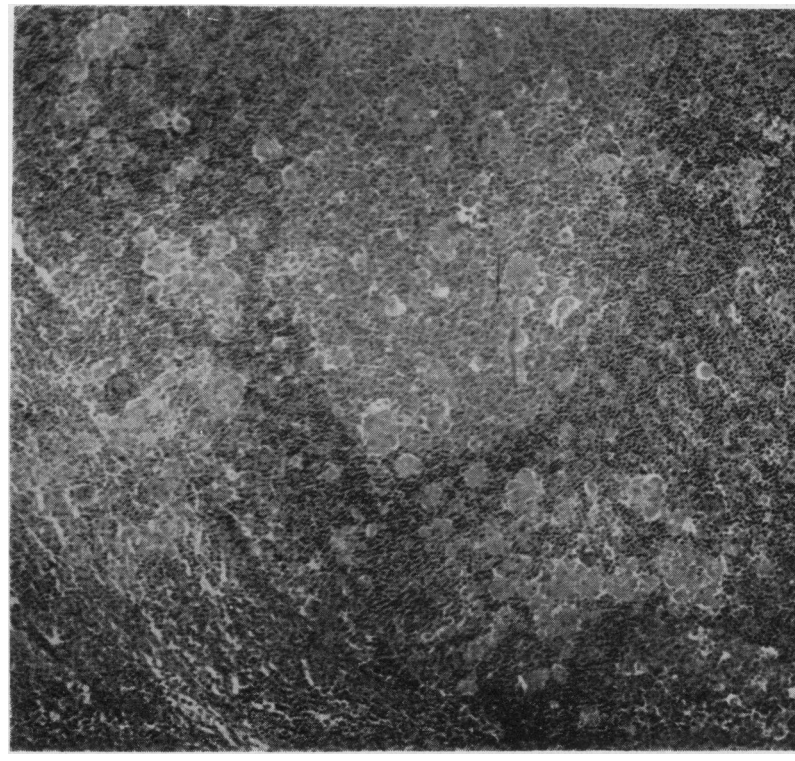

FIG. 1. *Clusters of histiocytic cells in medulla and also in an enlarged follicle. Haematoxylin and eosin* x 100.

are smaller than those usually seen in Boeck's sarcoidosis and are without giant cells. In addition in some of the nodes peripheral sinuses packed with mononuclear cells are a striking feature (Fig. 2). Many of these cells are lymphocytes but others are probably macrophages. The cell clusters of histiocytic cells and the prominent peripheral sinuses packed with mononuclear cells, when associated with marked reactive hyperplasia, are the features which suggest toxoplasmosis and remove the diagnosis from the non-specific group. There may be some variation in the extent to which the lymph nodes exhibit these changes; in some nodes the clusters of histiocytic cells are less prominent than in others but they still show the unusual pattern of distribution in the follicles. In none of the lymph nodes studied was there any infiltration by eosinophils. No toxoplasmic cysts were identified despite prolonged searching but these have only very rarely been described in lymph nodes.

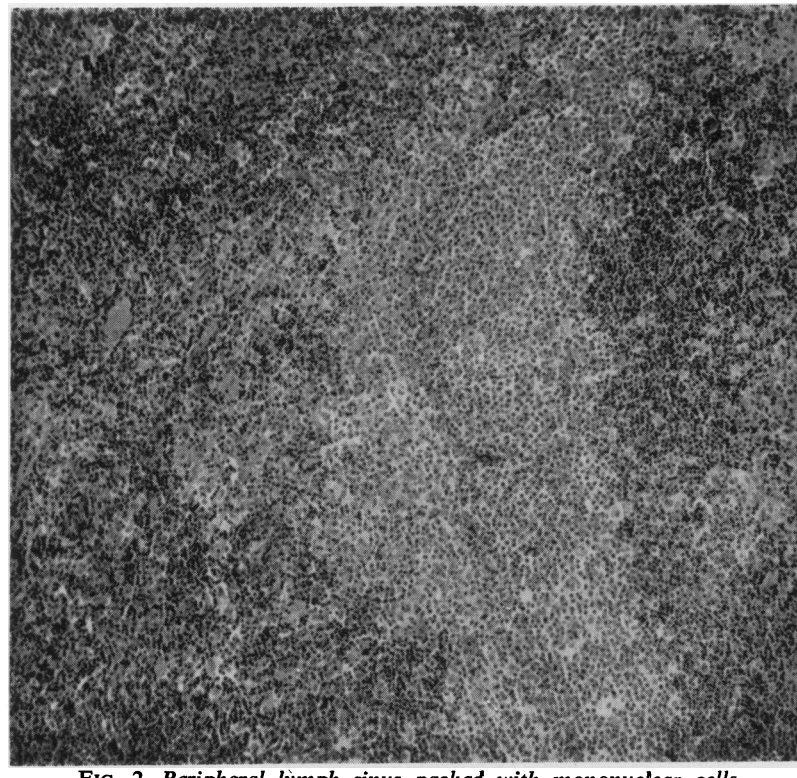

FIG. 2. *Peripheral lymph sinus packed with mononuclear cells. Haematoxylin and eosin* x 100.

PAS positive debris may be identified in the macrophages in the germinal centres. This has been interpreted as toxoplasma organisms but the similarity to nuclear debris makes this unlikely and these appearances cannot be accepted as having any diagnostic significance.

DISCUSSION

Lymphadenopathy may clinically be a very non-specific finding and toxoplasmosis is only one of many conditions causing the enlargement. In the cases recognised in the routine biopsy service the infection was not associated with any characteristic clinical findings and persistence of the lymphadenopathy resulted in biopsy usually to exclude malignancy or tuberculosis. It has been estimated that toxoplasmosis accounts for 2 to 13 per cent of otherwise unexplained lymphadenitis (Siim, 1956, 1961; Beverley and Beattie, 1958; Saxen and Saxen, 1959; Turunen, 1963). In a series of 958 lymph node biopsies in Finland reported by Turunen (1963) toxoplasmoisis was diagnosed histologically in 2.3 per cent while a higher figure of 13 per cent was found in a serological investigation of patients with lymphadenitis of uncertain aetiology (Siim, 1961). During the time the six lymph nodes in this series were recognised, a total number of 340 lymph node biopsies were received giving an incidence of 1.8 per cent. This is probably comparable with the incidence

recorded in Finland by Turunen (1963). His series consisted only of peripheral lymph node biopsies mainly from the cervical region while in this material peripheral lymph nodes from other sites and the mesentery were also included.

Toxoplasmic lymphadenitis is probably more prevalent than previously suspected and the incidence of infection obtained histologically is almost certainly low. In many cases the lymphadenopathy is transitory and does not lead to biopsy and unless the infection is suspected and antibodies looked for the aetiology remains unsuspected. The serology will often remain positive at a high titre for a considerable time after the lymph node enlargement has subsided.

The six lymph nodes all showed very similar histology but with some variation in degree and it is felt they allow a high degree of accuracy in diagnosis. While at present it is uncertain how specific these changes are for toxoplasmosis there is without doubt a striking degree of uniformity in the histology and once appreciated further cases are unlikely to escape detection. This morphology was described in 1947 by Robb-Smith and in 1952 by Piringer-Kuchinka without recognition of its aetiology. Robb-Smith (1947) described the lymph node changes as lympho-histiocytic medullary reticulosis. Later the same author, quoted by Beverley and Beattie (1958) for whom he reviewed a series of lymph nodes, doubted whether the appearances could be regarded as specific for toxoplasmosis. The diagnostic value of histological study was, however, stressed by Saxen and Saxen (1959) and Saxen et al (1962). They believed the appearances were adequate to establish the diagnosis in over 90 per cent of cases. Recently (Harrison, 1966) discussed the morphology and considered that the appearances were sufficiently characteristic to justify a provisional diagnosis pending serological investigation. Certainly in the six cases described here the small histiocytic clusters immediately attracted attention and their unusual distribution within the reacting follicles of the lymph node was striking. It is as yet uncertain how specific the histology is and the possibility of confusion with a malignant lymphoma, such as Hodgkin's disease cannot be completely excluded. The extent to which these changes occur in the lymph nodes is variable and it is possible that not all lymph nodes in toxoplasmosis show these distinctive features to draw attention to the infection. To date I have not seen any condition in which the histology has mimicked toxoplasmosis closely enough to cause confusion and all cases have been confirmed by serological tests.

Toxoplasma cysts have only very rarely been found in lymph node sections (Stanton and Pinkerton, 1953; Stansfeld, 1961). Cysts are probably the only form which should be definitely identified in tissue section. The parasite may be isolated by animal inoculation methods but this is not always possible and the diagnosis must be suspected prior to fixation of the excised lymph node.

Clinically the infection is unlikely to be diagnosed. Beverley and Beattie (1958) from a study of case records were unable to find any characteristic clinical features suggesting toxoplasmosis. Occasionally haematological investigations may be useful. In the peripheral blood there may be a relative or absolute lymphocytosis with occasional abnormal mononuclear cells similar to those seen in infectious mononucleosis (Table). The Paul-Bunnell test, however, is negative and this association is suggestive of toxoplasmosis.

Serological results provide the most useful confirmatory evidence of infection. In a disease where subclinical infection is common positive results with the dye

CLINICAL MATERIAL

No.	*Sex*	*Age*	*Site of lymphadeno-pathy*	*Duration of lymphadeno-pathy (weeks)*	*Dye test titre*	*Leucocytes/ cu. mm.*	*Lymphocytes cu. mm.*
1	F	27	Cervical	5	1/512	6,700	2412
2	F	21	Cervical	12	1/8192	3,700	2072
3	M	10	Axillary	11	1/4096	8,900	2248
4	F	23	Cervical	7	1/4096	4,000	2240
5	M	7	Axillary	–	1/2048	–	—
6	F	37	Cervical	8	1/128,000	5,000	2050

test are to be expected and may only indicate that the patient has been infected at some time with the organism. The titre in the glandular form of the disease is strongly positive as would be expected with a recent acquired infection and in conjunction with the histology gives reliable evidence of toxoplasmosis. From the table it can be seen that 5 of the 6 cases had strong serological reactions with titres above 1 in 2,048. In case 1 the titre was 1 in 516. Harrison (1966) considers that the titre must be in the order of 1 in 250 to make a diagnosis, but a higher titre is probably desirable. This level of dye test antibodies was found by Beattie (1957) in 0.2 per cent of a normal population and he believes that it is not unreasonable to look for a titre of 1 in 1,000, especially in the absence of the more reliable evidence provided by a rising titre (Beattie, 1967). This has also been emphasised as a feature of glandular toxoplasmosis in Scandinavia (Saxen et al, 1962). Case 1 had the shortest history of lymphadenopathy and it is quite possible that a higher titre might have been obtained with further testing at a later date. The antibody dye test may take up to 3 months to rise to a maximum titre (Saxen, Saxen and Gronroos, 1958; Tenhunen, 1964) and low titres in the early stages of infection may be misleading and do not exclude toxoplasmosis. Repeated low antibody reactions would certainly indicate the need for the histology of the lymph nodes to be reassessed.

SYNOPSIS

Six cases of acquired toxoplasmic lymphadenopathy are described involving peripheral lymph nodes. This gives an incidence of 1.8 per cent in a total of 340 lymph node biopsies received in a routine biopsy service over a period of fifteen months. The service covers rural and urban populations in Northern Ireland. Toxoplasmosis appears to be a commoner cause of lymphadenopathy than previously suspected.

The infection has been recognised on the basis of histological criteria and the distinctive changes in the lymph nodes are described. They allow a presumptive diagnosis of toxoplasmic lymphadenitis to be made.

The value of confirmatory serological tests is stressed and the high antibody dye test titres obtained are a typical feature of the disease without which the diagnosis is not justified.

I wish to thank Dr. J. E. Morison for his help and constructive criticism; Mr. J. Orchin for the photographs and Miss A. McCambridge for clerical help. I am grateful to the physicians and surgeons who kindly allowed access to the clinical notes of these cases.

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BOOK REVIEW

THE POCKET PRESCRIBER AND GUIDE TO PRESCRIPTION WRITING. By A. G. Cruikshank, F.R.C.P.Ed. Eighteenth Edition. (Pp. vii+303. 10s). Edingurgh and London: E. & S. Livingstone, 1969.

OLD and small and quaint. The eighteenth edition of this book first published in 1882, is 7×10.6×1.4 cm. in size and weighs 90 G. It fits the smallest pocket in my waistcoat. Doses are all metric. Prescriptions and remedies are listed rather arbitarily under disease headings – both sciatica and scurvey come under "General and Metabilic Diseases" – and I found it difficult to find what I wanted because drugs are not listed in the index.

There is a section on "Some Modern Remedies" which includes some proprietory preparations which would be better omitted and there is another section rather quaintly entitled "Selected National Formulae": I had hoped this would contain the medical equivalent of Mrs. Beeton's Scottish haggis and Italian risotto; it contains a selection of monographs from the British National formulary. I think the British National Formulary is better value and easier to use than the little book. But I like he first two pages on "Some Points of Practice" and I hope the little fellow makes his centenary. O.L.W.

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AMOEBOMA

By W. A. HANNA, F.R.C.S., and M. I. MEHTA, F.R.C.S.
Belfast City Hospital

AMOEBOMA of the large bowel is a recognized though uncommon variety of amoebiasis. The authors have diagnosed and treated amoebic dysentry frequently in India, but the following case of amoeboma, encountered in Belfast, is the first they have seen here or abroad.

Case Report

Present Illness. On 3rd September, 1967, D.L., a 31 year old Ulsterman, was referrred and admitted to Belfast City Hospital with a diagnosis of appendix abscess. He gave a 3 day history of colicky central abdominal pain and a more constant pain in the right abdomen. During this period his bowels had opened 2 or 3 times a day, the motion had been soft, but contained no mucus or blood. He had no nausea, vomiting or urinary symptoms.

Past History. In 1954 he had been treated for "dysentry" in Malaya. He was later investigated in Britain because of recurrence of symptoms, but no diagnosis was made. In 1966 he had been admitted to hospital in Belfast with features similar to the present episode, diagnosed as appendix abscess and treated conservatively. He failed to return for interval appendicectomy although he continued to get intermittent colicky abdominal pain, sometimes associated with diarrhoea.

Examination. Pulse rate and temperature were normal. There was a firm, slightly tender and mobile mass, about 3 inches in diameter, palpable to the right of and just below the umbilicus. Rectal examination was normal. A revised clinical diagnosis of Crohn's disease was made, and subsequent barium enema and operative findings seemed to confirm this.

Investigations. Haemoglobin and white cell count were normal. E.S.R. was 54 mm. in 1 hour. Faeces were weakly positive for occult blood. Sigmoidoscopy was normal to 15 cms. Barium enema showed a constant but non-specific narrowing of the proximal transverse colon.

Operation. At laparotomy on 14th September the previously palpated mass was found to consist of a relatively normal but low lying hepatic flexure, flanked by thickened oedematous segments of ascending and transverse colon, densely adherent to each other. The regional lymph nodes were enlarged but not hard. Right hemicolectomy was performed and the terminal ileum anastomosed to the left transverse colon.

Pathology. There were 2 segments of colon with thickened bowel wall, containing multiple mucosal ulcers, separated by normal mucosa. These ulcers were punched out in form and some had overhanging edges. Microscopic examination of these ulcers revealed a thick layer of necrotic debris overlying vascular fibrous tissue which was infiltrated with round cells and eosinophils. *Entamoeba histolytica* containing a single nucleus and red cells were seen in the depths of some of the ulcers.

Post-operative course. The patient had made a satisfactory and uncomplicated. recovery by the time this report was received. However, a 10 day course of daily injections of emetine 65 mgm., supplemented by chloroquine phosphate 500 mgms. t.i.d. orally, was subsequently given.

Discussion

An amoeboma is a localized form of amoebiasis characterized by the formation of an inflammatory swelling in the large bowel due to recurrent amoebic and superadded bacterial infection. It involves the entire bowel wall with the periluminal fat and adjacent structures (Morgan, 1944; Hargreeves and Morrison, 1965). The sites most commonly affected are caecum, recto-sigmoid and anal canal (Morgan, 1944). The microscopic findings quoted in the case report are fairly typical. The incidence of amoeboma in cases of amoebiasis varies from 0–2.25 per cent in the larger recorded series.

The clinical picture depends on the site involved. There may be a long history of chronic ill health and recurrent diarrhoea. A mass may be palpable and Crohn's disease, appendix abscess, diverticulitis and large bowel carcinoma may have to be considered in the differential diagnosis. The onset may be more acute with obstructive symptoms. Rare complications include intussusception, perforation, localized abscess and hepatic involvement. Barium enema alone, while demonstrating a lesion in the colon, is not diagnostic. Features suggestive of amoeboma are the presence of relatively long segments of incomplete and sometimes non-rigid narrowing, often with normal mucosal relief (Druckman and Schorr, 1945). Failure to demonstrate parasites in faeces or ulcer scrapings does not exclude the diagnosis, though the finding of them is supportive evidence. The only absolute confirmation of amoeboma is a positive biopsy, and this is possible only when it occurs within reach of the sigmoidoscope. Rapid resolution of an amoeboma generally follows the administration of emetine, and a therapeutic test may be considered when the diagnosis is suspected.

Surgery is indicated if obstructive symptoms are acute, if subacute symptoms are not relieved, or if carcinoma cannot be excluded. A course of emetine should be given to cover the operative and post-operative period in proven cases and possibly in suspected cases. Without this precaution amoebic involvement of skin with extensive sloughing, formation of faecal fistula, fulminant exacerbation of colitis, dangerous haemorrhage, peritonitis, or even death, may occur. The likelihood of some such complication is so high that Seaton (1967) could claim that he knew of no patient, other than his own, who had proceeded to uncomplicated recovery following operation without the protection of specific anti-amoebic therapy.

Summary

A case of amoeboma of the colon successfully treated by hemicolectomy is presented. Despite the uncomplicated recovery the patient was undoubtedly put at risk by the failure to cover the critical post-operative period with specific anti-amoebic treatment, due to delay in making a diagnosis.

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MECKEL'S DIVERTICULUM— STILL A CLINICAL PROBLEM

By JAN ORSZULOK and J. D. A. ROBB
From the Department of Surgery, Queen's University of Belfast, Northern Ireland

MECKEL'S DIVERTICULUM is a remnant of the omphalomesenteric duct. This observation was first made by Johann Meckel in 1809. Normally this embryonic structure is obliterated about the fifth to seventh week of intrauterine life. When this fails to occur the following anomalies may be found :

1. Complete or incomplete omphalomesenteric fistula.
2. Meckel's diverticulum.
3. Enterocysts.

These anomalies of the terminal ileum can display a remarkable range of pathological disorders. Bizarre cases have been described with findings quite unexpected pre-operatively [19, 23, 26, 28].

Although Meckel's diverticulum may present as an innocent finding during exploration of the abdomen, its surgical importance lies in its propensity to give rise to serious complications. These may be divided into two groups:

1. Complications caused by the diverticulum acting as a band or pouch (intestinal obstruction, diverticulitis, impaction of the diverticulum by a foreign body, tumour formation).
2. Complications derived from heterotopia (ulcer formation with the further complication of perforation and bleeding)[17].

In a total of 1,809 autopsies in children McParland and Kiesewetter[11] found Meckel's diverticulum in 1.5 per cent, and Jay et al[8] in autopsies on both children and adults found an incidence of 1.1 per cent. The incidence rates, however, given by various authors differ considerably[24].

Despite the abundant literature published about this subject since Johann Meckel first described it, it is still a source of error in diagnosis and surprise at operation. Therefore, we feel justified in publishing this analysis of 27 cases in order to point out some of the interesting clinical features.

Clinical Material

Twenty-seven adequately documented surgical cases of Meckel's diverticulum treated at the Royal Belfast Hospital for Sick Children from 1954 to 1967 have been reviewed. In 19 cases the diverticulum was the diagnosed cause for surgical intervention while in 8 cases it was an incidental finding in the course of other operative procedures.

Table I shows the age and sex incidence. The abnormality was found in 7 females and 20 males. It was most common in the 0–12 months age group (12 cases) and in the 1–4 years age group (11 cases). Only four cases belonged to the 5–13 years age group. It follows that over 85 per cent of patients were in the pre-school age. The average age was 3 years. The youngest patients were two infants of 1 and 3 days old respectively – both with large exomphalos. These were the only two cases with an additional congenital abnormality.

TABLE I — *Age and Sex Incidence*

Age (years)	*Average age*	*Number of Cases*	*Sex*	
			Female	*Male*
1	5 months	12	3	9
1–4	2½ years	11	3	8
5–13	10½ years	4	1	3
Total	3 years	27	7	20

TABLE II
Symptomatic and incidentally Found Meckel's Diverticula

Symptomatic Meckel's diverticula	19
Peptic ulcer	10
— bleeding	8
— perforated	2
Intestinal obstruction	5
— bands, volvulus	3
— intussusception	2
Inflammation	1
Bleeding – ulcer not detected	3
Meckel's diverticula as incidental finding	8

Of the eight cases (Table II) in which the diverticulum was an incidental finding the main presenting feature was abdominal pain in five, exomphalos in two and a mass in the right iliac fossa in one. In the five with abdominal pain, laparotomy failed to reveal a cause in two of them. In both of these the diverticula appeared normal on naked eye examination, lying quite free of the abdominal wall and of other surrounding intestinal structures. Microscopically, one of them was lined partly by gastric, and partly by intestinal type of mucosa; there was also a small area of pancreatic tissue. In the other three cases the clinical presentation was due to acute appendicitis, strangulated torsion of omentum, and intussusception respectively. In the latter the diverticulum was not involved. The case with a mass in the right iliac fossa proved to be a faecaloma in the caecum.

Where the diverticulum was the cause of the clinical presentation the cases were placed in one of three groups according to the associated complication:

1. Peptic ulceration.
2. Intestinal obstruction.
3. Inflammation.

Ulceration was found in 10 of these cases. In eight of them it was the source of rectal bleeding and in two it was perforated. In one of the latter the admission took place on account of rectal bleeding; perforation developed subsequently as an additional complication.

Intestinal obstruction was seen in five cases. In two of these the diverticulum formed the leading point of an intussusception, which was in one ileo-ileal and in the other ileo-colic. In both, the Meckel's diverticulum was inverted into the lumen of the ileum and it was impossible to reduce it. Small bowel resection and end-to-end anastomosis were performed. In two further cases there was a volvulus around the Meckel's diverticulum connected to the umbilicus. In one of these the diverticulum was embedded in a three-turn volvulus involving about 8 inches of small bowel. In addition there was a 180° volvulus of the entire mid-gut. This had displaced the caecum into the left iliac fossa. In the other case of volvulus the small intestine had undergone torsion around a fibrous cord tethering the Meckel's diverticulum to the umbilicus. The fifth case of intestinal obstruction was due to constriction of the small bowel to a point on the posterior abdominal wall. The diverticulum itself showed progressive inflammatory changes which had led to gangrene and perforation.

Inflammation, or diverticulitis, occurred in only one case. This patient had a typical clinical picture of acute appendicitis. At operation, a perforated, acutely inflamed diverticulum was found. The perforation seemed to be due to inflammation rather than to peptic ulceration, and this was confirmed by subsequent histological examination. Microscopically a considerable amount of heterotopic pancreatic tissue was detected in the region of the perforation.

Histological examination of the excised diverticulum was performed in 23 of the 27 cases under discussion. Table III shows the results of this examination and the relationship between the histological findings and the complications encountered. In the 23 specimens heterotopia was revealed in 13. Heterotopic gastric mucosa was the commonest finding and was seen in nine specimens. In two further cases gastric mucosa was accompanied by pancreatic tissue. Pancreatic tissue was the only heterotopic element in two cases. The remaining diverticula were lined solely by small intestinal mucosa. In 10 of the 13 cases of heterotopia complications occurred, whereas in 10 cases with normally lined diverticula complications were encountered in only four.

Meckel's diverticulum, as the possible cause of the clinical finding, was mentioned in the pre-operative diagnosis on only six occasions, and only in cases of

TABLE III — *Heterotopic Tissues in Meckel's Diverticula*

Histological finding	*Number on histological examination*	COMPLICATIONS				
		Ulcer	*Bleeding*	*Perforation*	*Inflammation*	*Obstruction*
Gastric mucosa	9	7	7	2	0	0
Gastric mucosa and pancreatic tissue	2	0	1	0	0	0
Pancreatic tissue	2	0	0	0	1	1
Small intestinal mucosa	10	3	4	0	0	3
TOTAL	23	10	12	2	1	4

rectal bleeding. The most common erroneous diagnosis made in those children presenting with rectal bleeding was that of intussusception. Other conditions considered with this type of presentation were rectal polyp, duodenal ulcer and purpura. In one case "Disprin" was mentioned as the possible aetiological factor responsible for the melaena.

There were three deaths in this group of cases. In two of these the condition was complicated by small bowel obstruction; in both, severe toxaemia, arising as a result, seemed to be the cause of death. In one of these there was in addition an inflammatory perforation. The third death occurred in a one-day-old child from postoperative pulmonary complications following closure of a huge exomphalos.

Discussion

Mekel's diverticulum appears as a blind pouch on the antimesenteric border of the ileum lying free in the peritoneal cavity. According to Mason[15] this accounts for 82.5 per cent of cases. The umbilical fistula (6.3 per cent) and the fibrous band running from the apex of the diverticulum to the umbilicus or other adjacent structure (10.0 per cent) are more rarely encountered. The latter form, however, is of great interest to the surgeon for it may produce obstruction of the small bowel. In the present series such a fibrous band was found three times and in each case it was the cause of such obstruction. In the remaining 24 cases the diverticulum appeared in the form of a free-lying intestinal pouch.

Variations in its site are of some importance to the surgeon. Kiesewetter[9] found 90 per cent of these diverticula arising within 100 cm. of the ileo-caecal valve; Wandsborough et al[27] in a series of 273 children found the distance varying from 15 to 122 cm. The average distance in adults seems to be slightly longer than in children. The mean distance measured by Owen and Finney[15] in a series of 143 children and adults was 48.8 cm.

From time to time some authors have reported the presence of Meckel's diverticulum in the jejunum[12, 15] and even on the appendix[21]. Sometimes the diverticulum is displaced together with the adjacent loop of bowel to unexpected regions of the abdominal cavity[28]. These facts should be kept in mind when searching for it, and a minimum of 6 feet of ileum proximal to the ileo-caecal valve should be checked whenever there is reason to suspect a Meckel's diverticulum as the cause of the symptoms[5].

Pathogenic Meckel's diverticula seem to occur mostly in infants[29] The median age reported by Söderlund[24] was 5 years, and in other series published in the literature approximately half of the children with symptomatic diverticula were less than 2 years old[1, 27]. By contrast, the average age of children with Meckel's diverticula as an incidental finding is reported to be higher. Söderlund[24] reports a median age of 9 for this group in his series. In the present group the mean age for the group of pathogenic diverticula was 1½ years, and nearly one-half (9 out of 19) of these children were less than one year of age, whereas the average age in the group where Meckel's diverticulum was an incidental finding was 5 years. The paediatrician should therefore remain aware of the possibility of Meckel's diverticulum as a cause of abdominal symptoms in infants, particularly as it may present in one of many guises due to its complications.

The incidence of pathologically complicated diverticula differs in various series.

Janeja and Janeja[25] showed in their report of 48 cases that the ratio of pathogenic diverticula to incidental diverticula was 9 : 1, where Söderlund[24] found it to be 1: 2. Our figures are similar to those reported by Egan[6] – 63 per cent of cases being symptomatic.

In his classical description of the diverticulum, Meckel stated that the congenital abnormalities of the omphalo-enteric duct are often associated with other malformations. This coincidence has not been emphasised so strongly in subsequent publications on the subject[2, 24]. In general a higher incidence has been found by authors investigating this problem at autopsy[27] than by surgeons at operations[24]. Exomphalos seems to be the most common associated malformation in any large series, and it was the only other malformation discovered in the cases under discussion. Congenital malformations may be responsible for an increased post-operative mortality rate[14] and ought to be taken into consideration when estimating the operative risk.

The most common clinical presentation of pathogenic Meckel's diverticulum seen in our cases was rectal bleeding, ranging from melaena to massive haemorrhage with bright red blood. Intestinal bleeding was often recurrent and was occasionally a cause of severe anaemia, the lowest level of haemoglobin recorded being 3.9 gm/100 ml. (26 per cent Haldane). Intestinal bleeding was associated with ulcer formation in the Meckel's diverticulum with the exception of three cases, where no cause of bleeding could be found. In these it was interesting that, following excision, no recurrence of bleeding was noted at follow-up. Other authors, too, have found intestinal bleeding as the most common complication of this condition in children[1, 7, 18]. Of the 12 cases of intestinal bleeding, eight were infants under the age of one year, the youngest being two months old, and, of the remaining four, none exceeded the age of three years. Although the complications of the diverticulum may occur at any age the literature suggests that intestinal obstruction, inflammation and haemorrhage from peptic ulceration usually occur in infants and young adults, whereas Littré's hernia and neoplasia are more characteristic of the elderly[17]. Benson[1] stated that obstruction and haemorrhage are most frequently present in the first two years of life, thereafter becoming less common while the incidence of acute inflammation increases. Bleeding as a frequent symptom has also been described in tumours of Meckel's diverticulum[4, 10, 17]. The incidence of these is extremely rare[29].

Peptic ulceration was the most common cause of presentation in our group. The ulcer was complicated by perforation and by bleeding. There is no typical clinical picture of perforation; the pain is unlike that in perforating gastric or duodenal ulcers. In particular, its onset is not so highly characteristic. The intensity and localization of the pain are often similar to that of appendicitis. Rigidity of the abdominal wall is usually present but it is rarely board-like in character. Thus the pain of perforated ulcer in the Meckel's diverticulum may be of little diagnostic aid and the operation is usually performed because of a presumptive diagnosis of appendicitis or intestinal obstruction[24]. Rectal bleeding accompanying or preceding the signs of so-called "acute abdomen" may be of great diagnostic significance[3]. The diagnosis is particularly difficult in infants for here it is impossible to evaluate the subjective feeling of pain. In one of the two cases of perforation in these cases intestinal haemorrhage preceded the sudden onset of peritonism. The other, a five

months old infant, was admitted to hospital with a three-day history of vomiting and diarrhoea. There was no intestinal bleeding. Progressive symptoms of peritonitis led to laparotomy which revealed a perforated peptic ulcer in the Meckel's diverticulum.

Intestinal obstruction was the second most common complication in this group, occurring in 29.4 per cent of the symptomatic cases (5 out of 17). In a series of 120 cases of pathogenic diverticula, Gross[7] found an incidence of 33 per cent of intestinal obstruction. Several other authors have found obstruction to be the commonest complication[24, 27]. Söderlund suggests that obstructive conditions caused by Meckel's diverticulum should be classified into two groups:

1. Bands, volvulus.
2. Intussusception.

In the present series forms of obstruction belonging to both groups were encountered. Intestinal obstruction seems to be the most dangerous complication, and there is greatest danger of mortality with these patients[1, 14].

Heterotopia is a common histological finding in the diverticulum. Gastric mucosa and pancreatic tissue are found most frequently, but colonic, duodenal and biliary epithelium have also been discovered[13]. The cause of this tissue dislocation has not yet been elucidated, although several theories have been proposed. The incidence of ulcer formation and associated complications seems to be closely related to the presence of gastric heterotopia. Of nine cases with gastric mucosa in the diverticulum ulcers occurred in seven, all of which were complicated either by bleeding or by perforation. The incidence of complications in the group of diverticula lined with small intestinal mucosa was significantly lower. Of 10 cases in this group bleeding was seen in four, in three of which an ulcer was found to be the cause. This astounding finding may be due to the fact that the diverticula were not examined by serial sectioning. Söderlund[24] showed that in Meckel's diverticula, gastric mucosa could be detected in about twice as many cases during the examination of serial sections as at ordinary microscopic inspection. It can be presumed that, if numerous sections are checked, diverticula which bleed will show gastric heterotopia in nearly 100 per cent of cases[31].

The review of diagnostic errors in these series indicates that the pre-operative diagnosis is difficult and rarely made, with the exception of those cases with abdominal symptoms and associated rectal bleeding. Routine barium studies of the small intestine have been very disappointing[22]. The use of special radiological techniques may lead to an increase in the pre-operative detection of Meckel's diverticulum[20, 30].

In view of the serious complications of Meckel's diverticulum it would seem reasonable to advocate its removal even when it is only an incidental finding. On the other hand, a very large number are non-pathogenic and remain asymptomatic throughout life. An aggressive approach in these can only be justified when excision of the diverticulum is unlikely to increase the operative risk to the patient. A routine laparotomy should not be considered complete without a search for this congenital remnant. Until diagnosis can be made with more facility it will continue to remain an unsolved clinical problem presenting in a variety of guises and sometimes causing distressing failures in treatment.

Summary

A clinical analysis of 27 cases of Meckel's diverticulum is presented. In 19 of these the diverticulum was the specific cause for surgical intervention, while in eight Meckel's diverticulum was an incidental finding. Over 85 per cent of the patients were in the pre-school age. The average age was 3 years. Pathological conditions causing the clinical symptoms are divided into three groups—peptic ulcer, intestinal obstruction and inflammation.

Peptic ulcer, found in ten cases, was complicated in eight by bleeding, and in two by perforation. Intestinal obstruction was seen in five cases and was the cause of death in two of them. An acutely inflamed diverticulum led to laparotomy in two cases. Meckel's diverticulum, as a possible cause of the clinical presentation, was only mentioned on six occasions and always in association with rectal bleeding. The overall mortality rate was 11.1 per cent – three fatal cases. The recorded observations were compared with data previously published by other authors.

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CASUALTY ATTENDANCES IN A SEMI-RURAL AREA IN NORTHERN IRELAND

By W. D. THORNTON, B.A., M.D.
Principal Assistant Senior Medical Officer, Northern Ireland Hospitals Authority

> *"It is said that there is a tendency for the casualty department to grow until it becomes a duplicate outpatients department, differing from the outpatient department proper in being subject to less regulation as regards hours of attendance and enquiry into circumstances."*
>
> King Edward VII Hospital Fund for London, 1910.

THE FIRST point of contact which an accident or emergency case has with the hospital is the casualty department. By virtue of this very function the casualty department finds it difficult to limit or control the flow of patients through its doors. It is expected to see and examine all comers irrespective of the duration and severity of their complaints. In this exposed position it is little wonder that the casualty department in its present form is regarded with disfavour by administrative and medical staff alike. The British Orthopaedic Association (1959) clearly stated the need for a proper accident and emergency service. The Nuffield Provincial Hospitals Trust (1960) reported on the poor conditions under which many casualty departments were working. This latter report made a strong plea for the recognition of this department as the place for the reception and initial treatment of accidents and emergencies by well trained and experienced staff.

In Northern Ireland the number of patients attending casualty departments has shown a rapid and progressive increase over the years. Casualty attendances may soon outnumber outpatient attendances; the quotation of 1910 has now been underlined by the facts of 1967. The population of Northern Ireland has increased by 2.26 per cent between 1964 and 1967; in the same period attendances at outpatient departments have increased by 5.85 per cent. During the same four years casualty attendances have increased by 41.34 per cent (N.I.H.A. Annual Reports, 1964-67). From these figures it can be seen that casualty attendances have increased out of all proportion to the population at risk. It is against this background that it was decided to investigate the casualty attendances in one of the areas in the province.

Methods

The survey was carried out in an area with an estimated population of 261,000 (General Register Office, 1966). The area, while being essentially agricultural, contained a number of towns, the population range being 6,000 to 20,000. Many of the towns have small factories, while the new town area has attracted a considerable volume of new industry.

Five general hospitals serve the area; the available acute beds within these hospitals are shown below:

Hospital A 63 acute beds
Hospital B 123 acute beds
Hospital C 167 acute beds
Hospital D 120 acute beds
Hospital E 200 acute beds

The survey included all new attendances at casualty departments from 7th January, 1968, to 21st January, 1968, inclusive. Excluded from the survey were:

(a) Waiting list admissions
(b) Routine outpatient attendances
(c) Emergency admissions already arranged by the general practitioner and going direct to the admitting ward.

Results

A total of 681 new patients attended casualty departments during the period under review. A chi-squared test showed that the attendances during the survey were statistically comparable to the annual attendance figures.

The age distribution of the patients who attended during the survey was compared with the age distribution of the population in the area. From this it was seen that the age group 15–24 years made significantly more demands for casualty services than any other age group in the population.

The distribution of the casualty work load throughout the 24 hours of the day is shown in Table I below.

TABLE I — *Time of Arrival (Totals for Area)*

	6 *a.m.*–12.00	12.00–6 *p.m.*	6 *p.m.*–12.00	12.00–6 *a.m.*	*Total*
Attendance	289	258	97	37	681
Percentage	42.4	37.9	14.2	5.4	100

Attendances were further broken down to show the duration of symptoms before arrival at hospital, Table II below. In retrospect, the four time intervals chosen leave much to be desired. The first period, 0–3 hours, probably accommodating the accidents and emergencies, the second period, 3–12 hours, less urgent cases. The third period is an unfortunate choice as it undoubtedly aggregates the reasonable patient injured in the evening who waits until the morning before seeking advice with those who wait three days before coming to casualty to have been seen at an outpatient department or general practioner's surgery.

TABLE II—*Duration of Symptoms (Totals for Area)*

	0–3 *hrs.*	3–12 *hrs.*	12 *hrs*–3 *days*	3 *days*+	*Total*
Attendance	249	109	177	146	681
Percentage	36.6	16.0	26.0	21.4	100

Patients attending casualty departments were classified and 77.1 per cent attended as a result of trauma. A total of 1.0 per cent attended as a result of poisoning or alcohol. Only 2.6 per cent came to casualty because of sepsis. Almost 20.0 per cent of attendances were unclassified.

The disposal of patients attending casualty departments is shown in Table III. It is interesting to note the wide variation in the disposal of patients from the five hospitals.

TABLE III — *Disposal of Patient*

Hospital	*Admit or Transfer*	*Discharge*	*To reattend Hospital*	*To G.P.*	*Total*
A					
Attendance	6	4	66	6	82
Percentage	7.3	4.9	80.5	7.3	100
B					
Attendance	18	19	47	13	97
Percentage	18.5	19.6	48.5	13.4	100
C					
Attendance	65	14	68	64	211
Percentage	30.8	6.6	32.2	30.3	100
D					
Attendance	20	23	75	26	144
Percentage	13.9	16.0	52.1	18.0	100
E					
Attendance	29	68	34	16	147
Percentage	19.7	46.3	23.1	10.9	100
Area Total					
Attendance	138	128	290	125	681
Percentage	20.2	18.8	42.6	18.4	100

In view of frequent comments about the abuse of the ambulance service by patients attending hospital, figures were obtained which showed that 69 per cent came to casualty by private car. The ambulance service carried 7.6 per cent of attendances while 17 per cent walked into the departments. Public transport was used by over 6 per cent of attenders.

The sources of the referrals to casualty are shown in Table IV.

TABLE IV — *Source of Referral*

	Referred for admission	*Referred for opinion with letter*	*Referred for opinion no letter*	*G.P. out*	*Casual*
Nos.	21	332	67	32	229
Percentage	3.08	48.75	9.80	4.7	33.6

Discussion

In view of the acknowledged difficulty in defining hospital catchment areas no attempt has been made to calculate casualty attendance rates per 1,000 population served. An examination of national figures for 1967 shows that slightly higher attendances per 1,000 population occur in England and Wales. Nevertheless, the figures from the survey in Northern Ireland suggest that even within a small area attitudes and environmental factors produced a wide variation in the casualty attendances generated within a population.

The age distribution of patients attending casualty departments was obtained; the age distribution of the total population served was also available. A comparison of these figures showed that the very young and the very old make less demands on the service than one would have expected. On the other hand, the young adults make the largest demands of any age group. The age group 15–44 years contains 47 per cent of all casualty attenders. Similar figures were obtained by the Nuffield Provincial Hospitals Trust (1960) where the percentage of patients in the age group 16–44 years was within the range 40 to 52 per cent. A survey at Cardiff Royal Infirmary by Evans and Wakeford (1964) showed that 65 per cent of attendances fell within the age group 14–43 years. This very high figure may reflect poor sampling technique as no effort appeared to have been made by the authors to check the statistical validity of their sample. In this latter survey it was also noted that the age distribution of the population served was similar to that in Northern Ireland.

Examination of the times of arrival of patients at the casualty departments confirmed that 80 per cent arrived between 6 a.m. and 6 p.m. Rather more of the attendances within this time took place before mid-day. Hospital "C" was a notable exception with almost 50 per cent of the attendances taking place between 12.00 mid-day and 6 p.m. A factor in this may be found in the abnormally high percentage of patients admitted from casualty by this hospital, 31 per cent compared to the area average of 20 per cent. Patients seen by their general practitioner after the morning surgery and referred for admission could reasonably be expected to arrive at hospital after lunch.

A close examination of the survey results showed that over a period of 14 nights from 6 p.m. to 6 a.m. five general hospitals had a total attendance of 134 patients. One small hospital closed its casualty at night, a second small hospital had a total night attendance of 15 patients for the 14 nights. The remaining three larger hospitals had 56, 26 and 31 attendances during the two weeks of the survey. There can be little justification for attempting to maintain fully staffed casualty services after 6 p.m. at all these hospitals; it can only lead to junior medical staff spending long hours on call for the benefit of a very few patients who could be seen at the larger hospital at little inconvenience and no danger to themselves.

As already mentioned above, the choice of time intervals for the duration of symptoms proved a little unfortunate but nevertheless the figures in Table II are worthy of examination. The misuse of casualty departments becomes clear when it is seen that more than one fifth of all attendances had had their complaints for more than three days before referral. The majority of these patients could have been referred to an outpatient session or to the general practitioner rather than to the casualty department. In the survey by Evans and Wakeford (1964) 38 per cent

of patients attended within 3 hours of the onset of symptoms and 28 per cent had had their symptoms for more than 24 hours. Similar figures were found in the Northern Ireland survey where 36 per cent of patients attended within 3 hours of the onset of symptoms. In the Nuffield survey between 10 per cent and 33 per cent had symptoms for more than 24 hours before attending hospital. Attendances of those with symptoms for less than 2 hours ranged from 31 to 57 per cent.

In the Northern Ireland series it may be significant that the hospital with the largest percentage of attendances for trauma also had the highest percentage of attendance within 3 hours of the onset of symptoms. On the other hand, the hospital with the lowest percentage of attendances within 3 hours of onset of symptoms had substantially the highest review rate of any hospital and also the lowest rate of discharge to the care of the general practitioner. One cannot help but feel that the former is fulfilling the function of an accident and emergency department while the latter is providing a general practioner service.

An attempt was made to divide the attendance into broad diagnostic groups so as to separate the cases arising from trauma from the remaining medical and surgical problems. In view of the widespread comments suggesting abuse of the casualty department it is surprising to see that in the first hospital mentioned 95.8 per cent of attendances were due to trauma. This figure may indicate poor sampling or may simply be due to good relations between the hospital and the general practioners thus avoiding the referral of non-traumatic cases. The relative disappearance of sepsis as a reason for attendance is striking and is probably a result of the early treatment of soft tissue infections with antibiotics. In the Nuffield survey involving eight hospitals 2 to 15 per cent of attendances were for sepsis while in the Northern Ireland survey only 0.7 to 5.4 per cent (mean 2.6)) attendances were for this reason.

Having discussed the various reasons for attendance at hospital it is profitable to examine the disposal of the patients seen at the casualty department. The figures for the Northern Ireland survey have been shown in Table III. Table V compares the findings from the Cardiff Royal Infirmary survey by Evans and Wakeford (1964) with the figure in Table III.

TABLE V — *Disposal of Patients – Percentage*

	Admitted	*Discharged*	*Discharged to G.P.*	*To reattend*
Cardiff Royal	3	33	27	38
N. Ireland	20	19	18	43

From the above figures it can clearly be seen that many more patients are admitted to hospital through the casualty departments in Northern Ireland than in Cardiff. In the Nuffield survey 4 to 12 per cent of patients attending casualty were admitted to hospital. Too few patients in Northern Ireland are discharged from casualty to the care of their general practitioner. In one hospital no less than 80 per cent of patients reattended the hospital. There can be little justification for high reattendance rates except for orthopaedic cases. Sutures inserted in hospital could be removed by the general practitioner or district nurse; abscesses once adequately incised could be dressed by the district nurse and supervised by the general

practitioner. Apart from "job satisfaction" there is little need to recall this type of patient to hospital; the only exception to this might be patients at a teaching hospital where doctors in training should be able to see the results of their work. The advent of health centres and group practices complete with treatment rooms and nursing staff presents an opportunity to the general practitioner to again undertake much of the minor surgical work which became the province of the hospital casualty officer after 1948. The under utilisation of the district nursing service shown by the Queen's Institute of District Nursing (1968) could to some extent be reduced by the referral of many of the minor cases from casualty to domiciliary care after treatment. This review expressed the hope that improved communications and an awareness of the abilities of district nurses would result in an increased use of the service with consequent mutual benefits to district and hospital. For their part the hospitals should support the health centres and district nurses in this work by supplying C.S.S.D. packs for dressings and minor procedures.

The method of referral was investigated and the figures are shown in Table IV. An examination of this table shows that almost half the patients attended at the request of their general practitioner and had with them a letter to the hospital. Only one patient in ten was referred by his general practitioner without a letter. The most disturbing feature was the high percentage of patients who attended without attempting to contact their general practitioner. One patient in three had made no attempt to use the general practitioner service before coming to hospital. Although 33.6 per cent of patients fell within this category it should be noted that a small proportion of the patients in this group are admitted as the result of a serious accident or emergency when they could not have been expected to contact a general practitioner. The Cardiff survey showed that 47 per cent of patients were casual attenders, while in the Nuffield series 54 to 75 per cent of attendances were of this type.

An assessment of the type of medical care needed by the patients attending casualty departments was carried out in the Nuffield survey. The results of this assessment showed that only 29 per cent of patients attending casualty needed more than general practitioner or domiciliary nursing care. An estimate of the severity of the patients' injuries or illness was carried out in the Cardiff survey. This showed that assessments of the same case were often very different when performed by different doctors.

Patients attending casualty departments make heavy demands on the radiological services of the hospital. The hospital with the lowest number of acute beds referred the highest proportion of patients to the X-ray department, and in spite of these X-ray examinations this hospital had also the highest recall rate for casualty patients in the survey. One reason for high radiology referral rates and high recall rates could be large numbers of patients suffering from trauma. In the case of the hospital above 83 per cent of patients came as the result of trauma while the area average was 77 per cent. Against this argument, this hospital attracted the highest percentage of patients who arrived on foot, this latter fact suggesting minor rather than major trauma. Nevertheless, the most potent cause of high radiology and review rates is the employment of relatively junior medical staff in casualty posts. The Accident and Emergency Department at the Luton and Dunstable Hospital achieves a low reattendance rate by having a consultant on duty in the department

at all times. It should also be noted that the hospital mentioned above has had a long period of staffing difficulties with frequent changes of medical staff in the intermediate grades.

The percentage of patients attending casualty who were sent for X-ray changed throughout the four survey periods in each 24 hours. Table VI shows that the highest proportion of attenders were referred before mid-day and the lowest after midnight. Those patients attending after midnight probably contained the highest proportion of true traumatic cases; if so, these are the cases most in need of radiological examination. Yet, during this time (midnight–6 a.m.) only 32.4 per cent have an X-ray while of those attending in the morning (6 a.m.–mid-day) 70.2 per cent are referred for X-ray examination. These figures immediately question the need for some of the radiological examinations performed in casualty departments during the day.

TABLE VI — *Demands for Radiological Examination*

	6 a.m.– mid-day	*mid-day– 6 p.m.*	*6 p.m.– midnight*	*midnight– 6 a.m.*
X-ray – Patients	203	156	44	12
No X-ray — Patients.	86	102	53	25
Per cent having X-rays	70.2	60.5	45.4	32.4

There has been considerable comment in the past about the use of the ambulance service by patients attending the outpatient and casualty departments. Table VII shows clearly that in the survey area the majority of new patients attending casualty arrived in private cars: almost 69 per cent came by private transport, and only 7.6 per cent arrived in hospital transport. As genuine accident and emergency cases are within this 7.6 per cent, there can be little criticism of the use of the ambulances in this group of hospital attenders. To ascertain how many of these patients who arrive by private car are brought back for review by ambulance is a subject worthy of further examination in another survey.

A section of the survey by Evans and Wakeford (1964) is devoted to an examination of the methods by which the patients arrived at the Cardiff Royal Infirmary. These results are compared to those obtained in the Northern Ireland series in Table VII.

TABLE VII — *Transport to Hospital (Percentages)*

	Bus	*Private car*	*Ambulance*	*Walking*
Northern Ireland	6.6	68.9	7.6	16.9
Cardiff R. Infirmary	50	25	6	12.0

The high numbers of patients arriving at the Cardiff Royal Infirmary by bus probably reflects the highly urban nature of the area around the hospital which would be well served by buses. It is interesting to note the similarity of the figures

for ambulant and ambulance patients in the two surveys even though one area is urban and the other semi-rural. In a survey of casualty attendances in London Fairley and Hewitt (1969) found that 15 per cent arrived by ambulance.

This survey has confirmed, as previous papers have done, that the casualty department has always been regarded by the public as a convenient source of medical care at any time of the day or night. Mestitz (1957) stated: "Many patients go to the casualty department as they would go to their own doctor's surgery." He showed that 700 patients out of a total number of 975 could only be regarded as casual attenders having no clear explanation as to why they attended hospital in preference to their own general practitioner.

Griffiths, King and Preston (1967) asked the question: "Casualty Department or G.P. Service?" The casualty department of the hospital in which the authors worked served the student quarter in Chelsea and Kensington, and the figures quoted support the findings of Beloff (1968) that the fluid population of a large city regard the casualty department as the universal source of medical care. The problem is not peculiar to the National Health Service as can be seen from an American publication by Beloff (1968). Beloff reasons that "the emergency room crisis brought on by the increased number of patients who appear with non-urgent problems is essentially a responsibility of the total health community and not solely that of the hospital. The traditional system of delivering medical care is not meeting the needs of the people, especially the poor. By default, this system has forced the hospital emergency service to fill the gap and to be used inappropriately by many people unable to get care when they need it. This inappropriate use interferes with the primary function of an emergency department, which is to be the community's medical resource for emergency problems that are not manageable in doctors' offices, clinics, or at home."

The above quotation is included in full because it seemed to underline some of the problems here under the National Health Service. While one can see how the high cost of medical care in the United States could drive patients to a hospital casualty department, the provision of a comprehensive health service here does not seem to have materially affected the demands for this type of service even though everyone has access to a general practitioner without charge.

The Oxford Accident Service has reduced the non-accident content of its work to 5 per cent of attendances, but Scott (1967) states that it is only by constant vigilance that they prevent the service being misused as was the old casualty department. Even with this degree of selectivity, the director is concerned at the load placed on the service by minor trauma. Scott has shown that multiple high velocity injuries are increasing in number; if these are to be successfully treated, accident and emergency departments must be relieved of the unnecessary load of trivial problems.

A study of casualty department attendances by the Nuffield Provincial Hospitals Trust (1960) has shown that only 29 per cent of casualty attendances require hospital treatment. If accident and emergency departments could be relieved of some of the unnecessary load they could then perform their correct and essential function – that of saving life.

The increasing number of well equipped health centres throughout the country should provide a method for first line treatment. It would seem reasonable that

patients should be seen at these centres during normal working hours. After working hours the hospital accident and emergency department could by consent treat the small number of patients with minor trauma, firmly referring back to the general practitioner all casual attenders falling outside this category.

A recent circular (Department of Health and Social Security, 1968) gives support to many of the findings and recommendations of this survey, particular mention being made of the rationalisation required to allow proper staffing levels to be maintained. Guidance is also given as to the attitude to be adopted to casual attenders.

Conclusions

There is little doubt that if the accident services of the province are to function as they should, radical reforms are necessary:

(1) Fewer but better equipped and staffed accident and emergency departments are required.
(2) These departments must provide a full service throughout the 24 hours.
(3) Casual attenders should be firmly discouraged and returned to their general practitioner.
(4) The general practitioner should again assume responsibility for the first line service for minor trauma and sudden illness. This becomes a more practical possibility with the increase in group and health centre practice.
(5) The casualty department should not provide a convenient method of admitting patients to hospital.

I end by quoting again from the article by Beloff (1968):

"The emergency room crisis is essentially a responsibility of the total health community and not solely that of the hospital."

I would like to thank the hospital staffs who were involved in the completion of the returns.

I am indebted to Dr. Maybin of the Northern Ireland General Health Services Board for his help and co-operation.

My thanks are due to my secretary, Mrs. K. Burrows for her assistance in the preparation and checking of the manuscripts.

The assessment of the situation and the solutions suggested are personal and therefore do not necessarily reflect the thinking of the Northern Ireland Hospitals Authority.

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BOOK REVIEWS

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It is perhaps of more value to the secretary in health centres or private practice than to the hospital secretary, and it provides a valuable review of the place of the efficient and trained secretary in clinical practice. Indeed, this comprehensive review of the operation of good British medical practice should be of value to doctors and administrators as well as secretaries, and it may point the way to the more effective use of the secretary in the medical team.

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The author draws attention to the similarity between many of the phenomena in the schizophrenic and organic cases, such as apathy, inattention, mobility disorders and perseveration. He believes that in both groups of disorders there is a disordered state of consciousness in which a leading feature is the inability to reflect upon what has just been experienced. He describes his concept of schizophrenia as a condition in which dissolution (in Jackson's sense) causes negative symptoms of loss of normal functions and positive symptoms by release of more primitive mental processes, and attempts at restitution by remaining "healthy" mental functions. In the final chapter the management of schizophrenic patients taking into account the concepts outlined is discussed.

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GERIATRICS AND THE GENERAL PRACTITIONER TEAM. By M. K. Thompson. (Pp. 128; plates 4. 20s). London: Baillière, Tindall & Cassell, 1969.

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There is an outline of geriatric hospital services contributed by Dr. Trevor Howell.

This little book is well-written, and any student of clinical practice today, undergraduate or post-graduate, will enjoy the fresh commonsense approach of the author, who knows his subject, and expresses his concept of geriatric medicine so well.

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This little book is well-written, and any student of clinical practice today, undergraduate or post-graduate, will enjoy the fresh commonsense approach of the author, who knows his subject, and expresses his concept of geriatric medicine so well.

G.F.A.

CLINICAL PSYCHIATRY. Edited by Eliot Slater and Martin Roth. Third Edition. (Pp. 1–xvi+1–904. 120s). London: Baillière, Tindall & Cassell, 1969.

NINE years have elapsed since the last edition of Mayer-Gross, Slater and Roth's *Clinical Psychiatry* was published. During that time it maintained its position both as a standard text for graduate students of Psychiatry and as one of he major reference books on the subject. This new edition has enhanced its stature and has provided British psychiatrists with an up-to-date and authoritative account of present day psychological medicine.

The influence of the late Dr. W. Mayer-Gross on the content and orientation of the book is still clearly discernible. It is to our advantage that the best of German psychiatry should be kept before us, but the authors have also drawn attention to important work from other European countries, especially Scandinavia. Psychoanalysis, Pavlovian psychiatry, behaviourism and existentialism all receive attention. Administrative and legal psychiatry is well covered and reference to the Mental Health Act (N.I.) 1961 draws attention to its distinctive features. The main legal provisions for mental treatment in other European countries and that which obtains generally in the United States is described. A useful chapter on social psychiatry draws attention to a growing and increasingly important field.

Psychiatry has yet to reach those lofty heights of certainty where contrary views are no longer tenable. Whilst some readers may find that they do not wholly subscribe to all the views expressed on such topics as the classification of depression and the replacement of the term "hysteria" by its adjective, their opinions can be set against those so clearly expressed by the authors with resulting further enlibhtenment. The same applies to the question of treatment; which is a field characterised by its diversity of approach and emphasis, depending on the orientation of the particular psychiatrist.

The detailed descriptions to be found in this book of the psychiatric concomitants of a wide variety of physical disorders is very useful especially when dealing with psychiatric problems referred from general hospital wards, but one looks in vain for a chapter entitled *Psychosomatic Medicine*. A short account of this field, in the reviewer's opinion, would have been useful especially for examination candidates.

This book can be recommended with confidence not only to students of psychiatry as essential reading for higher degrees and the D.P.M., but to all those working in the specialty.

J.G.G.

CLINICAL PHARMACOLOGY (DILLING). By S. Alstead, J. G. Macarthur and T. J. Thomson. Twenty-second Edition. (Pp. xii+760. 50s, limp cover 35s). London: Baillière, Tindall & Cassell, 1969.

THIS, the twenty-second edition of a well established book first published in 1884, still reflects a strong Scottish influence in its list of fifteen contributors. The extent of the changes introduced into this edition is not elaborated.

As an aftermath of the tragedy with thalidomide and as the number of new and more potent drugs increases, there has been greater interest and study of the mode of action and efficacy of new drugs in man. It is disappointing to find in a book with this title, little information about the mechanism of action of drugs in man and of the production of side-effects. The interaction of monoamine oxidase inhibitors with cheese, for example, is described in three lines with no comment as to the mechanism of the hypertensive episodes. Yet this book is comprehensive and covers adequately the drugs used for the treatment of most conditions. It will be of more value to students who have already had a course in basic pharmacology in addition to studies in physiology and some clinical experience. This probably arises from the nature of the medical curriculum in Glasgow where the contributors teach materia medica. Other medical schools which have an integrated course in Pharmacology and Therapeutics may well recommend, in addition, a textbook of pharmacology. Although it must be the editor's preference, one would have thought that the addition of illustrations, chemical structures and a much more detailed bibliography would have increased the appeal of the book.

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FIRST published in 1960 this book, affectionately known as "Small Brain", as opposed to "Big Brain", has now reached its third edition – evidence enough of its popularity. In writing it Lord Brain had in mind "the needs of those doctors and students who require to know only the essentials of neurology, but to know them thoroughly".This objective was achieved admirably, with a clarity of style characteristic of the author, an ability to summarise a complicated situation in a few well-chosen paragraphs (e.g. the anatomy and physiology of the extrapyramidal system in two pages!) and clear and relevant diagrams, clinical photographs and micro-photographs.

Dr. Roger Bannister, editing the third edition, has now enlarged the book by about 40 pages, bringing the mind of the scientist to enrich the observations of the clinician. Thus he expands the section on ancillary investigations to include isotope encephalography and echoencephalography and includes for the first time brief accounts of Refsum's disease and McArdle's syndrome – diseases which are now known to be associated with biochemical defects. The chapter on cerebrovascular disease includes references to the subclavian "steal" syndrome, some excellent reproductions of angiograms and a good summary of present views on the management of transient ischaemic attacks and subarachnoid haemorrhage. Recent ideas on the classification of neuropathy and myopathy have also been included.

But to my mind the most valuable part of this book remains the first 113 pages, which give an exemplary guide to the neurological examination and interpretation of physical signs. Even here the hand of the Reviser is at work and I am glad to see Brain's most confusing diagram of the external ocular movements (also to be found in the larger book) at last replaced by a simple, comprehensible drawing (Fig. 7, page 27).

There are no specific references in the text, but each chapter or section concludes with a short list of the relevant classical and recent literature and at the end of the book Dr. Bannister has added a guide to further reading in neurological subjects which will be useful to the postgraduate and trainee specialist.

It is a pleasure to acknowledge that this beautifully produced book is available in a paperbacked edition at the modest price of 42 shillings. M.S.

NOTES ON MEDICAL VIROLOGY. By Moray C. Timbury, M.D., Ph.D., M.C.Path. (Pp. vii+124; figs. 10. 10s). Edinburgh and London: E. & S. Livingstone, 1969.

THE second edition of this very useful set of notes on medical virology has been revised lightly, but most effectively, by Dr. Timbury and one admirable result is that the text has been kept within bounds even with the addition of new information. Most of the 20 extra pages are accounted for by new diagrams or tables.

The arrangement of the original edition has been maintained, except for moving the chapter on virus inhibitors to the end of the book and viruses are still described in relation to the clinical conditions which they cause. Laboratory details are reduced to a minimum. One excellent feature, the description of individual virus vaccines, has been retained and a few very appropriate references to general reading are now added to each chapter.

The serological types of human herpes virus are now mentioned; the section on zoster is now in its proper place and Epstein-Barr virus is also included in the group. Killed measles vaccine is no longer mentioned and Australia antigen appears in the section dealing with infectious hepatitis. Corona viruses have been added to the respiratory viruses and haemorrhagic fevers are mentioned under arbor viruses. Thus the revision is up to date.

More textbooks of this nature on medical microbiology would be welcomed by medical student and practitioner alike. K.B.F.

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THAT a second edition of a book on venereal diseases should be published within a comparatively short time of the first edition, not only speaks well for the popularity of the work itself but is indicative of the increasing problems facing the medical profession as a result of the steady and alarming increase in sexually transmitted diseases.

As well as giving a "comprehensive, well illustrated and up-to-date account of the epidemiology, pathology, diagnosis and treatment of the disease" the authors have brought the subject up-to-date in a number of places in the new edition: thus the chapter on serological tests for syphilis has been improved by a fuller account of the F.T.A. test, whilst the section dealing with penicillin treatment of gonorrhoea has been practically re-written, and though not all venereologists will accept some of the suggested treatment schedules, the increasingly large doses of penicillin recommended emphasize the growing resistance of the gonococcus to this antibiotic. The importance of adequate follow-up of patients after treatment for gonorrhoea to preclude the possibility of a concomitant syphilitic infection is stressed. A short account of the work on the TRIC agent in the causation of nongonococcal urethritis is included under the aetiology of that condition and a short but valuable chapter has also been included on the "Problem of Venereal Diseases". References for further reading are appended to each chapter.

The illustrations, photographs and coloured plates are excellent and their re-arrangement to bring them within the section of the texts to which they refer is a worthwhile improvement. The whole book is excellently produced – well written and easy to read. It will prove invaluable not only to the medical student to whom it should be strongly recommended, but it should also find a place on the book shelf of every practitioner of general medicine, consultant and general practitioner alike. J. S. McC.

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Professor Walton has, inevitably, completely rewritten the chapter on disorders of muscle and now gives a comprehensive account of current views on this expanding subject and includes some fine micro-photographs of muscle histology. The expansion of this chapter to 56 pages, together with a comprehensive bibliography up to 1969 makes it a particularly valuable addition.

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In spite of the wide range of Lord Brain's contributions to medical and neurological literature I suppose it is in this book that most people will remember him best. As Walton remarks in the preface it stands "as a permanent monument to Lord Brain's clinical expertise, to his thoughtful approach to neurological medicine and to his outstanding literary skills". The present revision maintains these high ideals and the book remains the best standard British textbook on neurology. M.S.

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THIS small book is said to be "a concise survey of modern obstetrics which meets the entire requirements for the final M.B. examination". It contains 300 pages of solid factual knowledge and the quality of the book and its form are very pleasing. This second edition has been well revised and many recent advances in the field of obstetrics are dealt with, if only briefly – placental localisation and its value in the management of antepartum haemorrhage; fetal blood sampling; antenatal examination of liquor amnii and placental function tests (including heat stable alkaline phosphatase) to mention but a few. A useful chapter on psychiatric conditions pregnancy has been included.

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As far as concise medical text books can go this volume will prove a useful adjunct to the student. W.T.

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To bring some form to this the first section of the volume is a more formal report concentrating first on two major events ofthe year under consideration: the death of Sir Henry Dale, the first director of the National Institute of Medical Research, and secondly the retirement of Sir Harold Himsworth, the Secretary since 1949. The Council's functions and policies are then reviewed in general, and specifically in relation to Radiobiology and the Council's overall long-term plans for research in this field.

The second section of the volume is a series of four reviews of notable achievements in selected fields of medical research during the period when Sir Harold Himsworth was Secretary, during which time Nobel Prizes were awarded to six members of the Council's staff. These reviews will have a wide appeal, written by authors deeply involved in the subjects they review. Dr. M. F. Perutz recounts the recent development of molecular biology: a delightful article revealing the author's enthusiasm for his subject. Dr. J. H. Humphrey reviews Immunology; Drs. J. M. Barnes and J. C. Gilson review Occupational Health and Toxicology; and Professor Doll reviews Epidemiology.

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NOTES FOR THE GUIDANCE OF PARENTS OF DIABETIC CHILDREN. By J. W. Farquhar, M.D., F.R.C.P.E. (Pp. 28; figs. 2. 5s). Edinburgh and London: S. & S. Livingstone, 1970.

THIS little book of 27 pages adequately covers what parents of diabetic children need to know to enable them to manage their child's disability successfully.

However, urine testing four times daily would seem to be a standard of perfection beyond reach and counting the total number of urine tests which are positive or negative for sugar between each clinic visit does not seem to be of any great value as a guide to the overall control of the child's diabetes. A deep intramuscular injection of glucagon, given by the parent, into the upper part of the buttock is recommended for the treatment of a child in hypoglycaemic coma. The fact that there is no mention of rapid transfer to hospital of such a child for intravenous glucose is rather surprising. It is debatable whether the parents' attention need be drawn to the long-term complications of the disease.

These are all minor criticisms and I have no doubt that parents of a diabetic child would find this book a very valuable additional source of information to that received on the ward and at the diabetic clinic. S.L.C.

BAILLIÉRE's ATLAS OF FEMALE ANATOMY. Revised by Katharine F. Armstrong, S.R.N., S.C.M., D.N.(Lond.); colour plates by Douglas J. Kidd. Seventh Edition. (Pp 32; plates 5, 25s). London: Ballière, Tindall & Cassell, 1969.

THE text of this book is an elementary account of the structure and function of the different systems of the body. It is clearly written and used in conjunction with the atlas would be very useful to student nurses. One inaccuracy occurs on page 25 where the parasympathetic nervous system is stated as relaxing lung muscle.

The atlas has five plates (41 figures in all) illustrating the skeletal, vascular, muscular, and nervous systems as well as many of the viscera. Five of the figures are 16 inches long and illustrate the whole body thus facilitating orientation. All the figures are well drawn and easily understood. A few illustrations of the position and structure of the male reproductive organs would contribute to the usefulness of the atlas.

This publication is confidently recommended to student nurses and those studying elementary anatomy without proper museum and dissecting room facilities. T.J.H.

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These are all minor criticisms and I have no doubt that parents of a diabetic child would find this book a very valuable additional source of information to that received on the ward and at the diabetic clinic. S.L.C.

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THE text of this book is an elementary account of the structure and function of the different systems of the body. It is clearly written and used in conjunction with the atlas would be very useful to student nurses. One inaccuracy occurs on page 25 where the parasympathetic nervous system is stated as relaxing lung muscle.

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THIS book – laid out in excellent print – is divided into three main sections, covering electrotherapy (direct and low frequency currents), high frequency currents, actinotherapy and other radiations. Each section progresses naturally towards the next sequence, and the whole work is punctuated with simple line diagrams to illustrate even more clearly the points made.

The chapter on electrical stimulation of nerve and muscle, and on electrical reactions has been brought up to date, and makes a valuable addition to the work, as does the chapter on semi-conductors and transistors and their place in the newer forms of electro-medical apparatus.

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The authoress is to be congratulated on producing this accurate, well-balanced and pleasantly written work, which is generally accepted by the Chartered Society of Physiotherapy, London, as a standard textbook for students of physiotherapy throughout their training and it is a most useful book for the Postgraduate training in Physical Medicine and Rheumatology. G.G.

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It is fitting that the effects of rheumatoid disease on the hand should have been chosen for special consideration in view of the complexity of the mechanisms involved and the frequency of severe rheumatoid deformity and disablement of the hand structures.

After an introduction by Prof. Welbourn, well known to this school, there follows a series of sections dealing with the anatomy and pathology of the hand and the biomechanics involved. Arthroplasties are then considered, following which there is an excellent section on the assessment of the hand from the physician and surgeon's view point. The operative technique is considered in papers and discussed in a stimulating manner and the indications and limitations of joint prosthesis are well aired in a section by the Editors.

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CENTRAL PAIN: A NEUROSURGICAL SURVEY. By Valentino Cassinari and Carlo A. Pagni. (Pp. xi+192. 63s). Harvard University Press (Dist. in Great Britain by Oxford University Press, London), 1969.

THIS book is a synopsis of world literature and personal experience of the authors in the problems of physiopathogenesis and treatment of central pain. The opening chapter reviews knowledge and theories concerning the pathways for pain in the spinal cord and brain, with diagrams. Central pain of spontaneous origin is discussed in brief, but the authors conclude that little of value can be learned from a study of spontaneous lesions such as tumors, vascular mishaps, disseminated sclerosis and syringomyelia, because of the grossness of such lesions. Studied in much greater detail, and occupying one- third of the survey, are the surgical operations that have given rise to central pain. Some of these operations have been performed for non-painful conditions such as extrapyramidal syndromes, tumours, encephalopathy of children, spastic syndromes, etc., but most of them have been neurosurgical operations performed for relief of pain of presumed non-central type. These operations have been at various levels and include thoracic and cervical antero-lateral cordotomy (often resulting in a substitution of central pain and discomfort for the original pain), commissural myelotomy and tractotomies at various levels. The latter have produced central pain and unpleasant paraesthesias, the open operations considerably more frequently than the stereotactic procedures. Other operations discussed are posterior cordotomy, parietal lobectomy, hemispherectomy, various leucotomies, pyramidotomies and extra-pyramidotomies.

There is no mention except briefly – "chemical radicotomy, now being tried out experimentally" – of phenol peri-ganglion injection for trigeminal neuralgia, or intrathecal injection for limb and trunk intractable pain, although these methods have been in use in a few centres for over a decade.

There is a discussion on theories which attempt to explain the onset of central pain, such as loss of a specific thalamic function, release phenomena, irritation of sensory pathways and centres (elaborated and supported later on in the book), central sympathetic or hypothalamic disturbance, etc.

The situation and character of sensory disturbance in relation to the level of the lesion in the central nervous system is discussed. The large number of surgical operations which have been and are in use in the attempted relief of central pain is a measure of the unsatisfactory results obtained, and, although some successes are claimed for most of the operations, results are unpredictable and inconstant, and relief frequently only transient. One of the conclusions reached in the final chapter is that the various surgical operations have substantially contributed to our knowledge of the anatomicopathological pathways for central pain, for instance, that data from thousands of cases all over the world have shown unequivocally that in stereotactic surgery on the thalamus, lesions which spare the sensory relay nuclei never give rise to central pain, whatever part of the thalamus or however much of its diffuse projection system, is destroyed. Another firm conclusion reached was that a lesion along the spinothalamicocortical pathway is necessary to produce central pain, and it is immaterial at what level or how complete this lesion is. The authors pronounce a warning to neurosurgeons that, if their theoretical premises are valid, it is impossible with the classic operations for pain syndromes – spinal cord, bulbar and mesencephalic tractotomy, and stereotactic surgery aimed at the ventro-posterior medial and lateral nuclei of the thalamus – for the surgeon to rule out the risk of production of central pain, and this risk should not be concealed from the patient. The authors append a summary of eight of their personally operated cases.

Although no doubt intended for the specialist, this book compresses a wide area into a small dimension and could be read with benefit by any doctor interested in the problem of pain, and even by the undergraduate who is interested in the clinical implications of neuro-anatomy.

G.A.G.