thought; a grading of nurses needing different degrees and different kinds of training—the hospital, the fever, the children's, the asylum, district, school, maternity—needs to be considered. It is the fact, however, and must be faced, that no scheme can succeed which begins by ignoring this key industry of the service. It might be advisable to get a committee of matrons of hospitals and infirmaries to consider any scheme put forward, and ask them to report on its feasibility from their point of view.

Summary.

To summarise. I consider that the medical service of a given area should be controlled as to general system by a Central Council of Medical Service, half of which should be medical men. Women expert in nursing, maternity, and infant welfare should sit on it. The Council should be the agents through which the national Exchequer and the county rates contribute to the cost of the hospitals, teaching and otherwise, and the infirmaries, as well as to all other branches of the service.

That the hospitals and infirmaries in an area should form a unit group, free to work out details and carry out improvements in their own group, but the whole group must come under the general jurisdiction of the Central Council, which will coördinate the working of the groups, and will also organise ancillary services—ambulance, nursing, fever, &c. That payment to a certain amount shall be received from every patient, either by personal payment or some form of insurance, or by payment by Guardians for paupers. That general practitioners may admit and take charge of their patients when admitted to the municipal hospitals, and for them the services of consultants shall be available—free or by payment. Consultants and specialists must be increased in numbers and be specially reared, but that is another story. The staffs of all hospitals, voluntary and municipal, shall be paid for treating cases, by salary for insured patients and by fees for paying cases. Voluntary hospitals shall remain voluntary in their individual management, but shall come into coördination with any general schemes inaugurated by the Central Council. Gifts to voluntary hospitals shall be mainly used for education, research, and the prevention of disease. Infirmaries shall be called by another name and become general hospitals. They shall cease to be under the control of the Guardians, but shall, with the existing hospitals, be under the control of a group managing committee, preferably a voluntary committee—e.g., the existing committee of the voluntary hospitals of the group. They should be very nearly self-supporting. The Central Council will not only be the agent for making grants, but also the agent for collecting payments for work done—e.g., for the insured, for paupers, and others. They should be the finance committee of the service. They might also be a central buying, storing, and distributing committee; a hospital labour exchange; an authority on medical education and nurses' training; and a bureau of information on all matters relating to health, collaborating with existing bodies such as the Medical Research Council, the College of Nursing, and the Consultative Council of the Ministry of Health.

I can see many difficulties in the foundation of such a scheme, or, indeed, any scheme which is to correlate bodies hitherto unrelated. It is only, however, by hearing the case stated from all points of view, as at such a meeting as this, that a scheme productive of most good and along the line of least resistance can eventually be discovered. In conclusion, I should like to thank the Harveian Society for the honour they have done me in allowing a layman to join in their deliberations. It is another instance of the unfailing courtesy of your profession, which I have met continuously in working among you for 30 years.

At the last meeting of the Plympton (Devon) board of guardians a superannuation allowance was granted to Dr. C. E. Cooper, on his resignation, through ill-health, of the post of district medical officer, after 20 years' service.

An Address

ON

THE MARCH OF SURGERY:

LESSONS FROM AMERICA AND ELSEWHERE.

Being the Latter Part of an Address Delivered at the Opening Meeting of the Belfast Medical Students' Association, Queen's University,

By SIR WILLIAM I. DE C. WHEELER, M.D., F.R.C.S.,
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THE group or team system of surgery, examples of which could be seen years ago at selected clinics, has recently attained a high degree of excellence. The most perfect existing instance of group work is probably that now carried out at Rochester, Minnesota, under the guidance of those two master-surgeons, William and Charles Mayo. I have recently visited Rochester; it might interest you to have a picture of group work as carried out in the Mayo clinic, showing the direction surgery is taking now and will take in the future. Such a picture cannot, perhaps, be contained in one address, but I will tell you about it in a diagrammatic sort of way.

The population of Rochester is about 8000, yet last year 60,000 patients presented themselves for advice. Two men have built up this vast organisation in about 25 years. From their earliest professional days the Mayos have travelled incessantly; by seeing the work of others, and by the exercise of a well-balanced judgment, they have imported to their own domicile everything of the best from the surgery of the world. So much for the advantages of travel. The Mayo clinic building is a new structure of some magnificence, fully equipped with every modern appliance, studded with chemical and pathological laboratories, and manned by a team of experts which is, I think, about 200 strong.

"Highly Coördinated Mechanism."

R. O. Beard, in the journal *Lancet*, 1914, after a personal inspection of the clinic buildings, writes as follows:—

"The principal parts of the building are a highly coördinated mechanism for investigation by any combination of men and methods that the particular case may demand. The agencies of diagnosis are carried in every department to the point of perfection, and the results are funded in a bureau of record and statistics which is admirably conceived in plan and elaborately equipped in detail. There is every facility for the study of metabolic phenomena, problems of immunity and bacteriotherapy, the histogenesis of pathologic forms, the redundant types of cell growth, the chemistry of disease processes, and the alterations of post-operative function. There are a series of laboratories for gastro-enterologic analysis with dressing-rooms and diet kitchens attached and equipped with every practical device for lavage and the isolation of enteric contents.

A system of coloured signal lights ranged along the corridors announces the presence and whereabouts of each leading clinician. The bureau clerks, through a system of signals and telephone communications, keep in touch with his movements and locate him when wanted. The registering and communicating devices of the bureau suggest a sort of mechanical detective agency. They give the keynote to the conduct of the clinic—viz., coöperative investigation. Each floor is more or less divided into spaces for clinical observation and laboratory research.

There are rooms for eye, ear, nose, and throat cases. Genito-urinary investigations are well provided for, cystoscopic and proctoscopic examinations are made daily on a queue of patients, and a special Roentgen laboratory is attached to the rooms allotted for this work. Thirty-four rooms are assigned to the X ray laboratory, in which diagnosis and research play the larger and therapeutic the lesser part. On the third floor there are laboratories of histology, pure pathology, photomicrography, physiologic and pathologic chemistry."

A portion of the basement is devoted to a species of zoological garden, where animals are kept for experimental research, and last but not least there is a studio for eminent artists employed by the clinic. The Mayos have no monopoly of the group system; Crile and all the other great surgeons whom I was privileged to see are hurrying forward on the same lines.

Passage of a Case Through the Mayo Clinic.

Now let us take an hypothetical case and follow a patient with a goitre from the time she reaches

Rochester to the day she is discharged cured. All particulars are taken down at an office, and preliminary forms are filled up until enough information is obtained to pilot the patient to some junior clinician or laboratory worker. The clinician requires a blood count, and by pressing a button the patient is transferred by a lift to one of the many laboratories. Let us suppose the blood count does not in this case give the lymphocytosis picture to which Kocher attached so much importance as a diagnostic sign in hyperthyroidism. Yet it is believed by the clinician that the case is one of commencing Graves's disease. Only slight importance is attached to the blood picture and watch must be kept for cases of colloid goitre in neurotic girls which are often mistaken for hyperthyroid cases; the patient travels on until the doubt is cleared up, after which, by the waft of a wand, she finds herself blowing in and out of a complicated-looking machine, in order that her basal metabolism may be estimated. It is only in thyroid and pituitary disturbance that the rate of exchange between inspired and expired air is altered from the constant normal; in the blood diseases, malignant disease, &c., the basal metabolism remains the same. To this test, then, the very greatest diagnostic importance is attached. From a prognostic point of view, however, it is often found that patients with only a slightly increased basal metabolism do badly, and vice versa, so that the clinical picture is in this respect a better guide. The junior clinician in charge, provided the patient has no complications or other condition apart from the goitre, has now got sufficient data for a *prima facie* diagnosis. When all the preliminary work is done one of the leading physicians or surgeons—perhaps Dr. W. A. Plummer or one of the Mayos—sees the patient and analyses the deductions made. Treatment is then advised, which in this case will be operative. (Strange to say, there is a complete agreement between physicians, surgeons, and laboratory workers that surgery is the really only successful treatment for hyperthyroid cases. Taking the latter altogether, the mortality is only about 2 per cent.) After operation the patient again passes through the laboratories; the basal metabolism has come down to normal and the blood picture, if altered in the first instance, has now resumed its proper character. It is more easy to imagine than to describe the fund of scientific information which is obtained by such methods.

Post-mortem Examinations.

Once a week post-mortem examinations are made at which every doctor concerned in the case must be present. The patient may have died after gastrectomy for cancer of the stomach. There is evidence perhaps that the X ray picture was inaccurate: the radiologist is present and explains the fallacies of his critics. How was it in this case—cancer following chronic ulcer—no hydrochloric acid was found at one examination and on the same day hyperchlorhydria was reported on the chart? Those responsible come forward and give details of cases where secretion of hydrochloric acid is inhibited at the time of testing, perhaps from the sight of the tube, perhaps in relation to the time of the last meal (hence the frequent necessity of fractional gastric analyses and tests at intervals of a quarter of an hour, when the results of such examination are considered of importance). So the discussion at the post-mortem goes on until finally the cause of death is attributed, say, to leakage at the line of anastomosis; the onus is then placed on the surgeon to explain why in this case he had adopted a certain operative technique which had failed. In the Mayo Clinic material is passed through a clinical mill; the untiring interest shown in the younger co-workers has eliminated the petty quarrels of jealousy, but no politeness stands in the path of investigation which leads to the goal of scientific truth.

Surgical Technique.

It would be impossible in a short time to describe the operating theatres and surgical technique; in a place where team-work is a religion it goes without saying that the latter is simple, effective, and thorough. From 30 to 40 major operations are performed each morning

in six theatres; illuminated signals in the corridors announce the name of each operation as it proceeds, and visitors are thus enabled to know without disturbing the operators exactly what work is progressing in each room.

The pathological laboratories in immediate connexion with the operating theatres are freely used; during operations specimens are constantly passing for examination, and the operative procedure is often determined by the report received a few minutes later. Great importance is attached by the workers in the laboratory to this examination of fresh living material; the cell picture of sections made of living tissues is quite different from that shown when dead cells are examined. For example, lymphocytes seen in smear preparations may not be lymphocytes at all; the change of cells into lymphocytes is a post-mortem effect. The old pathologist is comparable to the anatomist, the new to the surgeon. Exposure of the gall-bladder and ducts is facilitated by passing a large gauze wipe between the liver and diaphragm, and rotating the liver like a balance on a knife-edge. The liver easily topples over and presents its under surface by the aid of this simple device. In massive tuberculous peritonitis in the female the abdomen is opened and the finger inserted through adhesions into the pelvis, a line of cleavage is found, and—mirabile dictu—after a little manipulation, reminding one of prostatic enucleation, the Fallopian tubes—the fons et origo—appear in the conjuror's hands. There is no cutting or blunt dissection, and no ligature is used. These cases do excellently well.

Splenectomy.—Blood Transfusion.

The Talma-Morison operation for ascites is combined with splenectomy, for in this way 30 to 50 per cent. of the total blood is prevented from ever reaching the liver. Splenectomy was tried some years ago in cases of pernicious anæmia, but the results at that time did not justify the continuance of the operation. After a long interval, however, certain cases reported themselves, and had recovered sufficiently from the disease to justify the question being reopened. The bias is at present rather in favour of the operation. The blood picture did not much change in five cases, which were considered good results in a total of 50 splenectomies for pernicious anæmia and leukæmia. I am writing from memory on this point and those interested must verify it.

Transfusion of blood is done extensively; there is a roster of blood-givers in the town. Pain in the back is a first sign of reaction, and if this occurs the transfusion is stopped. Even with proper grouping, reaction and death have occurred. The cause of this reaction is not known, but careful investigation is proceeding, and the problem is not likely to remain unsolved. A case of pernicious anæmia is transfused once a fortnight; one case had 40 transfusions. They all die in the end, but the treatment is well rewarded by marked temporary improvement.

Gasserian Ganglion Operation.

The Gasserian ganglion operation appears to the onlooker like minor work; there is no blood, no shock, no hitch. A. W. Adson, who is not much more than 30 years of age, is responsible for surgical neurology. The patient is anæsthetised by a nurse, as is the custom. He is placed almost in a vertical position, his head being on a level with the head of the operator, who stands on the floor. A straight incision is made half an inch in front of the ear, the lower extremity being on the zygoma. The skull is opened with Hudson's drill and the opening enlarged with nibbling forceps. A little cerebro-spinal fluid is withdrawn to render easier the lifting upwards of the dura. The middle meningeal artery is tied and the dura propria is incised. The afferent root is divided with a specially constructed guillotine, and the operation is over. The ganglion is not avulsed or interfered with, and no trophic disturbance follows the operation; it may therefore be presumed that the trophic centre is in the ganglion or peripheral to it. Anæsthesia follows in the cornea, as is to be expected, but there is never a recurrence of the painful symptoms.

Active Principle of Thyroid Secretion.

One could proceed ad infinitum to mention points of interest—how, for instance, the active principle of thyroid secretion was discovered almost by accident in the laboratories after examination of some tons of thyroid obtained from meat factories. This substance administered to hypothyroid and myxœdematous patients produces results far in advance of any other known preparation, but it is much too expensive for general use. Efforts are now being made to produce it synthetically. Radium is used a week before operation in suitable malignant cases; the interval between application and operation is short owing to the adhesions and cicatrix found when a longer time is allowed to elapse. Very small capillary glass tubes are often used containing $\frac{1}{2}$ millicurie radium emanation, and these are left permanently in situ. I was in the laboratory when a demonstration was being made showing that thyroid extract produced by one firm had five times the iodine contents of that produced by another. Some popular preparations were useless, probably because bacterial action had destroyed the active principle in the drying process to which the gland is subjected.

Conclusion.

It is well to ponder the fact that when we write prescriptions containing the names of drugs—perhaps potent, perhaps not—but always with hieroglyphics and symbols, we carry on the old idea of mysticism associated with mediæval medicine. The rationalistic explanation that the large decorated R which ornaments all prescriptions is the initial letter of the verb "Recipe," will not do. It is the sign of Jupiter and signifies an abbreviated opening prayer to heaven that the drugs ordered may be taken without serious harm! "You humbugs of doctors," says one of Charles Reade's characters, "couldn't speak plain to save yourselves from hanging." Again, "after 15 years given to the science of obscurity Mr. Sawyer literally could not speak plain in one moment." It is suggested to the reader that the science of Æsculapius is guess-work, but the patient "goes on hoping and hoping something from traditional remedies, even when they fail and fail and fail before his eyes." The surgeon is pictured at each visit feeling the pulse and writing a prescription, "for it is a tradition of the elders that at each visit the doctor must do some overt act of medicine." Thus thinks the man in the street, and he is justified to some extent in doing so.

Already I have trespassed too much on your time and patience, and yet I have only touched on the fringe of what I wished to convey. As surgeons we must know anatomy, which remains the same; advances in physiology, pathology, biochemistry, and the allied sciences will guide us on the forward path. Ireland produced great men when individuals counted. Graves, Stokes, Tuffnell, Butcher, Corrigan, and Colles are almost all within our memory. Let us hope that in the future great teams and groups will arise, so that we may actively engage with others in the contest against disease armed with the irresistible weapon of conjoint action.

I have quoted freely from the work of those who have given and are giving us inspiration; in conclusion I will give the last two lines of Bland-Sutton's address on Science and Surgery: "Before all things let us remember that fellow-craftsmen should not be competitors, but comrades of the same honoured craft and guild."

UNIVERSITY OF CAPE TOWN MEDICAL DEGREES: LOCAL RECOGNITION.—A South African correspondent informs us that the Provincial Medical Council has notified that it is prepared to recognise as registrable medical qualifications in the Cape Province of South Africa degrees of M.B. and Ch.B., and the diploma in Public Health as now instituted at the University. This recognition is regarded in South Africa as the final stage of the movement to provide full facilities at the University of Capetown for South Africans to become qualified to practise medicine and surgery in their native country without having to go abroad for any part of their training.

THE TREATMENT OF LARGE DEFECTS IN PERIPHERAL NERVE INJURIES.

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ONE of the greatest difficulties encountered in the surgical treatment of injuries to peripheral nerves has been to evolve a satisfactory procedure for dealing with extensive defects, when it is impossible to bring the two ends into close apposition by the customary simpler methods.

In the course of my investigations for the Medical Research Council it has been possible to estimate the advantages and disadvantages of many of the operations which have been advocated at various times to cope with this problem of a "gap"; and, since several practical and important conclusions may be drawn from these observations, it seems a duty to put them on record.

It is not intended in this paper to refer in any detail to the minor defects, where the ends of the nerve can be just approximated by the temporary fixation of joints in positions which shorten the course of the nerve, but only to those cases in which a considerable length of the nerve has been destroyed, and it is found impossible to bring the ends together both by modification of posture and freeing of both segments. Neither will any reference be made to such alternative procedures as tendon transplantation, since my investigations have been confined to operations upon the nerves themselves.

Examples of Various Methods.

Examples of the following methods have been under observation.

1. *Plastic operations on the nerve*, similar to those adopted for the repair of defects in tendons, in which a flap is used from the proximal, distal, or both ends. Three examples of this method have been examined, one as late as three years after the performance of the operation, and in none was there the slightest clinical evidence of any regeneration. Stoker¹ has reviewed recently all the recorded results of this operation and has found that in only one patient was there any distinct return of function, and in only one other was there even "some improvement." Huber² performed the flap operation in a number of animals and failed to find any histological evidence of regeneration. Stoker concludes by stating that the futility of this treatment seems to be definitely determined on clinical and experimental data. There is certainly no physiological justification for such abusive treatment of nervous tissue, yet we see this method included in many text-books as one to be considered when confronted with a defect.

2. *Incomplete nerve crossing*, which consists of the lateral implantation of the distal, or both, segments of the injured nerve into a neighbouring intact nerve trunk. Seven patients treated in this way have been under observation. In each the ulnar had been implanted into the median; in five this had been carried out in the forearm, and in two in the upper arm. None of the patients exhibited any evidence of regeneration in the distribution of the ulnar nerve, and in all seven conduction in the median had been definitely interfered with, in two very seriously.

The following is a brief report of one of the patients in which the median had been less seriously damaged, and illustrates not only the failure of this method but also its effect upon the neighbouring nerve which receives the implantation.

The patient had received a gunshot wound of the left forearm on July 1st, 1916. In March, 1917, the ulnar nerve was exposed, and such an extensive defect was discovered that immediate end-to-end suture was impracticable; consequently, the distal segment of the ulnar was implanted into the inner border of the median. He came under my observation first in February, 1919, when there was complete paralysis of all the intrinsic muscles of the hand supplied by the ulnar, and definite paresis and wasting of the thenar group, together with the sensory loss shown in the