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THE MARCH OF SURGERY—SOME LESSONS FROM
AMERICA AND ELSEWHERE.

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The art of Surgery is as old as the existence of man. The most ancient remains bear the impress of the surgeon's skill. Skulls of epileptics were trephined to afford incarcerated evil spirits a chance of escape. The foundations of our surgical edifice were laid when man first appeared upon the earth. In a paper of limited scope it appears more profitable to deal with the present and think about the future, but we must be guided to some extent by the records of bygone days. Progress was indeed slow in the ages past, if none the less sure; for centuries we find one authority after another preaching the doctrines of his own forefathers.

Some few years ago I had occasion to review the works of Hippocrates and Galen, to search the writings of

*The Presidential Address to the Surgical Section, Royal Academy of Medicine in Ireland, Nov. 26, 1920.

Dupuytren, Hamilton, and Malgaigne, and to see what Velpeau, Wiseman and Ambroise Paré had to say on the subject of fractures. The study was absorbing, and the trail was followed through the great eighteenth century school led by Pott and Hunter to Sir Astley Cooper, Lister and modern times. The result of it all was to find that the Egyptians, three thousand years before Christ, in the fifth dynasty, probably treated fractures by more successful methods than are often employed at the present day. Grooved splints were used in compound comminuted fractures of the shaft of the femur, pads and bandages of linen tied with reef knots secured them in position. Three thousand years later, in the Christian era, treatment was the same, and another two thousand years found the Abyssinians adopting methods in no material way different from those of the ancients. A study of broken bones to its source takes us backwards past definite milestones, for a bone once broken forms a permanent index from which can be gauged the ideas and ability of the surgeons in the past, and from the earliest times there is an abundance of specimens from which this study can be made. Treatment, however, appears to have only undergone a real change in our own time; through the ages it was regarded as a thing like the laws of the Medes and Persians, which altereth not.

In a study of this kind it is disappointing to find that the surgical supermen of the past were obliged to engage in a heart-breaking struggle in their effort to advance. Reaction and conservatism haunted them as they haunt us. There was the inevitable make-believe that the hands of the surgical clock could remain stationary, and then, as now, men with their heads in the sand were content to believe that their own methods, employed in hidden corners, represented the finality of perfection. It is usually from those who have neither travelled nor read that dogma and conceit is expected, but we find so renowned an authority as Ambroise Paré, who has recently been described by Moynihan as one of the greatest original minds our art has known,

"Fearless, independent, alert and inventive," referring to himself in these words: "There be few men of this profession which can bring so much authority to their writings, either with reason or experience, as I can. I have so certainly touched the mark whereat I aimed that antiquity may seem to have nothing wherein it may exceed us, besides the glory of invention, nor posterity anything left but a certain small hope to add some things, as it is easy to add to former inventions." He little foresaw Lister and the future in cultivating an attitude so detrimental to progress. The quotation is useful to illustrate a condition of mind which is only too common at the present time. Those who described their own work were egoists; praise of the work of others was regarded in the nature of hero worship, and criticisms of faulty, ill-conceived effort were attributed to jealousy. The obstacles to progress appeared always in the ascendancy.

In studying the present age of rapid advance and making plans for the future, surgical progress can be helped by taking to heart certain lessons. If not from day to day, at all events from year to year, the outlook of the operating surgeon must alter. It is no use when young deciding what is best in surgery and developing to the utmost a system based on the work of contemporary leaders in the belief that it will suffice for a lifetime. Think of the manufacture of motor-cars and compare the engines of to-day with ten years ago, the small improvements in carburettor, magneto and essential parts have in a decade produced an almost perfect machine. The danger is that as we grow older and our minds less receptive we may miss in surgery the cumulative effect of small advances.

We learn another lesson by noting the incredulity and scathing disbelief, the merciless and destructive criticism which accompanied such epoch-making discoveries as anæsthesia and antiseptic surgery. Who knows but that we are on the verge of the solution of the cancer problem? All of us have seen the melting away into thin air of masses of cancerous growth under the action of radium;

it is almost past belief that an infiltrating ulcer in the tongue and mouth beyond the possibility of successful operation can be made totally to disappear in a few days, yet such cases are often seen. Truly, it is not a cure, but it prepares the mind for vast possibilities. Although surgery is defeated by metastasis in cancer, in syphilis salvarsan and its derivatives can search every corner of the organism until the virus is rendered inert or finally destroyed. Research is only temporarily baffled; an army of workers are abroad in the laboratories, and clinical observers are everywhere on the alert. How interesting it is to speculate on the connection between a slight injury to bone and the development of sarcoma. We think of the great capillary supply of the cancellous ends of the bones and how a slight injury causing a capillary hæmorrhage within may set free the tubercle bacillus or other organism with results which can be accurately pictured. It is not so long since our ignorance on this subject was complete. We know that the same slight injury, in the same place, in similar individuals, will be followed by a malignant growth, and yet a severe injury causing fracture is neither followed by the one condition nor the other. The case of the breast is perplexing, for carcinoma is very often preceded by injury, elsewhere it seems to be the product of continued irritation. Will the observation that growth in cancer is stimulated by acidity and inhibited by alkalinity lead us anywhere? That hot drinks are probably a cause of no little importance in producing cancer of the stomach requires careful thought.

Bland Sutton wonders if he could fathom the secret of the changes of pigmentation in the plumage of certain birds at the breeding season how nearer he would be to a solution of the problem of melanotic sarcoma. In an address on the surgeon of the future he is delightfully crisp in his denunciation of some of our reasoning powers and biological deductions. A lecturer on anatomy waxed eloquent on the subject of cerebro-spinal fluid serving as a water bed for the brain in order to preserve it from

harmful concussions. Bland Sutton was not convinced—he told his teacher that the explanation was absurd, for the relative bulk of the brain and cerebro-spinal fluid resembled an ironclad in a duck pond. He emphasises the relationship of sepsis and cancer, and contrasts the numerous cases of fatal infection after removal of the colon for cancer with the immunity from infection which follows operation on the abdomen for non-malignant disease. Our methods for preventing infection in the former class are to his mind almost as clumsy as attempts to kill fleas with bludgeons. He alludes to the use of gloves, sterilised overalls, caps, masks and top boots, when a cancerous segment of the colon swarming with bacteria is to be removed as surgical coquetry. In the same strain he describes surgeons as either craftsmen or biologists and credits the former, *inter alia*, with inventions such as the œsophagoscope, “which requires for its successful use a surgeon with the instincts of a sword-swallower and the eye of a hawk.” I do not know how far the experimentalists have carried us along the road, one thing only is certain that if the riddle of cancer is solved in our time and we resemble our ancestors, which God forbid; we will scoff for a generation and allow posterity to have the benefit. To those who would keep on the straight road and move as quickly as circumstances permit, Osler gives admirable advice. Teachers must have a full personal knowledge of the branch taught, not second-hand information derived from books. Men are required to have a sense of obligation, “that feeling which impels a teacher to be a contributor and to add to the stores from which he so freely draws.” To do this it is necessary to know the best all the world over. He will burden an already overladen literature with faulty and crude observations unless he is familiar with the workers abroad. In another essay he tells us that when a man talks slightly of the position and work of his profession in any country, or when a teacher tells you that he fails to find inspiration in the work of his foreign colleagues, in the words of the Arabian proverb, “He is a fool, shun him.” Personal

first-hand intercourse with the men of different lands when the mind is young and plastic is the best antidote against ignorance. Osler tells some home truths. He discusses the weakened receptivity and the inability of men over forty to adapt themselves to an altered intellectual environment. "It is this loss of mental elasticity which makes men over forty slow to receive new truths." It is well to recognise this unpleasant fact and to gain comfort by believing with so great a writer and physician that salvation lies "in living in and with the third decade in company with the younger, more receptive, and progressive minds." Thus it is essential to travel to see the work of others at frequent intervals, to cultivate discriminate reading, and to contribute from time to time useful knowledge for the benefit of others.

Hole and corner surgery will disappear, and playing to the gallery is already dead. "Surgery of the brilliant kind," says Moynihan, "is a desecration. Such art finds its proper scope in tricks with cards, in juggling with billiard balls, and nimble encounters with bowls of vanishing goldfish."

Some dreaming, a little hero worship, and speculation as to what we are aiming at and living for is not unprofitable, but there are many who will desire to approach the subject of surgical progress from a more practical and utilitarian point of view. To do this a fundamental contrast must be drawn between our ancestors and ourselves. Every epoch in surgery is associated in the past with the names of individual men. All, from Hippocrates to Lister, in the great procession answer their names to the roll call, and each one marks a notable period in surgical advance.

That day is passing, and from now on progress will have in all probability little or nothing to do with individual supermen, unless so far as they are the organisers and centre-forwards, so to speak, of a thoroughly efficient team. The art of surgery is now so wide that no one man can expect to be expert in all branches, and yet a knowledge of all branches should, in the interests of science, be brought to bear on almost every surgical or medical case.

The logic of it is that from henceforward work will be best done in teams and groups. Craftsmen and biologists, physicians, gynæcologists, biochemists and pathologists, those skilled in the use of X-Ray, radium and the cystoscope, with sub-divisions such as neurologists, abdominal surgeons and the like, must work as units in groups and teams so that they may fully understand their interdependence, one upon the other, in the search for truth. To some extent such a system pervades the atmosphere in every large general hospital, but it is by no means complete, and the close co-operation necessary to produce real results is everywhere conspicuous by its absence. The private patient is deprived, as a rule, of anything approaching scientific method.

To illustrate exactly what is meant, I will give you the impressions left on my mind after visiting the clinics of outstanding surgeons every year regularly, with the exception of the years of the great war, since I was qualified nearly twenty years ago.

It was difficult to understand at first why, for example, the late Professor Kocher of Berne stood head and shoulders above his neighbours and colleagues, men apparently with equal opportunities and a corresponding amount of grey matter. The same could be said of men in England and Scotland, in France, and elsewhere.

In one clinic an immense amount of operative work would daily be completed. One case after the other would reach the operating room as if those responsible for the preparation and anæsthesia could see through closed doors and always be ready at the psychological moment. Seldom at the operation was it found that an incorrect diagnosis had been made. The physician, radiologist, biochemist and all concerned were generally present to watch their observations put to the test. One could see the wheels working in a well-oiled machine. A visit would be paid the next day to some other clinic. A few words with the surgeon perhaps would leave the impression that the coming performance was to be headed by a genius. But in this

case the anæsthetic was not taken well; after the first abdominal incision the recti fought against further interference and there was a delay. The X-Ray photographs did not correspond with what was actually found, some vital point in the blood or urinary examination had been omitted, and those from whom information was required were not forthcoming. When finally the next case was expected in the theatre there was confusion, hurried orders, and the third patient appeared instead of the second. It is just the difference between the work of a well-trained team and the inco-ordinated action of isolated individuals.

So impressed was I with the advantages of such team work that nine years ago, on a very small scale, I started a hospital and a team of my own, and at the risk of being found guilty of egotism I will tell you what it means. The same anæsthetist, the same assistant, a theatre sister who has worked for me alone for nine years, the same nurses, the same light, the same instruments, the same atmosphere and surroundings for every private operation whenever a choice exists. Each one of this small team can now, after years of practice, anticipate every movement, almost every thought of the other, and the work done is never wearisome. Operations are carried out in many other private hospitals by the same team, and instead of giving offence, as was at one time feared, the nursing staffs and all concerned see for themselves and co-operate most loyally with the underlying idea. It is this small and modest experience of my own—a sort of nibble at a great feast—combined with what I saw when the system was developed on a great scale which makes me convinced that no longer should surgery be regarded in any sense as the province of one man. Recently things have progressed far in advance of this team system which could be seen years ago at selected clinics near and far. It is better to refer to the more modern idea as group work, and probably the most perfect group work is carried out in Rochester, Minnesota, under the guidance of those two master surgeons—William and Charles Mayo. I have recently visited Rochester and by

way of showing the direction surgery is now taking, and will take in the future, it might interest those who have not seen it to have a diagrammatic picture of group work as carried out by impressive and model methods.

The population of Rochester is about 8,000, and yet last year 60,000 patients presented themselves for advice. Two men have built up this vast organisation in about twenty-five years. From their earliest days the Mayos have travelled incessantly, and 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 advantage of travel. The Mayo Clinic building is a new structure of some magnificence, fully equipped with every modern appliance, studded over with chemical and pathological laboratories, and manned by a team of experts about 200 strong. The principal parts of the building are a highly co-ordinated mechanism for investigation by any combination of men and methods that the particular case may demand. The agencies of diagnosis are carried out in every department to the point of perfection, and the results are funded in a bureau of records 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 of bacteriotherapy, the histogenesis of pathologic forms, the redundant types of cell growth, the chemistry of disease processes, and the alterations of postoperative function. There are a series of laboratories, with dressing-rooms and diet kitchens attached, for gastro-enterologic analysis 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., co-operative investigation. Each floor is more or less divided into spaces for clinical observation and laboratory research. 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 therapeusis the lesser, part. On the third floor there are laboratories of histology, pure pathology, photomicrography, physiologic and pathologic chemistry. There is a sort of Zoological Gardens in the basement, where animals are kept for experimental research, and last, but not least, there is a studio for eminent artists employed by the clinic.

Now let us take a hypothetical case and follow a patient with a goitre from the time she reaches Rochester to the day she is discharged cured. All the particulars are taken down at an office, 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 disease. Only slight importance is attached to the blood picture, and many cases of colloid goitre in neurotic girls are mistaken for hyperthyroid cases; the doubt must be cleared, and the patient travels on. By the waft of a wand she now finds herself blowing in and out of a complicated-looking machine having an estimation made of her basal metabolism. 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, etc., 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 respond badly to treatment, and *vice versa*, so 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 investigation is complete, one of the leading physicians or surgeons, such as Dr. 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 only really successful treatment for hyperthyroid cases. Taking them all in all 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 easily imagined than described what a fund of scientific information is obtained by such methods.

Once a week *post-mortem* examinations are made and 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—that 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 numbers 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 quarter-

of-an-hour intervals when the results of such an examination are considered of importance. So the discussion at the *post-mortem* goes on, until finally the cause of death is attributed to, say, leakage at the line of anastomosis, and the onus is placed then on the surgeon to explain why in this case he had adopted a certain operative technic which had failed.

In the Mayo clinic material is passed through a clinical mill, but the untiring interest shown in the younger co-workers has eliminated the petty quarrels of jealousy, and no politeness stands in the path of investigation which leads to the goal of scientific truth.

It would be impossible in a short time to describe the operating theatres and surgical technic. In a place where team work is a religion it goes without saying, that it is simple, effective, and thorough. From 30 to 40 major operations are performed each morning in six theatres; illuminated signals in the corridors announces the name of each operation as it proceeds. Visitors are thus enabled, without disturbing the operators, to know exactly what variety of work is progressing in each room. The pathological laboratories in immediate connection with the operating theatres are freely used. During operation specimens are constantly passing for examination and the operative procedure is determined by the report received a few minutes later. Great importance is attached by the workers in the laboratory to the examination of fresh living material. The cell picture of sections made on living tissue is often 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 what appear to be 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 is 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.

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 operation. The blood picture did not much change in the five cases which were considered good results in a total of fifty 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 one of the first signs of reaction, and if this occurs the transfusion is stopped. Even with proper grouping, reaction and death has 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 forty transfusions. They all die in the end, but the treatment is well rewarded by marked temporary improvement.

The Gasserian ganglion operations appear to the onlooker like minor work; there is no blood, no shock, no hitch. Adson, who is probably not more than 30 years of age, is responsible for surgical neurology. The patient is anæsthetised, as is the custom, by a nurse. He is placed almost in

a vertical position, his head being on a level with the head of the operator standing 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 then opened with Hudson's drill and the opening enlarged with nibbling forceps. A little cerebro-spinal fluid is withdrawn to render easier the lifting up 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 nor interfered with, no trophic disturbance follows the operation, therefore the trophic centre may be in the ganglion or peripheral to it. Anæsthesia follows in the cornea as is to be expected, but there is never a recurrence of symptoms.

One could proceed *ad infinitum* mentioning points of interest, how 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 myxodematous 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 half a milli-curie of radium emanation, and these are left permanently *in situ*.

I was in a laboratory when a demonstration was being made showing that thyroid extract produced by one firm had five times the iodine content of that produced by another. Some popular preparations were useless because bacterial action had probably destroyed the active principles in the drying process to which the gland was subjected.

What a lesson to ponder over when we write prescriptions

containing the names of drugs, perhaps potent, perhaps not, but always with hieroglyphics and symbols, and thus we carry on the old idea of mysticism associated with the medicine of mediæval times.

"You humbugs of doctors," says one of Charles Reade's characters, "couldn't speak plain to save yourselves from hanging."

"After fifteen 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 our forward path.

Ireland produced great men when individuals counted. Graves, Stokes, Tuffnel, 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."