

## A FEW SURGICAL LESSONS OF THE WAR.

AN ADDRESS DELIVERED TO THE AMERICAN COLLEGE  
OF SURGEONS

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I APPRECIATE more deeply than I can express the great honour you have done me by inviting me to address you as a delegate from Britain. The admiration I have for the surgery of America, and for the countless personal friends who practise it, would alone make this voyage memorable to me; but, in addition to this, I can never forget the debt under which we are placed for help given to us at a very critical period at home.

The loan of twenty-five keen and experienced young surgeons placed at our disposal for the duration of the war, equipped and paid for by the American Government, has placed an obligation upon us very difficult to repay, and which I can only express in terms of affectionate gratitude. How that band of twenty-five rapidly swelled to close upon a hundred is known to many of you; but we on the other side, who lived amongst them, inspired by their energy, their sense of responsibility, their loyalty and devotion to duty, can alone speak of the sweet memories they have left behind. They filled a gap which seriously threatened to sterilize our reconstructive efforts, and they filled it with distinction and success.

When your nation entered upon the war most of our more tragic problems were being overcome. Sepsis and gas gangrene had largely lost their terrors. Shock was being adequately dealt with; wounded men at advanced units were promptly and effectively handled; continuity of treatment from regimental aid post to the base was being secured, and standardization of methods appreciated and practised. Team work was in full swing, while the segregation of special cases under expert men had already made advance.

But in the early days of the war, when the wounded passed into our country in countless numbers, our hospitals soon became full to overflowing. The same conditions were experienced in France. There was nothing for it but to evacuate the less serious cases to make room for others, with the result that our towns and even villages began to feel the burden of the cripple. If the men were not discharged they were found segregated in command dépôts, and these dépôts from their nature were not equipped with the personnel which could effectively deal with them.

A visit through these large camps very early proved to us that it was necessary to have certain hospitals governed by less stringent rules, where every accommodation should be provided for the type of case which required a sufficiently protracted stay to prevent deformity and to restore function. At Sir Alfred Keogh's request an experiment was first made in Liverpool, where 250 beds were placed at our disposal. Later, in Liverpool this number grew to 1,500, and fresh centres were started in Great Britain and Ireland, until the number reached over 25,000. Difficult as it was to find beds, it was even more difficult to find surgeons to superintend them, for all medical men under 45 were commandeered for foreign service, and it was the young men who were badly needed—men of sound surgical training, with minds sufficiently open and flexible to grasp and solve new problems.

Visits to general hospitals and command dépôts clearly proved that without segregation and continuity of treatment we were in danger of scrapping thousands of cases who possessed the potentialities of recovery; and these were not merely the serious cases, but also those suffering from lesser injuries upon the recovery of which we depended in order to replenish our fighting forces.

The cases we met with in these tours of inspection were malunited and ununited fractures—especially femurs. Stiff and ankylosed joints; flail joints; the after-effects of injuries to peripheral nerves and deformities due to the contraction of scars. Many of these conditions were recoverable, and most of them might have been prevented.

These men, when admitted into our centres, had usually

been to several hospitals. They were generally discontented, and by no means willing to undergo any further manipulative or operative attack. They did not necessarily come from our small auxiliary hospitals, but often from those institutions where, in normal times, we would find the most skilful and eminent surgeons.

Our first effort consisted in endeavouring to improve the mental outlook of the men and in making every effort to humanize the hospital. Persuasion and explanation took the place of command and penalty, and our various centres with their annexes became hives of industrious and contented men. In a very short time they were prepared to submit to anything we wished.

The segregation into large centres of so widely differing groups of cases involved great responsibility—more especially the nerve cases. Frequently I had been told by neurologists who operated in various hospitals that they were quite unable to follow their cases, there was no possibility of retaining them in the war hospitals, where convoys continually arrived, for much longer than it required to heal the wound. They were evacuated and found again in various small country hospitals, or even in command dépôts, sometimes under conditions anything but desirable. They had to be admitted to our centres, and it was therefore necessary to secure the service of eminent neurologists to help in the treatment. As most of the nerve injuries were accompanied by other lesions they were very admirably placed for general supervision.

It may be of interest to mention briefly certain lessons we have learnt in the treatment of these peripheral nerve injuries. The complications were such that we were often obliged to wait until they were overcome before any operation could be undertaken. Suppurating wounds, involving bones, muscles and tendons, and stiffness of joints, all delayed an attack upon the nerve. Muscles had to be freed and developed, and osteomyelitis drastically extirpated in order to render the muscles receptive to impulse. The sooner these complications were overcome or improved the better the chance for the nerve, not because delay in operating upon the nerve lessened the chance of regeneration, but because a chronic myositis very seriously impaired the power of the muscle to react when recovery of the nerve path was re-established.

Experience taught us that it was better to explore earlier and more frequently than we did at the beginning of the war.

It is found that if a nerve is simply concussed or compressed, and has undergone Wallerian degeneration, it will early show signs of recovery. In cases which do not spontaneously recover in a month or two, it is usually a mistake to await regeneration of the nerve, and an exploratory operation should be undertaken. Inspection of the exposed nerve at the time of operation and its faradic excitability should be regarded as a part of diagnosis. It is essential in such cases that the surgeon should be experienced in nerve surgery, and be prepared to close the wound without interfering with the nerve if it has an intact sheath, and gives a faradic response when tested with a weak current. It is probable that no interval between wound and operation is too long to preclude possible recovery after suture. The state of the muscles, tendons, and joints is the important factor.

It has been found in practice that end-to-end suture can be attained in the great majority of cases by posturing the joints and by transposing nerves. An inch and a half can be gained by transposing the musculo-spiral to the inner side of the humerus, and several inches by transposing the ulnar to the front of the elbow. In the rare instances where the nerve could not be brought together we found this could be accomplished by a two-stage operation. Silk was tied around the bulbs, and they were brought together as nearly as possible, extra length being secured by posturing the limb. The wound was then closed and gradual traction applied to the nerve through the limb for some weeks. At the second operation it was found that the ends could usually be brought together. It is needless to emphasize the importance of approaching the nerve through normal tissue above and below the lesion were it not that even yet surgeons may be found making the exploration through scar tissue. Nothing is to be gained from surrounding the suture line with vein or Cargile membrane or fat introduced from without. If the nerve has to be protected from scar tissue, a living muscular flap is indicated, but, whenever possible, the scar

tissue should be freely excised. The Medical Research Committee, whose report is not yet published, has carefully investigated a large number of cases operated upon. In the case of nerve grafting they have not met with one case of complete recovery and but very few partial recoveries. Most cases have ended in failure. Bridging by catgut, vein, alcoholized nerve, and other foreign material has consistently failed. The turning down of flaps of nerve, and nerve crossing or anastomosis—that is, implanting the distal end of the divided nerve into a healthy one—invariably fails. The conclusion comes to is that end-to-end suture by a one, or, if necessary, a two stage operation, is the method to be adopted in every case.

In cases of irreparable damage to the musculo-spiral or posterior interosseous, tendon transplantation properly performed has proved an unqualified success. It must be associated with a good technique, and be followed by careful re-education. The operation I suggested in pre-war days with certain modifications I still recommend, but I advocate a more frequent use of the pronator radii teres. The flexor carpi radialis and the flexor carpi ulnaris can be transplanted into the paralysed extensors of the thumb and fingers, and the pronator radii teres may be affixed to the radial extensors. In transplanting tendons it is important to pay careful attention to the correct tension, and the hand and fingers should be kept well dorsiflexed when the attachments are being made, and the transplanted tendon must run a straight course from its origin to its new insertion. Attention to these points will make the difference between success and failure. If the operation is a real success, the fingers and thumb can be easily fully extended. Tendon transplantation with the object of merely dorsiflexing the wrist should be discouraged, and tendon fixation with the object of permanently fixing the wrist in dorsiflexion should be reserved for those cases where transplantation has been a failure and where the extensor muscles and tendons have been destroyed.

Paralysis of the anterior crural is very rare, probably because the femoral vessels are usually destroyed by the missile. We have here a choice of hamstrings to attach to the patella. Strangely enough I have only met with one case, and in this instance the recovery was sufficiently good to permit of climbing stairs with increasing power.

Tilanus of Holland some twenty years ago suggested an operation for flail feet in poliomyelitis which he termed tenodesis. He used paralysed tendons as ligaments in order to sling the foot at right angles. Gallie and others have worked on similar lines. This operation, with modifications, is helpful in drop-foot due to sciatic injury where suture is impossible. The peroneus longus is cut about three inches above the external malleolus, and the tendon is withdrawn through an incision above the base of the fifth metatarsal. The loose tendon is then passed through the annular ligament and through a tunnel bored through the tibia. The tibialis anticus is also cut and passed through the same tunnel. The tibialis is passed from within outwards, the peroneus from without inwards. The foot is dorsiflexed to a shade beyond the right angle, and the tendon ligaments are drawn tight and attached to each other. The peroneus brevis is cut and attached to the fibula. The result of the operation is very satisfactory—much more so than in the case of children, where problems of growth have to be considered.

The prognosis as regards functional utility after nerve suture depends very largely upon which particular nerve has been injured. Thus the musculo-spiral usually makes a good recovery, whilst the ulnar, as regards the intrinsic muscles of the hand, does badly. Another factor of importance in prognosis is the occupation of the patient. A man with an ulnar nerve lesion will usually recover both sensation and muscular control quite well enough for most trades, but he will not recover control of the finer movements of the hand—such as are needed for piano playing.

After the musculo-spiral, in order of good recoveries, we must place the sciatic. The results of suture here are surprisingly good. A large number of our cases were examined two or three years after suture. Some of these men could jump, climb ladders, and run, and many have returned to their pre-war employment.

The brachial plexus often makes a good recovery, especially the upper part. Plexus lesions should be

watched for a long time, six to nine months or more, and not operated on for exploratory purposes as are the nerves themselves, because they frequently make excellent progress, and a generalized paresis may later be limited to one cord, or nerve.

Median injuries do fairly well, the thumb intrinsics even recovering in some cases, whilst it is usual for the wrist flexors and considerable sensation to recover. Sensation, however, is usually lost, or very slowly or rarely recovered from, over the terminal phalanx of the index fingers.

The ulnar recoveries are good as regards wrist and finger flexors, and even its sensory disturbance clears up well. As has been stated, good recovery of the interossei is very rare. They may and do recover their faradic excitability more often than voluntary power.

Combined lesions of the median and ulnar, particularly if complicated by ligation of the artery, do very badly. There is usually the stiff, rigid, board-like hand with joint changes to still further hinder the chance of good function. This is, indeed, the important obstacle.

The after-treatment of cases of peripheral nerve injury has not undergone much change. The relaxation of muscles is essential, and it is also necessary that the relaxed position of the nerve should not be too early dispensed with, otherwise the recently regenerated axis cylinders will be ruptured. Interrupted galvanic stimulation, massage, heat and re-education are indispensable desiderata.

Dr. Lloyd Roberts, who is in charge of the neurological department at the Liverpool Special Military Surgical Centre, has demonstrated a phenomenon which he describes as "opposative electrical reaction." He points out that in certain conditions electrical stimulation of a muscle induces, instead of contraction of the muscle itself, contraction of the muscle or muscles whose action is exactly the reverse of that of the stimulated muscle. For example, stimulation of the extensor longus pollicis will induce contraction of the flexor longus pollicis. This result has, of course, been frequently seen, but was supposed to be due to the overflow of a strong current. Roberts points out that it can readily be proved that this is not the case from the fact that the contracting muscle is not adjacent to the stimulated muscle, and that the intervening muscles do not contract. Similarly, stimulation of the extensor indicis will induce contraction of the index tendon of the flexor sublimis. Such is the delicacy of the reaction that the other flexor tendons are not at all stimulated. This reaction is never obtained when the nerve supplying the stimulated muscle is normal, or severed, or slightly compressed, but only in conditions of severe compression.

When compression is progressively increasing it is often the last electrical sign to persist, and, conversely, when a sutured nerve is recovering, it is often the first reaction to be obtained. In the case of the posterior interosseous it probably always indicates compression of the musculo-spiral by callus.

A series of very interesting trick movements have to be carefully watched for when we test the amount of recovery following suture, or when we are making a diagnosis. Unless the surgeon is familiar with their occurrence he is very liable to be misled.

In complete paralysis of certain muscles and muscle groups the unaffected muscles acting in combination can replace the movements lost by paralysis in a very remarkable manner. For instance:

1. The opponens pollicis can be perfectly imitated by the ulnar adductors of the thumb in combination with the extensor ossis.
2. The extensor ossis may act as a good wrist flexor in cases of complete paralysis of all median and ulnar muscles.
3. The fingers may be closed in complete median and ulnar paralysis by extending the wrist when the inelastic paralysed flexor tendons acting as ligaments permit the fingers to mechanically flex.
4. The elbow may be flexed by the pronator radii teres in combined lesions of musculo-cutaneous and musculo-spiral nerves.
5. Flexion of the fingers may extend the wrist in lesions of the musculo-spiral, simulating the movement of the wrist extensors.

Although electrical stimulation will generally teach us to discriminate between the true and spurious movements, the observer must be on the alert or he will be quite easily deceived.

Sir Anthony Bowlby, to whose organization we owe so much for work in connexion with the subject, has already addressed us on *Fractures of the Femur* as he met with them in France. In the early days of the war these injuries supplied our centres with a large proportion of deformities. In 1917 I described gunshot injuries of the femur as "the tragedy of the war," not only by reason of the fatality by which they were attended, but also because of the deformity and shortening so often associated with them. This was due to the absence of effective team work at home and abroad, a want of standardization of splints, and of continuity of treatment from front to base, and of the segregation of these injuries in special hospitals under expert men. I have it on the authority of Sir Henry Gray, who collected statistics over one of the army areas in 1916, that the mortality from these fractures amounted to almost 80 per cent., a large proportion of deaths occurring on their way to, or at, the casualty clearing stations. In the year 1918 Sir Anthony Bowlby tells us that "the mortality in field ambulances and in casualty clearing stations was reduced to 20 per cent."

To what are we to ascribe this dramatic change? First and foremost to the recognition, too long delayed, of the value of the Thomas splint, and to its distribution to the regimental aid posts. We cannot give too much credit to Sir Henry Gray for the work he did in this connexion. In pre-war days a certain kind of homage was paid to the Thomas splint, but that was all. Its use was strictly limited, and in spite of its simplicity very few surgeons knew how to apply it, and in many of our teaching hospitals it was only known by name. In Liverpool we have long taught that fracture of the femur, simple or compound, treated by a Thomas splint, should, at the worst, not yield more than half an inch of shortening, and that if a surgeon desired it he could easily produce an appreciable lengthening. It has taken a great war to drive this truth deep home. The calliper splint, which has been in use for over forty years, was scarcely known. The standardization of the Thomas splint, the education of men in its use, its application on the field of battle, secured for the fracture immobilization and simplified transport, it minimized shock, and it prevented the perforation of vessels by securing the alignment of the broken ends. Its use had to be understood from the field to the base hospital, for continuity of treatment was imperative. At the base hospital it might be necessary in more leisurely fashion to apply modifications in response to special requirements. A subjugation of sepsis and gas gangrene also played an important part in these improved statistics, with all those accessories for the prevention and lessening of shock, such as the heated ambulance and the hot chambers. In addition to this the mobile expert teams which were rushed from place to place allowed of more skilled and frequent operative treatment. Then came the equipping of special femur hospitals, where some of the best and most inspiring war work was done. In this connexion I feel I must refer to the work of Major Sinclair, who displayed remarkable ingenuity, and whose cases, even in the early days of the war, arrived in England with barely any shortening and in excellent alignment. To him and to Colonel Pearson and Colonel Watkin Williams we are much indebted for excellent pioneer work. Pearson, who later took charge of one of our large femur hospitals, using the modified Thomas splint to permit of knee flexion, obtained traction by the introduction of callipers which gripped but did not penetrate the femur, and used suspension of the Thomas ring and elevation of the femur. In addition, he designed a special bed which rendered dressing easy and painless.

In 300 cases of compound fracture treated in England in one of the special military surgical centres where this method of extension was employed, the average shortening was half an inch. There can be no doubt that the use of the safety ice-tong calliper in the hands of experienced surgeons has been of very great service. The arrangement should always be affixed to it to prevent it from entering the bone. This is especially important if evacuation takes place during treatment. Many cases arrived in England where the knee and ankle-joint had been infected by ice-tong callipers which were introduced into cancellous

tissue and worked their way downwards. It must be remembered, however, that fracture of the femur can be effectively treated by the Thomas splint with ordinary extensions. The pressure of the ring can be modified by tying the end of the splint to the end of the bed, which is elevated. Of 97 cases which were at the Liverpool Special Military Surgical Centre at one time, the average shortening was less than five-eighths of an inch, and the skilled nursing secured for the patient freedom from pressure sores and a comfortable convalescence. The extension callipers, combined with a free knee-joint, undoubtedly minimize a frequently obstinate stiffness, but they should never be used for transport purposes.

The Thomas, with plaster or glue extension, is the ideal transport splint, and fractures of the femur, such as we meet with in civil life, can be most adequately dealt with by this apparatus. The stiffness of the knee which follows retention is of a very tractable kind, and is usually quite overcome after two weeks' massage and exercise. As a transport splint in civil life it is ideal. I remember on several occasions when I assisted H. O. Thomas in the case of workmen brought to him with fractured thigh. A splint was applied in a few minutes without an anaesthetic and the patient sent home in a four-wheeled cab, sometimes a considerable distance.

The lessons that we civilian surgeons should learn from all this are clear. If such results are obtained by simple means in such compound fractures as have occurred in war, why should we have recourse to more complicated methods? Why should the student be taught that fractures of the femur can only be adequately dealt with by one of the various forms of internal splinting? Why should we spend so much ingenuity and time in devising operative novelties when it is so much easier and useful to learn the simple way? In the hands of the expert and cleanly surgeon catastrophes may generally be avoided, but what of the rest? In every village and hamlet the humblest of us may be called to treat a broken thigh, and the humblest of us should know before he leaves his studies how this can be done with safety and success.

Many years ago I pointed out that the textbook deceived us as to the time it takes for bone to consolidate sufficiently to bear body weight. This delay in firming is still more pronounced in war wounds. After several months of apparent union angulation may occur unless the bone is protected. The use of the calliper splint is the best protection. This splint is a Thomas splint running into the heel of the boot, and it should be used in the later stages of treatment of all fractured femurs. The removal of the splint should be gradual, and the experiment should be made under careful observation.

Time will only allow me to touch upon a few of the many interesting surgical problems that we have worked amongst. We have found loss of substance the most common cause of non-union. This is more especially the case in the humerus and the femur. When there is another bone to maintain the length, non-union is less common.

Esquilectomy, though at times inevitable, accounts for many of these gaps which do not fill up. It is quite impossible at the time of injury to say that a loose piece of bone has no blood supply. In the later stages of treatment we have been often impressed by the osteogenetic power of apparently loose pieces of bone which have lived in suppurative areas. This has led us to advise the maintenance of the length of limb rather than to approximate the bone ends, more especially in the case of the femur. Gaps which only exhibit a faint shadow here and there may ultimately be filled up with bone, and it is well to give the case its chance. Ununited fractures of the femur with loss of bone should be kept in calliper splints and allowed to walk with rubber tubes above and below the fracture. This, apart from maintaining the patient's health, increases local congestion and osteogenesis. Many ununited fractures of the humerus have been caused by prolonged and too powerful extension, and sometimes by the injudicious use of the Thomas arm splint. The Thomas arm splint is essentially a transport splint, and its prolonged use may give rise not only to non-union but also to ankylosed elbow, wrist and fingers. Compound fracture of the humerus is best treated with the arm abducted. Ununited fracture of the humerus is most surely united by the step cut operation, and the steps should be long. Shortening of the arm is of minor importance.

Bone grafting proved of no value in filling gaps in the shaft of the femur or the humerus. Real adequate development rarely if ever was secured even if the graft lived. Several grafts which have been used to make up the deficiency in flail joints have fractured, and in the few that have survived for over a year there is but little promise of adequate stability. The best results from bone grafting are in association with the radius and ulna, and I think that the method described by Hey Groves is best whereby the ends of the bone are freshened, their medullary cavity drilled, and a piece of tibia like a cricket ball is removed and the two sharpened ends are passed into the medulla. This technique is suited to non-union in association with a gap. If bone grafting is decided upon it should be done in two stages—the first being the removal of scar tissue. This allows of better blood supply and lessens the liability of sepsis. In malunited fractures we never operate in the presence of a sinus nor for some months after it has closed. We hasten the healing by free exsection of sinus, scar, and bone. If the alignment of the bone is good and the shortening does not exceed one and a half inches we do not operate. If the alignment is good but there is marked rotation of the limb, we perform an osteotomy some distance from the fracture. In malunion we rarely evacuate the ends of the bone through the wound, but prefer to follow the attached surfaces with a chisel and trust to extension without internal splinting. Rough manipulation stirs up all hostile factors. We should be merely gently efficient. Although we know fractures will unite in the presence of sepsis, the sooner we eradicate sepsis the firmer and better will union become. In recent and in ancient fractures all joints should be kept mobile, and the muscles should be regularly stimulated by electrotherapy.

The restoration of function in joints is too vast a subject to dwell upon. Suffice it to say that forcible movements are rarely indicated. Certain symptoms following manipulation and passive movements indicating injurious strain may be formulated:

If pain occurs after manipulation and is of short duration, movements may be continued.

If pain persists for lengthy periods after manipulation, *rest* is indicated.

If the increased range of movement is maintained after manipulation, further movements can be safely prescribed.

If in spite of movements, even in the absence of great pain, the range is continually diminishing, *rest* is indicated.

The duration of pain when tissues are relaxed, rather than its intensity, should be our clinical guide.

In overcoming adhesions and in subsequent manipulations the joint should be put through its various movements only once. The oft-repeated pump-handle movements applied at each sitting are never useful, and often start inflammatory symptoms. Voluntary movements can safely be allowed, and should be encouraged. They are not followed by obstructive reaction.

A more systematic and thorough education is required in the treatment of fractures. This can only be effected either by setting apart wards for fractures under the care of men who devote real interest to the subject, or by retaining certain institutions solely for the treatment of these cases. Education is sure to be imperfect if the treatment of fractures is to remain in the hands of surgeons who take no interest. We should regard every fracture as the potential cause of disability. In England, and I should imagine to a certain extent here, the demand for beds is so pressing in our civil hospitals that a junior officer will gain no favour if fractures are admitted in numbers or are retained for long. This, after all, is only a repetition of the story of early evacuation in time of war. It has no justification in time of peace. If general hospitals are not prepared to segregate cases of fracture, properly superintend them, and to treat them until evacuation is safe, they are far better without them, from the point of view of the surgeon and the student, and of the unfortunate victim.

Your nation taught us a valuable lesson when a committee was appointed to standardize splints, and all the surgeons were taught to master their construction and use. This again should be of value to us in civil life. If the

simplest and best splints were standardized by a committee of experts, and their application thoroughly taught to every student it would clarify a complex problem. The student should be taught not to be out and out adherents to an operative, a fixation, or a mobilizing school. He should be taught to cultivate a sense of proportion, and above all, he should be taught how to make a diagnosis without first consulting an x-ray picture.

War has taught us the importance of insisting that before a man becomes a specialist he should have a sound working knowledge of general surgery. Nothing is so fatal to progress in any special branch than when, from defect of education, a surgeon is obliged to take a microscopic rather than a telescopic view of a problem. When a firm surgical foundation is acquired he can deflect his energies with great advantage to special fields. One of the inevitable misfortunes of the war has been that able young surgeons with but little pre-war experience have graduated as excellent operators. They should, on their return, supplement their knowledge of the use of the knife by a careful study of conservative methods such as they will find in our reconstructive hospitals. The scalpel is not the surgeon's greatest asset—it may be his greatest curse. He requires a steady head even more than a steady hand.

War has brought to the front the young surgeon. He has left an indelible impression upon the evolution of surgery during a grave national crisis. We must give him more liberty, and make more use of him than we have been accustomed to in the past. His flexible mind has great potentialities. This can only be developed by giving him a fuller responsibility. It is a tragedy to see men between thirty and forty gathering the crumbs that fall from the table of Dives. The experience of age is after all only the product of opportunity. Let the young glean all that is worth gleaning from their seniors, but let us on our part offer the hand of friendship to all who strive to improve upon our methods, and value their loyalty all the more if they maintain a critical spirit.

War has done us one supreme service. It has cemented the two nations we love into a sacred bond of brotherhood. May it last in ever-increasing strength throughout the ages.

## SOME REMARKS ON MEDICAL EDUCATION.\*

BY

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OF the many questions needing an early solution at this time of change and reconstruction that of medical education is far from the least important. We may do well, then, to consider what changes are possible in dealing with the preliminary and intermediate subjects, and further, whether the teaching of the final subjects as at present carried on is adapted to the production both of the ordinary practitioner and of those whose duty it is to further the advance of the science of medicine and to serve as pioneers and teachers of others.

The spirit of this address is in no sense to raise any question as to the necessity of employing a scientific method in the teaching of medicine, but its object is to lay stress upon the fact that the "doctor" in the ordinary sense of the term is of necessity a practitioner of "*the art of medicine*." He is in a position to further the advance of the science by intelligent observation and logical reasoning, but the nature of his duties and the calls upon his time render it unnecessary to deal with him as a student of pure science, and hence the character of his education should correspond with the nature of the duties he will be called upon to perform.

The development of our present system has been a gradual process, of which one of the most important features—that of fitting a man for the actual practice of his profession—has been removed from the preliminary to the post-graduate stage. Under the ancient system of apprenticeship a boy acquired a knowledge of the essential qualities for successful practice, both from the

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