same conclusion." This is the nature of the argument, which is fairly well worked out. To show that the dissecting-room might be the source of danger, he makes the declaration:—"I myself was appointed for the second time to the clinical assistantship of the first *clinique*, and was in the habit of going into the wards after making explorations in the dead-room. The mortality in April and May was 18 per cent. and 12 per cent. respectively. During the four preceding months, I was only occasional assistant, and was not engaged in *post mortem* inquiries, nor was I obliged to examine the patients *seriatim* before the visits of the Professor. Look at the difference between the mortality in the two cases."

Then he goes on to show us from his tables that there is no connection between seasons of the year and the occurrence of the fever; so that it could not be said in any way to depend on epidemic conditions of atmosphere or temperature. There is a great deal more in the way of collateral evidence adduced by Semmelweis, but the main line of argument he pursued is thus broadly indicated. It was essentially based on statistics fairly arranged, without taking advantage of such data, and without overstraining them.

He did not neglect an important test of his views by ascertaining the effect on living animals of the artificial introduction of healthy pus into the circulation, thus proving that the symptoms could not be referred to such a cause as simple purulent infection.

I have said that Semmelweis's work consists chiefly of a collection of observations made by himself, without direct reference to the opinions of others. He does not omit, however, to mention the views of some few whom he was led to regard as the representatives of scientific thought, both in his own country and abroad. In this part of his work, however, it must be acknowledged that he gives proofs of possessing very limited knowledge indeed of the literature of his subject, and we cannot feel surprised that he finds but little difficulty in disposing of his opponents to his own satisfaction.

He brings his arguments together into a condensed conclusion at the end of his treatise in brief and forcible language. "I have shown", he says, "above that the excess of mortality in the first lying-in *clinique* in comparison with that in the second was occasioned by putrid matter, which was introduced by the hand of the examiner. I have shown that, in October 1847, the foul material of a foul cancer of the uterus produced puerperal fever. I have shown that, in November 1847, a decomposing material from a carious knee-joint produced puerperal fever; how the fever was connected with the visits of the surgeons in one hospital in particular, and how the mortality during six years was reduced to less than one per cent. when all connection with the surgical wards was broken off. It was the finger of the surgeon that carried the poison in the latter case; it was the atmosphere in the case of the knee-joint, and the air and the foul linen together in the *clinique* at Pesth, where the infection spread in spite of the washing with chlorine-water."

It may be mentioned that he had adopted the use of chlorine-water with signally good results, and derived from this fact increased support to his views of the septic origin of the disease. We will not venture to make any further comparison between the value of Semmelweis's treatise and that of Gordon. As far as the merit of priority is concerned, though the observations and opinions of the one may have been quite independent of the other, we can certainly claim for Gordon precedence in date by a considerable period.

In their style of composition, in their arrangement of data, and their logical powers, it is more than probable that we should be inclined to claim for Gordon decided superiority over Semmelweis. At the commencement of these lectures, I briefly alluded to the condition of mind which it is necessary for us to obtain in order to weigh fairly scientific evidence. It is easy to decide on the value of such evidence when we have tested it on the anvil of time. Observations and theories which have been conclusively analysed by that process naturally lose their interest. But, when we are studying the pages of history, it is the lives and characters of those who thought, and worked, and benefited us, that we feel an interest in contemplating, as well also as the lives and characters of those who did not think and did not work, and stood in the way to oppose the progress of scientific and practical knowledge. The history of this fever, if it contained nothing but facts, with the dates of their discovery, would not be a long one. The history of the erroneous ideas and statements which were advanced on the subject of its origin and nature would far surpass it in dimensions. It has been said by one who has displayed singular scientific acumen in philological research that, "for the discovery of truth, there is nothing so useful as the study of errors". It may be useful certainly to the individual who pretends to originality; but, for our purpose, I venture to think we have done well in confining our attention to the more limited object with which we started, of tracing the progress of truth through its various stages of development.

CLINICAL LECTURE ON CLUB-FOOT AND ITS TREATMENT.

By GEORGE BUCHANAN, A.M., M.D.,

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THERE are few operations in surgery which the surgeon approaches with more satisfaction than those for the cure of natural deformities. Amputation of limbs, resection of joints, and excision of tumours, are necessary and important as a means of saving or prolonging life after other treatment has failed to remove or arrest disease; but these are evidences of the imperfection of our knowledge of the nature and origin of many affections, and, at all events of the inefficiency of our therapeutic applications. Let us hope that the advance of pathological and therapeutical knowledge will one day diminish the number of radical operations, which at present are necessary in the treatment of surgical diseases.

But we cannot expect that any extension of our researches will diminish the number of children born with congenital deformities. Into the popularly supposed causes of these defects, it is not our place to enter; it is sufficient that they are common enough to demand a careful consideration on our part. It is very probable that many of you who are destined to become general practitioners, may never be called on to perform operations for the cure of deformities, delegating those duties to those who are to take the position of operating surgeons; but some of you will, I have no doubt, have as your sphere some place where you must rely on your own resources for every medical service demanded by your patients; and all of you will have it in your power to advise and direct patients as to the proper course to be followed. This is a most important position, for it is in early years that most of these defects can be most readily remedied. Never was this more impressed on my mind than by the case now before you. Here is a young gentleman, eighteen years of age, who has been the victim of talipes varus since infancy. The deformity seemed so hopeless to the medical attendant, that he did not venture to suggest any treatment; and the various surgeons, who were from time to time consulted, dissuaded the parents from any operative interference. Six months ago, he came to me, and, though the deformity was extreme and all the structures implicated were rendered rigid by the length of time they had been in their unnatural position, I did not despair of being able to improve his state, at least in a material degree. The result has exceeded our most sanguine expectations, and the patient is here to walk across the theatre on the sole of his foot, a thing he never did in his life till a month ago.

The further illustration of this subject will be found in connection with the case I shall now introduce, and also another in the wards, which will be operated on a short time hence. Here is a boy, aged seven years, with a well-marked example of talipes varus, or inverted club-foot. Observe the particulars of the distortion. First, the heel is raised and twisted towards the opposite foot. Second, the inside of the foot is twisted round so that the sole of the foot looks upwards, and the boy walks on the dorsum of the tarsus turned down. The sole of the foot is also curled inwards, so that the ball of the great toe is much closer to the heel than it ought to be. The whole foot is so distorted, that the only kind of boot which the boy can wear for the protection of the skin is a sort of leather bag with a strong thick sole. Let us now consider the structures concerned in this deformity. Let me remind you, then, club-foot exists in four varieties—talipes equinus, talipes calcaneus, talipes valgus, and talipes varus. Each of these varieties may depend on atony of one set of muscles, or an undue contraction of the antagonistic set. Hence we have tonic and atonic talipes. Now it is important to recognise this difference, because, though in both you may, by mechanical or operative means, restore the normal shape of the foot, yet it is in the tonic variety alone that you can promise a really favourable result as regards the future power of walking. I am far from taking a hopeless view of cases depending on muscular atony, or paralysis as it is often called, for I have had under my care a great many children in whom by persevering mechanical, gymnastic, and operative treatment I had had every reason to be satisfied with the result. The whole subject of the proper treatment of muscular atony, whether the result of deformity or prolonged retention in one position, is well deserving of notice, and I shall call your attention to it in another lecture.

The case before us is one of the tonic variety, in which the distortion is produced, or at least kept up, by the contraction or rigidity of the muscles, tendons, ligaments, and fasciæ. With regard to the

muscles, the first thing I wish to impress on you is the difference between *contraction* and *rigidity*, although these two terms are too often used indifferently. By contraction is meant the physiological action of a muscle, the vital movement produced in and by its particles. This, of course, cannot be continuous, but must be interrupted, varying with the stimulus applied to its molecules. But, by rigidity, we mean a permanent condition produced by the long retention of the muscle in one position. It loses its contractility to a great extent, and to a certain degree its elasticity, and assumes more of the nature of a tendon than a fleshy mass. Of course, there are various degrees of rigidity, but in extreme cases the above is a true description.

Examples of distortion maintained by muscular contractility are to be found in fractures and dislocations, where the abnormal position of the articulation or fragment of bone depends on the action of the muscles, to overcome which we have recourse to mechanical position, or the administration of chloroform, or both.

But in a club-foot the deformity is maintained more by mechanical rigidity than vital contractility. The muscles are shortened and stiffened in a very unyielding manner, and chloroform enables us to act on them only in so far as it abolishes pain and prevents the struggles of the patient.

There is no doubt that in persons with club-foot, who have been allowed to grow up and use the foot in walking, the bones of the tarsus become more or less altered in shape by mutual pressure, and the ligaments become shortened and stiffened; but primarily, and even in adult cases principally, the muscles are the offending structures.

In talipes varus the muscles concerned in the deformity are of two classes: those of the leg and those of the foot. The muscles of the leg which pass round the inner malleolus are more or less implicated, but it is only the *tibialis posticus* which is worthy of notice, and I believe that it is not nearly so important as many writers would seem to indicate. A muscle of its length, even when very rigid, can be stretched to a considerable degree, and if there are any cases of club-foot which can be "cured without cutting tendons", as some surgeons would have us believe, they must be very trifling examples of the deformity, and the defect must depend wholly on the long muscles of the leg, which is very rarely the case.

Turning now to the structures in the sole of the foot, we find several of these the principal, in many cases the only, cause of the distortion. The plantar fascia is always rigid and unyielding, and is stretched like a suspension-bridge across from the heel to the ball of the great toe. But I believe that there is something even more important than the fascia. My attention was first called to this matter by the unsatisfactory results of my earlier operations, in which my incisions were planned after the most reliable information I could find. I used to divide the *tendo Achillis*, the *tibialis posticus*, and the plantar fascia, all by subcutaneous incision; but, in many cases, I found either that the incurvation of the foot did not yield, or it recurred with a rapidity which showed that something more was wanted.

Reflect for a few minutes on the anatomy of the foot. Composed of a number of separated bones, articulated in such a way as to give that lightness and elasticity of step which is one of the prerogatives of man, there is one special joint on which centres its principal movement. I mean the ball and socket articulation, between the head of the *astragalus* and the cup of the *scaphoid*. The muscles of the sole are composed of two sets; one the superficial, which acts from the *os calcis* on the distal part of the foot; the other, all the deeper layers, which arising in front of the *os calcis* and *astragalus*, control the more minute movements, which are of such service to those who walk barefoot. The articulations in front of the *astragalo-scaphoid* and the muscles which act on them are little, if at all concerned in club-foot, the inversion and incurvation being situated in the joint referred to, and produced by the muscles which act on it.

The *tibialis posticus* is inserted into the tuberosity of the *scaphoid* bone, part of the tendon being sent forward to the bones anterior to it; but the important point for the surgeon is its attachment to the *scaphoid* bone. When it is in a state of undue contraction or rigidity, pulls the *scaphoid* round upon the head of the *astragalus*, and so twists the foot inwards, as you may see from the dissected specimen I here show you.

But in this other dried specimen of the bones of a case of *varus*, you will see that there is something more. The ball of the great toe is approximated to the *os calcis* to a degree that could not be accounted for by the action of a muscle attached to the *scaphoid* bone.

Now, I bring back the boy who was here a short time ago, and point out to you on the inner side of the foot a thick, strong, rigid band, binding the great toe towards the heel; and, on stretching the toe, it becomes as tense as a tight-rope. The superficial part of this band, no doubt, consists of fascia, but the thick mass is the rigid and unyielding

substance of the *abductor pollicis* muscle. You will remember, that the relation of the plantar fascia to the muscles of the foot is peculiar. They adhere to its deep surface, and their origin is greatly extended by this adhesion of their fibres to it. On the outer edge of the foot, and to the middle of the sole, the fascia is adherent to the muscular layer as far forward as the ends of the metatarsal bones, so that there is comparatively little muscular movement in that region; and it will be remembered that the outer part of the foot, both owing to this disposition of its muscle, and the small number of articulations, is designed to be a lever of station, while the spring of the foot depends on the elasticity of the inner arch of the instep. The *abductor pollicis* is covered by a comparatively thin layer of fascia, but, just at the place where it lies against the *flexor brevis digitorum*, the fascia is thick and there is a firm dense septum between the two muscles which adheres to both. This septum is well known to anatomical students, as its dissection to expose the deeper structures of the foot is a piece of manipulation requiring much care and time. If a case of *talipes varus* be critically examined, it will be found that the rigid band retaining the great toe in its incurved state, corresponds precisely with the situation of the septum I have alluded to, and the fascia covering the adjacent sides of the *abductor pollicis* and the *flexor brevis digitorum*. I again show you, in this boy's foot, the prominent unyielding band in the very region I have just indicated.

Now, I believe it is the close adhesion between the muscles I have named and the inner part of the plantar fascia which renders it so difficult for the surgeon to restore the proper shape of the foot, even after a partial division of the plantar fascia. No sooner is the section made than the muscular action tends to approximate the cut edges of the fascia, and, notwithstanding every effort, causes their union in a few days. It was this result in my earlier operations, demanding fresh incision, that made me dissatisfied with the operation as I then carried it out, and made me adopt the plan I now follow.

Let us now consider the various steps of the operation required for such a case as we have just seen; and I may here state that I do them all at the same time, and not in successive stages, as is often done; except in cases where the first incision in the sole is not sufficient, as is not unfrequently the case in adults.

The first part of the operation is the division of the *tendo Achillis*, which may be done either by introducing the tenotomy-knife in front of it and cutting outwards to the skin, or, as I always do, passing the knife superficial to it while it is in a state of relaxation, and cutting down upon it while extended till it snaps asunder. There are very few cases of *talipes varus* in which this is not necessary as a preliminary. Many surgeons do this part of the operation some weeks before attempting the rest; but I have seen no reason to depart from the plan of doing all the cutting part at the same time.

The second part of the operation, where it is necessary, is the division of the *tibialis posticus*. This I believe to be very seldom required. I am convinced of this, that if those surgeons who are in the habit of cutting it above the *malleolus internus* as the second part of the operation would delay it till the following proceeding is adopted, they would find very few cases in which it would be necessary. I explain this by the fact that it is really not often affected so much as is supposed; and also that, being a long muscle, it may be stretched in the subsequent manipulations. I never cut it above the *malleolus*, but I have seen it done by others; and I can confidently state that, in at least some in which the operator had satisfied himself that the division was effected, there was no release to the foot, from its distorted state—in fact, it remained bound in its abnormal shape by the tissues next to be dealt with. If I were quite satisfied that it was very tight in an adult with *talipes*, I should divide, as I have mentioned, above the *malleolus*; but, in children, I prefer to make the incision just proximal to its insertion into the *scaphoid* bone, through the same opening as is necessary for the next part of the operative proceedings.

The third stage is the division of those structures which maintain the incurvation of the *astragalo-scaphoid* joint, to which I have already referred, and which pull the ball of the great toe towards the heel. To effect this, the tenotomy-knife is to be entered at the inner edge of the foot just behind the tuberosity of the *scaphoid* bone. It is to be kept flat and pushed under the skin till it reaches to the middle of the sole; then it is to be turned with its edge to the plantar fascia, which is to be divided by a sawing movement of the knife, the parts being kept in extreme tension by an assistant. When the knife has passed through this part of the fascia, the point is to be dipped down so as to divide as far as possible the septum of fascia described before, and then the whole of the muscular substance down to the tuberosity of the *scaphoid* is to be cut through; and, before removing the knife from the aperture of entrance, the point may again be depressed, and the tendon of the *tibialis posticus* divided.

This may seem a somewhat heroic incision, but its effects on the distortion are most satisfactory; and I may state that I have never experienced any bad results from it, though I am in the habit of operating in this way many times annually. I believe that sometimes the internal plantar nerve and artery may be cut; but the artery in a child is a mere trifle, and never gives rise to hæmorrhage after the application of a bandage, and, as for the nerve, we know how rapidly repair of divided nerves occurs. At all events, experience shows that such incisions may be made subcutaneously with impunity, and with results which warrant their performance. When the muscular substance of the abductor pollicis is divided, the tendency of the plantar fascia to come together is obviated, at least, till the muscle reunites; and if means are taken to prevent that for a time, the cure of the deformity is rapid.

When the incisions are completed, a pad of lint is to be placed on each of the apertures of entrance of the knife and a bandage applied round the foot and ankle. I then usually put on the club-foot spring-boot for an hour or two. But the operative part, although very important, is by no means the only part of the treatment. For days, weeks, and months, the most patient and persevering manipulations must be carried on. I do not approve of keeping the foot in a rigid apparatus, and gradually screwing it round to the proper shape if that could be done. For at least a week or ten days, the apparatus is to be put on first for an hour or two morning and evening, adding an hour daily, till at last it is only removed for an hour morning and evening in order to undergo the necessary manipulations. These for the first week or two must be performed by the surgeon or his assistant, or by a skilled nurse, as no parent will undertake them at the outset. They are the *douche*, frictions, shampooing, and, above all, the systematic twisting of the foot towards its natural position. This is the most important part of the treatment, for during it the muscles are brought into play to a certain extent; and, if the child be old enough, or sufficiently intelligent, you will find that it will use its antagonistic muscles to assist you to turn out the foot, in order to avoid the pain produced by the twisting, which is always increased at first by the involuntary, though vain, endeavour to struggle against you. So important is this assistance, that I am in the habit of offering small rewards to the child to bribe him to turn out his foot without assistance. It not only helps you to overcome the deformity, but it adds tone to the peronei muscles, and is of singular value when you allow the child to begin to walk, which at first must always be done while the boot is worn.

Such being the chief points of importance to guide you in the management of such a case, I shall now again bring in the boy and make the incisions I described. The subsequent treatment will be done in the ward for a few days by myself, and then he will be committed to the charge of three dressers, who will on alternate days perform the manipulation described at the end of the lecture.

NOTE ON LIGATURE OF THE LINGUAL ARTERY IN CASES OF CANCROID DISEASE OF THE TONGUE.

WITH CASES IN THE PRACTICE OF M. DEMARQUAY, SURGEON TO THE
MAISON DE SANTÉ, PARIS.

[Communicated by M. E. SCHWARZ, Interne of the Paris Hospitals.]

LIGATURE of the lingual arteries has been employed in many cases of cancrroid of the tongue, with three distinct objects:

1. To stop hæmorrhage in cases of cancrroid, in which it is very common;
2. To prevent hæmorrhage in operations on the tongue;
3. To ward off the spread of the tumour to other parts, and to cause it to atrophy.

In the first and second cases, in consequence of the very slight anastomoses between the arteries on the two sides of the tongue, ligature of the lingual artery has afforded excellent results; and all surgeons have been well satisfied with it in cases for which it has been indicated. But opinions differ when the third case is in question.

The honour of having been the first to perform ligature of a vessel, in order to produce atrophy of a tumour which it nourishes, is due to Harvey; and it is on the basis of the same physiological principles that Mirault d'Angers, Moore, Liston, etc., and M. Demarquay, have performed ligature of the lingual arteries to produce atrophy of cancrroids of the tongue. In 1868, M. Demarquay, Surgeon of the Maison de Santé, published a memoir in the *Archives Générales de Médecine*, in which he summarised all that had been done in the matter, at the same time giving precise directions for tying the artery with ease; and praising ligature, not as a curative, but as a palliative means. He

gives reports of twelve cases of ligature of the lingual arteries, of which eight were made with the object of producing atrophy of the artery.

In 1869, M. Broca tied the common carotid artery in order to produce atrophy of a cancrroid affecting one side of the tongue. Mauvoisin has added to these cases another in which M. Broca performed ligature of the external carotid; and, in concluding his thesis, he recommends ligature of the lingual artery as a last resource. To these cases now remain to be added three more instances of ligature of the lingual artery performed by M. Demarquay. These cases give the opportunity of examining: 1. What are the indications for this operation? 2. When must one or both of the lingual arteries be tied? 3. What are the immediate and the consecutive results of the operation?

1. *What are the indications for ligature?* A clear indication for ligature is when repeated hæmorrhages occur, which quickly exhaust the patient if they be not arrested. In a certain number of cases, infection of the lymphatic glands is a second indication. It is, indeed, clear that, if the ulceration or a cancerous growth on the tongue be limited in extent and capable of being completely removed, no infection of the submaxillary glands being present, ablation will be preferable; but if, on the contrary, the patient have, together with ulceration or circumscribed growths, a cancerous glandular lump indicating a tendency to invasion, the operation, if performed, should not only extend to the tongue, but also to the glands. This is generally difficult, and is likely to be incomplete when the cervical glands are implicated. As a matter of course, the ligature of the lingual artery will itself be rendered less easy by the presence of glands; but, upon the whole, it will be less dangerous than the preceding operation; and, besides, recourse can then be had to the ligature of the large trunks of origin, as has been done.

Great extent of the lesion is a third indication for ligature. When it is impossible to reach directly the limits of the evil with the *éraseur* or galvanic cautery, ligature, by retarding its progress, will certainly prolong the life of the patient, or will arrest certain accidents.

A fourth indication is drawn from the size of the tumour, and from the symptoms of asphyxia and dysphagia which it then produces. It is specially in these cases that ligature of the lingual artery has often produced remarkable results. Additional indications may be derived from the cachectic or anæmic condition of the patient, very advanced age, or the harmlessness of the operation in itself. Such is a general view of the circumstances in which ligature of the lingual artery should by choice be performed.

2. *Should one or both arteries be tied?* In the cases quoted in M. Demarquay's memoir in the *Archives de Médecine* for 1868, he tied the two lingual arteries—a practice which has usually been followed. The sufficiently clear demonstration of the division of the circulatory system of the tongue into two parts, right and left, will afford a basis for judging of the opportuneness of single or double ligature, according to the situation of the points invaded by the epitheliomatous degeneration. If one of the edges or sides of the tongue be attacked (which often occurs), ligature of the corresponding lingual artery will suffice. If, on the contrary, the tumour or the ulceration be median, or, whilst invading one whole side, trespass also on the other, the two arteries must be tied, and that in two different operations.

The results obtained by simple or bilateral ligature are as follows. This operation affects the local condition of the lesion and the general condition of the patient through the medium of the very varied functions in which the tongue has a share. The following facts have been observed almost immediately after the ligature of one or both arteries, according to the existing conditions.

There is generally, at the end of twenty-four hours, a notable subsidence of the tumour, a diminution of the ichorous and fetid secretion of the ulcer, and a distinct softening of the tumour. These results are almost immediate. The functional results are no less remarkable, and even more marked. Speech becomes freer, mastication and deglutition easier; the patient can again keep up his strength by taking food, and his appetite is improved. If dyspnœa had previously been present, respiration becomes almost normal. These more or less immediate results are remarkable. The relief afforded to the patient is most often very remarkable; the more so, as the operation is almost always completely inoffensive, and gives only a little pain when the base of the tongue is moved during deglutition.

The consecutive results are as follows. Ligature of one or both linguals is evidently only performed with the object of palliating the evil, and, considering the circumstances in which it is indicated, it is impossible to pretend that it will arrest the progress of the disease or even make it retrograde. Thus, after a longer or shorter lapse of time which has not yet been defined by the majority of writers, the affection continues and resumes its progress; the more so, that the glandular infection has not been in the least arrested, and the patient is carried