CLINICAL LECTURES ON PRACTICAL ORTHOPÆDICS.

Delivered at the London Hospital.

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I.—KNOCK-KNEE AND ITS TREATMENT; WITH SPECIAL REFERENCE TO SUBCUTANEOUS EXTRA-ARTICULAR OSTEOTOMY.

GENTLEMEN,—The branch of general surgery called Orthopædics concerns itself with the treatment of bodily deformities, and, taken in its widest sense, would include the treatment of malformations generally. Plastic or reparative surgery would thus be a branch, and a very important branch, of it. But orthopædic surgeons do not, as a rule, deal with the cases which would come under this latter head, such as hare-lip, cleft palate, extroversion of the bladder, etc., but confine themselves to the treatment of deformities and debilities of the bony, muscular, and ligamentous portions of the limbs, trunk, and neck. There are thus three divisions of the subject: deformities of the limbs, of the trunk, and of the neck. We will, therefore, consider them in this order.

Under the first head come the various forms of club-foot, deformities from rickets, ankylosis, congenital dislocations and deformities resulting from fractures, dislocations, or diseased joints; under the second, come the various forms of spinal curvature; and, under the third, torticollis. When we come to speak of the various subjects individually, I shall tell what is known of their causation, diagnosis, prognosis, and treatment; but, to-day, I will attract your attention to that very common affection known as knock-knee, because it is a very frequent malady, and because cases come and go, from the out-patients' rooms of hospitals, with the usual outside splint, and the customary warning to the mother not to let the child walk, without in most cases any appreciable improvement.

Genu valgum, or knock- or in-knee, consists, as you know, of the too great protrusion inwards of the lower limb at the knee-joint. It has, like other ailments, various causes. A very common one is constitutional weakness, and a generally lax condition of the muscular and ligamentous structures. Another common cause is local ligamentous weakness—that is, that the weight of the body falling to a great extent to the inner side of the limbs, the internal lateral ligament is not strong enough to resist the pressure of the internal condyle, and allows it to project. Retraction of the biceps, or a too short external lateral ligament, will also cause it by compressing, and thus preventing the proper growth of the external condyle. Whether the contraction of the biceps or the excessive growth of the internal condyle be primary, is not yet known. I am inclined to the latter view, because of the difficulty of accounting for the contraction of the biceps alone, seeing that it is supplied by the same nerve as the inner hamstrings, which should also be contracted, but which are oftenest not affected. Rickets is also a common cause, and in this case the internal condyle is always overgrown. Severe talipes valgus or flat-foot will also, if not prevented, induce it; and you will very frequently find the converse true, viz., that genu valgum causes flat-foot, and in the way I shall presently describe. I have never seen a congenital case of in-knee, but intra-uterine rickets might be a cause of it. Paralysis is sometimes a cause of this deformity. It is highly important to detect and treat these cases at once, because, if left to themselves, as they too frequently are, under the erroneous impression that the sufferers "will grow out of them", they will not only go from bad to worse, but will cause lateral curvature of the spine. I will explain the mechanism of this, when we talk of spinal affections.

A patient, the subject of knock-knees, walks, as a rule, on the inner side of his feet, because his tibiae are, by the deformity, placed at a great angle to his femora, and also slightly rotated out, so that the stress of the body weight compels the inner sides of the feet to yield beneath it. In time, this abnormal distribution of the body-weight causes a similar condition at the ankle to that at the knee, viz., a stretching of the ligaments and tendons of the inner sides of the ankles and feet, and a contraction of those on the outer. In the worst forms of this deformity, the patient cannot get one knee past the other without the greatest difficulty. Sometimes, the patient walks on the *outer* side of the feet, but this is not very common. So you see that any of

these deformities in the lower limbs, whether congenital or acquired, require immediate and careful treatment; because, if left to themselves, one deformity may, and most probably will, induce another: a genu valgum will cause a talipes valgus, and a talipes valgus a genu valgum, and one or both will cause a lateral curvature, by rendering the pelvis oblique.

Now, we come to the treatment of these cases, and, after first pointing out the ordinary modes, I will describe to you some modern operations, especially one which I have lately performed, and, I am happy to say, with every wished-for result so far. I refer specially to subcutaneous extra-articular osteotomy; but I will also describe another operation which I have devised, which promises satisfactory and much more speedy results than those of the old plans.

Treatment.—This must naturally depend on the cause, and must vary with the severity of the case. Should the cause be relaxation and overstretching of the ligaments, especially of the internal lateral ligament, you should first give a patient trial to internal tonic remedies, iron being a valuable one, combined with the use of splints. These are of various shape and made of different materials, such as wood, iron, plaster-of-Paris, etc. Some surgeons prefer to apply them on the *outer* side of the limb, and to use strapping or elastic webbing, or simple bandages, to gradually force the knee out into a straight line or nearly so. Others give preference to an *internal* splint, and most orthopædic surgeons order a special splint, with a pelvic band and outside iron rod, with joints at the hip, knee, and ankle. The lower end of the rod fits into the boot, which should be provided with a sole-plate. This apparatus enables the patient to walk, and yet, by means of the knee-straps, exercises sufficient *external* pressure to slowly overcome the deformity. It has the double advantage of enabling the patient to move about, and at the same time of taking a large proportion of the weight of the body off the legs. From a pretty extensive experience, I can speak very well of it in the treatment of the milder cases, and also as an after-application in cases of knock-knee which have been submitted to tenotomy. Its expense is, of course, a drawback for poor patients; but, in London, one of the Surgical Aid Societies will render valuable assistance in the matter.

I wish to draw your attention to a splint which I have used for some time in double genu valgum, and in a manner which I have never seen indicated in any work. Before describing this simple splint and its mode of application, I must first impress on you the absolute necessity of keeping the patients off their legs. The mothers always tell you that they do so "as much as they can". This very often means next to nothing. The child is fretful at being confined, and sets up an intermittent howl, and the mother is too glad to shift the bandages and let "the little dear" run about. This is a mistaken kindness, and leads, in the case of hospital patients, to our seeing them for a very long period with very little benefit.

The splint of which I have spoken, and which I advise you to try, is made of deal, about seven inches wide and three inches thick, and should extend from about three inches from the perinæum to at least three inches beyond the feet. Opposite the internal condyles, it should be well hollowed out to receive them. Before being applied, it should be well padded. To apply it, the patient should be placed on his or her back; the splint be put between the legs; extending, as just said, from about three inches below the perinæum to three inches beyond the feet. Then the thighs must be fastened to the splint by means of broad strapping, and subsequently the legs should be strapped to the splint. The strapping should be applied just below the swell of the calf, so as to get longer leverage to act on the in-knee. The internal condyles and internal malleoli must be well protected with cotton-wool, or thick wash-leather, before putting on the strapping. Now, you will observe that the legs are very much straighter, and over them and the strapping apply a bandage moderately firmly. This arrangement, acting as it does on both legs at once and on the inner side, makes use of the internal condyle as a fulcrum, and forcibly stretches the shortened external lateral ligament and biceps. It effectually prevents the child from walking, and I have found that it is less likely to be shifted by the mothers, who are in the habit of pushing up the ordinary splints to let their children toddle. In the milder cases of which we are speaking, and which are primarily due to a lax internal lateral ligament, without any tension of the biceps or external lateral ligament, you will find this splint thus applied a very serviceable and inexpensive one. Should the child at any time be fretful or rather feverish, look to the condyles and malleoli to see there are no pressure-sores. If these be all right, and there be yet fever, you must seek another cause for it, bearing in mind that some children, through being kept quiet, work themselves into an excitable and feverish condition. By having the lower end of the splint notched, you can considerably counteract the talipes valgus, which often is present in these cases, by bandaging the feet, with

their soles towards the splint, and, passing the bandages over the notches, get traction on the peroneal muscles.

In cases which are caused primarily by a contracted biceps or shortened external lateral ligament, and in which, as a secondary consequence, you get the internal lateral ligament overstretched by the projecting and often overgrown internal condyle, you must not waste valuable time by using splints at the outset. The tendon of the biceps must first be divided and allowed to unite, and after the third day you should begin to straighten the limb. This may be done by the use of an ordinary outside long straight splint, or, if you require greater power, by using a long outside splint with an interruption at the knee, so as to carry the bandage from within out over the bracket, and thus force the knee slowly out. You will find these splints answer your purpose fairly well when a proper genu valgum extension-splint cannot be afforded. At the Royal Orthopaedic Hospital, we use what I have ventured to call a *proper* splint. It is made of japanned tin, sheet iron, or zinc, is well padded, and extends from the upper part of the back of the thigh to the sole of the foot, which is received in a foot-piece. There is a cog-wheel at the outer side of the knee, which is worked with a key; and, the thigh and leg being buckled-in position, a strong knee-strap, acting directly on the internal condyle, fastens on the outer side of the splint. By the use of the key, the knee is gradually but surely brought straight. Mr. Baker, the House and Assistant Surgeon, has added a piece on the inner side of the splint, to prevent rotation out of the foot. I think this is an improvement as well as an addition. Before dismissing your patient, you must see that he is properly fitted with the special splint of which I have already spoken.

Now we come to the treatment of the severer forms of this deformity, those which are due to overgrowth of the internal condyle from whatever cause. In these cases, should the biceps tendon be tense, you must divide it, also the ilio-tibial band of the fascia lata, and, if necessary, the external lateral ligament, should they need division. I have had occasion to divide all these in the severer forms of the deformity, and by the subsequent patient use of the splint just described have cured many bad cases. If time be no object, seeing that the severer method of osteotomy, of which I shall speak shortly, is yet on its trial, I advise you to adopt this slower but sure method of treatment; and, when you have straightened the limb, you must see that a special splint, as described, is worn for some time—several years in the worst cases—until the outer condyle has grown sufficiently to counteract the mischief due to the excessive growth of the inner one. The *rationalité* of tenotomy in these cases is, that it takes off pressure from the outer condyle and outer tibial tuberosity and allows them to develop in due proportion, provided it be done in time.

I will now draw your attention to some bold modern methods of treating knock-knees due to a too large internal condyle. I think I may say, without fear of contradiction, that we are indebted to anti-septic surgery for them. I think it unlikely that any surgeon would have dared to suggest opening the knee-joint and sawing off the internal condyle had he not believed he could do so with impunity, thanks to the modern improvements in treating wounds. This was first done by Dr. A. Ogston of Aberdeen, rather more than a year ago, and you will find an account of the case in the *Edinburgh Medical Journal* for March 1877. He operated on adults, and with success; that is to say, he cured the deformity, and his patients had useful limbs. His operation has since been performed by German surgeons on children, also with good results.

A large tenotome or scalpel is introduced obliquely into the knee-joint, over the anterior surface of the femur, to midway between the condyles; a small saw is passed along this opening, and the inner condyle is separated or very nearly so; the limb is then straightened, and the now separated condyle is allowed to become fixed in its new position. Now, although this operation has been done antiseptically about thirty times and with a good measure of success, I am sure I am justified in telling you that it is unnecessarily severe. The largest joint in the body is deliberately opened, and further damage is done by the saw; and, as it takes some little time to saw through the condyles, the operation is robbed of much of its subcutaneous character. Further, the blood and saw-dust which must get into the joint, added to the contusion of the soft parts by the saw, are additional reasons why a less severe method should claim your preference.

You may say: "It has been done thirty times successfully"; but you must know that, as Cruveilhier said, "even success does not always justify rash enterprises". I do not wish to be understood to say that Dr. Ogston's operation was either rash or unjustifiable. I believe it to have been ably planned and executed, and to be a great advance on the old methods of treating bad cases of knock-knee; yet, I would have you suspend your judgment on it—and others also—till time

enough has elapsed to determine the amount of immediate risk to the joint, as well as the ultimate result. One has heard of synovitis, constitutional disturbance, and ankylosis after it, and even suppuration has occurred; and, as all these risks are not improbable after this operation, I say it behoves you, in the meantime, to approve of some method which avoids opening the joint, or, if the joint must be opened, let it be done as gently, quickly, and with as little injury to it as possible.

Dr. Macewen of Glasgow published an account of his operation in the *Lancet* of March 30th, 1878. He says: "An incision was made over the inner condyle of the right femur, the centre of which corresponded with the upper part of the condyle, the object being to go as near the knee-joint as possible without opening it. A V-shaped portion of bone was struck out by the chisel from the inner side of the condyloid extremity of the femur; the remainder of the bone was broken, and the limb was brought round straight." Now, although these operations were done antiseptically, two of the three cases suppurred; and, as Mr. Barwell remarks, in his lectures in the *BRITISH MEDICAL JOURNAL*, "under such circumstances, there would seem to be some danger of extension of the inflammation to the knee-joint".

On March 17th, I performed an operation at the East London Children's Hospital, to which I gave the name of subcutaneous extra-articular osteotomy for genu valgum. Its object is to nearly separate the internal condyle, without, of course, entering the joint. That case, I am happy to be able to tell you, has done perfectly.

This simple operation is thus carried out. A scalpel, previously dipped in carbolic oil, is obliquely introduced just above the most prominent part of the internal tuberosity, and the soft parts and periosteum are divided; by the side of the knife, a chisel, also dipped in carbolic oil, is inserted, and, with a few strokes of the mallet, the condyle is penetrated at its greatest depth, *but only as far as the cartilage covering it*. The chisel, with the greatest depth of the condyle and soft parts—due allowance being made for the thickness of the cartilage—previously marked on it, is first directed towards the inner side of the inter-condylar groove, then partially withdrawn, its direction altered forwards and backwards until the condyle has been *loosened*—not separated. The feeling of resistance to the chisel should not at any time be overcome. This loosening can be ascertained by gently using the chisel as a lever, and placing the fingers on the condyle, which will be found to yield before them. I do not attempt to loosen the entire condyle; it is not necessary, as the limb can be straightened without it, and, by leaving a small portion of it to grow, the probability of a genu extrorsum, which may be induced by the increased growth of the external condyle, now relieved from excessive pressure, is much diminished. If the operation be accurately executed, there is no risk of entering the joint, of injuring the popliteal artery, or of damaging the epiphysal cartilage; but, if the joint were entered with the chisel, it would be of much less consequence than if opened by the other method, as the wound would be a clean incised one and more strictly subcutaneous. It is well to trace out the outline of the condyle before operating, as it is a good guide; but it is not absolutely necessary.

The operation being completed, it is only necessary to place a pad of lint dipped in carbolic oil over the small aperture in the skin, and to bandage the limb to a long outside splint. I prefer one with an interruption and a projecting iron bracket at the knee. You may leave it in for a fortnight, and then put it up in plaster-of-Paris, gum and chalk, paraffin, felt, or any other form of strong bandage for three or four weeks longer, in the case of children; six, seven, or eight in the case of adults; then begin passive motion.

I believe that the elasticity of the cartilage and of the slender pieces of uncut cancellous tissue permits the pressure, exercised on the loosened condyle by the tibia in straightening the limb, to be exercised without fracturing the cartilage. I hold this to be more particularly the case in children, in whom the condyles are not completely ossified; but experiment and experience must determine the matter in the case of adults. But I maintain that, even if the cartilage did fracture, or if the joint were entered accidentally or purposely with the chisel, the injury would be far less severe than if done with the saw. Other advantages in maintaining the continuity of the cartilage and some slender bridges of uncut cancellous tissue are, that there is very much less risk of non-union and necrosis of the loosened condyle, and that the joint surface will be more regular.

I have no experience of Max Schede's method, which, I believe, consists in removing a wedge-shaped piece of bone from the upper end of the tibia. I do not think this operation is right in principle, and fail to see how it can remedy the deformity, which, in the aggravated cases, is kept up, if not originally produced, by the elongated internal condyle. However, I must not say any more about it, as I have not seen any of his cases.

Delore of Lyons has had a large number of cases, to which he applied his method of *brisement forcé*. That is to say, that he, by sheer force, and without any tenotomy or other operation, broke off the lower femoral epiphysis and tore some of the ligamentous tissue on the outer side of the joint, and improved the deformity. I tried this method, now more than three years ago, when the Children's Hospital was at Ratcliff Cross, and partially succeeded, after using considerable force, in which I was aided by a colleague. The other day, I tried it again in a mild case of genu valgum; but I, and several other gentlemen, who used considerable force, failed to make any impression on the deformity. The proceeding seems to me to be rough and unsurgical, and I shall not repeat it.

Before concluding, I must tell you of another new operation which I have recently tried for the remedy of moderate cases of this deformity. I know it is dangerous to talk of anything being new, unless one is well up in surgical literature; but, after having looked up various old and new works and papers on the subject of genu valgum, I have not seen any mention of it. I divided the tendon of the biceps, the ilio-tibial band, and the external lateral ligament, and then at once forcibly straightened, or nearly straightened, the joint. The novelty of this method consists in the combination of the division of these three structures with immediate forcible straightening. Although I did not succeed in getting so completely rid of the deformity, as in the case in which I chiselled the condyle, still the improvement was manifest to the lookers-on, among whom were some American surgeons. This operation was done on a child the subject of double knock-knee, and I selected the side on which the deformity was less pronounced. I will publish the result of this and several other cases when they are complete; but I must enforce on you that at least a year, or even two or three, should be allowed to elapse before we can come to any accurate conclusion as to the permanence of the rectification, and as to the usefulness of the limbs. The immediate results are very good, and I have no doubt that the later ones will be equally satisfactory.

REMARKS

ON

SAYRE'S TREATMENT OF SPINAL DISEASE.

From a Clinical Lecture delivered at Guy's Hospital.

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WITH the manipulative part of Sayre's treatment of spinal cases you are all familiar, so frequently do you see it employed here; the principles involved in it, and the results that it yields, are rather our subjects of to-day. Given a crooked spine, the surgeon's endeavours have always been directed either to straightening it, or preventing the increase of the deviation from the normal. Till Sayre introduced his method of suspension and the plaster-jacket, these ends were but inadequately attempted by means of the ordinary "spinals"; and, though doubtless they were a support and comfort to the patient, they could do and did, from their very mode of action, little or nothing towards cure; for, in caries of the spine, where, first of all, absolute rest should be given to the diseased bones, and in general curvature, where straightening is the main object, these instruments completely fail; for, were they ever so perfect in construction and application, the mere fact of their being taken off every night would be fatal to their usefulness. The essential difference between Sayre's method and the hitherto adopted "orthopædic" plan lies in the substitution by the former of a "pull" for a "push," and in the introduction of "physiological rest" for the diseased spine.

If you treat a patient upon the "orthopædic" plan, you fit to him, or rather to his deformity, a leathern jacket strengthened with steel, and so constructed that, by certain screws, a boss here or a curve there in the spine may be pressed against with the idea of driving it in again; which means, of course, the elevation of as much of the trunk as lies above the boss or curve. A pair of steel crutches is added on each side of the apparatus, which can hoist the shoulders to the level of the ears, but which is intended to aid in the general support of the body-weight above the disease. I never yet saw the case that could bear this for long: the axillæ soon chafe. The inefficiency of this mode of treatment is sufficiently testified to by the number of cripples that one sees, who, from the first appearance of their disease, have been under "orthopædic" treatment; their apparatus has been altered

from time to time to accommodate the increasing deformity. To push up the superincumbent weight of the body from the boss or curve by pressure exerted upon either is impossible, and the weight above must be taken off before the spine can "spring" straight.

Consider the bent spine for the moment as a broken or all but broken bone, as in truth it becomes, and apply the same rules of treatment to it that you would to a fracture, and at once will you perceive the fallacy attaching to the orthopædic treatment that we have hitherto employed. In setting a fracture, you must do one of three things:—1. Obtain cessation by position of muscular action, and the fragments fall into place; apply splints to give absolute fixation and rest; 2. Overcome muscular action (or, in other words, that weight that would approximate too much the broken ends) by extension, and then apply splints; 3. If you are a mechanician, and neither a surgeon nor anatomist, you try to push the so-called "riding" fragment into place by pads and strapping, and you will not succeed. Of these three plans, the first has little material influence upon spinal distortion; the last is what we have hitherto been doing by orthopædic "spinals"; the second is the essence of Sayre's method. It is true that muscular contraction is at least secondary in producing spinal distortion, yet the principle remains the same, and the dead weight of the head, etc., upon the weakened vertebral column, which causes its bending, must be removed by extension applied at either extremity of the spine; the "pull" must be substituted for the "push". While thus extended, the splint (jacket) of plaster is applied, and the spine is fixed in its new position.

By extending the spinal column and applying the jacket, you gain much more than when a fracture is set by extension. In both, there is the local benefit; but in the former pain is at once eased; the chest is fixed in the inspiratory position, giving more play to the lungs and heart, and, as a natural consequence, the patient's general condition improves, and a clear healthy complexion soon succeeds to the dark and muddy one that so many spinal cases wear; the "pigeon-breast" is gradually unfolded, and, almost above all, there is an end to couches and reclining boards; for thus supported the patient may and should be out in the air as much as possible.

Is there no danger in suspending a case of spinal disease? Unhesitatingly no, if properly performed. In general curvature, there being no inflammatory action to rouse and no reparative material to damage, you can do no harm; straighten as much as you can. In caries, you may do harm if you disregard one important symptom—pain; sling your patient as long as he is comfortable; but, the moment he feels the strain in his back—if he should do so at all, but which many cases do not—cease to extend even if he have his toes still on the ground; put him up in that degree of extension; with the next jacket you will go further.

We employ here a slight modification in the mode of suspension and in the form of head-piece, as removing altogether what little risk there was about Sayre's original apparatus (*vide* woodcut).

The large iron bar is attached to the pulleys from the tripod; from the central small bar hangs the head-band, and from the two lateral pulleys the arm slings. By thus using a running cord the drag on the arms or head can be varied at pleasure. As represented in the figure, the angle made in the cord where the central pulley hangs is 120 deg., and the drag is equally distributed between the arms and head; but, by