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OVERGROWTH OF THE INNER TUBEROSITY OF THE TIBIA AS A CAUSE OF GENU VALGUM, INDEPENDENT OF ELONGATED INNER CONDYLE OF THE FEMUR.

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OVERGROWTH OF THE INNER TUBEROSITY OF THE TIBIA AS A CAUSE OF GENU VALGUM, INDEPENDENT OF ELONGATED INNER CONDYLE OF THE FEMUR.[1]

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It may at first appear necessary that I should offer an apology for introducing a subject so well known, so often discussed, and the treatment of which is now so well understood as that of genu valgum. It may perhaps be asked by some, What can be said fresh about it? But I venture to think that the special feature of the deformity to which I shall call your attention is not so generally recognised as it should be, and having met with two very well marked cases, I believe a few observations on the subject will prove interesting, and doubtless lead to a discussion which may prove profitable.

The first point for our consideration is the etiology of the deformity. Undoubtedly, the primary cause of genu valgum (apart from accident or other special circumstances to be noticed further on) is rickets, the femur becoming bent in an outward and forward curve at the upper and middle part of the shaft, developing (1) a tendency for the axes of the thighs to cross; and (2) a compensatory curve of the lower third of the femur, with convexity inwards, all this being favoured by a weakened condition of the muscles and ligamentous tissues, accompanied by stretching of the internal lateral ligament of the knee-joint. This is, moreover, generally—if not always—connected with a valgous condition of the ankle-joint, and flat foot. Naturally these conditions must throw the weight of the body upon the outer condyle, and corresponding part of the head of the tibia, thus lessening the pressure on the inner condyle, which correspondingly increases in size and length, just in proportion to the flattening of the outer condyle. The deformity having been once originated, must increase unless remedial measures are adopted. This is the history of the majority of cases of genu valgum, but in a certain proportion enlargement of the inner tuberosity of the tibia exists also.

[1] Read in the Section for Diseases of Children at the annual meeting of the British Medical Association, held in Nottingham, July, 1892.

There is, however, a *smaller* number in which the tibial overgrowth is the essential and sole element. That it is comparatively rare, or, at all events, has not been generally recognised, is proved by the silence of some surgical authorities, notably the standard works of Erichsen, Agnew, Mansell Moulin, Bryant, and Bowlby, and the very brief allusion made to by others. Ashurst (vol. vi. page 1052) thus refers to it: "Mr. Barwell says, in examining the tibia one feels the portion of bone for an inch below the knee-joint perfectly normal; just at that distance below the articulation one feels in a well-marked case of knock-knee an angle from which the shin-bone slopes outward." Mr. Barwell operates in this case by osteotomy of the femur and the tibia.

Holmes ("System of Surgery," vol. iii. page 825) writes: "Osteotomy at the knee has been performed from two points of view. The one based upon the belief that in knock-knee the inner condyle is unduly long; the other on the observed fact that genu valgum is often combined with curvature of both tibia and femur."

Walsham ("Theory and Practice of Surgery," page 824) says: "The deformity is variously believed to depend on an overgrowth of the internal condyle of the femur, and a corresponding uprising of the inner tuberosity of the tibia," and so on for other causes, and he does not allude to the necessity of any operation on the tibia.

Dr. MacEwen has referred me to his work on osteotomy, and has kindly quoted for me the following passage from it, page 50: "There is another element found in about one-third of the whole number of cases, consisting of an increase of osseous matter on the inner side of the tibial diaphysis at its proximal extremity, which causes the head to sit askew on the shaft. This tibial deformity when present is so to a small extent, though in a few it forms a prominent feature." He also states that Billroth and Mickerlitz have noticed the subject. Even this quotation does not indicate it as a *sole cause*.

But Owen ("Surgical Diseases of Children," pp. 77, 78) refers to it as an occasional sole cause, but says nothing about an operation on the tibia.

Doubtless there are allusions to the subject in other works to which I have not access. It is difficult to say why in some cases of genu valgum the femur should be first and solely involved, and in others the tibia *only*. I would suggest that, admitting the previous arguments, the condition is determined by some accidental circumstance, possibly a blow, or some irritation inducing increased

vascular action in one part rather than the other; and this generally takes place in the femur, further favoured by the flexed condition of the knee during several hours rest in bed, and when sitting during the day, in which position the head of the tibia is applied to the posterior surfaces of the condyles of the femur. We are familiar with cases of overgrowth of the shaft of a bone during the process of separation of a large sequestrum, and I have seen a case in which injury of the inner condyle going on to suppuration, with a constantly flexed condition of the knee, ended in a partially anchylosed joint with extensive genu valgum from undergrowth of the condyle. Bowlby ("Surg. Path., p. 2") writes thus: "The hypertrophy, which results from increased blood supply, may occur in tissues which are otherwise normal, but it is most often seen in connection with irritation or inflammatory lesions." Again (p. 3), "In cases of chronic inflammation, kept up by any cause in the neighbourhood of the epiphysis of a growing bone, the increased supply of blood to the developing tissue is followed by a corresponding increase of growth, and thus the limb on the diseased side may become longer than its fellows. In the tibia, such overgrowth is accompanied by curvature, for, being fixed to the fibula, it is unable to grow in length more rapidly than the latter bone, unless at the same time it yields to the resistance offered by the fibula." This fact, together with the very common practice of allowing a weakly child to wriggle about on a low stool or chair, dragging its legs after it and using the feet as paddles, or propellers, will fully explain the conditions tending to produce this deformity, which, once started at the head of the tibia, will soon extend to the curving of its shaft, dragging with it the fibula. In case No. 2 I have clearly ascertained that this was the practice followed.

I will now read brief notes of the two cases I have referred to.

Case 1.—Fanny C——, æt. five years, admitted into the Bristol Hospital for Children in a somewhat emaciated, neglected, and dirty condition, in December, 1888, with an extremely curved condition of the left tibia; also a considerable anterior curve of both femora. Careful examination of the left femur, by a line drawn through the long axis of the shaft, crossed at right angles by another line at the level of the lower part of the external condyle, showed that there was no abnormal elongation of the inner condyle, and that the deformity was entirely due to overgrowth of the inner tuberosity of the tibia, with secondary curving of the shaft. It was therefore obvious that the tibia and fibula alone had to be dealt with, and it was

considered desirable to remove wedges at the points of greatest curvature. (*See Fig.* 1 *A.*)

On January 3rd, 1889, the operation was performed as follows: A transverse incision through the skin and periosteum having been made, a wedge of bone having about three quarters of an inch for its base was removed by a chisel and saw, going through the whole thickness of the bone, just below the tubercle, to a point on the fibular side. A similar but narrower wedge was then removed at about the junction of the middle with the lower third, and

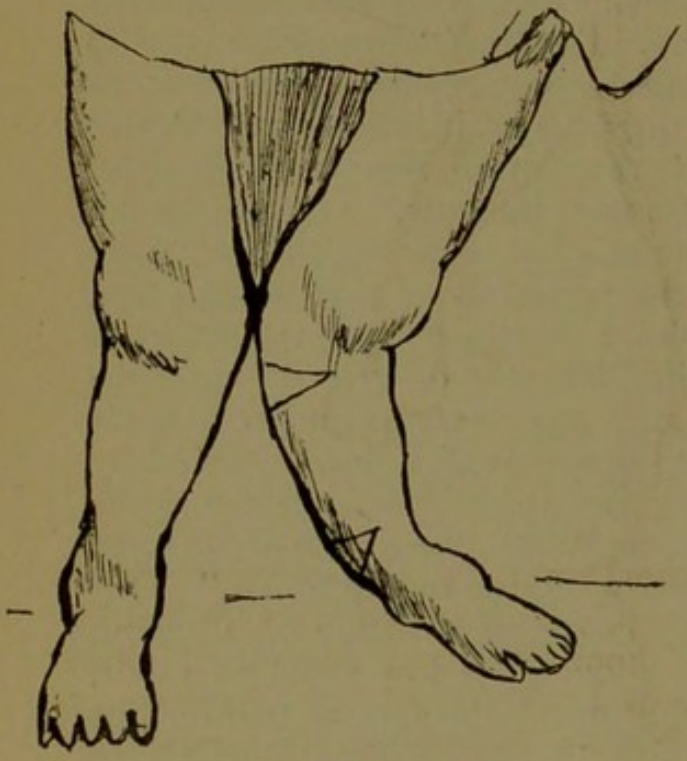

Fig. 1*a*.

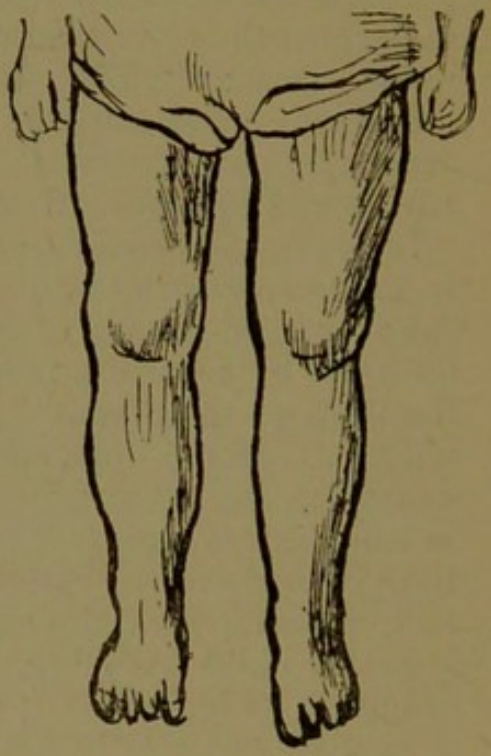

Fig. 1*b*.

the fibula was divided with a chisel. The limb was put up on a back splint, and swung in a Salter's cradle. The operation was performed with antiseptic precautions, and dressed accordingly. For some days all went well, but unfortunately the wound became septic, and suppuration was set up, causing for some time considerable anxiety as to the result, but when the acute symptoms had subsided, all went on well, and perfect union of the bone and soft parts occurred. On March 15th osteotomy of the right femur was performed, primary union taking place; and on April 12th the left femur was divided in the same way, with the very best results. (*Fig.* 1 *B.*)

Case 2.—Rose C——, æt. six years, admitted August, 1891. A feeble, rickety child, but otherwise healthy. Both tibiæ were extremely curved. Measured by the same method no condyloid abnormality was apparent (*Fig.* 2 *A. and B.*) On Aug. 25th it was decided to operate on the right

leg by the wedge method, using Adams' saw instead of the chisel. A similar wedge with a base of about half an inch was removed from the tibia just below the tubercle; another wedge with a narrower base from the middle of the shaft, and the fibula was divided with a chisel. Antiseptic precautions were taken, and primary union of the upper

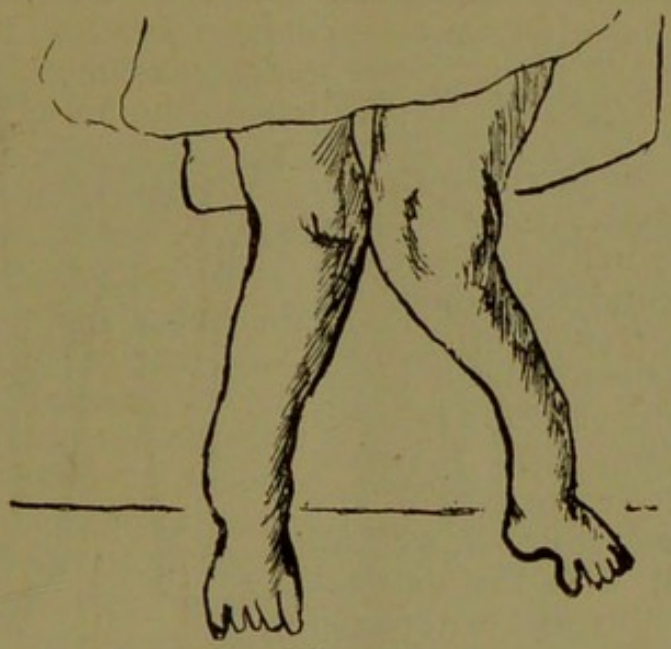

Fig. 2*a*.

wound occurred, the lower wound giving a little more trouble, but soon healing up. It was then evident that I had been too sparing of bone, a slight amount of genu valgum remaining, which I corrected by MacEwen's operation on October 6th. In December I operated on

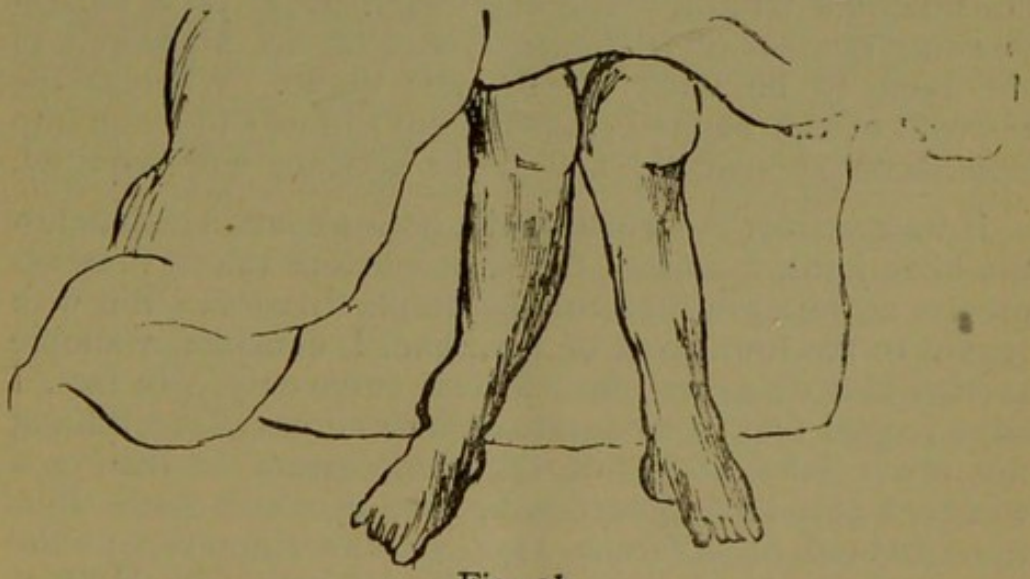

Fig. 2*b*.

the left leg by removing from the tibia, a little nearer the knee-joint, a rather larger wedge, no operation being considered necessary at the lower part of the limb, which came into excellent position, and all went well for a few

days, when, either from the delicate health of the child, or from want of due antiseptic precautions, suppuration occurred, and for some time considerable anxiety was experienced. However, all went well at last, and I have within the last fortnight had an opportunity of seeing her walking well with steel supports, as her knees and ankles are still somewhat loose and feeble. (*Fig.* 2 *C.*)

Fig. 2*c*.

We must consider the treatment adopted in these two cases. On looking at the respective positions of the three joints, hip, knee, and ankle, it must be quite obvious that neither condyloid, nor supra-condyloid operation on the femur could bring them into due relation to each other, *i.e.*, no line drawn could possibly intersect them all. However fully the proper position of the knee-joint was restored, we had still to deal with the extreme curve of the tibia, and two courses were open, either by a series of sections, or by removal of a wedge or wedges of bone to straighten it. Each has its advantages and disadvantages. Many simple sections must be required, especially in a case like No. 1, in which the curve formed a segment of a circle, and it was difficult to find a straight portion of any considerable length. And then there must be a corresponding number of triangular spaces on the fibula side of the bone to be filled up by new tissue. Whereas the removal of the wedge brings the cut surfaces of bone into immediate apposition, and fewer sections are required.

If we consider the width of the bone about an inch below the knee-joint, it must, I think, be obvious that it presents greater advantages than that of simple division. But with regard to the lower part of the bone, I consider a simple section may do as well for a lateral curve only. In fact, I have proved that in moderate *anterior* curves of the tibia at the lower third it is not always necessary to remove a wedge, a case having occurred to me in which both tibiæ were treated in different ways, with no difference in the appearance of the limb when fully healed. Mr. Holmes considers that as good results may be obtained by simple section of the bones as by removal of a wedge, and that further advantage is gained by the first method by not shortening the limb.

We must now consider what are the risks involved in the operation? It must be admitted that the risks incurred in the removal of a wedge are greater than in simple section of the bone, unless, indeed, perfect aseptic conditions can be obtained, and this, I think, ought to be insured under favourable circumstances. My first case was that of a most delicate child, perhaps not in the best condition for operation, and there were certainly circumstances attending it which ought in future to be excluded, and it is worthy of note that in spite of the trouble arising, I was able within ten weeks to perform osteotomy on the right femur at the middle, and a month after the same operation on the left thigh. In my second case the removal of the wedge below the right knee was attended with the most perfect results, primary union both of soft parts and bone taking place. The operation on the left tibia was very easily performed, but the child, naturally weak, was certainly much enfeebled by too long residence in the hospital, and therefore, I presume, less likely to bear a second severe operation as well as might otherwise have been hoped for. In a third case on which I operated some years ago, but which I have not included in my present paper, because it was complicated with elongation of the inner condyle (and in which I did Ogston's operation), no trouble whatever resulted from removal of the wedge from the tibia, and it can therefore be claimed as a complete success. Further experience will, I believe, justify my opinion as to the safety of the wedge operation.

It may properly be urged that these cases might have been treated on mechanical principles, and that a prolonged use of splints, etc., might have produced the same results. I must concede this, provided time and expense are not material considerations, and that it is always possible to get suitable and well made appliances. The majority of cases occur among the poor, or those in the middle class of life, and it is generally beyond their power to provide these costly fetters, and to keep them in constant repair. Why then should we spend years in a gradual, even if effectual, cure, when the same or better results can be accomplished in two or three months? Mr. Adams says that one year's instrumental treatment will generally suffice, and this may be the case with the better class of patients coming under the care of a London specialist, but it will not apply to the majority of cases in our overcrowded cities. Carefully padded and well adjusted splints will generally effect a cure in children under three years of age if care is taken to prevent the child from standing.

Mr. Holmes says: "The value of osteotomy must be

estimated by the length of time required for firm union," and as a rule this takes place in three or four weeks in children. It is scarcely necessary in the presence of so many distinguished members of this great association to allude to the vain and foolish argument, which I have so often heard, in favour of temporizing treatment by tonics, etc., in the hope, alas! how generally futile, that the young sufferer may "grow out of" the deformity, even when the age of five or six years has been attained.

But in my hospital practice I so often meet with very aggravated cases, and am told that the doctor said they would get all right in time, therefore I refer to it in order to utter an emphatic protest against such a delusive expectancy. That very slight cases of curvature may occasionally get remedied by improved health, wholesome diet, general careful maternal supervision, and well-made boots, I do not question, but they are the exception rather than the rule. No skilful gardener would act upon such unscientific principles applied to a valuable young tree, but would carefully apply corrective measures to remedy the vicious growth. As in reference to the vegetable kingdom, there is a true proverb, "Just as the twig is bent the tree's inclined," so with human structures: bad habits acquired in early childhood intensify as the child grows, and a slightly curved bone will soon degenerate into a crooked limb, and the whole body will sooner or later sympathize with the afflicted member. "The child is the father of the man" (a good axiom on which the learned president of this section last year founded his able address) in a physical as well as in a moral sense, and just as we should observe the good old maxim, "Train up a child in the way he should go," so we must endeavour by all available means: fresh air, good wholesome diet, and mechanical support when necessary, to correct any deviation from the normal condition of the bones and other tissues of the body, so that they may acquire vigour, strength, and comeliness, which will do credit to a loving mother, careful nurse and attentive doctor; but these measures all failing, or being neglected, the operative skill of the surgeon must come to the rescue, and I know of no more satisfactory and pleasing results than those which follow well timed, well directed, and patient efforts to accomplish some of the most brilliant illustrations of successful orthopraxic surgery.