A Post-Graduate Lecture

ON

LIMPS IN CHILDREN:

THEIR RECOGNITION, ORIGIN, AND TREATMENT.

BY

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PERHAPS I ought to apologize for dealing with a subject which the orthopaedist has come to regard as his own, but I am going to make no apology, because I speak from the point of view of the general surgeon—of one who has to spend much of his time in the wards of a children's hospital, and who is constantly experiencing the practical difficulties of which I speak.

In discussing the subject I shall attempt to illustrate certain distinctive limps by means of cinematograph pictures, a method of illustration which we are finding of increasing value in teaching the student, and also (if I may say so) of humbling the surgeon. The average surgeon is notoriously an optimist—I suppose his work makes him such, for someone has said that where there is no faith there can be no surgery. But, nevertheless, I am afraid that many of our surgical results are seen through rose-coloured spectacles. We forget the original picture, and we take too much credit for our post-operative results. A pre-operation film is an excellent corrective!

The Importance of Recognizing and of Investigating a Limp.

We have all had the experience of being asked to see a child because it is limping, and I know few more difficult problems than that of definitely localizing the site and the origin of the disorder. The younger the patient the more difficult does the problem become. He may be able to give us no assistance, and frequently he is actively antagonistic; the story of the parents may be garbled or actually misleading, and in many cases the elucidation of the mystery depends entirely on the clinical acumen and the trained observation of the examiner.

It is certain that the average parent has no sympathy with the doctor if he is unsuccessful in solving the mystery, or if he makes a mistake in diagnosis. To their minds the problem should present no difficulties, and therefore they make no excuse for error; but, as I have said, and as I shall attempt to show, few more difficult problems come under the notice of the specialist or general practitioner.

It is obviously essential that the origin and nature of the limp should be determined before adequate treatment can be carried out. Purely empirical treatment is rarely successful.

There is yet another reason why one urges the early and thorough investigation of a limp, and, though I mention it last, it is, from the practical point of view, the most important—early recognition and definition spells early treatment, and the pathology of many limps is of such a nature that early treatment means a good result, while delay may entail functional disaster.

A General Consideration of the Possible Causes of a Limp in a Child.

When a limping child is brought to notice and one is asked to furnish the diagnosis, I believe that it is a good plan to consider the problem from a logical standpoint—to say to oneself that there are certain groups into which limps may be classified. It is the first duty of the observer to recognize into which class the case falls. Having decided this more general consideration, it naturally becomes an easier matter to explore the various possibilities of the larger group, and to conclude with a local and exact diagnosis. We shall see the application of my argument in a moment when I have elaborated a scheme of classification.

Classification of Limps from the General Point of View.

This question of the general scheme of classification of limps is by no means as easy as it might appear. As far as I know, the question is not specifically considered from

this point of view by either the orthopaedist or the general surgeon, but it seems to me that there are certain general classes of limps, and when a limping child is brought to me for an opinion, the first thing I do is to attempt to put the limp into its general class. What are these general classes? I would venture to suggest that they may be tabulated as follows—and of course there is nothing original about the classification—it is merely common sense:

- I. Functional limps.
- II. Painful limps.
- III. Flaccid limps.
- IV. Spastic limps.
- V. Mechanical limps.
- VI. Stiff limps.

Let me in a few words explain what I mean by these relative terms.

Functional limp is rare in children, especially in the early years of life. If met with, it is generally found in girls over the age of 8 or 9 years. It has certain characteristics of stiffness, of variation in degree and of exaggerated symptoms unaccompanied by any discoverable lesion. It forms a distinctive class of limp, as I shall attempt to show, but its diagnosis must only be made after the careful exclusion of other possibilities.

Painful limp, or the "hurrying limp," as it is sometimes called, has as its essential feature the reduction to a minimum of weight-bearing on the limb. The source of the pain may vary from a blister of the foot-sole to an acute infection of the hip-joint. The degree of limp will be modified according to the situation and degree of the pain.

Flaccid limps. Under this term I include those gaits in which the distinctive feature is muscular weakness, from whatever cause it may proceed, whether the central nervous system, the peripheral nerves, or the muscles. The possible origin may have such varying sources as poliomyelitis, a peripheral nerve lesion, or a muscular dystrophy.

Spastic limps are generally characteristic, and there is rarely any difficulty in their recognition. The picture of the stiff and jerking gait is so distinctive that once seen the impression remains. Almost without exception they are the result of an error—congenital, inflammatory, or traumatic—of the central nervous system.

Mechanical limps. It is with this variety that I have had the greatest difficulty in nomenclature. I feel there must be some more expressive and representative term, but I cannot light upon it, and therefore, in place of a better, I have used the word "mechanical." By using this term, I mean to imply that the limp arises from an error in alignment of the various portions of the osseous system which forms the skeleton of the lower limbs, and of the possible errors in alignment there are these common ones:

- Actual shortening of the limb.
- Adduction of the limb in relation to the plane of the pelvis.
- Abduction of the limb in relation to a similar plane.

The mechanical limp may therefore have such widely divergent origins as a congenital dislocation of the hip, coxa vara, bow-legs, knock knee, and former hip-joint disease, which, though cured, has resulted in abduction or adduction of the limb. In the mechanical limp, as I intend it to be expressed, there is no muscular weakness and no joint pain—it is purely the result of a mechanical error in the relationship to one another of the bones which form the lower extremities.

Stiff limps. This is the last general group I propose to recognize. It depends upon an ankylosis of one or other of the joints of the lower extremities—hip, knee, ankle, or tarsal joints.

Now that I have given this rough general classification let us reconsider the position.

By closely watching the child as it walks in front of you I believe it is possible to classify the limp into one or other group, and this by simple observation alone, without putting the hand upon the limb. Of course, there may be some overlapping in the classification. For example, I can quite well imagine a gait or limp which is "painful," and yet has some mechanical error which demands that it should be included in the "mechanical" class. Similarly, a mechanical limp may be combined with a stiff limp. I need not, however, enlarge upon these combined types.

Distinctive Features of Each Class.

Each variety of limp has one or more distinctive features by which we are able to recognize it.

The functional limp would appear at first as though it were a painful limp of an exaggerated degree, but it has two features which should at once arouse suspicion. The first is that every now and again the heel is quite firmly brought to the ground. Now, in a true "painful" limp this manœuvre is most carefully avoided, except in the rare instances in which the origin of the pain lies in the fore part of the foot. The second distinctive feature of the functional limp is its variability in degree. At one moment it may be of the most exaggerated type, at another the limp is lost entirely, to be instantly reacquired. These two features, combined with the fact that on careful physical examination no lesion can be found, generally justify one in classifying a certain variety of gait or limp as "functional."

The painful limp. When a child has a diseased and painful focus in a limb it is most likely that pressure will increase the pain; therefore the distinctive point about the painful limp is the quite apparent unwillingness of the child to allow the full weight to be borne by the limb. It reduces to a minimum the amount of time during which the limb has to bear pressure, and same orthopaedists have descriptively termed it "the hurrying limp or gait." There are two other features generally present in painful limps. The one is that in order to avoid any jarring of the limb the heel is kept off the ground; exceptions to this rule are those cases in which the situation of the pain lies in front of the ankle-joint. The other characteristic feature lies in the fact that the various joints of the limb are held in a semi-flexed condition. This has as its explanation the attempt to diminish any jarring of the limb.

The flaccid limps are generally characteristic, and, according to the various groups of muscles which may be affected, different types of the flaccid limp appear. When the muscles round the ankle-joint are involved there is a distinctive high-stepping gait, with exaggerated lifting of the limb, in order to carry the paralysed foot clear of the ground. Around the knee-joint the extensor group of muscles are those most commonly affected, and in these cases the limp is very typical. The arm of the affected side is brought into use, and the knee is maintained in the extended position by keeping the hand firmly pressed against the front of the knee or thigh, the body being thrown forward to enable this manœuvre to be carried out. If the muscles round the hip-joint are extensively paralysed it is likely that the child will be unable to walk without artificial support; if, however, the paralysis in this region is limited and walking is possible, there is a characteristic outward swing of the limb with the foot in an everted position.

In all the flaccid paralytic limps the distinctive feature is the want of control over certain movements, with often exaggerated manœuvres of the healthy muscular groups.

The spastic limp. I need say very little of the characteristics of this type. The spastic condition of various groups of muscles is responsible for the spastic or "stotting" limp. The gait is forcible and jerky. It is well illustrated in spastic equinus, and it finds its most marked degree in the spastic diplegia or Little's disease. It is a limp which, once appreciated, is always easy of recognition.

The mechanical limp. I have defined the mechanical limp as being dependent upon an error in alignment of the bones which collectively form the skeleton of the lower limbs—I include therefore the pelvis. Of the possible errors in alignment there are three which I would mention as being responsible for characteristic mechanical limps—

Pure shortening of the limb.

Adduction of the limb in relation to the plane of the pelvis with apparent shortening, and

Abduction of the limb with apparent lengthening.

In the pure mechanical limp the limb is used as confidently as a normal limb—there is no muscular weakness, and no pain; the limp is therefore the result of the patient's effort to overcome the mechanical error which deformity or former disease or injury has induced.

If the error lies in pure shortening of the limb (as is

evidenced in congenital dislocation of the hip or in a fracture with shortening) there is a simple sinking of the pelvis towards one side. The sinking limp is best illustrated in a case of congenital dislocation of the hip, because in this condition not only is there shortening present, but, owing to the imperfect fixation of the hip, a further sinking is induced as weight is put on the limb.

If the limp arises from abduction of the limb in relation to the pelvis, the deformity may be wonderfully disguised. There are two points, however, which distinguish it—the patient walks with a broad base, keeping the feet well apart, while as each step is taken on the affected limb the body sinks towards that side. Frequently also the whole limb on the affected side is held stiffly, while it is swung outwards and forwards as progress is made. As a matter of fact, the pure mechanical limp of abduction is rarely seen. An abduction stiff limp is much more common. Here there is an ankylosis at the hip-joint, and, as the result of treatment of such a condition as a tuberculous hip, ankylosis has occurred in an abducted position.

Adduction of the limb produces one of the most characteristic and most distressing of all limps. To be able to walk efficiently the patient must go through a complicated manœuvre, and as each step forward is taken a series of movements is really carried out. From the adducted position the limb is first abducted, and to do this the body is tilted toward the opposite side; the limb is now adducted to bring it as far as possible parallel to its fellow, the pelvis and the body sinking towards the affected side. As these lateral movements are in progress, forward movement is at the same time being carried out. It is easy to imagine the exertion and the deformity entailed in an adduction mechanical limp.

Stiff limps. The question of stiff limps I shall dismiss in a word. Whenever a joint of the lower limbs is ankylosed or stiff, a limp results. Stiff tarsal-joints and ankle-joints give a characteristic wooden appearance to the walk. This deformity is often wonderfully disguised. The knee, if ankylosed in a position of slight flexion, may give rise to wonderfully little disturbance in the walk, but a characteristic stiffness is always noticeable. The limp of an ankylosed hip is a combination of the stiff gait and the mechanical gait, according to the position in which the limb is ankylosed, and the shortening which may be present.

Examination of the Limb after Classification of the Limp.

My thesis up to this point has been that by observation of the method of walking it is possible to classify the majority of limps into certain groups, and, when this has been done, a great advance has been made towards the final diagnosis. But this is not sufficient—it is necessary now to localize the exact situation of the limp and, if possible, to come to an opinion regarding the pathological condition which is at fault. Now these points of knowledge can only be gained by a close study of the history and by a careful examination of the limb.

There is little I need say in regard to the history: while the parents' story is often misleading in so far as an injury, imaginary or real, always bulks largely in their eyes, one must remember that the natural maternal instinct of the mother qualifies her as an exceptionally shrewd observer. The history may be of great importance in recognizing the congenital nature of a limp. But, apart from the consideration of the history, the ultimate diagnosis will depend on the accurate examination of the limb.

The child, who should be stripped, having walked before me, I begin by noting the position of the limb as a whole—does it lie in a normal or in a deformed position? I survey the skin for any pathological appearance; I estimate by comparison of the two limbs the degrees of muscular development or wasting, and here I bear in mind a very simple, yet a very important, clinical fact—namely, that if the muscles of a segment of the limb are wasted (paralysis and dystrophies being excluded), there is some pathological change in the joints and bones over which these muscles play.

Any alteration in the outline of the limb is now looked for as being representative of an abscess or collection of fluid. My eyes are now directed to the joints of the limb;

the relative positions of the bony points are estimated, any joint fullness or error in position is noted.

Only when I have exhausted the observations of which my eyes are capable do I attempt to use my hands, and the use I make of them is largely to confirm what my eyes have already told me. I estimate by feel the character of the skin, I investigate any local swellings, I carefully palpate in turn each structure which collectively forms the limb. I therefore palpate the subcutaneous tissues, the muscles, the bones, and the joints. For example, my hands will tell me whether a swelling in relation to a joint is osseous, is due to a thickened synovia, or to the excess of fluid within the joint. I very carefully estimate the relative position of the bony points around a joint—this in view of a dislocation being present.

I then proceed to the investigation of the muscular functions of the limb. As far as possible, voluntary movement of the various groups of muscles is elicited. In the child this may be difficult, but by a little ingenuity and the exercise of patience the difficulty is overcome.

The joint movements are now investigated—first actively, then passively. Each movement of which the joint is capable is tested. Examination of the passive movements of the joint is, perhaps, one of the most important of all the stages of the survey; the results bulk so largely in the differential diagnosis. For example, I can imagine four pathological conditions in relation to the hip-joint, all of which are associated with a limp, and from examination of the passive movements of the hip-joint alone I can form at least a provisional distinction between them. Let me illustrate: If I am dealing with early tuberculous disease of the joint, flexion and rotation are limited by muscular rigidity. If Perthes's disease (osteochondritis deformans juvenilis) is the condition present, flexion is perfect, while rotation is limited; if there is a congenital dislocation of the joint, abduction and external rotation are limited; in coxa vara abduction only is affected.

I now proceed to measurement of the limb. First, the ileo-malleolar measurements are taken, and, if true shortening is shown to be present, I localize the situation by subdividing the original measurements into three—from the adductor tubercle to the median malleolus, from the tip of the great trochanter to the tubercle of the tibia, and, thirdly, by the estimation of Bryant's triangle or Nélaton's line. In one of these three areas I shall find the shortening. The second group of measurements, as estimated from umbilicus to median malleolus (the iliac spines being on the same plane), will give me an estimate of apparent shortening or apparent lengthening—in other words, of abduction or adduction of the limb.

There is another point in the examination of the limb to which I would allude. There are certain muscles which pass into the limb from a higher origin, and of these the psoas is the most important. It is therefore always wise to include an examination of the lower abdominal viscera and the lumbar spine in the routine investigation. Tuberculous disease of the lumbar spine with associated contraction of the psoas muscle produces a limp which is closely similar to that produced by hip-joint disease.

Up to this stage the examination requires no special apparatus or facilities, and by the time this stage is reached the diagnosis will probably have been made. The further examination ought to be rather confirmatory than otherwise; it will take the form of radiographic examination of the bones and joints of the limb. In these days, when x-ray facilities are so general, I am afraid we tend to resort to them too readily. If we do, then our clinical acumen will suffer. It is wiser to treat them as a diagnostic luxury, and to use them as confirmatory or otherwise of a clinical diagnosis.

I have no intention of attempting to describe the distinctive limp in individual diseases—I question very much if such a thing is feasible. My idea has rather been to look at the problem from a general aspect, and to attempt, if possible, to formulate a scheme upon which the problem may be worked out. If I may put the scheme into a few words (and after all it is so simple that perhaps the word "scheme" is too pretentious) the idea upon which I work is primarily to classify the limp, and this classification may be made entirely by observation of the gait; the type having been recognized, detailed examination

of the limb will generally succeed in localizing the site and the nature of the condition which has produced the limp.

The Treatment of Limps.

In this connexion, of course, it is only possible to speak in general terms. Each individual condition must be treated upon independent and special lines; but it is possible to express general ideas on the subject.

If it is decided that the limp is functional, the less the attention paid to it the better. Sympathy and local treatment will probably intensify and prolong it. The child responds readily to suggestion treatment. I have seen a girl with a pronounced functional limp walk normally after a short period of suggestion treatment. [A film representative of this case was shown.]

Painful limps call for early and careful treatment. The exact localization and pathological condition of the disorder must be recognized, and, this having been done, painful limps are treated by rest and immobilization of the part. We may take it, therefore, that for the limps recognized as being in the painful class, efficient rest of the limb is the first essential in treatment. Later, and depending on the pathological condition at fault, more special surgical treatment may be demanded, but with these indications I do not propose to deal.

Flaccid limps suggest wide possibilities of treatment; as the majority owe their origin to poliomyelitis, I would remind you that prevention is better than cure. During the acute stage of the illness, and subsequently, accurate splinting of the part in such a position as to relax the weakened muscles may well obviate the later development of a limp. When the limp has become established, mechanical treatment and operative treatment offer the most promising lines of treatment. In this connexion in recent years surgery has made enormous strides—tendon transplantation, silk fixation, and arthrodesis are often successful in restoring function to an otherwise useless limb.

Mechanical treatment by splints in children is often disappointing. The appliances should be of the simplest possible description, but the weight, the effort entailed in their use, and the education required are often detrimental to success. The present aim of surgery is to reduce to a minimum the use of mechanical appliances.

Spastic limps call especially for educational efforts. Occasionally surgery steps in beneficially with such simple procedures as tenotomy and tendon lengthening, but the intelligent use of corrective splints applied at night and careful education during the day produce good results.

Mechanical limps call for a special word of warning, and it is this: I believe that as a general rule it is a wrong principle primarily to condone a mechanical limp by some mechanical appliance. The common essential feature of most mechanical limps is shortening, and the aim should be to correct, if possible, the mechanical error which is producing the shortening, rather than to disguise it by such a procedure as heightening the boot sole. This should only be done as a final stage in treatment and after all other errors, such as adduction, etc., have been corrected. If raising the boot sole is the only remedy adopted, it may lead to a progressive increase in shortening.

Stiff limps generally call for little in the way of treatment. It is essential, however, that the part affected should be in the best possible position for subsequent ambulation. In the treatment, therefore, of any joint condition which may end in ankylosis, it is essential that care should be taken so to arrange matters that where ankylosis subsequently occurs, the joint concerned is in the best possible position—the ankle should be at right angles to the leg, the knee very slightly bent, and hip in moderate abduction, with slight outward rotation of the limb.

At one time we hoped that arthroplasty offered a possible method of restoring movement to ankylosed joints, but I am afraid that in the lower limb, at least, the results have been disappointing. We realize that there are worse things than a joint firmly ankylosed in a good position.

These are some of the points which have occurred to me in discussing the subject of limps. There is nothing new or original in the matter brought forward: I have merely attempted to put the subject before you in a consecutive light.