Observations

ON

THE TREATMENT OF CONGENITAL DISLOCATION
OF THE HIP.*

BY

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A DISCUSSION of the treatment of congenital dislocation of the hip naturally resolves itself into a consideration and comparison of manipulative methods and open operations. It is barely thirty years since this disability was generally recognized as having been emancipated from the list of affections regarded as incurable. Prior to that time, once the diagnosis had been made, and the nature of the condition explained to the parents of the child, or to the patient himself, if old enough, the surgeon dismissed the case feeling that all that was possible had been done. Then came the quickening of interest and kindling of hope which resulted from the work of Lorenz, followed by the universal adoption of his manipulative method, the inevitable evolution of various modifications and improvements, and the development of open operations to be applied in cases which resisted manipulation, until to-day it may be said of this recently hopeless disability that, given an early diagnosis, anatomical and functional cure should be the rule and failure the exception, while even old and neglected cases are by no means quite beyond help.

Manipulative reduction is undoubtedly still the method adopted by the majority of surgeons in treating young patients, and sometimes those who are older. The original technique of Lorenz is still largely used, although many prefer one of the various modifications, the Denucé method being probably the most popular among those who have mastered it. Although statistics of the results of manipulative treatment present such extraordinary variation as to be largely valueless, there seems to be abundant evidence that in the hands of experienced operators a large proportion of the cases in young children can be permanently cured by manipulative methods.

When Lorenz first made his triumphal tour of American clinics I had the privilege of seeing him carry out his method on several patients, and the demonstration was striking and convincing. Full of enthusiasm I returned home, and immediately applied my newly acquired knowledge in the case of a girl, aged 3, with dislocation of both hips; a perfect anatomical and functional cure resulted. Unfortunately, however, this encouraging initial success was followed by a series of failures and incomplete cures, with only an occasional really satisfactory result; and I soon came to feel that a most uncomfortable uncertainty dogged my efforts to treat this disability. Diligent inquiry among some of my orthopaedic friends, and examination of cases treated by them, convinced me that their experience closely resembled my own.

My conversion to the open operation came in 1904, although for several years after that I employed it only occasionally and with misgiving born of inexperience. In June, 1904, the late Dr. Harry M. Sherman of San Francisco read a remarkable paper in which he advanced what seemed to me an unanswerable line of argument opposing manipulative reduction, and favouring arthro-tomy as the routine treatment. I wish to quote at some length from Dr. Sherman's paper:

"As regards the manipulative method, I am sure that Lorenz told the whole truth when he stated that the obstacle to reduction was the narrowed part of the capsule at the posterior and superior or superior part of the acetabular rim. If the opening at this narrowed part is big enough to permit the head to pass, reduction can be accomplished by manipulation, and may be maintained, if the acetabulum is deep enough.

I have in two instances done this I know, but in the twenty-eight hips in which I have done arthro-tomy and in which I have explored the narrow part of the capsule by my finger, and so know its size and the strength of its walls, there has been but one case in which the passing of the head would have been possible. I am not too dogmatic when I say that no possible force could have put the femoral head through the narrow part of the capsule in any of the other cases. One possibility and twenty-seven impossibilities! Now what happens when attempts are made to accomplish this impossibility? Lorenz has reported plenty of fractures of the femur and one each of pubis and of the ilium, and other operators have done the same.¹ Lorenz reports seven cases of paralysis out of four hundred odd operations, but Taylor,² looking carefully for the condition, finds eleven cases in less than fifty operations by various operators including, I believe, Lorenz himself. My own contribution to the casualty list is the report of a case of Lorenz's own, of rupture of the capsule of the hip-joint distal to the constriction, and the thrusting of the femoral head out among the muscles of the thigh. While only one case was shown we have had this accident, still, from the similarity of the clinical conditions, I believe another had it, and it is not in the least impossible or improbable that it occurs in very many cases, especially in the class called 'anterior transposition.' Finally on all sides one finds the absurdity of the term 'bloodless' pointed out, and the reference to the lacerations of the muscles, the extravasations of blood and haematomas. And, last of all, Lorenz has reported one case of gangrene of the whole lower extremity. These accidents must make anyone, who is not an enthusiast or a special pleader, stop and think. One must say that to justify the exposure to such risks the percentage of successes, anatomic and 'functional,' must be high, so that the benefit may, in the opinion of all, outrank the possible harm. What is the percentage of successes? From what we have seen of the Lorenz results scattered between Boston and San Francisco, we cannot believe that he ever really got good anatomic results in about half of all his cases."

Even if it be granted that Dr. Sherman presented an extreme view, and that his criticism of Lorenz's results was based in part upon the unwise application of the manipulative method to unsuitable cases, the essential fact brought out by him is that the entrance to the acetabulum is too constricted to permit the head to pass through it. I have personally verified this many times. But if Sherman's contention be true, how are we to account for the fact that so many undoubted cures are brought about by manipulative methods? In my opinion, in nearly all cases treated by manipulation the head does not at the time of apparent reduction fully enter the acetabulum, nothing intervening between the cartilage covering the head and the cartilaginous lining of the acetabulum. I believe that a wall of soft tissue is pushed before the head, and that this gradually disappears by pressure absorption during the prolonged retention in the abducted position, which forms such an essential part of the after-treatment of these cases.

I have long felt that the objections to the open operation do not rest upon a sound foundation. The word "bloodless" so frequently applied to manipulative methods is captivating, but to anyone who has seen the enormous haematomas which so frequently attend the Lorenz method this term makes no very convincing appeal. Then it must not be forgotten that almost overnight the Lorenz method of treatment was eagerly and universally adopted by the profession as the solution of the problem of treating these hitherto incurable cases, and treatment by manipulation soon became an established tradition, with the result that comparatively few surgeons have gained any extended experience with the open operation. Again, we must remember that thirty years ago orthopaedic surgery in general was much more the mechanical and manipulative department of surgery than it is to-day. Few indeed of the orthopaedic specialists of that time were trained operators, and as the great majority of congenital dislocations came into the orthopaedic department, manipulative reduction was practically the only method of treatment attempted. As I have said on other occasions, each worker in the field of the open operation for this condition has been more or less a pioneer, because the almost universal employment of manipulative methods has left the open operation largely without either teachers or students. Because manipulative methods produced results which were on the whole an enormous advance over the impotence of the era when these cases were classed as incurable, there developed too

* Made in opening a discussion in the Section of Orthopaedics at the Annual Meeting of the British Medical Association, Winnipeg, 1930.

general a feeling that both patient and surgeon should be congratulated even if results were often far from ideal. At the present time, given hospital facilities of the highest type, a surgeon to whom absolute asepsis has become a confirmed automatic habit, and who has acquired the necessary experience with this particular operation, it should be almost as safe as a tenotomy, and as likely to result successfully as an osteoclasia for bow-legs or an osteotomy for knock-knee, provided that one other factor is present. That factor is that the patient must be from 20 to 36 months old, and must never have been previously treated by manipulation. It is at this point that I come into conflict with many if not most of those who perform the open operation in certain cases. I believe the general teaching is that open operation should be held in reserve as a last resource where manipulative reduction has failed. I have always contended that such teaching is not merely wrong, but mischievous. The powerful grip with which traditional teaching holds the profession in regard to this particular surgical condition is well illustrated by a statement which occurred in a paper published in the *Lancet* about ten years ago by Mr. A. H. Tubby. He says:

"No matter what the age of the patient may be, no resort is made to open operation until every effort has been made to reduce the dislocation by the manipulative method. In one instance, no fewer than eight such unsuccessful attempts were made. Portions of the adductors had been excised, extension had been tried by heavy weights for several weeks, traction by pulleys up to the danger point had been used, and even when the trochanter major had been pulled down one inch below its normal position we found that flexion, hyperextension, abduction, circumduction inwards and outwards were all unsuccessful."

Such persistent unsuccessful efforts at manipulative reduction before resorting to open operation not only accomplish no good, but do great harm, and bring the open operation into undeserved disrepute. Tissues which have been bruised and scarred, and that have had their power to resist infection lowered by the traumatism inseparable from such unwise manipulative efforts, do not afford an inviting field for subsequent cutting operations, and cannot function as satisfactorily after the operation as tissues which have not been treated so unkindly.

In a young child the exposure of the hip by the Sprengel or Smith-Peterson approach is a simple procedure, and can be carried out rapidly and with little or no shock to the patient. Once the capsule has been opened and the constricted portion enlarged, reduction can be accomplished with almost no traumatism. Further, with the limb rotated inwards and maintained in moderate abduction of from 40 to 60 degrees, the head is so deeply buried in the acetabulum that with the most ordinary care there is no tendency to redislocation during the closure of the wound. When a plaster dressing has been properly put on, recurrence is practically impossible, no matter what position the patient is placed in. In my opinion, the actual traumatism is less, not more, in the average case, than when the manipulative method is employed.

Other things being equal, it must be granted that if a congenital dislocation can be reduced in a few minutes by an easy manipulative procedure which requires no elaborate surgical technique, it should be chosen in preference to an open operation which demands perfect asepsis, and which should never be attempted except by a highly trained surgeon. But are other things equal? Denucé teaches that his patients must not be allowed to begin walking until about one year has elapsed from the time reduction was effected, and he appears to regard as essential an elaborate course of after-treatment extending over many months, and even as long as two and a half years. Contrasted with this, after the open operation in children, walking in the plaster is encouraged within a month, and the plaster is abandoned and no treatment considered necessary after five or six months. Indeed, I believe the plaster could be removed with safety and all further treatment dispensed with much earlier in most cases; but I have not felt justified in taking chances in order to discover the minimum safe period of after-treatment. It is highly undesirable to keep the pelvis of a growing child enclosed in plaster for a year if half that period will suffice. The extended period of after-treatment insisted

upon by Denucé and others is not only an objection in itself, but I think it lends support to my belief that cure by any manipulative method can be brought about only by pressure absorption of capsular tissue, which more or less completely blocks the entrance to the acetabulum. In other words, reduction by manipulation is usually at first incomplete, and it becomes stable only after the capsular tissue pushed before the head has disappeared. On one occasion I performed the following experiment: I reduced the hip by manipulation, and immediately took an x-ray picture. The head was opposite the acetabulum, but not deeply within it. I then performed an open operation and took another picture, which showed the head much more securely related to the socket.

It is granted that the open operation should never be attempted except by trained surgeons who can operate under conditions such that the failure of any link in the chain of asepsis is practically impossible; but if this be an objection, it applies equally to many other surgical procedures, and should not deter the surgeon who has learned to have confidence in himself and in the environment in which he operates.

The objection sometimes raised to undertaking early treatment, even by the manipulative method, is the difficulty of keeping the plaster from becoming soiled, but this is a less serious problem to ingenious and conscientious nurses than to those who study to escape any avoidable trouble or exertion. At any rate, in my experience, it does not offset the greater ease with which reduction can be effected in younger patients. While I operate on children as young as 19 or 20 months, it may be stated that from 2 to 2½ years is perhaps the ideal age. In a general way, the operation becomes more difficult and uncertain as age advances, but there are exceptions to this rule. It may be anything but easy in a child aged 4 or 5. On the other hand, in the exceptional cases where the hip is lax and the head can be moved up and down on the ilium to a considerable extent, reduction may be quite easy in a patient aged 10 or 12. In children aged 3 years or younger who have never been subjected to manipulation, the ligamentum teres is usually intact, and is an important guide in locating the acetabulum. In older children and in those who have been subjected to a previous manipulative effort the ligamentum teres may be absent, or, if found, detached from the head and curled up in the socket. Exceptionally I have found the ligament so voluminous as to occupy too much space in the acetabulum, interfering with the deep burying of the head which is so desirable, and, on this account, I have occasionally detached it and removed a large part of it. Sometimes even in the younger children the acetabulum is found so shallow, or its roof so sloping, as to jeopardize the result. When this condition is encountered, a wide chisel curved on the flat is driven almost horizontally into the ilium to the depth of about three-quarters of an inch, just above the upper rim of the acetabulum, and after prying down the roof of bone thus loosened, bone chips cut from the ilium are wedged into the gap created by the chisel. The same procedure has been adopted with complete success at a second operation in a few cases where the shallow condition of the acetabulum had permitted redislocation to occur.

Before dismissing the matter of treating congenital dislocation in young patients, reference should be made to a recent article by Dr. Charles H. Jaegar of New York. He pleads for earlier diagnosis, and describes a new and simple plan of treatment which he claims can be used successfully in infants as young as 3 or 4 months. His article, which appeared in *Surgery, Gynecology and Obstetrics*, April, 1930, is illustrated by some striking x-ray pictures of two cases, one set of pictures being those of a child of 7 months old when treatment was begun, while the other patient did not come under his care until the age of 2 years and 7 months. Jaegar argues that the shallow condition of the acetabulum is caused by pressure of the dislocated femoral head against its upper rim during the first months of life when growth and development are very active, and that this pressure prevents the normal development of the acetabulum. He states that removal of this pressure is promptly followed by development of the upper rim, and points to his x-ray pictures as proof. His

plan of treatment is as follows: The child is placed in a long hip splint of rustless steel. This splint consists of two circular bands to fix the pelvis and chest, and two lateral bars to support the legs. The lower ends of the bars are furnished with a foot plate and leather anklet, the function of which is to maintain a mid-position of the leg as regards inward and outward rotation. The long outer bar is bent to fit the patient with the lower extremity abducted to 45 degrees. Gradual reduction is accomplished by an adjustable pad pressing downward and inward on the trochanter, this pad being controlled by a wing screw about one and a half inches long. In his first case the splint was worn for eight months. In the second and older patient it was discarded in a little over four months. He considers three months sufficient. Weight bearing is not permitted during the treatment, and he challenges the theory that functional weight bearing is necessary for deepening the acetabulum. He claims that x-ray pictures taken at frequent intervals show unmistakably that the upper rim of the acetabulum begins to develop rapidly as soon as the pressure of the head against it has been removed; and he suggests that the damage to the head seen so regularly in later years in cases treated by other methods may be due to the fact that the soft cartilaginous head is supposed to pound out a hollow in the harder socket.

Treatment of Older Patients.

Granting that congenital dislocation of the hip is usually curable in young children, the problem of successful treatment in older patients remains a formidable one. Inasmuch as I never attempt manipulative reduction at any age, it is only natural that I should protest against attempts at manipulative reduction and plead for some form of open operation in all patients who have passed the early favourable period. To me it seems altogether unjustifiable to use the amount of force so often employed, and especially to subject the patient to repeated attempts at reduction after the first efforts have failed.

Starting from this point, my discussion of the subject narrows down to a consideration of the kind of open operation to be chosen after the favourable early period has passed. In my opinion, actual reduction of the head into the acetabulum may be attempted by much the same method as I employ in children, in any patient irrespective of age, provided the case be one of those exceptional ones where the hip is lax and where the femur moves up and down until its upper limit is within a short distance, say one inch or less, of the roof of the acetabulum.

Preliminary traction, advocated by some writers, is practically valueless in my opinion, unless it be applied directly to the skeleton, and even then its advantage is doubtful. There is, however, a little-known method of using traction which I employ regularly in fractures of the femur, which may reasonably be expected to yield some result, if continued for several weeks. This method was originated by Michael Hoke of Atlanta, Georgia, U.S.A. Into a short plaster spica, which surrounds the pelvis and upper part of the thigh on the injured side, are incorporated the side bars of what is practically a Thomas splint minus the ring. The thigh portion of the plaster is little more than a wide collar, and its upper edge must not come within a couple of inches of the perineum. The plaster is also carried down on the opposite extremity so as to include the foot, which is placed at right angles to the leg. In treating fractures of the femur in young children the usual adhesive strips may be used, but skeletal traction is preferable in older children and adults, and in applying this method to congenital dislocation, skeletal traction is indispensable. Callipers may be used, but my personal preference is for a pin passed through the femur just above the condyles.

The degree of traction can be accurately controlled by a butterfly nut arranged on a screw, as shown in the illustration. The plaster is applied over very abundant padding, so that it fits the patient's body and limbs loosely. As soon as traction is applied, it tends to push the whole plaster dressing up on the patient's body, but the plaster cannot move upwards owing to the inclusion of the opposite limb. Thus perfect resistance is provided and all counter-pressure comes against the broad sole of the foot, a surface which is not only adapted to pressure but accustomed to it, instead of being secured by the ring of a Thomas splint pressing against surfaces not so well adapted to pressure. The pin through the bone, if aseptically introduced, causes neither trouble nor pain. Whether we use or discard preliminary traction, there are other aids to the descent of the femur; division of the iliopsoas, and subcutaneous section of the adductors and of the ilio-tibial band, may also assist in getting the head near or opposite the acetabulum; it may then be "shoe-horned" into place.

In the cases where there is little movement of the head on the ilium, and the head is not within easy distance of the acetabulum, it will usually be better to abandon any attempt at actual reduction and adopt some method which will increase stability and improve function by giving support to the head when the patient places his weight on the dislocated limb. The effort actually to reduce the head into the deformed acetabulum in cases where it is riding high on the ilium requires so much force and is attended by so much traumatism—to say nothing of not being exempt from actual danger—and so often results in a hip which is largely or altogether stiff, sometimes with added flexion and adduction deformity, that functionally the patient may be little better or even worse off than before. The method of turning down a generous layer of bone from the ilium and wedging it in this position with bone chips cut from the crest of the ilium, so as to form a good roof over the head, is probably the simplest and safest compromise that can be devised.

A most ingenious operation has recently been proposed by Hey Groves. Briefly, this consists of reaming out a new acetabulum on the ilium, and then, after detaching the capsule from its pelvic attachment and sewing it over the head of the femur, implanting the head covered by the capsule into the newly formed socket. The outside of the capsule grows fast to the new socket, forming a most satisfactory lining; and as the interior of the capsule is furnished with synovial membrane this method creates a new articulation having all the elements of a stable and movable joint. This new operation has to stand the test of further experience, but it is one of those surgical procedures which appear to be sound and reasonable.

I have had no experience with the bifurcation operation described by Lorenz. It has always seemed to me wrong in principle; nevertheless, many surgeons have reported so favourably regarding the improved function brought about by this procedure that it must be accepted as one solution of the problem of dealing with this deformity in adults. In these old neglected cases, anatomical cure is rarely if ever obtained, and any method which promises improved function and lessens disability must be welcomed. The Lorenz operation has the merit of great simplicity and relative freedom from risk; and in view of the good results reported by many surgeons, and the ease and safety with which it can be performed, it may come more and more generally into use.

The most difficult problem of all is furnished by the bilateral adult cases. Hey Groves has made an arresting suggestion in this connexion: He says:

"The main reason which makes the bilateral case come for treatment is pain. This will be relieved, if one side can be reduced even though this side becomes almost ankylosed. But

if one side is reduced and the other left, the patient will have legs of such an unequal length that she becomes more lame than ever. This difficulty may be overcome and the operation of reduction made much easier by the following device: The femur is exposed through an anterior incision, and cut through transversely just below the small trochanter. The upper end of the femur can then easily be brought down, and turned with the head into the new socket. After this has been done, the two ends of the femur will be overlapping by two or three inches. This overlapping part is cut off from the distal portion, and the divided femur united over a bone peg. When the patient has recovered from this operation, she will have the two legs of the same length, and, whether another operation is done or not, she will be quite freed from pain, because on one side the body weight will be transmitted directly on to the femur. In actual practice, the only patient for whom I have done this is now at full work as a factory hand, and has not thought it worth while to have her second hip operated upon."

If it be true, as Hey Groves says, that once the femur has been divided transversely just below the small trochanter the upper end of the femur can easily be brought down and turned with the head into the socket, why not employ this method even in unilateral cases? It would seem to dispose at once of the problem of getting the head low enough to effect reduction, and thus other means of overcoming the obstinate resistance to the descent of the head, such as preliminary traction and division of resisting soft parts, could be dispensed with. The objection that in unilateral cases there would still be inequality in the length of the limbs could be overcome by performing a second operation to shorten the limb on the unaffected side. To me it seems that the suggestion made by Hey Groves possibly puts the whole subject of dealing with the older cases on an entirely new basis.

REFERENCES.

- ¹ Davis: *Amer. Journ. Orth. Surg.*, 1904, February.
² Taylor: *Ibid.*, 1904, February.

BACILLUS COLI INFECTIONS.*

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EVERY clinician who works with children must be well acquainted with *Bacillus coli* infections of the urinary tract because the condition is a common one, especially during the earlier years; but as pyelitis can only be diagnosed with certainty by an examination of the urine it is difficult to form any estimate of the exact frequency of such infections. The symptoms are often misleading, so that the urine is not examined, and in less severe cases the diagnosis must be missed many times for each occasion on which it is correctly made. The unwary and the inexperienced, who have not pyelitis in mind and who neglect to examine the urine of small children, must fail to identify the infection; even the watchful and experienced do not always find the diagnosis easy, for the collection of a satisfactory specimen of urine may take days even under the best conditions in hospital. In dealing with girls a catheter specimen is essential, since there is a great risk of contamination of the urine passed naturally; the difficulty of collecting a sample of the urine of male babies is less, but may require both skill and patience. What is difficult in hospital is but seldom attempted in general practice, and here it is quite exceptional to find that the urine of a small child has been examined.

The typical urine is pale and opalescent, the appearance being unaltered by the addition of acid or alkali; there is at least a trace of albumin present, and under the microscope pus and *B. coli* are seen. But there may be no such gross bacilluria as to produce opalescence, and the quantity of pus may not be great, so that to naked-eye examination the urine appears normal. In such cases a correct diagnosis can only be made by a careful microscopic examination. It is hardly necessary to add that a culture of a fresh specimen of urine is always advisable.

*Read in opening a discussion in the Section of Diseases of Children at the Annual Meeting of the British Medical Association, Winnipeg, 1930.

During recent years the whole subject of urinary infection has been invested with a new interest since Chown and others, working from the pathological aspect, raised important questions of the etiology and pathology of the condition. These questions are of more than academic interest, for, if the pathologists are correct, the clinician must revise his ideas of both etiology and pathology, and will probably have to modify his prognosis and treatment.

Clinical Aspect.

This infection may occur as early as the first week of life; indeed, some cases have recently been labelled congenital. It becomes more common at a later date, and only begins to diminish in frequency after about the eighth year. In the earliest cases boys and girls seem to be almost equally affected, but at the age of 1 year the girls already outnumber the boys, and as the years pass the preponderance of girls increases. These facts are pretty well established clinically, although the more recently published figures suggest that the incidence among boys is not so much less than among girls. Authors differ considerably in their estimates of sex incidence.

The figures from the Birmingham Children's Hospital show: under 2 years, 47 cases; boys 7 (17.5 per cent.), girls 40 (82.5 per cent.); deaths 7 (all girls). From 2 to 12 years, 70 cases; boys 18 (25.7 per cent.), girls 52 (74.3 per cent.); deaths 2. These figures deal with the diagnosed cases—probably the more severe cases which needed hospital treatment; even in these more severe cases the mortality is only 9 in 117, or 7.7 per cent.

Chown has made interesting suggestions to explain the disproportionate number of girls. He says that the diagnosis of pyelitis, and its inherent suggestion of an ascending infection, renders girls more often suspect, so that their urine is more often examined than that of boys in whom the condition is not expected. Further, since a girl's urine is liable to contamination from infections of the vulva, etc., a number of spurious cases of pyelitis are added to the real ones, and so the number of cases occurring among girls increases, while in boys whose urine is unexamined the condition is missed. It is hardly likely that such mistakes can have affected my figures much, because the staff of a children's hospital are alive to the fallacies as well as to the facts of urine examination in children, and the urines to be examined are almost invariably catheter specimens, at least in girls.

Symptoms.

Cases may be classified as acute, subacute, or chronic. The acute case often commences with a rigor or convulsions and high fever, and general disturbance which may be so severe as to suggest meningitis or pneumonia; the child is obviously ill. Sometimes vomiting or gastrointestinal disturbance is a marked feature. In slightly less abrupt cases headache, backache, and general illness may suggest a typhoid or some similar infection. These acute symptoms are relatively common in the younger children and make the diagnosis particularly difficult and uncertain until the urine has been examined.

In older children the symptoms of pyelitis tend to be less puzzling, and constitutional disturbance is generally less severe. An abrupt onset is still common, but in the majority of these cases there is some local symptom, such as tenderness in the loin, frequency of micturition, or some discomfort in passing urine to point to the correct diagnosis. Still, many cases are obscure at the onset, and where vomiting is a feature the child may present the picture of a profound acidosis when first seen. At times an increased respiration rate may suggest pneumonia. Malnutrition and anaemia may set in rapidly, and occasionally jaundice complicates the diagnosis. Malaise, rather vague aches and pains, and moderate fever may suggest rheumatism, or abdominal discomfort and tenderness may lead to a mistaken diagnosis of appendicitis or abdominal tuberculosis. Indeed, there is scarcely any mistake which cannot be made in regard to these children.

Many of the chronic cases show surprisingly little constitutional disturbance. The patients are, perhaps, restless, imperfectly nourished children, who tend to be nervous;