



THE PELVIC ARTICULATIONS.

A CONSIDERATION OF THEIR ANATOMIC, PHYSIOLOGIC,
OBSTETRIC AND GENERAL SURGICAL IMPORTANCE.*

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The first paper on this subject was published by me in conjunction with Dr. Robert B. Osgood¹ in May, 1905. A second paper now seems justified, since as the result of a larger experience many features of the subject are better understood, and it is possible to write with greater definiteness than was the case two years ago.

In the first place, in the consideration of the subject, it is to be remembered that the pelvic articulations are true joints and that in normal health, entirely irrespective of age or sex, motion is a definite part of their function. In the next place, it should be remembered that because of the character of these articulations, being flat bone surfaces brought together with oblique or vertical axes, their stability is dependent on the tone and character of the muscles and ligaments. This being the case, and it being recognized that all of the strong trunk and abdominal muscles, as well as the muscles involved in the movements of the thighs, are attached to the pelvic girdle, it is evident that anything that interferes with the stability of the pelvis, or that which represents the structural base, must interfere with the normal use and development of the muscles attached to it. The converse of this is equally true, and anything that interferes with the normal use or development of the muscles in this region must result in weakness and lack of stability in these joints, so that after the condition has once started a vicious circle exists, the full significance of which must be recognized if the various features are to be understood and the appropriate treatment given. This, together with the effect which the unstable pelvis, associated with the weakened trunk muscles, must have on the support and function of many of the abdominal organs, is to be recognized, and should, it seems to me, be given special emphasis in a paper presented before this Association.

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ANATOMIC CONSIDERATIONS.

From the anatomic point of view the joint between the pubic bones is vertical in its axis, the bone surfaces are narrow, and the muscles are so placed that they can give but little direct support, while the ligaments are such that great strength or stability is impossible. It is well known, as was shown in the previous article, that the pubic bones are frequently entirely absent, and that full activity, even to uncomplicated pregnancy, is possible under such conditions. On the other hand, the joints between the sacrum and ilia are broad and flat, with strong ligaments and muscular attachments, so that in their anatomic formation strength is at once apparent. The axes of these joints are oblique, in two directions inclining upward and outward, as well as forward and outward, a fact that naturally adds strength, but which is also of much importance from an obstetric point of view. It is evident from a thorough study of these joints that the stability of the pelvic girdle depends almost entirely on them and that motion at the pubes is practically impossible except as there is relaxation or motion at the back. The motions which are normal and which should exist at all ages and in either sex, unless some pathologic condition or congenital defect be present, consist at the pubic articulation in simply an up-and-down play, this being markedly exaggerated in certain physiologic conditions, but only as there is a corresponding exaggeration at the sacroiliac joints. In these latter joints the normal motion consists in the tilting of the sacrum on the ilia (or the ilia on the sacrum), the motion taking place on a transverse axis situated about in the middle of the sacrum. Because of the position of this axis it is obvious that as the upper part of the sacrum moves forward the lower part moves backward, and vice versa.



PHYSIOLOGIC CONSIDERATIONS.

The effects of certain physiologic conditions on these articulations is of importance. In pregnancy a definite, and commonly a measurable, relaxation takes place as a normal feature, and while this becomes more marked toward the end of the term, it may nevertheless be present during the entire period and be so marked as to cause great disability.

Not only is this true, but there is probably a physiologic relaxation at every menstrual period, which from a physiologic point of view represents a miniature pregnancy. This is naturally not very marked under ordinary conditions, but it may be enough to cause considerable disability as well as explain many of the back-aches common at that time. The relaxation is certainly definite enough to justify the more careful avoidance, at such times, of those activities that would cause strain of these articulations, than would be necessary under other conditions.

Not only should these two conditions, that of the relaxation in connection with pregnancy and with menstruation, be recognized, but it is probable, after the study of a considerable number of cases in connection with the gynecologists, that any disease of the pelvic organs in which there is much circulatory disturbance may be followed by this same reflex relaxation of the pelvic joints.

While this is probably true, the converse of this is also true, that if the pelvic joints become relaxed as the result of accident or disease, the lack of stability of the pelvic girdle, with the resulting weakening of the support of the pelvic organs, leads to congestive disturb-

ances in these organs, and as this in turn probably acts on the joints, there exists, until the proper treatment can be instituted, a vicious circle of cause and effect.



OBSTETRIC CONSIDERATIONS.

From the obstetric point of view the pelvic joints are of importance, and recognizing that there is motion in these joints and that during pregnancy this motion is increased, a knowledge of the character of the motion is desirable.

The most important feature is the tilting or movement of the sacrum on the ilia (or the ilia on the sacrum), and because of the double obliquity of the axes of the joints between these bones, it is necessary, if the sacrum is moved backward at the top, that not only should the antero posterior diameter at the brim of the pelvis be increased, but the lateral diameter must also be increased. As, however, all of these motions are made on the transverse axis through the middle of the sacrum, it is necessary that, as the bones are moved in such a way that the diameters at the brim of the pelvis are enlarged, the diameters at the lower portion, or the outlet of the pelvis, must at the same time be reduced. If this motion be reversed so that the sacrum moves forward at the top the diameters at the brim are all narrowed, while those at the outlet are correspondingly increased.

The importance of the possibility of modifying these diameters is at once apparent, and the ease with which this can be accomplished should be understood. Pressure on the end of the sacrum forces the lower part of this bone forward, thus narrowing the diameters below, but enlarging those above. Pressure over the base of the sacrum or over the low lumbar spine forces the sacrum forward, thus narrowing the diameters above, while at the same time enlarging them below. Under ordinary conditions the amount of pressure necessary to accomplish this is easily compatible with that which could be borne by the patient and which could be applied by the accoucheur.

It is still further to be remembered that as all of the trunk and abdominal muscles are attached to the pelvis, these muscles can be of little assistance at the time of delivery if the pelvic relaxation is much in excess of normal unless some support is applied that will prevent this undue motion and make the basal attachment of these muscles secure. To accomplish this a belt carried around the body over the trochanters and sides of the ilia is the simplest and most practical form of support.



GENERAL CONSIDERATIONS.

When once it is recognized, in the consideration of the pelvic articulations, that we are dealing with true joints, it is evident that they are liable to the same disease conditions as are the other joints. That a tuberculous process may be present has long been recognized; but beside this, any of the non-tuberculous affections, the infectious arthritis, the atrophic arthritis, the hypertrophic arthritis, or the malignant diseases, may be present, the symptoms depending on the special disease present in the given case.

Not only are these articulations liable to disease, but because of their character, they are more liable to injury than any of the other articulations. Their obliquity, the lack of bony projections or formations that would tend to prevent strain or injury, such as the shape of the acetabulum in the hip joint, both emphasize the fact that the stability of the pelvis depends almost entirely on the ligaments and muscles. This being the case, anything that leads to loss in the tone of these structures renders the joints more liable to strain, and explains the frequency with which these conditions are met.

The simplest type of trouble consists of the strains of the sacroiliac joints which result from postures such as stooping, standing, lying, or sitting. In stooping, the muscles at first protect the joints, but as they tire, the support is then thrown on the ligaments, and if continued leads to sufficient strain of these structures to produce discomfort. This is usually instinctively relieved by stretching, in the act of which the lumbar spine is drawn forward or hyperextended, and the sacrum, moving with the spine, is drawn into its normal position, and the strain relieved.



In long standing the joint strain is similarly produced, except that the line of strain is downward, and is relieved by change of position, in which other muscles are used. On lying down in the supine position, or dorsal decubitus, strain of these joints is also possible, the spinal muscles soon tire, and as they relax the lumbar spine sags. With this downward movement of the spine the upper part of the sacrum is drawn downward also, the movement with reference to the pelvis being backward at the top or base and forward at the tip. If this position is continued for any length of time the drag on the ligaments results in distinct strain, with the common backache. This is naturally seen most markedly where, as the result of the large size of the buttocks or other physical peculiarities, the amount of depression of the spine, with the consequent drag on the sacroiliac ligaments, is greater than the average. It is also more marked when for any reason the support and protection of the muscles is more completely eliminated than is usual with simple recumbency. In this way the common postoperative backache is to be explained, the complete relaxation of the muscles from the anesthesia allowing the maximum amount of sag, together with the fact that at such times the patient usually lies on a hard, unyielding table, without opportunity for the buttocks to settle into it as they do, in varying degrees, into the mattress or surface of the ordinary bed. It is also in this way that the troublesome backaches occurring in connection with the acute sicknesses are to be explained, where as the result of the general disease the muscles are more relaxed than normal, while at the same time the position is commonly on the back.



A similar condition of strain results from long sitting, especially if the body is not held reasonably erect. The common lounging attitude in sitting, if continued, results in strain entirely similar to that seen in recumbency, and explains the backache seen under these conditions, especially common after long car journeys, the common car seat predisposing to such attitudes, while the few opportunities for change of position assist in favoring this strain.

In all of these conditions which have been described the symptoms are due simply to strain of the joint structures. No actual injury has taken place, and as soon as the position of strain is corrected the symptoms disappear. If, however, the position of strain is continued, the ligaments either give way, allowing the bones to become misplaced, causing a true sprain, or gradually become relaxed, producing greater instability of the joints, with or without misplacement of the bones, but always causing weakness and instability. In this latter type the condition can best be described as a chronic strain.

Of these two types, the first is most often seen in the so-called "stitch" or crick in the back, coming on after long stooping or standing in awkward positions, or in lifting or straining, especially where the load is suddenly increased. Under these conditions the sharp, sudden pain, usually referred to the lower part of the back and frequently definitely to one of the sacroiliac articulations, is due to the rupture of some of the ligaments of these joints, and as this allows a greater range of motion than is normal, a partial luxation at times results. In this there is, of course, very rarely an entire separation of the apposing articular surfaces, a complete dislocation, but the bones slip enough so that their normal relation is disturbed, with a corresponding disturbance in the normal function of the part. Frequently this is corrected simply by the muscular effort in assuming the erect position, but at other times the irregularities which form the surface of the articulation are caught in the irregularities of the surface of the apposing bone, and voluntary correction becomes impossible.



Because of the character of these articulations it is evident that if one joint is injured each of the other joints must be somewhat strained, so that the disability resulting from even a slight luxation of one of the sacroiliac joints at times is very great. The attachment of the thigh and trunk muscles to the pelvic bones explains the great disability that may result from such an injury.

In such an injury not only are the joint structures injured or strained, but the large nerve trunks which cross this articulation in front are frequently strained or irritated with resulting symptoms. Anatomically the sacral plexus with some of the branches from the lumbar plexus cross just in front of the synchondroses, and this being the case, it is not difficult to understand the fact that irritation of these nerves is possible. The symptoms resulting from such irritation naturally vary, depending on the special nerve irritated and the degree of irritation, but it must be remembered that the pain or disturbed sensation will be referred to the distribution of the nerve irritated and not to the seat of the injury. In this way the so-called referred pains, the areas of anesthesia or hyperesthesia so often seen, or the obstinate sciaticas, are to be explained, and the hopelessness of treatment applied to the seat of the pain is evident.

The displacement most often seen is backward of the upper portion of the sacrum on the ilium. In the acute injuries or disease conditions this is usually seen only on one side, while the chronic strains or the cases in which there is long-standing relaxation the displacement is usually on both sides, resulting in the flat back seen commonly in these cases. With the acute cases, while the usual displacement is of the sacrum backward, the reverse of this is possible, the upper part of the sacrum being drawn forward on the ilium. It is also probable that in rare instances, especially as the result of falls from heights striking on the feet, that the sacrum is forced downward, so that the ilium is made actually higher, with the apparent shortening of the leg. It is in these cases of injury or of disease on one side that the lateral deviations of the trunk are seen. It is also in these one-sided lesions in which the referred pains are met most frequently. In the chronic relaxations apparently the changes take place so slowly that the nerve trunks become adjusted to the changes as they



take place, so that referred pains are less common. It is to be remembered that the displacement of the bones which results in this nerve irritation may be produced by disease of the joints or by traumatism, and in either the pain may vary from slight twinges to most intense suffering. If the irritation is continued for any length of time the muscles supplied by these nerves may become atrophied, a fact that frequently shows by measurement, but which is very noticeable to the feel.

In the pelvic joints as in the other joints it is to be remembered that the joint weakness which results from the common injuries or long continued strains predisposes to disease which probably would not develop otherwise. This is undoubtedly true of any of the infectious processes, either the tubercular or the non-tubercular, and it is certainly true that continued strain or injury leads to the development of the hypertrophic arthritis (osteo arthritis), which in many instances results in the complete ankylosis of the joint.

Of the special disease conditions most often met in these joints, the infectious processes are the most common, and of these the tuberculous is less frequent than the non-tuberculous. Of the non-tuberculous infections, any of a large number of organisms may apparently produce the local conditions, being part of a poly-articular process or confined entirely to this region. The course of the disease in the given case must naturally depend on the particular organism that is present or on the degree of virulence shown by this organism. The symptoms may be mild, with no ultimate impairment of the joint function, or they may be very severe, with actual bone destruction, with much suffering, and with much disability.



CONSIDERATION OF THE PELVIC JOINTS IN CONNECTION
WITH THE SUPPORT OF THE ABDOMINAL AND
PELVIC VISCERA.

The importance of the stability of the pelvic joints in connection with the proper support of the abdominal and pelvic viscera has been mentioned earlier in the paper. It is, however, my wish at this time to emphasize this feature more definitely, since an understanding of it suggests the explanation of many conditions about which there has, at least, been uncertainty, and at the same time suggest treatment for the relief of symptoms now not satisfactorily controlled.

The viscera are held in position naturally by ligaments or structures which, while perhaps not so designated, are nevertheless ligaments in point of practical function, by muscles, and by the direct support which one organ from its bulk or structure may give another. In the first place, of these the muscular support is undoubtedly the most important. The tone of the ligaments naturally depends largely on the tone of the muscles, since that which stimulates one must stimulate the other, and also because that which lessens the muscle tone leads to increased strain on the ligaments, this in turn, if continued, leading to weakness of the structures strained. In the second place, the muscles are of importance not only by furnishing firm abdominal walls, thus preventing the sag of the viscera and leading to the weakness and relaxation of the ligaments, but are of quite as much importance in making it possible to hold the body in such attitudes that there is the least possible tendency to visceral sag with the ligamentous strain. It is evident at once that when the body is erect with the muscles in good tone, in which the abdominal walls are firm and comparatively flat, that the viscera,



the stomach, the liver, the intestines, the kidneys, in fact all the viscera, are causing the minimum amount of sag and producing the minimum amount of ligamentous strain. It is equally evident in the attitudes seen invariably in those who are poorly developed that there must be more drag on the ligaments, with consequently an increasing tendency for this drag to become more marked. The mere character of the attitudes, all of which are attitudes of muscle fatigue and in all of which there is the droop of the body forward, the organs sag more and drag forward, pulling directly away from their attachments. With the body erect and being held, as so many of these organs are, against the spine or back of the abdomen, this wall actually holds them in place to a certain degree, entirely apart from the ligamentous support, so that the amount of ligamentous strain is comparatively slight.

If this is true, and there can, it seems to me, be little question if the subject is carefully considered, especially if at the same time the results of the ordinary treatment of the loose or misplaced viscera are also considered, then the condition of the general muscle tone becomes of more importance than has been commonly held. It must be remembered that strain, relaxation, or disease of the pelvic joints must be followed by weakness and relaxation of the muscles attached to the bones making up the pelvis. It must also be remembered, as has been previously explained, that weakness of the muscles attached to these bones necessarily leads to weakness of the pelvic joints, so that strain and relaxation frequently take place.



If these two conditions are recognized, so that in whatever treatment may be decided on, whether surgical or medical, the stability of the joints is also recognized and appropriately treated, I fully believe that there will be a much smaller number of patients, than exist at present, who are unrelieved even after long and often heroic treatment for conditions in which the viscera are loose or misplaced. I do not naturally believe that the joint condition is responsible for all of the cases of visceral displacement and relaxation, with all their neurosthenic manifestations, but I do believe that either condition may lead to the other and that when once started there exists a vicious circle of cause and effect which makes it difficult to relieve unless both are recognized. Joint support and improvement in the muscle tone may not alone relieve the many symptoms present in such cases any more than does surgery by itself often relieve such cases, but if the problem is faced from both points of view I believe most fully that unless some actual disease is shown to be present (which, of course, is rarely the case), the relief of this large class of patients is simple and definite, and will not in the future represent the reproach to the profession that it does at the present time.



SYMPTOMS.

The symptoms on which a diagnosis of disease or weakness of the pelvic joints is to be based vary considerably, but certain ones are practically always present, and if properly interpreted should make its recognition easy. The most common symptom is the limitation of motion, and this in itself is usually very suggestive.

Pain.—Aside from the limitation of motion, pain, which may be localized at the seat of the disease or referred to the leg or foot, is the most important symptom. The referred pains may extend the length of the leg or may be referred to definite areas in the upper or lower leg or the foot. They are definitely increased by mo-



tions which result in strain of the affected joints, but are not increased by pressure along the course of the nerves, as would be true with a neuritis. The pain is almost always worse at night, because of the strain on the pelvic joints which results from recumbancy, but is relieved by changes of position which overcome this strain, and is prevented by postures in which this strain is not present. In the day time it is not apt to be present unless the joints are strained, as may result after long sitting, standing, stair climbing, stooping, etc. It is always worse in one leg, but may be present in both. The local pain when present may be referred definitely to the sacroiliac joints, but more often to the sacral region. This is made worse by anything that results in strain of these joints, and in women is worse at the menstrual period, because of the increased mobility of the joints at that time and consequently the greater possibility of joint strain. Recumbency, long sitting, or standing increases the pain because of the strain of these joints possible at such times.

With children the pains usually take the form of leg-ache or backache, rarely being acute, and while they may be present during the day and interfere with the normal activities, they are almost always present at night, awakening the child, and are often supposed to be growing pains or confused with the night cries and pains met with in disease of the spine or hip.

Swelling.—At times, usually in connection with the infectious processes, the sacroiliac joints are swollen sufficiently so that the swelling is visible and can be palpated. The character of the swelling will depend on the nature of the lesion. If tuberculous, there is usually considerable infiltration of the tissues without definite fluctuation, unless the process is so far advanced as to result in abscess formation. With this there is also to be expected considerable atrophy of the buttock, and this, with the history and slow onset, is usually enough to make the nature of the process clear. With the non-tuberculous processes the infiltration is less, and there can sometimes be made out a distinct sense of fluctuation. The muscular atrophy is slight, and this, together with the more acute onset and the usual involvement of some of the other joints, should make differentiation possible.



Abnormal Mobility.—While in lesions of the pelvic joints there is almost invariably limitation of some of the motions, there also, in certain cases, is an increase of the normal motion. This increase will naturally be seen chiefly in the cases in which, as the result of long continued strain, the joints are much relaxed. To determine this various tests may be made. Forced hyper-extension of the thighs, one at a time, thus moving the ilia on the sacrum, may be sufficient. At other times with the patient standing, if one hand is held over the sacrum and the pubic bones are held between the thumb and finger of the other hand, and the patient now raises first one knee and then the other, the motion is often quite distinct. Again if the crests of the ilia are grasped with the two hands, the thumbs resting on the sacrum, and the patient raises the legs as above, the mobility is also often apparent. Another method is to have the patient lie down and raise first one leg and then the other with the knee straight. With one or all of these the mobility is usually apparent, but it is to be borne in mind that while there is an abnormal amount of motion under certain conditions, there is also in these very cases under other tests, definite limitation of motion.

Attitudes on Standing or Walking.—Disease or weakness of the sacroiliac joints frequently results in peculiarities in the use of the body that are suggestive. When standing, the body is usually inclined away from the joint chiefly affected. In rising, the spine is usually held rigid, and the hands are frequently used for support. In stooping, the flexion of the trunk is avoided. In walking, the motions are made guardedly if the condition is at all acute, or if the joints are much relaxed the gait is rolling or even waddling as the result of this pelvic instability. If the condition be acute, a long step in walking is impossible, owing to the spasm of the hamstring muscles, produced where the knee is straightened with the thigh flexed. In lifting the weight with the knee bent, as in stair climbing or rising from the sitting posture, the discomfort is increased, and the hands are frequently used for support.



Limitation of Motion.—In any event, if the sacroiliac joints are strained or diseased, motion of the body which causes strain of these joints is limited involuntarily, as is true in the disease of other joints. With the sacroiliac joints, the limitation may show by motions of the body on the thighs or by the motions of the thighs on the body. In the first place, forward bending of the body with the knees straight will be limited if the lesion is one of any magnitude, since as soon as the hamstring muscles become tight, the motion which up to that point had been made largely in the hip and spine is then made by the sacroiliac joints and the spine. When this point is reached the spinal and trunk muscles contract reflexly to protect the irritated joint, and the motions are restricted. To determine whether this limitation of motion is due to disease of the spine or to the sacroiliac joints, the tension of the hamstring muscles should be released, and this is most easily accomplished by the patient being allowed to sit, and in this position the same motion tried. If the spine is involved the limitation will be present in this test as when standing. If the sacroiliac joints are at fault, however, the bending will be much more free, since with the hamstring muscles relaxed, the forward bending is performed almost entirely with the hips and the spine, the sacroiliac joints under such conditions being used only in the extremes of motion such as are rarely made. While the forward bending is limited when the patient is standing, the lateral bending is also limited. In this, as one side is usually more affected than the other, the bending to one side may be more free than to the other, and not only is this more free but it is usually made with different segments of the spine. While with the forward bending the change from standing to sitting makes a very noticeable difference in the motions, in the lateral bending this difference is not as marked, since in this the hamstring muscles play but little part. In backward bending the motions are usually guarded, while in the extreme cases the body may even be drawn forward so that it is not possible to assume the erect position, and under these conditions backward bending would naturally be entirely impossible.



Thus far in the consideration of the motions, the thighs are made the fixed point, and not only this, but the tests are made with the joints carrying the body weight. These same motions can be tested without the latter feature being present, by having the patient lie down and the thighs held fixed. In this way, if lying on the back, the forward bending can be tested by raising the body, and when on the face the amount of backward or lateral bending can also be determined.



After these tests have been made the leg motions should next be tried, the body, in this, becoming the fixed point. The knee motions should be free and with the knee bent, the hip motions should be free and without pain except when the disease or lesion of the joint is very acute, at which times the extremes of motion, especially outward rotation with abduction, may be associated with pain referred to the sacroiliac joints. In making these tests, while the hip motions are free as long as the knee is flexed, if the knee be straightened and then flexion of the thigh is attempted, the limitation will be definite. In this position the hamstring muscles are stretched, and since these muscles are attached to the ischia, then any motion made in which they are tense as in the straight leg raising, will result in the innominate bone moving with the leg and in this way the motion and possible sensitiveness to the sacroiliac joints will be developed. In any case in which there is definite disease or weakness of these joints, the straight leg raising will be limited, and not only is the motion limited, but attempt to carry it farther will develop pain which will be referred either directly to the sacral region or to the legs. In applying this test, whenever there is trouble in one joint, not only will the straight leg raising on that side be limited, but also there will be a similar limitation in the other leg, although naturally not as marked. This limitation on the opposite side is to be explained by the fact that in the motion made with the hamstring muscles tight the ilium on that side is moved, the sacrum naturally moving with it, and as the result of this movement of the sacrum the affected joint, although on the opposite side, is strained. Not only is this limitation of motion present on the side away from the lesion, but the pain which is developed by this same test is referred to the seat of the disease or to the leg on the side affected, so that whether one leg or the other is raised the pain is referred to the one on the side of the lesion. These tests, which should be at first made passively, will be even more striking if attempted actively by the patient.



TREATMENT.

It is not the intent in this paper to enter into a detailed discussion of the various features involved in the treatment of the pelvic joint lesions. The time is too short in the first place, and in the second place there is comparatively little new to be added to that which was described in the earlier paper already referred to. At this time it is the purpose to simply state the principles which should represent the basis of the treatment, leaving the application of these principles to the discretion of the physician who may be responsible for the given case. It must be remembered, and this should never be lost sight of, that the pelvic joints, being joints, differ in regard to their treatment only, as would be determined by their anatomic or mechanical peculiarities. If the joints are being strained, they should naturally be relieved from strain. If they are diseased, the treatment would be such as would be indicated for that particular disease in any of the other joints.

If the condition represents one of strain, whether acute or chronic, naturally the first consideration should be to protect the joints from strain; and, as the strain may be received under different conditions, in standing, in sitting or in lying down, all of these features must be taken into account. Long standing should be avoided, but in standing the body should be held erect so that the proper poise, with the weight through the shoulders,



hips, knees and ankles, is obtained. In sitting the lounging attitudes should be avoided, and, if necessary, a support in the hollow of the back should be used to prevent the sag of the lower spine. In lying, especially in the dorsal position, a support under the lumbar spine should be used also to prevent the sag to the back or sides.

Frequently by relieving the attitudes of strain the symptoms are relieved and the condition is corrected, so that nothing further is needed. At other times, however, while this relieves, it does not correct the trouble, and mechanical assistance for the support of the joints becomes necessary. For this the adhesive plaster strapping applied across the lower back may be sufficient, or belts fitted to give support about the pelvis (avoiding pressure on the crests of the ilia) are often required, while at times more rigid or complicated forms of apparatus may be needed, but only as the simpler forms fail.

In all of these conditions in which the symptoms are due to joint strain which is consequent almost always on the weakness of the muscles, it is to be recognized that, while mechanical supports may be necessary for a time in order to relieve the acute strain, these are nevertheless only palliative measures and do not correct the primary weakness. To overcome this, special exercises (given so as not to cause strain of the weak joints), massage, stimulating bathing, etc., are of the utmost importance and should be continued until every evidence of the weakness has passed.

If the symptoms are due to disease, the nature of the disease should, of course, be determined first, and then such treatment applied as would be consistent with the special disease present. If tuberculosis, the joints should naturally be protected so as to avoid painful use, and for this the stiff jackets are most often satisfactory. If inflammatory processes, due to other organisms than the tubercular, the so-called infectious arthritis, the joints should also be protected so as to avoid painful use, and for this all varieties from simple firm bandages covering the lower body and thighs, to the rigid jackets, may be required.

If the hypertrophic arthritis (formerly called osteoarthritis) is present, the joints should be protected, as is true with the same process in other joints.



At times the symptoms are due to the displacement of the bones, and when this is the case naturally, supports, no matter how perfectly they may be fitted, will fail to give relief. Under such conditions the position of the bones should be corrected, and, as the malposition does not often consist in more than the slight slipping of one ilium on the sacrum or sacrum on one or both ilia, this is not usually difficult and may be brought about in several ways. At times simply hyperextending the spine, as would be produced by having the patient lie with a firm pillow under the "hollow of the back," may, by raising the lumbar spine, draw the sacrum into place. At other times the same thing may be accomplished by having the patient lie face downward with the thighs and legs supported on one table, and the head and shoulders on another, the body hanging entirely unsupported between. In this position the weight of the body drags the spine forward, thus favoring the replacement of the sacrum. If this is successful, the plaster-of-Paris jacket, which may be considered advisable to hold the bones in place, may be applied before the patient is moved.

At times more definite pressure over the sacrum apparently is needed, and for this the frame which is in common use for the application of plaster-of-Paris jackets in the hyperextended position in cases of Pott's disease works admirably. In using this the flexible rods, which conform to the shape of the back, should be bent with a sharp curve low down, so that the greatest pressure is on the upper part of the sacrum and the low lumbar spine. In this position the weight of the body tends to force the sacrum forward, with frequently sudden marked relief as the bones slip into place. While in this position, the plaster-of-Paris jacket should be applied, the steels being removed when the jacket is thoroughly hard.

If these procedures are not successful, an attempt should be made to manipulate the ilium on the sacrum and thus effect the replacement. For this the patient should lie on the side, and with one hand gripping the ischium, while the other holds the iliac crest, the bone is moved on the sacrum either forward at the top or the reverse, depending on the character of the luxation.



In case none of these methods are successful, an anesthetic should be used so that the muscular relaxation is complete, and an attempt then made to overcome the difficulty. For this either of the above procedures may be used, but that which is most reliable consists in flexing the thigh, with the knee straight, so that the hamstring muscles are tight, to at least a right angle with the straight line of the body. If the displacement of the sacrum is backward, this manipulation will result in slipping the ilium backward on the sacrum and consequently into place. If the position of the bones is reversed the patient should lie on the face or side, and the thigh is drawn backward, the innominate bone moving with the femur because of the attachment of the Y ligament, so that the ileum is moved forward on the sacrum.

After the bones are once in place, they should be held by means of some fixed support, and for this purpose the plaster-of-Paris jacket is probably the best. This should be fitted well down over the buttocks and the trochanters, so that the pelvic bones, as well as the spine, are held.

Naturally from what has been said earlier in the paper, if disturbances of the pelvic or abdominal organs, such as could cause reflex relaxation of the pelvic joints, are present, these should be corrected before that which could more properly be called the joint treatment is undertaken.



PROGNOSIS.

The length of time required for treatment in a given case depends on many things. In a wrench or strain without much displacement of the bones, strapping for three or four weeks followed by a belt for a few weeks longer may be all that is necessary. If the condition still represents an injury, only more severe, the treatment must be kept up for a longer period, the duration and the completeness of the fixation depending on the severity of the injury. It should always be remembered in such cases that, as the sacrum and ilia are held in place almost entirely by ligaments and muscles, without bone sockets or other supports, the treatment should be continued for a considerably longer time and more attention paid to improving the tone of these structures than is considered necessary in other articulations where the ligamentous support is less important.

In the cases in which the symptoms are due to hypertrophic arthritis, tuberculosis or other inflammatory processes, the condition in these articulations should be treated in the same manner as a like condition in any of the other joints. The protection should be more complete than is necessary in the cases of strain, but the form of support is to be determined by the given case.

In the relaxed cases associated with pregnancy the patient may be allowed up with some form of support in three weeks after delivery, and the support should be worn until two or three menstrual periods have passed without trouble. If nursing prevents the menstruation the support should be worn for at least three months.

In some of the relaxed cases associated with menstruation without pregnancy or which are part of a general relaxation, it may be necessary to wear some form of support for an indefinite period.

In the cases in which the weakness has been associated with menstruation, or in which the weakness has followed pregnancy and gone on untreated, in case pregnancy should again occur, if the bones are properly supported during that period, benefit will result. The acute congestion of the joints occurring at such a time will act, as acute congestion in other chronic joint conditions acts, to stimulate more complete and more rapid repair.