

CONCLUSIONS. 1. In uncomplicated cases of tuberculosis the average number of red cells is normal or above excepting during a short time prior to death.

2. The hemoglobin percentage averages about 85 per cent. excepting during a short time prior to death.

3. The red cells exhibit an increased resistance to the hemolytic action of salt solutions, this resistance, as a rule, being increased directly as the progress of the disease.

4. Resistance to hemolysis will probably be found of diagnostic value.

5. The prognosis becomes less and less favorable as the hemolytic index falls.

6. The hemolytic index and lymphocyte percentage bear a direct relationship in prognosis.

7. The total white count increases directly as the disease progresses.

8. In most instances the stage of the disease, in uncomplicated cases, can be more or less accurately determined by the total white count.

9. The polymorphonuclear neutrophiles have but little if any phagocytic action in this disease.

10. A high polymorphonuclear percentage makes a bad prognosis.

11. It is strongly probable that the lymphocytes are markedly phagocytic in tuberculosis.

12. A high percentage of lymphocytes is a very favorable prognostic index.

13. The following blood findings are positive proof of improvement in any given case: (a) Decreasing white count; (b) falling polymorphonuclear percentage; (c) rising hemolytic index; (d) rising lymphocyte percentage.

14. Blood examinations should be made coincident with every physical examination, otherwise the physician misses most valuable information relative to his patients condition.

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## RELAXATION OF THE SACRO-ILIAC JOINTS AS A CAUSE OF SCIATICA AND BACKACHE:

WITH NEW POINTS IN THE DIAGNOSIS.

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SACRO-ILIAC disease is commonly overlooked by doctors. It is considered to be rheumatism, or more commonly sciatica, and is treated accordingly, mostly by salicylates, hydrotherapy, diet,

lithia water, and electricity. It has nothing to do with rheumatism or uric acid—it cannot be treated by drugs or hydrotherapy. To apply galvanism to compressed nerves is like pouring water on smoke and letting the fire burn itself out. The disorder is common in all walks of life and in people of all ages, save children; in them it is sometimes thought to be growing pains. Laborers get it and treat it better, and protect themselves against it better than do the well-to-do, who accuse themselves of high living and think they have gout. They frequent spas and baths, where the delusion is kept up by doctors who think the same thing. I have known medical men to have it, and they thought that they had rheumatism, and partook of salicylates and avoided meats, beer, and wine.

A prominent neurologist in the Massachusetts General Hospital recently remarked that hereafter all cases of sciatica should be sent to the orthopedic wards before they were sent to the neurological, since he found that at least 90 per cent. of such cases were really sacro-iliac disease, and not any disease of the sciatic nerve. And that is the cause of most nerve pain, both of the back and legs, I have more than assured myself during the past two years. In this time I have seen twenty cases either of sacral backache or of sciatica that were entirely relieved by treating the relaxed or dislocated sacro-iliac joints. All were due to this condition.

Goldthwait first systematized our knowledge of this affection, and it is right to call it Goldthwait's disease. An acquaintance with the anatomy of these joints is necessary before any abnormality can be discussed. They are true joints, the bones are covered with synovial membranes and bathed in synovial fluid.

When we were quadrupeds, and walked on all fours, the joints were firm and strong; but when we reached a higher scale, and walked upright, these joints became vertical, and therefore more unstable than any others. Goldthwait speaks of this articulation as the weakest part of the body, and rightly.

The joint surfaces are large, irregular, and firmly held in contact by ligaments (the greater and lesser sacro-iliac); and indirectly by the muscles of the back and pelvis. They move during every large motion of the trunk, and relax during labor and during menstruation. Motion of these joints always causes play of the two pubic bones, at the symphysis. Not only is it important to remember the structure, but also the relation of the sacral plexus to the articulation.

The upper two trunks of the sacral plexus emerge out of the sacral foramina and pass directly anteriorly down and outward to the lower pelvis into the leg; the gluteal nerves also cross this joint, anteriorly, and any gross or abnormal disturbance in this relationship of the sacrum and ilia causes either pressure on these plexus trunks or else a stretching of them, and this is followed at once by pain in the distribution of these nerves and disability.

The joints themselves are supplied with nerves, and local pain and tenderness is quite a common symptom of relaxation of these joints, due to arthritic strain. The sacrum moves on the ilia on an axis drawn horizontally through the middle. If the upper part of the sacrum is tilted forward on the ilia, the lower part is tilted backward, and the two ilia spread somewhat laterally. If these motions are abnormally exceeded, we have a condition of strain. The function of these joints is largely that of true but limited motion. The pathological changes are those that commonly affect other joints; simple osteo-arthritis, osteomyelitis (septic arthritis), tuberculosis, gout, carcinoma, and, lastly—and infinitely more common—relaxation or luxation of this joint.

That these joints are liable to strain is well illustrated by anybody who stoops for a long time, either in putting on an auto-tire, or over a bed, or who hoes in his garden. The pain in these joints is vastly relieved by straightening up and overextending the back—in fact, overextension is necessary at times to relieve the strained feeling. The guides in Maine who carry canoes, or who paddle them all day in a kneeling position, forestall any strain of these joints and consequent discomfort by wearing a wide webbing belt around the pelvis. This is true of the common laborers with shovel and pick; they support their trousers by a leather belt about the pelvis, just above the trochanters, and at the same time support their back joints. Iron moulders also wear broad belts as protectives.

There may be simple strain and relaxation of the joint ligaments, with some backache, due to auto riding or travel in cars or on horseback; or from lying in hammocks or soft beds with weak springs; or a subluxation may follow a violent trauma directly applied to the back, or strains during football, or wrestling, or from tripping, or slipping, or lifting. Goldthwait mentions the case of a woman who was invalided for thirty-five years after lifting a basket of peaches high up in the air. She felt something slip in her back and was bedridden for years after. Slouching in chairs is also a common cause, as are incorrect methods of walking. I have seen three hard labors followed by this trouble. Sudden slipping while rising from bed, chairs, or out of a bathtub has been followed by an acute luxation of this joint. It may occur in slender, weak women and children; it may affect the athlete with superb musculature.

Lateral curvature of the spine is apt to cause relaxation of these joints.

The symptoms are, first of all, backache, especially when lying on the back or on stooping, tender sacro-iliac joints, pain in the sciatics or buttocks, parasthesias in the feet and knees; often lameness and even atrophy of the leg or legs; inability to rise out of low chairs and out of bed quickly; resting in chairs or seats with the

back supported with cushions. In women this is worse during menstruation. The uterosacral ligaments insert in the region of the joint, and these become congested during menstruation and cause relaxation. It is a common cause of backache after operations. It may invalid people by reason of the pain.

The diagnosis is established by various manœuvres. First, it is most important to exclude actual joint disease with tissue change. After this, if there is localized pain on pressure over one or both joints, due to acute arthritis, pain in the legs, numbness, tingling in the toes or heels, we must move the joint in various ways. First, have the patient rise, if he can, out of a low chair; if he has the true joint relaxation, he holds his back stiff and does not bend gracefully, but pushes himself up with his arms and finally, with much effort, staggers to his feet. His back may be arched, and he stoops often when standing. An examination of the back—and this must always be done—shows frequently a straight lumbar spine, and not the normal lumbar lordosis. This is found in severe cases among laborers. Merely standing for a long time in a constrained position may cause joint sprain.

Limitation of motion can be shown by getting the patient to bend sidewise from the hips; one side will be more limited than the other if there is a true relaxation or luxation, although Goldthwait has shown that there is rarely unilateral relaxation. Even in bilateral disease one joint is worse than the other and causes most symptoms.

If the patient is laid on his back and the thigh flexed on the body, it is impossible then to flex the leg on the thigh, as in Kernig's test, without causing pain in the sacro-iliac joint on the same side. The hamstring muscles pull on the ischium, and this disturbs the bone relations of the tender joint and causes pain.

Grasping the crests of the ilia and separating them or drawing them together, causing a disturbance in the relationship of the bones of the joint, brings about sharp pain. Goldthwait's test consists in having the patient stand on one foot and then flex the thigh with the leg extended; during this last the surgeon must put one hand over the suspected joint and the other over the symphysis pubis. The latter will move with each motion of the leg. This, Goldthwait says, always occurs in sacro-iliac relaxation. And because there is greater natural mobility of this joint, there is more tendency to the relaxation. These occur *pari passu*. Then have the patient lie face downward on the bed and grasp the foot on the affected side and forcibly hyperextend the leg; this causes acute pain in the joint, and a corresponding limitation of thigh excursion on that side from pain.

I have modified Goldthwait's test by having the patient lie face downward on a table or bed. Then the examiner should slip one hand under the patient and firmly press the pubic bones, at the same time the leg on the affected side should be moved up and

down. Preternatural mobility of the pubic joint caused by the loose and relaxed sacro-iliac joint is easily detected. In this way the mobility of the pubic joint can be found more easily, because the patient is more steady.

Finally, in case of doubt, a radiogram should be taken of the pelvis, and the difference, if any, of the two articulations noted. In general practice it is absolutely imperative that every obscure joint condition, from rheumatism to dislocation or fracture, should be radiographed. This joint is, however, hard to photograph, and artefacts interfere greatly with a positive result.

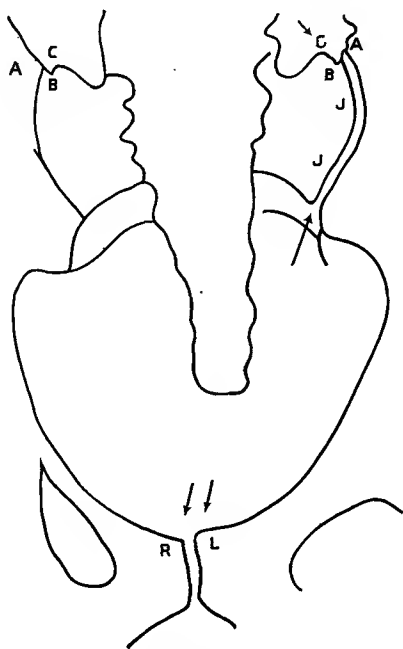


FIG. 1.—Relaxation of left sacro-iliac joint, as shown by the diastasis of the symphysis pubis and the widening of the joint at J J and the difference in the A B C angle in the two sides. Radiograph outlined with ink.

On studying several skiagrams in this disease I found that the pubic bone was higher up on the affected side than on the other in cases of unilateral relaxation. This was more marked than the actual luxation of the ilium or the sacrum. This observation that the whole os innominatum is thrust slightly up and back, the pubic portion of it being the distal end, as it were, of a lever; at this end the motion is greater than at the sacral end.

Relief from pain by posture is often a sign of this disease. Goldthwait mentioned a doctor who could not sleep unless his thighs were tied together. When he slept, if his knees were separated,

his joints relaxed and he had intense pain, because his ilia, being pushed apart by the thighs, caused joint strain at the sacro-iliac junction.

By producing the normal lumbar curve, either by pillows under the back when lying down or by lying face down between two chairs, if there is relief from pain, there is further evidence of relaxation of this joint. Sometimes by palpation the ilium on the affected side may be felt to be too far back or forward by comparison with the opposite one—this is rather a difficult thing to do for the untrained. Frequently in severe cases the patient may be bedridden or limp markedly.

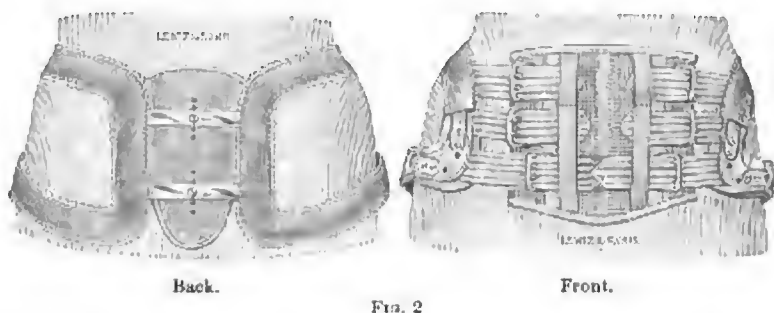
Having then established the fact that the normal joint relationships are disturbed, we must reduce the luxation and keep it reduced. This is accomplished in several ways, first by posture and correction of improper attitudes of standing and sitting. If the case is a slight one, have the patient lie with a pillow under his lumbar vertebræ, or else between two chairs, face downward. The joints, if really dislocated, may require anesthesia and forcible reduction and immobilization with a plaster cast. Generally the application of adhesive straps over the dorsum of the pelvis is sufficient. To do this have the patient stand up and then apply the end of an adhesive strap to the skin, just under the anterior superior spine; then very forcibly apply the plaster to the back, having the patient turn away from the surgeon; put on four straps reaching from the anterior spines down to the top of the trochanter and the top of the intergluteal fold. This generally gives immediate and very gratifying relief. Straps worn for six weeks will often completely cure a very bad case. Sometimes it is necessary to encircle the pelvis. One must be very careful not to have the straps come up too high, or else there will be some tilting of the ilia forward, and more relaxation and more pain.

A wide belt made of webbing nine inches wide, extending from the trochanters up to the crests of the ilia, and encircling the pelvis and buckling in front, gives great relief by immobilizing the joints. Perineal straps are needed in such belts—they are necessary to keep it in place.

Dr. Wm. J. Merrill, of Philadelphia, has devised a very efficient and ingenious brace, which consists of a pad over the sacrum, and shaped like it; it may be compared to a reversed truss with the pad over the back and not in front over the hernial rings. Upon this are four arms that encircle the pelvis to the anterior iliac spine. Two are on either side, and the upper and lower bands meet below the spine, and then the junctions on either side are held by a strap crossing the lower abdomen. These side arms are fastened to the sacral pad by flat springs. This apparatus is covered with soft leather and is easily worn, is comfortable, and requires no perineal bands to hold it in place. In three of my cases it was most efficient;

not only was it of great benefit to the patient, but was comfortable and did not get out of place. To make an accurate fit it is necessary sometimes to make a cast of the back, and then to mould the brace over this cast. It must be remembered that cases are prone to relapse.

The following cases, occurring in general practice, illustrate the various grades of this affection and the various ways of acquiring and of curing it.



CASE I.—J. W., a slender, middle-aged man of slight musculature, suffered much pain in his buttocks, which he thought was neuritis. This pain was aggravated by stooping, especially in putting on automobile tires. His lumbar spine was straight and his sacro-iliac joints relaxed. In putting him in a position of exaggerated lordosis, his pain at once left him. A webbing belt completely relieved him of all pain. He was forbidden to lounge in his office chair, and was ordered to support his back while auto-riding.

CASE II.—T., a tall, slender man, aged fifty years, limped into my office with sciatica. He had been treated for months by salicylates and drugs. His right sacro-iliac joint was markedly relaxed. He never could get out of bed during the past six weeks without help, but when once on his feet was fairly comfortable. By applying a belt and lordosis exercises he was completely relieved in about three days' time, and was cured in a month's time. Lounging in an office chair caused his relaxation.

CASE III.—Mrs. D., a young slender woman, the mother of three children, after the birth of the last—a twelve-pound boy—found that she could not rise out of bed in the morning except her husband lifted her bodily and put her on her feet. Her right joint was markedly relaxed; her backache, especially at her menstrual epoch, was very severe; she was nervous and inclined to be hysterical. Her bed, I found, was a very old spring mattress that yielded to the slightest pressure, and, in fact, where the patient lay was a deep depression in the springs. Her relaxed back came from a very hard labor and lying in a bed that sagged so much that her

sacro-iliac joints, being unsupported, gave way completely. Adhesive straps applied for a month completely cured her.

CASE IV.—Mrs. R., a young slender mother, suffered exceedingly from pain in her back after labor. Her pelvis was normal as to its contents, but her sacro-iliac joints were very tender, and Goldthwait's test caused her some increase in pain. Strapping and bandaging did very little toward relieving her pain—in fact, the only way in which she had any comfort was to lie in bed all day, with a pillow under her lumbar spine. After a year's effort by me, she obtained complete relief at the hands of Dr. Merrill, who applied one of his braces to her pelvis. Childbirth and an unnatural way of holding herself with the abdomen drawn in, in order to have a flat stomach, was the cause of her backache.

CASE V.—Mr. D., a grocer, a large, strong man, suffered much with his back. On examining him I found that he was unable to rise from an ordinary arm chair, without great effort and pain, and after arising he placed both hands over his sacrum and groaned. Various tests soon showed that he had relaxed joints and a very straight lumbar spine. He was in the habit of lifting heavy barrels into his wagon, and frequently suffered from pain in his back for hours afterward. Riding in his wagon on a seat without a back caused him constant pain. After much effort he was finally cured by the exaggerated lordosis posture between chairs. A belt seemed to tilt his sacrum so that his pain was increased; and strapping gave him no relief. He said that the hyperlordosis position gave him the greatest ease and final cure.

CASE VI.—A nurse in the Germantown hospital, a tall, large woman, frequently lifted a patient with appendicitis out of bed to a stretcher. Her back caused her much trouble, so that she was miserable most of the time. She could not with any comfort stand erect, and stooped quite markedly. After a night's journey in a sleeping-car berth she suffered so much from backache that she was unable to rise, and had to be lifted out by the porter and her friends. An extremely straight back and tender sacro-iliac joints were found; she could not lift her extended leg higher than a foot without causing her great pain in the corresponding sacro-iliac joint. A webbing belt worn for a month completely cured her. No doubt the strain of lifting, and the ride in the sleeper in a soft bed, causing the joints to relax more, was the cause of her extreme disability.

CASE VII.—Mrs. G., after a pelvic operation, suffered greatly with sacral backache. She was a neurotic woman, worn out with childbearing and the care of a large family. Goldthwait's test caused much pain in her joints, which were tender to the touch. Her pain was aggravated by riding in trains, and to secure any comfort she was compelled to brace her back with cushions, etc. She had sciatica during train riding, and parasthetic sensations



in her toes. Strapping helped her some—a belt did more; but cure was not effected until Merrill's brace was applied. The relaxation during ether, on a flat table, no doubt caused her joint ligaments to relax and her back to flatten, causing pain by pressure on the sacral plexus, from subluxation.

That sudden and total disability from the luxation of this joint can and does occur is illustrated by the following case:

CASE VIII.—Mrs. A., aged thirty years, mother of one child, had, after labor (a difficult and trying affair), a great deal of pain in her back and along the sciatic nerve on the left side. A completely torn perineum and cervix, and retroflexed uterus, led me to think that her backache was due to her uterine condition. Accordingly, a gynecologist effected a very skilful repair, and for a time the pain disappeared. While lifting her baby out of a crib she was seized with violent backache and sciatica. Examination showed that her left sacro-iliac joint was exquisitely tender, and the ilium on that side projected farther back than did the right one. Various tests all confirmed the diagnosis of subluxation of the left sacro-iliac joint, and she was strapped, then bandaged, with very little relief. Her nights were wretched; she could not turn or move without exquisite pain in her back and thigh. Pillows under her spine helped her somewhat, but complete cure was not obtained until a cast was made of the dorsum of her pelvis and Dr. Merrill, who did this, applied one of his braces, which effected great relief, and finally a cure.

I might enumerate a dozen more cases that I have seen among carpenters, sailors, and laundrymen, all of whom were crippled with sciatica, and who were relieved by postures, exercises, and fixative apparatus. I have demonstrated to people the cause of their disability and probable means of cure by encircling their pelvis with my own leather belt, applied low down and tightly, above the trochanters and over their clothes. All at once said that this simple measure gave partial but immediate relief.

These cases illustrate the futility of treating at least a portion of sciatica cases with drugs or any other measures save orthopedic ones. Having seen within two years twenty such cases in general practice and in hospitals, I am led to believe that true neuritis or neuralgia (idiopathic) of the sciatic nerve is a rare clinical entity. It may be due to reflex causes, such as constipation, pelvic tumors, etc., but it is hard to believe that actual degeneration of the sciatic nerve is a common thing.