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Pathology and Treatment of Sprains.

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By RICHARD O. COWLING, A. M., M. D.,

Professor of Surgical Pathology and Operative Surgery in the University of Louisville.



A PAPER READ BEFORE THE KENTUCKY STATE MEDICAL SOCIETY.

LOUISVILLE, KY.:

PRINTED BY JOHN P. MORTON AND COMPANY

1877



PATHOLOGY AND TREATMENT OF SPRAINS.

The importance of sprains can not be too carefully kept in mind. They are the fruitful sources of lameness; they lead to the destruction of joints; they may be the determining factor in malignant disease; they cut a ghastly figure in the causes for amputation.

The qualification of "simple," which so often accompanies reference to this injury, is a dangerous one, leading to neglect and disaster. It is a matter of experience that useless limbs have resulted from "simple sprains" as often as from those which had been denominated "severe." It was to emphasize this point that Sayre gave the quaint title to his essay, "Sprained Ankle, or the misfortune of not breaking your leg." It may indeed be written of sprain, in language similar to that used by Percival Pott in reference to head-injuries, that there are none so severe that may not be recovered from, none so slight that they may not destroy the usefulness of the limb. Every sprain is worthy of attention, and should receive professional treatment.

The diagnosis of sprains is not always an easy affair. Between them and fracture, or between them and dislocation, it is oftener far more difficult to distinguish than between dislocation and fracture, which is the problem in differentiation generally set for solution. The several varieties of arthritis—simple, rheumatic, and specific—are continually confounded with them, and I at least have mistaken malignant disease for sprain.

Our knowledge of the pathology of sprain (and indeed of the whole subject) has improved much of late years. While not disregarding constitutional causes in the explanation of many symptoms which may arise during the progress of a sprain, we do not take refuge in the diatheses as much as we were accustomed to do formerly. We look

more to the local condition of affairs for a solution of the difficulties. The problem has been greatly simplified.

A number of lesions resulting from a fall or twist may come under the name of sprain. Strictly speaking, the term should be confined to the stretching of the tissues around the joint, the muscles, tendons, aponeuroses, nerves, vessels, and ligaments; but the causes which give rise to this may, and do oftenest, lead to rupture of some of these structures. The articular surfaces may also be involved to the extent of erosion or displacement of cartilages. It must not be forgotten, too, that the stretching of inelastic tissues damages their integrity.

The symptoms following acute sprain are readily accounted for. The weakening of the vessels and consequent congestion, the unyielding aponeuroses, the swelling in a part not fitted to swell, the already injured nerves exposed to continued pressure, plainly explain why it is that a sprain hurts so badly. The damage done to the structures not only by rupture, but simple stretching, not unnaturally may induce an inflammatory stage. The derangement of the exquisite adaptation of the many elements contained in the joint and its motors, made up so much of tissue naturally slow to repair, the extravasations and exudates thrown in such quantity on the absorbents to be carried away, tell why it is that time must elapse before the functions of the joint are resumed. The history of events naturally flows from the primary violence; but there are cases in which the persistence of symptoms is out of all proportion to the damage inflicted at the outset.

Chronic sprain may follow upon acute sprain, or its subacute character may have been so from the first. Violence may not have induced it. A high heel or a run-down boot may cause it at the ankle; and I have seen a painful sprain of the middle finger of a lady gradually set up by the continued lifting of a heavy coffee-pot, all the symptoms as gradually disappearing when an urn was substituted.

The appearance of joints in chronic sprain is quite uniform. They are cold, they are discolored sometimes even to positive blueness, they are swollen, while the limb above is wasted. Swelling, however, is not constant; joints of seemingly perfect shape may be useless. Motion in them is difficult and accompanied with pain. On manipulation tender spots are discovered in the neighborhood. The situation of these spots is pretty constant for the several joints; to the outside

about the insertion of the biceps in sprain of the knee, to the outside and inside forward on the tarsus in sprain of the ankle, etc.

Languor in the circulation is the prominent feature, and the key to most of the conditions. There is malnutrition, local in its origin. Absorption is in abeyance. Plastic deposits resulting in the inflammatory stage, or slowly gathering as the result of chronic congestion, are not taken up. Adhesions are formed. Tendons, ligaments, and aponeuroses are shortened by continued disuse. The bodies of the muscles waste, and then contractility is lost. The nerve-structure has not been repaired. New fibers have been developed in adventitious tissue, and they all alike cry for good blood, and moving blood. With such a condition of affairs loss of function, pain, and tenderness naturally continue.

As violence instituted the acute sprain, prolonged rest is the chief factor in keeping up chronic sprain. We see, indeed, effects closely resembling those of sprain when no violence has been done to the particular part; as in the stiff knee, when the dressings for fractured thigh (far away from the joint) have been used long; the stiff elbow, when the arm has been carried for a while in a sling, it may be, for a wounded hand. And the rest not only accounts for the rust and shortening of tendons, etc., but the vessels about the joint are by nature fitted for the motion they must receive in the movement of the joint, and can not, but to the detriment of their use, be denied this too long. We are accustomed to refer the ill results from sprain from motion too early set up. It will be more convenient to reconcile this theory with the one presented when we come to the treatment of chronic sprain.

One word only as to the constitutional involvement in chronic sprain, and we pass to the consideration of treatment.

That the cachectic condition of very many subjects of chronic sprain is an effect, and not a cause, is well attested. It is not peculiar to this injury that local irritation may at length extend its influence to the impairment of general functions. While struma and rheumatism and syphilis may complicate this injury, and call for specific treatment, they are often blamed for what they do not deserve. The barren results from the use of the oils and iodides on one hand, and the brilliant results from local treatment upon the other, have shown this time and again. Surgery has had some sharp lessons taught it

upon this point from very humble sources. Specific treatment may be called for, and especially tonic treatment, in addition to local measures instituted to restore the natural condition of the joint; but these last are of prime importance.

The means of treating sprains are by immobilization, mobilization, and extension; and mobilization may be sudden and with force, as in the treatment of ankylosis; it may be gradual, and accompanied with friction and "massage;" it may be combined with extension. Beside these there are several adjuvants of treatment, constitutional and local, which can not be conveniently classed.

It will simplify matters if we direct our remarks chiefly to treatment of sprain at the ankle-joint (the seat of most of these injuries), and refer cursorily to sprains in other localities.

The safest treatment for acute sprained ankle is by immobilization.

The history of such a case, when it has been severe enough to cause a physician to be sent for, is generally this: domestic remedies have been tried; the ankle has been bathed in cold water; rags wet with arnica, brown paper steeped in vinegar or liniments have been applied to it; and probably little relief has followed.

The first thing to be done is to elevate the limb upon a pillow, if this has not already been attended to; next, to bathe the foot in hot water, which will generally be found more effectual than cold. It should be of the highest temperature tolerable by the patient, and had best be poured upon the ankle while the limb is still elevated and extended over the foot of the bed. When the foot is dipped into a vessel containing the water, which is the usual method followed, the necessarily dependent position of the limb mars in a great measure the efficiency of the remedy by favoring the congestion, which gives rise to so many of the symptoms to be subdued. During the affusion, which should last twenty or thirty minutes, the foot and ankle are to be stroked upward gently, at first, and with increasing pressure as it can be endured, and the joint moved carefully. It is more than probable that the patient will shrink from this portion of the treatment, but a speedy relief from his pain generally reassures him as to its efficiency, and allows it to proceed. Comparative ease having been established, immobilization of the joint is best secured, I think, by the many-tailed or strip bandage covered by the roller. The strips made of

muslin are wet and applied from the root of the toes to a point eight or nine inches above the ankle. These are covered with a flannel roller carried well up to the knee. We have here a very rational remedy. The heat and moisture continued in the many-tailed bandage, the compression and support offered by this and the roller to the weakened vessels, removing congestion, aiding absorption of the exudates, relieving spasm, and preventing further violence, go directly to the seat of the difficulty.

The patient having been rendered comfortable (a visit to a sprain is likely to consume an hour or so), may be left with directions for an opiate to be taken if from nervousness he can not sleep, and for removal of the bandage, if this from any cause may induce or aggravate pain. Hypodermic morphia or atrophine have been advocated in the outset of sprain. Though I have not used them, I can conceive their use to be beneficial at times.

Sprains of a mild character may be trusted at first to the wet towel, which is a favorite method of treatment, but there are few which do not demand the roller before weight can be borne upon the joint they involve.

Immobilization may be continued by means of the roller, leaving off the wet bandage beneath, after four or five days, when the acute inflammatory stage is passed. It is tedious to keep it up during the period necessary for the cure of a severe sprain, which may last several weeks. It should not be left to the patient or any of the patient's accomplished friends to apply. It is best, therefore, to replace it with plastic apparatus (the happy name given by St. John, of New York, to the various dressings commonly known as immovable). This may be made with any of the stiffening materials in use. It was my custom formerly to make a boot of manila paper strips, which is wonderfully stiff and light; but it is tedious to make them, and of late years I have almost invariably used the plaster-of-paris dressing. The old starch bandage, or flour and egg bandage, or silicate of soda bandage of course will do. The plastic dressing, of whatever it be, must rest on a proper layer of cotton batting. Without this the dressing not only loses its peculiar usefulness, but is fraught with danger. The plastic boot constructed for sprain may gradually be shortened for the convenience of the patient by cutting away the tops until it becomes

a high gaiter, still keeping the ankle at rest. It may be split in front, so that the limb can be removed at pleasure, for the purpose of friction, etc., and secured while on by the loop bandage. The patient, after a few days from the receipt of his injury, may be out on crutches, his foot in a sling-bandage, if necessary, secured around the neck. This may soon be discarded, as the support from the boot allows him, without pain, with the aid of his crutch, or even without it, to bear weight upon the injured foot. Before dismissing this part of the subject, I may say it is a very frequent practice to use the plastic dressing from the outset. I prefer, however, the more direct compressure exerted by the roller in the earlier stages.

The above details apply to a case of "severe sprain," one in which the lesion amounts to actual rupture of tissue, and the immobilization is kept up for its repair. Its severity, as already stated, is not called for in sprains of lighter degree; but it is upon this very point that the great difficulty in understanding sprains exists. I have referred to the point that the most serious results have followed upon simple sprains. The patient had continued to walk upon the foot, it is said, until serious mischief had resulted. It takes something more to explain the difficulty than this, at least if we wish to reconcile it with the experience of those who practice early movement as a cure. I think it will be found to be in this: the person does not walk naturally on the slightly sprained foot. We see that he limps. The movements of the joint are constrained. If the injury has not been severe enough, or the effects have subsided sufficiently for him to take free steps, difficulty is not likely to arise; but if this is not the case, in the half-way manner in which the joint is used, it is actually suffering from the combined effects of prolonged rest and continual irritation. My attention has more than once been called to the fact that immobilization is not absolutely necessary from the first, even in cases of sprain apparently severe, and have caused me to think much upon the means of discovering where the line was to be drawn. Two of my friends got sprained ankle within a day or so of each other, and apparently very severe sprains. One submitted to my treatment, had a plaster boot, etc., and was all right in about a month. The other declined all restraint, rubbed his purple and swollen ankle, walked out heavily upon it, as he said, the day after his accident, and continued to walk in a very short

time without inconvenience. He was a soldier, of vigorous build and indomitable pluck. He told me that the accident had frequently occurred to him during the war, and he had learned from experience that this was the best treatment for him. A man upon whom I had once put a plaster boot for severe sprain told me afterward that it was "next to the best way he ever saw of treating sprained ankle; he had had it several times, and could walk it off if he started in from the first." This man drank freely, and was generally fortified with liquor. A young lady had a sprain frightful to look at, extravasation extending from the instep up to the calf. It did not pain her much, she said; sent for me to quiet her mother's fears. In spite of my lecture upon the danger of neglect, she took off the bandage and put on a shoe the next day after my visit, escaped confinement to do her spring shopping, and had no serious results, nay, no inconvenience. But I confess that I am afraid to recommend such practice; and in joints of the lower extremity which have to sustain weight, must consider that immobilization is the safe practice in acute sprain. If the injury has resulted in intra-articular trouble the experiment would be highly dangerous. I have alluded to early movement as a palliative of pain in sprained ankle. In a number of cases of sprains in the joints of the upper extremity I have relied upon it exclusively. I was led to it, independent of my reading, from the following circumstances: A few years ago, after a sleet, by one of those curious coincidences which occur in practice, three cases presented themselves to me for injury at the elbow resulting from falls. In all of these pain and voluntary immobility were prominent symptoms. In the careful examination and frequent movements necessary to diagnosis at this joint, while I discovered that the trouble was sprain, I saw also that the patients were more comfortable after I had done with them than when I commenced. Immobilization and the continued warmth of cotton-batting, however, is still a most useful way of treating sprains of the upper extremity, and the hot water douche at times invaluable.

Mobilization has no substitute in sprains of a certain character. Passive motion is frequently necessary after a joint has been fixed for a time. The patient's will may not be strong enough for him to make it for himself, and its neglect has often caused the best instituted treatment to result badly. The use of mobilization in chronic sprain is

one of the most brilliant achievements in modern surgery. Practiced ignorantly for a century perhaps by the "bone-setters," at a comparatively recent date a knowledge of its rationale and limits have been determined by the regular profession. Its action at times is magical. The method of the "bone-setters" offers the most striking example of its usefulness. This was ably set forth by an English surgeon, Mr. Hood, in several papers in the *Lancet* five or six years ago, afterward published in a small volume. He had learned it from a Mr. Hutton, one of the most successful practitioners of the kind in England, a man perfectly ignorant of anatomy and pathology, but who had treated successfully cases which had limped for years under the first surgical talent of Great Britain. The principle is the same at all joints, and easy to practice. Hutton's idea was that all joints not plainly inflamed, etc., were "out," and his business was to get them back by manipulation. He prescribed a poultice persistently applied for a week. His manipulation was then done in the following manner: With the thumb of the left hand pressing closely on the tender spot which always exists near a joint in chronic sprain, with the right he performed flexion, extension, and circumduction, or rather a rapid twist. Sometimes after the first, at others after several movements of this sort, a pop is heard. The joint is "in." The patient, who may have been a sufferer for years, experiences immediate relief to a great degree, which is increased rapidly by further manipulation, and is cured in a trifling time. The pop, as explained by Mr. Hood, is the breaking of the adhesions, for which the sudden movements are instituted. With the rupture of these the restoration of the circulation, the adventitious material is absolved, and with it goes the hyperæsthesia. The confidence of the bone-setter in his practice is no unimportant factor in the cure of the patient. Of course he will fail in a number of cases. Success in a few, however, is enough to stamp his procedure as a marvel. Experience teaches the best of them in which variety of joint injury to practice, chiefly those not marked with inflammatory symptoms. I have practiced sudden mobilization in a number of cases, sometimes with wonderful success. A lady treated first with plastic apparatus for sprained ankle, resulting badly, limping for a year, and presenting the usual signs of a chronic sprain, was cured with one movement. A man with trouble in the hip-joint, who was treated for fracture (erroneously),

bed-ridden for several months, was put on his legs again after a month, during which time the movement was practiced half a dozen times. His improvement was well marked from the first. A young lady from Alabama, whom I saw with Prof. Yandell, on crutches for two years from a sprained ankle, returned home able to walk after forcible manipulation under chloroform. These are striking examples which have come beneath my notice. I have failed in a greater number of cases with the twist, sometimes, though not always, succeeding with other methods. Apparently one of the most favorable cases for the practice was in a girl under the treatment of Dr. Roberts and myself for several years. There was nothing about her ankle which indicated that it was unfit for use. She had sprained it, got on crutches, and, as happens with timid people at times, would not give them up. We practiced Hutton's method, heard the cracking, but nothing could induce her to try to walk without support. I made several more sudden movements at subsequent periods, prescribed the massage, which I have seen can not be intrusted to the patient's friends, but failed to get any benefit. She subsequently was put in a plaster boot by Dr. Roberts, and has worn it two years. She has gotten enough confidence to give up her crutches, and go without the boot a few days at a time, and apparently will be restored. The immobilization in this case is not so entire as to preclude all motion at the joint.

It is highly important to remember that the crutch may become a most dangerous enemy. A prominent lawyer of Louisville hobbled for two years on crutches from a sprained ankle; was treated by every method save motion; saw Paget and Nélaton about the matter, and was ultimately cured by Markoe, of New York, who simply took away his supports. He actually walked from the moment they were left off.

Massage is one of the most scientific of procedures for the relief of sprain. Its name and usage in modern times come from France, but the process is older than the Cæsars. Nor are its most brilliant results confined to this injury alone. I had best allow one of its chief advocates in this country to give its definition. In a paper published in the Philadelphia Medical and Surgical Reporter, September 5, 1874, Dr. Douglas Graham, of Boston, says:

"Massage is in its widest acceptation a hygienic and therapeutic agent, consisting not of friction, percussion, pressure, or movement alone, but of a permutation and

combination of all these varied modes of applying force to the surface and underlying tissues of the human body. In its most limited sense it is understood by the profession at large as "rubbing," but its pre-eminently useful maneuver is what the word *massage* literally implies; viz., kneading, pressure with movement, malaxation."

The motion in this plan is done gently, and with the *massage* increases as the patient may stand it. It has been advocated in sprain at all periods, but chiefly in chronic sprain. I have said all my space allows me of its applicability to acute sprain. I can not do better, in describing the process, than to copy from an excellent report of a case treated by this method made by Dr. W. R. Fisher, of New York, in the *New York Medical Journal* of January, 1874. The case was one of chronic sprain of aggravated character. Here is the description of one kneading:

"The whole limb from the knee down was first rubbed and kneaded for twenty minutes, lightly where the parts were tender and forcibly where the pressure was well borne. The skin was sponged with water and dried with a towel whenever the epidermis became dry and heated by the friction, and was in danger of being rubbed off. (It may here be remarked that oil is sometimes applied to the skin to prevent this accident.) Then the manipulator passively exercised the toes in various directions, and very gently moved the ankle-joint in the direction of extension and flexion. The extent of movement in the latter was governed by the amount of pain which it produced, care being taken to avoid giving rise to more than slight twinges, which could be borne without suffering. These maneuvers occupied about five minutes, and were followed by kneading and frictions a little more forcibly administered, which in turn gave way to the passive movements alternating until the whole treatment had continued for an hour and twenty minutes."

The exercises were repeated daily for seven days; during the last three reached to three quarters of an hour; on the seventh day the natural curve of the foot was restored. The patient walked with mechanical support; in three weeks gave up her crutches, and was ultimately restored to full bodily health with sound limbs. I give this extract to show that *massage* is a matter of skill and patience, and, as those who have experienced it in the Turkish bath will bear witness, one of physical endurance. Its rationale in the introduction of good blood to the parts is apparent. Its usefulness can not be overestimated, and failures from a few minutes' hand-rubbing must not be set down to its account.

Under this head of "Mobilization Continued" I report that in a case under my charge, of chronic sprain at the shoulder, where pain, in certain movements (elevation), and shrinking of the muscles are shown

after four months' inactivity, the patient has received great benefit from the health-lift. He will not submit to forcible circumduction nor to massage.

Extension is practiced in sprain, not without results. It is done with weight and pulley (Buck's method), and can only be superior to other methods where the trouble is in synovitis. If the trouble be intra-articular adhesions (Hood) the method by manipulation promises better and quicker results. It has the disadvantage of forced rest at a point where this is hurtful. To avoid this Sayre treats by extension, with motion, on the same principle as his method in hip-joint disease. As this method requires instruments fitted to the case, it is not likely to be of the general service of other plans we have referred to. It is more specially applicable to intra-articular trouble, but in extra-articular trouble also as motion is allowed, it has every advantage over extension by weight and pulley. Its success in the hands of its originator has been marked.

In conclusion, I may say that the chief difficulty in the treatment of the acute sprain is in getting the patient to submit to the necessary restraint. No directions can be given for the tact required by the surgeon to effect obedience to his commands, but the clearer his ideas be concerning the injury before him the easier will it be for him to make converts of those who come to him for treatment. In chronic sprain the conditions are reversed. It is the patient then who is anxious to submit to any thing for his relief, and the physician who must be aroused to action. The lazy prescription of a liniment, or directions left to the patient or the patient's friends to carry out, will not do. His personal superintendence is required, and the expense of not only his mental but physical energies. And the rewards of these are not surpassed by any of the achievements of surgery.

