

21. Klemperer, G., and F.: Versuche über Immunisirung u. Heilung beider Pneumokokkeninfektion; Berliner klin. Woch., 1891, Aug. 24 and 31, pp. 833 and 869.
22. Lambert, Alex.: Use of Antipneumococcic Serum; Jour. AM. MED. ASSN., April 14, 1900, xxxiv, pp. 900-902.
23. Eichhorst, Herm.: Behandlung der fibrinösen Lungenentzündung; Therap. Monatshefte, Feb., 1900, pp. 63-66.
24. Mo. Cyclop. of Pract. Med., xiv, July, 1900, p. 252-4.
25. Progressive Med., Sept., 1899, pp. 49-51.
26. Ibid., p. 19.
27. Twentieth Century Practice; xvi, pp. 44, 123, 124, 126 and 127.
28. N. Y. Med. Jour., May 7, 1898, pp. 646 and 647.
29. Med. Record, May 14, 1898, p. 714.
30. Gaz. d. Osp. e delle Clin., March 6, 1898.
31. Gould's Year-book, 1901, p. 497.

HOW TO TREAT MUSCULAR AND JOINT SPRAINS OF RAILWAY EMPLOYEES.*

HALDOR SNEVE, M.D.

CHIEF SURGEON, CHICAGO GREAT WESTERN R. R.
ST. PAUL, MINN.

Joint and muscular sprains differ, so far as I know, not the slightest from the same affections in other occupations, but the same justification that obtains in calling railway surgery a special branch of surgery will allow of the use of the title of this paper. Sprain of some sort or another is a very common accident among railway employees. This is perhaps due to the fact that so many of them, in the discharge of their duties, are forced to run backward and forward, work on machinery in constrained positions, do heavy lifting, and are exposed to falls from heights. In order to form an idea of how frequently such accidents affect railway employees, I have prepared a table of the sprains and strains of all kinds, reported as such to my office, occurring on the lines of the Chicago Great Western for the year 1899:

SPRAINS AND STRAINS OF CHICAGO GREAT WESTERN R. R. EMPLOYEES, 1899.

Firemen.		CAUSE OF INJURY.	
CHARACTER OF INJURY.	No.		No.
Thumb.....	2	Falling down	17
Wrist.....	4	Shaking grates	3
Shoulder.....	4	Muscular exertion	3
Lumbar.....	5	Collision.....	1
Foot and ankle.....	2		
Knee.....	2		
Hip and thigh.....	3		
Forearm.....	1		
Side.....	1		
	24		24
Brakemen.			
	No.		No.
Shoulder.....	3	Arm twisted	1
Knee.....	2	Muscular exertion	1
Arm.....	1	Falling.....	7
Elbow.....	1	Turning foot	2
Foot and ankle.....	5	Lifting.....	2
Lumbar.....	2	Collision.....	1
	14		14
Engineers.			
	No.		No.
Lumbar.....	5	Switching.....	1
Wrists.....	2	Wreck.....	1
Leg.....	1	Falls.....	5
Elbow.....	1	Arm Caught	1
Thumb.....	1	Collision.....	1
	10	Tank tipped	1
	10		10
Section Hands.			
	No.		No.
Inguinal region	1	Struck stove	1
Foot and ankle.....	2	Falls.....	4
Abdominal muscles	1	Collision.....	2
Wrists.....	3	Turned foot	1
Knee.....	1	Lifting.....	2
Neck.....	2		
	10		10

* Read at the annual meeting of the Academy of Railway Surgeons, held in St. Paul, Minn., Sept. 5 and 6, 1900.

Miscellaneous.

	No.		No.
Knee.....	2	Falls.....	18
Wrist.....	6	Muscular exertion	2
Side.....	2	Scuffling.....	1
Ankle and foot.....	13	Caught foot	4
Lumbar.....	6	Lifting.....	2
Leg.....	2	Turning foot	5
Finger.....	1		
	32		32

It will be seen from the table that, as far as occupation is concerned, the greatest number injured, strangely enough, were firemen, to the number of 24.

We would have expected *a priori* that the number of sprains would have been greatest in the brakemen, who are continually climbing over cars and running backward and forward along the train, but the number of these so injured was only 14. Next were engineers and section hands, 10 each, and finally all other occupations, switchmen, machinists, wipers, carpenters, etc., to the number of 32, making a total of 90 cases reported to my office as sprains or strains, out of a total of 622 accidents for the year 1899. The percentage of sprains and strains to the total is 14.45.

The character of injury in all these cases has been sprains or strains of fingers, wrist-joints, shoulder-joints, foot and ankle, knee, hip and thigh, arm, back and side. By far the largest number of sprains reported were of the ankle and foot, 22 cases out of 90. Wrists were sprained 15 times. In all the cases of strains, by far the greatest number were of the back, or, as I have tabulated it, of the lumbar region, a total of 18 cases. It appears that engineers hurt their backs, brakemen their ankles, while the firemen sprain backs, wrists and shoulders indifferently.

The cause of injury shows a preponderating number due to slipping and falling, resulting in injuries to the wrists and ankles especially. The total number of cases due to falling is 51. Various sorts of muscular strains resulting from muscular exertion were present in 9 cases.

The percentage of sprains and strains in a total of 622 cases being 14.45, these are therefore frequent accidents among railway employees, and six years of experience in railroad work leads me to believe that these are precisely the injuries which lay up the employees the greatest length of time, and the object of this paper is to show how the time of recovery can be shortened, in my opinion at least 50 per cent.

What do we mean by sprain? The definition of Dr. Douglas Graham is a very good one: "A sprain is a sudden partial displacement of two joint surfaces followed by immediate replacement." A strain is a stretching of the tissues beyond their normal limits, resulting in rupture of some of the tissue elements. These strains may affect any of the tissues, but do not, in my opinion, ever occur in ligaments.

Dr. P. S. Conner, Cincinnati, teaches that ligaments are made up of white fibrous tissue which is absolutely inelastic, and therefore can not stretch; at the same time it is so strong that it is easier to pull it from its attachments in bone or muscle—tendon—than to rupture it. A writer in Gerrish's Anatomy says that a little reflection will teach us that if tendon could stretch then our muscular efforts would be wasted on the elasticity of the medium between muscle and bone. Morris' Anatomy also teaches that white fibrous tissue is incapable of stretching. I mention this particularly because the term "stretching of the ligaments," especially as applied to the ankle-joint, is used so frequently and so loosely. In a very few instances postmortems after

injuries of joints have been made which would seem to indicate that ligaments can rupture, but experimental work has shown that it is easier to pull off a scale of bone at the attachment of the ligament than to rupture the ligament, i. e., in ligaments other than thin fascial expansions, and I believe, owing to the absence of elasticity in the ligament and its great strength, that such accidents as rupture almost never occur. Therefore, when surgical writers speak of stretching and rupturing ligaments it means one of two things: the stretching and rupturing of connective tissue, the areolar tissue, blood-vessels, etc., or it means the tearing off of a scale of bone at the attachment of the ligament involved. The last is what generally occurs in very severe sprains of joints. So much for the pathology.

TREATMENT.

From the earliest times war has been waged as to what constitutes the proper treatment of a sprain, especially as regards sprains of the ankle-joint. On the one hand, there have been those who contend that what a joint needs after an injury is rest, and the more absolute this rest can be made the quicker recovery ensues. The adherents of this idea elevate the limb affected, put it up in immovable dressings, and wait around until the rest and dressings have resulted in the disappearance of swelling, which requires from fifteen days to three months; then the patient is requested to walk around and use his leg so as to make it strong again. If the patient has been laid up two or three months he finds himself unable to follow the surgeon's advice, as his limb is weak and walking painful and difficult. What has occurred? We know that immobility of a joint induces passive inflammatory changes, leads to the disappearance of the synovial fluid and roughening and thickening within the joint. On the muscles this so-called rest cure has produced atrophy and possibly contraction. The fat and other tissues forming the pads around the ligaments and tendons have been absorbed, and we find a preternatural immobility in our joint.

Adherents of immediate motion apply bandages or adhesive plasters and encourage their patients to get around immediately after the injury. At the present time there is a large class who endeavor to skim off the cream of both contentions. They keep their patients perfectly quiet for a few days with immovable dressings, and then advise massage and motion. The results have been much better, as regards the time required for recovery and the strength of the limb, with the last-mentioned treatment, than with the so-called absolute rest treatment.

To have a correct idea of how to handle these cases in order to promote speedy recovery, we should bear in mind the few points I cited regarding the pathology and, further, the surgical indications. There are perhaps very few sprains of the joints which are not accompanied by contusion of the joint surfaces. The tearing of the areolar tissue and the rupture of the small blood-vessels, results in a rapid, painful exudative swelling and discoloration, for which the first surgical indication is rest, but the question immediately arises: What is rest for these involved tissues? Ranke rinsed out the vessels of fatigued muscles with a normal saline solution, which immediately restored them to full vigor; the experiments of Zabłudowski have shown that muscles exhausted by faradization could be restored at once by massage; Maggiora showed that massage of muscles fatigued by mechanical labor quickly restored them to normal function. What do these experiments mean? They mean that the muscles are constantly functionat-

ing, even when a limb is immobilized; the muscles are in a state of tonic contraction, and fatigue simply means a heaping up of the waste products resulting from the work of the muscle cells, such as lactic acid, creatin, carbonic acid, acid phosphates, and perhaps toxins, and *rest for muscle means the getting rid of these waste products and the furnishing of new oxygen and new food from the blood.* We know that immobilization produces atrophy and contraction of the muscles, and knowing what the physiology of muscular rest is, it must be plain to every one of us that rest does not mean to confine a limb in a dressing which does not permit of motion of the muscles. On the contrary, rest for the inflamed, contused, torn and otherwise involved tissues does mean immobilization. The next indication to be made is the antiphlogistic one. How can we limit excessive leucocytosis and inflammatory exudation? The application of cold water and evaporating lotions fulfils these indications. In cases where there has occurred a rupture of the attachment of the tendon or ligament with its scale of bone, practically a fracture, an indication arises for the maintenance of a proper position in order to allow of union. Now, how are we to fulfil all these indications for treatment, some of them which seem paradoxical, i. e., both motion and immobilization? The muscles involved in every sprain should have motion all the time in order to allow muscular contraction to exert its pump action on the lymph-vessels which carry away waste products whose presence produces fatigue and pathologic changes.

The contused joint surfaces should at the same time be immobilized, providing the contusion and laceration is very severe. The index to the severity of such an injury will be found in the amount of pain and nausea experienced, and the amount of swelling. Discoloration of the skin is not an index of the amount of injury. We can elevate the limb affected, apply a wet cheese-cloth to the swollen joint, and over this an ice-bag during the first few hours or days until we attain to the height of the inflammatory process resulting from the trauma. Motion can at the same time be administered to the muscles passively, by means of massage, which produces for these purposes precisely the same changes as active muscular action, and besides carries away the waste and inflammatory product in the lymph and venous blood. In all sprains of moderate severity both massage and active use of the limb can be instituted immediately or after a few hours.

In a case of the ankle we should apply an elastic cotton bandage firmly to the limb, or leave on the shoe in the case of the ankle, lacing it up, and encourage our patient to walk the sprain away. On retiring, the patient can have massage treatments, and hot applications or a local wet pack. The massage should be begun as soon as possible after the injury. It should be administered by a skilled masseur and should consist of centripetal strokings and kneadings, and extremely light frictions and strokings over the inflamed area, the last being designed to favor the centripetal circulation and the spreading out of waste products in the tissues so that they can be the more easily absorbed by the lymphatics.

After the acute symptoms have subsided, hot applications are the best because they dilate the superficial vessels and promote local circulation, which assists in carrying away the inflammatory products. Since fractures or displacements frequently occur in the region of the ankle-joint, and as the inflammatory symptoms are usually more severe in these cases, we will at times

be forced to keep our patient quiet for several days, using ice-bags and massage, before we can put on the bandage or Gibney's plaster bandages, and put the patient on his feet. It is astonishing to the surgeon how quickly the patient can get over the sprain, if compression be put on the joint and the patient receives massage and gets about. I know a recent case where the plaster dressings and rest were used in a sprain of the ankle and foot, where two years and six months were required to put the patient on his feet without crutches and appliances at his ankle, and I feel sure that had this patient been treated properly along the lines mentioned in this paper, only a few months would have been required at the utmost. As it was he was in almost useless condition at the end of two years and three months. The muscles of his leg were atrophied, there was too much motion at the ankle-joint, and the patient was fearful of putting his weight on his leg, and complained of getting tired quickly, and of pain in the whole limb. Systematic massage, use and encouragement sufficed in a short time to remove all this disability. In these old cases, besides the measures referred to, the use of the Scottish douche is good, that is, hot and cold water applied alternately. It is of great value in promoting recovery. Swedish gymnastics, in the shape of active and passive movements of all the joints of the limb affected should be used, in conjunction with other measures. In the vast majority of sprains of the ankle, the ambulatory treatment is very satisfactory. The average time required for recovery will be from six to twelve days. In 400 cases it was nine days. (Douglas Graham.)

A muscular strain of considerable severity will show to the palpating finger an elevation of ruptured muscular fibers. In these cases a little gentle massage will promote speedy recovery. In a vast majority of so-called muscular strains, there will be no elevation to be felt by the palpating finger, and in these cases the cold douche, and static electricity both for its local and mental effect, gives remarkable recoveries.

To recapitulate: 1. Ligaments are rarely if ever torn in so-called sprains, and are never stretched. 2. The pathology in the majority of sprains is a rupture of the areolar and connective tissue around the joint, and a contusion of the lining of the joints. 3. Immobilization of muscles is not rest. On the contrary, in all sprains the muscles should have passive exercise the first few hours, and days, and active exercise after that. In the majority of cases active exercise should be instituted from the beginning. 4. The plaster casts should not be used at all, even in cases where we have a fracture, unless it be impossible to maintain a proper position of the joint. 5. Hydrotherapy in the shape of ice applied over a wet cloth the first few hours; water in the shape of hot fomentations or in the shape of the Scottish douche, where we wish a stimulation, is of very great value. 6. The counter-irritation of static electricity in conjunction with massage is the best treatment for a strain. 7. The ambulatory treatment of sprains in conjunction with massage is to-day the best treatment.

Statistics of Quebec Province.—There has been evidently a marked falling off in the ratio of increase of the population in the province of Quebec during the last decade. In the report of the board of health for the year 1900, the recorder of statistics estimates the increase in population between 1898 and 1899 only 2.5 per cent. The large centers of population have gained most, but the aggregate for the whole territory being slight it would appear that in the rural districts here as elsewhere there has been possibly some local actual decrease.

DIAGNOSIS AND SYMPTOMATOLOGY IN THE APPENDICITIS OF CHILDREN.*

THOMAS H. MANLEY, Ph.D., M.D.

Visiting Surgeon to Harlem Hospital; Professor of Surgery in New York School of Clinical Medicine

NEW YORK CITY.

So much has been published in medical literature of late on the subject of appendical inflammation, that it might seem but little remained pertaining to it to be further elucidated.

The operative technique in its surgical management has nearly advanced to perfection, so that in properly selected cases, and utilized at the proper time, surgical intervention in skilled hands should be followed by only a very low mortality. The greatest difficulty which confronts the surgeon is not so much how the operation shall be done, as the question of properly interpreting symptoms, locating the precise seat of pathologic changes and appreciating the character of existing complications.

THE GENERAL AND SPECIAL CHARACTERS OF APPENDICITIS IN EARLY LIFE.

In 1827 Melier first accurately described the pathology of appendicitis and recommended the excision of the appendix (*Mémoire et observations sur quelques maladies de l'appendice caecal*).¹ There was no echo to his publication until 1838, when the writings of Albus, Dance and Menière appeared. Although these authors approved of radical measures they maintained that the primary seat of lesion was in the cecum, as is maintained to-day by Treves. About 1888 the original observations of Sands, Fitz, and Talamon appeared, with the brilliant achievements of McBurney which settled beyond dispute the fact that in the great majority of cases the original lesion is in the appendix and that this organ must be primarily dealt with. On Friday, Dec. 30, 1887, the late Prof. Henry B. Sands, of New York, performed the first operation for appendicitis successfully after having first correctly diagnosed the condition existing. The patient was a male, 12 years old. The case had first been diagnosed as one of perityphlitis. He tells us that the child had indigestion, etc., and that there was no tumor.²

Weir, in 1887, was able to collect but 15 cases in which laparotomy had been performed for perforated intestine; the appendix was the seat of perforation or gangrene in 4 of these, although it was not discovered until after death. In 5 the appendix was found perforated, and removed, but all died.³

Appendicitis presents practically the same sexual difference in early life as is noted later in the adult; thus Jalaguier records 182 cases in his own practice, 4 were under 5 years; 42 from 5 to 6; 64 from 10 to 15; 25 from 15 to 20. There were 112 males and 70 females.⁴ According to Bamberger's table, the relative frequency as to age was: Under 2 years, 2 cases; 15 to 20 years, 20 cases; 20 to 30 years, 32 cases; after 30 years, 17 cases. Fitz's table shows: 20 months to 10 years, 22 cases; 10 years to 20 years, 86 cases; 20 to 30 years, 65 cases; after 30 years 55 cases. Matterstock's table shows: Under 2 years, 2 cases; 2 to 5 years, 10 cases; 5 to 10 years, 25 cases; 10 to 15 years, 35 cases. Gordon's table reads: 2 to 5 years, 5 cases; 5 to 10 years, 33, and 10 to 15 years, 41 cases. Bruns' table says: 1 to 5

* Read by title, in the Section on Diseases of Children, at the Fifty-first Annual Meeting of the American Medical Association, held at Atlantic City, N. J., June 5-8, 1900.