which normal appendices are found are thus imperfectly based.

CONCLUSIONS.

It is such experiences as these which have brought me to the conclusion that every case of appendicitis whose diagnosis is thoroughly established should be operated on, always, if possible, in the interval between attacks. Of the diagnosis, however, we should be reasonably certain. In view of the occasional difficulties of diagnosis, it may happen now and then that a normal appendix is removed. But I have come to the conclusion, too, that it is better to have a few normal appendices removed than that one which ought to have come out should remain and cause the death of its owner. The appendix is not an organ of which we need be especially proud. It is useless and exceedingly vulnerable and without powers of resistance when attacked.

1506 Spruce Street.

DISCUSSION.

DR. CHARLES G. STOCKTON, Buffalo—I can not refrain from saying a word on the subject. I wish to compliment Dr. Tyson on his courage in attempting to classify appendicitis and, perhaps, his classification is as good as can be made. It seems to me that the classifications usually given are altogether inadequate. I agree with Dr. Tyson in his statement that appendicitis should be operated on; I would like to go still further and say that it should be operated on immediately. I disprove of the delay of from twenty-four to forty-eight hours which some surgeons allow. For this delay physicians are often responsible. The danger lies in postponing the operation twenty-four hours. Either operate immediately or else do not operate till late in the interval, is a good rule.

DR. H. H. WITHERSTONE, Rochester, Minn.—I wish to congratulate the author of the paper for the position he has taken relative to appendicitis. To illustrate my ideas in reference to this disease I would like to relate two cases. A few months ago I saw a young lady who was suffering from intense pain in the region of the appendix and who had all the classical symptoms of appendicitis. I recommended an operation at once. When the abdomen was opened it was discovered that she would not have died in that attack; it was a catarrhal condition, not a suppurative one. A few days later I saw a young man who suffered in the same identical way. I also recommended an operation which was done thirty hours after the attack began. The appendix in this case was swollen and contained one or two drams of pus. These two cases were identical; yet the first patient probably would have recovered from that attack without an operation, while the second would surely have died. We have no light at present by which we can determine at the beginning of an attack which case will and which case will not suppurate. Therefore, it is my judgment that every case should be operated on within the first thirty-six hours. If the operation is done thus early practically all the patients will get well. Without rehearsing the differential diagnosis between appendicitis and the diseases for which it may be mistaken, I will say that with a careful examination the diagnosis in appendicitis ought to be reasonably certain. With my experience before me I am strongly impressed that the error of delay is a most serious one.

DR. J. M. ANDERS, Philadelphia—The classification Dr. Tyson has given will serve as a working basis for the general practitioner. Every case in which the diagnosis is clear should be operated on at once. This is a lesson that we have been slow to learn and can not be too strongly emphasized. If there is the slightest doubt as to the diagnosis of appendicitis, and even if we think that we have made only a reasonably certain diagnosis of this affection, we should call to our aid a skillful surgeon. Without advising the family that an immediate operation is demanded we can, and in such instances should, send for a competent surgeon. No matter whether in his judgment an immediate operation should or should not be done you have divided the responsibility and not failed in your duty. If a competent surgeon is not available, in a large class of cases

in which the operation is not performed immediately, or in which it can not for any reason be performed immediately, we should employ refined methods of diagnosis. My experience teaches me that when the local symptoms are comparatively mild and yet point to an attack of appendicitis, the blood examination will show a mild leucocytosis. I want to state at the outset that the degree of leucocytosis by no means gives a clear, definite idea of the nature and extent of the pathologic change; in a general way, however, it can be relied on as a guide if the accompanying symptoms are carefully considered. If repeated examinations of the blood be made at short intervals in cases in which suppuration is present there will be found a rapid rise in the leucocyte count; if gangrene occurs the count rises more rapidly still. A notable exception to this rule is met in cases of perforation with associated evidences of generalized peritonitis. In such an instance, however, the associated symptoms will almost always serve as a guide. On the other hand, I have frequently found that a mild leucocytosis may rapidly disappear at the end of a day or two and, after a free purgation, the count will return to the normal. I approve of an operation in cases of relapsing appendicitis. Finally, I hope that the internists, as well as progressive surgeons, will soon learn this lesson; that all cases as stated by Dr. Stockton in which the diagnosis is clear, should be operated on at once and thus decidedly diminish the mortality rate.

DR. TYSON, in closing—In the matter of classification I made no attempt to classify any other except those cases which came under my personal observation and which fell into one or the other of the three divisions. It is simply a working classification and most cases fall into one of these three categories.

With regard to the time of operating, what was stated was based on the idea that surgeons still regard the risk of the operation less when done "in the interval" than during an attack and that, therefore, if an operation can be deferred with safety to the patient until the acute attack is over it is rather better to do so.

THE SURGICAL RELATIONS OF TRAUMATISM OF THE PERIPHERAL NERVES.*

HAROLD N. MOYER, M.D.

CHICAGO.

The title of this essay requires some limitation. It is not our purpose to deal with surgical operations on the nerves, nor with resections for the cure of neuralgia, but to consider certain diagnostic relations of the peripheral nerves in the treatment of injuries.

A traumatism of the nerve is frequently overlooked. In an examination of an injured part the surgeon estimates the damage to blood vessels, joints, tendinous and muscular structures, but often fails to take into account the condition of the nerve; hence, a favorable prognosis is not borne out in the subsequent history of the case and the patient is dissatisfied. We have known of several malpractice suits due to a failure to estimate the injury to the nerves. All of these occurred in accidents involving the shoulder, in each case there was a dislocation without fracture, the bones were replaced and the statement was made to the patients that in a few weeks they would recover. The resulting paralysis of the nerve from direct contusion, or from secondary inflammation resulted in a disability which lasted for many months. The prognosis of the surgeon not being borne out by the subsequent history of the case, led to the institution of a suit for malpractice, it being claimed that the surgical attendance was not what it should have been, when, as a matter of fact, it was only the surgeon's prognosis that was at fault.

Late surgery recognizes the general principles in the treatment of the nerves in open wounds; a nerve

* Read before the Dubuque Medical Society, June 30, 1902.

should be sutured if it has been divided. The results of nerve suture, both primary and secondary, are good, the latter nearly as successful as the former, providing too great a time has not elapsed from the time the nerve was severed. Primary union of nerves may take place in the lower animals. In man, at least, every section of a nerve results in degeneration. In the majority of cases, the nerve regenerates, at least in part, and suture favors this regeneration. The bringing together of the nerve sheath forms a sort of bridge that enables Nature to restore the interrupted pathway. The power which nerves have of regenerating is remarkable; and in some instances they are able to bridge a considerable space in the effort to unite the severed portions.

The degeneration of a severed nerve is fully recognized in surgical practice, but it is not so generally known that simple contusion may have the same effect as severing the continuity of a nerve trunk. A contusion may abolish the function of a nerve for a short time, for some hours, but if the function is not restored within a comparatively short time, there may be a degeneration of the nerve the same as though it had been severed. Such degeneration is followed by a regeneration comparable in all respects to that which takes place after section.

A peculiarity of nerve contusion is that it may lead to inflammation, and this, owing to the peculiarities of the structure of a nerve trunk, may result in what is really a pressure paralysis. A nerve trunk is surrounded by a connective tissue sheath from which septa extend into the interior, dividing it into numerous compartments. A nerve trunk of considerable size is made up of a number of bundles, each surrounded by a connective tissue sheath, and from this, smaller trabeculae support the smallest bundles. This strong fibrous sheath plays an important rôle in the pathology of neuritis. The nerve, like other structures in the body, has its own vascular supply, its lymphatics, and also the special nerve supply which endows a nerve with local sensibility. A contusion often sets up a secondary neuritis; there is a congestion of the nerve, cloudy swelling, edema and distension of the nerve sheath, which is an unyielding connective tissue structure. If the inflammation is of some severity, the swelling compresses the nerve fibers so that we have in addition to the neuritis the phenomena of pressure paralysis.

It might be possible by splitting the nerve sheath to relieve this form of neuritis, just as improvement is obtained by splitting the capsule of the kidney in inflammations of that organ. The practical difficulty is that this neuritis commonly supervenes rapidly, or pressure symptoms are abrupt in their onset, and if they last for a number of hours the nerve will degenerate.

A rupture of a nerve, or its section in an incised wound, is almost always recognized at the time an injury is received. The effect on muscular power is so pronounced that a torn or lacerated nerve will probably be recognized in almost every instance, but the same is not true of contusions. If of sufficient severity to excite a secondary inflammation, the primary symptoms of contusion may be absent, and this is probably the mechanism in the majority of cases. If there is no paralysis at the time the injury is received, it is often concluded by the surgeon that there is no injury to the nerve and that there will not be any. The paralytic phenomena due to neuritis, as well as the symptoms of the latter, are so obscured by the pain and swelling incident to the bone joint and other injuries, that they are overlooked. An additional factor is the fixed dressings that are often

necessary in the treatment of dislocations and fractures, by which the paralysis is completely concealed.

It is of some importance to distinguish between the laceration or section of a nerve and simple contusion. We know of no accurate means, aside from actual inspection of the nerve trunk, that enable one to do this immediately after the receipt of an injury, but within five or six hours it is usually possible to do so, as the contused nerve will have regained some power of conduction, even though it ultimately loses that function due to a secondary inflammation. The importance of distinguishing between contusion and laceration relates to the treatment, primary suture being somewhat more successful than secondary, and should be employed. Mere contusion of a nerve, no matter how severe the subsequent neuritis, can never be aided by an operation, as the nerve sheath being intact, nothing that surgery can do will aid in the regenerative process.

The diagnosis of nerve injury after traumatism is by no means simple. As we have said, a severing or a laceration is usually apparent in the loss of motility which occurs immediately after the accident. The same is not true of contusion. Here the loss of conductivity of the nerve may be transitory and at the time the case reaches the surgeon, if he does make an investigation of the condition of the nerve, he finds it apparently unimpaired. In the next few days a peripheral neuritis may appear, with all the paralytic phenomena associated with it.

It may be difficult in many injuries to determine the motility. In fractures and dislocations there is a limitation of voluntary contractions of the muscles. But it is always possible to determine the sensation of the skin, and, as a rule, we have an accurate means of comparison in the uninjured member. Ordinarily an esthesiometer is recommended for this purpose; as a matter of fact a camel's hair brush is by far the best instrument. We have seen a pin used, it being thrust somewhat deeply into the skin, the patient being asked if it is felt. This test is too coarse. In estimating the sensation of the skin, a pledget of cotton, or light brush easily discovers impaired sensation, even when it is not all lost. It is this lessening of the acuteness of sensation which is of diagnostic importance. An accurate diagnosis of nerve injury is not so essential in the treatment, but it is of great importance in prognosis, as it is an awkward experience to tell a patient with a dislocation of the shoulder that he may look forward to a recovery in three or four weeks, when, as a matter of fact, five or six months elapse before he is able to move the elbow from the side. The electrical reactions furnish a valuable means of estimating the motor impairment due to these peripheral lesions, but they require a somewhat complicated apparatus, and furnish no more valuable data than does the simple testing of sensation. It is the latter symptom that the physician should be constantly on the lookout for, and when it is found, a guarded prognosis should be given, as there is a prospect of nerve degeneration with its associated paralytic phenomena.

Injuries to the nerve, complicating fractures, are not very common, and when they occur the nerve is usually torn and there is often associated injury to the blood vessels and other soft parts, so that the vitality of the limb is seriously impaired, or an amputation is needed. In most fractures complicated by nerve injuries, the nerve is torn and consequently the extent of the injury is recognized. The violence which produces a fracture may cause a contusion of the nerve, just as the dis-

placement of the fragments may tear or contuse the nerve trunk. Associated injury to the peripheral nerve is, generally speaking, not common in fractures, but it occurs relatively with greater frequency in the arm than in other parts. The involvement of the musculo-spiral nerve in fractures of the humerus, is quite frequent. The ulnar nerve is commonly involved in fractures of the humerus near the elbow.

In dislocations we have by far the largest number of complicating injuries to peripheral nerves. Especially is this true of the shoulder joint. We are convinced that no favorable prognosis should be given in a shoulder dislocation until at least two weeks have passed, because of the liability of coincident nerve injury. We have seen a complete flaccid paralysis of all the muscles of the shoulder and arm result from a dislocation of the shoulder which had been promptly reduced. There was no regeneration in this case, and the patient two years after the receipt of the injury had a flail-like arm, and not the slightest motion in any of the muscles of the extremity. This case was exceptional, and was probably due to a severe contusion of the brachial plexus, which caused an immediate complete flaccid paralysis. In this case there were no signs of neuritis.

The four malpractice suits that have come under our observation were each of them connected with injuries to the shoulder. All of them were dislocations; the dislocation was reduced, a retentive apparatus used and a favorable prognosis given. Secondary neuritis resulted in paralysis of the deltoid, and in some cases the other shoulder muscles. In every case there were adhesions in the shoulder joints. In one of the cases there was permanent impairment and in the others a fair recovery took place. In the favorable cases recovery was many months after the time that the physician had assured the patients that they would be well.

In dislocations of the shoulder the injury may be to any one of the nerve trunks which comprise the brachial plexus, consequently the distribution of the paralysis is varied. The most insidious is an injury to the circumflex nerve. It results in paralysis of the deltoid; there is inability to carry the elbow from the side and there is always secondary inflammation in the joint. A degeneration of this nerve always means a partial disability of some months.

This injury to the circumflex nerve is readily overlooked. The deltoid alone is paralyzed. A want of motion in this muscle may not be discovered until the retentive apparatus is removed and all signs of local inflammation have subsided. If examined early a loss of sensation will be found over the deltoid region. In every case of shoulder injury the sensation of this region should be carefully tested. If found diminished a guarded prognosis should be given. Involvement of the circumflex is by far the most frequent of all nerve injuries about the shoulder and it is the most insidious.

Dislocations occasionally may injure the sciatic, but this is exceptional. The same rarity of injury to the popliteal is noted in dislocations about the knee. In dislocations of the ankle and tarsus there is frequently contusion and inflammation of the perineal with paralysis of the muscular group supplied by it.

The so-called reflex paralyses due to joint injuries are still referred to in the text-books. The older writers understood by this a secondary atrophy of the muscles above the joint, which they attributed to joint injury and its associated synovitis. In rare cases a contusion of an extremity will lead to a progressive muscular atrophy, involving all the muscles of the limb and later

extending to the trunk. These severe cases are exceptional, but the paralysis of the segment of a limb after a blow upon the joint is not infrequent. In speaking of them as reflex paralyses we are following an ancient nomenclature which was in vogue before our knowledge of the changes in the peripheral nerves was as complete as it is at present. It is probable that these reflex paralyses are caused by a contusion of the nerve, and that the secondary atrophy and paralysis is due to the inflammation of the peripheral nerve following the contusion.

In the prognosis of nerve injury we can generally rely on the tendency which nerves have to regenerate. They do not do so in all cases, but in the majority; a muscle which has been paralyzed, due to a degeneration of its nerve, may be confidently looked upon to have a restoration of that function in time. A nerve regenerates at about a millimeter a day, providing its trophic center is intact. This, of course, varies with the individual, the state of nutrition and the local conditions. After some injuries, and not always the most severe, there is no tendency in the nerve to regenerate. Just why this is so we can not say. Many of these cases seem quite alike in their symptoms, the nature of the injury and the physical condition of the patient. The rule is that regeneration takes place.

One may ask if Nature will restore the continuity of the nerve, what is required in the way of treatment, and will treatment be of benefit when the rate of regeneration is fixed within comparatively narrow limits? We answer most emphatically that treatment is of great importance, as in all of these cases there are fibrous adhesions in the joint, about the tendons, and possibly in the muscular structures themselves, that seriously impair the movements of a joint, even if the nerve supply is healthy. When a nerve has in part regenerated the first voluntary impulses that reach the muscle are very feeble. If adhesions in the joints or tendons are met with, these slight impulses may be futile in establishing voluntary movement of the muscle. Consequently, a muscle may remain permanently out of use because of mechanical difficulty in responding to the slight impulses which are able to travel over a partially regenerated nerve. It has been experimentally shown upon animals that electricity and massage maintain to a considerable extent the nutrition of a muscular fiber that has been cut off from its trophic center. It is not probable that such treatment would maintain the integrity of the muscle fiber if completely severed for a long time, but it hinders the process of degeneration so that when the connection is re-established there is a better muscular fiber to act on than though such treatment had been omitted. Massage is of great utility in maintaining muscular tone and is also of some value in preventing tendon and joint adhesions which form such a hindrance to the proper use of the extremity after the nerve supply is re-established. When voluntary motion once reaches the paralyzed muscle, and there are no adhesions or mechanical hindrances to the movement of the part, then the patient may safely be left to his own resources, as there is no stimulus to a partially atrophied muscle equal to that of voluntary contraction.

It is impossible to emphasize too strongly the importance of local treatment of joints in injuries to the peripheral nerves. Quite without exception these cases present a chronic synovitis either as a direct result of the trauma or the secondary trophic disturbances due to neuritis. Every case of chronic synovitis has ad-

hesions; the consequent limitation of motion is a fatal hindrance to the restoration of muscular tone.

In studying the surgical relations of traumatism of the peripheral nerves the following conclusions are justified:

1. Section or laceration of a nerve, if of some size, is usually recognized at the first examination.
2. Contusions of nerves are common, the symptoms often being latent until neuritis develops; the latter may be delayed some days.
3. Contusion of a nerve may complicate any fracture or dislocation, but is especially frequent in dislocations of the shoulder.
4. Injury to the circumflex nerve merits special mention because of its frequency, the ease with which it is overlooked and its serious consequences.
5. The "reflex paralysis" after joint injury is probably due to a traumatic neuritis.
6. The management of the joint tendon and muscular complications comprises in the main the treatment of traumatic neuritis.

103 State Street.

THE OCCURRENCE OF GOUT IN THE UNITED STATES: WITH AN ANALYSIS OF THIRTY-SIX CASES.*

From the Medical Clinic of the Johns Hopkins Hospital.

THOMAS B. FUTCHER, M.D. (Tor.)

Associate Professor of Medicine, the Johns Hopkins University.
BALTIMORE.

There are practically no published statistics as to the occurrence of gout in the United States, so that it is difficult to form any accurate idea regarding the relative frequency of the disease in America as compared with Great Britain and the continental countries. In a careful search of the "Index Catalogue" I have failed to find any reference on this point. There is a very prevalent impression among writers on gout, particularly the English authorities, that the disease is extremely rare in the United States. Thus, Sir Dyce Duckworth,¹ writing in 1889, makes the statement that "In the United States of America gout is practically unknown. A few cases are met with in the large cities, but, according to Dr. Da Costa of Philadelphia, the disease has not yet developed among the increasing population." Ewart² speaks of the United States and Canada possessing a considerable immunity from declared gout. Dr. Osler,³ in a brief note on "Acute Gout in the United States" written in 1895, remarks as follows: "The comparative infrequency of gout in this country is a matter of everyday comment. In hospital statistics, and in bills of mortality the disease is mentioned but rarely; thus, it does not occur among the causes of death in the Report of the Medical Officer of the City of Baltimore for 1894." Later he says, "During the session of 1894-95 I had in the ward four cases of gouty arthritis at one time, a unique event in my hospital experience." It is of interest to note here that the 36 cases in the present series, excluding one instance, have all been admitted to the Johns Hopkins Hospital since Jan. 1, 1894, and with one exception to Dr. Osler's wards.

The present and particularly the past conditions of life in the United States are not generally held to be those which favor the development of gout or a uric acid diathesis. In England, where gout is generally

conceded to be more prevalent than in any other country in the world, there has for generations been a large leisure class who have been heavy eaters and liberal drinkers and who have led rather inactive, sedentary lives. The conditions that are believed to prevail in America may be best described by again quoting briefly from Sir Dyce Duckworth as follows: "The ancestry, diet and habits of the citizens of the United States for the most part are such as will long prevent the onset of gout in that country. The immigration of Irish, Scottish, Scandinavian and German people into that country peoples it mainly with a stock void of gouty heritage. The good climate and the active open-air lives of the people will tend to avert goutiness. But little wine is used, the beer is light and much water and weak tea is taken. The alcohol chiefly used or abused is rye whisky."

Notwithstanding these generally-expressed views as to the comparative infrequency of gout in the United States, I am inclined to the opinion that the disease is much more frequent than is usually believed. In considering the apparent infrequency of gout in this country the failure to recognize the condition must be taken into account, as Osler has pointed out. There is no question in my mind that many cases are mistaken for rheumatism even when well-recognized tophi occur about the joints or on the ears. The disease is not an unimportant factor from an insurance standpoint. The "Report of the Mortality Records of the Mutual Life Insurance Company of New York" for fifty-six years (from 1843 to 1898) shows that there were 50 deaths from gout out of a total of 46,525 mortalities. This in itself is ample proof that gout is far from being rare in America. The best method of determining the relative frequency of the disease in the United States as compared with southern England, where cases are more numerous than in any other part of the world, is to compare the number of cases admitted to a general hospital for acute diseases in a large American city with the number of cases admitted to a similar institution in London. Thus, for the first thirteen years since the Johns Hopkins Hospital was opened, from May 15, 1889, to May 15, 1902, there were 35 cases of gout admitted to the medical wards out of a total of 13,400 medical admissions, or, in other words, 0.24 per cent. of the cases. For a similar period of thirteen years, from 1888 to 1900 inclusive, there were 116 cases of gout admitted to the medical wards of St. Bartholomew's Hospital, London, out of a total of 31,100 medical admissions, or 0.37 per cent. of the cases. In other words, the gout cases constitute 0.24 per cent. of the total medical admissions in a general hospital in Baltimore while in London they comprise 0.37 per cent. of the medical admissions. That is, in the home of gout the cases are only one-third more frequent than they are in at least one American city. This disparity is not marked and it shows that gout is far from being a rare disease in the United States. In justice to those who claim that gout is rare in America it may be stated that there was only one additional case admitted to the various other services of the Johns Hopkins Hospital during the thirteen years, making 36 cases of gout out of 39,000 total admissions, or only 0.09 per cent. of the cases. A similar comparison at St. Bartholomew's Hospital would, however, probably show a corresponding percentage reduction.

The 36 cases analyzed in this series will serve to illustrate the main features of gout as they are manifested in this country. We will first consider what in-

* Read at the Fifty-third Annual Meeting of the American Medical Association, in the Section on Practice of Medicine, and approved for publication by the Executive Committee: Drs. Frank A. Jones, George Dock and J. M. Anders.