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[Extracted from The American Journal of the Medical Sciences for July, 1859.]

SUCCESSFUL TREATMENT

OF A

CASE OF LIGAMENOUS UNION OF FRACTURED RADIUS AND ULNA

BY DRILLING AND WIRING, AFTER FAILURE BY OTHER MEANS.

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ALTHOUGH cases of *non-union* or *ligamentous union* of fractured bones are of considerable frequency, and, when occurring, are of most serious consequence to both patient and surgeon, it would probably be the feeling of most surgeons, if expressed, that there is no class of surgical cases in which they would operate with less certainty of success, or be more embarrassed in the selection of the best method of operation, than the one under consideration; for, notwithstanding a varying degree of success has followed a great variety of operations for ununited fracture, the very multiplicity of methods recommended by distinguished authorities is a virtual confession of the inadequacy of any operation yet devised to safely meet in all cases the surgical exigency of a confirmed *non-union*.

The *seton* has been successful in many cases; but it has also failed in more cases, probably, than any other means, because, on account of the comparative ease with which the operation is performed, and its apparent freedom from danger, it has been performed more frequently than any other operation. But, aside from the uncertainty attending the introduction of the seton, the recovery, if it takes place, is prolonged and tedious, and the operation is not always free from danger, particularly from erysipelatous inflammation, induced by the presence of so large a foreign body in the cellular tissue.

Resection has also had its triumphs; but it has also signally failed; and, where recovery takes place, it is not a restoration of the strength and proportions of the limb, on account of the shortening which is necessarily involved in this operation. It is also a dangerous operation; and a fail-

ure, if it is not accompanied by loss of the limb, generally precludes all chance of success from any subsequent operation.

The method of *drilling* the ends of the fractured bones, to induce adhesive inflammation, which has been introduced within a few years, though not a difficult or dangerous operation, and in many cases a successful one, is still unreliable, for it has failed, after thorough trial, in repeated instances. Dieffenbach's operation, of introducing ivory pegs, and Langenbeck's modification of it, the substitution of iron screws for the pegs, are severe operations, and the former, at least, uncertain. During the winter of 1854 I had the pleasure of seeing the distinguished Berlin surgeon, Langenbeck, perform his peculiar operation in two cases with success; and he informed me that it had never failed in his hands, though he had not applied it in the *femur*.

On returning home, I recommended the operation in a case of ununited fracture of the humerus, and assisted to perform it. On the second day it became necessary to remove the screws, in consequence of the violence of the inflammatory action, which soon took the form of *phlebitis*, and resulted in destruction of the head of the humerus, abscess, and finally ankylosis of the shoulder-joint. Although the patient's life was endangered by this operation, yet the union of the bone was perfect, and the arm is now strong and useful.

Though strongly impressed in favour of the German operation by the results I saw from it in the hands of its skilful originator, my experience in the above-mentioned case has not inclined me to repeat it; though I am fully of the belief that the complication of *phlebitis*, &c., in the case arose from accidental causes, which could be avoided in another operation.

A case of ligamentous union in both bones of the forearm has been treated by me within the last few months, with such satisfactory results as greatly to increase my confidence in the efficacy of surgery in these cases, and also to confirm my belief in the "*law of tolerance of living structures for the presence of foreign metallic bodies.*"

CASE. Mr. J. H. P., of Vermont, aged 33, of lymphatic temperament, and inclined to corpulency, broke his forearm in January, 1858, while at work in the woods. The points of fracture were—*radius*, upper third; *ulna*, junction of middle and lower third, or about three inches below the upper fracture. The fracture was simple, and presented no extraordinary features in any respect. The limb was dressed by a neighbouring physician without any delay; four plain splints being used, according to the patient's account, and the arm being suspended by a sling in a *prone* position. After the lapse of four or five weeks it was ascertained that no union had taken place, and, by the advice of another physician, a single splint (*Goodwin's spoon splint*) was substituted for those originally adjusted. Subsequently a starch bandage was applied over the splint. The fracture still giving no signs of consolidation, several attempts at inducing union by rubbing the ends of the bones together, &c., were made during the three following months, but with no effect. In September, eight months subsequent to the accident, the pa-

tient went to Albany for advice and assistance, and finally placed himself in the hospital for treatment. A seton was introduced at the point of fracture in the radius, the fractured ends of the ulna were drilled, and the ligamentous union lacerated subcutaneously. On the third day symptoms of erysipelatous inflammation appeared about the upper wound; and on the fourth day the seton was removed, in consequence of the violence of the local and general disturbance. The inflammation soon subsided, and the patient, after remaining in the hospital three and a half weeks, returned home with the arm in splints, with some appearance of commencing union, at least in the upper fracture. These appearances, however, were fallacious, and in November the patient returned to Albany, where the operation of drilling, &c., was repeated. No perceptible effect followed the second operation, and the patient soon returned to his home.

In December—a year, within a few days, from the time of the accident—the patient presented himself to me for examination and advice. The limb then presented the usual features of false joint. There was no soreness of any part; the limb was, however, entirely powerless—not strong enough to sustain its own weight—while the ends of the fractured bones could be readily felt as the arm bent by the weight of the hand.

The patient was naturally very much discouraged, and had little faith in any further attempts on the arm. I proposed and explained the operation that I finally performed, after his assurance that he should not, at any rate, return to the hospital. He left, undecided as to his course. In about two weeks he returned, and placed himself under my charge; and on the 23d of December I performed the following

Operation.—Having previously decided to operate on but one fracture at a time, I selected the upper one, or the radius, for the first trial. I first made an incision, about four inches in length, on the radial side of the forearm, directly over the fracture. The incision was then extended down to the bone, and the broken ends displayed. A knife was then passed through the fracture, separating the connecting ligament readily. The ligamentous covering was then carefully dissected from the end of each fragment. The fracture was found to be *oblique*, the lower fragment lying by the side of the upper, and separated from it about *half an inch*. The wedge-shaped end of each fragment was then bored through with a small gimlet, at a distance of three-quarters of an inch from the end, and through these holes a *stout silver wire* was passed, and the ends twisted with strong clasp forceps until the broken ends were firmly held together in the loop. The external wound was then loosely brought together by adhesive strips, the twisted ends of the wire projecting an inch or more from the middle of the wound. The limb was placed in an elbow-splint—made of tin, for the purpose—extending from the axilla to the fingers. The splint was placed on the inside of the arm and forearm, and was deep enough to embrace one-half the circumference of the limb, while the wound was left free for dressing, &c., without disturbing the arm. The wound was finally dressed with lint and cold water.

The patient underwent the operation without any anæsthetic, by preference. One small artery only was ligatured.

Dec. 24. Saw the patient at 9 A. M. Found him in bed, with some febrile symptoms. Pulse 100; face slightly flushed. Chiefly complained of pain in the head and back, which prevented him from sleeping the latter part of the night. No pain of consequence in the arm. Changed the dressings. Found the limb swollen below the elbow, with bloody serum

discharging pretty copiously from the wound. Ordered a saline cathartic, with mucilaginous drinks.

25th. Patient passed a better night than the one before, though complains still of pain in head and back. Pulse 90. Is sitting up, and makes no complaint of the arm.

Jan. 2. Nothing worthy of mention has occurred up to the present time. The wound commenced discharging freely on the fourth day, and the swelling has rather increased, though there has been no particular pain in the limb. Last night there was a sudden recurrence of pain in the head and back, accompanied with difficulty of breathing, and cough. The limb was observed also to be hot, and more painful, with an erysipelatous blush extending up to the elbow. At eight in the evening I applied a solution of sulphate of iron as a lotion to the limb, and gave directions for its assiduous application during the night; also administered a diaphoretic mixture. This morning I found the patient relieved, with scarcely a trace of inflammation in the skin, which is yellow and shrivelled under the application of the iron.

20th. The patient has been progressing favourably. There is now no soreness. The wound has healed up, as far as the projecting wire will allow it. Very little discharge from the wound. No swelling in the limb generally, and very little about the fracture. Took the arm out of the splint, and found no evidence of union. The wire was loose in the bones, and could be handled without giving pain. The arm was carefully replaced in the splint, and with strong clasp forceps the wire was twisted as tightly as the patient could bear.

22d. The operation of twisting the wire has been followed by pain and swelling, and increased discharge. The pain, however, is up and down the radius. At the point of fracture, also, the bone is extremely sensitive, and the least touch of the wire gives great pain. Patient is now taking phos. lime and chalk in considerable quantity.

24th. The swelling and sensitiveness in the region of the fracture have greatly diminished. The wire has also become slightly loose in the bone. Something like an ensheathing callus is observable at the point embraced by the wire. The wire is again twisted until the patient exclaims from pain.

Feb. 1. The operation of twisting has been continued every alternate day up to the present time. A temporary discharge has been produced, but the increase of the *callus* is quite evident. This morning, while twisting the wire as usual, the small neck of bone that held it gave way, and the wire was wholly removed.

2d. Removed the arm from the tin splint, and made a careful examination. The *union* is evident, though it is not firm. As the swelling has nearly subsided, I substituted the *gum and chalk bandage* for the splint, enveloping the limb from the axilla to the fingers with several layers of bandage smeared with a thick mucilage of *acacia*, thickened to the consistence of white paint with *pulverized chalk*, leaving a small open space opposite the small wound whence the wire was removed.

15th. Removed the gum bandage, and found the union quite firm. A small abscess occurred, just over the point of fracture, a week since, but it is now closed. The patient having the impression that the lower fracture is also consolidating under the influence of the stiff bandage, it is reapplied, and Mr. P. goes home to await the result.

March 16. The expectations of the patient in regard to the fracture of

the ulna have not been realized. Although the arm is quite strong, and the use of the thumb and first and second fingers is recovered, the condition of the false joint in the ulna remains unchanged. Accordingly to-day I performed on the *ulna* precisely the same operation that I previously did in the case of the *radius*. I will not go over the details of the second operation, which would be merely a repetition of the first account. The condition and situation of the bones were nearly the same as in the *radius*. A little more difficulty was experienced in introducing the wire than in the first instance, on account of the inability to *turn out* the ends of the bones from the wound, as was readily done in the operation on the *radius*. The same splint and dressings were used as in the previous operation.

April 1. No unfavourable symptom has been manifested since the second operation. The wound has nearly closed. A large *node* or *callus* has been thrown out about the wire, and union is evidently taking place. The patient is out of doors daily, and has not been confined to bed since the operation.

12th. The wire was to-day removed by gentle twisting and traction, and the union found to be quite firm. The arm was replaced in the splint.

20th. The wound in the arm has been closed several days. The patient is gradually beginning to use the arm. Both fractures are *perfectly consolidated*. The power of pronation and supination is possessed to a considerable degree, and it is quite evident that a little *use* is all that is required for the complete restoration of the motions of the arm.

May 21. As a completion of the somewhat extended history of this case, I will only add that I have had frequent reports, up to the present date, of the daily improvement of my patient's arm under the influence of daily exercise about the farm.

Remarks.—The wire used in these operations was composed of four threads of silver wire, of the size recommended by Dr. Simms for sutures. Being closely twisted, they made a wire of the size of a small knitting-needle; and, from its perfect flexibility and strength, I found it much easier of introduction, and more manageable afterwards, than would have been a single wire of similar size and strength.

The difference in the *time* of union in the two fractures will have been noticed by the reader. In the *radius* there were no signs of union on the thirtieth day after the operation.

In the *ulna* union was quite evident as early as the sixteenth day after the operation, and apparently firm in twenty-eight days.

In the *radius* the wire was so firmly held in the bones as to be removed with great difficulty, and after repeated trials of the *twisting* process.

In the *ulna* the wire was removed, without force, after *once* twisting with the forceps.

Undoubtedly one reason why the second fracture united so readily was the *immobility* secured by the previously united *radius*. But still another cause, I think, may be found in the fact that in the last operation, besides the holes bored for the reception of the wire, I made several *other* perforations with the gimlet in each fragment, a feature in the operation which I should be careful not to omit in another case.

I am aware that the *wire* has been used before in treating ununited fracture; but, as far as I know, it has been to *secure coaptation of resected bones*, as in Rodgers's case (N. Y. Hospital), and Brainerd's case (*Am. Journ. Med. Sciences*). In the latter case the wire *embraced the circumference* of the broken shaft, and in both *resection* was the operation, and the wire was used as an auxiliary.

If it shall be found that the dangers and deformity of resection can be avoided, and that the *metallic wire* alone, through its instrumentality in procuring apposition of separate fragments, but more particularly in its peculiar property of exciting *adhesive inflammation* in living tissues, is the safer and surer means, it will not be one of the least of modern improvements in surgery.

In concluding, I take pleasure in referring to the valuable assistance received, in treating the above case, from Prof. Woodward, of Castleton; Dr. Griswold, of this town; also Dr. Page, brother-in-law of the patient, to whose immediate and constant supervision of the case the success is in a great measure, undoubtedly, due.

RUTLAND, VT., May 23, 1859.

