CASES
OF
UNUNITED FRACTURE,
SUCCESSFULLY TREATED.

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Case I.—*Ununited fracture of radius and ulna. Removal of the fractured extremities of both bones at the end of thirty-four weeks. Recovery.*

ALEXANDER S., aged 19, formerly an itinerant potter, but of late a railway labourer, was admitted into the Cumberland Infirmary, November 12th, 1845, with an ununited fracture of the left fore-arm.

He states that about seventeen weeks before his admission, while engaged on the railway, he was knocked down by a waggon weighing about five tons, which passed over a great part of the left side of his body, and caused the following injuries :—Fracture of the left clavicle, near its acromial extremity ; fracture of some of the lower ribs of the same side, accompanied by hæmoptysis, which continued for several days ; and fracture of both bones of the left fore-arm, at about the junction of the middle with the lower third ; together with three wounds near to the seat of fracture, some or all of which probably communicated with it. There was also a wound over the elbow-joint, and he thinks he was informed that another fracture existed lower down in the same fore-arm ; but of this there is now no evidence.

For six weeks he was confined to bed, during which time the arm was placed on a splint, and the dressings were changed every, or every other, day : no attempt, he says, was made to extend the limb, and but little attention seemed to be paid to keeping the fractured bones at rest.

When admitted, he appeared in not very robust health, although he considered himself nearly as strong as usual. The fracture of the clavicle, the situation of which was very evident from the deformity that remained, was firmly united; and if fracture of the ribs ever had existed, they also had united firmly and without displacement. The left fore-arm, which was much attenuated, he carried in a sling; it was about an inch and a half shorter than the right, and perfectly powerless from the great overlapping and free motion which existed at the fractured part : he was quite unable to raise the distal extremity, which dropped down in any direction as a dead weight. On examination it was found that the upper portion of the ulna was internal to, and overlapping, the lower to the extent of about an inch, and the lower end of the upper portion was drawn somewhat forward, so that a space existed between it and the lower part of the shaft of the bone. The overlapping of the radius was fully as great as that of the ulna, the upper extremity here being posterior to the lower; but there was little if any lateral displacement, and the lower portion was in close contact with the radial artery. Considerable hardness was felt in the structures around the broken ends of the bones, as if an attempt had been made by nature to affect union, such effort having been frustrated by the long interval between them, owing to their great overlapping; it was therefore determined, if possible, to extend the limb, but the means employed proved altogether ineffectual. Although there appeared to be scarcely a possibility of any benefit resulting from it, it was resolved that the part should be kept firmly bound up for a lengthened period, that he might have the full benefit of nature's attempt at cure. During the first few days, he complained of occasional pains about the seat of fracture, which gradually subsided : at the end of a month

the splints were removed, no change appeared to have taken place, and they were re-applied. His diet was liberal, including a pint of porter daily. Another month was allowed to elapse, when the limb was again examined, but it was found in the same state as at first. It was now once more bandaged as before, the seat of fracture being left bare in order that strong tincture of iodine, and other stimulants, might be applied. No benefit resulted, and the case having been left to the remedial powers of nature under the most favourable circumstances for nearly four months, both patient and surgeon were fully convinced that a further trial of any such means as those hitherto employed were useless, and the patient was extremely desirous that some other should be adopted.

The introduction of a seton being as little likely to be productive of advantage, as it would certainly have been attended with danger from the difficulty of avoiding the principal vessels and nerves, some of which were evidently much displaced, one means alone appeared to offer any probability of a favourable result—viz., the placing of the extremities of the bones in such a position as to render ossific union possible; and resection of the bones was the only method by which this reposition could be effected.

That the want of union in this case resulted from causes affecting the limb itself, and not from any constitutional peculiarity, was evident from the perfect ossification of the clavicle and ribs, and thus one part of the great difficulty which often exists in such cases, ignorance of the cause of the evil, was removed. Although the difficulties and dangers consequent upon the operation were fully considered, as was also the unsatisfactory result usually attendant upon it, the removal of the fractured ends of the bones was determined on, as preferable to the condemnation of the limb to amputation, or to abandoning the case as incurable. I believed also that the man would certainly not be in a worse position than at present, and that possibly even should union not take place, he might ultimately be in a better condition; for if the ends

of the bones could be placed in apposition, and some external support afforded to the arm, the muscular force on either side of the limb being so nearly balanced, it might be made in some degree useful.

March 9th, 1846.—The arm being laid on its flexor surface, an incision upwards of four inches in length was made directly down to the bone, immediately over the fracture, on the inner and back part of the ulnar side of the fore-arm. The muscles and the structures attached to this part of the bone having been carefully dissected from it, it was found that a very oblique fracture of the ulna existed, extending from above, downwards, backwards and inwards; the upper portion being internal and posterior to the lower, and at its extremity separated from it by a considerable interval. A slightly curved elevator was now introduced beneath the upper and more superficial portion of the bone, both for the sake of raising it and thus bringing it more readily into view, and also to protect the soft parts from injury. By means of a small Hey's saw, the division of the bone was effected, and a piece about three-quarters of an inch in length removed. The lower end of the bone was now seen; and the soft parts having been as much as possible detached from it, the elevator was with some difficulty introduced beneath, and an attempt at separation made with Hey's saw; but, owing to the depth at which it was situated, the entire removal of a portion in this way was found impracticable; the division was therefore completed with the cutting forceps, carefully and gradually worked through the bone, and about three-quarters of an inch was removed,—in all, upwards of an inch of the shaft of the bone. A second incision of equal length with the first was next made along the middle of the radius on the back of the arm, and the soft parts were separated from the bone. The fracture was here found to extend obliquely from above downwards, and the upper portion greatly overlapped the lower. In order that the operation on the lower end might be as limited as possible, since, from its great depth and the contiguity of the radial artery, this was

looked upon as extremely hazardous, a piece of bone fully an inch in length was removed from the upper part, in the same way as that from the ulna. And now much difficulty was experienced in raising the lower end of the bone sufficiently to allow it to be brought within reach of the forceps, and to admit of its being subsequently placed in apposition with the upper extremity. This was, however, at length accomplished, and the end of the bone was removed with the cutting forceps, without hæmorrhage, although the radial artery was felt in close contact with the finger at the bottom of the wound. The excision of this portion of the bone might have been much more readily completed by an incision over it on the flexor surface of the arm, where it was very superficial; but it was of importance to retain that part entire, to allow of the subsequent application of a splint. The two ends of the radius were now brought into linear apposition, and there held while an attempt was made to approximate the divided extremities of the ulna, which was effected with much difficulty; and it was found necessary to remove a further small portion of that bone, it being rather longer than the radius.

Both bones being now in proper position, the edges of the wound were brought together with strips of lint encircling the limb, and the arm and fore-arm were immovably fixed to an angular splint with strips of adhesive plaster, the fore-arm being maintained in a position between pronation and supination. Not more than an ounce of blood was lost during the operation, which occupied fully three-quarters of an hour, and was borne without a murmur.

The constitutional disturbance consequent upon the operation was not at any time such as to give rise to anxiety on the patient's behalf. The wounds were every day dressed with wet lint, and occasionally a fresh splint was applied, great care being taken at such times to prevent displacement; the arm lay constantly on a pillow, and the man was kept in bed in a recumbent posture. The wounds healed rapidly and without interruption, with the exception of the

formation of an abscess over the radial side of the arm in the beginning of April.

On the 13th of April, the wounds being healed, the whole fore-arm and arm were encased in a dextrine bandage (mucilage of gum arabic and whiting), outside which a light wooden splint was applied, and over all a second dextrine bandage; thus forming a perfectly immovable enclosure.

As he complained of some pain over the inner condyle of the humerus, the bandages were removed on the 1st of May; and that part being protected from pressure, the same applications were repeated. A very careful examination was made; the ends of the bones were in perfect position, and union appeared to be becoming firm, although the part still admitted of motion.

May 22nd.—The bandage was this day removed; union was quite firm between both bones, and he was able to lift the arm. The wrist-joint was nearly motionless, from the long-continued rest to which it had been subjected. He was unable to use his fingers, and the power of pronation and supination appeared to be lost. To prevent the possibility of injury, a single dextrine bandage was applied.

June 2nd.—He complained of pain about the seat of fracture; the bandage was removed, and the fore-arm was perfectly firm. Two dextrine splints were placed along the limb, one on the anterior, the other on the posterior, surface, and were retained in position by a common roller.

On the 5th of June he left the hospital.

June 15th.—When he came on this day it was evident that the bandage had been removed since he had been discharged; and, on inquiry, he admitted that, feeling the arm quite strong, he had taken off the splints the day before, and had lifted a chair with that hand. His fore-arm was nearly an inch and a-half shorter than its fellow; it was certainly less emaciated than it had hitherto been.

November 23rd.—He came to show himself at the hospital. He has for several months followed his former avocation, that of a carter on the Lancaster and Carlisle Rail-

way. He says that the injured arm is quite as strong as the other, and nearly of as much use as ever; and the only inconvenience he finds, and this he did not mention until very closely questioned, is that he feels a "tightness" at the fractured part, when he forcibly flexes or extends some of the fingers. The muscles of the whole arm have become much more fully developed, especially those above the seat of injury; the situation of which is rendered evident from this circumstance.

Case II.—*Ununited fracture of tibia and fibula. Introduction of a seton at the end of eight months. Recovery.*

Robert C., aged 16, was admitted into the Cumberland Infirmary, December 2nd, 1846, with ununited fracture of the right tibia and fibula. Upwards of six months before, he was run over by a waggon, on the Newcastle and Berwick Railway, by which both thighs were broken near the trochanters, and the right leg at about its middle: there was also an extensive wound on the outer side of the leg, communicating with the fibula, a considerable portion of which bone is now wanting. Splints were applied to the thighs for nine weeks, and others to the leg for about a month: the thighs have both united firmly, and with little deformity; in the leg, there is free motion at the seat of fracture, by which the limb is rendered perfectly useless. The fracture here appears to have been rather oblique, the broken ends of the bone are in apposition, and there is no evidence of any foreign substance being interposed between them; but there is displacement outwards of both portions of the bone, which form an angle of three or four degrees with each other. He states that but little care has been taken to keep the limb at perfect rest since the removal of the splints, and that even while they were applied it was frequently moved in dressing the wound.

In this case it was evident that want of union resulted from that most common cause of all, the not keeping the limb at rest during the continuance of that action on which

the deposition of ossific matter depends. It was, therefore, obvious, that the only means from which any favourable result could ensue, was the re-exciting a certain amount of inflammation in and around the fractured extremities of the bones. With this view I determined to employ, for a considerable period, firm and continued pressure, so applied as to ensure the co-aptation of the fractured extremities, together with perfect rest.

For two months the limb was as firmly encased in dextrine bandages as the patient could bear; but at the end of that time motion was as free, and union as imperfect, as on his admission; and as it was considered that the means employed might have been insufficient to induce such an amount of vascular action as was necessary for the production of callus, it was resolved that a seton should be inserted,—not between the ends of the bone, for this would have been highly dangerous, if not impracticable, but—on the surface of, and immediately along, the seat of fracture. Accordingly, on the 1st of February, I introduced two setons, each of four silken threads, the one over the outer, the other over the inner, surface of the fractured bone. Considerable inflammation was excited by this step, insomuch that it was found necessary to remove the threads on the 11th. The leg was again kept at perfect rest, for ten weeks; and, at the end of that time, on the 16th of April, was carefully examined, and I had the gratification of finding that the tibia was firmly united. A light dextrine bandage was again applied, and he was allowed to get up, and walk about carefully. The limb gradually became stronger and more useful, and he left the hospital on the 16th of June 1847: he returned from time to time, to show the strength of his leg, until the end of August, when he left this part of the country to resume his former occupation as a railway labourer in Northumberland.

Case III.—*Fracture of the tibia and fibula, ununited at the end of nine months. Perfect quietude of the limb for three months. Recovery.*

Edward S., aged 25, a muscular, well-formed man, while engaged in assisting a vessel into Maryport harbour on the night of December 16th, 1846, received a blow from a rope, which fractured the right leg at the junction of the middle and lower thirds. He states, that there was considerable displacement and hæmorrhage, but no protrusion of the bone, and that he was attended by a medical practitioner, who reduced the fracture and placed the limb in splints. Two days after he was seen by a bone-setter, who “worked over it two hours, and left it much worse than he found it.” Three days after this the bone had penetrated the skin, and gradually protruded until two inches of it were visible, in which state it continued about eight weeks, when a wedged-shaped piece of the tibia, one inch and three-quarters long in front, and about three-eighths of an inch behind, was removed with a saw. During the next seven months the man was kept in bed, and the wound was frequently dressed,—the healing of the wound, rather than the quietude of the limb, appearing throughout to be the great end of the treatment. From time to time a considerable number of pieces of bone were removed, both from the wound over the tibia, and also from another on the fibular side of the leg.

September 15th, 1847.—The man was admitted into the hospital this day, his leg being at the time very neatly bound up in leathern splints. The displacement at the seat of fracture was by no means great, there was much thickening of the superjacent parts, and two large wounds existed, the one on the inner, the other on the outer, side of the limb; and motion was so free, that the leg could be shaken almost as readily as a flail.

The general aspect of the man at once conveyed the impression, that the want of union was not dependent upon any constitutional defect, and inquiry failed to discover the presence of any specific disease which might account for it. The

cartilaginous hardness of the textures around the seat of injury, while it prevented my obtaining that information which a manual examination of the part might have given, afforded presumptive evidence of an attempt at reparation having been made. The severity of the injury, together with the frequent manipulation to which the limb had been subjected during that period when rest was necessary, determined me, before attempting any other means, to keep the leg in a perfect state of quietude for several months; and this failing, to have recourse to the method proposed by Dieffenbach, of introducing some foreign body into the extremities of the fractured bone. The limb was therefore carefully fixed in a suspensory splint, the wounds being left open: at the end of a month these were quite healed, when the leg was enveloped in a dextrine bandage, and again placed upon the splint. Two months more were then allowed to elapse, when the bandage was removed, and the limb proved to be as firm as the other. He was ordered to get up, and to bring it gradually into use. On the 19th of January 1848 he was discharged, suffering only from the inconvenience necessarily attendant upon one leg being an inch and a half shorter than the other, and from some stiffness and swelling about the ankle: he was able to walk about the passages of the hospital with a single stick, and hoped again to go to sea at no very distant period.

This case affords, as I conceive, an interesting example of the advantage of abstaining from all active interference, until the curative powers of nature have been fully and fairly tried.

Case IV.—*Fracture of humerus. Union not commenced at the end of seven weeks, from want of sufficient nutriment. Recovery.*

Margaret B., aged 32, a poor, emaciated woman, the wife of a weaver, and mother of many children, fell forcibly against the edge of a loom, by which her right humerus was fractured about its middle. The arm was bound up in the usual way, and she attended, from time to time, at the hospital, of which

she could not be persuaded to become an inmate, as she had several young children at home. At the end of seven weeks there was no attempt at union,—a state plainly dependent upon the imperfect nutrition of the woman. She was now induced to leave her home, to stay for a time with her father, a farmer, in easy circumstances, the arm being bound up as before: at the end of a month she again appeared, looking healthy and well-fed; the limb was examined, and union was found to be perfect.

Case V.—*Fracture of tibia and fibula. Union not commenced at the end of six weeks. Administration of mercury. Recovery.*

James E., a footman, admitted October 30th, 1846, with an oblique fracture of both bones of the leg, received about an hour previously, his leg having become entangled in the wheel of a carriage; the displacement was by no means considerable. The broken limb was placed on the suspended splint I usually employ, and appeared in every way likely to proceed most favourably. Such, however, was not the case, for, at the end of six weeks, union had not commenced, and during the whole of that time he suffered much from severe nocturnal pains in the limb, and also from its extreme tenderness. On being questioned, he admitted that some months before he had had a chancre, of which he had been cured while under a mercurial treatment. He had now a sore-throat and eruption characteristic of constitutional syphilis, and also another chancre contracted shortly before his admission. A presumable cause of non-union was thus rendered evident; and as no reparative process could be looked for while the syphilitic poison was in active operation, it was considered that no means could be effective but such as would destroy the venereal virus. Mercury was, therefore, administered until the system was brought fully under its influence; the nocturnal pains and tenderness gradually ceased, the chancre healed, ossific matter was deposited around the fractured extremities of the bones; and, in the beginning

of February, union was sufficiently firm to admit of his leaving the hospital, the limb being bound up in dextrine splints.

In no class of affections which the surgeon is called upon to treat, is a correct appreciation of the cause of the malady more important; in none, perhaps, is that cause oftentimes more difficult of detection; and in none, are precise rules of treatment less generally applicable than where the fractural extremities of bones have not become firmly united by ossific matter. The foregoing cases furnish instances of the two great divisions under which all may be arranged; the one, in which non-union is dependent upon causes purely local; the other, in which there is no local impediment to union, but only a participation in causes affecting the system at large. In the last case the reparative process was evidently interfered with by the presence of the syphilitic poison; it was dependent upon a general cause, and, therefore, no local appliances could have produced any beneficial result. The local treatment remained unchanged, and union was not effected until the lurking poison was destroyed. In the fourth case also no change was made in the treatment of the fracture, which evinced no tendency to unite until the vital powers of the patient, so evidently deficient, had been raised to a more healthy standard. In the first three cases there was abundant evidence that the want of consolidation resulted from causes purely local; and that, therefore, local treatment alone was applicable to them.

The resection of fractured bones has so often been attended with a want of success, and has, in so many instances, placed the patient in a worse condition than before, that its all but universal rejection as one of the legitimate operations of surgery has been the consequence: but that there are cases in which this proceeding is alone applicable, the foregoing instance I conceive bears witness. When the overlapping of the bones is such as to render ossification impossible, or when the intervention of some foreign body has made it

equally so, no means can be availing without the exposure of the part and the removal of the mechanical impediment. But, however successful its adoption may be in particular instances, the importance of the operation itself, and the danger consequent upon the conversion of a simple into a severe compound fracture, must ever render it inapplicable except in a very limited number of cases; and in those only where the cause has been clearly ascertained.