CASES OF DISLOCATION
OF THE
OS CALCIS AND SCAPHOID
FROM THE
ASTRAGALUS;
WITH
REMARKS ON THE IMPORTANCE OF DIVIDING THE
GASTROCNEMIUS AND OTHER TENDONS,
TO FACILITATE REDUCTION IN VARIOUS DISLOCATIONS
OF THE LATTER BONE.

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H. N—, æt. 43, a large, stout man, was admitted into St. George's Hospital, under the care of Mr. Keate, in August, 1843.

The man had thrown himself out of a chaise, while his horse was running away, but was unable to give any accurate description of the manner in which he fell, or in what way his foot was injured. The right foot was found to be considerably bruised about the ankle-joint; the sole was somewhat everted; and on the inner part of the instep there was projecting inwards a prominent mass of bone, apparently the head of the astragalus dislocated

inwards and forwards. The integuments over this were tightly stretched and very much bruised.

From the amount of tumefaction of the soft parts, and the extensive bruising of the skin, it was somewhat difficult to determine the exact nature of the injury. The foot was fixed, and very little flexion could be produced. All movements gave rise to great pain.

Mr. Keate saw the man soon after his admission, and made great efforts to extend the foot from the leg, with the hope of reducing the dislocation. Not the slightest alteration was produced in the relative position of the displaced bones by these means.

Attempts at reduction were again repeated on several successive days, but each attempt entirely failed. It was then determined to leave the injured limb without further molestation. Pulleys were not used, as the soft parts appeared too much bruised to be able to bear any severe amount of pressure.

The integuments, which were tightly stretched over the prominent and displaced astragalus, soon sloughed; and within a short time a considerable external opening communicated with the tarsal joints. Suppurative inflammation subsequently extended up the leg; and, considering the amount of local mischief, and the accompanying constitutional disturbance, it was decided to remove the leg by amputation below the knee.

On examination of the foot, after its removal, the following conditions presented themselves. The astragalus was dislocated forwards and inwards from the os calcis and scaphoid. The upper surface of the astragalus was not dislocated from the tibia and fibula. The extremity of the external malleolus was broken off, but attached by the external lateral ligament to the os calcis. The deltoid ligament maintained the connexions between the tibia and astragalus. The head of the astragalus was lying internal to the anterior tibial tendon, on the upper and inner surface of the scaphoid; while the posterior inferior extremity of the astragalus was pressed into the groove on the upper

surface of the os calcis; the lower articular surface of the astragalus was in apposition with the posterior surface of the scaphoid. The sub-astragaloid (interosseous) ligament was torn through. The surfaces of the articular cartilages of the tibio-tarsal and larger tarsal joints were partially absorbed. The ankle-joint was open in front and behind, but it was uncertain whether this condition was not entirely the result of suppurative action subsequent to the dislocation.

The man died on the 7th of October.

R. L—, æt. 43, was admitted into St. George's Hospital in August 1858, in a state of delirium tremens. He was much bruised about the body; and there were two scalp wounds on the left side. An extensive lacerated wound occupied the back part of the left leg, extending through the integuments to the fascia, and from the lower part of the popliteal space half-way to the ankle. The left foot was much distorted and painful, and attracted immediate attention. There was some slight bruising of the skin, and superficial abrasions over the outer surface of the instep. A considerable prominence of bone presented itself on the outer side of the foot, in front of the external malleolus: the integuments were stretched tightly over the projection. The prominence was caused, apparently, by the head of the astragalus, this bone being dislocated from the articular surfaces of the scaphoid and os calcis. The foot was inverted, so much so, that its outer border was turned downwards, and the sole inwards. The internal malleolus could not be detected, being evidently buried in the soft parts of the inner side of the inturned foot. The external malleolus was very prominent, and its extremity on a level with the outer border, and now lowest margin of the foot. The tendo Achillis was very prominent, tense, and slightly curved inwards. The surface of the dorsum of the foot was shortened.

Mr. Venning, the house-surgeon, finding himself unable to reduce the dislocation, sent for me about 11 p.m. The

patient was then rather faint from loss of blood, and restless and talkative.

The account given of the accident was, that, in a fit of delirium, he threw himself out of a back window on the second floor of the Gloucester Coffee House, in Piccadilly, and that he had fallen through a skylight into a kitchen beneath. He was immediately carried to the hospital, and was seen by me within two hours of the accident.

It was at once apparent that the astragalus was dislocated outwards; the os calcis and other bones of the foot being thrown inwards. As the man was faint, and offered no resistance, the limb was at once flexed at the knee, and extension made on the foot. I grasped the heel and anterior portion of the foot, while Mr. Venning and Mr. Ash, the dresser, kept up counter-extension. Though extension was thus maintained, with as much power as could be safely applied, there was not the slightest alteration produced in the relative position of the displaced bones.

Recalling to my recollection the numerous unsuccessful attempts at reduction, made by Mr. Keate, in the case first related; and the amount of force which was uselessly applied in that instance; and recollecting the mischief which then followed, from the sloughing of the stretched and bruised integuments over the displaced astragalus, in consequence of relief not being afforded, either by reduction or otherwise, and feeling satisfied that, in this instance, violent efforts at reduction might be fatal to the already bruised integuments, and that delay in the reduction would only complicate this evil; I at once decided to divide the gastrocnemius tendon.

As the patient was partly unconscious, the division was made without placing him under the influence of chloroform. The wound having been dressed, extension was again tried; and, to our great satisfaction, the reduction of the bone took place immediately, and without the slightest difficulty. A splint was applied to the outside of the leg, which was allowed to lie on a pillow, so as to avoid pressure on the wound at the back part.

On the following day, the foot, though swollen, and having considerable subcutaneous extravasation of blood around it, presented no indications of unhealthy inflammation, nor any tendency of the integuments to slough. The man was still delirious, but more quiet than on the previous evening.

Subsequently, he became worse with general symptoms, independent of the condition of the limb. Into further particulars it is not necessary to enter, as the condition of the foot remained perfectly satisfactory until his death, which took place on the fourth day.

Post-mortem examination.—Two scalp wounds on the left side exposed the bone to a small extent. Extensive oedema of the scalp surrounded these wounds. There was a slight bruise of the surface of each posterior lobe of the brain, and corresponding to the bruises were superficial extravasations of blood into the arachnoid. The brain was very wet, and the lateral ventricles much distended with serum.

The tendo Achillis of the left foot was divided about one inch and a half above its insertion, and the divided portions were separated by an interval of one inch and five eighths. There was no kind of union between them. The bones of the foot were in their natural position, except that the rounded head of the astragalus projected outwards rather more than usual. The slightest force, however, was sufficient to displace the os calcis and scaphoid from the astragalus, so as to allow the foot to turn inwards, with the sole vertical. It was then seen that the interosseous ligament, between the astragalus and os calcis, was stretched, but not ruptured. The fibrous structures surrounding these two bones on the outside were torn, except a small slip, which was left, corresponding to the neck of the astragalus. The cartilage on the posterior articulating surface of the os calcis was slightly bruised. The external lateral ligament of the ankle was torn away from the bone of the leg, with the exception of the posterior slip. The internal lateral ligament remained entire. A small fragment of the astragalus at its posterior, internal, and inferior margin, and

the tip of the os calcis, with which the above portion of the astragalus articulates, were broken off. The astragalus was also bruised in a few places. The malleoli remained entire, except that there was a slight roughness, corresponding to the part from which the lateral ligament had been torn away. The ankle-joint was entire. There was a good deal of ecchymosis both in the dorsum and the sole of the foot, but no other injury of importance.

It will be observed that the injury, in both of the foregoing cases, was simply dislocation of the os calcis and scaphoid from the astragalus; the head of the astragalus, in the last case, having been thrust *outwards*, external to and below the extensor tendons, but the bone itself being in no degree dislocated from the tibia and fibula: in the first case, having been pushed *inwards*, but the ankle-joint being equally free, as in the last case. In fact, they were dislocations of the foot on the astragalus, or, rather, as Mons. Broca, in an excellent article addressed to the Society of Surgery in Paris, terms them, "*luxations sous-astragaliennes*."

It is not my intention to enter into a consideration of the variety of dislocations affecting the astragalus, such as these cases might suggest, further than is necessary to illustrate the advantages of the treatment advocated in this communication, and such as I adopted in the case last mentioned.

Every surgeon who has had any experience in dislocations common to the astragalus, whether the astragalus be simply thrust out from its box, *i. e.* its upper and lower articular receptacles; whether the astragalus be dislocated backwards; whether, as in the above cases, it is dislocated inwards or outwards on the os calcis and scaphoid; or lastly, whether the dislocation be complicated with an external wound; every surgeon will allow that attempts at reduction are generally attended with much trouble, often necessitate much violence, and are oftener unsuccessful; that, in most instances, the condition of the soft parts

is such, that the slightest attempts at reduction render these parts still more liable to slough than they may already be from the accident; and that, when these attempts are unsuccessful, they materially assist in hastening the destruction of the integuments.

I should needlessly occupy the attention of the Society, were I to dwell on the numerous recorded cases of dislocations of the astragalus, to illustrate the observations contained in this paper, or if I endeavoured to impress upon the members the very serious character of these accidents. At the conclusion of these remarks, a short table of cases will be found, which proves sufficiently how anxiously the surgeon should always regard the treatment of dislocations of the astragalus, and how serious may be the injury to the patient, when attempts at reduction are unsuccessful, and nothing worse remains to mark our defective skill than a permanently deformed foot.

The first case related in this paper occurred some fifteen years ago, and was the first case of dislocation of the astragalus I had ever witnessed. It happened when I was house-surgeon at St. George's Hospital, and I had every opportunity of watching its progress. The treatment and termination of the case impressed me strongly at the time with the following ideas. First, that, considering the anatomy of the tibio-tarsal and tarsal articulations, it was evident that in most varieties of dislocations of the astragalus, division of the larger posterior tendons of the leg must materially diminish the difficulties encountered in the attempts at reduction, if those difficulties would not be entirely removed by that division. Secondly, if division of the tendons did not prove beneficial to such an extent, and if the integuments over the displaced and prominent bone were much bruised and stretched, and, consequently, threatened to slough, it would be the best practice at once to liberate the integuments by a free incision; and that the astragalus should be removed as soon as practicable, so as to restore the foot, as nearly as possible, to its natural position.

I fully determined to put in practice the first of these suggestions, whenever it should fall to my lot to treat a case of dislocation of the astragalus which withstood ordinary efforts at reduction, in whatever direction the dislocation might occur. I had to wait until the present year before such a case came under my notice; and I have ample reason, I think, to be satisfied with the results of the treatment.

Dislocations of the os calcis and scaphoid, inwards or outwards, from the astragalus, may occur to such a partial extent, or the muscles of the leg may be so little resistant in some more complete cases, that reduction can be effected without much force, and without loss of time. A man was admitted into St. George's Hospital in the autumn of 1857, having fallen off a scaffold about twelve feet from the ground. He was taken into the ward while I was speaking to another patient in the same room. I was requested by Mr. Percival, the house-surgeon, to examine the man's foot. The left foot was slightly inverted; the head of the astragalus slightly prominent on the outside of the instep; the skin over it was not bruised, nor much stretched. The man stated that his foot bent under him when he came to the ground. The limb was immediately flexed at the knee, and extension made by my grasping the foot and heel, and drawing directly downwards. In a few seconds the reduction followed, attended by a peculiar sound, as if ligaments were being torn through, by the forcible separation of bones at a joint. In three weeks the patient was able to leave the hospital.

Mr. Paget has kindly favoured me with notes of the following case, which occurred in his practice at St. Bartholomew's Hospital.

A labourer, about forty years old, fell from a great height, and his left foot bent inwards beneath his weight. He was quickly taken to the hospital. There was no swelling about the foot or ankle, and the nature of the

injury he had received was as evident as it would have been in a skeleton. The astragalus was felt in its normal relation to the tibia and fibula, with the integuments stretched tightly over it. The foot was carried completely inwards; its axis being at right angles with that of the leg, and its sole flat, turned neither inwards nor outwards. It was a little drawn up towards the leg; the inner malleolus probably resting in the cavity in which the astragalus naturally rested.

The reduction of the displacement was easy. The knee being bent, the foot was pulled straight downwards, with one hand grasping the metatarsus, and the other the heel; and, as it yielded a little, the foot was pushed outwards. It at once slipped under the astragalus, with a distinct rub of the articular cartilages. There was no fracture of either tibia or fibula, and both malleoli were perfect. The patient had no hindrance to his recovery.

Such cases as these require very little consideration; they are attended with few difficulties, and they recover without deformity or much loss of time.

But dislocations of a more severe character are not so easily managed. Mr. Keate's case is a good instance of a difficulty in practice; though I believe that, if the gastrocnemius tendon had been divided immediately after the admission of the patient into the hospital, reduction would, in that case, have been readily effected, and would probably have been followed by much less mischief in the soft parts than subsequently supervened. In the preparation¹ may be observed the altered position of the astragalus. The preparation also explains the manner in which the efforts at reduction may be frustrated by the position and action of the tendons and their muscles.

If other cases were wanting to prove how difficult the reduction may be in similar instances, we can find them

¹ See preparation A. a. 87, Catalogue of St. George's Hospital Pathological Museum.

recorded in numbers. Mr. Arnott¹ reports a case in which the os calcis and scaphoid were dislocated outwards from the astragalus. The latter bone projected inwards, and there was a large wound exposing it. "The knee was bent, and counter-extension made. At first it was attempted to replace the bone, by grasping the heel and instep, then drawing the foot powerfully downwards, and at the same time endeavouring to press the astragalus back into its place by the points of the thumbs. No perceptible change was produced in the relations of the bones. A folded towel, previously wetted, was then carried round the outside of the foot, and its ends twisted together on the inside. By these means the foot was grasped very securely. Assistants were required to pull upon the foot, while Mr. Shaw endeavoured to guide the astragalus into its place, at the same time raising up the outer edge of the foot, with the view of depressing the inner border of the os calcis, to bring it under the level of the displaced portion of the astragalus. But these attempts proved equally unavailing as the first. It was next thought that a better direction might be obtained for the force, by twisting the towel on the contrary side of the foot, and then drawing upon it; but no advantage was gained by this method. In whatever way the force was applied, the astragalus remained immovably fixed. As the patient had undergone much severe pain, and as no hopes were entertained of reducing the bones, and as it was thought that to continue the attempts at reduction any longer would only be adding to the severity of the injury already received, it was determined to desist from making any further trials." The same evening the astragalus was removed by Mr. Shaw, and the patient subsequently recovered with a useful limb.

This was a case of *compound* dislocation. Some surgeons, as I shall hereafter mention more particularly, consider reduction, in such a complication, next to impossible. But

¹ 'London Medical Gazette,' vol. xx, p. 588.

if the amount of force necessary to successful reduction in some cases of *simple* dislocation, is to be fully appreciated, I cannot do better than notice shortly a case which occurred to Mr. Hancock in Charing Cross Hospital. The os calcis and scaphoid, in that case, were dislocated outwards upon the astragalus; and there was no wound of the skin. "I endeavoured," says Mr. Hancock, "to reduce the dislocation by placing the foot on its outer edge upon my knee, pressing it up, while I, at the same time, drew the front of the foot downwards and forwards with my hands, but unsuccessfully; therefore, under the circumstances, and fearing that if something were not done to relieve the tension, extensive sloughing of the integuments would ensue, I determined to apply the pulleys; but I did not make any very great efforts, as I found it necessary to have an apparatus made on purpose, and was unwilling to produce more disturbance than was absolutely necessary."¹ An apparatus, which he describes, "was employed to make extension; it was kept up for one hour and a quarter;" after which time "the reduction was effected," seven days after the occurrence of the dislocation. The integuments over the instep subsequently sloughed, and exposed the bone. About three quarters of an inch of the astragalus was afterwards removed; and in seven months the man left the hospital with a useful limb.

The few cases of dislocations of the astragalus from the os calcis and scaphoid, mentioned by Sir A. Cooper, furnish excellent evidence of the difficulties met with in attempts at reduction. "In these cases," he says, "the use of pulleys will be required, and the action of the muscles should be lessened by tartarised antimony." In fourteen cases of compound and simple dislocation recorded in his work, reduction, by ordinary measures, was effected in three only. "The difficulties of reduction," he says, "seemed to arise from the small size of the wound in the capsule of the joint, and in consequence of the bone being tightly held

¹ 'Lancet,' vol. ii, p. 36, 1844.

by the tendons." In speaking of dislocation of the tibia inwards from the astragalus, "great force is required," he says, "if the limb be placed in the extended position, from the resistance of the gastrocnemius." Notwithstanding that these remarks point so directly to the action of the gastrocnemius and its tendon, and to the necessity of relaxing, or dividing the latter, a case is recorded by him, of dislocation of the tibia forwards, in which unsuccessful attempts with simple extension alone were made, and the deformity remained for life. The dissection of another case is also described by him, accompanied by an engraving of the displacement, which indicates clearly that the action of the gastrocnemius interfered chiefly with the reduction.

"Dislocations of the astragalus," says Mr. Turner, "are accidents of unfrequent occurrence, in comparison with many others which happen to the human body. But in looking over the list of surgical accidents, there is not one more serious in its character and in its consequences; and there is not one in which we are so destitute of rules to guide us in our practical proceedings. What are the obstacles to reduction in most cases?" he asks, and "since reduction is impracticable, in almost all cases of dislocation of the astragalus, by what principles are we to be governed in the treatment of this accident?"² In reply, I trust I shall be able to establish,

1st. That certain principles should guide us in our practice.

2d. What the chief obstacles to reduction are.

3d. That reduction is not impracticable in the great majority of cases.

A case in most respects similar to that of R. L—, the second related in this paper, is reported by Dupuytren.³ The comparative results of the treatment, in each case,

¹ 'Treatise on Dislocations and Fractures.'

² 'On Dislocations of the Astragalus,' by Thomas Turner, Esq., Surgeon to the Manchester Royal Infirmary.

³ 'Injuries and Diseases of Bones.' Published by the Sydenham Society.

are practically important, and deserve our attention. A man fell down as he was going into his house; he immediately felt an acute pain in his left foot, and perceived that it was deformed. He was taken to the Hôtel Dieu, on the following morning. The foot was found twisted considerably inwards; the point of the internal malleolus could not be felt; the outer malleolus was prominent; there was a very distinct prominence of a rounded form, anterior to the outer ankle. The swelling was moderate, and the foot appeared a little shortened. The tibia and fibula were sound. Extension was made in a most energetic manner several times, but as these efforts did not succeed in reducing the dislocation, the patient was bled and kept in a tepid bath for some hours. On the following day renewed attempts were made at reduction, but they only proved so far effective, that though the dislocation was not entirely reduced, there was a manifest improvement in the shape of the limb. A splint was applied to the outer side of the leg, so as to give the foot a more natural direction. The man would not submit to anything else being done to the limb; and when he left the hospital, the foot was only slightly inverted, and the points of the toes directed a little more downwards than natural.

A case, in many respects similar, is related by Mr. Turner, as having occurred to Mr. Smith, of Leeds. Attempts at reduction were made for two hours without success; after which, a second trial was made to reduce the dislocation by means of pulleys; this also failed. Subsequent sloughing of the integuments took place, and the astragalus was removed at a later period, the patient recovering with a useful limb.

It must not be supposed that I claim credit to myself, as the first to suggest the division of tendons in the leg to facilitate reduction of dislocations of the astragalus; nor am I the first to have divided these tendons in order to obtain such a result. Mr. Turner alludes to the practicability of this operation in the following terms: "tenotomy may be regarded as a means of facilitating reduction, and in this

point of view the practice is justifiable." I should state that I had not seen these observations when I first decided to put in practice the division of the tendo Achillis in cases of dislocations of the astragalus. I consider myself fortunate in having my suggestion strengthened by the support of such an authority in his profession, and more than satisfied that the practice, which so completely succeeded subsequently in my hands, had already been alluded to by a surgeon of such experience as Mr. Turner.

Mr. Fergusson, writing on dislocations of the astragalus, says, "it has been proposed in cases where the reduction is difficult, to divide some of the neighbouring tendons by subcutaneous incisions, and possibly in certain instances there might appear some encouragement to do so; certainly the practice would, if judiciously applied, do no harm."¹

In volume xxxiii of the 'Transactions' of this Society, is published a paper by Mr. De Morgan, on the section of the tendo Achillis in certain cases of fracture of the bones of the leg. The proposal to divide the tendon in such cases is well worthy the attention of all surgeons, and confirms, in a great measure, the view taken in the present communication, of the importance of dividing the tendon in dislocations of the astragalus, whenever the slightest difficulty is experienced in an attempt at reduction. It may be supposed that the action of the gastrocnemius is much more evident, and direct, and powerful in *producing* displacement in an oblique fracture of the tibia and fibula, than in *maintaining* displacement, when opposing our efforts at reduction in a case of dislocation of the astragalus. But I can only urge in argument, that the manifest facility with which the reduction took place, after division of the tendon in the case already related by me, not only strongly confirms the principle of Mr. De Morgan's proposal and practice, but also establishes something like a principle in the treatment of all cases of dislocation of the astragalus.

In the first volume of the third series of 'Guy's Hospital

¹ 'System of Practical Surgery,' third edition, p. 364.

Reports,' will be found an interesting account of several cases of fracture of the leg, and dislocation of the ankle-joint, which occurred respectively under the care of Mr. Cock, Mr. Birkett, and Mr. Poland, and in all of which the tendo Achillis was divided. These cases, in every respect, confirm Mr. De Morgan's views respecting the great advantages derived from dividing the tendon in certain injuries of the leg, and they also in most respects bear upon my proposal. One case, however, requires especial consideration: it is reported as "one of well-marked dislocation of the astragalus." Mr. Birkett, under whose care this patient was, has kindly furnished me with some further particulars of the dislocation and result of treatment, which will be referred to presently, as they bear on another point of treatment in certain forms of dislocation.

As a general rule, and as *the* principle to guide us in our practice in dislocations of the astragalus, I do not hesitate to recommend the division of the gastrocnemius tendon, in all cases in which moderate extension with the hands of the surgeon does not succeed. I trust I may not be considered too sanguine in venturing to express a belief, that *most* cases of dislocation will thus be successfully treated.

I purposely make use of the guarded term, that *most* of these dislocations can be reduced by the adoption of the treatment now advocated. The question naturally arises, will not all cases be equally benefited by its adoption? I think not. I hope I shall prove satisfactorily, that in some few exceptions, though the gastrocnemius tendon should be divided as a preliminary measure, if that be not sufficient, the division of the tibialis posticus tendon will be necessary, and will be sufficient to allow the ready reduction of the displaced bone.

The most common forms of dislocation of the astragalus, as far as I have been able to ascertain, appear to be those either outwards or inwards on the os calcis and scaphoid, in which the astragalus is not dislocated at the same time from the tibio-fibular surface. Mons. Broca appears also to

be of this opinion. Dislocations of the astragalus, complete from all its corresponding articular surfaces and attachments, I believe to be the most rare of all dislocations implicating this bone. Now of the dislocations *outwards*, those that cannot be reduced in the first instance by manual extension, I believe, will be always under manual control, *subsequent* to division of the tendo Achillis. My own case gives evidence in favour of this assertion. In this form of dislocation the external tendons rarely appear to be implicated in any way with the displaced bone. I cannot find the record of a single instance in which such a complication existed. But when the astragalus is dislocated *inwards*, the os calcis and scaphoid being thrown outwards, then it sometimes happens that the tendon of the tibialis posticus is thrown in front of the neck of the astragalus, and so closely embraces it, that the head of the bone is fixed between the tendon and the calcaneo-scaphoid ligament to such an extent that reduction is impossible until this tendon be divided, either alone or in conjunction with the tendon of the gastrocnemius. It will be seen at once, that if the above condition respecting the tibialis posticus tendon prevails, extension only aggravates the obstruction, by tightening the very tendon that holds in its embrace the constricted neck of the astragalus, the head of which has to be drawn inwards between this tendon and the ligament beneath.

The following cases illustrate this displacement of the tendon, and, I think, justify me in drawing the foregoing conclusions.

The first case is reported anonymously in the 'Clinique de Marseilles,' and is also mentioned by Mons. Broca. A man, 63 years of age, was taken to the Hôtel Dieu, at Marseilles, in October, 1842. He had fallen from some height, and had a severe wound on the left foot. The foot was everted almost transversely, the toes pointing outwards, and the heel inwards; the sole of the foot was not unnaturally placed. The inner margin of the foot presented a prominent angle, the summit of which was formed by the

head of the astragalus. This was exposed, and projected through a wound, which extended from the dorsum of the foot, passed below the internal malleolus, and terminated near the tendo Achillis. The neck of the astragalus was entangled between the tendon of the tibialis posticus, which embraced its upper half, and the inferior calcaneo-scaphoid ligament, which embraced its lower half. The scaphoid was situated external to and a little above the head of the astragalus. The posterior tibial vessels and nerves were exposed in the wound; they were much stretched, but not lacerated. There was a comminuted fracture of the external malleolus. The reduction was not possible until after the division of the tendon of the tibialis posticus. The reduction then became easy, though very painful to the patient. He died on the fifth day.

Post-mortem examination.—The astragalus was in its place; the os calcis, scaphoid, and cuboid presented their natural relations, and their ligaments were intact. The ligaments which united the astragalus to the bones of the leg were not torn, but the sub-astragaloid (interosseous) ligament was ruptured for the greater portion of its extent. The external fibres only remained.

I am indebted to my friend Mr. Birkett for the following case.

C. H—, æt. 45, was admitted into Guy's Hospital in August, 1853. There was well marked dislocation of the astragalus inwards, from the os calcis and scaphoid. The foot was everted, and a prominence existed in front of the internal malleolus; the integuments were much stretched over the projection, but there was no wound of the skin. Extension was made with the hope of reducing the dislocation, but entirely failed to produce any effect on the displaced bones. On the following day the tendon of the gastrocnemius was divided by Mr. Birkett, and extension again made, but with no better success than before the division of the tendon. As sloughing of the integuments subsequently occurred, Mr. Birkett cut down upon the

astragalus in order to remove it, but he experienced some difficulty in endeavouring to do so, in consequence of the tendon of the tibialis posticus lying over, and in front of the neck of the bone, which was consequently tightly fixed in its new position. As soon as the tendon was divided, the bone was readily removed. Subsequent amputation of the leg was performed, and the patient ultimately recovered.

Mr. Poland was kind enough to favour me with the particulars of the next case.

A young man was admitted into Guy's Hospital with dislocation of the astragalus inwards: all attempts at reduction proved ineffectual. There was no wound in the skin, but subsequent sloughing of the integuments exposed the dislocated bone. The patient did not survive the injury many days. On examination of the foot the tendon of the tibialis posticus was found running in front of the neck of the astragalus, and, as in the former cases just related, no doubt prevented or assisted in preventing the reduction of the bones, when extension was made.

In the 2d volume of the '*Bulletin de la Faculté et de la Société de Médecine*,'¹ a case is mentioned of dislocation of the astragalus, in which all attempts at reduction failed until the tendons of the tibialis anticus and posticus muscles had been divided. There are on record three cases of dislocation of the astragalus backwards; reduction was not effected in any one instance. It appears to me that division of the tendo Achillis would prove all important in any future instance of this rare injury.

It appears doubtful, at present, how far it may be desirable to replace the astragalus in cases of compound dislocation of this bone, if the attachments of the bone have been much destroyed. In compound dislocations the safety of returning the astragalus is, in Mr. Turner's opinion, a "very serious consideration, since if the bone be so loose and detached as

¹ P. 245.

to be capable of being easily reduced, is it not likely," he asks, "that it will die from want of sufficient vascular connexions?" It will, I trust, be fully understood that I have no desire to urge the division of tendons in all extreme cases. Every surgeon can best judge in the individual instance, whether it may be desirable to reduce a compound dislocation by simple measures, and at once replace the bone in its natural position, and thus relieve the integuments of all tension and pressure; or whether it may be more expedient and safer to remove the bone at once, or even to have recourse to amputation. Mr. Turner is of opinion, that in preference to any attempts at reduction, "extirpation ought always to be performed" in compound dislocations; and he adds, that in the experience of the surgeons of the Manchester and Leeds Infirmaries, a case of complete compound dislocation of the astragalus had never been reduced, nor had he been able to ascertain that any reductions in similar injuries had been accomplished in the Liverpool, Bristol, or other provincial hospitals. "All attempts at reduction are not only hopeless, but prejudicial," he says; "but the discouragement does not arise from the non-success of the practice alone, but from the mischief which often results from torturing attempts at reduction."

Now, although the cases mentioned in Sir Astley Cooper's work disprove, to a certain extent, the correctness of Mr. Turner's conclusions respecting the treatment of compound dislocations of the astragalus, yet the last quoted paragraph indicates to my mind that surgeons may modify their opinions and practice in this interesting and important question, after mature consideration of the treatment advocated in this communication: at any rate, that this treatment may be adopted in many instances, before proceeding at once to the removal of the astragalus: and I am strengthened in this expectation, when reminded that in three cases of compound dislocation of the astragalus, mentioned by Cooper, reduction was effected in each, and each case recovered.

It would be presumption on my part to speak decidedly as to the line of practice to be pursued in every case of compound dislocation of the astragalus, but I should certainly be inclined to divide the tendo Achillis in almost all such cases. I believe that the reduction of the bone would generally be secured readily without forcible means, and that the soft parts would be subjected to much less disturbance than if the immediate removal of the bone were attempted. If, however, the bone were much shattered, its removal must no doubt be desirable; but if it were broken without much comminution, and there did not appear much necessity for its immediate removal, division of the tendon would, in my opinion, conduce much towards the quietude of the injured parts, nor would the operation itself involve important considerations.

M. Broca prefers attempting reduction in the first instance in compound dislocations of the astragalus. The relaxation of the soft parts, by incision if necessary, and the section of certain tendons, he says, should facilitate the reduction of the bones; but that, notwithstanding these measures, the dislocation will often remain unreduced. He further adds: "1st. In dislocations *without wounds* it is necessary above all means to try reduction; if this is not effected it behoves us to wait. If abscess or sloughing follows, subsequent extraction of the astragalus must be performed. 2dly. In dislocation *with wounds* it is also necessary to attempt reduction; and in having recourse to it, if necessary, to relieve the skin, and also to have recourse to tenotomy."¹

It is interesting to observe how near Mons. Broca has approached the true appreciation of the importance of dividing tendons in dislocations of the astragalus without having thoroughly established, as a rule, their division in every such case. He does not allude to their division in the treatment of simple dislocations, in which it will, no doubt, prove most beneficial, although he recommends

¹ 'Mémoires de la Société de Chirurgie de Paris,' vol. iii.

tenotomy generally in compound dislocations, in which cases it may sometimes be impracticable, from the severity of the injury. M. Broca does not, however, appear ever to have practised division of any tendons in any form of dislocation of the astragalus.

I may add in concluding the consideration of compound dislocations in connexion with division of the tendons, that Dupuytren's opinion, as regards the treatment of such cases, was that "the removal of the astragalus was far preferable to repeated attempts at reduction."

The figures in the appended table point out most strongly the seriously damaging character of dislocations of the astragalus, even under some apparently favourable circumstances, unless reduction be effected with gentle means. I trust, therefore, I am not too urgent in my endeavour to impress upon the Society and the profession generally, the advantages of dividing the gastrocnemius and other tendons in all dislocations of this bone, if simple extension by ordinary measures does not succeed; and that rather we should have recourse to it in all cases, in order that we may, as far as practicable, avoid contusion of parts already bruised, and often severely lacerated; and that we may put in practice this treatment, as a far preferable preliminary to, if not an entire substitute for pulleys. Will any surgeon dispute the advantages of dispensing with pulleys, at the expense of the division of a tendon, when he calls to mind the extensive mischief that has followed even their successful application?

Extraction of the astragalus is an operation, frequently of remarkable innocence, as far as life is concerned. But I am clear that it would have been much less frequently practised if reduction could have been readily effected; and that it has only been performed, when extension failed, rather than leave the bone prominent, and pressing on the stretched and contused integuments.

The following appear to me the most reasonable rules to guide us in our practice:

1st. In all *simple* dislocations of the astragalus *outwards*,

from the os calcis and scaphoid, in which moderate extension fails to effect reduction, the gastrocnemius tendon should be divided, and extension subsequently made.

2dly. In all *simple* dislocations of the astragalus *inwards*, if moderate extension fails, the gastrocnemius tendon should be divided; if this be not sufficient to permit reduction under gentle extension, the division of the tibialis posticus tendon should be had recourse to, for reasons already mentioned. Some care may be required to divide this tendon, as it is sometimes displaced from the groove behind the internal malleolus.

3dly. In *compound* dislocations, not reducible under gentle extension, division of the tendons, which interfere with the reduction, should at once be performed.

I must beg leave, in conclusion, to remark that too much must not be expected in these injuries from division of the tendons necessary to facilitating the reduction of the dislocation. I do anticipate that the operation will usually and materially assist reduction. I do not anticipate that it will, to any great extent, modify or affect the subsequent treatment or progress of severe cases. But I believe it will materially diminish the mischief in the soft parts which is liable to follow the severe handling in extension, or the pressure caused by the application of pulleys, or other measures in unsuccessful attempts at reduction. If, however, any satisfactory results are obtained by the adoption of such a simple and readily performed operation as division of the tendons mentioned, in but a small number of cases of this formidable accident, I trust that the members of the Society will not consider this communication on my part a useless one, but rather that the principles advocated in it are based on sound and practical considerations.

Results of treatment in fifty-five cases of Simple and Compound Dislocation of the Astragalus.

Nature of Dislocation.	Treatment.	Result.	Total.	
Simple dislocation, 32 cases.	Amputation {	Recovered. 1 Died 3	4	{ In one case tendo Achillis divided.
	Extraction of astragalus {	Recovered. 3 Died 1 Uncertain. 1	5	
	Reduced ... {	Recovered. 13 Died 1	14	{ In one case tendo Achillis divided.
	Not reduced {	Recovered. 8 Died 1	9	
	Total of cases		32	{ Recovered. 25 Died 6 } 32 cases. Uncertain. 1
Compound dislocation, 23 cases.	Amputation {	Recovered. 0 Died 3 Uncertain. 2	5	{ In one case tendon of tibialis posticus divided.
	Extraction . {	Recovered. 11 Died 2	13	
	Reduced ... {	Recovered. 2 Died 2	4	
	Not reduced {	Recovered. 1 Died 0	1	
	Total of cases		23	{ Recovered. 14 Died 7 } 23 cases. Uncertain. 2

The total number of deaths was 13 out of 55 cases of compound and simple dislocation of the astragalus. This rate gives an average of 1 death in $4\frac{1}{4}$ cases of dislocation.

The total number of reductions was 18 out of 55 cases. Three of these died; leaving 15 cases of recovery after reduction, treated by the usual methods of extension. These give an average of about one reduction in every four cases of dislocation of the astragalus.