

tion, and the biceps was felt distinctly attached. There was no other lesion. The reduction was easily accomplished by pressing with the fingers upon the inner and back part of the fibula, thrusting it outwards and forwards. A compress and bandage were applied, and the limb placed at rest. The reduction continued complete, and after a few days he was permitted to use the limb.<sup>1</sup>

I find in the *St. Louis Medical and Surgical Journal* for March, 1881, copied from the *Canada Journal of Medical Science*, the case of a boy æt. 2 years, who had fallen from a chair, and on examination two weeks later, the doctor found the head of the fibula displaced backwards. It was easily replaced, and without pain; but some months later the surgeons in attendance were unable to retain it in place.

Bryant says he has seen three examples of the backward dislocation, but gives no account of them.<sup>2</sup>

## CHAPTER XXII.

### DISLOCATIONS OF THE LOWER END OF THE FIBULA.

*Syn.*—"Luxations of the inferior peroneo-tibial articulation;" Malgaigne.

EXCEPTING Boyer's case of dislocation of both the upper and lower ends of the fibula, already referred to, Nélaton relates the only example of a simple dislocation of this articulation of which I have any information. The patient who was the subject of this accident presented himself at the hospital under the care of M. Gerdy on the thirty-ninth day after the accident, which had been occasioned by the passage of the wheel of a carriage obliquely across the leg in such a manner as to push the malleolus externus directly backwards. The lower end of the fibula was in almost direct contact with the outer margin of the tendo Achillis; the outer face of the astragalus, abandoned by the fibula, could be distinctly felt in nearly its whole extent; the foot preserved its natural position; and he could walk pretty well, only that he was obliged to step with some care. M. Gerdy believed that the bone was too firmly fixed in its new position to be moved, and therefore made no attempt at reduction.

<sup>1</sup> Richardson, *Amer Journ. Med. Sci.*, April, 1863.

<sup>2</sup> Bryant, *Practice of Surgery*, Eng. ed. of 1872, p. 810.

## CHAPTER XXIII.

### TARSAL DISLOCATIONS.

#### § 1. Dislocations of the Astragalus.

*Syn.*—"Double dislocations of the astragalus;" Malgaigne.

THE astragalus may be dislocated forwards, outwards, inwards, backwards; or it may be dislocated obliquely in either of the diagonals between these lines; it may be simply rotated upon its lateral axis, without much, if any, lateral displacement; and, finally, it has been occasionally driven between the tibia and fibula, tearing away the intermediate ligaments, and generally fracturing one or both bones of the leg.

*Causes.*—The causes which have been found chiefly operative in the production of this dislocation are very much the same as those which produce, under other circumstances, a dislocation of the lower end of the tibia.

Thus, a fall from a height upon the bottom of the foot, accompanied with a violent abduction, adduction, flexion, or extension, may determine a dislocation of the astragalus inwards, outwards, backwards, or forwards. Sometimes it is accomplished by a mere wrenching and twisting of the foot in machinery, or in the wheel of a carriage, or by being caught between two irregular bodies. It may be produced also by a direct blow.

*Symptoms.*—The great prominence occasioned by the displacement of the bone in either of these several directions, accompanied generally with more or less lateral deviation of the foot, is alone sufficient to indicate the true nature of the accident. In some cases, also, the foot is forcibly flexed or extended; the leg is shortened in consequence of the tibia having fallen down upon the calcaneum; the superincumbent skin and tendons are rendered tense; blood is effused, and swelling speedily occurs. In the backward dislocation, the position of the foot is not much changed, but the tibia being slightly carried forwards, the length of the dorsal aspect of the foot is proportionately diminished.

To be more precise, I shall quote at length from the careful analysis of this subject made by Poincot in the French edition of this treatise.

FIG. 377.



Dislocation of the astragalus outwards. Anatomical relations.

"The signs of the different varieties of dislocation of the astragalus may be briefly stated as follows:

"The dislocation *forwards*, which is very rare, is characterized by the prominence of the astragalus on the dorsal surface of the foot, at a point corresponding exactly to the space midway between the two malleoli, or to the dorsal surface of the scaphoid bone; that prominence is movable upon the foot and upon the bones of the leg.

"In the dislocation *forwards and outwards*, the most common of all, the foot is in a state of strong adduction, its extremity being directed inwards, and its internal border being shortened and concave. The tibia rests upon the calcaneum, instead of the astragalus, and seems as if embedded in the soft parts; the fibula gives rise to a marked projection on the outside. Through the stretched integuments, in front and on the outside, the articular facetta of the astragalus can be recognized.

"When the dislocation has been produced *forwards and inwards*, the projecting astragalus is felt at that point; moreover, the foot is slightly abducted, with its external border elevated; but the characteristic sign consists in the change of direction taken by the astragalus, whose head is directed downwards, its axis having thus become parallel with that of the tibia.

"The dislocation directly *backwards* is characterized by the projection of the astragalus between the tibia and the tendo Achillis, which is pushed backwards; in addition to this displacement backwards, the astragalus undergoes a rotation in the direction of its transverse axis, which brings its superior surface forwards and the inferior one backwards. The tibia being slightly carried forwards, the dorsal surface of the foot is shortened.

"In the dislocations *backwards and inwards*, or *backwards and outwards*, the projecting astragalus is felt behind the corresponding malleolus.

"The symptoms observed following a dislocation *inwards* are: forced abduction of the foot; the existence, below the malleolus externus, of an enormous depression, into which the integuments may be pushed; the very marked projection of the internal malleolus, below which the facetta of the astragalus is felt directed completely inwards.

"The signs are reversed in the dislocation *outwards*, viz.: forced abduction of the foot; projection of the malleolus externus, below which is the facetta of the astragalus turned outwards; depression below the malleolus internus.

"The clinical history of the dislocations *by rotation* or *by renversement* is too incomplete yet to give any hope of their diagnosis being established with precision. I will relate, however, in the way of information, what has been written by M. Delorme regarding the signs which, according to his statement, would enable one to diagnose the dislocations of the astragalus by renversement or *upside down*.

"If, in the dislocation without rotation, the two bony borders of the pulley of the astragalus be looked for, they begin to be felt very near the head, at 1 or  $1\frac{1}{2}$  centimetres from it. In the dislocations by rotation (of 180 degrees or by renversement), on the contrary, the projections by which the inferior and posterior articular surface of the astragalus is

limited, and which were taken for the margins of the facet, are  $3\frac{1}{2}$  to 4 centimetres behind the head, two fingers' breadth, as Chassaignac has observed, who did not take advantage of this sign to establish his diagnosis.

"In dislocations without rotation, the interval separating the two bony margins of the facet of the astragalus is 3 centimetres, measured directly over the bone. It would exceed 3 centimetres, but would not reach 4, on a foot covered by the soft parts and swollen. In dislocations by rotation, the interval separating the projections which overhang the posterior articular surface of the astragalus is already 4 centimetres. The thickness of the soft parts and the swelling would increase it to nearly 5 centimetres.

"Finally, by careful search, it would not be more difficult to feel the depression of the articular surface, between the two projecting eminences of the inferior surface of the astragalus, than to feel the flat part of the superior surface, which is commonly recognized in the double dislocations

FIG. 378.



Simple dislocation of the astragalus outwards.

FIG. 379.



Compound dislocation of the astragalus inwards.

without rotation. At any rate, establishing the absence of this surface would be the acquisition of a valuable sign."

Such are the symptoms which may ordinarily enable us to recognize the true character of these displacements when not much swelling exists, even though the skin is not broken and the bones are not exposed; but in a majority of the examples which have been seen, the integuments have been more or less extensively torn, exposing to the eye at once the naked bone, and thus removing all chance of error in the diagnosis.

Norris mentions a case seen by Hammersley, in which the astragalus was thrown completely out, and was subsequently found in the earth

where the patient had received his injury. Inflammation, gangrene, and tetanus supervened, and the patient died on the seventh day.<sup>1</sup>

*Prognosis.*—It will be readily understood that nothing short of very great violence could disturb and completely break up the connections of a bone so compactly and firmly seated as is the astragalus, and that, aside of any unusual complications, under the most favorable circumstances, intense inflammation must naturally be anticipated; and, with few exceptions, this has actually taken place. Even when reduction has been promptly and easily effected, inflammation, gangrene, and death have sometimes speedily ensued. But more often the reduction has been found to be exceedingly difficult or impossible, and complete removal of the bone or amputation has been immediately demanded.

In a limited number of cases, on the other hand, the bone has been easily reduced, and recovery has taken place, with a tolerably useful limb; or resection has been practised with an equally favorable result; in still other cases the bone has been left protruding, and the patient has finally recovered so far as to be able to walk again, but in such a crippled condition as to render the achievement a very doubtful triumph of conservative surgery.

M. Poincot has attempted to decide, by means of figures, in what proportions these very opposite results are to be hoped for or feared.

"Out of seventy-eight cases of simple double dislocation collected by M. Broca, he finds that nineteen were reduced. M. Dubrueil, since the date of publication of Broca's statistics, counted five reductions out of twelve cases of double dislocation without any primary wound. Beginning in 1864, when Dubrueil's statistics were published, I have been able to collect thirty-one cases of simple double dislocation, in which attempts at reduction were made, and which furnished nineteen successes. Twenty-one of the latter cases were published elsewhere: in that number, reduction had been effected twelve times; of the nine other patients, one had suffered immediate amputation, and the last eight had been submitted, at least at the beginning, to the expectant treatment."

According to Broca, the attempt at reduction failed in 54 cases out of 63.

Poincot narrates briefly other cases collected by himself, and which have been reported by Guéniot,<sup>2</sup> Busch,<sup>3</sup> Iverson,<sup>4</sup> Gore,<sup>5</sup> Uthoff,<sup>6</sup> Ward,<sup>7</sup> Fairbank,<sup>8</sup> Hird,<sup>9</sup> Landerer,<sup>10</sup> Lloyd,<sup>11</sup> and F. H. Hamilton.<sup>12</sup>

"Out of the eleven preceding cases, therefore," says Poincot, "reduction was successful eight times; in the other three cases, extirpation of

<sup>1</sup> Norris, George W. Amer. Journ. Med. Sci., 1837, p. 383.

<sup>2</sup> Guéniot, Gaz. des Hôp., 1872, No. 94.

<sup>3</sup> Busch (Madelung), Berliner Klin. Wochen., 1873, 7 u. 8.

<sup>4</sup> Iverson, Nordiskt Med. Ark., 1876, Bd. 8, Hft. 3.

<sup>5</sup> Gore, The Lancet, 1880, vol. i. p. 625.

<sup>6</sup> Uthoff, The Lancet, 1880, vol. i. p. 701.

<sup>7</sup> Ward, The Lancet, 1880, vol. i.

<sup>8</sup> Fairbank, The Lancet, 1880, vol. i. p. 745.

<sup>9</sup> Hird, The Lancet, 1878, vol. i. p. 311.

<sup>10</sup> Landerer, Central. für Chir., 1881, p. 609.

<sup>11</sup> Lloyd, The Lancet, 1882, vol. ii. p. 353.

<sup>12</sup> Hamilton, 5th ed. of this treatise, 1880, p. 774.

the astragalus had to be performed at a varying period following the accident. The three patients operated upon recovered in good condition.

"By adding our statistics to those of Broca and of M. Dubrueil, we reach a total of 121 cases of reduction with 43 successes, making an average of successes of 35.5 per cent. I will call attention to the fact that our personal statistics, which are more recent than the two others, furnish an average of successes not below 61.2 per cent.

"In the fortunate cases, three times (cases of Crosse, Bryant, Moore), the reduction could not be accomplished until after the tendo Achillis had been divided; such was the case with Cock's patient, mentioned by Dubrueil. In two of the cases where reduction could not be effected, the surgeons (Busk, Cheevers) had not only divided the tendo Achillis, but also the tibialis posticus, the extensors of the toes, and the extensor proprius pollicis. Pichorel, of Havre, was not more successful, but he had only divided the tendo Achillis. Broca has reported four additional cases of tenotomy, taken from Chaussier, Despaulx, Solly, and from the clinic at Marseilles: reduction was only obtained twice. I will also state Shaw's case, recalled by Dubrueil, and in which the division of the tendon of the flexor longus did not effect the reduction. After all, tenotomy, practised in twelve cases, effected the reduction six times, thus giving an average of 50 per cent., which exceeds by 15.6 per cent. that furnished where attempts at simple reduction were made. With such results, one may be allowed to wonder why tenotomy is not resorted to more frequently in cases of irreducible dislocations.

"It is especially in the dislocations backwards that failures at reduction have been most frequent: in twenty cases which we have been able to collect, reduction was effected only four times. The first one of those cases was reported by Malgaigne, without any author's name: the only indication as to its origin states that it was observed in 1839, in one of the hospitals of London; the displacement, which had occurred inwards and backwards, was reduced in ten minutes, by means of strong extension combined with lateral pressure. Erichsen, although insisting upon the extreme difficulties that are met with in the dislocations backwards, declares that the surgeons of the University Hospital of London recently succeeded in a case which was complicated with a fracture of both bones of the leg. Erichsen advises the subcutaneous section of the tendo Achillis in cases where the ordinary procedures have failed. The third case was published in detail by Dr. Blatin, of Clermont-Ferrand: A man 50 years of age, robust and muscular, falling into a cellar from a height of several feet, dislocated the astragalus directly backwards: the displacement was incomplete as to its relations with the articular ends of the tibia and fibula, complete as to its relations with the scaphoid and both articulations of the calcaneum. M. Blatin, in order to obtain the reduction, resorted to the following procedure:

"I made vigorous traction upon the calcaneum, in order to disengage that bone from the groove of the astragalus and so as to obtain sufficient room for the return of the astragalus. Then I extended the foot strongly upon the leg, in such manner as to disengage the hollow at the articulation of the calcaneum with the astragalus, and so as to use the posterior and superior portion of the calcaneum as a means of pushing the astrag-

alus forwards. . . . After the second attempt, the astragalus had resumed its normal position.' Finally, in 1875, Dr. Morgan stated, at the Pathological Society of London, that he had recently seen a case of dislocation of the astragalus backwards, without fracture, where the reduction was easily effected.

"In eight cases out of fifteen, the results of which are known to us, failure at reduction did not deprive the limb of more or less usefulness. Lizars states that he saw a case of dislocation backwards where, although all attempts at reduction had failed, the limb was saved, and afterwards, the patient could use it pretty well. Such was the result in a case in Mr. Liston's practice. Phillips has published two cases of dislocation backwards which had resisted all efforts: the two patients walked easily, notwithstanding the persisting displacement; one of them wore a shoe cut behind in order to avoid pressure upon the projecting astragalus. A patient of Cheevers, to whom I have already alluded when speaking of tendinous sections, recovered notwithstanding the gangrene of the skin on a level with the astragalus; five months after, he walked pretty easily with a cane. In the two other cases, the dislocation had not been recognized in the beginning, and had been mistaken for a fracture; one of them has been reported by the author of this treatise.

"Dr. MacCormac, in 1875, presented to the Pathological Society of London a specimen of dislocation of the astragalus taken from a subject who had had the leg amputated for a chronic affection of the knee. The dislocation dated back two years, and had been treated for a fracture. The deformity was very slightly marked, and the patient walked easily with the aid of a cane. He could climb a ladder and walk on the scaffoldings. At the dissection, the head of the astragalus was found in place, but the body of the bone was displaced backwards and adhered to the tendo Achillis; the other tendons passed on the sides of the dislocated portion of the bone. At the same meeting, Dr. MacCormac recalled a similar fact of Mr. Legros Clark, which dated back to 1863: the patient when seen again recently (1875), twelve years after, walked very well with his unreduced dislocation.

"But, in a certain number of cases, the expectant treatment resulted in gangrene of the skin over the projecting astragalus, and extraction of the bone had to be resorted to. Such was the measure adopted in two cases by Foucher, Buchanan, and Williams, of Dublin. In each case the operation was followed by success.

"In a patient of M. Pichorel, of Havre, two attempts at reduction and section of the tendo Achillis were followed by a purulent arthritis which required amputation.

"Immediate extraction of the astragalus, in dislocations backwards, has only been practised twice, by Hulme, of Dunedin, and by Turner; the latter case being a compound dislocation. In both cases, the results of the operation were sufficiently satisfactory.

"The expectant plan of treatment which has been relatively fortunate in dislocations backwards, has only been followed by deplorable results in other displacements of the astragalus. Out of seventeen cases, I count only two successes; and out of the fifteen failures, there was one death by gangrene, nine consecutive extractions, and one amputation.

"The two successes belong to Dupuytren and Dr. Barton, of Philadelphia. I take from M. Dubrueil the very brief history of the first one of these cases: 'In a simple and complete dislocation outwards, observed by Dupuytren, the bone could not be replaced; there occurred a superficial eschar which did not communicate with the articulation, and, two months after the accident, the patient could use the limb very well.' Barton's case, and the one preceding, present the greatest similarity; the inflammation was severe, and the sphacelus exposed the projecting portion of bone; but after the lapse of a certain time the skin cicatrized. Five months later, the patient could walk and use the articulation well, although a well-marked deformity of the foot still existed, and notwithstanding the fact that every now and then new ulcerations of the cicatricial tissue would occur.

"In a second case of Barton, however, extensive gangrene occurred, soon after the accident, and the patient died.

"In a patient of Dauvé, suffering with a dislocation of the astragalus forwards and outwards, with rotation on its antero-posterior axis, the pressure upon the integuments produced gangrene, and the exposed astragalus became necrosed. The result is not known to us, but the case may already be considered as one of the failures by the expectant plan. Two patients of Guthrie, in whom a similar displacement could not be reduced, could not possibly use their feet. A soldier, seen by Sir Wm. Fergusson, and who had a dislocation of the astragalus dating several years back, could only walk with the aid of a cane, and applied only the tip of the foot to the ground.

"Dr. Wilson, of Manchester, has reported a case of dislocation outwards of two years' standing. The right foot turned strongly inwards, it rested on the ground with its external border, the point d'appui being represented by the external borders of the calcaneum and of the fifth metatarsal bone. The patient could not use the foot. There existed at the external side of the dorsal aspect a voluminous projection; the integuments, at that point, would get inflamed on the slightest fatigue, and had ulcerated on several occasions. Wilson amputated the leg, and the patient recovered.

"The cases of secondary extraction have given one death, which occurred in the practice of Dr. Smith, of Leeds. A tall and robust gentleman dislocated the astragalus while jumping out of a carriage, on May 14, 1864. The skin sloughed, the bone became loose, and Mr. Smith extirpated it on the 14th of June. One month after, the patient died with eschars on the sacrum. The same surgeon scores three recoveries out of three operations which he performed, the patients being able to use their limbs perfectly. An equally good result was obtained in the cases of Busk, Cruveilhier, Lallemand, Loewer, and Shillitoë.

"The dangers of the expectant method [except perhaps in the backward dislocation—H.] and the almost absolute necessity of resorting subsequently to extraction of the astragalus, have suggested to a certain number of surgeons the immediate performance of that operation. Such was the procedure which I adopted in a case mentioned above, in the chapter on Fractures of the Astragalus; I will recall the fact that the patient died after having undergone amputation of the thigh; the extir-

pation was incomplete, as I had left in place the head of the bone which had maintained its relations with the scaphoid."<sup>1</sup>

George W. Norris, of Philadelphia, relates the following case, illustrating the imminent danger to which even the life of the patient may be exposed in those examples which are apparently the most simple:

William Summerill, *æt.* 30, was admitted to the Pennsylvania Hospital on the 26th of September, 1831. An hour previous, while descending a ladder, he slipped and fell in such a manner as to throw the entire weight of his body upon the outer part of his left foot. The foot was turned inwards, and nearly immovable; a slight depression existed immediately below the lower end of the tibia, and there was a hard rounded projection on the outer part of the foot, a little below and in front of the extremity of the fibula; the skin over this projection was not broken or excoriated, but reddened; there was no fracture of either bone of the leg.

The symptoms rendered it plain that the astragalus was dislocated forwards and outwards. Dr. Barton, under whose care the patient was received, proceeded soon after to make attempts at reduction. The muscles of the leg were relaxed as much as possible, and extension made from the foot by seizing the heel and front part of the foot while an assistant made counter-extension at the knee. The bone was also pushed inwards toward the joint by the surgeon. These efforts were continued for a considerable time, but had no effect in changing the position of the bone.

Six hours afterwards, Drs. Harris and Hewson being in consultation, the attempt was again made to accomplish the reduction, but without success; and the surgeons immediately proceeded to excise the bone.

An incision was made parallel with the tendons, commencing a short distance above the projection, and extending down far enough to expose fairly the astragalus and its torn ligaments. The bone was then seized with the forceps and easily removed after the division of a few ligamentous fibres that continued to connect it with the adjoining parts. Very little bleeding occurred, only two small arteries requiring the ligature.

After removal, it was discovered that about one-half of the surface which plays in the lower end of the tibia had been fractured, and that it remained firmly attached to the extremity of that bone. No attempt was made to remove this fragment; but, the joint being carefully sponged out, the sides of the wound were brought together and closed by sutures, adhesive straps, and a roller; after which the foot, placed in its natural position, was laid in a fracture-box.

On the fifth day a slough began to form upon the outside of the foot, which was followed by suppuration at other points, and on the thirteenth day an opening was made to evacuate the pus near the malleolus internus. At the end of about eight weeks the fragment of the astragalus which had been suffered to remain was found to be carious, and it was removed; the heel also had ulcerated from pressure, and several other bones of the tarsus were discovered to be carious. Fifteen months later,

<sup>1</sup> Poincot, French ed. of this treatise, p. 1182 et seq.

this poor fellow was still in the hospital, suffering from hectic, with extensive disease in the bones of the tarsus and ankle-joint. Finally, amputation of the leg was practised by Dr. Barton, a few days after which the patient died.<sup>1</sup>

Norris mentions also two examples of simple dislocation of the astragalus at the Pennsylvania Hospital which came under the observation of Dr. Barton, in both of which the bone was left unreduced. In one case inflammation and sloughing soon effected a complete exposure of the protruding bone, but after a time the skin cicatrized. At the end of five months the patient walked and had good use of the joint, though great deformity of the foot existed, and he continued to be subject to ulceration of the newly formed skin on its outer part. In the other case gangrene supervened soon after the accident, and the patient died.

Norris adds that "the late Professor Wistar removed the astragalus in a case of compound dislocation, and the patient was cured with some motion at the joint."

Dr. Alexander Stevens, of New York, made the same operation in a case of compound dislocation, and, after several months, he affirms that the patient "has recovered with very trifling deformity of the foot, and with a flexible joint. He walks with very slight lameness."<sup>2</sup>

I am indebted to Dr. B. H. Hart, of Marietta, Ohio, for an account of the following case, and for the specimen, which has, also, kindly been put in my possession.

In June, 1853, Thomas Williams was thrown from his carriage, alighting upon his left foot and causing a compound dislocation of the ankle-joint. Dr. Hart was immediately called, and found the bones of the leg thrust through the integuments on the outside, the malleolus internus broken, and the astragalus partially dislocated. After enlarging the opening in the integuments with a pocket-knife, the doctor was able to reduce the dislocated bones. It must be mentioned that this man weighed 225 pounds, and that in his fall he descended a precipice or bank 30 feet in height. Soon after the reduction the patient had two severe convulsions, which were arrested by bleeding and opiates, and never returned. Cool lotions were applied to the limb; and on the sixth day erysipelas supervened and extended nearly to the body. The erysipelas continued about nine days. Extensive suppuration throughout the joint resulted, and some fragments of the bone came away, and on the thirty-third day Dr. Hart removed, without the aid of the knife, the entire astragalus. In three months the patient walked upon crutches, and in eleven months he could walk well without a staff, a slight motion having been preserved in the ankle-joint.

The dislocations backwards, of which we have found recorded only twenty examples, have all, with but four exceptions, been left unreduced; yet in several instances the patients have recovered with pretty useful limbs. Such was the fact with Liston's, Lizars, and my own patients, and also with Mr. Phillips's two cases, to all of which I shall again refer. It must be noticed, however, that, in each of the cases

<sup>1</sup> Norris, George W., *Amer. Journ. Med. Sci.*, Aug. 1837, p. 378.

<sup>2</sup> Stevens, *North Amer. Med. and Surg. Journ.*, Jan. 1827, p. 200.

mentioned as followed by a successful termination without reduction, the dislocations were simple.

Turner, of Manchester, has reported one example of compound dislocation outwards and backwards, in which, finding himself unable to effect reduction, he removed the astragalus, with a tolerably successful result.<sup>1</sup> Finally, a case was presented in one of the London hospitals in 1839, of a dislocation inwards and backwards, which was reduced in about ten minutes, by extension accompanied with lateral pressure.<sup>2</sup>

In Sept. 1870, I saw, with Dr. Sayre, in consultation, a subluxation of the astragalus forwards and outwards, in the person of Mr. Stewart, of this city, which had just occurred in consequence of an injury received in being thrown from a carriage. The dislocation seemed to be nearly but not quite complete, causing great projection and tension of the skin. Under the influence of chloroform, by extension and pressure, it was easily reduced by Dr. Sayre. In five weeks from this time he was able to walk, and soon after the restoration of the functions of the joint was complete.

Basil Norris, Surgeon U. S. A., in a paper read before the American Surgical Association in 1883, reports a case of dislocation of the astragalus forwards and outwards, caused by being thrown from a carriage, and alighting upon his foot. In less than an hour after the accident, under the influence of ether, it was reduced by Drs. Lincoln and Ashford, of Washington. The method employed was to draw the foot forcibly downwards, while it was at the same time rotated outwards. The first attempt was unsuccessful; but in the second, the extension being aided by direct pressure, the bone was at first partially restored to its position; the restoration being finally completed by continued extension, and by direct pressure upon the neck of the astragalus. No grave inflammatory accident ensued. The same paper contains communications from several surgeons reporting similar cases; only one of which, that of Dr. John Brinton, of Philadelphia,<sup>3</sup> had been previously reported.

In Dr. Brinton's case, the astragalus was dislocated forwards and inwards, and the fibula was broken, but the integuments were not torn. Several ineffectual attempts at reduction were made on the same day by Drs. Brinton and Moss. A severe inflammation ensued, with other alarming symptoms, and on the 14th day Dr. Brinton practised excision. A portion of the os calcis subsequently became carious, and was removed, and he finally recovered with a tolerably useful limb.

A communication from Dr. J. W. S. Gouley, contained in the same paper, gives an account of a case of simple dislocation forwards and outwards which he had reduced. Reference is made also to other cases seen by Drs. Gouley, Vollum, and Agnew, but not with sufficient precision to render their repetition in this place useful.

*Treatment.*—Various attempts have been made by surgical writers to determine the line of treatment which should be adopted in these un-

<sup>1</sup> Turner, Trans. Provin. Med. and Surg. Journ., vol. ix. Essay on Dislocations of Astragalus, with nearly fifty cases. For additional cases, see Med. and Surg. Reporter, Jan. 1867.

<sup>2</sup> London Lancet, vol. ii. p. 559.

<sup>3</sup> Brinton, Photographic Rev., No. 2, Dec. 1870.

fortunate cases, but with very unsatisfactory results, since they are far from having arrived at similar conclusions, nor have they been able always to settle the question definitely for themselves. The difficulty consists in the multiplicity and lack of uniformity in the complications which attend these accidents, rendering it impossible to establish a classification upon which a uniform treatment may be safely based. There are certain principles, however, which seem to be sufficiently settled to allow of an authoritative announcement; these may be briefly stated as follows: If the dislocation is simple, reduce the astragalus immediately, provided this is possible. If the dislocation is complete, and it cannot be reduced, even partially, except in cases of dislocation backwards, proceed at once to resection or to amputation. In compound dislocations, resection or amputation affords the only safe resource. In all cases the inflammation is likely to be intense, in order to prevent which complication the surgeon must be unremitting in his use of the appropriate remedies.

The several indications and rules of treatment above enumerated I shall proceed to illustrate a little more fully.

In a recent simple dislocation of the astragalus forwards, the leg should be flexed to a right angle with the thigh, and, for the purpose of making extension, one assistant should take hold of the foot in both hands in the same manner that a servant draws a boot, that is, with the right hand grasping the heel, and the left placed upon the dorsum of the foot, near the toes. A second assistant should seize the lower part of the thigh, in order to make counter-extension, while the surgeon presses with the ball of his hand against the head of the astragalus, upwards and backwards. If these simple measures fail, the pulleys ought to be employed as a substitute for the hands in making extension. In applying the extension, the toes must be kept well down, and occasionally the foot should be moved gently from one side to the other.

An oblique dislocation must be reduced, if possible, to an anterior dislocation, before an attempt is made to carry the head of the bone back to its place, as by this mode the reduction will be greatly facilitated.

Lateral dislocations may be reduced by the same means; but if the astragalus is dislocated outwards, the foot must be held forcibly adducted during the extension; and if it is dislocated inwards, the foot must be held strongly in the opposite direction.

Lizars says that he has seen one case of backward dislocation, and that all attempts at reduction were unavailing. The limb was, however, preserved, and proved to be useful.<sup>1</sup> Liston was equally unsuccessful in a case which came under his notice.<sup>2</sup> Phillips has reported two cases, in neither of which was the reduction accomplished.<sup>3</sup> Nélaton has seen a compound dislocation which he could not reduce.<sup>4</sup> Mr. Erichsen, however, who believed that when dislocated backwards it had not hitherto been reduced, declares that the surgeons at University Hospital have succeeded in one case recently, in which both the tibia and fibula were broken also.<sup>5</sup>

<sup>1</sup> Lizars, System of Practical Surg., Edinburgh ed., 1847, p. 161.

<sup>2</sup> Liston, Elements of Surgery, vol. iii. p. 348.

<sup>3</sup> Phillips, Lond. Med. Gaz., vol. xiv. p. 596.

<sup>4</sup> Nélaton, Pathologie Chirurg., t. ii. p. 482.

<sup>5</sup> Erichsen, Science and Art. of Surg., Amer. ed. 1869, p. 270.

Mr. Erichson suggests also that, in case of a failure by the ordinary means, we should resort to a subcutaneous section of the tendo Achillis. Mr. Williams, of Dublin, in a similar case, which had been left unreduced, was obliged finally to extract the bone, in consequence of the integuments having sloughed.<sup>1</sup>

In February, 1875, Mr. J. N. Hall, of Colorado, æt. 38, consulted me in reference to an injury to his foot sustained two years before. The foot had been caught between a couple of timbers and violently twisted inwards. The nature of the accident was not at first recognized. I found the astragalus displaced backwards as far as the posterior extremity of the calcaneum, causing the tendo Achillis to curve backwards; the astragalus was especially prominent on the inner side, posteriorly. The foot was at a right angle with the leg, and shortened in front three-eighths of an inch. The leg was shortened five-eighths of an inch. The foot was at times painful and numb. He walked very well with the aid of a cane. Of course, no surgical interference could be recommended.

Compound dislocations, and such as are otherwise complicated, demand of the surgeon immediate amputation or exsection, the latter of which ought to be preferred whenever the condition of the limb encourages a reasonable hope that the foot may be saved.

Dr. Grant, of Canada, has reported a case of success after reduction of a compound dislocation of this bone. The man was 35 years old, and in good health. Immediately after the accident the astragalus was found completely dislocated forwards, and lying with its long axis placed transversely, so that the anterior extremity protruded through the integuments one inch on the outer side of the foot. There was no fracture. The first attempt at reduction, by extension and pressure, failed; but in the second attempt moderate pressure, without extension, was successful. Suppuration ensued, and continued two months. At the end of eight months he walked without a cane; and at the date of the report the ankle was in all respects perfect.<sup>2</sup>

"In the dislocation by rotation, or renversement," says M. E. Delorme, "if the bone has been rotated upon its antero-posterior axis to the extent of 90 degrees, thus having brought its trochlear surface inwards or outwards, it is necessary, in order to effect reduction, that while pulling on the foot, the bone should be tilted, outwards in inward dislocation, and inwards in the external variety, which is done by pressing upon the margin of the facet which has become superior. In a case of dislocation by renversement, the surgeon must try first, by a tilting motion, to convert that rotation of 180 degrees into one of 90; and then to press again upon one of the margins of the bone, in order to transform the displacement into an ordinary dislocation inwards or outwards."

When exsection is practised, and the bone is found to be broken, as it often is, all the fragments should be carefully removed, since they are certain to become necrosed if left in place. "This happened," Poincot remarks, "in the cases of Barton and Smith, and the accidents which occurred in Sampson's patient and in mine, seem to me to be due to the

<sup>1</sup> Williams, Erichsen, op. cit., p. 271.

<sup>2</sup> Grant, Canada Med. Journ., Oct. 1865.

fact that the extirpation had been incomplete." Nor ought the surgeon to hesitate to lay open freely the tissues in every direction, in order that he may accomplish this purpose; even the tendons lying over the protruding bone may be sacrificed unhesitatingly, since, after having been so severely bruised, stretched, and lacerated, they are pretty certain to slough. Indeed, the more freely the tissues are divided over the bone, the less will be the danger of inflammation, and the safer will be the life and limb of the patient.

In addition to the examples already cited of compound dislocation in which the astragalus was removed, the following, reported by Dr. W. A. Gillespie, of Ellisville, Va., will also illustrate the occasional value of exsection in these severe accidents.

Mrs. A., aged about 50 years, fell from a horse on the 23d of May, 1833, dislocating both ankles. The dislocation of the right foot was accompanied with a dislocation of the astragalus outwards, which projected through a very large wound in the integuments, and its trochlea was placed at an angle of about 45° with its natural position. Early on the following day it was removed by severing its few remaining connections, and the wound was immediately closed by stitches, adhesive plasters, and light dressings. From the moment of the receipt of the injury, and for several days afterwards, she suffered excruciating pain in the limb, and on the third day tetanus was apprehended, but its full accession was prevented by the free use of opiates. The limb was suspended in N. R. Smith's fracture-apparatus; and as gangrene with hectic fever soon threatened the life of the patient, fermenting poultices were diligently applied, and the patient was sustained by wine, bark, and other tonics. Two months after the injury was received, the date at which the report is given, the wound had entirely healed, and her complete recovery was regarded as certain.<sup>1</sup>

## § 2. Astragalo-Calcaneo-Scaphoid Dislocations.

It is perhaps quite as common for the astragalus to be dislocated from the scaphoid bone and calcaneum, while it retains its connections with the tibia, as to be dislocated from all these bones at the same time. This astragalo-calcaneo-scaphoid dislocation is that which Malgaigne has termed "subastragaloid." Produced by the same causes which determine true dislocations of the astragalus, it may occur in the same directions, and is liable to the same complications; nor will either the prognosis or treatment differ essentially from that which is recognized and established in the other accident.

As in dislocations proper of the astragalus, so also in this accident, opposite results have occasionally followed from similar modes of treatment. Thus, Dr. Detmold, of New York, stated in 1856 to the New York Academy of Medicine, that he had recently met with a dislocation of the astragalus, in which the bone had retained its proper relations with the tibia, but not with the bones of the tarsus. The patient had fallen from a wagon and caught his foot in the wheel. Dr. Detmold made

<sup>1</sup> Gillespie, Amer. Journ. Med. Sci., Aug. 1833, p. 552.