

## CHAPTER XIX.

## DISLOCATIONS OF THE HEAD OF THE TIBIA (FEMORO-TIBIAL).

*Syn.*—"Tibia upon the femur;" "dislocations of the leg."

IN consequence of the great size and irregularity of the articular surfaces between the tibia and femur, together with the remarkable number and strength of the ligaments which bind the two bones together, dislocations at this joint are exceedingly rare. They are known to take place, however, in four principal directions, namely, backwards, forwards, inwards, and outwards. A dislocation may also occur in either of the diagonals between these points, that is, antero-laterally or postero-laterally, or the tibia may be dislocated by rotation. Dislocations of the head of the tibia may be either complete or incomplete. Velpeau found upon record thirteen examples of complete dislocations forwards and eight backwards, but not one of a complete lateral dislocation. Velpeau thought, also, that the antero-posterior dislocations were always complete, but Malgaigne has shown that this opinion is erroneous.

## § 1. Dislocations of the Head of the Tibia Backwards.

*Symptoms.*—The head of the tibia is felt in the popliteal space; and, if the dislocation is complete, the pressure upon the popliteal nerve becomes excessively painful.

A marked depression exists in front, immediately below the patella, and especially upon the sides of the ligamentum patellæ; the condyles of the femur project strongly in front; the leg may be not at all (incomplete) or only slightly shortened, or the shortening may amount to one inch or more; and usually it is in a position of extreme extension, or thrown forwards from the line of the axis of the femur; but its position has been found to vary greatly in different cases, the limb being sometimes very much flexed, and in others very slightly flexed, or perfectly straight.

*Pathological Anatomy.*—The posterior ligament of the joint is torn; the muscles of the ham are stretched; the popliteal nerves and vessels compressed; and the head of the tibia either rests partly upon the posterior half of the lower articulating surface of the femur (incomplete), or it passes up and rests only against its posterior articulating surface, which in this direction extends an inch or more upwards. If the dislocation is complete, the crucial ligaments are also torn, and all the parts about the joint suffer extensive injury from stretching, laceration, or compression.



FIG. 365.  
Complete dislocation of head of tibia backwards.

joint suffer extensive injury from stretching, laceration, or compression.

*Prognosis.*—Malgaigne has seen three examples of incomplete backward dislocations which were not reduced, and neither of the persons was very greatly maimed in consequence. One walked with crutches after three or four days, and with a cane after about five weeks. Another did not leave his bed under one month, and it was nearly one year before he could lay aside his crutches; but both of them were finally able to walk at least twelve leagues per day. Malgaigne informs us, however, that in a similar case seen by Lassus, the patient was confined to his bed two years, although he finally recovered a tolerable use of his limb.

If the reduction is promptly effected, the limb kept perfectly quiet a sufficient length of time, and in other respects properly managed, not much inflammation need generally be anticipated, and the limb may suffer in the end very little if any maiming.

*Treatment.*—It will be proper, at first, to attempt the reduction by simple manipulation, as this is often found to succeed when the dislocation is recent and incomplete, and especially when the system is greatly depressed by the shock of the injury. If the dislocation is complete, however, we can hardly anticipate success without the application of some extending force.

In the employment of manipulation we ought to be governed at first by the same rule which we have found so generally applicable in dislocations of the femur, namely, to carry the limb in those directions in which it will move easily, or without the application of much force. If this fails, we may at once resort to forced flexion alternating with extension; rotating or rocking the limb also occasionally from one side to the other, while at the same moment strong pressure is made upon the projecting bones at the knee-joint in opposite directions, or in the direction of the articulation.

Finally, it may be necessary to resort to extension, made by means of a lacque, or by the hands of strong assistants, above the ankle, always at first in the direction of the axis of the tibia; the counter-extending band being applied to the perineum if the leg is straight, but to the lower and back part of the thigh if the leg is flexed.

A very convenient mode of making extension, where we wish to apply more than usual force, is to lay the whole limb over a firm double-inclined plane, or fracture-splint, securing the thigh to the thigh-piece with a roller, and making the extension with the screw attached to the foot-board. This method, however, while it enables us to use great force in the extension, prevents the surgeon from employing, at the same time, those flexions, extensions, and other manipulations, upon which success so often depends.

Dr. James Carmichael has reported a case in which reduction was effected easily by flexion, when traction failed.<sup>1</sup>

Mr. Rose has related, in the *Provincial Med. Journal* of June 11, 1842, a characteristic example of this accident, except that the patella had also suffered a lateral displacement, presenting the usual favorable termination.

A woman was standing upon a low ladder, when a carriage driven furiously came in contact with it, and precipitated her to the ground. Mr. Rose, who saw her almost immediately, found the tibia completely dislo-

<sup>1</sup> New York Med. Gazette, Aug. 22, 1868; from the *Lancet*.

eated at the knee, the head being driven behind the condyles of the femur into the ham, with the patella thrown to the outside of the external condyle, and the leg in a state of fixed extension. Immediately, and without difficulty, the bones were restored by applying one hand to the patella, the other to the back of the upper portion of the tibia, and simultaneously pulling and pushing those bones toward their natural positions. The patient was then removed to a bed, and by the diligent use of antiphlogistic remedies inflammation was kept in check, and the case reached a favorable termination without one untoward symptom. After the lapse of only a few weeks, she had completely recovered the use of the knee-joint.<sup>1</sup>

Dr. Walsham communicated a case to Sir Astley Cooper, in which the dislocation was not only complete, but the tendon of the quadriceps extensor was ruptured. The leg was bent forwards. The reduction was accomplished very easily by extension made with the hands by four men, in the line of the axis of the limb. In about one month this man began to walk with crutches, but he was not perfectly recovered until after five months; at which time the crutches were finally laid aside.<sup>2</sup>

### § 2. Dislocations of the Head of the Tibia Forwards.

The signs of this accident are the reverse of those which belong to dislocations backwards. The patella, tibia, and fibula are prominent in front, while the condyles of the femur may be felt behind, pressing strongly upon the muscles, nerves, and bloodvessels which occupy the popliteal space. In case the dislocation is complete, a shortening may

FIG. 366.



Subluxation of the head of the tibia forwards.

exist to the extent of one or even three inches. Dr. O'Beirne, of Dublin, has mentioned a case to Mr. B. Cooper, in which the shortening was three inches and a half, and Mr. Mayo has seen one example in which the dislocated limb was "fully four inches" shorter than the other.<sup>3</sup>

In consequence of the pressure upon the popliteal artery, the pulsations in the branches below are frequently interrupted, and in one instance this pressure was sufficient to produce finally a dry gangrene.

Dr. Gorde relates a case in the *Bulletin de Thérapeutique*, occurring in a woman nearly sixty years old. This woman was returning home at night with a heavy burden, and in a state of intoxication, when she stepped into a ditch as deep as up to the middle of her thighs. The body was thrown forwards by the fall, while the feet struck at the bottom of the ditch; the whole force of the impulse being sustained by the thighs. The lower end of the femur was found driven

<sup>1</sup> Rose, Amer. Journ. Med. Sci., vol. xxxi. p. 216.

<sup>2</sup> Walsham, Sir A. Cooper on Disloc., etc., 2d. Lond. ed., p. 188.

<sup>3</sup> B. Cooper's ed. of Sir Astley Cooper on Disloc., etc., pp. 214, 215.

downwards and backwards, and lodged under the muscles of the calf of the leg; the limb being shortened three inches. Reduction was promptly effected, and without inflicting any pain of which the patient complained. In six weeks the patient was cured.<sup>1</sup>

Mr. Toogood has reported also, in the *Provincial Medical Journal* of June 18, 1842, an example of complete dislocation in this direction, in which the appearance was so dreadful, that Mr. Toogood at first despaired of being able to reduce it; but by directing two men to make counter-extension while he made extension, the reduction was immediately effected. At the end of one month the patient was able to leave his bed; and sixteen years after, Dr. Toogood saw him walking "with very little lameness."<sup>2</sup> Parker, of Liverpool, has reported another example in the *London and Edinburgh Monthly Journal* for December, 1842, which was occasioned by the fall of a heavy spar upon a man's back, and the consequent violent bending of the knee under his body. In this case the limb was slightly flexed, and the patella was loose and floating. The reduction was effected without much difficulty by extension and counter-extension made by two men, while the operator, placing his knee in the ham of the patient, attempted to bring the leg to a right angle with the thigh.<sup>3</sup>

B. Cooper, Malgaigne, Little,<sup>4</sup> and others, have recorded examples of this accident.

March 9, 1865, Hiram Wescott, of Sandy Cove, Nova Scotia, æt. 45, was caught by his sled, drawn by horses, in such a way that a beam pressed against the front and lower end of the femur while the heel was caught and arrested by a stump. The foot was thrown forwards and the upper end of the tibia completely dislocated in the same direction. It was at once reduced by a person who was present, but on attempting to use the leg in walking it was redislocated immediately. Mr. J. H. Harris, medical student, found the limb soon after completely dislocated, with the leg thrown forwards in the position of dorsal flexion about 40°. The tendons of the hamstring muscles were not ruptured, but had slid forwards past the condyles of the femur. There was no external wound. Reduction was easily accomplished by simple extension. Pasteboard splints were then applied. On the third day the knee was considerably swollen, and some ecchymosis existed about the popliteal region. On the fifth day these symptoms had much increased. Mr. Harris then applied extension to the foot, with the aid of adhesive plaster, pulley and weights, and by elevating the foot of the bed. The amount of extension employed was 9 lbs. This gave immediate relief to the pain, and was continued until the inflammation subsided. His recovery was steady, and in four months he walked with crutches or a cane.

In 1864 a similar dislocation was presented at the Brooklyn City Hospital, in which reduction having been practised, the patient died. The case is reported very fully by Dr. Le Roy M. Yale.<sup>5</sup>

Dr. White, of Buffalo, invited me to see with him a lad, æt. 10,

<sup>1</sup> Gorde, Amer. Journ. Med. Sci., vol. xvi. p. 225, May, 1836.

<sup>2</sup> Toogood, Amer. Journ. Med. Sci., vol. xxxi. p. 465.

<sup>3</sup> E. Parker, *Ibid.*

<sup>4</sup> Little, New York Med. Times, Aug. 17, 1861.

<sup>5</sup> Yale, New York Journ. Med., vol. ii. p. 124, Nov. 1865.

whose tibia had been partially dislocated forwards eight weeks before, by a boy having hit the top of his knee with his head, while they were at play. His father, himself a physician, residing near town, reduced the limb very easily, by extension made with his own hands, and by pressing upon the projecting bones. Violent inflammation ensued, but at the time when I saw him, the knee was free from soreness or swelling, and the motions of the joint were nearly restored.

Dr. Charles S. Downes, of McIndoe's Falls, Vt., has sent me the following account of a case which occurred in his own practice. October, 1861, Mrs. H., a robust young married woman, aged about 20 years, was driving a young horse and holding her infant in her arms, when the horse ran and she was thrown out. One of her legs being caught in the wheel, she was carried over three or four times in its revolutions before she became disengaged, holding meanwhile upon her infant with such firmness that it suffered no harm.

A few hours later Dr. Downes and Dr. Burton found a complete dislocation of the tibia and fibula forwards, and the lower end of the femur could be felt under the muscles of the calf of the leg. The limb was shortened four inches and a half. The patella lay loosely in front of the femur, with its lower margin tilted forwards.

The patient was laid upon a bed, and a perineal band made fast to one of the posts, while a lacque was placed upon the foot and attached to a rope folded upon itself and forming a pulley or "Spanish windlass," such as is described at page 827. In this way the reduction was speedily and easily accomplished. Hot fomentations were subsequently applied for several days, the limb being kept perfectly at rest. In about three months she was able to do her own housework, and in a short time after all traces of her accident had disappeared.

The following account of a case was sent to me by my young friend, Dr. Alonzo Pettit, of Elizabethport, N. J.:

"Joseph McGuire, laborer, *æt.* 26, was stealing a ride upon a freight train upon the Central Railroad of New Jersey, on the evening of June 19, 1874. He was sitting upon the platform of the car, with his feet upon the platform of the next car, his legs extended. The train slacking up at a station, before he had time to bend his knees, the cars came together and pushed the head of the left tibia upwards upon the femur.

"I saw him about half an hour after the accident, and found a complete dislocation of the head of the tibia, with the patella forwards upon the femur. The leg was slightly flexed, and shortened two and a half inches. I succeeded in reducing it easily without assistance, or the use of anesthetics, by grasping the leg with the left hand, the right being in the popliteal space, making moderate extension and flexion, and pressing upon the condyles of the femur. There was considerable swelling and inflammation, but they yielded under the use of refrigerant lotions. The leg was kept extended for three weeks, during which time he suffered no pain whatever. At the end of two weeks I began the use of passive motion, cautiously, and after three weeks I allowed him to begin to walk, wearing a firm elastic knee-cap. July 22d, when I last saw him, he walked with a very slight halt, and could bend the knee about 25°, and was still improving."

### § 3. Dislocations of the Head of the Tibia Outwards.

Occasionally, owing to a violent wrench of the knee-joint, the lateral ligaments upon one side or the other are ruptured, and consequently the joint surfaces separate somewhat from each other; or when the limb is moved, the head of the tibia may slide a little forwards or backwards, or to either side. These are not properly examples of subluxation; nor should we consider as belonging to this class the accident originally described by Mr. Hey as an "internal derangement of the knee-joint," but which also by some writers has been termed "a subluxation of the knee." Of this latter accident I will take occasion hereafter to speak a little more particularly.

In subluxation, properly so called, if the direction of the dislocation is outwards, the outer condyle of the femur rests upon the inner articulating surface of the tibia, and if the direction of the dislocation is inwards, the inner condyle of the femur rests upon the outer articulating surface of the tibia.

The signs which characterize this accident are such as cannot easily be mistaken. The limb is not shortened, nor is there anything especially diagnostic in its position, since it has been found to be sometimes flexed, and at other times straight; but the strong lateral projections made by the inner condyle of the femur on the one hand, and by the heads of the tibia and fibula on the other, cannot fail to inform us as to the true nature of the accident.

The treatment will not differ essentially from that which has already been recommended in dislocation of the tibia backwards or forwards. If any other expedients can prove useful, they must be left to the judgment of the surgeon whenever the exigencies of the case shall demand them.

I have already mentioned the case of N. Smith, who, in consequence of a fall from a window, had a dislocation of the right femur, tibia, and patella. The tibia was subluxated outwards, and the leg was partially flexed upon the thigh, with the toes everted. By moderate extension, made with my own hands, united with alternate flexion and extension, the bone was easily and promptly restored to its place. Having reduced the femur also, the limb was laid over a gently inclined plane made of pillows; and cloths moistened with cool water were kept constantly applied to the knee for many days. Very little swelling followed the accident, and his recovery was rapid and complete.

A man was received into the North London Hospital, with a partial dislocation of the tibia outwards, and although the knee was much swollen, the nature of the injury was easily determined. The knee was immovable, and the toes turned outwards. Mr. Hallam, the house surgeon, reduced it by extension and counter-extension made with his own hands.<sup>1</sup>

FIG. 367.



Subluxation of the head of the tibia outwards.

<sup>1</sup> Hallam, Amer. Journ. Med. Sci., vol. xix. p. 251.

Mr. Pitt records a similar case in a young lady, produced by a fall down a flight of stairs. It was reduced easily by extension and counter-extension. Inflammation followed, but it was finally controlled, and she regained the use of her limbs.<sup>1</sup>

In one case of subluxation, mentioned by Sir Astley Cooper, and in a second recorded by Bransby Cooper, the recovery of the functions of the joint did not seem to have been so rapid; the joint remaining unstable and tender for a long time afterwards.<sup>2</sup>

#### § 4. Dislocations of the Head of the Tibia Inwards.

There is nothing peculiar in either the signs, conditions, or treatment of this accident, as distinguished from a dislocation outwards, to demand of me a special consideration.

Sir Astley Cooper has mentioned two cases of subluxation inwards, and Mr. B. Cooper has added to these a third. Sir Astley remarks that in the first accident, the only one indeed which he had himself ever seen, he was struck with three circumstances: first, the great deformity of the knee from the projection of the tibia; second, the ease with which the bone was reduced by direct extension; and third, by the little inflammation which followed. The second case of which Sir Astley speaks was communicated to him by a Mr. Richards. In this case the fibula was also broken, and the reduction was accomplished only after extension had been made by several persons for half an hour. The limb became excessively swollen, and remained so for many weeks. Eighteen months after the accident the knee continued somewhat stiff, and there was an unnatural lateral motion in the joint, from the injury which the ligaments had sustained. The patient referred to by Bransby Cooper had met with the accident by a fall upon the foot, with his leg bent under him; and a fellow-workman had reduced the bone by extension and pressure. Mr. Cooper thinks that not only the internal lateral ligament was torn, but also



FIG. 268.  
Subluxation of the head of the tibia inwards.

some fibres of the vastus externus and the crucial ligaments. Violent inflammation ensued, which did not permit him to leave the hospital until after about two weeks.<sup>3</sup> Fergusson has seen two examples of unreduced subluxation inwards, in both of which the patients had regained useful limbs.<sup>4</sup>

Malgaigne mentions that Boyer, Costallat, and Key had each seen one similar example; and he also enumerates two additional cases of complete dislocation attended with a protrusion of the bone through an external wound; in both of which the reduction was easily effected and the patients recovered.<sup>5</sup>

<sup>1</sup> Pitt, *Ibid.*, vol. xxxi. p. 465.

<sup>2</sup> B. Cooper's ed. of Sir Astley, *op. cit.*, pp. 111-13.

<sup>4</sup> Fergusson, *op. cit.*, p. 284.

<sup>3</sup> *Ibid.*

<sup>5</sup> Malgaigne, *op. cit.*, tom. ii. p. 956.

#### § 5 Dislocations of the Head of the Tibia Backwards and Outwards.

In June, 1853, Henry J., of Dansville, N. Y., æt. 24, was thrown by an enraged bull, and his left leg, being caught under the knee by the horns, was twisted violently. Drs. Prior, of Dansville, and Batton, of Burns, were called, and found the left knee completely dislocated; the tibia being displaced backwards beyond the condyles of the femur, and also a little outwards. The foot and leg were inclined outwards. With the assistance of four men, extension and counter-extension were made in the line of the axis of the limb, and the reduction was easily accomplished. Pasteboard splints, bandages, etc., were applied to maintain the bones in place; but the swelling came on rapidly, and in the evening these dressings were removed. The limb was now laid over a double-inclined plane carefully padded, in order to press the upper end of the tibia forwards, as it manifested a constant inclination to become displaced backwards. This apparatus was employed six weeks, with the exception of two or three days, during which the limb was laid upon pillows, but as the pillows did not sufficiently support the back of the tibia, the double-inclined plane was resumed. After the removal of the plane, during seven weeks longer, an angular splint was kept closely applied to the back of the limb.

Seven months after the accident, on the 23d of January, 1854, Dr. Robinson, of Hornellsville, brought the gentleman to me. I found the bones displaced backwards about three-quarters of an inch, and half an inch outwards, or to the fibular side. This was the position of the bones when he was sitting with his leg bent at a right angle with the thigh, but when he stood erect and bore some weight upon the foot, the outward displacement ceased, and the backward displacement only remained. It was very easy, however, in whatever position the leg might be, to push the bones forwards by the hands until nearly all deformity had disappeared. He could flex the leg to a right angle with the thigh, and straighten it completely, but he could not lift the foot and leg from the floor while sitting with his limb extended in front of him. He was unable to bear sufficient weight upon his foot to use it at all in progression, on account of the inability to fix and steady the limb, but not on account of any pain or soreness which it occasioned.

It was very plain that the surgeons were not in fault for this unfortunate condition; indeed, they seem to have exercised throughout great ingenuity and skill in its management.

I directed the young man to Mr. John C. Seiffert, of Buffalo, a very ingenious instrument-maker, who has since succeeded, I learn, in adapting to his knee a mechanical contrivance which enables him to walk quite well.

Thomas Wells, of Columbia, South Carolina, has described a similar accident, the tibia being dislocated outwards and backwards, which terminated fatally on the fourth day in consequence mainly of exposure, intemperance, and neglect to apply for surgical aid. The bones were never reduced, and the autopsy disclosed also a fracture of the internal condyle of the femur.<sup>1</sup>

<sup>1</sup> Wells, *Amer. Journ. Med. Sci.*, vol. x. p. 25, May, 1832.

### § 6. Dislocations of the Head of the Tibia Forwards and Outwards.

Duvivier,<sup>1</sup> in 1828, treated an officer who had fallen from his horse, causing a dislocation of the tibia forwards and outwards, which was accompanied with a shortening of six inches. Reduction was effected, and at the end of a year the motions of the joint were only partially restored.

In a case reported by Wathen<sup>2</sup> the reduction was easily effected, but inflammation of the joint ensued, and the cure took place with fibrous ankylosis.

### § 7. Dislocations of the Head of the Tibia Forwards and Inwards.

M. J. Cloquet<sup>3</sup> met with an example of simple complete dislocation of the head of the tibia forwards and inwards, which had existed one year, and upon which the patient could bear the weight of his body. This latter circumstance led Malgaigne to express a doubt as to whether it might not have been only a subluxation; a supposition, however, which cannot be entertained if Cloquet was correct in saying that the limb was shortened one inch and a half. Gerdy<sup>4</sup> met with a case of complete dislocation, the limb being shortened half an inch, slightly flexed, and immobile. The popliteal artery was compressed. Reduction having been effected, the patient was able on the twenty-first day to walk very easily.

In a case reported by Sir Astley Cooper the dislocation was accompanied with a tearing of the integuments, and the limb was amputated. Dissection disclosed a large laceration of the vastus externus, and of the capsule and ligaments posteriorly. The lateral and crucial ligaments were unbroken.

In a case seen by Malgaigne<sup>5</sup> the displacement was incomplete.

W. Mulligan<sup>6</sup> reports a case of complete dislocation in the person of a man 26 years old caused by a direct blow upon the anterior and internal part of the thigh. The injury seemed simple and the integuments were intact. Reduction was effected easily by flexion, but it was then noticed that arterial pulsations in the foot had ceased, and a little later the appearance of gangrene in this portion of the limb rendered amputation necessary.

*Treatment.*—Malgaigne says "the dislocation may be reduced by direct extension, as in the case of outward dislocations, but it may be found a little more difficult; Gerdy employed three assistants, but I employed only two. The pressure applied to the tibia by resting the femur upon the knee, did not prove to be sufficient," and it became necessary to employ a more solid resistance, and to substitute a block of wood for the operator's knee. It will be remembered that Gerdy's case was a complete dislocation, while Malgaigne's was incomplete.

Sir Astley experienced great difficulty in the reduction; and the dislocation having at once been reproduced, amputation was practised.

<sup>1</sup> Duvivier, Malgaigne, from Arch. Gén. de Méd., 1829, t. 20, p. 292.

<sup>2</sup> Wathen, Poinsot, from Med. Times and Gaz., Nov. 23, 1872.

<sup>3</sup> Cloquet, Dic. de Méd., Art. Genou.

<sup>4</sup> Gerdy, Arch. Gén. de Méd., 1835, t. 13, p. 163.

<sup>5</sup> Malgaigne, op. cit., vol. 2, p. 959.

<sup>6</sup> Mulligan, Med. Press and Circular, Sept. 15, 1875.

### § 8. Dislocations of the Head of the Tibia by Rotation.

Rotation sometimes accompanies either of the preceding dislocations; but I speak now of examples in which the dislocation is by rotation alone. Malgaigne<sup>1</sup> has cited the following examples:

In the case of Dubreuil,<sup>2</sup> which was presented in the service of Malgaigne himself, the leg was extended and rotated outwards until the head of the fibula projected in the popliteal space, and the patella, dragged by the tibia, was completely dislocated outwards. The dislocation was reduced two hours after the accident by a single assistant, who, grasping the upper portion of the leg with both hands, made slight traction and then rotated the limb from without inwards. Nineteen months after the accident the knee was stiff, painful, and incapable of supporting the body.

Boursier,<sup>3</sup> of Bordeaux, published an example of this form of dislocation which occurred in a person *æt.* 19. When admitted to the hospital the leg was slightly flexed, and rotated outwards. There was no discoloration or swelling. The patella was lodged upon the external condyle. Attempts at reduction by extension and rotation were unsuccessful; but on placing the patient under the influence of chloroform the reduction was easily effected by the same manœuvres. Codman and Pétrequin have each reported one example of outward rotation seen in autopsies.

Malgaigne cites also a case reported by M. Paris<sup>4</sup> of dislocation by rotation inwards, the internal condyle of the tibia resting behind the internal condyle of the femur. Reduction was easily effected, but a chronic arthritis ensued.

### § 9. Internal Derangement of the Knee-Joint.

*Syn.*—"Slipping of the semilunar fibro-cartilages;" Hey. "Partial dislocation of the thigh-bone from the semilunar cartilages;" Sir Astley Cooper. "Subluxation of the semilunar cartilages;" Malgaigne. "Subluxation of the knee;" Erichsen. To these I think it proper to add, as giving rise to the same class of symptoms, "Floating cartilages in the knee-joint."

I have already expressed the opinion that this accident is in no proper sense a subluxation of the knee; and I should not, therefore, think it worth while to make any farther allusion to it, were it not necessary in order to enable the student of surgery to distinguish between the phenomena which belong to it and those which belong strictly to subluxation of this joint.

*Symptoms.*—The patient is suddenly thrown to the ground while walking, as if by an instantaneous loss of power in the affected limb, this loss of control over the limb being accompanied usually with sharp pain, referred to the region of the knee-joint; or he trips his toe against something in his path, and the toes becoming everted, the leg suddenly gives way under him; in some cases it has happened when the patient was turning in bed, the weight of the bedclothes hanging upon the toes so as

<sup>1</sup> Malgaigne, op. cit., vol. 2, p. 962.

<sup>2</sup> Dubreuil, Arch. Gén. de Méd., 1852, t. 30, p. 152.

<sup>3</sup> Boursier, Journ. de Méd., Bordeaux, Dec. 31, 1882, p. 225.

<sup>4</sup> Paris, Malgaigne, from Rev. Med. Chir., vol. 12, p. 174.

to occasion a strain and rotation outwards at the knee-joint, or it follows upon a subluxation of the joint, as in one example which I shall presently relate; or it may result from forced flexion of the knee.

If the patient is walking when the accident takes place, and he falls to the ground, he finds himself unable to move the limb, or to stand upon it; but by manipulation or extension, the difficulty is, in most cases, as easily overcome as it occurred, when immediately the motions of the joint become free, and he walks off as if nothing had happened.

When the accident has once taken place, it is afterwards exceedingly liable to occur from very slight causes, and eventually the knee-joint becomes tender and the capsule fills with synovia, indicating the existence of subacute synovitis.

A young man, from Colesville, N. Y., æt. 23, consulted me, on the 27th of Oct. 1858, in relation to the condition of his knee-joint. He stated that on the 13th of August, 1858, while standing with the whole weight of his body resting upon the left leg, a mate struck him on the inside of the lower end of the left femur. The blow was made with the palm of the hand, but with sufficient force to throw him down. It was immediately noticed that the tibia was partially dislocated inwards at the knee-joint. The whole lower part of the limb was inclined outwards. A person present in the room seized upon the foot and by extension easily brought it back to place; the bone resuming its position with an audible snap. After this he continued to walk about until night. Two days after, the knee had become so much inflamed that he was obliged to take to his bed, on which he was confined three weeks. Gradually the swelling subsided, and in about five weeks after the accident he began to walk on crutches. On the 23d of Sept. he was walking in the store without crutches, when he suddenly felt a sensation of slipping in the joint, and he fell to the floor as if he had been tripped up. At the time when he called upon me, this had happened many times, but had never been attended with pain. The joint was filled with synovia, and tender, yet I could distinctly feel a hard body just to the inside of the ligamentum patellæ, and which moved freely under the finger.

Prof. Le Fort<sup>1</sup> has described this accident as it occurred in his own person, in consequence of a forced flexion of the leg. He was conscious at the time of a movement in the joint at the external part of the right knee, and when he arose he found the limb fixed in the position of flexion, and he was only enabled to straighten it by a violent muscular effort, the effort being accompanied by a violent pain, and a very loud crack, as if something which was displaced had resumed its place. Immediately all pain disappeared and the motions of the joint were restored. For several months the accident was repeated whenever the knee was much flexed; the phenomena attending the displacement being in each case the same as at first, he having always a distinct recognition of the movement of displacement, and always the voluntary straightening of the limb reproduced the crack, and caused the pain to cease. By avoiding the causes the accident ceased to occur; but after a time he failed to exercise the same caution, and the accident again occurred; but this time the dis-

<sup>1</sup> Le Fort, Bull. Soc. Chir., Paris, 1879, July 2.

placement of the cartilage was backwards instead of forwards, as it had been previously, and the straightening of the limb caused an atrocious pain, which lasted, in some degree, more than eight days. He has since then exercised the same caution as before and the displacement has not recurred.

*Pathological Anatomy.*—The same class of symptoms, with only very slight modification, belongs probably to several varieties of "internal derangement of the knee-joint;" and first it will be remembered that the semilunar cartilages upon which the margins of the condyles of the femur rest, are attached to the tibia by several ligaments; but when, from relaxation or a violent strain, any one of these ligaments becomes elongated or gives way, the portion of cartilage which it restrains is permitted to become partially displaced, and by interposing its thick margin between the deeper articulating surfaces the bones are separated and the muscles lose their control over the joint; second, these ligaments may not only yield, but a fragment of one of the cartilages may become actually broken off from the main portion; third, the femur may perhaps escape behind some portion of an interarticular cartilage, and thus, instead of the cartilage placing itself between the joint surfaces, the femur itself may have thrust it into this position; fourth, a cartilage, or some portion of a cartilage, may become hypertrophied, and thus give rise to the symptoms described; fifth, in other cases still, a bony, cartilaginous, fibrinous, or calcareous growth or concretion forming within the joint, and, if originally attached, becoming separated from the capsule, may move about more or less freely, and give rise to the same class of symptoms which I have described.

This last variety has generally been described under the name of "floating cartilages;" but since these bodies are not always cartilaginous, and especially since they do not always by any means move so freely as to be properly designated as "floating," the term is less appropriate than that originally given by Hey, and which I have chosen to adopt.

*Treatment.*—For the purpose of obtaining immediate relief, it is generally sufficient to flex the leg completely and then suddenly extend it, or to combine this motion with a slight twisting or rocking of the knee-joint. Sometimes this experiment has to be repeated several times before it is completely successful, and in a few instances it has failed altogether. I think I must have met with ten or twelve examples in the course of my practice, and in no instance has the sudden flexion and extension of the limb failed to overcome the difficulty.

As to the question of subsequent treatment, especially as to whether it is proper to attempt extirpation of the cartilages when they are found to be actually floating, or to make any other surgical interference, I prefer to leave its consideration to those general treatises upon surgery where it more properly belongs.

## CHAPTER XX.

DISLOCATIONS OF THE LOWER END OF THE TIBIA  
(TIBIO-TARSAL).

*Syn.*—"Dislocations of the ankle-joint;" Chelius and others.

THE tibia may be dislocated at its lower end in four directions; namely, inwards, outwards, forwards, and backwards. Most of these dislocations complicate themselves with fractures of the fibula or of the tibia, or with fractures of both bones.

Dupuytren, Malgaigne, and a few other surgeons have reported examples also of dislocations forwards and inwards.

Boyer, with a majority of the French writers, and several English and German surgeons, speak of these dislocations as belonging to the foot; consequently the outward dislocation of Boyer is the inward dislocation of Sir Astley Cooper, Malgaigne, myself, and others, who prefer to regard the tibia as the bone dislocated.

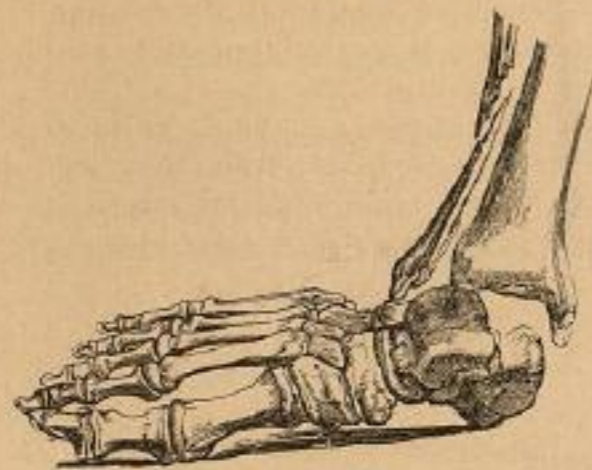
## § 1. Dislocations of the Lower End of the Tibia Inwards.

*Syn.*—"Inward tibio-tarsal luxations;" Malgaigne. "Dislocations of the foot outwards;" Boyer and others.

*Causes.*—This dislocation is occasioned generally by a fall from a height, upon the bottom of the foot, the foot receiving at the same moment a sufficient inclination outwards to determine the main force of the impulse toward the inner side of the ankle. It may be produced also by a blow received directly upon the outside of the leg just above the ankle, or by a violent twist or wrench of the foot outwards.

*Pathological Anatomy.*—I have already, in the chapter on fractures of the fibula, stated my opinion that a large majority of those accidents

which have been called inward and outward dislocations of the tibia, were merely examples of lateral rotation of the astragalus within the half ginglymoid and half orbicular socket formed by the lower extremities of the tibia and fibula; and that true dislocations, either partial or complete, are at this joint and in these directions very rare occurrences. I shall continue, however, in accordance with the general practice of writers, to call them all dislocations, whether the astragalus simply ro-



Dislocation of the lower end of the tibia inwards  
(foot turned outwards). (Pott's fracture.)

tates on its axis, or is displaced laterally and horizontally from the tibia.

In the most common form of the accident, then, when the foot is violently twisted outwards, the astragalus becomes tilted upon its outer and upper margin in such a way that this margin slides inwards and places itself underneath the middle portion of the lower articulating surface of the tibia; its upper and inner margin descends toward the extremity of the malleolus internus, and the outer surface of the astragalus presents obliquely upwards and outwards, instead of directly outwards as it would do in its natural position. This cannot occur without a rupture of the internal tibio-tarsal ligaments, or a fracture of the malleolus internus, or both; indeed, a fracture of the internal malleolus is a very common circumstance in connection with this form of dislocation. Much more frequently, however, the fibula itself gives way at a point within from two to five inches of its lower extremity; or sometimes the fracture in the fibula occurs through that portion which forms the malleolus externus. For more particular information as to the causes and relative frequency of these fractures, I refer the reader to the chapter on fractures of the fibula.

Rarely it happens that, instead of this lateral rotation of the astragalus, there occurs a true lateral displacement of the tibia inwards upon the astragalus, and the outer portion of the lower articulating surface of the tibia comes to rest upon the inner portion of the upper articulating surface of the astragalus; or it may slide completely off in the same direction; a result which is usually attended with a laceration of the muscles and integuments, converting the accident into a compound dislocation. In some cases this extreme displacement occurs without such laceration.

In this form of the accident, the true lateral dislocation, the fibula may remain unbroken and undisturbed, the tibia merely having become displaced inwards; or the fibula may give way also above the articulation, while the malleolus internus, and the internal lateral ligaments, are equally liable to rupture as in the other form of the accident.

Sometimes, in addition to these complications, the lower end of the tibia is found to be broken obliquely upwards and outwards from the articulating surface, leaving that fragment attached to the fibula which corresponds to the inferior peroneo-tibial articulation.

*Symptoms.*—The foot is more or less violently abducted, the sole of the foot presenting downwards and outwards instead of directly downwards; the malleolus internus projects strongly at the inner side of the joint; and at the outer side there is a corresponding depression, generally most marked a little above the articulation near the point of fracture in the fibula. The pain is very great, and the foot is immovably fixed so far as the volition of the patient can determine motion, but the surgeon can generally move it pretty freely, yet not without causing a great increase of the pain. When the dislocation is complete, and the fibula is also broken, the limb becomes slightly shortened.

*Treatment.*—When the accident is of the nature of a simple rotation of the astragalus upon its axis, the reduction is often accomplished with the greatest ease by seizing upon the foot and forcibly adducting it. Not unfrequently the patient himself, or some other person who is

present, has effected the reduction before the surgeon is called. In other cases, and especially when it partakes of the nature of a true dislocation, much difficulty is sometimes experienced in the reduction. The

FIG. 370.



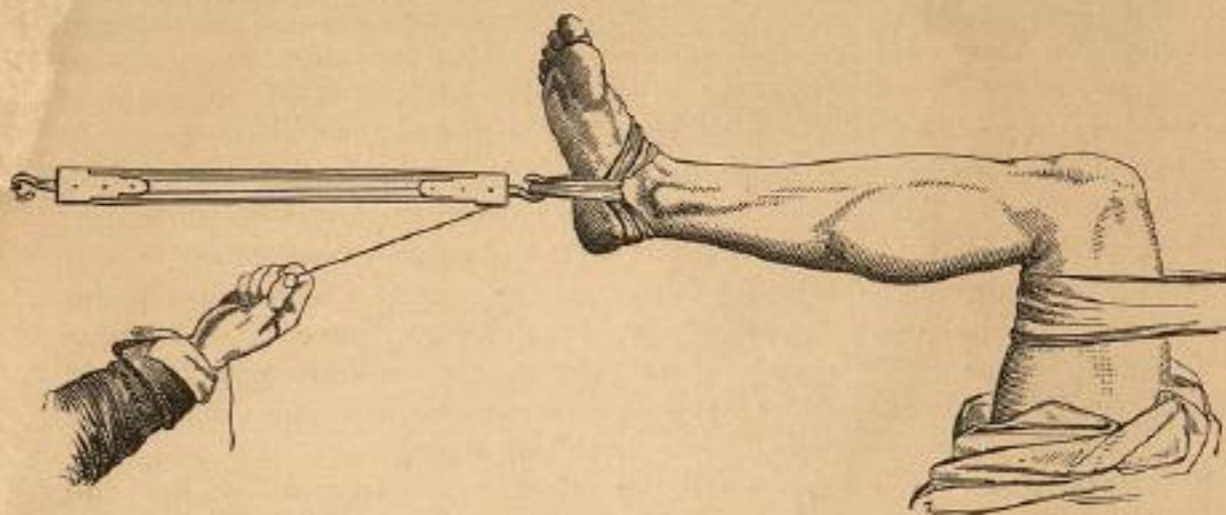
Dislocation of the lower end of the tibia inwards (foot turned outwards).

surgeon ought then to flex the leg upon the thigh, in order to relax the gastrocnemii muscles, and holding the foot midway between flexion and extension, he should pull steadily upon it with his own hands, while an assistant makes counter-extension and supports the limb with his hands, grasping the thigh above the knee. At the same moment lateral pressure should be made upon the projecting bone in the direction of the articulation. It is of some use, also, occasionally to flex and extend the limb moderately, and to give to the foot a gentle rocking motion. If more force is needed, it may be applied by placing the limb over a firm double-inclined fracture-splint, and making the extension by the aid of a screw attached to the foot-board, as I have suggested in certain cases of dislocation at the knee. Or we may employ the pulleys after the manner represented in the accompanying drawing, Fig. 371.

Charles Sauer, aged about thirty years, while carrying a weight upon his shoulders, on the 6th of May, 1854, slipped upon the sidewalk, and fell, dislocating the left tibia inwards, and fracturing the fibula four inches from its lower end. I was in attendance soon after the accident occurred, and found the tibia projecting inwards, with the other symptoms usually accompanying a simple rotation of the astragalus upon its axis. Seizing the foot with my hands and flexing the leg, while an assistant held up the thigh and made counter-extension, I had scarcely

begun to pull upon the foot before the reduction was effected. Dupuytren's splint was at once applied, and the subsequent inflammation was so trivial as scarcely to deserve notice. In six weeks the limb was sound, and free from all anchylosis.

FIG. 371.



In my report on dislocations, made to the New York State Medical Society for the year 1855, I have mentioned twelve similar examples, in addition to some examples of compound dislocations, all of which were easily reduced, but the results were not always so favorable.

If, as rarely happens, the tibia is broken obliquely into the joint, the complete reduction of the dislocated tibia may be found impossible, owing to the obstacle presented by the displaced fragment.

The following I am disposed to regard as examples of dislocation accompanied with fracture of the tibia within the articulation:

Brockway, of Cortland, N. Y., aged about twenty-seven years, consulted me, at my office, a few years since, in relation to the condition of his foot. I found the tibia dislocated inwards, and projecting more than an inch beyond the astragalus; the sole was turned outwards, compelling him to walk upon the inside of his foot; the fibula was bent inwards against the tibia, at a point about four inches above the ankle, which seemed to have been the seat of fracture of this bone. He stated to me, that immediately after the receipt of the injury, which was occasioned by a fall from a height upon the bottom of his foot, he had consulted a surgeon, Dr. A. B. Shipman, of Cortland, and that although Dr. Shipman made repeated and violent efforts to effect the reduction, he had been unable to do so. Indeed, the bone had never been removed from the position in which it was at first placed.

J. Borland, of Erie Co., N. Y., æt. 31, fell under a rolling log, and dislocated his left tibia inwards, breaking off the internal malleolus, and fracturing the fibula four inches from its lower end. Dr. Sweetland, an old and experienced practitioner, was immediately called, who, with another surgeon, failed, after repeated efforts, to reduce the dislocation. I saw the patient, in consultation with these gentlemen, twenty-four hours after the accident. The foot and ankle were somewhat



swollen and discolored. The lower end of the tibia projected so far inwards as to threaten a rupture of the skin: the foot was strongly everted. We first flexed the leg upon the thigh, and made extension with our hands, in the manner I have already directed. This we continued several minutes; finally moving the limb in various directions, and adding forcible pressure upon the inside of the projecting tibia. We then placed the leg over a double-inclined plane, and, securing it firmly in place, we attached a screw to the foot through a sandal and gaiter, and while the leg was well flexed upon the thigh, we renewed the extension and lateral pressure. This was continued, with the application of more or less power, during half an hour, meanwhile changing the position of the limb occasionally by varying the angle of the splint. Our efforts were prolonged in all more than one hour, when, as we had made no impression upon the bone, and the patient had repeatedly implored us to desist, the attempt was given over. The end of the tibia seemed to rest partly upon the astragalus, and the extension was plainly all that was demanded, but the obstacle was beyond doubt within the articulation, or rather between the tibia and fibula.

Four weeks after the accident, Mr. Borland walked on crutches, and during a year he was compelled to use a cane, but since that time a period of twelve years, he walked without any artificial support. For a year or two he felt a yielding in his ankle, as the weight of his body settled upon his limb; but this gradually ceased, and for some years past he has walked without any halt, and seems to step as firmly as before the accident. The foot still inclines outwards; the tibia projects inwards one inch, and the broken ends of the fibula can be felt resting against the tibia, where they are reunited.

Not long since, I had occasion to amputate a limb for a compound dislocation inwards, at the ankle-joint, and the possibility of this fracture was confirmed by the dissection. About one-third of the outer portion of the articular surface was broken off obliquely, and the fragment was lying so displaced that a reduction would have been rendered impossible.

Dr. Townsend, of Boston, has reported a case of compound dislocation, in which also amputation became necessary; and, with other injuries, the dissection showed a fragment from the outer margin of the tibia, one inch and a half long, and one inch thick at its widest part, with a very sharp point, displaced, and lying almost transversely over the astragalus.<sup>1</sup>

In 1842, A. Berard,<sup>2</sup> in order to effect reduction, divided subcutaneously the tendo Achillis, and at the same time the peroneus longus and brevis.

Valentin<sup>3</sup> reports a case of dislocation forwards and inwards, which had resisted all efforts. Tractions made by three strong assistants, while the patient was under the influence of chloroform, and at two different days, had produced no result. Valentin divided the tendo Achillis, and was then able to reduce the dislocation alone, and without the employ-

<sup>1</sup> Townsend, Mass. Hosp. Reports, Boston Med. and Surg. Journ., vol. xxxiii. p. 277.

<sup>2</sup> Berard, The Lancet, 1844, vol. i. p. 8.

<sup>3</sup> Valentin, Thèse de Strasbourg, 1836, No. 970; Arch. Gén. de Méd., t. 1, 1867.

ment of excessive strength. The patient recovered with a restoration of the natural motion of the foot.

For a more full account of the prognosis and the general management of these cases subsequent to the reduction, I beg again to refer the reader to the chapter on fractures of the fibula; and for my views in relation to the treatment of compound dislocations of the ankle-joint, I will refer also to the chapter on compound dislocation of the long bones.

## § 2. Dislocations of the Lower End of the Tibia Outwards.

*Syn.*—"Outward tibio-tarsal dislocation;" Malgaigne. "Dislocations of the foot inwards," of others.

The causes are the same or similar to those which are known generally to produce dislocations inwards; only that the force of the concussion or the direction of the rotation must have been reversed.

The external lateral ligaments, peroneo-tarsal, are either ruptured, or the lower portion of the fibula gives way, or both of these circumstances may have happened;

while the internal malleolus may also yield to the shock and to the weight of the body now resting upon it. The nature of the accident may vary also in respect to the relative position of the articular surfaces; the astragalus may simply rotate on its inner and upper margin, or the tibia, with the fibula, of course, may actually slide outwards until the lower end of the tibia more or less completely abandons the upper surface of the astragalus.

*Treatment.*—The modes of reduction, and the general principles of treatment, will not differ from those which I have mentioned as suitable for dislocations in the opposite direction. The examples which have fallen under my observation are not numerous, but the reduction has always been easily effected. Thus, a man, æt. 21, fell from a scaffolding, alighting upon his feet. He says that his left foot struck the ground obliquely, and upon its outer margin. I found the fibula projecting very strongly outwards, evidently carrying with it the tibia; the malleolus internus was broken off, and the foot forcibly turned inwards. Without either flexing the leg upon the thigh or call-

FIG. 372.



Dislocation of the lower end of the tibia outwards (foot turned inwards).

ing to my aid any degree of counter-extension except what was made by the weight of the body, I grasped the foot and drew upon it gently, while at the same moment I rotated the foot outwards. Immediately the bones resumed their places.

In June of 1846, Henry Wilson, æt. 38, consulted me in relation to his foot, which he said had been dislocated four weeks before. He had fallen upon the outside of his foot and turned it suddenly inwards, so that when he looked at it he found the sole presenting toward the opposite side. Seizing upon it with both hands, he pressed it forcibly outwards, and the reduction immediately took place with a snap. Very little soreness followed, nor was he confined to his house a single day. He had continued to walk about with only a slight halt in his gait, nor would he have thought it necessary to consult me at all except that the tenderness had not yet disappeared. He was not aware that the fibula had been broken also, until I called his attention to the fact. The fracture had taken place two inches above the ankle; and although it was already united, the depression occasioned by its having fallen in somewhat toward the tibia was very plainly felt and recognized.

### § 3. Dislocations of the Lower End of the Tibia Forwards.

*Syn.*—"Forward tibio-tarsal luxations;" Malgaigne. "Dislocations of the foot backwards," of others.

*Causes.*—This dislocation may be produced by a violent extension of the foot upon the leg; as, for example, when, the foot being engaged under a piece of timber, the body falls backwards to the ground; or it may be caused by a fall upon the bottom of the foot, the foot resting upon a slightly inclined plane. It may be caused also by any of that class of accidents which are known to produce fractures of the fibula with fracture of the malleolus internus, or fracture of the fibula with rupture of the internal lateral ligament; for example, by a fall upon the bottom of the foot, or upon the inside of the sole, followed immediately by an outward twist of the foot. In these cases the dislocation of the foot backwards, or, as it is generally found to be, the semiluxation, may be consecutive upon the accident, and the result only of contraction of the gastrocnemii. It may, therefore, occur immediately after the fracture has taken place, or not until after the lapse of several days.

*Pathological Anatomy.*—The displacement may be very slight, so that the end of the tibia is only a little advanced upon the astragalus; or it may be such that the tibia rests one-half upon the naviculare and one-half upon the astragalus, or it may even desert the astragalus entirely. The fibula may at the same time be broken at any point, but it is generally broken two or three inches above its lower extremity. The malleolus internus is also sometimes broken, but more often the internal lateral ligament is torn. Still more rarely a fracture occurs through the posterior margin of the articular surface of the tibia.

*Symptoms.*—The length of the foot in front of the tibia is diminished, while the projection of the heel is correspondingly increased; the toes are turned downwards and the heel drawn upwards, and fixed in this position; the end of the tibia may generally be distinctly felt in front of

the astragalus; the extensor tendons of the toes are sharply defined, while the tendo Achillis is curved forwards, and tense.

At the regular meeting of the New York Pathological Society, November 22, 1865, I presented a specimen obtained from the dissecting-room of the Bellevue Hospital College. The history of the case was unknown.

Before dissection, the foot was observed to be turned outwards, and shortened in front of the tibia, while there was a corresponding lengthening of the heel. The specimen, after dissection, disclosed a fracture of the internal malleolus half an inch above its lower end, and a fracture of the fibula a little above its lower end. The tibia was displaced forwards about three-quarters of an inch, so that only the posterior half of its lower end rested upon the articular surface of the astragalus, and at the point of contact with the astragalus a new socket was formed in the tibia, concave upwards, half an inch deep, and presenting an appearance as if the posterior lip of the lower end of the tibia had been broken off and had become displaced upwards. It was supported by a broad buttress of bone. It is not certain, however, but that this appearance was

FIG. 373



Partial dislocation of the tibia forwards, with fractures of malleolus internus, and fibula. Skeleton.

FIG. 374.



Partial dislocation of the tibia forwards, with fracture of the malleolus internus, and fibula.

occasioned solely by the long-continued pressure of the tibia upon the astragalus at this point. The fragments of the malleolus internus, and the lower fragment of the fibula, remained attached to their upper fragments and to the two sides of the astragalus in their normal positions, consequently each fragment was inclined downwards and backwards at an angle of 45°. The lower fragment of the fibula was driven upwards, also, but both of the fractures were firmly united. This specimen is now in the museum of the Bellevue Hospital College.

At the same meeting of the Pathological Society I reported the case of Mary Conlan, æt. 38, admitted to Bellevue Hospital, November 13, 1865, having been thrown three days before from a street-car. She could give no account of the manner in which she fell. I saw her November 16th. The limb was then much swollen, and I diagnosed a fracture of the lower end of the fibula. (It had been supposed to be

a mere sprain up to this time.) The limb was directed to be wet with cool water, and to rest upon a pillow. From this time I looked at it occasionally, to see whether the swelling had sufficiently subsided to warrant the application of a splint. November 20th it was examined again carefully by the house surgeon, Dr. Farrall, but no displacement was noticed. November 23d I found the lower end of the tibia displaced forwards, and ascertained, also, that the internal malleolus was broken at its base. The dorsum of the foot, measuring from the front of the tibia to the end of the great toe, was shortened half an inch. The heel was lengthened.

There can be no doubt that in this case the dislocation occurred subsequent to the fracture, and that it was caused by the contraction of the gastrocnemii. I reduced the dislocation a day or two later, and maintained it in position by the method which I shall presently describe.

Dr. Voss reported to the Society a similar case which had come under his notice, and Dr. Buck remarked that he also had met with such examples.<sup>1</sup>

In May, 1878, I found in my wards at Bellevue an old subluxation of this character in the person of Catharine Brady, æt. 30; the cause of which I was unable to ascertain precisely.

Dr. Prince, of Illinois, has reported a case of this character, which, remaining displaced, led to a prosecution for damages. A lady, æt. 40, met with an accident, August 31, 1863, which resulted in a fracture of the fibula near its lower end, and a partial dislocation of the tibia forwards to the extent of one inch. The toes were not pointed downwards, but the foot had its natural angle with the leg. Nearly three months after the accident, Dr. Prince, assisted by two other surgeons, broke up the adhesions, and reduced the bones to their natural positions.<sup>2</sup>

*Treatment.*—The reduction is to be attempted by flexing the leg upon the thigh, and making extension from the foot, while, at the same moment, pressure is made upon the front of the tibia and against the heel. When the bone begins to slide into place, the foot should be forcibly flexed upon the leg. A slight lateral motion or rotation in either direction may assist in restoring the bones to place.

In general, the dislocation has been easily reduced, but in a majority of the examples recorded, great difficulty has been experienced in maintaining the reduction; and in a few cases it has been found impossible to do so.

In order to maintain the reduction, the leg, flexed upon the thigh, may be laid on its back in a box; and the foot supported firmly against a foot-piece placed at a right angle with the box. In this position the weight of the leg will tend somewhat to overcome the action of the muscles, which are disposed to displace the foot backwards. Generally it will be found necessary to make additional pressure directly upon the front of the leg above the ankle; which, in order that it may not prove mischievous, must be effected with some soft material, and must be ap-

<sup>1</sup> New York Journ. Med., April, 1866, p. 40.

<sup>2</sup> Cincinnati Journ. Med., April, 1867, p. 202. See also Todd's Cyclopædia of Anat. and Phys.; Adams on Ankle-joint, p. 160 et seq.

plied over a broad surface. Perhaps nothing will better answer these indications than to pass a cotton band, six or eight inches in width, through slits or mortises in the sides of the box; these slits being of a width equal to the width of the band, and placed at a point sufficiently below the level of the spine of the tibia, so that when the band is made fast underneath the box, it shall press the leg firmly backwards. To prevent the heel from suffering in consequence of this pressure, it also should be supported, or suspended by another band passing underneath the heel and fastened above to the top of the foot-board.

The plaster-of-Paris dressing, also, answers the purpose exceedingly well in these cases; indeed, as I have explained more fully in connection with the subject of Pott's fracture, I must regard it as the most effective means for preventing these accidents, as sequences of this fracture; and as the most certain means for retaining the bones in position when, the displacement having actually occurred, they are again put in place.

Dupuytren relates the following example of this accident:

Pierre Froment, æt. 33, was carrying a heavy weight upon his back and had his right foot in advance, when by accident he came suddenly in contact with a beam placed across his path. Under the fear of being precipitated forwards, he made a sudden effort to throw his body backwards, by which he lost his balance, and fell with the point of the left foot inclined inwards and forwards, and his whole weight was thrown first on the outer side, and then on the front of the ankle-joint.

On examination, the leg seemed to be planted upon the middle of the foot; the toes were directed downwards and the heel drawn up. On the instep there was a large bony prominence, over which the extensor tendons of the toes were stretched like tense cords. Behind the joint was a deep hollow, at the bottom of which the tendo Achillis could be felt forming a tense, resisting, semicircular cord, with its concavity directed backwards. The fibula was also broken; the lower end of the lower fragment remaining attached to the foot, while the upper end of the same fragment was carried forwards by the displacement of the tibia, so that it lay nearly horizontally, with its broken extremity directed forwards.

Dupuytren directed one assistant to fix the leg, and a second to make extension from the foot, while Dupuytren himself, standing on the outer side of the limb, forced the heel forwards and the tibia backwards. The first attempt succeeded partially, and the second completed the reduction. The limb was then placed in the apparatus employed by this surgeon for a fractured fibula, which I have before described, and laid on its outer side in a semiflexed position. The patient recovered rapidly, and in little more than a month he was able to walk.<sup>1</sup>

But such fortunate results have not usually been observed; indeed, Dupuytren encountered much more serious difficulties in two other cases which came under his own notice, one of which he has himself recorded. This was in the person of a woman æt. 48, who was brought to l'Hôtel Dieu in 1815, the accident having just happened from a slip in going down stairs. The fibula was broken, and also a fragment was broken

<sup>1</sup> Dupuytren, Injuries and Dis. of Bones, London ed., p. 278.

from the tibia. The house surgeon reduced the bones, and placed the limb in the ordinary apparatus for broken legs; but on the following day Dupuytren found them redislocated, and laid the limb on his own splint, but the pressure requisite to keep the tibia in place soon induced sloughing, ulceration, and abscesses, and after four months' treatment, during which time the tibia had been repeatedly displaced, she left the hospital, able to use her limb, but with a certain amount of incurable deformity.<sup>1</sup>

Malgaigne mentions the third example as having been seen by himself in Dupuytren's service in 1832, in which case the attempt to maintain the reduction by a tourniquet resulted in gangrene and finally the death of the patient.<sup>2</sup> Earle lost a patient after amputation made on the eighth day. The tibia could not be kept in place, and the amputation became necessary on account of the final protrusion of the bone through the integuments, which had sloughed.<sup>3</sup>

Reginald Harrison,<sup>4</sup> who had seen three cases of this dislocation, practised section of the tendo Achillis for the purpose of maintaining the tibia in place, and with complete success.

#### § 4. Dislocations of the Lower End of the Tibia Backwards.

*Syn.*—"Backward tibio-tarsal dislocation;" Malgaigne. "Dislocations of the foot forwards," of others.

More rare than the dislocations forwards, Malgaigne has, nevertheless, succeeded in collecting five examples.

They appear to have been produced, generally, by a cause the reverse of that which we have seen to produce in certain cases the preceding

FIG. 375.



FIG. 376.



Dislocations of the lower end of the tibia backwards.

dislocation. Thus, while the dislocation forwards is produced sometimes when the foot is in violent extension, this dislocation has occurred, in at least two or three cases, when the foot was forcibly flexed upon the leg.

<sup>1</sup> Dupuytren, *op. cit.*, p. 276.

<sup>2</sup> Malgaigne, *op. cit.*, p. 1044.

<sup>3</sup> Malgaigne, *op. cit.*, p. 1044.

<sup>4</sup> Harrison, *The Lancet*, 1876, vol. i. p. 707.

The symptoms are strongly marked and characteristic. The length of the foot from the tibia to the ends of the toes is increased one inch or more, the heel being correspondingly shortened, or rather wholly obliterated; a portion of the articulating surface of the astragalus may be distinctly felt in front of the tibia; the posterior surface of the tibia touches the tendo Achillis; the leg is shortened, and the malleoli approach the sole of the foot.

In most cases one or both of the malleoli have been broken; and R. W. Smith, who has reported one of the examples alluded to, believes that the dislocation is never complete.

By letter I am informed that a similar case came under the observation of Dr. S. B. Ward, of Albany, N. Y., in November, 1882. The patient had fallen from a scaffold, and Dr. Ward found him with a fracture of the internal malleolus and a dislocation of the tibia backwards, the signs of which were characteristic and marked. Reduction was easily effected, and was accompanied with an audible snap. There was no apparent tendency to a recurrence of the dislocation, and there resulted finally a complete restoration of the motions of the ankle-joint. Dr. Ward remarks incidentally, that he has found another case reported by M. Poland, in *Guy's Hospital Reports* for 1855.

Reduction should be attempted by a method similar to that which has been recommended in all the other dislocations of the ankle, only with such modification as the peculiarities of the case must necessarily suggest.

## CHAPTER XXI.

### DISLOCATIONS OF THE UPPER END OF THE FIBULA.

*Syn.*—"Dislocations of the superior peroneo-tibial articulation;" Malgaigne.

SURGEONS have frequently described a condition of the peroneo-tibial articulation in which the ligaments have become relaxed, giving a preternatural mobility to the head of the bone. It is also not unfrequently displaced upwards, in consequence of an oblique fracture of the tibia. I have myself seen several examples of both these accidents; but simple traumatic dislocations, which can only occur forwards or backwards, are very rare (Boyer<sup>1</sup> relates a case in which both the upper and lower peroneal extremities were dislocated, and the foot dislocated outwards).

#### § 1. Dislocations of the Upper End of the Fibula Forwards.

Malgaigne has collected three examples of this dislocation, observed by Saviourin, Jobard, and Thompson, respectively, uncomplicated with any other accident; and not, apparently, due to any abnormal condition of the ligaments; two of which, at least, seemed to have been produced by

<sup>1</sup> Boyer, *Traité des Mal. Chir.*, t. 4. p. 375.

the violent action of the muscles which, arising from the anterior face of the fibula, traverse below the anterior surface of the foot. The third example, reported by Thompson, permits a doubt as to whether the displacement was occasioned by muscular action, or by a direct blow upon the part.<sup>1</sup>

The signs which characterize the anterior dislocation are the absence of the head of the fibula from its natural position, and its presence in front, near the ligamentum patellæ; the altered direction of the biceps flexor cruris muscle; and, in one case, considerable deformity in the shape and position of the leg has been observed.

Thompson and Jobard<sup>2</sup> were unable to accomplish the reduction while the leg was extended upon the thigh, but succeeded readily after having flexed the leg. In Thompson's case the bones returned with a distinct *crepitus*. Saviourin's case is related by Goyrand<sup>3</sup> from memory. A woman, æt. 35, in falling caught her right foot, turning it violently inwards. Saviourin was called at once. He flexed the leg violently, in order "to relax the muscles going from the anterior face of the fibula to the dorsal surface of the foot," and then easily pushed the bone into its place with his fingers. The patient was kept in bed eight days, no dressings or splints being applied, and on the twelfth day she was dismissed cured. Malgaigne thinks that flexion of the leg, combined with flexion of the foot, would render the reduction more easy.

In whatever position the limb is placed, the surgeon must rely chiefly upon forcible pressure made with the fingers against the front and upper portion of the displaced bone.

J. E. Hawley, of Ithaca, N. Y., late Professor of Surgery in the Geneva Medical College, has furnished me with a brief account of a case which came under his observation:

On the 29th of March, 1854, Bambak, while vaulting upon the parallel bars in a gymnasium, unintentionally made a complete somersault, and fell with his right foot upon the edge of a plank. Dr. Hawley, who was immediately called, found his right leg semiflexed and immovably fixed. The head of the fibula was plainly felt in front of its natural position, near the ligamentum patellæ. The patient was suffering the most intense pain. Extension and counter-extension were made, and while the doctor was pressing with both of his thumbs upon the head of the fibula, it went into its place with an audible snap. The relief was instantaneous. Complete rest was observed for a few days, while cooling lotions were constantly applied, and within a week he was able to attend to his usual duties.

## § 2. Dislocations of the Upper End of the Fibula Backwards.

Sanson has recorded one example, in which the passage of the wheel of a carriage across the upper part of the leg, precisely on a level with the peroneo-tibial articulation, ruptured the ligaments which bind the fibula to the tibia, and caused a displacement, which, however, seems to

<sup>1</sup> Thompson, *The Lancet*, 1850, vol. i. p. 385.

<sup>2</sup> Jobard, *Rev. Med. Chir.*, 1853, t. 14, p. 114.

<sup>3</sup> Saviourin, Goyrand, *Clin. Chir.*, Paris, 1870, p. 111.

have been spontaneously overcome. Nevertheless, there remained a preternatural mobility, permitting the fibula to be pushed easily backwards or forwards upon the tibia.<sup>1</sup>

Sanson did not think that a permanent dislocation could be produced at this joint, but that the bone would be restored to its socket inevitably by the strong resistance offered by the aponeurosis attached to the head of the fibula; and Malgaigne seems not to have considered the case related by Sanson as a fair example of complete backward dislocation. It is my opinion however that, considering the nature and direction of the force applied, and the character of the symptoms present, it ought to be regarded as a complete backward dislocation; in which, however, the aponeurosis not being much disturbed, the bone was easily restored to its position and retained.

The first unequivocal case of this dislocation, unaccompanied by other complications is related by Dubreuil.<sup>2</sup>

A man, æt. 32, in order to save himself from falling, sprang suddenly, with his right leg in a position of extreme abduction, and at the same moment he experienced a severe pain in the region of the peroneo-tibial articulation. The head of the fibula was found to be thrown backwards, and formed under the skin a marked prominence; the foot was drawn outwards, and the whole outside of the limb became cold and numb. Dubreuil flexed the leg moderately, and pressing the head of the fibula from behind forwards, the reduction was easily effected. On the following day, the limb having been straightened, the dislocation was found to be reproduced. It was again replaced, and the knee covered with a leather cap, secured moderately tight. After twelve days of complete rest, the knee was moved gently, and on the seventeenth day the patient walked with the help of a cane. For some time the leg had a tendency to incline outwards; but in about three months the cure was perfectly established.

It is probable that in this latter case the dislocation resulted from the violent action of the biceps flexor cruris. Such, at least, is the opinion of both Dubreuil and Malgaigne, and I see no reason to question the correctness of their theory.

Erichsen mentions that a gentleman, 23 years old, fell in descending the Alps, with his leg bent forcibly under him, dislocating the head of the fibula backwards. When seen by Mr. Erichsen it was found impossible to reduce it, owing to the tension of the biceps. He suffered no permanent inconvenience from the accident, except that this limb was a little weaker than the other, and he could not jump.<sup>3</sup>

Another example has been reported by Dr. Jos. G. Richardson, resident physician to the Pennsylvania Hospital. John Dixon, æt. 9, fell five feet and struck upon the outside of the left knee. When admitted to the hospital, the leg was partially flexed and the toes a little everted, and he was unable to flex or to extend the limb completely. The head of the fibula was seen three-quarters of an inch behind its natural posi-

<sup>1</sup> Sanson, *Dict. de Med. et Chir. pratiques*, p. 274, from Malgaigne.

<sup>2</sup> Dubreuil, *Journ. de Chir.*, 1844, p. 214, from Malgaigne.

<sup>3</sup> Erichsen, *Science and Art of Surgery*, Amer. ed., 1873, vol. ii. p. 440.

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.