

Morel-Lavallée, Roux, and Maisonneuve had each met with the accident.¹

In 1879, Trendelenburg,² in a girl, æt. 15, with an irreducible dislocation of eight weeks' standing, having made an external incision, with a chisel separated the olecranon process from the shaft, and then reduced the dislocation. Observing now that, when the arm was flexed there was a wide separation of the fragments, he again straightened the arm and brought the fragments together with a wire suture. He states that the results were satisfactory!

Voelker,³ in an old incomplete backward and outward dislocation in a boy, æt. 13, attended with complete paralysis of the parts supplied by the ulnar nerve, severed the olecranon with a saw and then wired the fragments together. The result of the operation was a certain degree of improvement in the motions of the arm, and the disappearance of the paralysis.

In 1839, Gerdy,⁴ in a dislocation of six months' standing, divided subcutaneously the triceps and the adjacent adhesions, but he was still unable to reduce the dislocation.

Maisonneuve⁵ and Blumhart⁶ only effected the reduction after the most extensive tegumentary, muscular, and ligamentous dissections. Von Wahl,⁷ in two cases made an external incision, and having divided in one case both of the lateral ligaments, and in the other the external only, and having destroyed the adhesions, was unable to effect reduction. He proceeded therefore to practise resection of the joint.

Emmert⁸ and Boeckel⁹ have each practised resection in similar cases; and Ollier¹⁰ has three times resorted to the same expedient in old irreducible dislocations.

It is scarcely necessary to say that all of these latter surgical expedients should be reserved for exceptional cases. Not one of them is wholly free from danger, and the results are not in all cases such as might be hoped for. Moreover, experience has abundantly shown, and especially when the accidents have occurred in early life, that a persistence of the dislocation is not incompatible with the subsequent formation of a new and very useful joint.

In a recent case, the dislocation being reduced, it may be a matter of prudence, sometimes, to apply a right-angled splint, first carefully padded, to the palmar surface of the arm and forearm; remembering, however, that considerable swelling will soon occur, and that it ought not therefore to be bandaged to the limb very tightly. At least once a day it should be removed, and the arm examined; and in a very few cases can it be necessary or judicious to continue its application beyond

¹ Malgaigne, op. cit., Paris ed., 1855, vol. ii. p. 144.

² Trendelenburg, Centralblatt für Chir., 1880, No. 52, p. 833.

³ Voelker, Deutsche Zeitschrift für Chir., Bd. 12, Hft. 6.

⁴ Gerdy, Annal. de Chir. Française et Étrang., t. 2, p. 151.

⁵ Maisonneuve, Poinsot, op. cit., 918.

⁶ Blumhart, Gaz. Méd. de Paris, 1847, p. 238.

⁷ Von Wahl, St. Petersburger Med. Wochenschrift, 1879, No. 23, p. 221.

⁸ Emmert, Rev. Méd. Chir., t. 3, p. 177.

⁹ Boeckel, Frag. de Chir., Paris, 1882, p. 85.

¹⁰ Ollier, Rev. Mens. de Chir., 1882, pp. 722-734.

one week. At the same time, if there is any especial tendency in the radius to become displaced backwards, owing to a rupture of its annular ligament, this must be prevented, if possible, by a compress and bandage. Some surgeons regard these precautions as necessary in all cases, but I have seldom employed any splint or bandage whatever, nor have I ever had reason to regret this omission.

Finally, we are to place the arm in a sling, and adopt such measures as are calculated at first to reduce the inflammation; and at a very early day we ought to begin to move the elbow-joint, in order to prevent ankylosis.

Dislocations Backwards and to the Radial Side will be considered in connection with outward dislocations; and *Dislocations Backwards and to the Ulnar Side*, in connection with dislocations inwards.

§ 2. Dislocations of the Radius and Ulna Outwards (to the Radial Side).

(a) COMPLETE OUTWARD DISLOCATIONS.

The large majority of outward dislocations of the forearm are incomplete; indeed, only nine examples of a complete dislocation have been collected by Denucé, including two seen by himself.¹ (In his last memoir he has added four more.) Malgaigne has recorded two;² Mollière, of Lyons, has reported one,³ Amboni,⁴ Hatry,⁵ Bertin,⁶ have each reported one. Andrews⁷ has also reported one, and Salleron one,⁸ Osborne one,⁹ Varick one,¹⁰ Wylie one.¹¹ Dr. Erskine Mason has reported two, in children of seven and twelve years respectively, and he refers to another reported by one of his colleagues at Bellevue in the Medical Record for Oct. 9, 1875, in the person of a lad æt. 17,¹² making in all nineteen cases. Dr. Varick's case is reported as follows:

"George Knight, æt. 9 years, was thrown violently from a wagon while in rapid motion, striking on his head and back, with his left arm behind him in a state of flexion. He was brought to my office on the 31st of August, 1867, within ten minutes after the receipt of the injury, and, consequently, in the most favorable condition for manipulation, no swelling of the soft parts having yet occurred. The forearm was in a state of semiflexion, supported by the hand of the opposite side, the ulna lying to the outer side of the external condyle, with slight posterior projection of the olecranon. The olecranon, coronoid process, and greater sigmoid cavity could be distinctly defined, and the head of the radius, in its normal relations to the ulna, could be felt rotating subcutaneously on

¹ Denucé, Mém. sur. Lux. des Coudes. Paris, 1854.

² Malgaigne, op. cit.

³ Mollière, Monthly Abstract Med. Sci., vol. i. p. 269, 1874.

⁴ Amboni, Annal. Univ. di Med., July, 1872.

⁵ Hatry, Lyon Méd., t. 18, p. 13, 1875.

⁶ Bertin, Union Méd., 1876, p. 609.

⁷ Andrews, Med. Record, Oct. 23, 1875, p. 720.

⁸ Salleron, Pingaud, Art. Coude, Dic. Encyc. Sci. Méd., ser. 1, t. 21.

⁹ H. B. Osborne, Hosp. Gazette, Nov. 29, 1879, p. 613.

¹⁰ T. R. Varick, Med. Record, Nov. 1, 1867, p. 337.

¹¹ W. Wylie, Med. and Surg. Rep., March 22, 1879, p. 250.

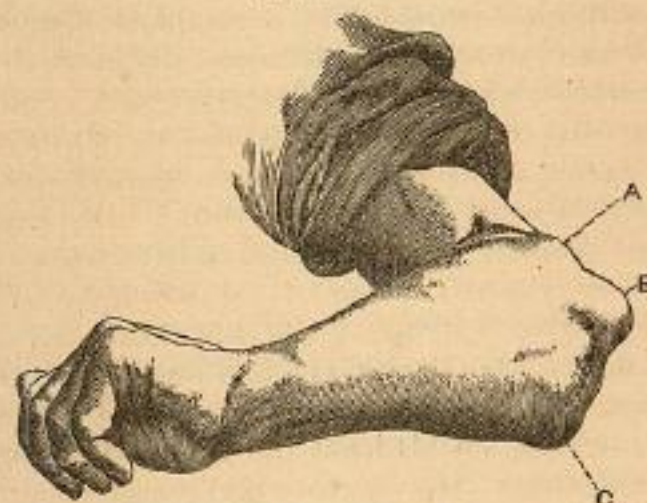
¹² Mason, Med. Record, April 10, 1880, p. 397.

pronating and supinating the forearm. Free motion of the forearm in every direction was present, giving the impression of being attached to the arm solely by the soft parts. The projection of the internal condyle was out of all proportion to what is seen in cases of incomplete dislocation. The trochlea, coronoid depression, and the olecranon depression were distinctly recognized. Complete dislocation of the radius and ulna outwards was diagnosed, which diagnosis was corroborated by my friend, Dr. B. A. Watson, who was present and assisted in the reduction.

"The patient was placed fully under the influence of ether, and moderate extension, combined with lateral pressure, effected the reduction without difficulty. The subsequent treatment consisted of rest and cold irrigation for a few days, followed by passive motion of the parts, which resulted in perfect recovery. The amount of inflammation which followed the injury was exceedingly slight, due unquestionably to the prompt reduction of the dislocation."

Dr. Wylie kindly permitted me to see the case which he has reported, and of which the two accompanying woodcuts (Figs. 299 and 300) are

FIG. 299.



A. Radius; B. Olecranon process; C. Lower end of humerus.

excellent illustrations. Dr. Wylie, who was at that time House Surgeon at the Long Island College Hospital, Brooklyn, in the service of Dr. S. D. Mason, relates the case essentially as follows:

Edward Baker, aged thirty-eight, native of St. John's, Newfoundland, was engaged in a fishing enterprise in 1862. While fishing, standing on a staging formed of three-inch sticks laid crosswise three inches apart, he fell with one arm raised, striking on the inner side of the elbow; at the same moment a barrel of fish, weighing two hundred and fifty pounds, fell over, striking the arm about three inches above the external condyle. Upon rising he found the arm flexed at a right angle, pronated, and immovable at the elbow-joint. No attempt at reduction was ever made, nor was there any retentive apparatus applied. He put the arm in a sling, and after a couple of months he commenced using it a little. At the end of two years his arm was sufficiently recovered to permit him to return to his sailor life, which he followed up to six months ago, when he was admitted to the Long Island College Hospital, for other injuries.

At the present time, seventeen years after the accident, the inner border of the olecranon process rests upon the external border of the humerus, above the external condyle, where, probably, an articular facet

FIG. 300.



The same. Arm nearly extended; the lower end of the humerus projecting below.

has been developed. Just anterior to and to the inner side of this is the head of the radius, which can be recognized by sight, but more surely identified by touch. The internal condyle of the humerus projects greatly, and the trochlea can be distinctly felt. When extended, the radial border presents a gentle outward inclination from the elbow down. This may be greatly increased or diminished by manipulation. This extremity is one and three-quarters of an inch shorter than the other. (This is my own measurement, and differs a little from that given by Dr. Wylie.) The patient has full control of this limb, can flex or extend, pronate or supinate it nearly as well as the other, and he thinks it is in every particular as serviceable as the other.

Causes.—This accident has been produced generally either by a fall upon the hand or upon the elbow. In the latter case, it has been occasionally noted that the force of the concussion was received upon the internal portion of the elbow.

Pathological Anatomy.—Two varieties of this accident have been recognized; one in which the sigmoid fossa of the ulna is situated externally and above the epicondyle, and one in which the sigmoid cavity embraces the epicondyle externally or is situated below it; while the head of the radius is carried forwards by the resistance offered by the pronator muscles.

Symptoms.—There is usually little or no difficulty in recognizing the nature of this dislocation, since the articular projections are easily felt and seen beneath the integuments. The deformity is very marked, and in the case of the supra-condyloid dislocation, the arm is shortened, the forearm is flexed and rotated inwards, and the motions of the joint are limited; while in the infra-condyloid variety, the forearm is very little or not at all shortened; it is flexed also, and the pronation is more extreme.

Prognosis.—In most of the examples reported, the reduction has been effected, and the functions of the arm have been restored; and even when not reduced, the usefulness of the arm has not been diminished in such a degree as might naturally have been expected. In the case of

Baker reported above, the arm seemed after the lapse of seventeen years to be as useful as before.

Treatment.—Extend the forearm upon the arm, with the hand in a position of forced supination, and make traction; and at the same time make direct pressure with the thumbs upon the projecting point of the ulna. In case the dislocation is infra-condyloidian, the hand may be maintained in a position of pronation during this procedure.

(b) INCOMPLETE OUTWARD DISLOCATIONS.

Incomplete dislocations must, however, in this case be regarded as typical; but even these are by no means frequent.

Causes.—A careful examination of a large number of recorded examples, and of those which have come under my own eye, renders it certain that a majority of these accidents result from a blow received directly upon the inner side of the forearm or upon the outer side of the humerus, or from the action of two forces pressing in an opposite direction. Of course, these forces must act upon the bones somewhere in the neighborhood of the elbow-joint. Occasionally it has been produced by a fall upon the hand; sometimes by a violent twist of the arm, as when the hand is caught in machinery; and in other cases it has been found consecutive upon a dislocation backwards, being produced in the attempts made to accomplish reduction of this latter form of dislocation.

FIG. 301.



Most frequent form of incomplete outward dislocation of the forearm.

Pathological Anatomy.—In most of the examples of simple incomplete outward dislocation of the forearm, the great sigmoid cavity of the ulna still embraces the lower end of the humerus; but instead of reposing upon the trochlea fairly, it is carried outwards half an inch or more, so as to rest its central crest upon the depression which separates the trochlea from the lesser or radial head of the humerus. If the annular ligament remains unbroken, the radius is displaced in the same direction and to the same extent.

Occasionally, however, where the violence has been greater, the central crest of the great sigmoid cavity rests fairly upon the condyle, or upon the articulating surface of the humerus where the head of the radius was formerly applied, and the dislocation approaches more nearly to the character of a complete dislocation. At the same time, owing perhaps to the resistance afforded by the skin, or some of the ligaments, the head of the radius may be thrown either forwards or backwards, so as to be out of line with the ulna. Such a displacement generally implies a rupture of the annular ligament.

We have now only to suppose the action of a more considerable force in the same direction to render the dislocation complete; in which case the upper end of the radius is sometimes thrown

completely forwards, and its head may even be found resting in front of the ulna, occasioning an extreme pronation of the forearm and hand.

The anconeus and brachialis anticus are the only muscles in either of these dislocations whose fibres are generally much disturbed; the biceps and triceps being only made to traverse the articulation a little more obliquely.

In examples of fracture of the external condyle, the condyle being carried outwards, the radius may remain in contact with the trochlea, and the ulna may accompany it in this outward displacement; but this must be regarded as a fracture rather than as a dislocation.

Denucé, Malgaigne, A. Cooper, and others have preferred to speak of the dislocation *backwards and outwards* as a distinct form or species of dislocation. I prefer to regard it as only a variety of the outward dislocation, since it may, and no doubt often does, occur consecutively upon a simple incomplete outward dislocation; and if the dislocation outwards is complete, the bones of the forearm can scarcely fail to be drawn more or less upwards. Sometimes also it has been consecutive upon a simple backward dislocation, or upon unsuccessful attempts at reduction where the form of dislocation was originally backwards; yet, as it does not so naturally follow upon a complete backward dislocation as upon a complete outward dislocation, I find sufficient reason for studying its mechanism in this place.

The beak of the olecranon process not only, but a large portion of the body of this process, now lies above and behind the condyle: the brachialis anticus becomes more stretched, if not actually torn; and the biceps is laid against the articulating surface of the humerus; but the triceps becomes again relaxed; as in simple dislocation backwards and upwards.

In all these dislocations the capsular ligaments are more or less extensively torn, but the principal arteries and nerves do not generally suffer greatly, if at all.

Symptoms.—The forearm is usually flexed to about the same angle at which I have found it in dislocations backwards; once I have found it nearly or quite straight; occasionally it is flexed to a right angle. In all the cases seen by me the forearm has been pronated, and the elbow-joint has been very immovable. The most striking diagnostic sign, however, consists in the unnatural form of the elbow-joint, which is so remarkable as not to be easily misunderstood. The internal condyle of the humerus (epitrochlea) projects strongly to the inner side, leaving a deep depression below; while upon the other side, the head of the radius, with its cup-like extremity, can be distinctly felt, and made to rotate outside of its socket. The olecranon process, driven from its fossa, projects more or less posteriorly, and even the fossa itself may sometimes be plainly felt.

A girl, twelve years old, had fallen upon the inside of her elbow, producing an incomplete dislocation outwards of the forearm. I saw her within half an hour. The forearm was bent upon the arm about fifteen degrees, and immovably fixed. The head of the radius could be distinctly felt external to and a little in front of the outer condyle, while the olecranon process of the ulna, which rested upon the back and outer surface

of the humerus, was less distinctly felt than in the opposite arm. The inner condyle projected sharply to the inside, and the olecranon fossa was plainly felt with the fingers. The child was suffering very little pain.

Seizing the wrist with my right hand and the lower end of the humerus with the left, and making moderate extension in these opposite directions, the bones easily, and after only a moment's effort, resumed their places. Her recovery was rapid and complete.

James O'Neil, æt. 16, was admitted to Bellevue Hospital in Dec. 1865, with a partial dislocation caused by the kick of a horse, the blow having been received on the ulnar side of the forearm near the elbow-joint. When he came under my notice the dislocation had existed three weeks. I found the head of the radius reposing upon the radial and posterior side of the humerus. The ulna was displaced one inch to the radial side. The forearm was not at all, or but very slightly, flexed upon the arm. The natural deflection of the forearm to the radial side was a little exaggerated: forearm pronated: elbow-joint admitting of a little motion; but motion caused great pain.

This patient was not in my service, and I have not learned the result of the attempt at reduction.

If the dislocation is complete, the position of the arm is usually the same, but the pronation of the hand is greater, and the projection of the inner condyle more striking.

If now the bones, by a continuance of the original force, or by the action of the triceps, are drawn upwards also, the arm becomes a little more flexed, and the olecranon process more prominent, while the length of the whole limb is sensibly diminished.

Prognosis.—In recent cases, and where no complications exist, the reduction is generally easily effected; and M. Thierry claims to have reduced an outward and backward semi-luxation after eight months. A patient of whom Debruyne has spoken was not so fortunate. On the 16th of April, 1841, a lad, æt. 18, fell upon the palm of his hand and semi-luxated both bones outwards and backwards; on the following morning a surgeon attempted to reduce the dislocation, and the attempt was repeated on the next day by another surgeon; but on the day following this last attempt, gangrene ensued in consequence of the great violence employed by the surgeons, and although the limb was amputated, the patient died. The autopsy showed that both the brachial artery and the median nerve were torn asunder, and that the tendons of the biceps and the brachialis anticus were slipped behind the outer condyle, probably having been thrown into this position during the violent twistings to which the arm had been subjected.¹

I have seen three examples of semi-luxations upwards and outwards which the medical attendants had failed to reduce. The first was in the case of a lad, William Kinkaid, fourteen years old, who had fallen from a wagon and struck upon the palm of his left hand. The surgeon who was immediately called made extension, and supposed that the reduction was accomplished. The lad was brought to me a few months after the

¹ Denucé, op. cit., p. 103.

accident. The arm was slightly flexed, and neither prone nor supine. There existed only a slight motion at the elbow-joint. I did not think it worth while to make any attempt at reduction. Several years after this, in the month of February, 1859, I had an opportunity of examining the arm again. He had now recovered considerable motion in the joint, but he could not tie his cravat. Pronation and supination were perfect.

In the second example, a lady, æt. 33, had fallen upon the inside of her elbow, and reduction not having been accomplished, I found her, nine weeks after the accident, with scarcely any motion at the elbow-joint, and complaining of a numbness in the forearm and hand.

The third instance of unreduced semi-luxation I will relate more at length:

Francis Banfield, aged twenty-two years, a resident of Alleghany County, N. Y., on the 31st of September, 1857, fell from the sweep of a threshing-machine to the ground, a distance of about five feet, striking upon the palm of his hand, his arm being extended in front of him. On rising, he found his arm forcibly flexed and abducted. He straightened it without difficulty, and it assumed the position it now occupies. A physician was called and saw the patient an hour and a half after the accident, who pronounced it a case of dislocation of the radius and ulna, and made efforts at reduction, which he continued from 8½ A. M. until 2 P. M., a period of five and a half hours, to no purpose, when he abandoned the attempt. During the attempt at reduction, the extension was made at times with the arm flexed, and at others extended. At 9 P. M. another physician was called, who made efforts at reduction until 3 A. M., upwards of six hours, at which time he also abandoned the attempt. On the third day another physician, the patient being under the influence of ether, made efforts at reduction for twenty minutes, when he pronounced it in place, and applied a bandage. From the patient's account, the arm was swollen to such an extent as to render this point difficult to determine. On the fifth day the first physician was called, and, believing that he discovered a grating, pronounced it a fracture of the external condyle.

Four months after the accident, when the patient applied to me, the limb presented the following appearances: The "forearm extended upon the arm; looking at the limb along its radial margin, we notice a gentle outward inclination of the forearm from the elbow down, but by manipulation this may be greatly increased; the power of pronation and supination is not affected; the inner condyle projects an inch to the ulnar side; the head of the radius, completely removed from its socket, projects to an equal extent on the radial side. The top of the olecranon process is an inch higher than the top of the inner condyle, so that the radius and ulna are carried upwards as well as outwards."

I believe that the external condyle was not broken, as in that case the arm would be *permanently* deflected outwards to a much greater extent. For, although this arm may be deflected outwards by the surgeon to an angle of 135°, still the degree of mobility which exists would be adverse to the supposition of its being a fracture of the external condyle. The condyles also can be plainly felt in their natural situations, which would

not be the case if a fracture of the external condyle existed. The patient was advised not to submit to any further attempts at reduction.

The following will serve as an illustration of a recent accident of this character:

John Collins, of Buffalo, *æt.* 8, fell while wrestling, his companion falling upon his arm. I found the forearm slightly flexed, pronated, and both radius and ulna thrown over to the radial side and carried upwards. Pressing firmly upon the radius from the outside, the bones assumed suddenly the position of a backward and upward dislocation, from which position they were readily reduced to their original sockets by simple extension.

Treatment.—In relation to the treatment of these accidents I have little to add to what has already been said of the treatment of dislocations backwards. The reduction, if effected at all, has generally been accomplished by moderate extension, or by extension combined with lateral pressure. If the head of the radius is in front of the humerus, or of the ulna, the hand should be first supined, and then the extension should be applied. In some cases the reduction has been effected by placing the knee in the bend of the elbow and flexing the forearm, while the surgeon was making extension from the hand.

§ 3. Dislocations of the Radius and Ulna Inwards (to the Ulnar Side); always Incomplete.

This form of dislocation has generally been considered as much more rare than the incomplete dislocation outwards, a fact which may perhaps find a sufficient explanation in the peculiar form of the trochlea, the inner half of which rises much higher than the outer, forming thus an elevated inclined plane, over which the articulating surface of the ulna must rise before the dislocation can occur. Hahn and Sprengel have, however, observed the incomplete inward dislocation more often than the incomplete dislocation outwards.

Like the opposite dislocation, the typical form of the accident is that in which the displacement is *incomplete*; indeed, *no example of a complete inward dislocation has, I think, been yet recorded.*

Causes.—A fall upon the hand or forearm, a blow upon the radial side of the forearm near its upper end, or upon the ulnar side of the arm near its lower end, a violent wrenching or rotation inwards, of the forearm, are among the causes which may occasion this dislocation.

Pathological Anatomy.—The ridge which divides antero-posteriorly the greater sigmoid cavity of the ulna, having been driven over the elevated inner margin of the trochlea, falls down upon the epitrochlea, so as, in some sense, to embrace it instead of the trochlea; while the head of the radius passes inwards also, and is made to occupy the trochlea, from which the ulna has escaped. Generally the head of the radius is found in the same line with the ulna (Fig. 302), but it may suffer a dislocation and be found a little in advance of the ulna, or possibly a little back of the ulna.

I choose also to regard the semi-dislocations *inwards and upwards* as only a variety of the semi-dislocation inwards; in which form of the accident the coronoid process of the ulna is thrust upwards above the epicondyle, and the head of the radius occupies the olecranon fossa, or rests upon the back of the humerus somewhere in this vicinity.

In addition to the injury suffered by the ligaments and muscles, the ulnar nerve in both varieties of inward dislocation is peculiarly liable to contusion, in consequence of its being crushed between the olecranon process and the epitrochlea.

The attention of the reader must again, as in examples of fractures of the external condyle, be called to the fact that, in fractures of the internal condyle the radius and ulna are apt to suffer a lateral displacement also; but that these examples are more properly to be considered as fractures rather than dislocations.

Symptoms.—If the displacement is only inwards, the olecranon process can be felt projecting upon the inner side, and completely concealing the epicondyle; while the head of the radius, having abandoned its socket, may be felt indistinctly in the bend of the arm. The external condyle (epicondyle) is remarkably prominent. The forearm is generally more or less flexed. The natural outward deflection of the forearm is also lost, or it may be even inclined slightly inwards. This phenomenon is explained by the position of the epicondyle, upon which the greater sigmoid cavity now rests, allowing the ulna to overlap a little upon the humerus; rendering the forearm actually somewhat shorter along its ulnar margin, although the head of the radius may still occupy the summit of the trochlea.

If the bones are displaced *upwards*, as well as *inwards*, a considerable shortening is declared, and the head of the radius may now be felt behind the trochlea, or over the olecranon fossa. In three of the four examples seen by Malgaigne, all of them ancient, the forearm was in a state of supination.

August 25th, a girl, *æt.* 5, fell from a swing, striking upon her right elbow. A physician was called, who supposed it to be a fracture. Five weeks later it was seen by Prof. T. F. Prewitt, of St. Louis, Mo. The forearm was flexed, and could not readily be extended beyond a right angle; it occupied a position midway between pronation and supination ordinarily, but could be supinated and pronated perfectly. The olecranon process was on a line with the extreme point of the inner epicondyle, and the head of the radius could be felt below the olecranon fossa. A finger could be pressed readily into the fossa. A small, sharp spiculum of bone had been torn off, and lay loose over the external condyle, which

FIG. 302.



Most frequent form of incomplete inward dislocation of the forearm.

was very prominent. Attempts were made by Dr. Prewitt to reduce the dislocation under the influence of an anæsthetic, but without success.¹

The following example of this dislocation, unreduced after the lapse of fourteen years, is reported to me by Dr. T. H. Squier, of Elmira, N. Y.: Thomas Cook, now in his nineteenth year, was four years and ten months old when he fell from a pile of boards about as high as a man's shoulder. According to his statement, given at the time, his right arm caught between the boards, and, in falling, he turned a somersault. The mother, to whom the child immediately ran, grasped his arm which he said was broken, and found that it would roll and turn in various ways. When the surgeon arrived, three hours afterwards, the arm was very much swollen, and the accident was supposed to be a fracture. At present the flexion and extension are perfect. The forearm has an inward deflection of a hand's breadth more than the other. The power of pronation is complete, but the forearm and hand cannot be supinated entirely. The external condyle is very prominent, but the internal is almost hid by the olecranon, which projects inwards nearly as far as the point of the epicondyle. The finger can be laid in the olecranon fossa behind, and all the back part of the trochlea can be distinctly traced. By flexing the forearm slowly, as it approaches a right angle, the tendon of the triceps may be felt, lodged, as it were, on the back part of the point of the epicondyle; and by continuing the flexion, the tendon suddenly slips over this point and places itself on the anterior aspect of the arm. When the forearm is fully flexed, the tendon is advanced full three-quarters of an inch in front of the epicondyle. The arm is very serviceable, but invariably pains him after a hard day's work.

Prognosis.—Malgaigne was unable to reduce the bones in a recent case of incomplete internal dislocation which came under his own notice. Triquet succeeded in a child seven years old, on the fifteenth day, after many trials; but the movements of the elbow-joint were never restored. Debruyne succeeded on the fifth day, but not without difficulty; Prewitt failed at the end of five weeks; the case reported by Squier was mistaken for a fracture, and no attempt at reduction was made; and in a case seen by Velpeau, reduction was easily accomplished, and on the eighth day the patient was dismissed.²

Of the four examples of *inward, backward, and upward* dislocation seen by Malgaigne, not one was ever reduced; but as the history of them all is not complete, it is by no means to be inferred that the reduction could not have been easily accomplished, at least in some of them, at the first. Nor, with such imperfect details before us, can we understand fully what complications may have existed, such as would perhaps render these exceptional, rather than illustrative examples.

One of these patients had a completely ankylosed elbow at the end of two years, but pronation and supination were preserved. In the case of another, however, even flexion and extension were as perfect as in the normal condition.

Treatment.—The indications of treatment are the same as in semi-dislocations outwards, with only such slight modifications as the judgment

¹ Prewitt, St. Louis Courier of Med., Jan. 1879, p. 43.

² Denucé, op. cit., pp. 154-156.

of every surgeon must naturally suggest. I prefer to employ by way of illustration the example diagnosticated by Velpeau.

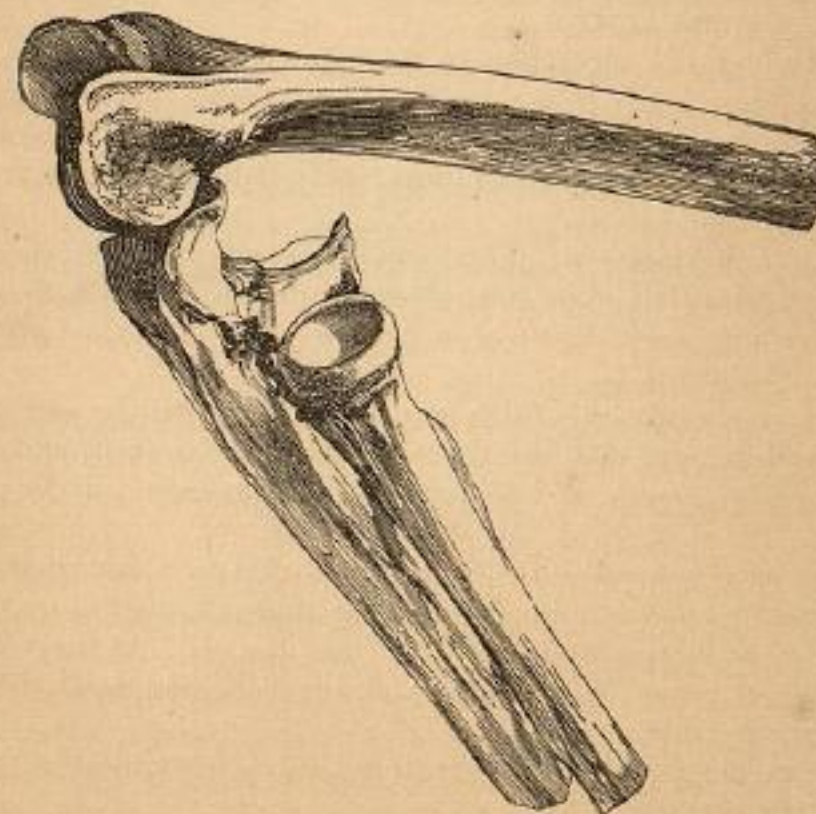
On the 10th of May, 1848, Alexandrine Guyot, æt. 22, entered the Hospital of La Charité with an incomplete inward dislocation of the forearm, which had just occurred. The hand and forearm were in a state of forced pronation, half-flexed, and the whole limb from the elbow downwards was deflected inwards. There were present also all the other usual signs of this dislocation, and Velpeau had no doubt as to its true character.

In order to accomplish reduction, one assistant made counter-extension upon the arm, while a second made direct extension upon the forearm. At first the tractions were made in the direction of the forearm (flexed and prone), but gradually the arm was straightened and supinated. Then the surgeon, seizing with one hand the superior extremity of the forearm, and with the other the inferior extremity of the arm, acted forcibly upon the two portions in opposite directions, and immediately the reduction was effected with a noise.¹

§ 4. Dislocations of the Radius and Ulna Forwards.

Sir Astley Cooper, Vidal (de Cassis), and others have denied that this dislocation was possible without a fracture of the olecranon process; but Monin, Prior, Velpeau, Canton,² and Denucé have each reported one

FIG. 303.



E. Canton's case of dislocation of the radius and ulna forwards.

¹ Denucé, op. cit., p. 155.

² Dub. Quart. Journ. of Med. Sci., Aug. 1860.

example, also Wittlinger, Flaubert, Secrestan, and Cannin,¹ so that its existence may now be considered as established.

The following is a summary of the facts in Velpeau's case: Alexandrine Carelli, æt. 23, was knocked down by a carriage, on the first of July, 1848, the wheel passing over the right arm. The arm was found in a right-angled position, and it could neither be flexed nor extended; the forearm was strongly supinated; the projecting angle usually made by the olecranon process was replaced by the irregular extremity of the humerus; the forearm was shortened upon the arm; the head of the radius resting in the coronoid fossa, and the olecranon process being also carried upwards and a little outwards. Reduction was easily accomplished, and the patient left on the nineteenth day, with only a slight remaining stiffness in the joint.²

A case is reported to have come under the observation of Mr. J. W. Langmore, House Surgeon at the University College Hospital, London. It was occasioned by a fall upon the elbow. The reduction of the ulna was easily accomplished by placing the knee in the bend of the elbow and flexing the arm. The radius was then reduced by pressure and extension.³

Chapel has reported a case of dislocation forwards and outwards, which he readily reduced soon after it occurred, while Colson, Leva, Ancelon, and Guyot have each reported one example of *sub-luxation* forwards, in which the extremity of the olecranon process has been found resting upon the extremity of the humeral trochlea.⁴

In a case of incomplete dislocation forwards mentioned by Date⁵ the internal condyle was broken.

The fracture of the olecranon as accompanying this accident, has, according to Poinset, only been observed in six cases, namely, by Richet, Velpeau, Guérin, Morel-Lavallée, and Guerre. In the latter case, according to Pingaud, the dislocation was easily reduced, and the result was a very useful limb.

Causes and Mechanism.—This accident seems to have been, in most cases, caused by a fall upon the elbow while the forearm was forcibly flexed. In Date's case, however, a boy 14 years old, the fall was upon the palm of the hand.

In case it is caused by a fall upon the elbow, with the arm in a position of forced flexion, the olecranon receives the impact, and this fact, aided perhaps by torsion and abduction of the forearm, drives the bones forwards.

Pathological Anatomy.—In the case reported by Canton, amputation became necessary, and an opportunity was thus afforded to make a careful dissection of the parts involved in the injury. At the time of the accident the arm was in a position of forced flexion, with the forearm twisted upon the chest.

The olecranon was found lying in front of the little head of the hume-

¹ Poinset, *op. cit.*, p. 939.

² Denucé, *op. cit.*, p. 110.

³ New York Med. Record, March 1, 1867, from the London Lancet.

⁴ Denucé, p. 120.

⁵ Date, *The Lancet*, 1872, vol. 2, p. 97.

rus, the radius was in a position of supination, preserving its normal relations with the ulna. The anterior ligament was torn, as were also the posterior and lateral ligaments. The annular and oblique ligaments were intact. The triceps was torn from its insertions. The two external radial and most of the muscles originating at the epicondyle, were more or less torn. The biceps and brachialis anticus were in a state of tension. The larger vessels were unbroken. The ulnar nerve was torn opposite the condyle. The median nerve had suffered only slight lesions.

Treatment.—If the dislocation is complete, and the forearm is shortened and flexed upon the arm, the reduction should first be attempted by violent flexion, or by flexion combined with extension from the wrist, and counter-extension from the lower portion of the humerus. If the dislocation is incomplete, and the forearm is extended upon the arm, the reduction may be readily accomplished by extension alone, or by moderate flexion.

Dislocation of the Radius and Ulna Forwards, with Complete Retroversion of both Bones.—Maisonneuve¹ has reported a case in which both bones being dislocated forwards, the ulna was turned upon itself, so that its sigmoid cavity embraced the articular extremity of the humerus. The patient, a woman æt. 43, had fallen upon the internal margin of the humerus. The inferior extremity of the humerus projected posteriorly, covered only by the skin. The triceps, slightly stretched, was carried outwards and forwards, and lay in front of the condyle. The olecranon, unbroken, was in front of the trochlea; its great sigmoid cavity embraced the articular pulley. The radial cup was entirely hidden. The forearm was forcibly pronated.

Reduction was effected by carrying the forearm outwards, by which the olecranon was disengaged, and the cup of the radius presented itself externally; continuing to press the forearm outwards, the olecranon now abandoned the trochlea, embraced the condyle, and then slid outwards. The forearm at once took the position of supination, and the great sigmoid cavity again presented forwards, passing behind the humerus. The dislocation, having thus been transformed into a backward dislocation, was easily reduced.

§ 5. Diverging Dislocations of the Radius and Ulna.

(a) DISLOCATIONS OF THE RADIUS FORWARDS, AND ULNA BACKWARDS.

This accident was first recognized, according to Malgaigne, by M. Michaux and M. Bulley in 1841, when each of these gentlemen met with a case.

Michaux's patient was a man, 44 years old, who had fallen eight feet, striking upon his elbow while it was carried away from his body. At first the dislocation of the radius was not recognized, but having reduced the ulna by traction, he discovered the head of the ulna in front, which was finally reduced by direct pressure made upon it with the thumb.

M. Bulley's patient was a male also, æt. 28, who had been thrown

¹ Maisonneuve, *Gaz. des Hôp.*, 1867, No. 37. Poinset, *op. cit.*, p. 944.

violently upon the palm of his hand. The forearm was slightly flexed, and could not be moved from this position without causing great pain. The coronoid process rested in the olecranon fossa, and the head of the radius in the coronoid fossa. With slight traction the ulna was reduced, and afterwards the radius was reduced by methodic processes.

M. Mayer reported a case which was not recognized until the fourteenth day, and then he found himself unable to reduce it.¹

Denucé mentions these three cases and no others.

Tillaux² also saw a case, of eight days' standing, in a girl 22 years of age, which he was unable to reduce. Minich,³ in a case which came under his observation, reduced the ulna easily, but did not succeed in reducing the radius until he had made several attempts. Minich, in his report of this case, refers to three other cases as having been seen by Vignolo, Bardeleben, and Chevalier.

Poinsot has also reported a case seen by his colleague Arnoz, which was accompanied with a fracture of the internal condyle, but which for that reason cannot be considered as representing a true dislocation.

To these cases I will add the case reported by Dr. Erskine Mason as having been seen by himself and Dr. Whybrew. The man was 28 years old, and the accident had happened in a fall when he was intoxicated. He had supposed it was a sprain, and these gentlemen were not consulted until the eighteenth day. The character of the dislocation was apparent, but they could not positively determine but that a portion of the external condyle had been broken off; there was, however, no crepitus. The limb was nearly straight, and would admit of but slight flexion. Under ether, prolonged efforts at reduction were made, with the result of finally reducing the ulna, but the radius remained unreduced.⁴

(b) TRANSVERSE. ULNA INWARDS, AND RADIUS OUTWARDS.

The following case, reported by Warmont, was presented in the service of Guersant,⁵ at the Hôpital des Enfants, June 29, 1854. A boy, 15 years old, had fallen a few feet, striking upon the palm of his left hand. The elbow was enormously swollen; its transverse diameter was much increased, while the antero-posterior seemed flattened. No abnormal protrusion existed in front, but externally the head of the radius projected, having ascended along the external border of the humerus. The olecranon was displaced inwards, so that the inner condyle was embraced by the great sigmoid cavity. Between the bones of the forearm, thus separated, almost the whole of the articular surface of the humerus was lodged. The forearm was semiflexed, and semipronated.

(c) OBLIQUE. ULNA BACKWARDS, AND RADIUS OUTWARDS.

Samuel Withe⁶ has described the case of a boy æt. 13, who had fallen violently upon his left elbow. "The condyles of the humerus protruded

¹ Michaux, Bulley, Mayer. From Malgaigne, Paris ed., 1855, vol. ii. p. 631.

² Tillaux, Gaz. des Hôp., 1877, No. 99.

³ Minich, Lo Sperimentale, 1880, fas. 6.

⁴ Mason and Whybrew, Med. Rec., April 10, 1880, p. 297.

⁵ Warmont, Rev. Med.-Chir., t. 16, p. 303.

⁶ Withe, A. Cooper, Euv. Chir. ed. de Chassaignac, et Richelot, Paris, 1837.

through the skin at the internal portion of the articulation, exposing entirely the trochlea of the humerus; the ulna was dislocated backwards, and the radius outwards." Reduction was easily effected and a satisfactory result ensued.

(d) OBLIQUE. ULNA FORWARDS, AND RADIUS OUTWARDS.

Mahner Mons¹ witnessed this dislocation in a man who had struck his elbow violently against a wooden obstacle while it was in a position of forced flexion. The ulna was displaced forwards without fracture of the olecranon, the radius was completely displaced outwards. Reduction was easily effected by traction and pronation. The cure was effected in two months.

CHAPTER XI.

DISLOCATIONS OF THE WRIST (RADIO-CARPAL).

REGARDED as an accident of not unusual occurrence by Hippocrates, J. L. Petit, Duverney, Boyer, and by most if not all of the older writers, its frequency began to be questioned by Pouteau, and finally its existence was almost absolutely denied by Dupuytren, who remarks: "I have for a long time publicly taught that fractures of the carpal end of the radius are extremely common; that I had always found those supposed dislocations of the wrist turn out to be fractures; and that, in spite of all which has been said upon the subject, I have never met with, or heard of, one single well-authenticated and convincing case of the dislocation in question." Dupuytren subsequently declared that he would not positively deny the possibility of the accident, yet that "it must at least be admitted that the accident is an extremely rare one." Wishing to explain this infrequency, he says: "In examining the structure of the soft parts, one cannot fail to perceive that it is not the ligaments which prevent the displacement of the articular surface forwards, but that this effect is especially due to the multitude of flexor tendons, deprived as they are at this point of all the fleshy parts, and reduced to the simple fibrous tissue which composes them. These tendons are bound together beneath the anterior annular ligament of the wrist, and thus offer so efficient a resistance that severe falls are insufficient to tear them through; the hand is forced into a state of extreme extension, and the tendons are firmly applied on the anterior part of the radio-carpal articulation. If the extension is still further augmented, the wrist-joint is yet more closely clasped by these parts, and their power of resistance is incalculable; I am convinced that a force equivalent to one thousand pounds weight would be inadequate to overcome it; and the known power of the tendo Achillis is sufficient to prove that this computation is not exaggerated.

¹ Mahner Mons, Deut. Milit. Zeitschr., 1877, Hft. 8 u. 9, p. 401.