

keep its place. In the adult it needs to be six or seven inches long. In the direction of the axis of the limb, its length should be less, perhaps four inches. Being now well pressed up into the axilla, and secured with a needle and thread to the upper edge of the roller which encircles the lower part of the arm and the body, it will keep its position and serve some useful purpose.

The sling may be made of cotton or flannel cloth, and suspended from the opposite shoulder by the aid of four tapes, a broad and thick pad of folded cloth being laid upon the shoulder to support the knots. A considerable experience has satisfied me that the stuffed collar, used in the Fox dressing, possesses no advantage as a means of suspension. The leather sling, also, in use in some hospitals, is liable to the objection that it cannot be stitched to the roller, which encircles the body and lower part of the arm, in the manner I shall hereafter describe.

The roller should be made to encircle the lower fourth of the arm, and a few turns should pass beneath the forearm as far forwards as the hand, in this manner securely fixing the elbow and forearm against the side and front of the body.

If thought necessary, the hand may be supported by a loop of bandage passed under the wrist and tied over the neck.

Finally, in order that this dressing may retain its place and serve its purpose most effectually, its several parts should be stitched together thoroughly wherever the dressings cross or approach each other. In no other way can anything like permanency be insured in a portion of the body so movable as the shoulder and chest; but even with this precaution, daily attention and occasional readjustment are generally required.

Treatment of Incomplete Fractures of the Clavicle.—In case of partial fracture of the clavicle, accompanied with a persistent bend in the line of the axis of the bone, it is proper to attempt the replacement of the fragments by direct pressure. The ends of the bone being fixed, we cannot, as in the case of a partial fracture of other long bones, employ leverage; and with direct pressure alone, applied in a degree which might be regarded as incurring no danger of causing a complete fracture or of a dislocation, our chances of success are very small. I cannot say that I have ever succeeded in accomplishing anything in this way, although I have often made the attempt, and would always advise others to do the same. A failure, however, to restore completely the line of the axis of the bone is not, I imagine, a matter of great consequence, since, as has already been fully explained when speaking of partial fractures in general, the natural form will be in most, if not in all cases, completely restored after the lapse of a few months or years. This observation applies especially to partial fractures occurring in childhood and infancy. I have no experience as to what is the result of a similar deformity left after a partial fracture in the adult.

As to the method of dressing these fractures, it need not differ from that recommended for complete fractures; but in a majority of these cases I have thought it sufficient to place the arm in a sling, with a bandage around the elbow and body to keep the arm at rest; or I have directed the mother to make the sleeve fast to the front of the dress with tapes; or the hand and arm of the child may be withdrawn from the

sleeve and placed across the body inside the dress, and secured in this position by a belt around the waist. In this case, of course, the dress must remain upon the child until the cure is completed. The axillary pad can seldom, if ever, serve any useful purpose.

Union occurs with great rapidity, sometimes as early as the seventh or tenth day; but the arm ought to be kept quiet, as a matter of safety, two or three weeks.

For a more full consideration of the subject of partial fractures of the clavicle, the reader is referred to the chapter on "Incomplete Fractures."

CHAPTER XX.

FRACTURES OF THE SCAPULA.

FRACTURES of the scapula may be divided into those which occur through the body, the neck, the acromion process, and the coracoid.

§ 1. Fractures of the Body of the Scapula.

Under this title I propose to consider not only fractures of the "body," properly speaking, but also fractures of the angles and of the spine.

Causes.—The scapula is usually broken by the fall of some heavy body directly upon the bone, or by some severe crushing accident, by the kick of a horse, by a fall upon the back; in short, by direct causes alone, and by such causes as operate with great violence.

Malgaigne says that a Doctor Heylen published an example of this fracture, which he believes to have been the result of muscular action, occurring in a man forty-nine years old. The case, however, is not stated so clearly as to relieve us entirely of a doubt as to the nature and cause of the accident.

I have myself recorded six cases which have been under my treatment; and I have seen a few other examples of fractures of the body of the scapula not caused by firearms. There are two cabinet specimens of fracture of the body of the scapula below the spine in the Pennsylvania Medical College, and two involving the spine. Dr. Mütter had in his collection a fracture of the posterior angle, and Dr. March had a specimen of fracture of the body. I believe, also, that in the collection of the late Dr. Charles Gibson, of Richmond, there were one or two specimens of this fracture. I know of no other museum specimens in this country except my own of partial fracture, described in the chapter on "Partial Fractures."

Ravaton, after a practice of fifty years, declared that he had never seen a fracture of the scapula except as it had been produced by firearms. Among 2358 fractures reported from Hôtel Dieu during a period of twelve years, only four examples of fracture of the scapula are

recorded; and, at Middlesex Hospital, Lonsdale has noticed, among 1901 fractures, only eight of the body of the scapula.

The infrequency of this fracture is no doubt due in a great measure to the elasticity of the ribs, to the mobility of the scapula, and to the softness of the muscular cushion upon which it reposes.

Symptoms.—Since this bone is seldom broken except by great force directly applied, the usual signs of fracture are likely to be concealed by the speedy occurrence of swelling. It is for this reason that it becomes necessary, generally, that the examination should be made with great care before we can safely determine upon the diagnosis. I have more than once had occasion to correct the diagnosis of other practitioners, who believed they had discovered a fracture of the scapula.

When, however, the line of the fracture has traversed the spine, and any considerable displacement has occurred, one may recognize the

fracture easily by merely carrying the finger along the crest.

If the fracture has occurred through the body, below or above the spine, or through either of the angles, the displacement may not be so easily recognized. The surgeon ought then to trace carefully with his finger the outlines of the scapula; and this he will be able to do more satisfactorily if he places the scapula in such positions as elevate its margins and render them more prominent. In examining the posterior angle, the hand of the injured limb may be placed upon the opposite shoulder, the forearm being carried across the front of the chest; but in searching for a fracture below the spine, the forearm ought to be laid across the back.

Crepitus, which is not always present owing to the fact that the fragments overlap completely, or because they have been widely separated by the action of the muscles, may generally be de-

Fracture of the posterior angle of scapula, with fissure. Mütter's collection, Specimen C. No. 187.

tected by placing the palm of the hand upon some portion of the scapula, so as to steady the fragment upon which it rests, while the arm is moved backwards and forwards, and in various other directions, until their broken surfaces are brought into contact.

Some degree of embarrassment in the motions of the shoulder and arm must always result from this fracture; sometimes this embarrassment is very great, but it ought not to be considered ever as diagnostic of a fracture, since it may be produced equally by a severe contusion; and



FIG. 60.

even when it is accompanied with a fracture, it is due rather to the contusion than to the fracture.

Pathology, Seat, Direction, etc.—Of incomplete fractures of the scapula, I have already mentioned that I have seen one example.

Malgaigne thinks that he has seen one case of incomplete fracture, which occurred in a man who was injured by the fall of a heavy block of stone upon his back; but as the patient recovered, his diagnosis must remain doubtful. I know of no other recorded examples.

Complete fractures occur most often below the spine, and they are generally oblique or transverse, sometimes nearly longitudinal.

Fractures involving the spine are noticed occasionally; but I am not aware that any one has ever seen a specimen of a fracture of the spine alone, although many surgeons have spoken of them.

I have mentioned one example of a fracture of the posterior angle as being in the cabinet of Dr. Mütter, of Philadelphia. Malgaigne seems to doubt its existence, but speaks of it as a fracture which surgeons have "imagined."

Occasionally the bone is broken into more than two fragments.

As a result of the fracture there is usually more or less displacement; generally, if the fracture is below the spine and transverse, and especially if its direction is oblique from before backwards and downwards, the inferior fragment is displaced forwards, or forwards and upwards, by the action of the serratus major anticus, or of the teres major, whilst the superior fragment is inclined to fall backwards, and sometimes it is carried upwards and backwards, following the action of the rhomboideus major.

In cases of comminuted fractures, and occasionally in simple fractures, the direction of the displacement is reversed, or altogether changed, so that the lower fragment, instead of being in front, is behind the upper fragment; and instead of overlapping the two fragments are more or less drawn asunder. These are deviations which are not easily explained, but which depend, perhaps, rather upon the direction of the blow than upon the action of the muscles.

In a few cases there is no displacement in any direction, although the crepitus and mobility sufficiently demonstrate the existence of a fracture.

Prognosis.—If displacement actually has taken place, it will be found very difficult, as we shall see when we come to consider the treatment, to hold the fragments in apposition until a cure is completed; so that they are pretty certain to unite with a degree of overlapping, or other irregularity.

Lonsdale, Lizars, Chelius, Nélaton, Gibson, Malgaigne, and others have spoken of the difficulty or impossibility generally of keeping these fragments in place. Nélaton and Malgaigne, indeed, confess that they have never succeeded; Gibson declares that it is scarcely possible; whilst Chelius affirms that if the fracture is near the angle, the cure is always effected with some deformity.

But then it is not probable that the patient will ever suffer any serious inconvenience from this irregular union of the fragments, since the perfection of its function depends less upon any given form or size than in the case of almost any other large bone; and if, as has been observed

by Lonsdale, the free use of the arm is not recovered for some time, or if, as has been noticed by B. Bell, a permanent stiffness results, these should be regarded as due to the injury which those muscles have suffered which envelop the scapula, or to some injury of the ligaments and muscles which surround the shoulder-joint.

In some few examples upon record, the bone has been so comminuted, and the soft parts adjacent so much injured, that suppuration and necrosis have ensued. And in one case of gunshot fracture of the scapula, resulting in necrosis, I have had occasion to remove the entire scapula.¹

The case referred to is briefly as follows: Private Wm. Murphy, 73d Regt. N. Y. Vol., et. 33, was admitted to my service, Bellevue Hospital, February, 1866. He stated that he was wounded at Fredericksburg, December 13, 1862, by grape-shot, which fractured both the scapula and head of the humerus. Six days later the head and a portion of the shaft of the humerus were removed. At a later period necrosis attacked the scapula, and I removed the entire scapula, including the acromion and coracoid processes, at Bellevue, February 10, 1866, in the public amphitheatre. Subsequently the patient and the removed scapula were brought before the New York Pathological Society. At this time he had recovered very good use of the limb, and was able to contract effectively the biceps and coraco-brachialis, although their upper points of attachment were only cicatricial tissue. Murphy received a pension, and is subsequently reported by the pension officers as having a large cicatrix over the site of the scapula, the wound made by the resection having healed completely within a few months after the operation. They report, also, some points of bone, which must have been reproductions. The arm was atrophied, and of little value. He died June 24, 1874, having survived the operation more than eight years. Dr. Otis, compiler of the Surgical History of the War of the Rebellion, who has gathered a complete account of this case, remarks that "it affords perhaps a solitary example of a successful extirpation, for the results of shot injury, of the scapula, with preservation of the upper extremity."

Treatment.—In the treatment of this fracture, the first object with all surgeons has been to restore the fragments to place, and this they have chiefly sought to accomplish by position; after which they have endeavored to immobilize the fragments by bandages, etc.

In seeking to accomplish the first indication, they have placed the shoulder and arm in a great variety of postures. Nearly all seem to have regarded it as of some importance that the shoulder should be elevated, so as to relax the muscles attached to the upper and back part of the scapula, and thus permit the upper fragment to fall downwards and forwards.

If we confine our remarks first to fractures through the body, and do not include fractures of the inferior angle, this indication is the only one which Nélaton and Mayor have sought to accomplish, and for this purpose they employ a simple sling; while Amesbury, Liston, Lons-

¹ Surgical History of the War of the Rebellion, vol. ii., Washington, 1876, pp. 492, 494, 498, 499, 500. Proceedings of N. Y. Patholog. Soc., 1866, in Med. and Surg. Reporter, vol. xiv. p. 372.

dale, S. Cooper, South, Skey, Miller, Pirrie, have added to the sling a bandage or roller, which is made to inclose snugly the body and arm.

Erichsen uses the body bandage alone, as in fractures of the ribs, while B. Cooper, Lizars, and Tavernier employ a bandage which incloses not only the body, but also the arm; neither of these last-mentioned surgeons recommends a sling, or any other means to elevate the arm.

Johannes de Gorter advises that a sling shall be used, but that the elbow shall be lifted away from the side of the body, so as to relax the deltoid. Chelius and Desault recommend the same position, but with the addition of an axillary pad, whose apex shall be directed upwards, secured in place with appropriate bandages.

Pierre d'Argelata used also an axillary pad, but instead of a wedge he recommended a simple roll; and instead of lifting the elbow away from the body, he directed that the elbow should be secured against the side, making use of the axillary roll as a fulcrum.

Petit and Heister advised that the elbow and forearm should be carried forwards upon the front of the chest, and secured in this position.

In the treatment of no other fracture perhaps have surgeons differed more widely as to the indications than in this, since, as we have seen, some recommend the elbow to be carried from the body, and some that it shall be made to approach the body; one directs that the elbow shall fall perpendicularly beside the chest, a second prefers that it shall be carried a little back, and a third that it shall be brought well forwards. In one thing alone have they nearly all agreed, namely, that the elbow shall be lifted; and generally also it has been recommended that the arm, forearm, and body shall be confined by sufficient bandages to insure quietude. It might be proper to conclude, therefore, that the sling and bandage constitute all of the apparatus which is necessary or useful; and that it is relatively unimportant whether the elbow is near or remote from the body, or whether it is in front of, or behind, or beside the chest.

Such, indeed, is the conclusion to which I have myself arrived; yet if, in relation to the position of the elbow, a choice were to be expressed, I would give the preference to that in which the arm is laid vertically beside the body, or, perhaps, with the elbow a little inclined backwards, so as to relax as completely as possible the *teres major*.

It is quite probable, however, that no single position will be found of universal application; and perhaps it would be more safe to advise the surgeon in any given case first to reduce the fragments as completely as possible by manipulation, and then to place the arm in such a position as, upon careful experiment in this particular instance, he shall find enables him best to retain them in place.

If, however, the fracture is such as to have separated the inferior angle from the body, it will be well to follow the advice of Boyer and of others, and to place a compress in front of the inferior angle, to resist the greater tendency to displacement in this direction. This compress will more effectually accomplish this indication if the roller with which it is secured to the body, and with which we seek to immobilize the scapula and chest, is turned from before backwards, or in a direction of antagonism to the action of the muscles which produce the displacement.

Desault, with Chelius and Bransby Cooper, has recommended also, in the case of a fracture through the angle, that the forearm should be acutely flexed upon the arm, and that the hand should be placed in front of the chest, upon the sound shoulder, a position which is always irksome, and sometimes insupportable, and which does not offer in any case sufficient advantages to render it worthy of a trial.

§ 2. Fractures of the Neck of the Scapula.

If by the "neck" of the scapula surgeons mean that slightly constricted portion of this bone which is situated at the base of the glenoid cavity—and it is to this portion, we believe, that anatomists have generally applied the term "neck" (we will take the liberty of calling this the "anatomical" neck)—then its fracture is certainly very rare. Indeed, the existence of this fracture, uncomplicated with a comminuted fracture of the glenoid cavity, is denied by Sir Astley Cooper, South, Erichsen, and others. Mr. South says there is no such specimen in any of the museums in London; and I have not been able to find one in any of the American cabinets. Dr. Valentine Mott has said to me that he had never seen a specimen, and that in the natural condition of the bone he regards its occurrence as impossible. Such, I confess, also, is my own conviction.

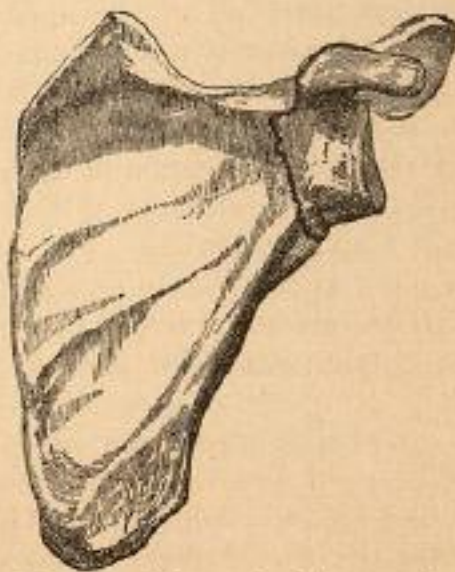
If, however, it is intended, in speaking of fractures of the neck of the scapula, to refer, as Sir Astley Cooper has done, only to fractures extending through the semilunar notch, behind the root of the coracoid process ("surgical" neck), then its existence is certain; yet the fracture

FIG. 61.



Comminuted Fracture of the glenoid cavity.

FIG. 62.



Fracture of the neck of the scapula; according to Sir Astley Cooper.

is not common. Duverney has reported one example, the existence of which he established by a dissection. The coracoid process was broken at the same time, but the fracture through the surgical neck was distinct from this; and Sir Astley has recorded three examples in which the diagnosis was very clearly made out, yet not actually proved by an autopsy.

In Holmes's Surgery it is stated that there is one specimen in the museum of Guy's Hospital; another, in which repair has taken place, in the museum of the Royal College of Surgeons; and the writer refers, also, to the case reported by Duverney in 1751.¹

Perhaps some of the cases, diagnosed during the life of the patient as fractures of the neck of the scapula, were fractures of the lower or anterior lip of the glenoid cavity; but I have never found such a specimen in any collection of bones which I have yet examined, and it must be admitted to be exceedingly rare.

Symptoms.—Sir Astley Cooper justly remarks that "the degree of deformity produced by a fracture of the surgical neck of the scapula depends upon the extent of laceration of a ligament which passes from the under part of the spine of the scapula to the glenoid cavity. If this be torn" (and to this we ought to add the ligaments passing from the coracoid process to the clavicle and acromion process—coraco-clavicular and coraco-acromial), "the glenoid cavity and the head of the os humeri fall deeply into the axilla, but the displacement is much less if this remains whole."

The usual signs are, a depression under the acromion process, the same as in dislocation of the head of the humerus downwards, but not so deep; the head of the humerus felt, perhaps, in the axilla; crepitus, and the immediate recurrence of the displacement whenever, after the reduction has been fairly accomplished, the arm is left unsupported. The crepitus is best discovered by resting one hand upon the top of the shoulder in such a manner as that a finger shall touch the point of the process, while the arm is rotated and moved up and down by the opposite hand. It may also be easily ascertained that the coracoid process moves with the humerus instead of the scapula. Occasionally the accident is accompanied with paralysis of the arm, from pressure upon the axillary nerves; and a rupture of the axillary artery is also mentioned by Dugas.²

Treatment.—The indications of treatment are three, namely, to carry the head of the humerus, with the glenoid cavity, etc., up, to carry it out, and to confine the body of the scapula. The first is accomplished by a sling, the second by a pad in the axilla, and the third by a broad roller carried repeatedly around the arm and chest and across the shoulder. In short, the treatment is essentially the same as that which I have recommended for a broken clavicle.

§ 3. Fractures of the Acromion Process.

Examples of fracture of the acromion process have been reported by Duverney, Bichat, Avrard, A. Cooper, Desault, Sanson, Nélaton, Maligne, West,³ Brainard,⁴ Stephen Smith, and others. I have myself seen five cases.

In the case seen by Cooper it entered the articulation of the clavicle,

¹ Holmes's Surgery, vol. ii. p. 776, Amer. ed., 1870.

² Remarks on Frac. of Scapula, by L. A. Dugas, Georgia. Amer. Journ. Med. Sci., Jan. 1858.

³ West, Penin. Journ. of Med., vol. v. p. 254.

⁴ Brainard, Bost. Med. and Surg. Journ., vol. xxxi. p. 501.

and produced at the same moment a dislocation. Malgaigne says it occurs generally farther up, and posterior to the attachments of the clavicle, "near the junction of the diaphysis with the epiphysis," and that the fracture is in most cases transverse and vertical; but Nélaton saw a case in which the fracture was oblique. In the case reported by C. West, of Hagerstown, Md., the fracture was through the base of the process. In two of the examples seen by me the fracture was in front of the clavicle; in the third, occasioned by the fall of a barrel of flour upon the shoulder, the fracture occurred at the acromio-clavicular articulation, and was accompanied with an upward dislocation of the outer end of the clavicle; in the fourth the fracture occurred at the same point, but there was neither displacement of the clavicle nor of the process, the fracture being only recognized by the crepitus and motion. The fifth, a man *æt.* 31, was brought to my notice by Dr. Thomas J. Sabine, surgeon to Bellevue Hospital, Oct 23, 1876. The patient had been struck by a policeman's club. There was distinct crepitus, the fracture being posterior to the acromio-clavicular junction, but there was no displacement of the fragments or of the clavicle.

There is some reason to believe, I think, that a true fracture of the acromion process is much more rare than surgeons have supposed, and that in a considerable number of the cases reported there was merely a separation of the epiphysis; the bony union having never been completed. If such fractures or separations occurred only in children, very little doubt might remain as to the general character of the accident; but the specimens which I have found in the museums, and the cases reported in the books, have been mostly from adults. It is more difficult, therefore, to suppose these to be examples of separation of epiphyses, but I am inclined to think that in a majority of instances such has been the fact. It is very probable, also, that in the case of many of the specimens found in the museums, called fractures, the histories of which are unknown, they were united originally by cartilage, and that in the process of boiling, or of maceration, the disjunction has been completed. The narrow crest of elevated bone which frequently surrounds the process at the point of separation, and which Malgaigne may have mistaken for callus, is found upon very many examples of undoubted epiphyseal separations which I have examined; and this circumstance, no doubt, has tended to strengthen the suspicion that these were cases of fracture.

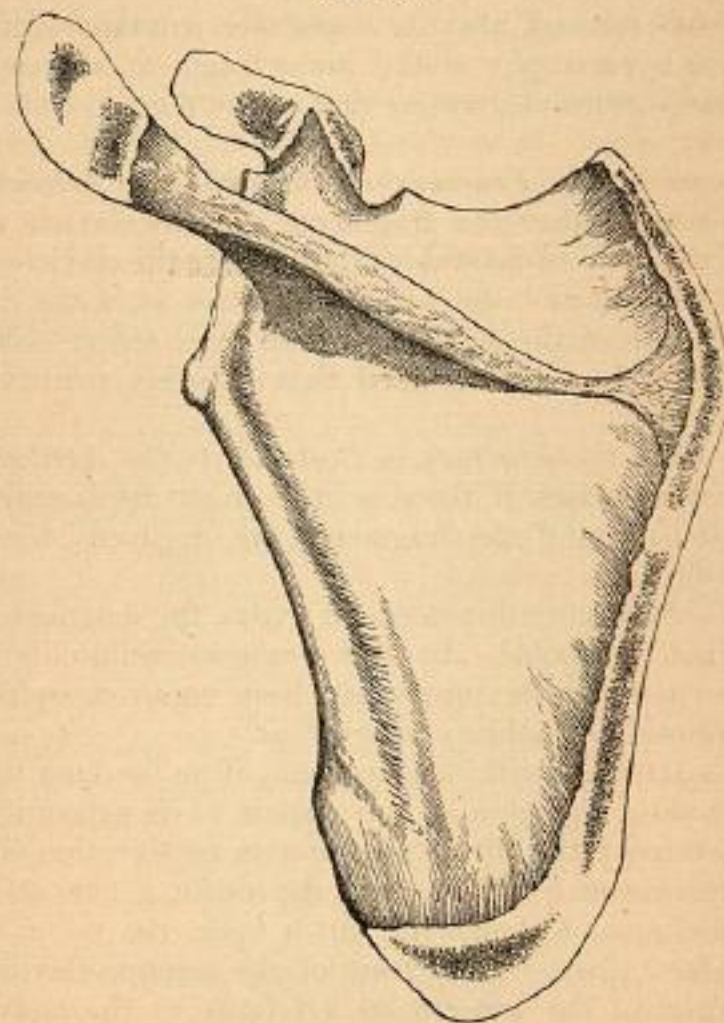
The opinion is confirmed by the remark of Mr. Fergusson that a fracture of this process is an accident "of rare occurrence." "I have dissected," he adds, "a number of examples of apparent fracture of the end of this process; but in such instances it is doubtful if the movable portion had ever been fixed to the rest of the bone." Dr. Jackson, in a letter to me, says there are four specimens in the museum of the Massachusetts Medical College, and in the museum of the Boston Society for Medical Improvement, which might easily be mistaken for fractures, but which only illustrate to how late a period the bony union is sometimes delayed. In one specimen the patient could not have been less than forty years of age; "the acromial process of each scapula was fully formed, but having no bony union whatever with the bone itself. The union was ligamentous, but strong and close."

To the same class belong several specimens in my own collection; specimens 163 and 997 in Dr. March's collection in Albany; 707 in the Albany College collection; two specimens in the Mütter, and one in the Jefferson Medical College museums.

I wish to mention also, that in the case of my own specimens of epiphyseal separation, as well as most of the specimens which I have examined, the ends of the fragments were closed with a compact bony tissue.

The mode of development of the scapula will explain these cases. The scapula is formed from seven centres; namely, one for the body, one for its posterior border, one for its inferior border, two for the acromion process, and two for the coracoid. Ossification of the body exists to a certain extent at or near the period of birth. It commences in one of

FIG. 63.



Scapula, with epiphyses. (From Gray.)

the centres of the coracoid process, about one year after birth, and unites to the body at about the fifteenth year. All the other centres remain cartilaginous until from the fifteenth to the seventeenth year, when ossification commences, and is completed by a common union among all parts, usually between the twenty-second and twenty-fifth years.

No doubt, however, a fracture of this process does occasionally take place. In addition to my own, I have already mentioned several other

examples, some of which have been confirmed by dissection, and in the case mentioned by Stephen Smith, an autopsy, made three weeks after the accident, showed a fracture in front of the clavicle without displacement, the periosteum covering its upper surface not being torn; the fragment could be turned back as upon a hinge.

Prognosis when the Fracture is in front of the Clavicle.—The process generally unites with a slight downward displacement. This occurred in the two examples seen by me; but in such cases the motions of the arm are not in consequence much, if at all, impaired; unless, indeed, it is so much depressed as to interfere with the upward movements of the arm; a result which Heister erroneously supposed was inevitable.

Sir Astley Cooper says that a true bony union is rare in these fractures, and that there generally results a false joint, the fragments uniting by a fibrous tissue; but sometimes the surfaces, instead of uniting either by bone or ligament, become polished and even eburnated.

Malgaigne has noticed, also, in a specimen contained in the Dupuytren museum, a hypertrophy of the lower fragment, this portion having a diameter nearly twice as great as that of the portion from which it was detached.

Prognosis when the Fracture is through the Articulation of the Clavicle.—Where neither the fragments nor the clavicle are displaced, the prognosis ought to be favorable; but in case the clavicle is dislocated, there will be encountered the same difficulties as in the case of simple acromial dislocation of the clavicle, or even more serious difficulty, and I do not see how it can be expected that a perfect reduction should be maintained.

Prognosis when the Fracture is Posterior to the Articulation of the Clavicle.—In these cases, if there is little or no displacement, the prognosis is favorable; but if the fragments are displaced, a perfect adjustment may be difficult.

Symptoms.—Where no displacement exists, the diagnosis must always be difficult, if not impossible. In such a case we could only be instructed by the manner in which the injury had been received, by the contusion, and by the presence of mobility or crepitus.

In examples attended with displacement, if no swelling is present, the finger, carried along the spine of the scapula to its extremity, will easily detect the fracture by the abrupt termination or elevation of the process, or by the presence of a fissure, or a depression; but as to the other symptoms, they must depend very much upon the point at which the fracture has taken place. If in front of the acromio-clavicular articulation, the position of the arm in its relations to the body will not be changed; but if the fracture is through the articulation, and a dislocation of the clavicle results, or if it is behind the acromio-clavicular articulation, the arm, having in either case lost the support of the clavicle, will be inclined to assume the same position that it does in a fracture of the clavicle; that is, the shoulder will be disposed to fall downwards, inwards, and forwards.

Treatment.—If the fracture has taken place in front of the acromio-clavicular articulation, no doubt the most rational plan of treatment, if one aims at the accomplishment of a perfect bony union, is that recommended by Delpech; that is, placing the patient in bed, upon his back,

and carrying the arm out from the body nearly to a right angle; since by this method the fragment is not only lifted, but the deltoid muscle is relaxed, and, consequently, the fragment is no longer forcibly drawn away from the spine of the scapula. If, therefore, the patient will submit to this treatment for a sufficient length of time, the union must be accomplished with the least possible amount of displacement. But in the case of a fracture of the acromion process at the point indicated, only a few fibres of the deltoid muscle are attached to the fragment which has been broken off, and consequently, even in case no union took place, the muscular power of the arm could not be appreciably impaired. Nor would a slight falling or depression of the fragment cause any embarrassment to the motions of the shoulder-joint.

For these reasons it is scarcely worth while to do anything more, in a great majority of cases, than to place in the axilla a pretty heavy wedge-shaped pad, with its apex upwards, and then secure the arm to the side with a sling and roller, the same as in the case of a fracture of the clavicle.

If, however, the fracture has taken place at or behind the junction of the clavicle with the process, the indications of treatment will be, in all respects, the same as in the case of a fracture of the clavicle.

§ 4. Fractures of the Coracoid Process.

“The coracoid process,” says Mr. Lizars, “is said to be broken off, but this I question very much; it must be along with the glenoid cavity, or there must be a fracture of the neck of the scapula.”

Dr. Neill, of Philadelphia, has in his cabinet a specimen of separation of this process at about one inch from its extremity. The line of separation is somewhat irregular; there is no callus, but it is united to the upper portion by a dried tissue, half an inch in length, and continuous with the periosteum. This has been regarded as an example of fracture; but although the scapula is large, and evidently belongs to an adult, the fact that the acromion process is not yet united by bone renders it probable that this, also, is an epiphyseal separation. Prof. Charles Gibson, of Richmond, Va., has informed me also that he has in his cabinet a dried specimen, from an adult, which has been broken obliquely near the end, but which is now united by a ligamentous or fibrous tissue of one line and a half in length. The fragment is displaced a little forwards as well as downwards. Reuben D. Mussey, of Cincinnati, possessed a very remarkable and conclusive example of this fracture. The humerus is dislocated forwards, the head and neck being firmly united to the neck and venter of the scapula, while at the same time the coracoid process is broken and displaced. Dr. Jackson, of Boston, says that specimen No. 453 in the museum of the Massachusetts Medical College seems clearly to have been a fracture involving the base of the coracoid process, and which, having taken place somewhere within a year of the death of the person, had become united by bone, and that just before death the process had broken off, and so completely, as to involve a portion of the glenoid cavity.¹

¹ The author's Report on Deformities, op. cit.

Bransby Cooper relates a case of fracture through the base, which after eight weeks, when the patient died, was found to be united by a ligament. The acromion process was broken at the same time, and had united in the same manner. The head of the humerus was also broken and partly united.¹ One example is said to have occurred in the practice of Dr. Arnott, at the Middlesex Hospital, London, in consequence of which the patient died, when a dissection disclosed the true nature of the accident.² Mr. South has also reported a case resembling somewhat Mussey's, but much more complicated. The humerus was partially dislocated forwards, the clavicle, acromion process, and the olecranon were broken as well as the coracoid process. Neither the fracture of the clavicle nor of the coracoid process was made out until after the patient

FIG. 64.



Fracture of the coracoid process.

died, which was on the fourth day; the fact of the existence of these fractures being then ascertained by dissection.³ Holmes has reported a case.⁴ Erichsen says there is in the museum of the University College a preparation showing a fracture at the base of this process, the line of fracture extending across the glenoid cavity.⁵ Duverney, Boyer, and Malgaigne have also reported four additional examples, confirmed by dissections.⁶

The existence of this form of fracture, established by at least nine or ten dissections, can no longer be denied; yet it is often accompanied with serious complications, and such as have sometimes proved fatal. In the only two cases, however, in which I have had reason to believe that I had to deal with a fracture of this kind, the symptoms and termination were less grave, although they were both complicated with an upward dislocation of the outer end of the clavicle. A gentleman residing in the country was struck by a board which fell edgewise upon his shoulder. The fracture of the coracoid process does not seem to have been recognized by his surgeon. An apparatus was applied to retain the clavicle in its place, but after three months, when he called upon me, it still remained displaced as at first. During all of this time the apparatus had been steadily kept on. On laying off the dressing, I discovered that the coracoid process was detached, obeying constantly the movements of the head of the humerus, but being not at all subject to the movements of the scapula. Some months later I examined the arm again, and found the parts in the same condition as before, but the functions of the arm were not impaired. A girl was admitted to Bellevue Hospital in

¹ B. Cooper, edition of Sir Astley on Frac. and Disloc., Amer. ed., p. 380.

² Arnott, Fergusson's Surg., p. 231.

³ South, Lond. Med.-Chir. Rev., 1840, vol. xxxii., new series, p. 41.

⁴ Holmes, Med.-Chir. Trans., vol. xli. p. 447.

⁵ Erichsen, Surgery, p. 207.

⁶ Malgaigne, op. cit., p. 512.

November, 1868, having fallen upon her left shoulder, and having sustained a complete luxation of the acromial end of the clavicle, upwards and outwards. Upon careful examination, a fracture of the coracoid process was also diagnosticated, indicated by both mobility and crepitus.

By courtesy of Dr. James L. Little, of this city, I was permitted to see, on the 4th of April, 1879, an example of this fracture in the person of John Gannon, *æt.* 38. Four days before he had been struck by an iron rod upon his shoulder, but at what precise point could not be determined. There was no mark over the seat of fracture, and not much sign of contusion. The arm, forearm, and hand were completely paralyzed. The coracoid process seemed to be displaced inwards, or toward the median line of the body; but when the humerus was forcibly rotated outwards, the coracoid resumed its place, and if now pressure was made upon its extremity, it became again suddenly displaced, with a subdued, grating sensation. The presumption appears to be, that the fragment was reduced by external rotation of the humerus; but this position could not be maintained on account of the severe pain which it caused.

Dr. E. C. Huse, of Rockford, Ill., has also recently reported a case—not confirmed, however, by an autopsy.¹

E. Hulme believed that he had met with this fracture, caused by muscular action, in the person of a man who, in falling, was caught by his arm in such a way that it was drawn forcibly from the body.²

It has been generally stated that when this process is broken off, it will be carried downwards by the united action of the pectoralis minor, the short head of the biceps, and the coraco-brachialis muscles; but this will depend upon whether the coraco-clavicular ligaments are ruptured also; a circumstance which is not very likely to occur, at least to any great extent; and in fact not one of the well-attested examples of this fracture has ever been accompanied with any considerable displacement in this direction.

Treatment.—In a case of simple fracture of the process, unattended with any other lesions, it has been recommended to place the arm in a sling, with the elbow advanced as much as possible upon the front of the chest, as by this position we relax somewhat all of the three muscles having attachments to this process, and then to confine the scapula by a few turns of a roller. It is not probable, however, that by these measures we would accomplish enough to justify their continuance if they were found to be painful, or even exceedingly irksome. Patients under my observation have generally complained very much of the pain and discomfort attending this position of extreme flexion of the arm and forearm, first employed by Velpeau for fractures of the clavicle. Moreover, I do not think the fragments are generally displaced; and if they were, and the final union were to be accomplished solely by ligament, I think the usefulness of the arm would not be at all impaired. Such, at least, has been my experience in the two cases above recorded, and in both of which no bony union occurred. In Dr. Little's case rotation of the humerus outwards seemed to effect a reduction, but upon what principle

¹ Huse, Chicago Med. Journ., Aug. 1879.

² Hulme, Lancet, vol. ii. p. 737, 1873.

precisely this position acted to effect the reduction I am not prepared to say; perhaps by drawing upon the coraco-brachialis and short head of the biceps—nor am I prepared to say that it would accomplish the same result in any other case, yet it may deserve a trial.

In the graver forms of the accident, where other bones about the shoulder are broken or dislocated, or the limb has suffered other severe injuries, which, as we have seen, constitute the larger proportion of the whole number, the treatment must generally have little or no regard to this particular injury.

CHAPTER XXI.

FRACTURES OF THE HUMERUS.

It is not sufficient to consider fractures of this bone as occurring through the shaft and its two extremities, as some systematic writers have done; since upon this simple arrangement it is impossible to base a natural division of their causes, symptoms, prognosis, and treatment.

We shall find it necessary to consider—

1. Fractures of the head and anatomical neck. (Intracapsular; non-impacted and impacted.)
2. Fractures through the tubercles. (Extracapsular; non-impacted and impacted.)
3. Longitudinal fractures of the head and neck, or splitting off of the greater tubercle.
4. Fractures of the surgical neck. (Including separations at the upper epiphysis.)
5. Fractures through the body of the shaft. (Shaft below the surgical neck and above the base of the condyles.)
6. Fractures at the base of the condyles. (Including separations at the lower epiphysis.)
7. Fractures at the base, complicated with fractures between the condyles, extending into the joint.
8. Fractures or separations of the internal epicondyle.
9. Fractures or separations of the external epicondyle.
10. Fractures of the internal condyle.
11. Fractures of the external condyle.

Of 203 fractures of the humerus examined and recorded by me, 51 occurred through the upper third, 43 through the middle third, and 103 through the lower third. An observation which is in contrast with the statement made by Amesbury, and which has been repeated by Lizars, B. Cooper, Fergusson, Gibson, and others, that this bone is most often broken in its middle third, unless they intended to speak of fractures of the shaft alone.

Of the fractures belonging to the upper third, 6 were supposed to be epiphyseal separations, one was probably a fracture at or near the ana-

tomical neck, with impaction and splitting of the tubercles, one was a fracture of the greater tubercle alone, and 44 were fractures at or near the surgical neck; some of them probably involving the shaft below the neck.

Of the fractures belonging to the lower third, 22 were through the internal condyle, 29 through the external condyle, 18 were at the base of the condyles, 6 through the condyles and across the base at the same time. One at the epiphysis, the remaining 27 being through the shaft, but above the base.

Unfortunately, surgical writers have not been agreed in the use and application of the terms "head," "neck," "anatomical neck," and "surgical neck" of the humerus; and, as a consequence, their meaning is often obscure, and their teachings are sometimes contradictory and absurd.¹ It is necessary, therefore, that we should define them more precisely.

The "head" of the humerus is that smooth, elliptical surface, covered by cartilage and synovial membrane, which articulates with, and is received into, the glenoid cavity of the scapula.

The "anatomical" neck is the narrow line immediately encircling the head, and which receives the insertion of the capsular ligament.

The "surgical" neck is that portion which commences at the lower margin of the tubercles, or at the point of junction between the epiphysis and the diaphysis, and which terminates at the insertion of the pectoralis major and latissimus dorsi.

The "neck" is all of that portion included between the head and the insertions of the pectoralis major and latissimus dorsi; comprising not only the anatomical and surgical necks, but also the tubercles; which latter occupy the triangular space between these two.

§ 1. Fractures of the Head and Anatomical Neck. (Intracapsular; Non-impacted and Impacted.)

Fractures of the Head.—The causes which have been found competent to produce fractures of the head are, the penetration of balls or of other missiles directly into the joint, producing thus a compound, and generally comminuted, fracture of the head; and falls, or direct blows upon the shoulder, without penetration.

When the fracture results from the direct penetration of some foreign body into the joint, it is not only a compound fracture, but the head of the bone is almost necessarily broken into many fragments. If the patient recovers, sooner or later the fragments have generally to be removed, or resection has to be practised.

Examples of fractures of the head of the humerus, not caused by penetrating injuries, and not accompanied with fracture of the anatomical neck, or of the tubercles, are very rare. Nevertheless now and then a specimen has been found for which this distinction has been claimed. In most of which the fracture has been of the nature of a simple fissure.

Gosselin describes a case in which there were two fissures extending through the articular cartilage, and about one centimetre into the spongy structure. The joint contained half an ounce of blood; death having

¹ Boston Med. and Surg. Journ., June 24, 1868, p. 410.