

almost obliterated by the emphysema, which had also invaded the mediastinal space, and extended over the body as low as the knees.

### § 2. Fractures of the Cartilages of the Ribs.

Boyer was incorrect when he said that the cartilages of the ribs could not be broken until they were ossified. They are often broken when there is no ossification, at the same time that the ribs themselves are broken. Sometimes they are broken alone. Not unfrequently, also, the separation takes place at the precise point of junction between the cartilage and the bone. G. Puel infers, from experiments upon the cadaver, that the fracture would take place at this point most often.<sup>1</sup>

Pyper relates a case in which the sternum was broken in a man aged twenty-five years, and also the cartilages of the sixth, seventh, and eighth ribs of the right side, as was proved by the autopsy, yet the cartilages were not ossified. The vena cava ascendens was also ruptured by the force of the compression.<sup>2</sup> The reader is referred also to my own and Dr. Watts's cases reported in the chapter on "Fractures of the Sternum." Since the date of the report of these cases I have met with several examples of fracture of the cartilages.

*Etiology.*—The causes are the same as those which produce fractures of the ribs, yet it is generally understood that it will require greater force, and that consequently the injury done to the viscera of the thorax will be more complicated and intense.

In the reports of the Massachusetts General Hospital an account is given of the case of a man aged thirty, who was crushed by the fall of a heavy weight upon his body, and who died after about sixty hours. An examination after death revealed a fracture of the cartilages of the third and fourth ribs, with a laceration of the intercostal muscles to such an extent that a hernia of the lungs had occurred at this point. This hernia had been discovered and recognized by Dr. Warren soon after the accident occurred; the protrusion being at that time as large as the clenched fist, and regularly rising and falling with each movement of respiration. It was accompanied, also, with a moderate emphysema.

*Pathology.*—The fracture is clean and vertical, or transverse; never irregular or oblique. The direction of the displacement varies as in fractures of the ribs, but the anterior or sternal fragment is generally found in front of the posterior or spinal.

Union takes place in these fractures, according to the testimony of most pathologists, not through the medium of cartilage, but of bone. Sometimes the new bone is deposited only between the ends of the fragments, in the form of a thin plate; at other times it is formed around the fragments as well as between them. The latter of these two processes has been most frequently observed. The ensheathing callus appears to be supplied by the perichondrium, whilst the experiments of Dr. Redfern render it probable that the intermediate callus may result from a conversion or transformation of the adjacent cartilaginous surfaces. Paget

<sup>1</sup> Puel, *Frac. des cart. cost.* Anvers, 1876.

<sup>2</sup> Ranking's Abstract, vol. i. p. 147, from the *Lancet*, Oct. 1844.

remarks, also, that the ossification extends to the parts of the cartilage immediately adjacent to the fracture.

According to Poinot, in 1869, H. Peyraud related in his thesis several experiments showing that, in animals, some portions of the costal cartilages nearly four centimetres long having been taken off, they may be entirely reproduced, if care has been taken to save the perichondrium, and a case has been published by Bassereau showing that in man the extremities of a broken cartilage may unite by fibro-cartilaginous tissue. In reference to the experiments of Peyraud, it must be said that we can make no positive inferences as to the process of repair in man from observations made upon other animals.

I have seen one example, in the person of Hiram Leech, æt. 38, which, after the expiration of more than one year, had not united. The fracture had occurred in the united cartilages of the ninth and tenth ribs. The posterior fragment overlapped the anterior, and they played freely upon each other at each act of inspiration and expiration.

I do not know that any observations have been made upon the repair of these cartilages in very early life, and it is possible that the process may differ from this, which has been described as it has been observed in the adult.

*Treatment.*—The treatment need not differ from that already recommended for fractured ribs.

## CHAPTER XIX.

### FRACTURES OF THE CLAVICLE.

FOR the sake of convenience, I shall divide fractures of the clavicle into those occurring through the inner, middle, and outer thirds. By the "outer third" is meant all that portion of the clavicle included between its scapular extremity and the internal margin of the conoid ligament. The remaining portion is intended to be divided equally into two separate halves. The peculiarities of these several portions, in respect to anatomical relations, liability to fracture, results, etc., will explain the propriety of the divisions.

*Causes.*—If we except gunshot fractures, the clavicle is broken, in a large majority of cases, by a counter-stroke, such as a fall, or a blow upon the extremity of the shoulder.

Occasionally it is broken by a direct stroke, as when a blow aimed at the head is received upon the shoulder; it is broken sometimes by the recoil of an overloaded gun, especially when the person lies upon the ground, with the butt of the gun resting against the clavicle.

Gibson has seen a case in which it was broken in a child at birth, by

an ignorant midwife pulling at the arm,<sup>1</sup> and Dr. Atkinson has reported an example of intra-uterine fracture of the clavicle.<sup>2</sup>

Gurlt has collected seven cases of intra-uterine fracture of the clavicle caused by external violence.<sup>3</sup>

I have once seen the clavicle broken by muscular action alone. A large, well-built, and healthy man, aged thirty-seven, standing upon the ground, attempted to secure the braces of his carriage-top with his right arm, when he felt a sudden snap, as if something about his shoulder had given way. He did not, however, suspect the nature of the injury, and did not consult any surgeon until eight days after, at which time I found the right clavicle broken near its centre, but rather nearer the sternal than the scapular extremity. The fragments were but slightly, if at all, displaced, but motion and crepitus at the point of fracture were distinct. A node-like swelling was also present, indicating the existence of a considerable amount of ensheathing callus. He had been unable to raise the arm to a right angle with the body since it was broken, but he had suffered no other inconvenience from it.

A similar case is reported in the number for January, 1843, of the *American Journal of Medical Sciences*, copied from the *Revista Medica*. The subject of this case was a colonel of cavalry, about sixty years of age. In mounting his horse, he experienced a sensation as if something had broken, followed by acute pain in his left shoulder, and, on examination, it was found that the clavicle was fractured in the middle. The health of this gentleman had been impaired, it is further stated, by repeated attacks of syphilis.

W. E. Whitehead, U. S. N., has reported the case of a healthy and muscular man, twenty-eight years old, who broke his left clavicle at the junction of the outer and middle thirds, while attempting to raise himself to a platform eight feet high. The fracture was transverse, and unaccompanied with displacement.<sup>4</sup>

Malgaigne has recorded three other examples of fracture of this bone from muscular action; and Parker saw a case which was produced by striking at a dog with a whip. The bone, in the latter case, had been previously somewhat diseased, yet it united favorably.<sup>5</sup>

Of these seven cases, five occurred on the right side, and always near the middle of the bone, if we except one case reported by Malgaigne, in which the point of fracture is not mentioned. In neither case did the fragments become displaced, only as they were found, in some of the examples, inclined slightly forwards.

Gurlt has collected twenty cases of fracture from this cause.<sup>6</sup>

Dr. Pooley reports an example of fracture of the clavicle in a child, supposed to have been due to muscular action, and which was the result

<sup>1</sup> Gibson, Principles of Surg., sixth ed., vol. i. p. 272.

<sup>2</sup> Atkinson, Bost. Med. and Surg. Journ., July 26, 1860.

<sup>3</sup> Gurlt, Holmes's Surgery, ed. of 1870, vol. ii. p. 765.

<sup>4</sup> Whitehead, Pacific Med. and Surg. Journ., 1871.

<sup>5</sup> Parker, N. Y. Journ. Med., July, 1852.

<sup>6</sup> Gurlt, Holmes's Surgery, ed. of 1870, vol. ii. p. 765. See also paper by M. Delcous on Fractures of the Clavicle from Muscular Action, in *Archives G n rales*, March, 1875.

of a fall upon the back.<sup>1</sup> It does not appear to me absolutely certain that in the latter case the manner of the fall was determined, and that it could be fairly set down as due directly to muscular action.

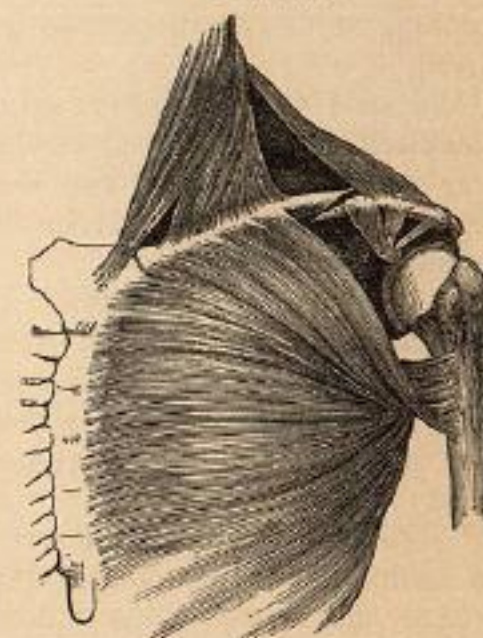
*Pathology.*—It has already been observed, in speaking of partial fractures, that this bone suffers an incomplete fracture more often than any other, and that in such cases the lesion occurs generally in the middle third, or rather to the sternal side of the centre, and in a direction nearly or quite transverse. They are not usually accompanied with much displacement; but if a displacement exists, it is a slight forward inclination of the fragments.

Fractures which are complete occur mostly after the bones have become firm and unyielding. They are also generally oblique, seldom comminuted, still more rarely compound. The point of the clavicle at which a complete fracture usually occurs is at or near the outer end of the middle third, and a little to the sternal side of the coraco-clavicular ligaments, near where the trapezius and deltoid cease their attachments. It might be more exact to say that the fracture extends from this point downwards and inwards, toward the sternum, embracing one inch or less of its entire length. In some cases the obliquity is greater, and the amount of bone involved is much more considerable.

Why the bone should break more frequently at this point, especially in the adult and in the male, it is not difficult to understand. It is smaller here than elsewhere, and less supported by muscular and ligamentous attachments. At this point, also, the axis of the bone begins pretty abruptly to curve forwards, and more abruptly in the adult and male than in the child and female. When, therefore, the clavicle is broken, as it usually is, by a counter-stroke, the force of the blow, conveyed from the shoulder through the outer portion of the bone, is suddenly arrested, and expends itself upon the point where the direction of the axis is changed.

In a record of one hundred and fifty-seven fractures, including partial and comminuted, and not including gunshot fractures, one hundred and twenty-seven have occurred through the middle third; and, with the exception of the partial fractures, the fracture has in nearly all of the cases taken place near the outer end of this third. Four have occurred through the inner third, three of which were within one inch of the sternum; and seventeen through the outer third. A more practical analysis can be based, however, upon the point of fracture with reference to its cause; and I have never, but once, seen a complete

FIG. 48.



Complete oblique fracture of clavicle.

<sup>1</sup> J. H. Pooley, Prof. Surg. Starling Med. Coll., Columbus, Ohio. A Clinical Lecture, 1877.

fracture of this bone, in the adult, produced clearly by a counter-stroke, which was not near the outer end of the middle third.

When the fracture is at this point, or in any portion of the middle third, the direction of the displacement is almost uniformly the same. The sternal fragment is slightly lifted by the action of the clavicular portion of the sterno-cleido-mastoid muscle, notwithstanding the resistance of the rhomboid ligament, the pectoralis major and the subclavius muscles. On the other hand, the acromial fragment is dragged downwards by the weight of the arm, aided by the conjoined action of a portion of the pectoralis major and the latissimus dorsi, feebly resisted by the trapezius and other muscles from above; by the action of the same muscles, aided by the pectoralis minor, and perhaps by some portion of the subclavius, it is drawn toward the body, diminishing thereby the axillary space; while by the preponderating strength of the pectoralis major and minor, the acromial end of the fragment, with the shoulder, is drawn forwards; the sternal end of the same fragment being rather displaced backwards, and at the same time resting at a point somewhat elevated above the acromial end.

Desault has recorded one example of an overlapping by the elevation of the acromial fragment over the sternal;<sup>1</sup> and Bichat remarks that Hippocrates speaks of the phenomenon as a thing which was familiar to him. Syme has mentioned a case of this kind which he had seen.<sup>2</sup> Guéretin, Malgaigne,<sup>3</sup> and Stephen Smith have each reported an example.<sup>4</sup> In Stephen Smith's case the fracture occurred in a man thirty-eight years old. The bone was broken through the outer third, and transversely. He was treated at the Bellevue Hospital, but the overlapping, to the extent of one inch, remained after the cure was completed.

Margaret O'Donnell, æt. 40, was admitted to the Charity Hospital, Blackwell's Island, June 1, 1868, with a single fracture of the clavicle, near its middle, caused two weeks before, by a fall on the shoulder. The sternal fragment was lying beneath the acromial, and in this position it finally united.

In nearly all cases of oblique fractures occurring through the middle third there follows immediately an overlapping, varying from one-quarter of an inch to an inch, and sometimes, though very rarely, exceeding this; the average shortening being about half an inch. There is a specimen in the Dupuytren Museum, in which the shortening equals one-third of its entire length.

Transverse fractures, wherever they may occur, whether in children or adults, are seldom found displaced, at least in the direction of the axis of the bone, as the following examples will illustrate, and they unite usually without shortening or deformity:

An old lady, aged eighty years, fell down a flight of stairs, breaking the right clavicle transversely, about one inch from the sternum. I saw her, with Dr. Trowbridge, on the day following the accident. Motion and crepitus were distinct, but there was scarcely any displacement. No dressings were applied, but she was directed to keep quiet in bed, and

<sup>1</sup> Desault on Frac., op. cit., p. 16.

<sup>2</sup> Malgaigne, op. cit., p. 461.

<sup>3</sup> Amer. Journ. Med. Sci., vol. xvii, p. 251.

<sup>4</sup> N. Y. Journ. of Med., May, 1857.

upon her back. In the usual time the fragments had united, without deformity.

A man, about forty years old, fell backwards from a wagon, breaking the collar-bone near the middle. The fragments were movable, but not displaced. He was treated successfully and without any resulting deformity, by simple confinement in the recumbent posture during a few days, and after this by suspending the arm in a sling, while he was permitted to walk about.

A young man, aged twenty-six, fell while wrestling and broke the clavicle at the outer end of the middle third. There was some displacement at first, but the fragments, being reduced, were found to support themselves. A cross, secured with straps, was applied to the back, and on the twenty-eighth day the union was complete, and without deformity.

A child, aged three years, fell about six feet, striking upon his shoulder. He was sent to me on the same day, by Dr. G. Burwell. I found the left clavicle broken off completely, about one inch from its scapular end. Crepitus and motion were distinct, but the fragments were not displaced. The arm was placed in a sling, and on the seventh day both motion and crepitus had ceased. The cure was accomplished without any degree of displacement.

The example of a fracture from muscular action, already mentioned as having been seen by me, was also probably transverse, and union has occurred without treatment and without displacement.

Stephen Smith, of New York, has met with two examples of transverse fractures without displacement, in a hospital record of eleven cases. Bichat says Desault has frequently observed the same, it having been seen three times at Hôtel Dieu, in the course of the year 1787.<sup>1</sup> Desault thinks, also, that sometimes the fracture, taking place obliquely upwards and inwards, the usual form of displacement is prevented, and apposition is preserved. In nearly all of the examples of partial transverse fractures, occurring in children, seen by me, there has been no longitudinal displacement.

If the fracture is near the sternum, and within the fibres of the costo-clavicular ligaments, as in the case of the old lady just cited, the displacement is inconsiderable. I have seen one other similar case, in an adult also. Lonsdale mentions a case, in a child three years old, which came under his observation in Middlesex Hospital,<sup>2</sup> which he regarded as a separation of the epiphysis, the point of fracture being half an inch from the sternum; but the only epiphysis in connection with this bone, is an exceedingly thin plate at the sternal end, which does not begin to ossify until about the eighteenth year of life. Neither the age of the patient, nor the point of separation, would justify an opinion that this was an epiphyseal separation. Malgaigne mentions two other examples, in one of which the fracture was so near the sternum that it was difficult to say whether it was not a partial dislocation. The displacement was only trivial.<sup>3</sup> But the only two specimens contained in the Dupuytren Museum offer a considerable displacement, and in both the external fragment is thrown downwards and forwards.

<sup>1</sup> Desault on Fractures, op. cit., p. 15.

<sup>2</sup> Lonsdale on Fractures, p. 206.

<sup>3</sup> Malgaigne, op. cit., p. 491.

March 32, 1865, I presented to the New York Pathological Society a similar case, obtained from a patient in Bellevue Hospital. The man from whom this specimen was taken was forty-five years old, and the fracture, occasioned by a fall upon the shoulder, extended from the sterno-clavicular articulation upwards and outwards one inch and a half. The fragments were overlapped three-quarters of an inch, and were firmly united. The character of the accident was not recognized until after death. The specimen is now in the museum of the Bellevue Hospital.

A case is reported from Mt. Sinai Hospital, in this city, of a fracture of the clavicle in an adult, at a point about one inch from the sternum. The inner fragment was drawn, by the action of the sterno-cleido-mastoid muscle, into a vertical position, and the outer was drawn down upon the chest. It became apparent that replacement could not be effected without division of the muscle; and, inasmuch as the displacement caused no inconvenience, it was permitted to remain as it was found.<sup>1</sup>

With regard to the amount of displacement usually attendant upon fractures near the outer end of the bone, surgical writers have generally united in declaring that it was in a majority of cases very inconsiderable, while some have even affirmed that there would be found no displacement whatever; neither of which opinions, according to the observations of Robert Smith, of Dublin, is strictly correct. He has examined eight specimens of fracture of the outer extremity of the clavicle, contained in the museum of the Richmond Hospital School of Medicine; three of which were broken between the conoid and trapezoid ligaments, and are united with very little displacement, whilst the remaining five, broken beyond the trapezoid ligament, present a very marked deformity.

The following is a summary of the conclusions to which he has arrived:

"When the clavicle is broken between the two fasciculi of the coraco-clavicular ligament, there is seldom any displacement of either fragment, and always much less than in fracture of any other portion of the bone. When displacement does occur, it is usually limited to a slight alteration in the direction of the bone, by which the natural convexity of this portion of the clavicle is increased.

"The explanation of which facts is found in the attachments of the ligaments from below to the two fragments; and in the action of the trapezius from above, by which they are antagonized.

"But the case is very different when the bone is broken external to the trapezoid ligament. Here the coraco-clavicular ligaments can have no direct influence upon the outer fragment, which is displaced now

FIG. 49.



Fracture outside of trapezoid ligament. United.

partly by muscular action, and partly by the weight of the arm, the sternal end of the outer fragment being drawn upwards by the clavicular portion of the trapezius, while, by the action of the muscles passing from the chest, the entire outer fragment is drawn forwards and inwards, so as to bring sometimes its broken surface into contact with the anterior surface of the inner fragment, and placing it nearly at right angles

<sup>1</sup> New York Med. Journ., Jan. 1877, p. 48.

with this fragment, in which position it is generally united. The displacement in this direction, rather than any degree of overlapping, explains also the shortening which existed in all of these cases, varying in the different specimens from half an inch to one inch, and averaging about three-quarters of an inch."

Such are the views of Mr. Smith, and I see no reason to call in question their correctness. In my own experience, a fracture occurring in a child three years old, within one inch of the acromial end, probably between the ligaments, was never displaced at all; a second, and third, occurring in adults, presented no displacement. Two cases were displaced each one-quarter of an inch, and two cases half an inch; these four latter cases occurred in adults, and always within an inch of the acromial end of the bone. In one of these last examples, the inner fragment was rather behind than above the outer fragment.

But it would be unsafe to draw conclusions from an experience which is confined entirely to living examples, and in which no dissections have been made, to verify the exact point of fracture, or the precise amount and character of the displacement. So far as they go, however, they seem to me to confirm the general correctness of the observations made by Robert Smith.

It has happened to me only six times to meet with a comminuted fracture of the clavicle, except in cases of gunshot injuries, all of which fractures occurred through some portion of the middle third of the bone; the intercepted fragments being from one inch to one inch and a half in length, and lying obliquely, or, as in one case observed by me, at nearly a right angle with the main fragments.

I have never seen a compound fracture of this bone except as the result of a gunshot injury, although, in many cases, the sharp point of an oblique fracture has seemed just ready to penetrate the skin.

One case is reported as having been presented at St. Bartholomew's Hospital. It occurred in a boy fourteen years old, and was produced by his having been drawn into some machinery while it was in motion.<sup>1</sup> Two similar cases are reported from the New York Hospital, as having been observed during the last ten years preceding the date of the report. The whole number of fractures of the clavicle during this period was 191.<sup>2</sup>

Lente also mentions a case, seen by himself, occasioned by the fall of a derrick upon the shoulder. The patient, twenty-four years old, was admitted into the New York Hospital in August, 1848. The left clavicle was broken at about its middle, and a large wound in the integuments communicated with the fracture. The fragments united firmly in about six weeks, after several pieces of bone had been discharged from the wound.<sup>3</sup>

A double fracture, or a simultaneous fracture occurring in both clavicles, seldom occurs. I have recorded two cases (*four fractures*, three of which are incomplete), both occurring in young boys.<sup>4</sup> Dr. Burr, of Binghamton, N. Y., has reported a case which occurred in a man about

<sup>1</sup> London Med. Gaz., vol. ii. p. 382.

<sup>2</sup> New York Med. Times, March 16, 1861.

<sup>3</sup> Lente, N. Y. Journ. of Med., July, 1850.

<sup>4</sup> Rep. on Def. after Frac., Cases 5, 6, 10.

50 years old.<sup>1</sup> To these M. Polaillon has added 8 others gathered from various sources.<sup>2</sup> Malgaigne says it has only happened once in 2358 cases at the Hôtel Dieu, and he can recollect only five other examples. And of 158 cases of broken clavicles reported from the New York Hospital, it is stated to have occurred in only four.

*Symptoms.*—In all cases of complete fracture with displacement, no difficulty will be experienced in deciding upon the nature of the injury.

The patient is found generally leaning toward the injured side, whilst the opposite hand sustains the elbow of the same side, to prevent its dragging downwards.

The shoulder falls downwards, forwards, and inwards; whilst, at the same time, the line of the bone is interrupted by the sharp and projecting point of the sternal fragment.

If the fracture is the result of a direct blow, a swelling and discoloration may be seen at the seat of fracture; but if it is the result of a counter-stroke, we must look to the top or point of the shoulder for the signs of a contusion.

The patient also experiences pain when an attempt is made to raise the arm at a right angle with the body, and especially in attempting to carry the arm across the body, by which the ends of the broken clavicle are driven into the flesh. In two cases (Cases 19 and 50 of my Report on Deformities) of oblique fracture, accompanied

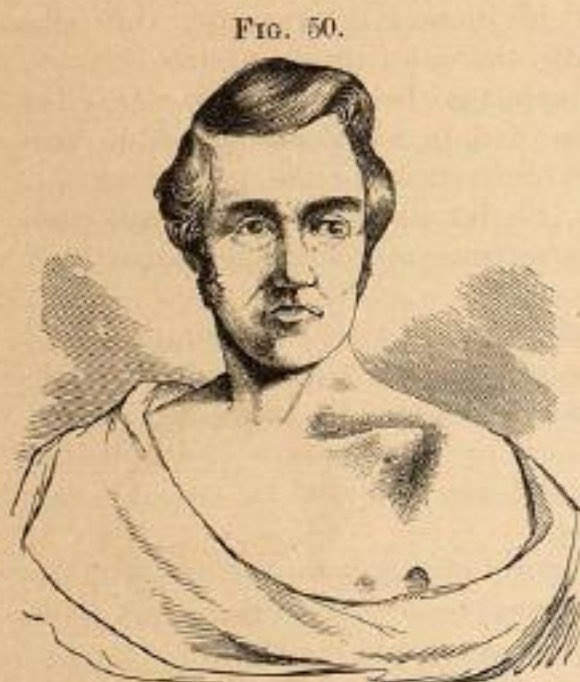


FIG. 50.  
Complete Fracture.—Oblique; at junction of outer and middle thirds. (From nature.)

with displacement, occurring in the middle third of the bone, I have particularly noticed that the patients could easily lift the hands to the head, and in one of these cases the patient, a boy fourteen years old, raised his arm perpendicularly over his head. Such exceptions are not very uncommon.

Crepitus can be detected sometimes by simply pressing down the sternal fragments, but it is almost always present when we draw the shoulders forcibly back, so as to bring the broken fragments into more perfect contact.

If there is no displacement, still crepitus may generally be discovered by grasping the bone between the thumb and fingers, and moving it gently up and down, or by slight pressure upon the point of fracture.

When the fracture occurs close to the acromial extremity, external to the coraco-clavicular ligaments, quite frequently there is no perceptible or marked displacement, and its diagnosis will require, therefore, more care and attention on the part of the surgeon.

<sup>1</sup> Burr, Med. Rec., May 6, 1882.

<sup>2</sup> Polaillon, Dic. Enc. des Sci. Med., t. 17, p. 691.

*Prognosis* in this fracture deserves especial attention. In no other bone, except the femur, does a shortening so uniformly result. Of seventy-two complete fractures only sixteen united without shortening; and of twenty-seven simple, oblique, complete fractures, which occurred at or near the outer end of the middle third, only one united without shortening (Case 46 of my Report), and in this case the patient was but fifteen years old, and the fragments were never much displaced; nor can I say that the treatment—a board across the back, after the manner of Keckerley—had anything to do with the result. Six cases of complete transverse fracture, occurring at the same point, united without shortening.

The shortening, after the union is consummated, varies from one-quarter of an inch to one inch or more; and the fragments are almost always, especially when the fracture is through the middle third, found lying in the position in which we have described them to be at the first; the outer end of the inner fragment being above, and often a little in front of, the outer; sometimes, especially in lean persons, and when the fractures are very oblique, presenting a sharp and unseemly projection.

The greatest amount of shortening is generally found in those fractures which occur through the middle third, or, as Dawson has correctly said, between the rhomboid and coraco-clavicular ligaments.<sup>1</sup> In fractures near the sternal end, within the region occupied by the rhomboid ligament, there is usually very little permanent displacement. The same is true when the fracture is at the acromial end, and between the fasciculi of the coraco-clavicular ligaments, as the observations of Robert Smith, already quoted, have sufficiently established; but if the fracture is beyond these ligaments, near the acromial end, the final displacement and deformity may be very great.

The presence of a small amount of ensheathing callus soon after the cure is completed, sometimes increases the deformity. It is rarely seen to encircle the bone completely, and occasionally it appears to be most abundant in the direction of the salient points of the fracture, that is, above and below; so that, unless the examination is made with care, the projecting points of callus which remain, sometimes after many years, may be easily mistaken for an intercepted fragment turned at right angles to the axis of the bone.

Robert Smith has observed, also, that in cases of fracture external to the conoid ligament, osseous matter is freely formed upon the under



FIG. 51.  
Comminuted Fracture.—United. (From nature.)

<sup>1</sup> W. W. Dawson, M.D., Prof. Surgery Med. Col. Ohio. "The Clinic," Cincinnati, Jan. 5, 1878.

surface of each fragment, but there is seldom any deposited upon the upper surface of either. These osseous growths, occupying the situation of the coraco-clavicular ligaments, frequently prolong themselves as far as the coracoid process, and in some cases to the notch of the scapula. Still less frequently these osteophytes become fused with the coracoid process, and a true ankylosis exists.

In comminuted fractures the intercepted fragments generally fall off from the line of the other fragments, and cannot easily be restored.

The clavicle, being a spongy and vascular bone, usually unites with great rapidity, generally within twenty days. In the fourth example of transverse fracture already mentioned as having been seen by me, the union seemed to be tolerably firm in seven days. Wallace reports one case from the Pennsylvania Hospital, which was cured in eight days, and another in nine days.<sup>1</sup> Velpeau says the clavicle will unite in from fifteen to twenty-five days; Benjamin Bell in fourteen; Stephen Smith has seen it firm in fifteen days.

Whatever may be the degree of displacement, or the condition of the system, unless in a case of gunshot fracture, it is very seldom that it refuses to unite altogether, or that the union is ligamentous. In Mühlenberg's tables of 656 cases of delayed and non-union of long bones, there is but one example of non-union of the clavicle. And in the few cases found upon record of a ligamentous union, the functions of the arm do not seem to have suffered any serious ultimate injury, as the following example will illustrate:

Edmund Nugent, a stout Irish laborer, twenty-five years old, was received into the Buffalo Hospital of the Sisters of Charity, in March, 1854. Several years before, he fell from a horse, and broke his left clavicle, at the outer end of the middle third. This was near Cork, in Ireland; and, without consulting any surgeon or "handy man," he continued at work, holding the tail of the plough, nor from that day forwards did he employ a surgeon, or dress his arm, or cease from his work.

The clavicle presented the same deformity which many other similar fractures present after what is usually termed successful treatment, except that it was not united by bone. The outer end of the inner fragment rode upon the inner end of the outer fragment half an inch. The ligament uniting the two extremities was so long and firm that it could be distinctly felt, and the fragments moved upon each other with great freedom.

In order that we might determine the amount of injury which he had suffered from the ligamentous union, we directed him to lift weights placed on a table before him, while he was seated upon a chair. We ascertained from this experiment that with his left arm he could lift as much, within three ounces, as he could with his right, and he was not himself conscious of any difference. The muscles of the left arm seemed as well developed as those of the right.

In May, 1868, I found in the Charity Hospital, Blackwell's Island, in the person of A. Bragg, æt. thirty-four, a fracture of the left clavicle, which had united only by ligament. The fracture had occurred, when

<sup>1</sup> Am. Journ. Med. Sci., vol. xvi. p. 115.

he was twenty years old, at about the junction of the outer fourth with the inner three-fourths. No surgeon was employed, and no treatment had ever been adopted. The ligament was quite long, and the fragments moved freely upon each other, yet the arm was nearly as strong and as useful as before.

Chelius also refers to two cases mentioned by Gurdy and Velpeau, in which, although an artificial joint remained, the use of the limb was but little impaired.<sup>1</sup>

In a case of compound and comminuted gunshot fracture reported by Ayres, of New York, the recovery was remarkable. The man was sixty-two years old, and in excellent health, when the injury was received. The clavicle was so extensively comminuted that before the wound closed over one-third of the bone had escaped, and yet at the end of one year from the time of the accident the shoulder was perfectly symmetrical with its fellow, without drooping or falling forwards. Dr. Ayres thinks that all of the clavicle which was lost had been reproduced.

A partial paralysis, with atrophy of the muscles of the arm, accompanied, also, with more or less rigidity and contraction of the muscles both of the arm and forearm, is, according to my observation, a more frequent result of these fractures.

Mr. Earle has recorded a case of comminuted fracture of the clavicle, in which the nerves converging to form the axillary plexus were so much injured that paralysis of the arm ensued; and it was noticed as an interesting fact, that the patient could not afterwards put her hand into even moderately warm water without the effects of a scald being produced, characterized by vesications, redness, etc.<sup>2</sup>

Desault saw a case at Hôtel Dieu, in which, although the clavicle was not broken, the force of the blow upon the clavicle was sufficient to produce a severe concussion of the brachial plexus, and paralysis of the arm. A timber had fallen from a building, striking upon the external part of the left clavicle. A considerable wound, followed by swelling, pointed out the place on which the blow had been received. No apparatus was applied, and on the third day a numbness and partial loss of the power of motion occurred in the arm of the affected side. Soon afterward an insensibility came on, and by the seventh day the paralysis of the arm was complete. It was not until after a tedious treatment that the limb recovered in part its original strength.<sup>3</sup>

In Case 23 of my report to the American Medical Association, which was followed by paralysis of the opposite arm, and spinal curvature, these results were probably due to some injury of the back received at the time of the accident; but one cannot avoid a suspicion that the apparatus, Brador's jacket, contributed somewhat to the unfortunate result. No axillary pad was employed, but the straps over each shoulder were buckled so tight that he was compelled to incline his head constantly to the right side. He was unable to lie down, and could only incline in a half-sitting posture. This treatment was continued four weeks; and two months after its removal the paralysis and spinal distortion commenced.

<sup>1</sup> Chelius, Amer. ed., vol. i. p. 603.

<sup>2</sup> S. Cooper's First Lines, fourth Amer. ed., vol. ii. p. 323.

<sup>3</sup> Desault on Frac. and Disloc., Amer. ed., p. 14, 1805.

In Case 38, also, of the same report, a comminuted fracture, paralysis with contraction of the muscles extending to the wrist and fingers existed, but whether it was due to the severity of the original injury or to the treatment, could not be satisfactorily ascertained.

Gibson relates a remarkable instance of this kind. A young man was struck on the clavicle by the falling limb of a tree, breaking it into numerous pieces, and bruising the parts so severely as to give rise to violent inflammation. "The fragments had been driven behind and beneath the level of the first rib, and so compressed the plexus of nerves as to wedge them into each other, and by the subsequent inflammation to blend them inseparably together. Complete paralysis and atrophy of the whole arm ensued, and the patient's object in visiting Philadelphia was to submit to an operation, in hopes of elevating the clavicle to its natural height, and taking off pressure from the nerves." Dr. Gibson, however, did not believe that the prospect of success was sufficient to warrant the operation, and the young man was sent home.<sup>1</sup>

It will not do to deny, therefore, the possibility of a paralysis as resulting from a concussion of the axillary nerves, produced by a blow upon the clavicle, nor of a paralysis resulting from a direct injury inflicted by the points of the fragments upon this plexus in certain very badly comminuted fractures; but it is certain that these conditions will not satisfactorily explain all of the examples in which paralysis has followed simple fractures. In some cases it is no doubt due rather to the injudicious mode of using an axillary pad, by means of which the arm is converted into a powerful lever, and thus the brachial nerves are made to suffer from compression along the inner side of the arm itself. In short, it must be confessed that it is sometimes due to the treatment alone, and not to the original injury.

Parker, of New York, in a note to the edition of S. Cooper's Surgery, just quoted, declares that he has seen one patient who had lost the use of his arm from the pressure upon the nerves by the wedge-shaped pad, over which the limb was confined, in order to pry the shoulder outwards. Stephen Smith mentions a case of partial paralysis from the same cause.<sup>2</sup>

A similar case has come under my own observation. A lady, aged fifty-one years, was thrown from her carriage, breaking the right clavicle obliquely at the outer end of the middle third. During the first three weeks the arm was dressed with Fox's apparatus, which was at no time particularly painful. She was then placed under the care of another surgeon, who, finding the fragments overlapped, applied very firmly a figure-of-8 bandage, with an axillary pad, securing the arm snugly to the side of the body; hoping by these means to restore the fragments to their place. The pain which followed was excessive, and, notwithstanding the free use of anodynes, it became so insupportable that at the end of fourteen hours the dressings were removed by another surgeon, and Fox's apparatus again substituted. These were also applied much more tightly than at first, and during the four weeks longer that they remained on, repeated attempts were made to reduce the fragments.

<sup>1</sup> Gibson, op. cit., 6th ed., vol. i. p. 271.

<sup>2</sup> S. Smith, New York Journ. of Medicine, May, 1857.

Forty-eight days after the accident, she consulted me. The clavicle was then united, and overlapped half an inch. The whole arm was swollen, painful, and very tender, with total inability to move it.

I removed all the dressings, and, during the time she remained under my care, in a private room at the hospital, there was a gradual improvement in the condition of her arm, in respect to swelling and tenderness, but the paralysis did not much abate.

Erichsen thinks he has seen one case of comminuted fracture, produced by a direct blow, in which the subclavian vein was ruptured; great extravasation of blood resulted, and the arm was threatened with gangrene. The patient having recovered, however, the diagnosis could not be determined by actual dissection.<sup>1</sup>

M. Maunoury, of Chartres, met with a similar case, in which, while attempting to tie the vein, the patient died in consequence of the admission of air.<sup>2</sup>

J. W. Ogle has reported a case of wound of the internal jugular caused by a fragment of a broken clavicle.<sup>3</sup>

Dupuytren stated in a clinical lecture in 1831, that he had seen two examples of aneurism consequent upon fracture of the clavicle. Follin says, that Sir Robert Peel having been thrown from his horse, had his left clavicle broken, and death ensued, in consequence, it was believed, of a traumatic aneurism resulting from a wound of an arterial vessel.<sup>4</sup> Blandin has also reported an example of supposed laceration of the subacromial artery in consequence of a direct blow.<sup>5</sup>

"M. Moré, reported to the Surgical Society, in 1876, a case of fracture of the clavicle, in which M. Verneuil and the majority of the members admitted the existence of a partial rupture of the subclavian artery. An old man had his clavicle broken in consequence of direct violence. The apparatus (bandage and axillary pad) was only applied on the third day; on the same evening pains and formications occurred in the hand, which, the next day, presented a bluish appearance in color; in addition, no pulsations in the radial or ulnar arteries could be felt. In view of these accidents, the apparatus, already loose, was removed. It took two months for the limb to regain its normal strength and appearance; but the pulsations in the vessels did not return until after the lapse of eight months. Indeed, this case is not absolutely conclusive, and, notwithstanding the great authority of the surgeons who admitted the rupture of an artery, it is fair to ask if the pressure produced by the axillary pad was not, as in the cases reported above, the real cause of all these accidents."<sup>6</sup>

To these judicious comments of M. Poincot in reference to the case of M. Moré, I wish to add my opinion, that there is good reason for believing, if a vessel were torn, it was done by the surgeon in his attempts to restore the fracture to place; and that if it was not torn, the violent

<sup>1</sup> Erichsen, Surgery, Amer. ed., p. 205.

<sup>2</sup> Maunoury, Prog. Med., Avril, 1882.

<sup>3</sup> Ogle, Brit. Med. Journ., July 23, 1872.

<sup>4</sup> Follin, Path. Ext., t. 2d, p. 849.

<sup>5</sup> Jacquemier, th. d'agrég., Paris, 1844, p. 36.

<sup>6</sup> Moré, Rev. des Sci. Méd., t. 10, p. 235. Poincot.

and injudicious efforts of the surgeon to maintain it in place by an axillary pad, bandages, etc., might explain the obliteration of the arterial circulation. The lesson is not, in my opinion, to be overlooked by those who so assiduously attempt, by similar means, to accomplish what, in most cases, is impossible.

Fracture of the clavicle may also be complicated with a wound of the lung and with extensive emphysema. M. Polaillon has published three cases of this kind taken from Vigaroux, Velpeau et Huguier. Very recently, M. Gibier de Savigny reported a case of fracture of the clavicle in which the external fragment had perforated the lung. Considerable emphysema supervened, and the patient recovered almost without treatment; but a pseudarthrosis remained.<sup>1</sup>

Since among surgeons some difference of opinion seems to exist as to the practicability of overcoming the displacement in certain fractures of the clavicle, it is proper that I should defend the accuracy of my own observations by a reference to the observations of others.

In nine of eleven cases reported by Stephen Smith, one of the surgeons at Bellevue Hospital, New York, more or less deformity remained after the cure was completed. In the two remaining cases the actual results are unknown.<sup>2</sup>

Chelius remarks: "Setting of this fracture is easy, yet only in very rare cases is the cure possible without any deformity." . . . "It is considered, also, that the close union of the fracture of the collar-bone depends less on the apparatus than on the position and direction of the fracture (therefore, in spite of the most careful application of this apparatus, some deformity often remains)."<sup>3</sup>

Velpeau, in a lecture given in 1846, and published in the *Gazette des Hôpitaux*, declares that with all the bandages imaginable, in the case of an oblique fracture at the junction of the outer third with the inner two-thirds, we cannot prevent deformity.

Vidal observes: "Fracture of the clavicle is almost always followed by deformity, whatever may be the perfection of the apparatus and the care of the surgeon."<sup>4</sup>

"Hippocrates has observed that some degree of deformity almost always accompanies the reunion of a fractured clavicle; all writers since his time have made the same remark; experience has confirmed the truth of it."<sup>5</sup>

Turner remarks as follows: "As to the reduction of this fracture, it must be owned the same is, often easier replaced than retained in its place after it is reduced; for its office being principally to keep the head of the scapula, or shoulder, to which, at one end, it is articulate, from approaching too near, or falling in upon the sternum, or breast-bone, it happens that, on every motion of the arm, unless great care be

<sup>1</sup> Polaillon, Dict. Encyc. des Sci. Med., t. 17, p. 695. French ed. of this treatise, p. 220, note by Poinsoit.

<sup>2</sup> New York Journ. Med., May, 1857, p. 382.

<sup>3</sup> System of Surgery. By J. M. Chelius, of Heidelberg, with notes by South. First Amer. ed., vol. i. pp. 603, 605.

<sup>4</sup> Vidal (de Cassis), Paris ed., vol. ii. p. 105.

<sup>5</sup> Treatise on Fractures and Luxations. By J. P. Desault. Edited by Xav. Bichat, and translated by Charles Caldwell, M.D. Philadelphia, 1805, p. 9.

taken, the clavicle therewith rising and sinking, the fractured parts are apt to be distorted thereby. Besides, even in the common respiration, the costæ and sternum aforesaid, where the other end of this bone is adnected, together with the motion of the diaphragm, rising and falling, especially if the same be extraordinary, as in coughing and sneezing, are able to undo your work, not to mention the situation thereof, less capable of being so well secured by bandage as many others. All which, duly considered, it is no wonder that upon many of these accidents, although great care has been taken, these bones are sometimes found to ride, and a protuberance is left behind, to the great regret particularly of the female sex, whose necks lie more exposed, and where no small grace or comeliness is usually placed."<sup>1</sup>

Says Johannis de Gorter: "Restituiter facile tractis humeris a ministro posterioris, dum simul suo genu locato ad spinam dorsi, dorsum sustentet minister, nam tunc chirurgus folis digitis claviculam fractam reponere potest. *Difficilius autem in reposita sede retinetur, sed loca cava supra et infra claviculam spleniis implenda.*"<sup>2</sup>

Says Heister, writing only a little later: "The reduction of a broken clavicle is not very hard to be effected, especially when the fracture is transverse; nor is it unusual for the humerus, with the fragment of the clavicle, to be so far distorted as not to be easily replaced with the fingers; but the difficulty is much greater to keep the bone in its place when the fracture is once reduced, especially if the bone was broken obliquely."<sup>3</sup>

Amesbury, after having exposed the inefficacy of all previous modes of dressing, and especially of the figure-of-8 bandage, Desault's, Boyer's, and an apparatus recommended by Sir Astley Cooper, proceeds to describe his own apparatus and to affirm its excellence. It is, however, not much unlike a multitude of others, and is liable to the same objections.<sup>4</sup>

M. Mayor, of Lausanne, thinks that up to this day no successful mode of treatment has been devised. "Here everything appears as yet so little determined, that each day sees some new propositions and different procedures," etc. He believes, however, that in his simple handkerchief bandage, with straps across each shoulder, the indications are most fully accomplished and the most successful results are obtained. If, however, it were to be treated *without* apparatus, the horizontal position, lying upon the back, would, in the end, make the most perfect unions.<sup>5</sup>

Says M. Malgaigne: "The prognosis, considering the trivial character of this fracture, is sufficiently difficult. For, little as may be the displacement, the surgeon ought not to promise a reunion without deformity; and certain successful results, proclaimed from time to time, betray, on the part of those who relate them, the most extravagant exaggerations."<sup>6</sup>

M. Nélaton having spoken of the various plans which have been sug-

<sup>1</sup> The Art of Surgery, by Daniel Turner, vol. ii. p. 256. London ed., 1742.

<sup>2</sup> Johannis de Gorter; Chirurgia Repurgata, p. 79. Lugduni Batavorum, 1742.

<sup>3</sup> Heister's Surgery, vol. i. p. 134. Lond. ed., 1768.

<sup>4</sup> Treatment of Fractures, by Joseph Amesbury, vol. ii. p. 527. London ed., 1831.

<sup>5</sup> Nouveau Système de Délégation Chirurgicale, par Mathias Mayor, de Lausanne, p. 384, etc. (also Atlas, plate 3, figure 23). Paris ed., 1838.

<sup>6</sup> Traité des Fractures et des Luxations, par J. F. Malgaigne, tome premier, p. 473. Paris ed., 1847.



gested to retain this bone in place, and of their inefficiency, comes at last to speak of the handkerchief bandage of M. Mayor, and remarks:

"This apparel is very simple; but neither will it remedy the overlapping." . . . "Of all the apparels which we have passed in review, there is, then, not one which fills completely the three indications usually present in the fracture of a clavicle. None of them oppose the displacement; they have no effect, with whatever care they may be applied, but to maintain immobility in the limb. We think, then, that it is useless to fatigue the patient with an apparatus annoying, and, perhaps, even painful; a simple sling, secured upon the sound shoulder, will be sufficiently severe. Nevertheless, as this does not assure so complete immobility as the bandage of M. Mayor, it is to this that we think the preference ought to be given in all cases of fractures of the clavicle, whether accompanied with displacement or not, whether they occupy the middle or the external part of the clavicle. If the fracture presents no displacement, we shall obtain a cure which will leave nothing to be desired. If there is a tendency to displacement, the consolidation will be effected with a deformity more or less marked; but since this deformity is inevitable, at least with adults, whatever may be the apparel which we employ, it is evident that the apparatus which causes the least constraint ought to have the preference. We may remark, farther, that this union with deformity in no wise impairs the free exercise of all the movements of the members."<sup>1</sup>

"The venerable gentleman who stands at the head of American surgery, and whose manipulations with the roller approach very nearly to the limits of perfection, informed us, in 1824, that he had never seen a case of fractured clavicle cured by any apparatus, without obvious deformity."<sup>2</sup>

I need not say that the "venerable gentleman" to whom Dr. Coates refers in this passage was the late Dr. Physick, of Philadelphia.

Dr. Gross says that, according to his experience, "fractures of the clavicle are seldom cured without more or less deformity, whatever pains may be taken to prevent it."<sup>3</sup>

Among the late German authors, Roser speaks as follows: "The treatment of fractures of the clavicle is, after all that has been said, very imperfect; and it is very often the case that, after a most careful treatment, some deformity will remain, such as protrusion of the inner fragment, crossing of the fragments, and consequent shortening."<sup>4</sup>

Says Bryant, in his excellent Treatise on Surgery, "Deformity almost always exists in spite of treatment."<sup>5</sup>

*Treatment.*—If evidence were needed beyond that which has been furnished, of the difficulty of bringing to a successful issue the treatment of this fracture, it might be supplied, one would think, by a reference

<sup>1</sup> *Eléments de Pathologie Chirurgicale*, par A. Nélaton, tome premier, p. 720. Paris ed., 1844.

<sup>2</sup> Reynell Coates, *Amer. Med. Journ.*, vol. xviii, p. 62, old series. It is probable that Dr. Physick here referred to complete and oblique fractures of the middle third, or that Dr. Coates has forgotten the precise language employed on this occasion.

<sup>3</sup> Gross, *System of Surgery*, vol. i, p. 954, 1872.

<sup>4</sup> W. Roser, *Handbuch der Anatomischen Chirurgie*, 6 Aufl., Tübingen, 1872.

<sup>5</sup> Bryant, *Practice of Surgery*, 1872, p. 927.

merely to the immense number of contrivances which have been at one time and another recommended.

A catalogue of the names only of the men who have, upon this single point, exercised their ingenuity, would be formidable, nor would it present any mean array of talent and of practical skill.

All these surgeons, however, have admitted the same indications of treatment, viz., that in order to a complete restoration of the outer fragment, which alone is supposed to be much displaced, we are to carry the shoulder upwards, outwards, and backwards. But as to the means by which these indications can be most easily, if at all, accomplished, the widest differences of opinion have prevailed; and, in the debate, it may be seen that whilst, on the one hand, no invention has wanted for both advocates and admirers, on the other hand, no method has escaped its equivalent of censure.

Hippocrates, Celsus, Dupuytren, Flaubert, Lizars, Pelletan, and others, directed the patients to lie upon their backs, with little or no apparatus. S. Cooper and Dorsey also recommend that the patients should be confined in this position during most of the treatment; and from the account given by Dr. Lente, it will be understood that a similar plan was at one time adopted in the New York City Hospital. "But this result," speaking of angular deformity, not overlapping of the fragments, "rarely happens when the patient has strictly followed the directions of the surgeon, as to position especially, for it is by position, more than by any other remedial means, that a good result is to be effected."

Nearly the same method we find recommended by Alfred Post, in 1840, then one of the surgeons of that hospital; the arm being merely kept in a sling and bound to the side, with the patient lying upon his back. Dr. Post mentions a case treated in this manner, which terminated with very little deformity;<sup>1</sup> and I have myself treated many cases by this plan, with more than average success.

Dr. Edward Hartsborne, of Philadelphia, has published, in the second volume of the Pennsylvania Hospital Reports, 1869, a very ingenious argument in favor of the supine position, in which he seems to have demonstrated that the special efficacy of this plan depends upon the pressure made against the angle of the scapula. In order to accomplish this, and to place the scapula in the position most favorable for the reduction of the clavicle, the back should rest upon a broad, firm, and unyielding mattress, and not upon a pillow between the shoulders, which latter has the effect rather to defeat than to promote the indication; the head should be slightly raised so as to relax the sterno-cleido-mastoid muscles and somewhat extend the trapezius; the arm and forearm of the injured side should be flexed, resting across the chest, with the hand reaching over the sound shoulder, as recommended by Velpeau in the use of his dextrine apparatus, or it should be placed at right angles with the body, as recommended by Dupuytren. Bryant, of London, recommends essentially the same method.

It is scarcely necessary to say that the absolute immobility required by the posture treatment must always limit its application, and render

<sup>1</sup> *N. Y. Journ. of Med.*, vol. ii, p. 226.

its general employment impossible. Dr. J. A. Packard, of Philadelphia, regards the scapula, also, as the bone upon which the restoration of the clavicle chiefly depends; and he finds in the serratus magnus the especial obstacle to this restoration.<sup>1</sup>

Dr. Eve, of Nashville, Tenn., and Dr. Eastman, of Broome County, N. Y., have also employed this method successfully;<sup>2</sup> whilst Malgaigne declares it to be the most reliable means of obtaining an exact union.

Albucasis, Lanfranc, Guy de Chauliac, Petit, Parr, Syme, Skey, Brunninghausen, and very many others, especially among the English, have preferred, in order to carry the shoulders back, a figure-of-8; whilst Desault, Colles, South, Bryant, and Samuel Cooper have represented this bandage as useless, annoying, and mischievous.

Heister, Chelius, Miller, Breffield, Keckerly,<sup>3</sup> Coleman,<sup>4</sup> Hunton,<sup>5</sup> prefer, for this purpose, some form of back-splint, extending from acromion to acromion, against which the shoulders may be properly secured.

Parker says that splints of this kind, with a figure-of-8 bandage, are "better than all the apparatus ever invented," whilst Mr. South gives his testimony in relation to all dressings of this sort as follows: "I do not like any of the apparatus in which the shoulders are drawn back by bandages, as these invariably annoy the patient, often cause excoriation, and are never kept long in place, the person continually wriggling them off to relieve himself of the pressure."

Fox,<sup>6</sup> Brown,<sup>7</sup> Desault, and others bring the elbow a little forwards, and then lift the shoulder upwards and backwards. Wattman and Lonsdale carry the elbow still farther forwards, so as

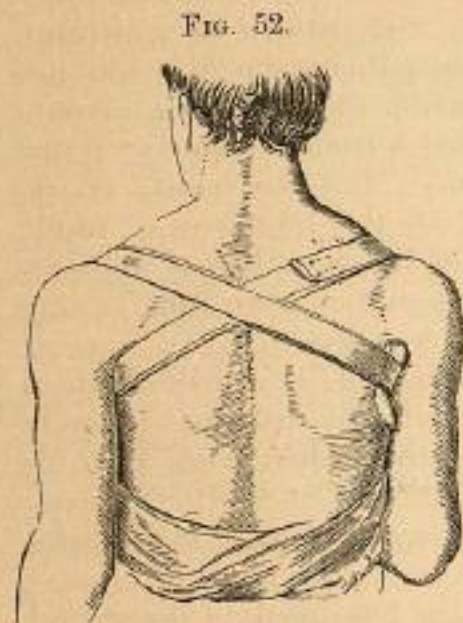


Figure-of-8.

to lay the hand across the opposite shoulder; whilst Guillou carries the hand and forearm behind the patient, and then proceeds to lift the shoulder to its place. Moore, also, recommends that the elbow shall be carried back.

Thus Desault, Fox, and Wattman accomplish the indication to carry the shoulder back, by lifting the humerus, with the elbow in front of the body; whilst Guillou and Moore accomplish the same indication by lifting the humerus when the elbow is a little behind the body. Chelius

<sup>1</sup> Packard, New York Journ. of Med., 1867.

<sup>2</sup> Bost. Med. and Surg. Journ., vol. lvi. p. 468.

<sup>3</sup> Keckerly, Amer. Journ. Med. Sci., vol. xv. p. 115; also, my Report on Deformities after Fractures, in Trans. of Amer. Med. Assoc., vol. viii. p. 440.

<sup>4</sup> Coleman, New York Journ. Med., second series, vol. iii. p. 274, from New Jersey Med. Rep.

<sup>5</sup> Hunton, *ibid.*; also, New Jersey Med. Rep., vol. v. p. 146.

<sup>6</sup> Fox, Liston's Practical Surgery, Amer. ed., p. 47.

<sup>7</sup> Brown, Sargent's Minor Surgery, p. 132.

also says: "The elbow, as far as possible, is to be laid backwards on the body."

Sargent, who believes that with Fox's apparatus "the occurrence of deformity is the exception," and not the rule, and prefers it to all others, has treated three cases by Guillou's method, and is perfectly satisfied with its operation. Hollingsworth, of Philadelphia, has also treated one case successfully by Guillou's method, and adds his testimony in its favor. Several surgeons think they have obtained equal success with Moore's apparatus.

But how shall we explain these equal results from opposite modes of treatment? Is the indication to carry the shoulders back, which Fox sought to accomplish by pressing the elbow upwards and backwards, as easily attained by pressing the elbow upwards and forwards? Or are we not compelled to infer that there has been some mistake as to the precise amount of good accomplished by the apparatus in either case? Moreover, Coates,<sup>1</sup> Keal, and others instruct us that the only safe and proper position for the humerus is in a line with the side of the body, and that it must neither be carried forwards nor backwards.

Paulus Aegineta, Boyer, Desault, Pecceti, Liston, Fergusson, Samuel Cooper, Erichsen, Miller, Skey, Levis, Dorsey,<sup>2</sup> Gibson,<sup>3</sup> Fox, H. H. Smith,<sup>4</sup> Norris,<sup>5</sup> Sargent, Eastman,<sup>6</sup> recommend an axillary pad; whilst Richerand, Velpeau, Dupuytren, Benjamin Bell, Syme, Moore, deny its utility, or affirm its danger. Dr. Parker has seen one patient in whom paralysis of the arm resulted from the pressure upon the brachial nerves, in the attempt "to pry the shoulder out;" and I have myself recorded another.

Cabot, of Boston, Massachusetts, has recommended a mould of gutta percha laid over the front and top of the chest.<sup>7</sup>

Desault's plan, which took its origin, as Velpeau thinks, in the spica of Glaucius, under various modifications, is recommended by Delpech, Cruveilhier, Lasere, Flamant, Samuel Cooper, Fergusson, Liston, Cutler, Physick, Dorsey, Coates, and Gibson; whilst by Velpeau, Syme, Colles, Chelius, Samuel Cooper, and Parker, it is regarded as inefficient and troublesome. Says Mr. Cooper: "In this country, many surgeons prefer Desault's bandages; but I do not regard them as meeting the indications, and consider them worse than useless."

The dextrine bandages, or *apparatus immobile*, of Blandin, Velpeau, and others, constitute only another form of the bandage dressing of Desault. In this connection it ought to be noticed that Velpeau does not regard the employment of this apparatus, or of any other demanding great restraint, as imperative. In his great work on anatomy, referring to the fact that when the bone is broken and overlapped, the patient is still able, in many cases, to move the arm freely, he remarks: "Do not

<sup>1</sup> Coates, Am. Journ. Med. Sci., vol. xviii. p. 62.

<sup>2</sup> Dorsey, Elements of Surgery, vol. i. p. 133.

<sup>3</sup> Gibson, Institutes and Practice of Surgery, vol. i. p. 271.

<sup>4</sup> H. H. Smith, Practice of Surgery, p. 354.

<sup>5</sup> Norris, Liston's Practical Surg., Amer. ed., p. 46.

<sup>6</sup> Eastman, Apparatus for Fractured Clavicle, by Paul Eastman, Aurora, Ill.; Boston Med. and Surg. Journ., vol. xxiii. p. 179.

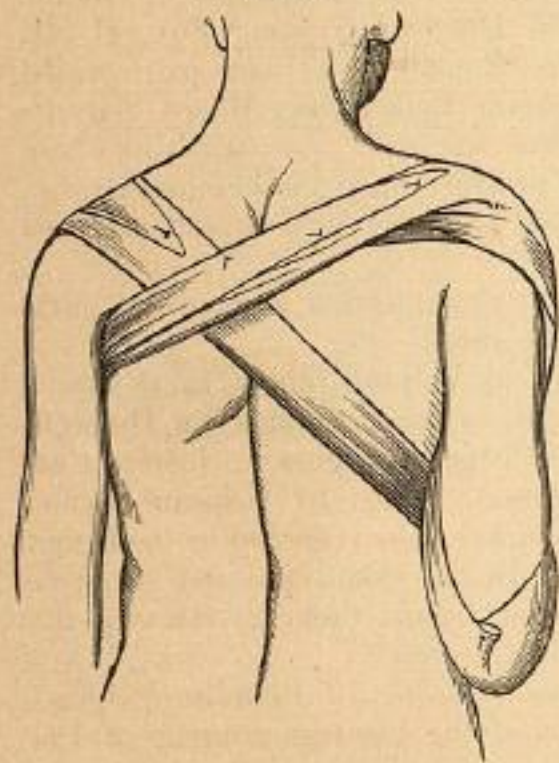
<sup>7</sup> Cabot, Bost. Med. and Surg. Journ., vol. lii. p. 232.

these cases give support to the opinion of those who admit that fractures of the clavicle do not actually require any other apparatus than the simple supporting bandage? "It is necessary to observe," he adds, "that by thus acting we do not prevent an overlapping,"<sup>1</sup> etc.

According to Flower and Hulke, authors of the article on "Injuries of the Upper Extremities" in the last edition of Holmes's Surgery, in most of the hospitals in London the surgeons employ a moderate-sized pad in the axilla, and then secure the arm to the body with a broad calico roller, some of the turns of which are made to pass beneath the elbow and over the opposite shoulder. Some of the surgeons advance the elbow, others carry it back, but a majority permit it to hang perpendicularly beside the body. As will be hereafter seen, this plan is essentially the same as that adopted by myself.

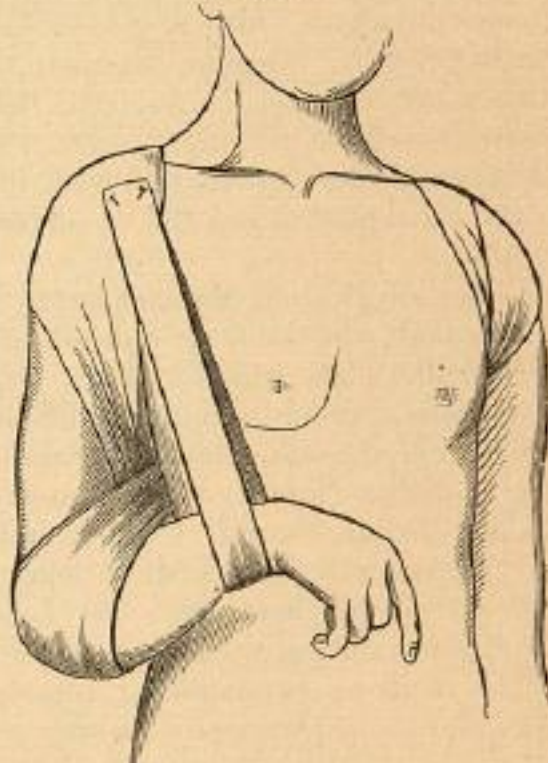
Professor E. M. Moore, of Rochester, in a paper read before the New York State Medical Society in 1871, has called attention to what he terms the "Figure-of-8 from the elbow," by which he proposes to render tense the clavicular fibres of the pectoralis major, and at the same time

FIG. 53.



Moore's apparatus. Back view.

FIG. 54.



Moore's apparatus. Front view.

draw the scapula backwards toward the spine. He is thus able, he affirms, to overcome the action of the sterno-cleido-mastoid, which lifts the sternal fragment; and to draw the acromial fragment outwards and upwards.

These ends are accomplished by placing the extremity of the middle finger of the broken arm upon the ensiform cartilage, with the forearm and elbow pinned back and against the body. In order to secure the arm in this position, "I use," says Dr. Moore, "a shawl or piece of

<sup>1</sup> Velpeau, Anatomy, Amer. ed., vol. i. p. 242.

cotton cloth, which, when folded like a cravat, eight inches in breadth at the centre, should be about two yards long. Placing this at the centre across the palm of the surgeon, he seizes with his hand the elbow of the patient which corresponds with the broken clavicle. The two ends of the bandage hang to the floor. The one falling inwards toward the patient is carried upwards, in front of the shoulder and over the back, making a spiral movement in front of the shoulder. This is intrusted to an assistant. The outer end is then carried across the forearm, behind the back, over the opposite shoulder, and around the axilla. This meets the other end, which may be carried under the axilla and over the shoulder of the opposite side, thus making the figure eight (8) turn, around the sound shoulder. This twist, it will be seen, makes also the figure eight (8) turn, around the elbow of the affected side. I therefore style the bandage 'The elbow figure eight (8).'

"The forearm should be sustained by a sling which raises it to an acute angle in order that gravity may assist in moving the whole arm backwards. This is best done by a simple strip three or four inches wide, which may be pinned to the shawl at the shoulder, or by a sling across the opposite shoulder and behind the back. The former much to be preferred. Any tendency on the part of the shawl to slide from the shoulder may be arrested by a pin thrust at the crossing. The shawl at the elbow is kept in place by folding the upper part that fits the arm and securing it by a pin. This makes a sort of cup for the elbow."

The principle upon which this dressing is constructed appears to me sound; but hitherto, in the five or six cases in which it has been employed under my observation, it has failed to accomplish any more than is accomplished by many other forms of dressing. It is especially liable to become disarranged, and to cause excoriations in the sound axilla; in this respect being quite as liable to criticism as the ordinary figure of eight.

Dr. Lewis A. Sayre, of this city, has for some time employed an apparatus for dressing broken clavicles, by which he proposes, also, to render tense the clavicular attachments of the pectoralis major, and thus secure more effectually the depression of the sternal fragment, while at the same time the shoulder is lifted and carried back.

Two strips of adhesive plaster are prepared, each about three and a half inches wide, for an adult; one long enough to encircle, first the arm, and then the body completely; the other of sufficient length to reach from the sound shoulder, over the point of the elbow of the broken limb, and across the back obliquely to the point of starting. Maw's moleskin plaster, or some plaster equally strong, is to be preferred.

FIG. 55.



Sayre's apparatus.

The first strip is looped around the arm just below the axillary margin, and pinned, or stitched, with the loop sufficiently open to avoid strangulation. The arm is then drawn downwards and backwards until the clavicular portion of the pectoralis major is put sufficiently on the stretch to overcome the sterno-cleido-mastoid, and thus draw the sternal fragment of the clavicle down to its place. The strip of plaster is then carried completely around the body, and pinned or stitched to itself on the back.

The second strip is then applied, commencing on the front of the shoulder of the sound side, thence it is carried over the top of the shoulder, diagonally across the back, under the elbow, diagonally across

FIG. 56.



FIG. 57.



the front of the chest, to the point of starting, where it is secured by pins or thread. A longitudinal slit is made in the plaster, to receive the point of the elbow.

Before laying the plaster across the elbow, an assistant must press the elbow well forwards and inwards, and it must be held firmly in this position until the dressing is completed. It will be now seen that the arm has been converted into a lever, whose fulcrum is the loop of adhesive plaster at the lower margin of the axilla; and upon this it is believed that in a great measure the efficiency of the apparatus depends.

Certainly it no longer depends upon the position of the elbow, which was at first carried back in order to render tense the clavicular fibres of the pectoralis major, since, for the purpose of converting the humerus into a lever, the elbow is subsequently drawn forwards, and the clavicular fibres of the great pectoral are again relaxed. If, therefore, the apparatus has any advantages over other modes of treatment, it is solely by its action upon the humerus as a lever; but the fulcrum is too remote from the upper end of the humerus to act very efficiently. Great force has to be applied to secure this end, or at least so much force that, if

steadily maintained, it is pretty sure to cause excoriations of the arm where the fulcrum acts; or, as more often happens, it will speedily loosen, under the expansion and contraction of the chest in respiration, and thus cease to be efficient. Several cases of fractured clavicles, treated in Bellevue and St. Francis hospitals by this method, have come under my notice, some of which were dressed by Dr. Sayre himself, and the results have been no better than when my apparatus has been used, whilst they have in most cases caused much more discomfort.

Dr. Satterthwaite has substituted Martin's elastic bandage for the adhesive plasters, and has devised a water bag to be used as an axillary pad, constructed in the form of a horse-shoe, which he says "has given entire satisfaction in the two instances in which it was applied." From which I must infer that he is satisfied with a union accompanied with some overlapping of the fragments; a conclusion to which most other experienced surgeons have arrived.

The sling, in some of its forms, is employed by Richerand, Huberthal, Colles, Miller, Fox, Stephen Smith,<sup>2</sup> H. H. Smith, Bartlett,<sup>3</sup> Levis,<sup>4</sup> Dugas,<sup>5</sup> Benjamin Bell, Bransby Cooper, Earle, Chapman, Keal, and by a large majority of the English surgeons.

No apparatus, perhaps, has been so generally employed, among American surgeons, as that form of the sling introduced by Dr. George Fox into the Pennsylvania Hospital in 1828.

Sargent says of it: "Fractures of the clavicles, treated by this apparatus, are daily dismissed from the Pennsylvania Hospital, and by surgeons in private practice, cured without perceptible deformity."

Norris, in a note to Liston's Practical Surgery, affirms that "the chief indications in the treatment of fracture of the clavicle are perfectly fulfilled by the use of this apparatus."

H. H. Smith, in his Minor Surgery, declares that Fox's apparatus accomplishes "perfect cures" in very many cases, and that it is "a very rare thing for a simple case to go out of the house (Pennsylvania Hospital) with any other deformity save that which time cures, viz., the deposition of the provisional callus." He has also repeated substantially the same opinion in his larger work, entitled Practice of Surgery.

Such testimony in favor of any dressing demands respectful attention; and I shall not be regarded as detracting from the respect due to these authorities when I express my belief that it is in deference to the distinguished reputation of the surgeons who had during the preceding thirty years had charge of the services in that hospital, and who have been so loud in its praise, that the use of this apparatus has, with us, become so general. I must be permitted, however, to express a doubt whether it has made deformities of the clavicle "the exception, instead of the rule," with us. I have used this dressing in the early years of my practice

<sup>1</sup> Thomas E. Satterthwaite, M.D., Medical Record, Sept. 27, 1879.

<sup>2</sup> Stephen Smith, New York Journ. Med., vol. ii. 3d series, p. 384 (May, 1857).

<sup>3</sup> Bartlett, my "Report on Defor." etc., Appendix; also, Bost. Med. and Surg. Journ., vol. li. p. 404. For illustration, see first edition.

<sup>4</sup> Levis, H. H. Smith's Practice of Surg., p. 265. Am. Journ. Med. Sci., April, 1860, p. 428.

<sup>5</sup> Dugas, Report on Surgery.

quite often, but my success has by no means been so flattering as has been the success of these gentlemen. I have seen others employ it, also, and with pretty much the same result.

Fox's apparatus consists of a sling, made of muslin cloth; a wedge-shaped axillary pad, made of muslin, also, stuffed, and half the length of the humerus; and of a stuffed collar. The axillary pad is not so thick or firm as Desault's pad, and for that reason is not likely to do harm. It is placed with its thickest end upwards, in the axilla corre-

FIG. 58.



George Fox's apparatus.

sponding to the broken clavicle, and secured in place by tapes attached to its upper end, and made fast to the stuffed collar upon the opposite shoulder. The sling is, in like manner, suspended from the stuffed collar. Finally, the hand is suspended over the front of the chest by a piece of muslin, looped under the wrist, and tied around the neck. No bandage is employed to confine the elbow to the body, and no effort is therefore made to convert the arm into a lever, and thus force the shoulder out.

It will be understood that I am speaking of this dressing as it was employed some years ago, and when the gentlemen whom I have quoted spoke of it so approvingly. Since then it may have undergone many modifications, or it may have been laid aside altogether.

It must be apparent to every practical surgeon that this apparatus could not

answer "perfectly" all the indications of treatment, namely, to carry the shoulder up, out, and back, so that the clavicle would be made to unite without shortening or deformity.

If, however, the writers intend only to say that no very serious, or very marked deformity usually ensues upon the plan of treatment, and in some cases none at all, then it will be proper to reply, that this amount of success may be attained by almost any form of dressing. It has been attained by myself with my own dressing, and with the dressing recommended by others.

It will be further necessary to say that the absence or presence of a striking deformity, will depend very much upon the age of the patient, the character of the fracture—whether more or less oblique—upon the point at which the bone is broken, and upon the condition of the patient. It will be generally more marked, other things being equal, in thin or muscular persons, than in those who are fat and of small and feeble muscle. If the overlapping of the fragments is in the plane of the surface of the integument, the deformity will be less apparent than if one fragment lies in front of the other.

Of the treatment of fractured clavicles by the wire suture, said to have

been suggested and practised by Langenbeck,<sup>1</sup> I have only to say that I trust, for the reputation of surgery, and the good of the patients, the practice of this distinguished surgeon will find few imitators.

Finally, while I deprecate incautious assumptions in regard to the capabilities of any form of dressing for broken collar-bones, a disposition to which is manifested by more than one advocate of special plans, I am ready to declare my preference for an apparatus consisting essentially of a sling, axillary pad, and bandages to secure the arm to the chest. Among the considerable variety of dressings which I have used, this has seemed to me most simple in its construction, the most comfortable to the patient, the least liable to derangement (if I except Velpeau's dextro bandage, and certain other forms of "immovable" dressings), and as capable as any other of answering the several indications proposed, while the patient is permitted to walk about.

No apparatus is better able to answer the first indication, namely, to "carry the shoulder up," than the sling. Indeed, in nearly all the forms of dressing hitherto devised, the sling is employed for this purpose. The bandage carried beneath the elbow is, in effect, a sling. In a few instances, men of no practical experience have sought to substitute an upward pressure in the axilla for the sling; but it is scarcely necessary to declare the absurdity of this practice, inasmuch as no patient will be found willing to submit to it beyond a few hours.

It is proper to say, however, that some surgeons, whose opinions are entitled to respect, believe that it is quite as important to depress the sternal fragment as it is to elevate the acromial, the outer end of the sternal fragment being lifted, more or less, by the action of the sternocleido-mastoid muscle. No doubt this is one of the difficulties with which we have to contend in our efforts to restore the two fragments to the original line of the axis of the bone.

But then the elevation of the sternal fragment is only slight in any case. The rhomboid ligament quickly arrests its displacement in this direction, so that the marked projection of the outer end of this fragment is due rather to the depression of the outer fragments than to an elevation of the inner.

Inclination of the head to the side of the fractured limb will allow the sternal fragment to fall; but it is impossible for the patient to maintain this position for any length of time. A compress laid over the sternal fragment, and held in place by adhesive straps or bandages, will be found totally inefficient. Dr. Moore has adopted a more ingenious and philosophical method, by calling into requisition the clavicular fibres of the pectoralis major to antagonize the sternocleido-mastoid. Indeed, this is one of the essential principles upon which he rests the superior claims of his dressing; and I have myself observed that when, in the case of a recent fracture, the elbow is thrust behind the body, the outer end of the sternal fragment is depressed. Nevertheless, I have certain theoretical and practical objections to the doctrine as taught so ingeniously by Dr. Moore. My theoretical objection is that the clavicular fibres of the pectoralis major will soon, under the continual strain, become relaxed, and

<sup>1</sup> Langenbeck, Dawson, Med. Rec., May 20, 1882.

after a little time cease to accomplish what they did at first. This is a law in regard to the action of muscles put upon the strain, as every surgeon knows. It may be supposed that, if the pectoral muscle is thus rendered less competent to depress the fragment, the sterno-cleido-mastoid will be rendered, also, less competent to elevate the fragment; but this is not strictly true: the latter operates at right angles with the axis of the bone, and to great advantage, whilst the former acts very obliquely, and to a corresponding disadvantage.

The practical objection which I have to offer is, that the dressings required to maintain this position are exceedingly liable to cause excoriations and to become disarranged, and that in fact this has happened in all, or nearly all, of the cases which have been observed by me. Moreover, whatever cause may be assigned for the failure, the results have been no better, so far as overlapping and deformity are concerned, than when my own dressings have been used.

The second indication, namely, "to carry the shoulder back," is certainly more difficult of accomplishment than the first, and it is only imperfectly met by my own method, or by any other form of sling dressing. Desault taught that when the arm was lifted by the sling, or by any mode of pressure beneath the elbow perpendicularly, the shoulder was necessarily carried back. This is probably true, but its effect is not very marked. The ordinary figure of 8, which might at first be supposed to be the most rational mode of effecting this purpose, has long since been proved to be a failure. None of the contrivances to hold the shoulders back by bands which traverse the axilla, made fast to back-splints, have done any better. They all cause excoriations, and soon become intolerable. Dr. Sayre's adhesive plaster band, attached to the upper part of the humerus, below the axillary margin, either loosens or excoriates, also, and in the end proves inefficient.

After all it must be said, that the indication "to carry the shoulder back," except so far as it incidentally accomplishes the indication "to carry the shoulders out," and thus obviate the overlapping of the fragments, is relatively unimportant. It is seldom that the falling forwards of the shoulders is very marked, or in itself a source of deformity; but carrying the shoulder back does diminish or overcome the riding of the fragments, and in this view alone is it important, and for this reason, surgery will be indebted to any one who devises a method by which this position of the shoulder can be maintained until the union of the fragments is consummated.

The third indication is "to carry the shoulder out," by which means it is proposed to overcome, directly, the riding of the fragments. We have seen that this may be accomplished, indirectly, by carrying the shoulder back; but, unfortunately, no means has yet been found by which this can be done and permanently maintained, while the patient is in the erect or sitting posture.

The thick axillary pad, and all other devices by which it is proposed to act upon the humerus as a lever, and thus force the shoulder out, have totally failed or proved eminently mischievous. In short, I may say that this indication can, in my opinion, be effectually accomplished in only one way, and that is, by laying the patient upon his back on a

flat, firm mattress, and thus pressing the base and inferior angle of the scapula strongly and steadily against the back. The requisite pressure upon the scapula cannot be maintained by any plan yet contrived while the patient is in the sitting or standing posture, and especially when permitted to walk about. We shall be warranted therefore in attempting to accomplish this indication fully in only rare and exceptional cases. If a slight overlapping and deformity were to cause any appreciable diminution of the strength or usefulness of the arm, patients might properly enough be subjected to such restraints for a few weeks; but experience has shown that such displacements do not, in any degree, maim the arm. Whether in the case of women, in examples of unusual displacement, the danger of disfigurement would warrant a resort to this method, must be left to the judgment of the surgeon and the choice of the patient; but in adopting what may be termed the "posture" treatment, it will be advisable also to employ the sling, pad, and bandages in the manner hereafter to be described.

The mode of dressing a fractured clavicle which, while the patient is at liberty to walk about, will secure the best results with the least suffering and annoyance, is as follows:

The arm hanging perpendicularly beside the body, a sling is placed under the elbow and forearm, and tied over the opposite shoulder. An axillary pad, composed of cotton batting inclosed in a cloth cover, is placed well up in the axilla, and the elbow is then secured firmly to the side of the body with several turns of a roller.

Dr. Coates, in the excellent paper already referred to, calls attention to the danger of making too much pressure upon the brachial artery and nerves, when the axillary pad is used, and the arm is, at the same time, carried forwards upon the body. In bringing the elbow forwards, so as to lay the forearm across the body, the humerus is made to rotate inwards, and the brachial artery and nerves are brought into more direct apposition with the pad;<sup>1</sup> while in the position which I have recommended and practised hitherto, these nerves and vessels are removed in a great measure, but not entirely, from pressure.

The pad should be no thicker than is necessary to fill completely the axillary space, its purpose being to steady the arm, and, in some slight degree, to counteract the action of those muscles which tend to displace the shoulder inwards. It should be long enough in its antero-posterior diameter to project distinctly in front and behind, otherwise it will not

FIG. 59.



The author's dressing for fractured clavicle.

<sup>1</sup> Coates, Am. Journ. Med. Sci., vol. xviii. p. 62.

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