The Classic

A Dissertation Upon Dislocations and Fractures of the Clavicle and Shoulder-Joint

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Abstract This Classic Article is a reprint of a section on scapula fractures in the original work by T. Callaway, Jr., A Dissertation Upon Dislocations and Fractures of the Clavicle and Shoulder-Joint. An accompanying biographical sketch of Thomas Callaway, Jr. is available at DOI [10.1007/s11999-011-2097-2](https://doi.org/10.1007/s11999-011-2097-2). The Classic Article is ©1849 and is reprinted from Callaway T. A Dissertation Upon Dislocations and Fractures of the Clavicle and Shoulder-Joint. London: Samuel Highly; 1849.

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Fractures of the Scapula

The Scapula, as might be expected from its protected situation, is not very liable to fracture; the muscles with which it is surrounded, the looseness with which it is attached to the trunk, and its consequent mobility, all tend to diminish the chances of this injury. Still we find that its prominences, being more exposed than the general body of the bone, suffer from the application of external violence. In Mr. Lonsdale's Table, taken during six years at the Middlesex Hospital, out of 1901 fractures of all the bones of the body, 18 were of the scapula.

Of the body of the bone there were 8
Of the acromion process there were 8
Of the neck there were 2

Of the upper extremity, it is certainly the bone least frequently fractured. From what I have seen I cannot but think that the acromion process more frequently suffers than the body of the bone, the former accident not being so severe as the latter. Mr. Lonsdale gives no history of his two cases of fractured neck.

I shall divide the fractures of this bone, 1st, into those of the body, as supra- and infra-spinal fracture; 2dly, those of its angles, as fracture of the anterior angle or neck of the bone, and fracture of the inferior angle; and, lastly, I shall speak of fracture of its processes.

Fracture above the spine would nearly always be transverse or oblique, and this latter case would amount to a fracture of the internal angle; but, as it would be nearly impossible for either one or the other to occur without implication of the angle, I shall speak so, and describe them as a supra-spinal fracture. I do not think it possible for a vertical fracture to take place above the spine without the whole body of the bone sharing in the accident. From the great depth at which this portion of the bone is situated, and the complete manner in which it is covered with a pad of muscular fibre (the supra-spinatus), it is an accident exceedingly unlikely to occur. Chelius alludes to one; Mr. B. B. Cooper, in his Anatomy, gives a drawing of one; Mr. South says he never saw one. I can find no reference to fracture in this part of the bone by any authority I have consulted; should it occur, I think the supra spinatus, and serratus magnus, would antagonise the levator anguli, and

prevent displacement. It would be very difficult to detect; the patient might complain of pain upon making a forced inspiration; the motions of the arm would be affected; and upon drawing the shoulder backward, to relax the muscles, a notch might be felt in the posterior costa. I should apply a figure-of-8 bandage, and enjoin rest. It could only occur from great violence.

Fracture of the body below the spine may be perpendicular or transverse, the latter by far the most common; it must, however, be borne in mind, that there is always great difficulty in speaking as to the precise direction a fracture shall have taken, a musket-shot passing through the bone, or a cart-wheel over it, would produce complications, which would materially impede the accuracy of the diagnosis.

Fractures of the body of the scapula are nearly always the result of some great and direct violence, the soft parts covering it commonly suffer severely with it. Mr. South thinks the violence necessary to produce the injury has been overrated. He adds,¹ "Nor have I seen any very severe bruising of the soft part attending these accidents." Mr. S. Cooper, and most writers, concur in the degree of violence necessary to produce the injury. All the cases I can find, with the exception of one, the following, which occurred from muscular action, have been from direct force.

Fracture of the Scapula by Muscular Action²

H. S., aged 49 years, a labourer, of excellent health, dry constitution, but with muscles well developed, returning from market the 9th of November, was jumping into his cart, when the horse set off at full gallop; not being able to scramble into the cart, and not daring to let himself fall, for fear of being caught in the wheels, he held himself with his left hand, which had to support the whole weight of his body, whilst with his right he held the reins of the horse and tried to stop it. Thus suspended by the left arm, and not venturing to change his position, from the rapidity of the motion, he must have made great efforts to preserve his equilibrium, until, after having proceeded a hundred yards, the animal stopped, and allowed him to put his feet to the ground; he did not feel at first any pain, but found some difficulty in approximating the arm to the body. In the evening he felt a sharp pain in the left shoulder, which on the least motion of the arm, on coughing or sneezing, became a lancinating pain. He remained in this state "till the 11th, two days after the accident, when he applied to Dr. Heylen, thinking he had sprained his shoulder. On examination, the following symptoms were observed:—The

shoulder presented no manifest deformity, where the arm was applied to the trunk. It was not greatly swollen. On separating the arm from the trunk, and raising it, the hand could be easily applied to the head. He was prevented by pain from doing this himself, without the aid of the other arm. On letting the arm fall, a degree of rigidity was observed in its motion, and it was only by raising it that it could be returned to its original position. At a certain point the patient screamed, and said he heard a cracking, which was also felt at the hand: no loss of continuity could be felt in the clavicle or humerus. On examining the shoulder, it appeared to be normal, yet it was certain, bony crepitation could be felt. On sliding the finger along the spine of the scapula, a depression was found in the middle of the apophysis, and, on pressing the most elevated part, it gave way with crepitation: this was also produced on rotating the arm, the finger being placed on the spine of the scapula, and on the clavicle. To determine whether it was a fracture of the spine, the base being separated from the body of the bone, a finger was placed on the coracoid process while the arm was rotated, when crepitation was felt; the shoulder did not present that deformity described by authors as characteristic of fractures of the acromion, and of the spine of the scapula. It was now inferred, either that the neck was fractured, or that the spine, at its base, was completely separated from the body of the bone. The exact diagnosis was difficult, for the displacement was little marked, the fragments being retained in juxtaposition by the muscles of the shoulder-joint, which retain the head of the humerus on the glenoid cavity. Externally, there was no ecchymosis or trace of violence.

If there be transverse fracture through the body and below the spine, the patient complains of pain, and tenderness at the seat of injury, which is increased upon moving the extremity or drawing a deep inspiration; if the surgeon apply the palm of his hand flat against the scapula, a sudden crepitus is often felt; to obtain this sign more fully and clearly, let the hand be applied to the spine of the bone, and the lower portion moved against the upper in the ordinary way, and crepitus will be generally detected.

To assist in the reparation of the injury, I should apply a flat compress upon the dorsum, and another against the anterior costa of the bone, securing them with a flannel bandage; this I should pass round the trunk for a necessary number of times, and by its last turn or two secure the arm to the side; in this, as in all bandages to the trunk. I should stitch each fold together, and throw transverse slips across each shoulder to support the whole (as in fractured ribs). When the fracture is vertical, there is little displacement, but, owing to the greater violence required for its production, more contusion of soft parts. The treatment would be precisely similar. Inflammation of the chest, as a sequence of the injury, I should not expect to follow, unless a rib

¹ Chelius, vol. i, p. 584; § South.

² By Dr. Heylen. From Ranking's 'Half-Yearly Abstract of the Medical Sciences.'

were broken simultaneously, or a spicula of the fractured scapula driven through an intercostal space, and the pleura thereby wounded; in this case the scapula would most likely be comminuted, and the symptoms be not unlike those of a fractured rib.

Fracture of the inferior angle only differs from the fractures of the other part of the body of the bone by the peculiarity of the deformity which accompanies it; the serratus magnus, being stronger than the lower portion of the rhomboideus major, draws the separated portion of the bone forwards. The teres major would assist in this most materially. The best diagnostic mark of the accident is, that upon the patient's employing his arm, the lower portion of bone does not participate in the movements of the upper portion of the scapula, but remains stationary; the converse of this, of course, takes place.

The treatment is similar to the other fractures, care being taken that the arm is well secured and kept at rest. Mr. T. W. King says he has seen this fracture united by ligament, but does not add whether the powers of the extremity were much impaired. For my own part I should fancy not.

The question of the existence of a fracture of the cervix scapulæ, or anterior angle of the bone, has for years, like that of a union of fracture of the cervix femoris, been debatable ground among English surgeons. At one time all injuries in and about the shoulder, which were at all obscure, and which baffled the acumen of the surgeon, were set down as fracture of the cervix scapulæ; if any accident was found to be neither a fracture of the head of the humerus, nor dislocation of that bone, then the scapula was at fault, and a fracture of its neck was diagnosed. The rarity, however, of any pathological specimens of this injured bone have gradually led many surgeons in the present day to suspect the frequency of its occurrence, and some to withhold altogether their belief as to its existence. Mr. South says, "I believe there seems good reason for believing this accident never occurs. ... I believe there is not any existing specimen of fracture of the neck of the blade-bone."³

If the injury exist at all, it can only take place across the surgical neck of the bone; i.e. from the notch upon the superior costa to about half an inch below the glenoid cavity. A fracture of the true anatomical neck, i.e. a separation of the glenoid cavity, is clearly impossible, unless the bone be so entirely comminuted that no part can be said to be broken off from the other.

The drawing in the *frontispiece*, Fig. 1 (taken from the original preparation in the Museum of Guy's Hospital), shows clearly what is ordinarily understood by a fractured cervix, and is, I believe, unique; indeed there is hardly a

³ Chelius, vol. i, p. 549.

THIS ESSAY,
THE FIRST FRUITS OF PROFESSIONAL STUDIES, PURSUED
UNDER THEIR GUIDANCE AND TEACHING,
IS RESPECTFULLY INSCRIBED
TO
CHARLES ASTON KEY, Esq.,
BRANSBY B. COOPER, Esq., F.R.S.,
EDWARD COCK, Esq.,
JOHN HILTON, Esq., F.R.S.,
THE SURGEONS OF GUY'S HOSPITAL,
AS
A TRIBUTE IN ADMIRATION OF THEIR SKILL AND EXPERIENCE
AS SURGEONS, THEIR ACCURACY AND LEARNING AS
ANATOMISTS, AND THEIR GENERAL
SCIENTIFIC ACQUIREMENTS;
ALSO
IN ACKNOWLEDGMENT OF MANY OBLIGATIONS TO THEM FOR
THEIR CARE, KINDNESS, AND COURTESY,
BY THEIR FAITHFUL SERVANT,
THE AUTHOR.

WELLINGTON STREET, LONDON BRIDGE;
 MARCH 1849.

Fig. 1 The illustration shows the original frontispiece with Callaway's dedication

single case known of fracture occurring by itself without the bone suffering at the same time some other severe fracture. In the Museum at Fort Pitt, Chatham, there is a specimen, but the anterior portion of the bone is much comminuted. Duverney mentions a case of simple fracture, proved by post-mortem examination, and therefore valuable; Boyer another; and Sir A. Cooper three; but the last four cases were not verified by inspection. I am, indeed, able to state, that before his death Sir A. Cooper expressed himself very doubtful of the possibility of the injury.

The great strength of the bone at this part, the depth of its situation, and the protection it receives from surrounding structures, all tend to diminish the probability of the accident; should it occur, it must result from most direct violence, as a grape-shot passing through, or a cart-wheel passing over it; all indirect force, as *contre-coup*, &c., is quite out of the question in the production of the accident; and I should, *primâ facie*, be sceptical as to the existence of

a fractured cervix scapulæ, were the injury said to be the result of a fall or blow,—grounding my opinion on the natural solidity of the part, its protected situation, and the extreme mobility of the bone.

The signs of the injury are entirely negative; at first sight the accident is taken for a dislocated shoulder, there is a hollow beneath the acromion, a flattening of the deltoid, a lengthening of the arm, and the head of the humerus can be felt in the axilla; this, however, is easily restored to its proper situation, but soon again relapses into its abnormal condition. If the coracoid process be fixed, and the humerus rotated, crepitus will be felt, a sign to be received with great caution, as the cracking sound being near a joint may be produced by other bones and structures besides the fractured surfaces of the scapula. The displacement is inconsiderable, owing to the acromio-clavicular and acromio-coracoid ligaments, which would retain the fragments *in situ*; should these be ruptured, the coracoid process of the injured side would sink upon a plane lower than that of the opposite one; this would materially assist the diagnosis, and for myself I should rely upon it with greater confidence than upon any other symptom; the arm hangs helpless by the side, the entire shoulder droops, and all the motions caused by the surgeon, although free, are productive of great pain. It is known from the dislocation downwards, by the great freedom of motion which it has, the ease with which the deformity is made to disappear, the great pain upon moving the arm, the absence of the projection of the elbow from the side, and the want of numbness in the fingers. It very closely resembles a fracture of the anatomical neck of the humerus; in this latter injury, upon abducting the arm from the side and tilting the elbow upwards, the acute margin of the fractured bone, in place of its rounded head, is felt in the axilla; there is also a want of lengthening in the limb, i.e. from the acromion process to the external condyle of the humerus; moreover, if the scapula be injured, pressure upon the coracoid process produces pain, which is not the case if the humerus be fractured. It sometimes, though rarely, happens that a small portion of the lip of the glenoid cavity may be chipped off; this could not, of course, be detected by the surgeon, it would give the patient great pain and inconvenience, perhaps be attended with deformity,—even this would be slight. In this latter case I should enjoin rest and spica bandage, but should much fear that the integrity of the joint would permanently suffer.

The treatment of a fractured cervix consists in putting a pad in the axilla, throwing the shoulder upwards and backwards, and bringing the elbow forwards and to the trunk. These ends may be accomplished with Desault's apparatus. At the end of seven weeks I should remove the bandage and commence passive motion, and direct the patient to resume the use of his arm with caution. The

depth at which the fracture is seated renders the employment of all external applications fruitless. The cold douche bath might perhaps be of service, as tending to restore the tone of muscles which had been so long quiescent.

Fracture of the Cervix Scapulæ⁴

A moderately tall man, aged 44, and apparently healthy, being in a state of intoxication, was thrown out of a cart, and he seems to have fallen on the back part of his head, and also on the right shoulder. His most serious injury was of the head. A transverse fracture of the scapula was discovered by Mr. Cock, of Guy's Hospital, with some difficulty; crepitus was not felt on pressing its processes and rotating the humerus, but the hand on the inferior angle detected grating. The roundness of the shoulder was *not lost*, but there was an incomplete dislocation of the outer end of the clavicle upwards. The figure-of-8 bandage was applied with pads in the axilla. He survived only eight days. The coraco-clavicular ligaments were not torn through; the injury to the scapula consisted of separations between the spine, with a considerable part of the supra-spinous fossa, and the neck, and the inferior portion of the bone; a line of fracture run from the posterior costa along the under side of the base of the spine, and another from the superior costa, leaving a little of the supra-spinous fossa attached to the cervix, and also half an inch of the foundation of the root of the spine; this line terminated at about an inch and one third from the glenoid cavity, in a third line which extended from near the inferior edge of the glenoid cavity more than half way towards the inferior angle, tending to isolate the thick edge of the interior costa. Figure 1 in the *frontispiece* is a drawing of this fracture; the original is in the Museum of Guy's Hospital.

Of the two processes, acromion and coracoid, the former is by far the most liable to fracture, indeed it is more frequently broken than any other part of the scapula; situated as it is above the shoulder-joint, it must necessarily be obnoxious to all violence threatening the articulation from that quarter. Its fracture might also result, but this very rarely, from a force applied from below. I can find no case of this occurring without a simultaneous dislocation of the shoulder upwards, and the accident is most commonly caused by a fall upon the elbow, drawing the head of the humerus upwards, fracturing the acromion, and producing the displacement. It may occur at any part between its base and apex, but most commonly at one inch from its extremity, and has the peculiarity of nearly always being transverse.

⁴ By the late T. W. King, of Guy's Hospital. Post-mortem and history by Messrs. Cock and Hilton.

It is known by the shoulder assuming a slightly flattened aspect; there is a depression upon the apex of the shoulder (noticed by Cheselden) upon carrying the finger along the spine of the scapula; an acute depression is felt at the point of separation; if the spines of the two scapulæ be measured, the suspected one will be found shorter than its fellow; the distance between the sternum and the shoulder is less upon the injured side than upon the opposite; the arm drops down by the side, the patient being unable to elevate it; he has all the under motions of the joint, but they give him pain. If the hand be placed upon the shoulder, and the humerus pushed upwards and rotated, this movement restores the contour of the joint, and crepitus is felt.

To favour the reparation of the injury, the elbow should be tilted well upwards, and slightly backwards, and the deltoid relaxed by putting a pad between the side and the elbow (this is according to Sir A. Cooper). Chelius recommends a conical pad between the side and the arm, its base being downwards; both plans would have the same effect; should they be thought superfluous, the hand and fore-arm should on no account be supported in the bandage (which should act upon the elbow alone), their weight having a very beneficial effect in throwing the elbow backwards, and consequently the head of the humerus upwards. A spica bandage, or a complete encasement of soap plaster may be applied prior to the chief suspensory bandage, but this at the discretion of the surgeon—and I think quite superfluous.

The bone most commonly unites by ligament; sometimes, but more rarely, a false joint is formed, as in the preparation.⁵ In the fourteenth volume of the *Medical Gazette* are seven dissections of injured shoulder-joints, their pathological condition described by Mr. Gregory Smith; five had the long tendon of the biceps ruptured, and in two it was dislocated; two of these having the tendon ruptured, had fractures of the acromion, in both a false joint: they must have been preparations precisely similar to my own. I account for the formation of a false joint in the three cases thus: the tendon of the biceps being ruptured, the head of the humerus loses its chief anterior ligament, and rides forward, and cannot offer the same support to the fractured acromion as it would under ordinary circumstances. The process, wanting that natural support or splint, is continually acted upon by the deltoid muscle; gentle attrition takes place between the fragments, and a synovial sac is formed. Fortunately the utility of the arm is not much affected by the want of bony union; I should, however, certainly try to obtain it by keeping the patient's arm in the bandage for six weeks.

⁵ The preparation sent in was a fracture of the acromion, with false joint, and rupture of the biceps tendon. It was not calculated to show well in a drawing, or I would have had a sketch made of it.

The coracoid process could only be broken by some direct violence, and its fracture is usually accompanied by some other important lesion. The two cases mentioned by Messrs. South and Arnott, in the *Medico-Chirurgical Transactions* (vol. xxii), and one by Mr. Boyer, died; the last of the shock. It is somewhat curious, and worthy of remark, that both the former were accompanied by fracture of the clavicle.

The fractured portion would be moveable under the finger and thumb, and drawn downwards by the three muscles, pectoralis minor, coraco-brachialis, and biceps, which radiate from it. Mr. Liston says, the crepitus may be felt by placing the hand over the process, and making the patient breathe deeply. I have never met with a case of the kind, but should employ Velpeau's bandage, i.e. should fix the hand of the injured side upon the opposite shoulder. A pad, I think, would be of very equivocal utility. Fergusson says, "I have known an instance where the coracoid process was broken, and drawn down by the combined action of the pectoralis minor, coraco-brachialis, and biceps muscles: nothing could be done to keep the process in its natural position."⁶

Displacement of the Lowest Angle of the Scapula

An accident to the inferior angle of the scapula, with reference to the upper margin of the latissimus dorsi muscle, although painful to the patient, and troublesome to the surgeon, is happily of rare occurrence. The only mention of it by any surgical authority is in the 'Elements of Surgery,' by Mr. Liston, who thus describes it: "The inferior angle of the scapula occasionally escapes from under the border of the muscle; the displacement is occasioned by raising the arm above the head to an unnatural extent. The angle of the bone projects considerably, and the muscle is felt playing beneath it; the movements of the limb are limited and painful." He directs the reduction to be effected by raising the arm, and pressing the angle inwards; the parts are to be treated with a bandage passed lightly round the chest: this is to be retained for a considerable time; "for," he adds, "in general the bone soon regains its former unnatural position." I saw a case of the kind among the outpatients at Guy's Hospital, under Mr. Callaway; it was in a young girl of 17 or 18 years of age; I have, however, no history, or particulars of the case Fig. 2.

I think it is a question worthy of consideration, whether the accident depends at all upon the muscle having an origin from the angle of the bone; at any rate, I think this circumstance is a predisposing cause, and would be very likely to favour the accident, inasmuch as these fibres,

⁶ *Practical Surgery*, p. 184.

Fig. 2 The illustration shows a specimen from the museum at Guy's Hospital. Callaway commented, it "shows clearly what is ordinarily understood by a fractured cervix, and is, I believe, unique; indeed

there is hardly a single case known of fracture occurring by itself without the bone suffering at the same time some other severe fracture."

taking their *point d'appui*, under peculiar circumstances, from the insertion of the muscle, would act upon the angle of the bone, and draw it upwards and over that portion of the muscle arising from the dorsal spines. It would occur, I conceive, in weak, delicate persons. Were I to have a case whose reduction I was unable to effect, I should not hesitate to divide by a subcutaneous section the obstructing

fibres of the muscle; for although the patient ultimately suffers but little inconvenience from the injury, yet in men the deformity would be very apparent; in women who wear stays the projection would be pressed upon, and somewhat controlled; still a very troublesome bursa might form between the bone and the superimposed integuments, giving rise to much trouble and inconvenience.