EXCISION OF THE CLAVICLE
A REVIEW OF THE NINETEENTH-CENTURY LITERATURE
KEITH R. J. de BELDER

From The Royal Isle of Wight County Hospital, Ryde

Reports of excision of the clavicle in the nineteenth century literature are reviewed, and certain operative complications discussed. Osteomyelitis was the most common indication, and was described first in this country by Syme in 1833. The first successful excision of the entire clavicle was performed by McCready of Kentucky in 1813. The removal of tumour-bearing clavicles provided memorable challenges at a time when anaesthetics were not available, blood transfusion unknown and antibiotic therapy non-existent.

Surgical resection of the clavicle is seldom necessary. Excision of the medial or lateral articular segment is undertaken for arthritis or for displacement after trauma or infection. Part of the shaft of the clavicle may be removed to facilitate exposure of the subclavian vessels, and part of, or the whole, clavicle for inflammatory or neoplastic disorders.

A large sequestrum representing the central part of an osteomyelitic clavicle was removed in a man aged 26 years by Syme "after suitable dilatation of the opening in the integuments". As resident surgical officer he included this case history in the tenth report of the Edinburgh Surgical Hospital which was published in the Edinburgh Medical and Surgical Journal in 1833; this seems to be the first description in the British literature of osteomyelitis of the clavicle.

Syme reported that: "Sixteen weeks previous to the time of admission he made a violent exertion in raising a cart that had been overturned. No inconvenience was immediately perceived but a few days afterwards the upper part of the chest between the shoulder and the sternum became the seat of inflammation, attended with great pain, swelling and redness. Suppuration followed, and an abscess over the clavicle which opened at the end of two weeks and continued to discharge a large quantity of matter."

Seven years earlier a French physician, Lombard, had removed the left clavicle almost in its entirety from a girl aged 9 years in whom, 10 weeks earlier, suppurative osteomyelitis of both clavicles had developed as a complication of smallpox (Lombard 1826).

Roux treated two patients with tuberculosis affecting the clavicle by excision; one subsequently died and this led him to advise against such operative treatment (Roux 1834).

In 1837 Benjamin Travers of St Thomas' Hospital, London, successfully excised the clavicle in a young East Indian boy aged 10 years who had been resident in England for five years. No difficulty was reported in excising the large tumour which occupied three-quarters of the clavicle. The case history was presented at a meeting of the Royal Medical and Chirurgical Society under the presidency of Dr Bright, and reported in the Lancet in 1837 and in Medico-Chirurgical Transactions in 1838. Members considered the tumour malignant. Travers, however, held it to be a confined haematoma. He thought it was "quite philosophical to look for a simple cause where we could find it for an effect" and the explanation he had given of the cause of this tumour was satisfactory to his own mind. Furthermore, he entertained the opinion that "many anomalous tumours on record arise from changes within the medullary canal of the bones and were exasperated into intractability by their confined situation."

In 1848, before the medical class in the Medical College of Georgia, USA, Professor Eve operated on "Ned, a very powerful young man belonging to Mr. H. of Washington county". The clinical history suggested a chronic discharging osteomyelitic lesion complicating a comminuted fracture. "The sternal extremity of the clavicle was first attempted to be dislocated, but as this was found difficult to accomplish on account of hemorrhage, &c., a long incision was made over the length of this bone, and deeply into the tumour passing through the periosteum. A portion of the clavicle, including its entire circumference and measuring 4½ inches, was now extracted through this opening. There were also some smaller pieces removed during the operation. Twelve or more arteries had to be ligatured, two tents were placed in the wound and the usual dressing of adhesive plaster,
compress and bandage, was applied." Two months later there was no deformity or tumefaction and no pain. The patient was "considered as well as he ever was—is, in fact, one of the strongest men in his county".

In Newcastle upon Tyne, Potter (1849) resected the carious clavicle of a 42-year-old woman. The bone had enlarged progressively over 10 months and had failed to respond to the application of leeches and the internal use of iodide of potassium. An aneurysm needle, armed with a stout thread made fast to the eye of a fine chain-saw, was passed beneath the clavicle about 1\(\frac{1}{2}\) inches from its sternal end, and the bone divided. Disarticulation of the acromial end was next effected, and a loop of string fastened to the bone so as to raise it up while the remaining portion was separated from its attachments. No vessel of consequence was wounded and no ligature was required. The costocoracoid ligament and deep cervical fascia were respected to "leave a basis for the firm semi-tendinous band which now occupies the place of the clavicle". Six months later the patient was "in a condition to go through the household duties" and reported that her arm was becoming stronger every day.

In Guy's Hospital Bransby Cooper (1852) excised the outer part of a tumour-bearing clavicle in a girl aged 15 years. The operation was described as being of a very delicate nature but was performed without much loss of blood. The tumour, however, had spread to the scapula and neighbouring parts and the patient survived only a few weeks. The distressing nursing problems presented by such terminally ill patients were discussed. The "foul, sanious and foetid matter" discharged from the surface of the fungating encephaloid cancer was regarded as being of great detriment to the sick lying in the same ward. Separate chambers, fitted with a powerful ventilating apparatus, were recommended to accommodate these unfortunate patients.

A similar medullary form of carcinoma arising from the left clavicle of a girl of 16 years was excised by Bowman (1859) at King's College Hospital. The need to leave the scaleni and subclavian vessels covered by fascia was stressed. Operative measures in this situation were attended with greater risk than elsewhere because of the important relations of the neighbouring structures.

A chronic abscess in the clavicle of a 34-year-old man presented with a pathological fracture and discharging sinuses. Gay (1858) of The Great Northern Hospital explored the clavicle; the fracture surfaces were resected and "confined in apposition by proper bandages and pads". The fracture united and normal function was restored. Gay considered the lesion to be "idiopathic necrosis and the nidus of an acralacyst". The fracture was thought to result from the absorption which attended the ravages of these cystic parasites.

In 1867 John W. Irvine, surgeon to the Liverpool and West Derby Hospital, treated a 16-year-old woodturner with osteomyelitis of the right clavicle. Pus escaped copiously from a wound which exposed the central portion of the bone. Further abscesses discharged near the sternum and scapula and the patient continued to lose flesh and become more and more depressed in spirits. This determined Irvine to resect the clavicle. After disarticulating the sternoclavicular joint no operative problems were encountered, though the surgeon remained "painfully perceptible of the pulsation of the subclavicular artery". Three blood vessels were controlled by torsion and four ligatures were applied. After the operation the patient was allowed "a plentiful supply of porter, beef tea, nutritious broths and every dainty, which the governor of the workhouse was requested to supply". No secondary haemorrhage occurred and in a week the scapular end of the wound had healed by the first intention and the arterial ligatures had been removed. Six months later perfect function had returned to the arm. Irvine had knowledge of only one similar patient treated in France by Moreau (1834), who removed the entire clavicle for necrosis in a young man. The surgeon had the satisfaction of seeing the excised bone replaced by a new one which enabled the arm to regain its former usefulness.

Bird (1896), Murray (1896), Allingham (1898) and Wyeth (1890), reported the complete reformation of the clavicle after its subperiosteal resection, whereas Battle (1892) achieved only strong fibrous union after partial resection of a clavicle affected by syphilitic necrosis; the overlying large gummatous ulcer healed after a course of potassium iodide.

The general opinion emerging from these published accounts was that subperiostial resection of the clavicle, usually for inflammatory disease, offered no particular problem to the surgeon. When the bone was excised, in part or in whole, for a tumour that had extended into and become adherent to neighbouring structures, then technical problems could be formidable.

Excision of the clavicle seems to have been performed first in the State of Kentucky by McCreary in 1813. The case history was not published until 40 years later and its recollection was provoked by the pioneering claims of Valentine Mott, Professor of Surgery at Rutger's College, New York (Mott 1828). Mott's letter to a medical colleague in Paris was forwarded to Benjamin Travers, who brought it to the attention of the London Medical Gazette.

Letter from Dr D. L. Rogers to Mr Benjamin Travers

Dear Sir,

I send you inclosed the letter of Professor Mott, of which I made mention to you in London; it contains the history of the operation for removing the clavicle. The disease requiring this operation was osteosarcoma of two years standing and originated from a blow on the shoulder. The details of this case will in a short time appear in some of the American journals. The inclosed letter is at your disposal.

With much respect,
I remain,
Your humble servant,
D. L. Rogers.
Letter from Professor Valentine Mott to Dr D. L. Rogers

New York, June 30th, 11 p.m.
1828

My dear Doctor,

One word though at a late hour. The agony is over, my operation completed and the patient, I believe, will recover. It is the most tremendous case I have any knowledge of—the most dangerous and most difficult operation I have ever performed, or seen performed by any surgeon. The incision extended from the articulation of the sternum to the top of the shoulder in a semi-circular direction; below, the dissection, to get under the tumor was on a line with the fourth rib; above in a direction to the top of the shoulder, an inch below the thyroid cartilage and base of the jaw, and terminated with the same point as the first. The tumor, of a bony character, was in contact with the coracoid process insomuch that I was obliged to saw it through near the acromion scapula. Below, the vein was embedded in the tumor from the coracoid process to the scalenus anterior. Then my attention was directed to separating the tumor from the deep seated fascia of the neck to protect the deep seated jugular and thoracic duct, the operation as you know being on the left shoulder. It was a bloody operation—fully thirty vessels were tied.

Wherever you go you may say that this is a great operation and challenge any one to equal it.
Believe me to be
As Ever
Yours faithfully,
Valentine Mott

In a subsequent letter to Travers, Mott wrote how the young man had enjoyed excellent health since the operation and was enabled to study divinity and become a clergyman in Charleston, South Carolina.

While Mott’s technical virtuosity stands unquestioned, the subsequent history of his patient casts doubt on the diagnosis of osteosarcoma. Two years later Dr A. E. Vaché of New York reported on the perfect health of the gentleman upon whom it was performed. . . . “he had perfect use of the arm in all its motions and the cicatrix was all that appeared to indicate any operation having been performed” (Vaché 1830).

In 1888 Bull published an account in the New York Medical Journal of excision of the clavicle for syphilitic necrosis. In the ensuing discussion Mott’s patient was remembered; he had died not long before and necropsy had shown some of the acromial end of the clavicle to be still present and the conclusion was reached that it was not therefore a true case of total excision. This was not only uncharitable but erroneous, as the common experience is that regeneration of the whole clavicle can follow its resection, particularly when the periosteum is left intact. It also seems reasonable to surmise that a 60-year survival period is incompatible with the diagnosis of osteosarcoma: perhaps it was a very low-grade fibrosarcoma.

Fifteen years before Mott’s operation, excision of the clavicle was performed by McCready for osteomyelitis and was completely successful. The historical interest of this operation merits reproduction of the original communication as it appeared in the Transactions of the Kentucky State Medical Society in 1853.

“This bold, delicate, and extraordinary operation was executed for the first time in America, in 1813, by the late Dr. Charles McCreary, of Hartford, in this State. The subject of the case . . . was a youth of the name Irwin, fourteen years of age, laboring under a scrofulous affection of the right collar bone . . . Dr. McCreary removed the whole of the collar bone, and the patient survived the operation thirty-five years without any return of the disease. He died in Muhlenburgh county, in this State, in April, 1849, aged forty-nine. The loss of the bone did not seem to impair the functions of the corresponding limb.

“The operation of Dr. McCready reflects great credit both upon himself, and upon the American profession. Performed as it was in a remote and comparatively obscure part of the United States, and at a period when surgical science was but little cultivated, or appreciated, it is surprising that he should have ventured upon so daring an enterprise, an enterprise requiring the most consummate skill, and no ordinary share of anatomical knowledge, for its successful execution. Dr. Mott, who performed excision of the collar bone sixteen years later, deems the operation . . . as the most important, difficult and dangerous operation that can be performed on the human body; and so, indeed, it must be regarded by every one who has a proper knowledge of the subject. Dr. Mott calls it his ‘Waterloo operation’; and believing that he was the first surgeon who performed it in the United States, he proudly claims the credit of it for his country, his city, and himself. Dr. Johnson, of New Orleans, who published a short and imperfect account of Dr. McCreary’s operation, in the New Orleans Medical Journal for January, 1850, proposes to call it the ‘Thames operation’, and claims credit of it, and that justly, too, for Kentucky, and for Dr. McCready . . .

“I have been anxious to obtain some information respecting the private and professional character of Dr. McCready, but regret to say that all my efforts have been in vain. To none of my communications, addressed for the purpose to some of his relatives and friends, has any reply been received. I have learned, however, incidentally, through one who knew him well, that he was a bold and fearless practitioner, as well as a hard student, and that he died about the age of thirty-seven, from the effects of intemperance, to which he had been addicted for many years.”

I am indebted to Mr C. Davenport, former librarian of The Royal National Orthopaedic Hospital, for his perseverance in tracing many of the older references. His help and global connections were invaluable. I am indebted also to Mrs Janice Mayhew, Librarian of The Lord Mayor Treolar Hospital, Alton, Hants for her admirable efforts in retrieving so many of the references.

References on next page
REFERENCES


Cooper B. Encephaloid disease of the clavicle and scapula. Lancet 1852;ii:34.


Irvine JW. On a case of excision and regeneration of entire clavicle. Lancet 1867;i:206.


Mott V. An account of a case of osteo-sarcoma of the left clavicle, in which excision of the bone was successfully performed. Am J Med Sci 1828;3:100-8.


Potter HG. Excision of the clavicle. Lancet 1849;i:392-3.


Travers B. Removal of the clavicle with a tumor situated in that bone. Lancet 1837-8;i:389-91.


Wyeth JA. Removal of the entire clavicle with complete reproduction of the bone and restoration of function. NY Med J 1890;51:271.