REFRESHER COURSE FOR GENERAL PRACTITIONERS

FRACTURE OF THE CLAVICLE

BY

T. P. McMURRAY, C.B.E., M.Chir., F.R.C.S.Ed.

Emeritus Professor of Orthopaedic Surgery, University of Liverpool

Fractures of the clavicle occur more frequently than any other bony injury, and they are almost invariably the result of transmitted or indirect violence applied to the clavicle through a fall on the outstretched hand or on the elbow, or through contact with the tip of the shoulder. Although compound fractures of the clavicle are not unknown, especially in war injuries, yet this fracture is usually simple, even when resulting from a direct blow on the anterior surface of the bone.

Age Incidence

The fracture is one of the more active period of life, occurring mostly in youths and young adults. As it is commonly caused by a fall, it is usually seen in children or in those taking part in sport. In the elderly, fracture

Examining the clavicle for an ununited, or obscure recent, fracture. (From Mr. Hamilton Bailey's *Demonstrations of Physical Signs in Clinical Surgery*, by permission of the author and John Wright and Sons, Ltd.)

of the clavicle is a comparatively rare accident; at this age a fall on the outstretched hand is more likely to cause a Colles' fracture or an injury to the neck or head of the radius.

Site of Fracture

The fracture usually occurs slightly beyond the middle of the bone where the medial anterior curve meets the posterior curve of the outer segment. Here the strain is greatest. The fracture may also occur toward the inner or outer ends of the bone, the site of the lesion in the inner segment being usually at a point three-quarters to one inch from the sternal attachment of the bone, while the site of the distal fracture is usually the same distance from its acromial attachment.

Symptoms and Signs

These vary according to the type of fracture. With a greenstick fracture, which is common up to the age of 14 or 15 years, the symptoms and signs are slight. Following a fall, the patient, usually a boy, may complain of an ache in the shoulder region but may finish the game he is playing with comparatively little discomfort. Later, persistent aching in the shoulder may draw attention to a clavicular swelling, tender on pressure, but causing little disability and no limitation of movement. Radiographic

examination will confirm the presence of a crack in the bone, usually without displacement.

The symptoms and signs which follow a complete fracture in the usual mid-clavicular situation are more severe. The patient complains of a sudden pain in the shoulder region accompanied by a feeling of uselessness in the whole arm and forearm. As a rule, in order to relieve the pain the affected arm is immediately supported by the other hand in an effort to lift the shoulder and prevent the dragging weight across the site of fracture.

On examination of the site of injury it is evident that the clavicle has been broken. The outer sharp, irregular edge of the inner fragment of the bone can be felt projecting under the skin above its normal site, and restoration of the line of the clavicle is possible only by raising the shoulder above its normal position. The radiograph demonstrates that considerable displacement has occurred at the site of fracture, the outer fragment being displaced downwards and the outer end of the inner fragment projecting upwards, leaving a considerable gap between the broken ends.

The symptoms and signs of fracture at the inner or outer end of the bone are considerably modified from those which follow a lesion in the usual situation. As a rule, with either of these fractures there is little displacement and a minimum of deformity. Pain and disability following their occurrence may be so slight that the injury may easily be overlooked unless demonstrated by radiographic examination.

With a fracture close to the inner end of the clavicle impaction on one side of the bone is often present. Some thickening and tenderness are apparent over the injury and movements of the arm are limited because of pain.

When the fracture has occurred towards the outer end of the clavicle there is no displacement if the lesion is situated between the attachments of the acromioclavicular ligaments; tenderness, and swelling over the site of injury and subcutaneous haemorrhage indicate the severity of the injury.

Common sites of fracture of the clavicle.

Diagnosis

The diagnosis is, as a rule, an easy matter if the possibility of this injury is borne in mind. The only difficulty is met with in the greenstick fracture of children and in the fractures occurring close to the extremities. A simple subperiosteal haemorrhage may cause some difficulty in clinical diagnosis, but the doubt can easily be settled by radiographic examination.

Complicated Injuries of the Clavicle

On occasion this fracture is accompanied by injury to some of the neighbouring tissues. Thus, fracture of the clavicle may be associated with a lesion of the brachial plexus, particularly of its upper components. After a fall on the point of the shoulder it is obvious that the patient

has sustained a fracture of the clavicle, and unless a careful examination of muscle movements is carried out an accompanying injury to the fifth and sixth cervical nerves may be missed. Because of the pain produced by the fracture the patient naturally keeps the whole shoulder at rest, and it is frequently difficult to separate the loss of power which follows injury to the plexus from the reflex inhibition produced by the fracture.

If the force applied to the shoulder is extreme the fracture may also be associated with a lesion of the whole of the plexus. In this event the differential diagnosis is comparatively simple, and is indicated by the complete flaccidity of the whole of the affected arm, with a loss of sensation over the entire limb below the elbow.

When the fracture has resulted from a violent pull on the arm in a position of full-extension the lower cord of the plexus may be stretched or torn, giving a loss of power in the intrinsic muscles of the hand—a complication which is very difficult to diagnose directly following the injury. Injury to the neighbouring blood vessels may occur also, usually not as a result of traction but following direct injury to the vessels by the sharp surface of the inner end of the outer fragment of the bone.

These injuries can all be diagnosed by a careful examination of the patient, and treatment of the fracture should be delayed until the possibility of these complications has been eliminated.

Treatment

The treatment of this fracture is not difficult, and if a few simple precautions are employed a successful result is to be expected.

Methods

Figure-of-8 Bandage.—The objects of treatment are to raise the shoulder to bring the two fragments of the broken bone into alignment; to pull back the shoulder to prevent overriding of the broken bone; and to restore full length, with fixation in that position until clinical union has occurred. The simplest and most generally satisfactory method of accomplishing these aims is by the use of the figure-of-8 bandage. Two or three large flannel or calico bandages are employed, passing round each shoulder in turn and crossing each other posteriorly. These bandages are applied firmly, the shoulders being pulled back by each turn of the bandage. When the bandages have been firmly fixed in this position by pinning or tying, a firm loop of bandage is attached to each shoulder loop in front across the chest. This simple method of retention keeps the original figure-of-8 in position and prevents the bandage slipping from the shoulder, which would destroy the fixation.

Diagram illustrating the pulling back of the shoulders without the anterior bandage support. (From Mr. George Perkins's *Fractures*, by permission of the author and Oxford University Press.)

When fixed in this way the patient is encouraged to use the hand, fingers, and elbow in order to prevent stiffness of these joints, a complication which is to be feared in the adult patient. After four weeks clinical union is usually

satisfactory, and the patient may be allowed freedom from all control, gradually restoring full movements at all the joints by voluntary exercises. A sound, fully functioning limb is to be expected, with no disability except for the presence of a bony nodule at the site of fracture.

Occasionally, especially if the fracture has been comminuted, a spike of bone is present at the fracture site projecting under the skin. This spike should not be interfered with or removed, as it rapidly diminishes in size and gradually becomes rounded.

T-Splint.—To obtain the same fixation a T-shaped wooden splint may be used. This is placed on the patient's back, the long arm of the T extending from the sacrum to the level of the middle of the scapulae. The cross arms of the T extend behind each shoulder, and to these cross arms the shoulders are firmly bandaged, stability of the splint being obtained by fixing the main portion to the body and pelvis. The object of fixation and raising the shoulder can be attained equally well with the less cumbersome figure-of-8 method, and there are no special advantages in the use of the splint.

Strapping Method ("Sayre's").—This method of fixation by applying strapping round the arm and chest to pull back the shoulder and pull the elbow upwards and forwards has been gradually abandoned. It was the procedure generally adopted and taught in the textbooks for many years, but there are so many disadvantages in the method that it has now been largely superseded by the less troublesome fixation by bandages. In applying this form of treatment the arm was first pulled backwards and fixed to the chest by wide strapping, while by a second strap the elbow was pulled forward and upward with the hand and fingers firmly applied to the chest wall. The subsequent rigidity of all the joints of the limb usually required a long period of physiotherapy for their relief, and in many instances full movements could not be restored to the adult patient.

Treatment in Recumbency.—For those few patients in whom the presence of a nodule on the substance of the bone would be considered to be a great deformity, better alignment and a smaller mass of callus can be secured by treatment in recumbency. The patient is treated recumbent on a firm mattress with a small sandbag placed between the shoulders. This position is maintained for three to four weeks. As a result the alignment is improved and less callus is formed, but the confinement to bed for a month is usually considered to be unbearable for the treatment of a comparatively simple injury.

Intra-medullary Wiring.—An attempt has been made to restore and maintain the exact alignment of the bone by fixing the fragments in position by means of an intra-medullary wire. This is introduced through an opening in the outer or inner fragment and threaded along the medullary cavity of both fragments. The method is not to be recommended; snapping of the wire has occurred on several occasions and the presence of the wire does not stimulate but rather retards bony union.

Sequelae of Fracture of the Clavicle

If treated by the simple figure-of-8 bandage without fixation of the hand and fingers the result is usually excellent. Full movements are gradually restored to all the joints and the patient is left with no disability. Under certain circumstances the result is not so satisfactory, and subsequent trouble and disability may be encountered.

Rigidity.—Limitation of movement may affect any of the joints of the upper limb, either as a direct result of the fall or as a consequence of inefficient treatment. At the

time of the accident the shoulder joint or the muscles of the shoulder region may be injured, and as full movements of the joint cannot be maintained until the fracture is united limitation of movement may become obvious when all fixation has been removed. The limitation may be reduced by the patient's own efforts during treatment, but massage and exercises may be needed at a later date.

A much more serious state of rigidity is encountered in those patients, especially adults, in whom the hand and fingers have been kept at rest during the course of treatment. Massage and voluntary exercises help to diminish the rigidity, but as a rule a considerable disability is left if the possibility is forgotten.

Non-union.—Non-union of a fracture of the clavicle is a comparatively rare complication, especially when the fracture is simple. It may occur in spite of correct and efficient treatment, but is usually seen only when treatment has been neglected or when a portion of the bone has been removed in a compound fracture. As a result of non-union the patient usually complains of aching and a feeling of clicking when the arm is used. There is usually little or no tenderness over the fracture, but the movements of the fractured surfaces on each other are disabling.

Treatment of Non-union

On occasion, union of the fractured bone can be obtained by continuing the fixation for a longer period. If the fracture is comparatively recent a further period of fixation of four to six weeks may be sufficient to produce a sound, painless union. When non-union has been present for a considerable period even prolonged fixation is usually unsuccessful in producing union, and operative interference is advisable.

Bone Grafting.—In attempting to produce bony union a bone graft is applied to the site of fracture. An inlay graft is placed in a deep slot cut on the antero-inferior aspect of the clavicle and reduction maintained as in a fresh fracture of the bone. Because of the difficulty of obtaining complete fixation of the fracture the bone-grafting operation may not be successful, and if the operation has failed on the first occasion the prognosis is much worse if a further attempt is made.

Partial or Complete Removal of the Clavicle.—If bone grafting has failed and the patient still complains of pain and disability a considerable improvement in the condition may be effected by the removal of a large section of the clavicle from either side of the fracture. As a result of this the painful clicking of the fractured surfaces is eliminated, and though the shoulder tends to fall forward to a slight degree the usefulness of the limb is increased. Because of the possibility of the re-formation of the clavicle which has been removed it may be advisable on occasion to remove the whole of the bone, which, though apparently a radical procedure, does little to reduce the strength and usefulness of the affected limb.

The Ministry of Health has notified hospital boards and committees that it will not set up any central machinery for dealing with redundant, worn-out, or obsolete equipment in hospitals. Boards and committees should dispose of such equipment as before. Serviceable items of equipment which become redundant in any hospital should be transferred to another hospital where they can be used. No cash adjustment should be made for the transfer, but it should be recorded. Hospitals holding equipment issued on loan during the war under the Emergency Hospital Scheme should use it where possible. Schedules of this equipment should be prepared and sent to the Ministry of Health, Supplies Division 1, Whitehall, London.

SURGICAL TRAVELS IN COLOMBIA

BY

RONALD W. RAVEN, O.B.E., F.R.C.S.

Honorary Professor, National University of Colombia; Surgeon to the Westminster Hospital (Gordon Hospital); Surgeon to the Royal Cancer Hospital

Surgical travels in other lands are full of interest, and are valuable for the development of understanding between the countries involved. Our country always welcomes the surgeons of other lands to her surgical centres, and many avail themselves of the facilities provided. Others find it impossible to make the journey, but they can be reached and helped when British surgeons undertake such a mission as is described in this paper. The National University of Colombia extended an invitation to Dr. Lawrence H. Morris and myself to visit Bogotá in order to deliver a course of lectures and perform surgical operations. This invitation was accepted, and we left England on April 26, 1949. As this is the first occasion such a visit has been made, it is felt that a record of it might be of interest.

Historical Background of Colombia

Colombia is the only country in the New World which bears the name of the discoverer, Christopher Columbus. The exploration of this region was carried out by his companions and contemporaries, and resulted in the foundation there of Santa Marta in 1525 and Cartagena in 1533. These ports developed into two of the most important centres of this vast continent and became the scene of many struggles and sieges in bygone days. In some of these expeditions Sir Francis Drake was actively engaged. The last great attack which Cartagena suffered in the colonial age was in 1741, when Sir Edward Vernon arrived at the head of the greatest army ever to reach the coasts of the Caribbean Sea.

Colombia was the cradle of the great Chibcha and Kimbaya Indian civilizations, which fell before the Spaniards. Santa Fe de Bogotá was founded by Jiménez de Quesada after a heroic expedition, and the future capital of the country came into being. Its history is bound up with the revolt of the Comuneros and the beginnings of Colombian science under Mutis and Caldas. Finally there came the great revolutionary movement organized by Bolívar, Nariño, and Santander, which transformed the country and ended in its independence being established. The Colombians have never forgotten the help they received from the British soldiers in their fight for freedom.

Geographical Facts

Colombia extends over an area of nearly half a million square miles of land in the north-western region of South America. It is the only country in this continent to face two great oceans, since its western seaboard opens on the Pacific Ocean while its northern coastline looks out on that portion of the Atlantic Ocean which forms the Caribbean Sea.

The outstanding feature of the country is the gigantic mountain ranges of the Andes, which rise in the Caribbean region and continue southward across the continent. This great mountain system spreads out into three main ranges, united in the south-west and opening towards the north. Thus on the left is the Western Cordillera of Chocó, in the middle the Central Cordillera of Quindío, and on the right the Eastern Cordillera of Sumapaz. Scattered among these mountain ranges are high tablelands where the population is denser, especially in the eastern region. To the east and south-west of the Eastern Cordillera is an immense plain traversed by the great rivers Caquetá and Vichada, which empty respectively into the Amazon and the Orinoco.

The country lies entirely within the Tropics, but the climatic conditions vary greatly. The line of the Equator traverses its southern part, but when the rivers, forests, and lowlands are left behind, temperate valleys and plateaux are reached where there is perpetual springtime with orchards and flowers in full bloom; and rising high above the plateaux are the mountains.