SOME COMPLICATIONS OF COLLES' FRACTURE AND THEIR TREATMENT

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Though Colles' fracture is a common injury its complications and their treatment are seldom dealt with in surgical papers. In this paper it is proposed to discuss the following complications:

1. Redisplacement.
2. Mal-union.
3. Laxity of the inferior radio-ulnar joint.
4. Joint stiffness and adhesions.
5. Traumatic arthritis of the wrist joint.
6. Pain over the ulnar aspect of the wrist.
7. Late rupture of the extensor pollicis longus tendon.
8. Sudeck's atrophy (post-traumatic osteo-dystrophy).
9. Injuries of the median nerve.
10. Prolonged absence from work.

1. Redisplacement

This is the commonest complication of importance. Between 15 and 20 per cent. of all Colles' fractures for which reduction has been required show some degree of redisplacement. The three main causes for this are (a) faulty immobilization, (b) gross comminution and (c) compression of bone on the dorsal aspect of the fracture.

Immobilization of the joints immediately above and below the site of a fracture is a cardinal principle in treatment, but the standard fixation of a colles' fracture, whether by plaster cast or other forms of splintage, makes no attempt to fix the elbow joint and so control rotation of the forearm. It is imperative, therefore, that whatever splintage is used it should be applied with considerable care and should be observed at frequent intervals, especially during the first two weeks. It has been stated by Lambrinudi, and repeated by Charnley (1950), that fixation with the forearm in pronation and wrist in ulnar deviation is the most reliable position for holding reduction. Immobilization in

other positions has been tried, such as the Cotton Loder (full palmar-flexion of the wrist and ulnar deviation with extreme pronation of the forearm), but no position is completely successful in preventing redisplacement.

Gross comminution may be seen in all age groups but is more commonly observed in the elderly. Comminution means instability, and even with the best support redisplacement is therefore always a possibility.

Compression of bone on the dorsal aspect of the fracture is the direct result of the causative force. In some instances it is so well marked that after good reduction has been obtained a distinct gap may be seen dorsally between the fracture surfaces in the lateral radiograph.

Treatment

Minor degrees of malalignment may be accepted as they are compatible with good function. In elderly subjects even gross redisplacement may be accepted and it may be justifiable to allow the primary displacement to remain unreduced. Success from simple manipulation can be expected up to 14 days from the initial injury, after which time the use of the Thomas' wrench offers more chance of success. Beyond the third week it is better to accept the position and treat the case as one of mal-union, because forcible attempts at reduction are usually unsuccessful and may do harm.

2. Mal-Union

Mal-union is also a common complication. The severity and type of deformity vary considerably. The normal forward inclination of the plane of the articular surface of the radius is 20°, but this is lost in nearly 20 per cent. of patients. The articular surface may be at right angles to the shaft or even grossly tilted backwards. This is the commonest form of mal-union occurring alone.

FIG. 1.—Mal-united Colles' fracture with inferior radio-ulnar dislocation and traumatic arthritis. The patient, a man aged 68, had sustained the fracture many years previously. The wrist was painless, the grip good and the range of movement almost full.

It may be accompanied by shortening of the radius, or by radial and dorsal displacement of the lower fragment giving prominence to the head of the ulna and broadening of the wrist. In these circumstances some distortion of the anatomy of the inferior radio-ulnar joint is inevitable and subluxation or even dislocation of this joint may be found.

Treatment

In many patients with mal-union the functional result is satisfactory even when the deformity is gross (Fig. 1). Conservative treatment is indicated when the deformity is slight, the disability only moderate and the patient elderly. At the outset a course of active exercises and hot wax baths may regain adequate movement and power.

Operation is seldom indicated. As a general rule its aim should be directed solely to the improvement of function, and it is therefore rarely

advised for mal-union when function is adequate. However, in the younger age groups and especially in women with gross dorsal tilting of the lower radial fragment, an osteotomy through the fracture site may be performed to restore normal alignment even though wrist movements have not been seriously restricted.

In these patients the object of the operation is to delay late traumatic arthritis and to improve the appearance of the wrist. The osteotomy is performed through a dorsal approach at the level of the old fracture. It is important to fill with a bone graft the dorsal defect created when alignment has been restored lest displacement should recur. The wrist is then immobilized in plaster until union has taken place.

When in addition to dorsal tilting there is considerable shortening of the radius and some radial displacement, surgical interference may be required on account of pain, stiffness and an un-

slightly deformity. Here much of the disability is due to the derangement of the inferior radio-ulnar joint, and excision of the lower $1\frac{1}{2}$ in. of the ulna gives a satisfactory result. Following this operation (*vide infra*), the prominence of the ulnar head is abolished, pronation and supination are considerably improved or fully restored and discomfort is relieved. The results following more complicated operations are uncertain and often disappointing.

Very occasionally in comminuted fractures a projecting fragment of bone on the anterior or posterior aspect of the radius interferes with tendon action and causes local pain from a traumatic teno-synovitis (Fig. 2). Excision of the offending fragment is seldom required as the symptoms do not as a rule persist.

3. Laxity of the Inferior Radio-Ulnar Joint

It has been demonstrated by Lippman (1937) by experiments on the cadaver, that severance of the triangular fibro-cartilage produces a very small degree of abnormal laxity, but when in addition the dorsal radio-ulnar ligament is divided, a dislocating radio-ulnar joint results. These findings have been confirmed by the writer in the dissecting room. Lippman has come to the conclusion that when a Colles' fracture with displacement is sustained, the dorsal ligament is damaged and its subsequent failure to heal is the main cause of the residual laxity, the associated lesion being either a rupture of the triangular fibro-cartilage or a fracture of the styloid process of the ulna.

Although the condition frequently occurs with mal-union, it is quite often present when the fracture has united in excellent position. Minor degrees of laxity are sometimes followed eventually by arthritis of the joint while major degrees constitute a dislocation.

Clinical Features

There may be no symptoms. Pain over the ulnar side of the wrist, local tenderness, limitation of supination and pronation, prominence of the head of the ulna and abnormal laxity form the full clinical picture. The radiographs reveal a dislocation when present and occasionally arthritic changes.

Treatment

When disability exists, a moulded leather wrist strap is the best form of conservative treatment. Manipulation in an attempt to increase pronation and supination does not meet with success and is, indeed, dangerous, several instances of fracture of the shaft of the ulna having been reported (Patrick, 1946). Excision of the distal $1\frac{1}{2}$ in. of the ulna is

the best operative procedure and gives good results (Boyd and Stone, 1944) (Figs. 3a and 3b). It is performed through a dorsi-medial incision; the bone is resected extra-periosteally to avoid new bone formation, and it is not necessary to remove the triangular fibro-cartilage. Active exercises should be commenced a day or two after the procedure. As a result of the operation, little or no residual weakness of the wrist ensues.

4. Joint Stiffness and Adhesions

The majority of patients regain full movements of the wrist a few weeks after immobilization has been discontinued. Residual stiffness may be due either to intra-articular adhesions following a fracture involving the radio-carpal joint, or to extra-articular adhesions following traumatic oedema with organization of the serofibrinous exudate into adhesions. Stiffness due to the latter cause is seen in particular when more than one attempt at reduction has been required. It should also be remembered that persistent stiffness is sometimes an early symptom of traumatic arthritis.

FIG. 2.—Mal-united Colles' fracture showing a small spur of bone on the anterior aspect of the fracture site. This projection caused persistent local discomfort especially at work. Excision of the projection was required.

FIG. 3 (a).—Colles fracture with inferior radio-ulnar subluxation.

The patient, a man aged 32, complained of pain over the ulnar aspect of the wrist, weakness of grip and inability to rotate the forearm.

Treatment

Active use of the shoulder, elbow and hand from the outset is an essential feature of the routine treatment of a Colles' fracture and plays a large part in the dispersal of oedema, thus materially helping to prevent subsequent stiffness of the wrist joint.

Active use, hot wax baths and exercises supervised by the physiotherapist should be instituted, and if after a lapse of several weeks a satisfactory return of movement has not been regained, recourse may be had to manipulation under a general anaesthetic and followed by further active exercises. Manipulation may be repeated if necessary.

5. Traumatic Arthritis of the Wrist Joint

This condition is an infrequent sequel and by comparison arises much more commonly after fracture of the carpal scaphoid. There is no clear

FIG. 3 (b).—The same wrist after operation. Full painless function was regained.

explanation for this. Interruption of the continuity of the articular cartilage by the fracture line alone is sufficient to initiate arthritic changes, and when, as in comminuted fractures, it is often impossible to restore completely the anatomical alignment of the articular surface, arthritis occurs more rapidly.

Major degrees of mal-union without recognizable interference with the articular cartilage by the fracture are occasionally followed by arthritis. This is seen chiefly in those patients who make constant demands on their wrists at work (e.g. manual labourers). The condition is then a sequel

to raised pressure on the articular surfaces and continued stresses on the ligaments.

It should be borne in mind that the so-called traumatic arthritis may be, in fact, an aggravation or reactivation, caused by the trauma, of a pre-existing chronic arthritis.

Clinical Features

The symptoms may arise very soon after the fracture or be delayed for years. The signs are those of an osteoarthritis in any joint, and in the early stages the diagnosis is based mainly on the clinical features, as the radiographic changes are minimal. Even when the arthritis is advanced, osteophytic lipping is not a well-marked feature in the radiographs and is best looked for at the tip of the radial styloid process.

Treatment

Mild cases benefit by suitable physiotherapy. When the arthritis is well established the treatment depends upon the severity of the symptoms, the occupation and age of the patient. A moulded leather wrist support is adequate for the majority of patients and arthrodesis of the wrist joint is only rarely indicated.

6. Pain over the Ulnar Aspect of the Wrist

This is a fairly common complaint after fixation has been discarded. Although the symptoms may be present when there is non-union of a fracture of the ulnar styloid process, in the writer's experience it is more frequently found when no such fracture has been sustained. The pain is then attributable to an unhealed sprain or partial rupture of the internal lateral ligament of the wrist, and it may well be that even in the presence of non-union of the ulnar styloid process, the discomfort is ligamentous in origin. A point of local tenderness is consistently found close to the proximal attachment of this ligament.

Treatment

The discomfort is almost always of temporary duration and responds to diathermy.

7. Late Rupture of the Extensor Pollicis Longus Tendon

This is an uncommon but well-recognized complication. Formerly it was thought that the rupture was due to a process of attrition caused by roughness of the tendon groove on the dorsum of the lower end of the radius. However, in a substantial proportion of the reported cases, no reduction of the fracture was required and no roughening of the groove found subsequently at operation. At the present time it is held that an avascular necrosis of the tendon occurs following

injury to the meso-tendon with haematoma formation and subsequent fibrosis. Operative findings tend to support this view (Trevor, 1950). The lesion is found near the lower border of the dorsal carpal ligament. At operation in recent ruptures, bruising, yellowish discoloration and fraying of the tendon ends may be seen. Only occasionally is roughening of the tendon groove found.

Clinical Features

Females preponderate and the patient is usually over 50 years of age. The youngest patient recorded is a girl aged 14 years (McMaster, 1932). Local pain and swelling may precede the rupture, which is sometimes heralded by a sudden snap. In other patients, inability to extend the interphalangeal joint of the thumb is the first complaint.

Physical examination reveals inability to extend the interphalangeal joint, slight limitation of abduction of the thumb and absence of the subcutaneous bow-string which is formed by the intact tendon.

Treatment

Satisfactory results have been obtained from a variety of operations, but the result following direct end-to-end suture is always unpredictable. Among the many operations performed are:

(a) Transference of the extensor indicis proprius to the distal end of the tendon. This operation gives gratifying results and causes minimal interference with the function of the index finger, the only disability being a suggestion of weakness of extension and a tendency to radial deviation of the digit at the metacarpo-phalangeal joint. As the extensor indicis tendon lies on the ulnar side of the tendon of the extensor communis digitorum, the unopposed action of the latter tendon leads to the slight radial deviation.

(b) Suture of the distal end of the tendon to the extensor brevis pollicis or to both the extensor brevis pollicis and abductor pollicis longus.

(c) A free tendon graft.

(d) Transference of extensor carpi radialis longior or brevior into the distal end of the tendon.

(e) Restoration of the continuity of the tendon by using nylon suture material, fibrous tissue ultimately bridging the gap between the tendon ends (Trevor, 1950).

8. Sudeck's Atrophy (Post-Traumatic Osteo-Dystrophy)

Sudeck's atrophy may follow a Colles' fracture, but is a relatively more common complication of minor injuries of the wrist. Its aetiology is not fully understood. It is believed that the injury

initiates an abnormal reflex arc, with pain impulses forming the afferent side and sympathetic impulses, both vasoconstrictor and vasodilator, the efferent.

Clinical Features

Attention is first drawn to the dystrophy a few weeks after the injury by pain, with stiffness of the wrist and fingers which is at first due to muscle spasm. The pain is materially aggravated by movement. Vasomotor changes take the form of a cyanotic, moist, glossy skin.

In radiographs the degree of decalcification is far greater than that of a simple disuse atrophy. There is at first a patchy decalcification of the bones of the wrist and hand which is seen especially close to the joints; later the decalcification becomes diffuse, leading to a glassy appearance. In very severe and protracted types there may be fibrous ankylosis of the carpal joints.

Treatment

Treatment is unsatisfactory, but wax baths, active use, encouragement and the passage of time may effect a cure. Immobilization, deep X-ray therapy, injections of local anaesthetic into the cervico-dorsal sympathetic chain and preganglionic cervico-dorsal sympathectomy have been tried with varying success. Sympathectomy has little or no effect on the bone changes but relieves the pain temporarily and may abolish the vasomotor phenomena.

Prognosis

Full recovery is unlikely. Only when the dystrophy is mild can a good recovery be anticipated, and when severe, a substantial residual disability is to be expected (Klser Sven, 1947-8).

9. Injuries of the Median Nerve

An incomplete lesion of the median nerve, sustained at the time of injury or following reduction, is by no means uncommon. It is due to a contusion of the nerve. Clinically it is found that the sensory supply of the nerve is partially affected; the motor side almost invariably remains intact. The patient complains of numbness of one or more digits in the median distribution and on examination there is impairment but not complete loss of sensation in the affected skin area. As the loss of sensation is only of temporary duration, no treatment is required.

More serious injuries of the nerve due to anterior displacement of bone spicules have been described but are rare. Lesions of the superficial branch of the radial nerve may also occur.

10. Prolonged Absence from Work

This is frequently due to uncomfortable primary splintage and to failure of the surgeon to insist on active use of the limb at once. In some modern industrial centres workers often lose less than a day off work owing to the immediate provision of suitable employment.

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