Third Edition

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DePalma's

THE MANAGEMENT OF FRACTURES AND DISLOCATIONS

an atlas

JOHN F. CONNOLLY

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VOLUME 2

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FRACTURES AND DISLOCATIONS IN THE REGION OF THE WRIST

FRACTURES OF THE LOWER END OF THE RADIUS: COLLES', SMITH'S AND BARTON'S FRACTURES

REMARKS

Like most fractures of the upper limb, these eponymic fractures result from a fall on the outstretched hand. Varying force vectors produced by the fall, the position of the wrist, and the differing structural properties of bones account for the differences in fracture types.

Forceful hyperextension with the forearm and wrist pronated drives the carpals into the distal radius and produces a bending and compressive failure of the cancellous subchondral bone.

Colles' fracture is a typical fracture of weakened osteoporotic bone; 60 to 70 per cent of these fractures occur in postmenopausal women.

The same hyperextension mechanism in the young adult male is more likely to produce a fracture of the scaphoid.

The hyperextension injury to the child's wrist usually results in failure through the physis or produces a distal greenstick fracture.

Occasionally, the force vector of the injury drives the carpal bones in a volar direction. This results in a fracture that angulates volarly instead of dorsally, i.e., Smith's fracture.

The same force vectors with volar direction in a young adult male shear off the articular surface of the distal radius and produce a Barton's fracture with volar dislocation of the carpus.

Each of these fracture types carries different implications regarding stability of reduction and prognosis; however, each is managed with the same ultimate objective — restoration of painless function.

Colles' Fracture

REMARKS

Colles' fracture with its dinner-fork deformity is among the most common fractures seen in emergency rooms.

The force vectors of injury produce the characteristic fork deformity of the patient's wrist. This consists of three components: radial shortening, dorsal tilt, and radial deviation of the distal radial fragment.

Correcting the dinner-fork deformity is done by pulling the radius out to length and then restoring the normal volar and radial tilt of its distal end.

The reduction must be maintained until the weak subchondral bone heals sufficiently to prevent redisplacement. This is the difficult aspect. In actual practice, recurrence of deformity, particularly radial shortening, is common because of the eggshell structural properties of the fractured bone in this region.

A good reduction is important for the patient's subjective opinion about the result, which is based primarily on the appearance of the wrist and the range of rotation after healing.

Avoid overtreating these injuries in the elderly patient. Particularly avoid extreme positions of forced flexion, pronation, and ulnar deviation (Cotton-Loder position), which add to the likelihood of postreduction neuropathy and disuse hand-shoulder syndrome.

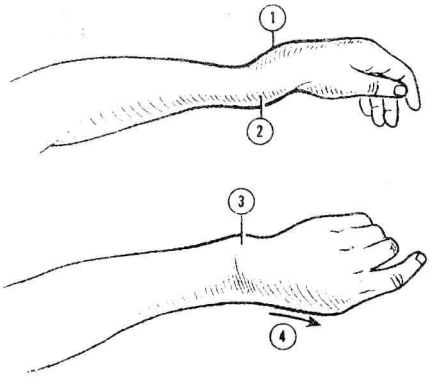
The deformity may actually be worsened by forced pronation, which accentuates the deforming pull of the brachioradialis on the distal fragment.

For unstable fractures use pin fixation through the distal radius. This technique is particularly useful to correct the disruption of the radioulnar joint and radial shortening that commonly cause the unsatisfactory appearance and rotational limitation after Colles' fracture.

Avoid pins through the hand, which can produce extremely recalcitrant disuse hand-shoulder or ocular-palmar syndrome. The latter syndrome occurs in the patient who has become so intimidated by the injury or, more often, by its treatment that whenever he looks at the hand it hurts.

The hand-shoulder disuse syndrome after fracture can be virtually eliminated by treating the fracture with emphasis on early active range of motion to the fingers and shoulder, and by avoiding the use of a support sling.

COLLES' FRACTURE WITHOUT COMMINUTION



Dinner-Fork Deformity

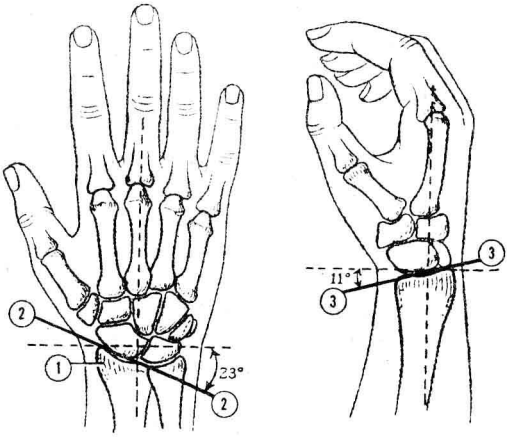
1. Abrupt dorsal prominence.
2. Gently rounded volar prominence.
3. The wrist is broadened.
4. The hand is deviated radially.

Appearance on X-Ray

NORMAL WRIST

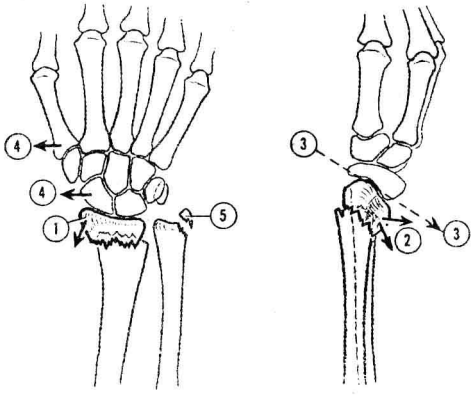
1. The styloid process of the radius extends 1 cm beyond that of the ulna.
2. The articular surface of the radius projects toward the ulna 15 to 30 degrees (average 23 degrees).
3. The plane of the radial articular surface slopes downward and forward 1 to 23 degrees (average 11 degrees).

Note: Compare these anatomic features with those seen in a Colles' fracture.

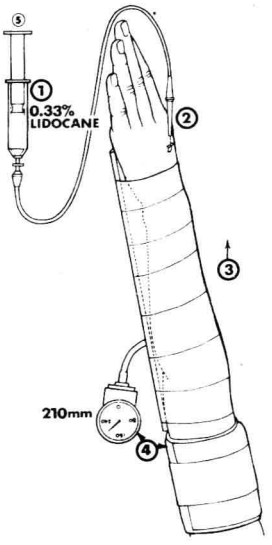


COLLES' FRACTURE

1. The distal radial fragment is displaced proximally. (The radial styloid may be on the same plane as the ulnar styloid or proximal to it.)
2. The distal radial fragment displaces dorsally and proximally.
3. The plane of the articular surface of the radial fragment tilts dorsally. (This angle varies greatly in different patients.)
4. The carpus and the hand deviate toward the radius.
5. The ulnar styloid may or may not be fractured.



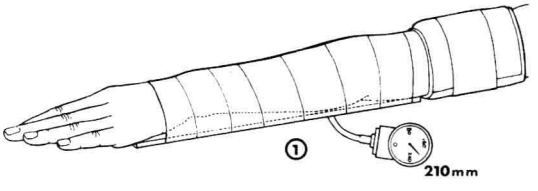
Preferred Method of Anesthesia: Regional Intravenous Anesthetic



1. Mix 15 cc. of 1% lidocaine and 30 cc. of normal saline to make a 0.33% solution. The dosage should be 0.5 cc. of this solution per kg. of body weight.
2. Insert a small butterfly needle into the hand on the fractured side, which is immobilized in a splint.
3. Elevate the limb for at least 3 minutes to diminish edema.
4. Using a pretested and securely taped blood pressure cuff, stop circulation by rapid inflation to at least 210 mm Hg.

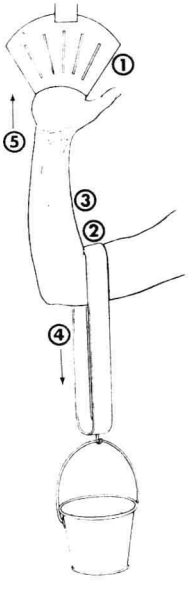
Note: Specially designed double tourniquets may also be used.

5. Lower the arm and inject the lidocaine solution in appropriate dose.



1. The needle is removed, and after 10 minutes the fracture is reduced. Always keep the cuff inflated for at least 15 minutes.

Reduction by Traction and Manipulation



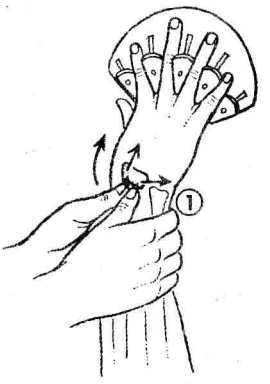
The patient assumes the supine position on the fracture table.

1. Finger traction is applied.
2. The elbow is flexed to a right angle.
3. The forearm is in neutral rotation.
4. Counter traction is made using a muslin sling with a water bucket for traction.
5. Traction is maintained for approximately 5 minutes to pull the radial styloid distal to the ulnar styloid.

Note: The tourniquet for intravenous anesthesia is maintained during reduction.

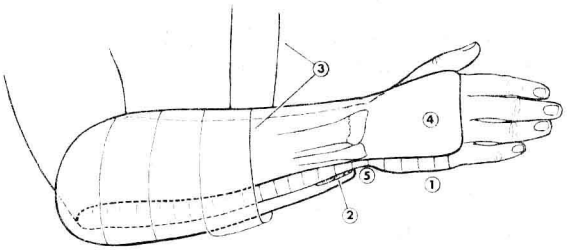
Reduction by Traction and Manipulation (Continued)

1. With the fingers of both hands on the volar side of the forearm, use both thumbs to push the distal fragment forward and toward the ulna.

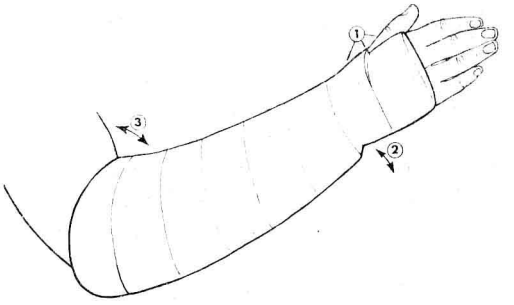


Application of Sugar-Tong Splint (Miller Method)

1. Apply cast padding from the metacarpal heads to above the elbow.
2. Add a felt pad to the volar surface of the proximal fragment.
3. Wrap a 10-cm sugar-tong plaster splint with circumferential gauze bandage.
4. The dorsal half of the splint ends at the metacarpal heads and is molded over the distal fragments.
5. The volar half ends 1 to 2 cm proximal to the fracture.



1. The wrist is in neutral rotation and slight flexion. Forced flexion or pronation accentuates the deforming pull of the brachioradialis and should be avoided.
2. The sugar tong splint allows slight wrist flexion and
3. Limited elbow motion without forearm rotation.



Note: If reduction is satisfactory, deflate the tourniquet for intravenous anesthetic to 80 mm Hg and after 10 seconds reinflate it to 210 mm Hg. Monitor vital signs and mental status; if they are unchanged, remove the tourniquet completely. Continue monitoring vital signs and mental status for 10 minutes following release of tourniquet. The entire procedure requires two assistants, one to monitor the pressure of the cuff during the block and the other to assist in reduction. Minimum tourniquet time should always exceed 15 minutes. Resuscitation equipment should be immediately available when administering anesthetic of any type.