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Managing Colles' fractures in rural practice

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Introduction

Distal radial fractures (DRFs) are encountered regularly in rural practice. Of 31 287 patients who made emergency visits to Sundre Hospital (serving a population of about 5500) over 5 years, 222 patients in the computer database in all age groups presented with radial fractures (ICD-9 code 813) (Jim Thompson, Sundre Alta: unpublished data, 1997). Based on diagnoses recorded in general terms (e.g., broken wrist), 57% were children under 18 years of age; at least 25% had DRF and 80% of them were under 18 years of age. Twenty-one patients reportedly had Colles' fractures, of whom 5 (24%) were under 18 years of age. A MEDLINE search revealed no published studies of DRF or Colles' fracture management in rural settings. The eponym "Colles' fracture" originally referred to a very specific subset of DRFs first described by the Irish surgeon Abraham Colles in 1814.1 Falling on outstretched hands usually caused the fracture. The fracture had postmortem characteristics of dorsal angulation of the radial fragment, radial shortening, dorsal deviation and an ulnar styloid fracture (Fig. 1).

These 4 characteristics now define the true Colles' fracture. Colles might not have realized that these fractures sometimes involved joints, because he studied the fracture 80 years before the invention of radiography.2 He did note that the fractures tended to be unstable, settling back after reduction to leave the patient with a "deformity undiminished through life."1

Today, patients with DRF tend to be of 2 groups: younger patients subjected to higher kinetic energy forces when they are injured and elderly patients who sustain lower energy injury and have osteopenic bones. Colles' fracture usually is restricted to the second group and should be used only for fractures with the 4 characteristics already listed. Strictly speaking the eponym "Colles" refers to a DRF with dorsal angulation of the radial fragment which does not have articular involvement. One DRF classification scheme listed as many as 144 different types of DRF, and at least 4 classification schemes have been proposed for DRF.2,3

In this article, we review key decisions for treating rural patients in their home community versus referring them, and techniques for closed reduction and casting of these fractures.

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Simple casting, closed reduction or surgery?

The treatment goals are to restore satisfactory function and avoid disabling complications. As Fig. 2 demonstrates, the many varieties of DRF, including Colles' fracture, occur on a continuum ranging from undisplaced, simple fractures requiring only casting, to fractures that can be treated

with closed reduction and casting (Fig. 1) to more complex fractures requiring open surgical reduction and fixation (Fig. 3).4 The majority of DRFs, including Colles' fractures, can be managed by simple casting or closed reduction, but the decision must be made carefully.

Attempts to correlate Colles' fracture characteristics shown in Table 1 (Fig. 4) with the DRF complications shown in Table 2 are ongoing, which is why there still is controversy over the optimum way to manage more complex DRFs. There is general support for 2 notions, however. First, that achieving near-anatomic reduction is important and, second, that a more severe fracture is more likely to be associated with complications. Outcomes can be poor regardless of management, perhaps because of the degree of soft-tissue damage suffered in high energy injuries.4

The solution we suggest is to describe each fracture by the characteristics listed in Table 1. If a fracture has fewer of these characteristics and the degree of disruption is less severe for each characteristic, then probably the fracture can be managed with nonsurgical measures. Minimally displaced, minimally comminuted, extra-articular Colles' fractures can be managed by casting. Moderately displaced and more comminuted extra-articular fractures that are likely to remain stable can be treated with closed reduction.

Table 3 shows approximately acceptable limits of anatomic disruption for active patients. These limits seem to correlate with persistent stability and better outcome.4 Often a fracture within these limits can be managed by casting, without reduction. A more displaced fracture should be reduced. Upper ranges of these limits might be more acceptable for older, more sedentary patients.

Table 4 shows the indications for referral. In uncertain cases the rural physician can use the characteristics in Table 1 to describe clearly the fracture on the telephone to a specialist in another community before committing the patient to a transfer. In some cases the decision to refer for surgical fixation can be made only after attempting closed reduction. An attempt should be made to reduce all displaced fractures to decrease pain and minimize ongoing soft-tissue and neurovascular injury during transfer, even if it is clear from the outset that referral will be required. The patient should be referred during follow-up if the fracture fails to maintain good position. It is possible, though not proven, that neuropathic complications such as reflex sympathetic dystrophy can be prevented with intervention, if the complication is detected early.

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Illustrative cases

Fig. 1 shows pre- and post-reduction x-rays for an active 24-year-old woman whose typical Colles' fracture was treated with closed reduction by a rural family physician. The initial x-rays

show 24° dorsal tilt instead of the normal 0 to 22° palmar tilt, radial inclination to only 14° instead of the normal 19° to 29°, about 10 mm of radial shortening, a small degree of minor comminution, no intra-articular involvement, minor ulnar displacement of the radial fragment and no ulnar or radial styloid fracture. There was a moderate degree of kinetic energy in the mechanism of injury. After reduction there was 3° of palmar tilt, restoration of dorsal cortex apposition and improvement in all the other characteristics. She had an excellent result.

Fig. 3 shows a fracture suffered by a sedentary 78-year-old osteopenic woman. She had severe dorsal tilting (36°), considerable loss of apposition of the dorsal cortex, severe loss of radial inclination (to 8°), severe radial shortening (radial length, -5 mm), comminution extending volarly beyond the mid-radial axis (visible on the oblique view which is not shown), intra-articular involvement at one location, a 1-mm step deformity, radial displacement of the radial fragment, an associated ulnar styloid fracture and no radial styloid fracture. Low kinetic energy was absorbed at the time of injury. She was referred to an urban orthopedic surgeon who inserted 2 pins. She had an excellent result at 2 months' follow-up.

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Analgesia/amnesia/anxiolysis

A variety of options are available for analgesia, amnesia and anxiolysis. In Sundre we tend to use either hematoma block with intravenous sedation, or Bier block.

- Hematoma block with lidocaine (Fig. 5 and Fig. 6). Use 5 to 10 mL of 1% lidocaine without epinephrine (toxic dose is 3 mg/kg). Insert the needle dorsally into the hematoma toward the distal forearm, about 30° to the skin. Try to get the needle tip into the fracture space by touching the fractured surface of the distal fragment. Ideally, try to get a blood flashback before injecting.
- Intravenous sedation with midazolam and fentanyl. This can be used with a hematoma block. Ensure adequate monitoring for cardiorespiratory complications while the physician is busy with reduction and casting.
- Bier block, fully described by Roberts.5
- Regional nerve blocks.
- General anesthesia.

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Closed reduction

- Prepare a bandage-padding wrap. The wrap can be placed after reduction, to make it easier to palpate the reduction with your fingers.

- Prepare a plaster or fiberglass volar splint. Be aware that more than 8 layers can cause thermal burns.

- Get an assistant to provide counter-traction above the elbow.

- Place both thumbs (Fig. 7) or one hand (Fig. 8) over the dorsal fragment and reduce in 1 of 2 ways:
    1. In an adult, apply longitudinal traction and bend the hand and wrist volarly into the reduced position.
    2. In a child, because the periosteum is thicker and stiffer, apply longitudinal traction, increase the dorsal deformity and then bend the hand and wrist volarly into the reduced position.

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Casting

- Wrap soft bandage padding on the forearm, wrist and hand, with good padding along the distal ulna (Fig. 9).

- Apply the volar splint below the elbow on the volar forearm and wrist, with the wrist in slight flexion and slight ulnar deviation (Fig. 10). Leave the metatarsophalangeal joints out of the splint and subsequent casts to allow them to move. Excessive flexion (greater than 20°) can cause median nerve compression. The forearm should be in a neutral pronation/supination position, with the palm vertical. Allow the splint to solidify while moulding with your hands. Wrap firmly enough to protect the fracture site with a supporting tensor, avoiding excessive pressure (Fig. 11). Casting and splinting alone do not hold a DRF in place.

- Obtain an x-ray to ensure the reduction is satisfactory (Table 3). This can be done before splinting if movement can be avoided after reduction.

- Instruct the patient very carefully regarding elevation above the heart, splint pressure complications and reasons for an urgent return visit (persistent or new pain, finger blanching or numbness). Advise the patient to wiggle the fingers within the splint and subsequent cast.

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Follow-up

- Plan a follow-up visit in 1 to 2 days to check the cast.

- Repeat x-rays weekly for 3 full weeks to ensure that reduction is maintained. Even an undisplaced Colles' fracture can develop radial shortening and loss of radial inclination. Slippage occurs in the first 1 to 3 weeks and begins to heal in that position by 2 to 3 weeks.

- Refer if the reduction is not maintained.

- If reduction persists, then remove the splint at 3 weeks and put in a below-elbow circular cast for 2 to 3 weeks more with the wrist in a neutral position, providing that adequate reduction is maintained. "Neutral" means no wrist flexion, extension or ulnar deviation, and no forearm pronation or supination. Like the splint, the cast should allow free movement of the metacarpophalangeal joints.

- Recognize development of painful neuropathy early. Adjust cast position promptly and consider referral if the patient continues to report pain under the cast after recasting. Some believe that reflex sympathetic dystrophy can be prevented if it is recognized early.

- Stop casting when there is radiographic evidence of healing and clinical signs that the fracture is united, but do not cast longer than 6 weeks.

- Refer if there is evidence of malunion, or if the criteria in Table 3 are not met.

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Rehabilitation

- Ensure early rehabilitation to improve functional outcome and reduce risk of reflex sympathetic dystrophy, finger stiffness and wrist pain.

- Exercises should begin during the immobilization period, particularly for free joints in the affected limb. Advise the patient to wiggle fingers in the splint and cast.

- Begin physiotherapy as soon as the final cast is removed.

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[Contents]

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