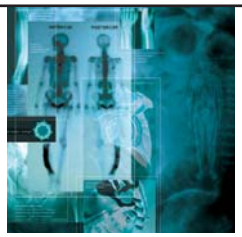

Early management of upper limb fractures in general practice

BACKGROUND Upper limb injuries are very common and patients frequently present to general practitioners for treatment. Circumstances of the injury and varied patient factors are critical to assessment. Outcome of these injuries involves short term pain control and diagnosis; fracture immobilisation, comfort and function in the treatment device medium term; and longer term, the best functional outcome.

OBJECTIVE This article aims to guide GPs through the initial assessment and early management of fractures and provides a logical, simple structure for this process. Understanding of different injury patterns and patient characteristics to assist correct overall management is emphasised and the correct timing for early follow up is discussed.

DISCUSSION Many upper limb fractures can be comprehensively managed in general practice. Bad outcomes from injuries are not uncommon and most commonly occur due to relatively minor errors in early decision making. These 'second accidents' are often completely preventable.

General practitioners are frequently confronted with injuries to the upper limb, most commonly from falls. This article focusses on upper limb fractures and the important issues relevant to correct early management.

History of injury

A careful history should consider in detail the circumstances of the accident or fall (*Table 1*). This helps predict likely injury and is essential to distinguish simple slip falls from medical causes of collapse. Isolated injury must be distinguished from an injury as a part of actual or potential multiple trauma. Patients with a severe dramatic and painful injury can be distracted, often resulting in other injuries of significance being initially overlooked. Simple enquiry about other possible injury often unearths unusual replies. 'My neck is also a bit sore' may be the only clue to an otherwise unsuspected spinal injury.

Other history

Hand dominance, occupation, pastimes and home circumstances are critical information that may affect early management decisions. Socially isolated people with minor dominant hand injuries frequently need extra community supports or brief hospital admission. Past medical history, medication and allergy history are important to assist decisions especially regarding appropriate analgesia. Analgesic requirement should always be explored individually. Pain perception, self administered analgesics before consultation and prior experience with pain and analgesics often influence decisions of type, strength and method of administration.

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Table 1. History of injury

Why the fall occurred?	'Simple slip', medical causes, intoxication
When the injury occurred?	Delay may change management or suspect child abuse
Where the injury occurred?	Home, work, high speed car accident
How the injury occurred/ mechanism of injury?	This often predicts likely injury and its consistency with stated cause
What force was involved?	Large force increases risk of more severe orthopaedic injury

Have you any other injury from the fall/incident?

Table 2. Examination of isolated upper limb trauma

1. Any swelling or deformity?
2. Intact skin?
3. Define likely site of fracture
4. Look for possible second injury in same limb
5. Examine joint above and below area of likely injury
6. Check circulation
7. Check sensory and motor function

Table 3. Analgesic options

Temporary splints	
Elevation	
Drugs	
Paracetamol	15–20 mg/kg orally
Codeine	1 mg/kg orally
Ibuprofen	10 mg/kg orally
Morphine	0.2 mg/kg intramuscularly
Pethidine	1 mg/kg intramuscularly

Table 4. Recommended early referral to hospital

- Compound fractures
- Amputations
- Grossly deformed fractures requiring manipulative reduction
- Suspected fracture dislocations (eg. Monteggia fracture)
- Actual or suspected high risk vascular compromise (eg. elbow swelling possible supracondylar with absent radial pulse)
- Neural compromise (especially where exploration or reduction can improve outcome)
- Patients who will not manage in the community for social reasons

Table 5. Causes of failure to diagnose fractures with imaging

Failure to X-ray

Failure to image the joint above and below the suspect area

Failure to get adequate views

Failure to see fractures - obvious or subtle

Failure to recognise soft tissue changes suggesting fracture (eg. sail sign at the elbow from effusion)

Acceptance that normal X-ray equals no fracture

Failure to repeat X-rays with persistent pain

Failure to image both sides in cases of doubt, eg. epiphyseal injury near elbow in child

Failure to seek advanced imaging if persistent doubt

Figure 1. Classic examination of anatomical snuff box for scaphoid tenderness

Figure 2. Palpating in another direction for scaphoid tenderness on volar aspect of hand

Figure 3. Compressing for scaphoid tenderness by pushing thumb and first metacarpal toward radius

Examination

Defining the likely injury and its location by examination is critical (*Table 2*). Localisation of pain by the patient may be significantly above or below the injury, eg. forearm or elbow with shoulder injury. Localisation of bony tenderness is important to ensure imaging of the correct area.

When gross deformity suggests an obvious fracture, direct palpation of the deformed area is not necessary, as management is not changed. When absent, look at and palpate the whole limb comparing to the opposite side if necessary. Specifically seek bony tenderness to assist the decision to X-ray. Palpating the bone in different directions can assist doubtful bony tenderness. This technique can be used on most bones but is demonstrated and particularly

Figure 4. Active extension of wrist testing radial nerve motor function

Figure 5. Active opposition of thumb and forefinger testing median nerve motor function

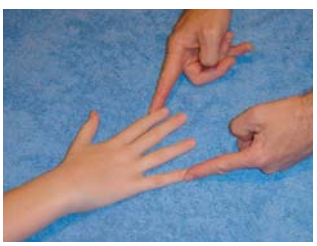

Figure 6. Abduction of fingers testing ulna nerve motor function

helpful in assessment of the scaphoid bone (*Figure 1–3*). Palpate and evaluate the joint above and below any suspected fracture closely. Assess circulation by presence of pulses and capillary return distal to the injury. Sensory and motor function for radial, ulna and median nerves tested in the hand is usually sufficient for most injuries distal to the shoulder area (*Figure 4–6*). Axillary nerve function should also be tested when the shoulder and upper humerus are involved (*Figure 7*). Use of a wooden spatula that has been broken in two is a suitable clean tool for sensation testing.

In infants and young children who present extremely distressed but with no obvious deformity or swelling, clinical localisation is often almost impossible. Parenteral analgesia with narcotics followed by a deferred examination looking for reproducible tenderness in one area can often assist in this situation.

Figure 7. Testing axillary nerve sensation (chevron patch) over insertion of deltoid

Figure 8. Temporary wrist splint from magazine and crepe bandage

Early management

Appropriate analgesia tailored to the individual patient and injury should be given (*Table 3*). Intravenous titration of parenteral narcotics is considered ideal in a hospital environment but is not practicable in a busy general practice. Compound wounds ideally should be irrigated with sterile water or normal saline to remove gross contamination and covered with a sterile dressing.

Temporary splinting greatly improves patient comfort and may prevent conversion of closed to compound fracture during transport. This may be a simple sling or a temporary splint (*Figure 8*).

Ice is variably reported by patients to assist pain and is of proven benefit for soft tissue injuries.

An early decision on whether to image locally and continue management by the GP should be made. This will depend on the local medical environment, time of day and expertise of the GP. Recommendations for early referral are listed in *Table 4*.

Imaging

A low threshold to imaging is necessary with plain X-rays the usual modality. Failure to diagnose occurs for several reasons and these are listed in *Table 5*. On X-rays the fracture should be sought. Fractures are not always visible in all planes so a line visible in a single film may be all that is seen. A clear disruption of the continuity of the cortex is usually diagnostic. Greenstick fractures in adolescents are often more subtle and may only be evident as a minor irregularity or 'buckle' in the area of tenderness.

X-rays are not always diagnostic in the first few days postinjury and if there is a clinical suspicion of fracture then management should be as if a fracture is present. Repeat examination for bony tenderness and repeat X-ray at 7–10 days postinjury will usually confirm previously suspected fractures. By this time, resorption of bone from the fracture site makes any fracture visible.

If a fracture is seen, always consciously examine the rest of the film looking at other bones for fractures or dislocations. Fractures in more than one bone and associated dislocations are common in the forearm and the carpus

region. History of high force or high velocity injury increases dramatically the likelihood of second and associated injuries.

Advanced imaging techniques such as computerised tomography (CT) and magnetic resonance imaging (MRI) do not have any significant place in the early assessment of most upper limb fractures. They can sometimes assist in cases of doubt when repeat X-rays at 10 days postinjury have not diagnosed a suspected fracture.

Diagnostic formulation

History, examination and X-rays are used together to arrive at a diagnosis. If an obvious fracture is not discovered on X-ray, but there is strong clinical suspicion, always discuss with the patient and treat as if an undisplaced fracture is present. Classically this is described for scaphoid fractures but also applies to all other bones. Children and adolescents with distal forearm fractures commonly present in this way. Sprains of the wrist are very uncommon especially in this age group. Reassessment as described above at 7–10 days postinjury will provide clarification in most cases.

Early definitive treatment

After the above has been carried out, a provisional or definite diagnosis of fracture should have been made. Treatment of each individual fracture is beyond the scope of this article but information is readily available in the literature. Broad principles of treatment are outlined in *Table 6*. The following case histories provide

Table 6. Principles of upper limb fracture treatment

- Immobilise as necessary fracture site with plaster cast/sling/collar and cuff
- Encourage mobility of limb when appropriate and unaffected joints after initial rest
- Elevate on pillows or with sling for the first 48 hours
- Analgesia
- Day after follow up visit
- Give plaster cast instructions to all patients with plaster
- Early referral if required
- Follow up at appropriate intervals
- Follow progress radiologically at appropriate intervals
- After healing and removal of cast advise on re-injury risk
- Rehabilitate to best function

Case history – James Kamikaze

James Kamikaze, 8 years of age, falls directly onto his right elbow off a swing at school. He presents to his GP who makes a diagnosis of a minimally displaced supracondylar fracture. His elbow is moderately swollen and circulation is normal.

James is placed in a long arm plaster slab, pulse is normal after application and he is admitted under his GP for circulation observations. At 2 am, the night supervisor rings to explain some concern that James' pain is increasing despite analgesia, that he can't move his fingers, and his capillary return is greater than 4 seconds but, surprisingly, he still has radial pulse.

The GP recognises a potential early compartment syndrome from the classic findings above. He advises that all bandages and slab be removed and the arm rested in a position of comfort elevated on pillows. He asks the supervisor to ring in half an hour with a progress report. There is dramatic improvement and a potentially limb threatening compartment syndrome from constricting bandages and slab has been avoided. Loss of pulse is not always present in compartment syndrome. The GP advises a collar and cuff with elbow flexed as much as able within limits of pain while maintaining radial pulse and continued overnight observation.

Lesson

Supracondylar fractures are a high risk for compartment syndrome. Encircling plasters or bandages increases this risk.

Case history –Trevor Petrolhead

Trevor Petrolhead has crashed his motorbike at an admitted 160 km/hour on a rural highway. He has surprisingly few injuries after thorough assessment. The major injury is a closed left wrist injury that is causing great pain. It is swollen and tender over the scaphoid area. He has numbness in median nerve distribution. X-rays are unreported but on your viewing he has a displaced scaphoid fracture. You are unsure but the carpus looks unusual. In view of Trevor's high velocity injury, odd X-rays, his severe wrist pain and median nerve signs you refer him to the regional trauma centre. The hand surgeon from the hospital rings you the next morning congratulating you on your referral. Trevor has a perilunate dislocation as well as his obvious scaphoid fracture which has been treated successfully. The hand surgeon comments that these are often missed with subsequent bad outcome.

Lesson

High velocity injury can be severe. After seeing one injury on X-ray, search for other known associated injuries.

Case history – Ethan Rocket

Ethan Rocket is 6 feet tall and 14 years of age. He fell onto his right hand at football. He sustains an undisplaced greenstick fracture of distal radius and ulna. He is placed in a correctly moulded short arm plaster. He is reviewed the next day and presents in 5 weeks for removal of the plaster.

The plaster is removed and to the GP's surprise there is now a marked 'dinner fork' deformity present. X-ray confirms 45 degrees of dorsal angulation but excellent union. The GP can't explain it, but requests an urgent orthopaedic opinion.

Lesson

Undisplaced fractures, including greenstick fractures, can and do shift in correctly applied plaster casts. Regular X-rays for the first few weeks are essential to monitor these fractures until callus formation. If displacement is picked up early, urgent closed manipulation can usually rectify any problems.

Figure 9. Correct long arm plaster immobilisation of distal forearm injury in a child less than 12 years of age

Case history – Brenda Fender

Brenda Fender, 8 years of age, fell from the 'monkey bars' at school on Thursday. She has an undisplaced distal radius and ulna fracture of her dominant arm. You place her in a short arm cast and ask to review her in a week. At review her mother tells you that she was in a lot of pain over the weekend so was taken to the local hospital. The doctors put her in a long arm plaster and repeated the X-rays. She has been pain free since this manoeuvre. This puzzles you.

Lesson

A short arm plaster cannot adequately immobilise distal forearm fractures in children. This is because the cross section of their arms is round. Adult arms are more like rectangles with rounded edges allowing three point moulding to hold the desired position. Children's arms rotate in short arm plasters causing marked pain and also greatly increased risk of movement of the fracture. Age less than 12 years usually requires long arm immobilisation (*Figure 9*).

Case history – Mabel Bull

Mabel Bull, 80 years of age, is a fiercely independent widow who lives alone. She has a slip fall and sustains an impacted neck of humerus with minimal displacement on the right side. Mabel fails to return for a planned follow up visit at 5 days. The GP asks the receptionist to contact her for another appointment, but again Mabel fails to turn up. Mabel eventually presents 4 weeks after the fall. She has not moved her shoulder over this time, religiously keeping it in a sling as it is painful.

The GP assesses her range of movement and finds it very poor. Mabel admits she is having trouble coping. The fracture is healed at 6 weeks but she takes 2 years to recover reasonable function despite intensive physiotherapy. During this time with maximal community services she is unable to care for her house or self and is admitted to a hostel.

Lesson

Some simple fractures require mobilisation at an early time in their management to optimise functional outcome. Great care should be made to ensure these simple things happen. Reasons for attending follow up when requested for time critical interventions should be emphasised to patients.

Case history – Lois Legend

Lois Legend, 18 years of age, is a right handed sculptor and potential national netball player. She has fallen playing netball on Friday night and sustained a comminuted distal radial fracture with intra-articular extension to the right wrist. There is a 4 mm step in the joint surface and you anticipate surgery. You place a widely split cast and ring the local hand surgeon who is not answering his phone. You review Lois the following day and there are no plaster problems. You ask Lois to ring the surgeon's rooms first thing Monday for an urgent appointment. Unknown to you, he is away for 2 weeks and sees Lois almost 3 weeks postinjury. At this stage he feels attempts to operate are likely to worsen any outcome; potential fusion of the wrist joint at a later date is discussed.

Lesson

A window of opportunity for manipulation or surgical correction typically occurs in the first week after injury. Referrals where surgery is anticipated or fractures have some possibility of loss of adequate position should occur in this period to ensure the best outcome. Patients are not always aware of these implications and may consider an urgent appointment some weeks hence as reasonable. The GP must ensure that an appropriately timed appointment is made.

illustrative 'real life' case studies of common pitfalls for GPs who may treat common fractures. Names have been changed to protect identities.

Conflict of interest: none declared.

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