Diagnostic Imaging Pathways - Paediatric, Elbow Injury

Population Covered By The Guidance

This pathway provides guidance on imaging children with elbow injuries.

Date reviewed: July 2014

Date of next review: 2017/2018

Published: July 2014

Quick User Guide

Move the mouse cursor over the PINK text boxes inside the flow chart to bring up a pop up box with salient points.
Clicking on the PINK text box will bring up the full text.
The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

Pathway Diagram

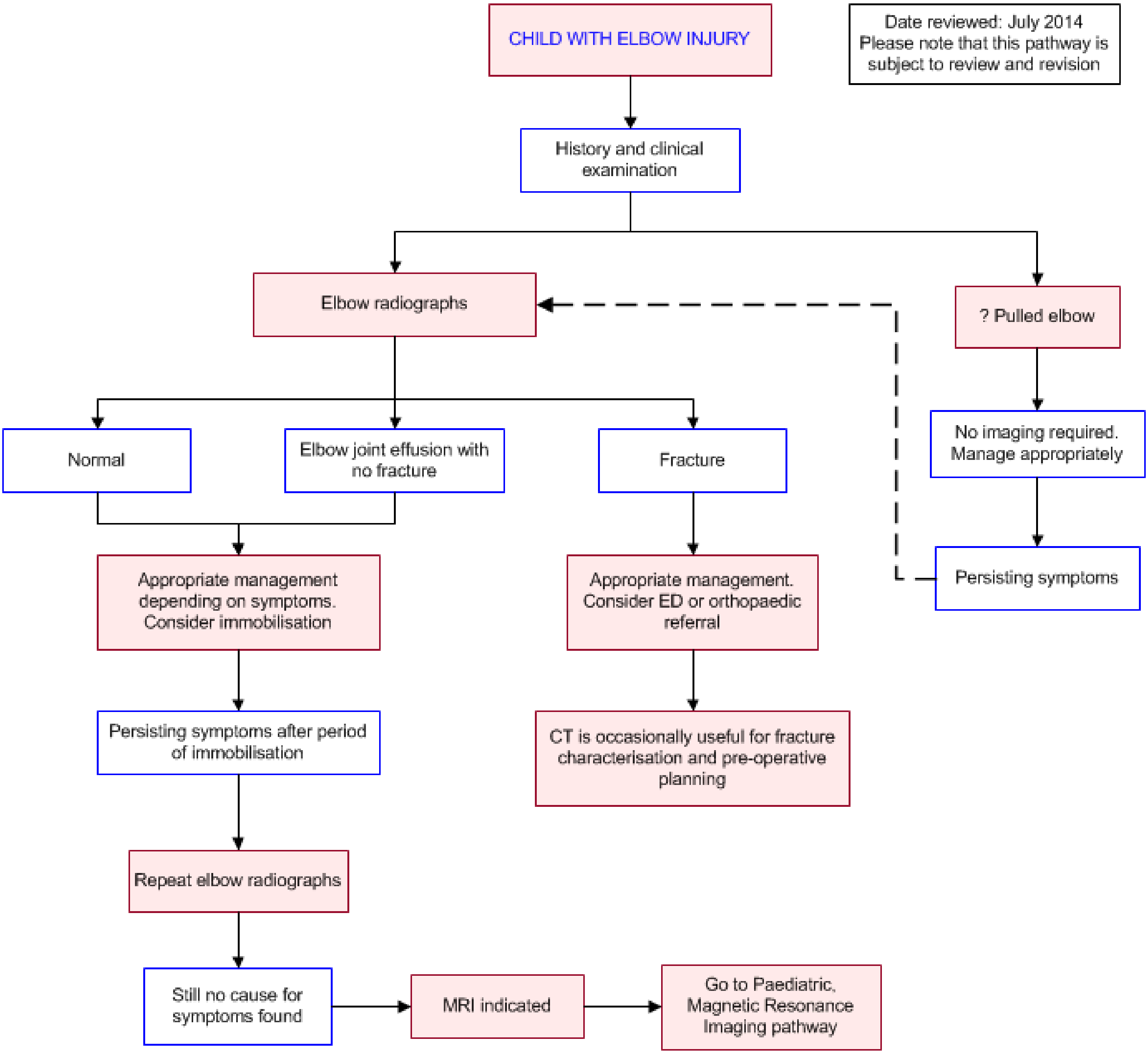

Image Gallery

Note: Images coming soon

Teaching Points

- Trauma to the paediatric elbow is common, and there is a higher incidence in this population compared with adults

- Children instinctively protect themselves by using outstretched hands when they fall. 75% of all paediatric fractures occur in the upper extremity 1
- Unrecognised fractures may result in permanent neurovascular deficit and growth disturbances
- Radiographic imaging is commonly used to assess elbow injuries

Plain Radiographs

- Plain radiography of the elbow is the investigative mainstay for assessing elbow injuries in children in the acute and sub-acute setting
- Interpretation is complicated by the relative radiolucency of the cartilaginous anatomy and complex nature of epiphyseal growth. Although ossification centres generally develop in sequence, there is variability with gender and race
- Standard views are antero-posterior & lateral projections of the elbow. Additional oblique views and comparison views of the opposite limb may also aid assessment. Stress views using valgus-stress can provide additional information on the ligamentous integrity of the joint in the sub-acute and chronic setting 2
- In many cases, particularly those involving high-energy trauma, fractures may be readily apparent
- When no fracture is apparent, radiographic findings such as the presence of a joint effusion or displacement of the fat pads can raise the suspicion of an occult fracture
- Occult fractures are found in 80% of patients with isolated posterior fat pad displacement on initial or follow-up radiographs 3
- The sensitivity and specificity of plain radiographs for detecting elbow fractures has been documented as 64-71% and 56% respectively 4,5
- Whilst MRI scans detect more injuries than radiographs, the vast majority of these will make no difference to patient management or outcome

Computed Tomography (CT)

- Multidetector computed tomography (MDCT) allows rapid scanning times, multiplanar and 3D reconstruction and, unlike MRI, is readily available and generally does not require sedation or general anaesthesia
- Due to its excellent resolution of bony structures, MDCT may be used for fracture characterisation and for pre-operative planning of complex fractures
- A major limitation is the radiation dose which is of particular concern in the paediatric population. However, dose reduction techniques and low-dose protocols can substantially reduce the radiation exposure 6
- Chapman et al found that MDCT was highly sensitive and specific (92%, 79% respectively) for detecting radiographically occult fractures of paediatric elbows 7

Magnetic Resonance Imaging (MRI)

- Magnetic resonance imaging has the advantages of no ionising radiation, excellent soft tissue resolution and capable of multi planar reconstructions
- Rarely would an MRI scan be required. Whilst MRI may detect additional injuries these rarely change management
- MRI is able to evaluate a spectrum of injuries not visible on plain radiographs. These include injuries to the soft tissues, cartilage/epiphyses and bone contusions

- Disadvantages include costs, limited access and the need for sedation or general anaesthesia for young children
- There have been a number of case series examining the use of MRI in paediatric patients with elbow trauma. In general, MRI has been used when plain radiographs are equivocal or demonstrate an effusion only
    - Griffith et al studied 50 paediatric patients with moderately severe elbow trauma not requiring immediate surgery. They found radiographically occult fractures in 22% and radiographically occult transphyseal or physeal injury in 19%. However MRI findings did not result in any change in treatment 4
    - Wei et al studied children with little league elbow and, whilst MRI demonstrated more abnormalities compared with radiographs, these did not change clinical management 8
    - Pudas et al studied 25 consecutive paediatric patients with elbow trauma. In those patients with a radiographic joint effusion but no fracture, MRI confirmed occult fracture in 8 of 9 patients and led to a change in management of 4 of the 9 patients. Three of these involved putting the patient in a cast although one had septic arthritis subsequently diagnosed after a fracture was excluded 5
    - Major et al studied 13 consecutive paediatric & adult patients with elbow trauma & radiographic joint effusion. 4 of the 7 children demonstrated occult fractures. All patients demonstrated bone marrow oedema 9
    - Carey et al studied 14 patients with documented or suspected growth plate fractures of the upper and lower limbs. The MRI findings changed the diagnosis in 7 of 14 patients and management in 5 patients 10
- MR and CT Arthrography are advanced joint imaging studies where contrast is injected directly into the joint space to study the internal architecture of the joint. These are reserved for conditions like capsular and ligamentous injuries, intra-articular loose bodies, focal cartilaginous abnormalities and elbow dislocations. These conditions tend to be associated with young athletes 12

References

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