Diagnostic Imaging Pathways - Head Injury (Adult)

Population Covered By The Guidance

This pathway provides guidance on imaging patients with a recent head injury. The Canadian CT Head Rules have been used to formulate the guideline.

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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

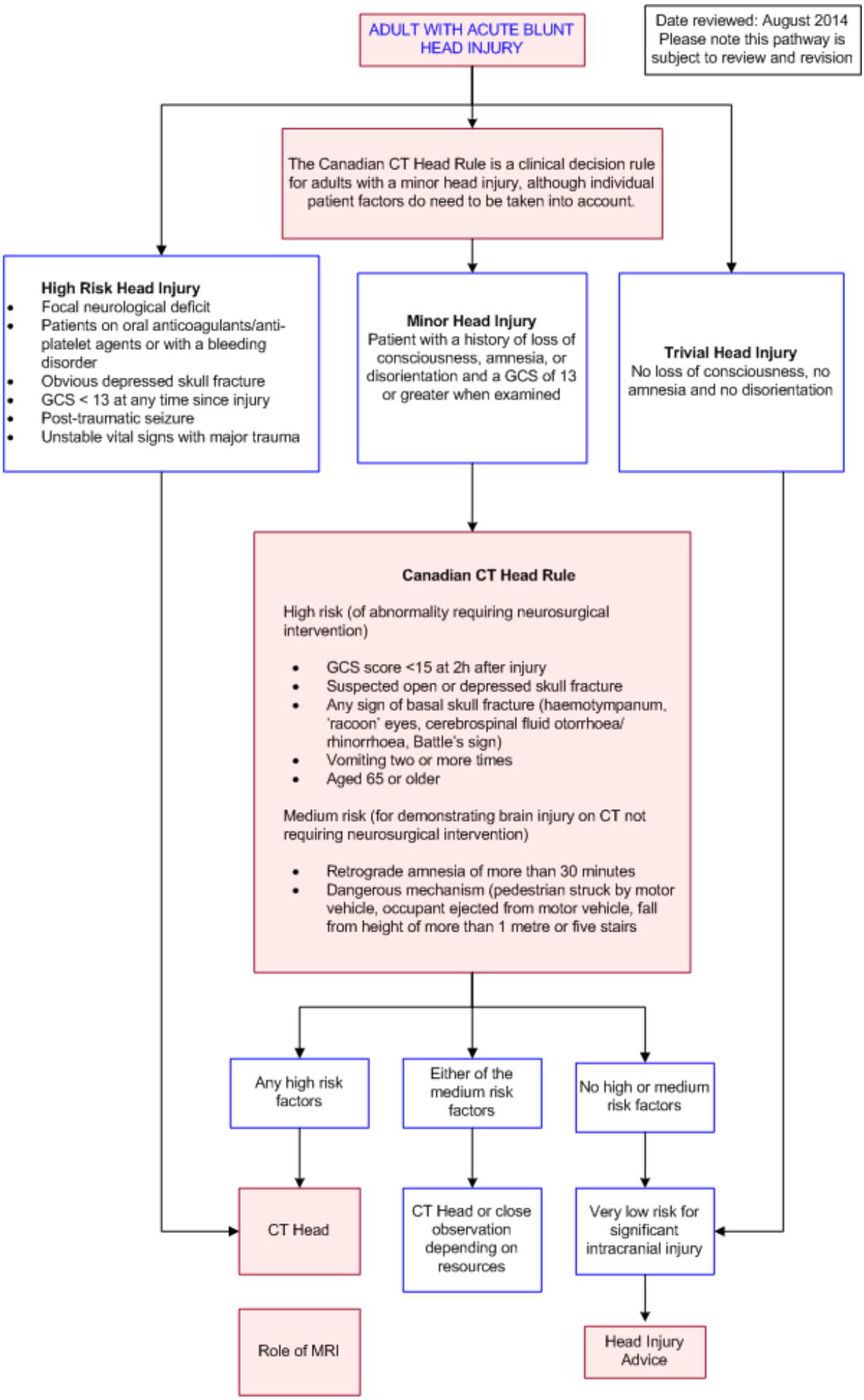


Image Gallery

Note: These images open in a new page

1

Subdural Haematoma

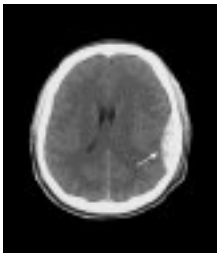
Image 1 (Computed Tomography): Acute post-traumatic right fronto-parietal subdural haematoma with midline shift showing the typical crescent shape (arrow).

2

Bilateral Chronic Subdural Haematoma

Image 2 : Post-mortem specimen of the dura matter peeled back to reveal old haematoma within the subdural space (arrow).

3



Extradural Haematoma

Image 3 (Computed Tomography): Acute traumatic left extradural haematoma (arrow) showing the typical lens or convex shape with compression of the lateral ventricle.

Pathology images courtesy of PathWest Laboratory Medicine.

Teaching Points

- Certain clinical findings mandate immediate CT head - focal neurological deficit, patients on anticoagulation or suffering with a bleeding diathesis, penetrating skull injury, depressed skull fracture, < GCS 13 at any time since injury, post-traumatic seizure, unstable vital signs with major trauma
- Patients with a history of LOC, amnesia/disorientation and a GCS > 13 must be further risk assessed based on clinical findings. Observation or CT head may be indicated
- Patients with no LOC, amnesia or disorientation and GCS 15 can be safely discharged with advice and into the care of a responsible individual

Head Injury Advice

- The following advice has been adapted from the NICE (National Institute for Health and Care Excellence) Guidelines and the Royal Perth Hospital Emergency Department Head Injury Advice Form 1
- Patients are advised to seek immediate medical attention if the following symptoms develop within

a week post head injury
    - Disorientation, confusion, drowsiness for more than an hour, lack of awareness, gradually increasing dullness, or reduced conscious level
    - Any difficulties in understanding or speaking
    - Unequal pupils of the eye, blurred vision, loss of vision in one or both eyes
    - Onset of fits or seizures
    - Severe and continued headache
    - Any vomiting
    - Weakness in one or more arms or legs
    - Difficulties with walking or maintaining balance
    - Clear fluid coming out from your ear or nose
    - Bleeding from one or both ears
    - Onset of hearing difficulties
    - Any other marked changes

Canadian CT Head Rule

- The Canadian CT Head Rule was prospectively derived on 3121 patients who had a minor head injury, defined as a GCS of 13 or greater with witnessed loss of consciousness, disorientation or definite amnesia 2-4
- The authors found that patients with minor head injury could be classified into two levels of risk. Those with one of the five high risk factors are at substantial risk for neurosurgical intervention and CT is considered mandatory in these cases 2-4
- Patients with either of the two medium risk characteristics could have a clinically important brain injury that would be seen on CT but are not at risk for needing neurosurgical intervention. The authors concluded that these patients could be managed with CT or close observation depending on local resources 2-4
- Prospective validation was carried out in Canada and reported a sensitivity of 100% and a specificity of 52.1% for clinically important brain injury 5
- External validation of the Canadian CT Head Rule has been disappointing. A Dutch study of 3181 consecutive patients reported a sensitivity for predicting neurosurgical intervention of 100%, but a sensitivity of only 84.5% for clinically important brain injury. Similarly, a retrospective study of 240 patients in Australia found that two of ten clinically important brain injuries would have been missed if the Canadian CT Head Rule had been applied 6,7
- The CCHR has been found to perform variably better than the New Orleans Criteria(NOC) in trials that have compared the two depending on what particular accuracy measure was analysed. 8,9 In an external validation of the CCHR and the NOC, the CCHR was found to have a lower sensitivity than the NOC for neurocranial or clinically important CT findings 6
- Despite this the CCHR remains the most widely research decision rule and compared to other decision rules remains the most widely validated combined with high sensitivity and acceptable specificity 10,11
- The NICE Head Injury Guidelines (National Collaborating Centre for Acute Care - National Institute of Clinical Excellence) also recommends CT imaging for patients with post-traumatic seizure or a GCS of less than 13 at any time since injury 13
- A recent Austrian trial 12 found that by using different parameters to that of the CCHR for the assessment of high-risk patients sustaining mild head trauma a better sensitivity was achieved 90% versus 80 %. External multi centre validation is required to assess the results of this trial better

Computed Tomography (CT) Head

- Generally considered the most appropriate first line investigation for patients with head injury
- Is able to detect scalp, bone, extra-axial haematomas and parenchymal injuries 13
- There have been a number of guidelines developed for the use of CT in head injury with various recommendations. The Canadian CT Head Rule is generally considered the best of these guidelines 2
- Although skull x-rays have been historically advocated as a first line investigation they are now rarely used because of the lack of correlation between a skull fracture and a significant intracranial haematoma 14, 15
- As CT is widely available and relatively inexpensive many hospitals are now using CT as a means of rapidly determining those patients with minor head injuries who can be safely discharged versus those who need admission or neurosurgical opinion 16-19
- There have been some reported cases of patients who have had a normal head CT and subsequently developed an intracranial haematoma. 20,21 The evidence in the literature suggests that the probability of life-threatening complications after a normal CT is minimal. 22,23 Clinical caution should be exercised in those on anticoagulation/antiplatelet agents which are associated with increased risk of developing intracranial haemorrhage following trauma 24,25
- Information for consumers on CT InsideRadiology

Magnetic Resonance Imaging (MRI)

- May be used in the subacute setting to evaluate patients with unexplained neurological deficits
- MRI is superior to CT in identifying diffuse axonal or shear injury and small intraparenchymal contusions 26,27
- Magnetic resonance angiography may be used in some patients to assess for arterial injury or venous sinus occlusion
- Disadvantages
    - Insensitive to acute subarachnoid or parenchymal haemorrhage, and fracture compared with CT 13,26
    - Limited role in the acute setting due to long acquisition times and difficulty in performing a scan of the critically ill patient who may require life support systems
    - Certain absolute indications; e.g. pacemaker
- Information for consumers on MRI InsideRadiology

References

Date of literature search: July 2014

The search methodology is available on request. Email

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. Download the document

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Information for Consumers

Information from this website	Information from the Royal Australian and New Zealand College of Radiologists' website
Consent to Procedure or Treatment Radiation Risks of X-rays and Scans Computed Tomography (CT) Magnetic Resonance Imaging (MRI)	Computed Tomography (CT) Magnetic Resonance Imaging (MRI) Radiation Risk of Medical Imaging During Pregnancy Radiation Risk of Medical Imaging for Adults and Children

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