

# Diagnostic Imaging Pathways - Thoraco-Lumbar Spine Trauma

## Population Covered By The Guidance

This pathway provides guidance on the imaging of adult patients at risk of thoraco-lumbar spine injury following trauma.

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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



Date reviewed: December 2018  
 Please note that this pathway is subject to review and revision

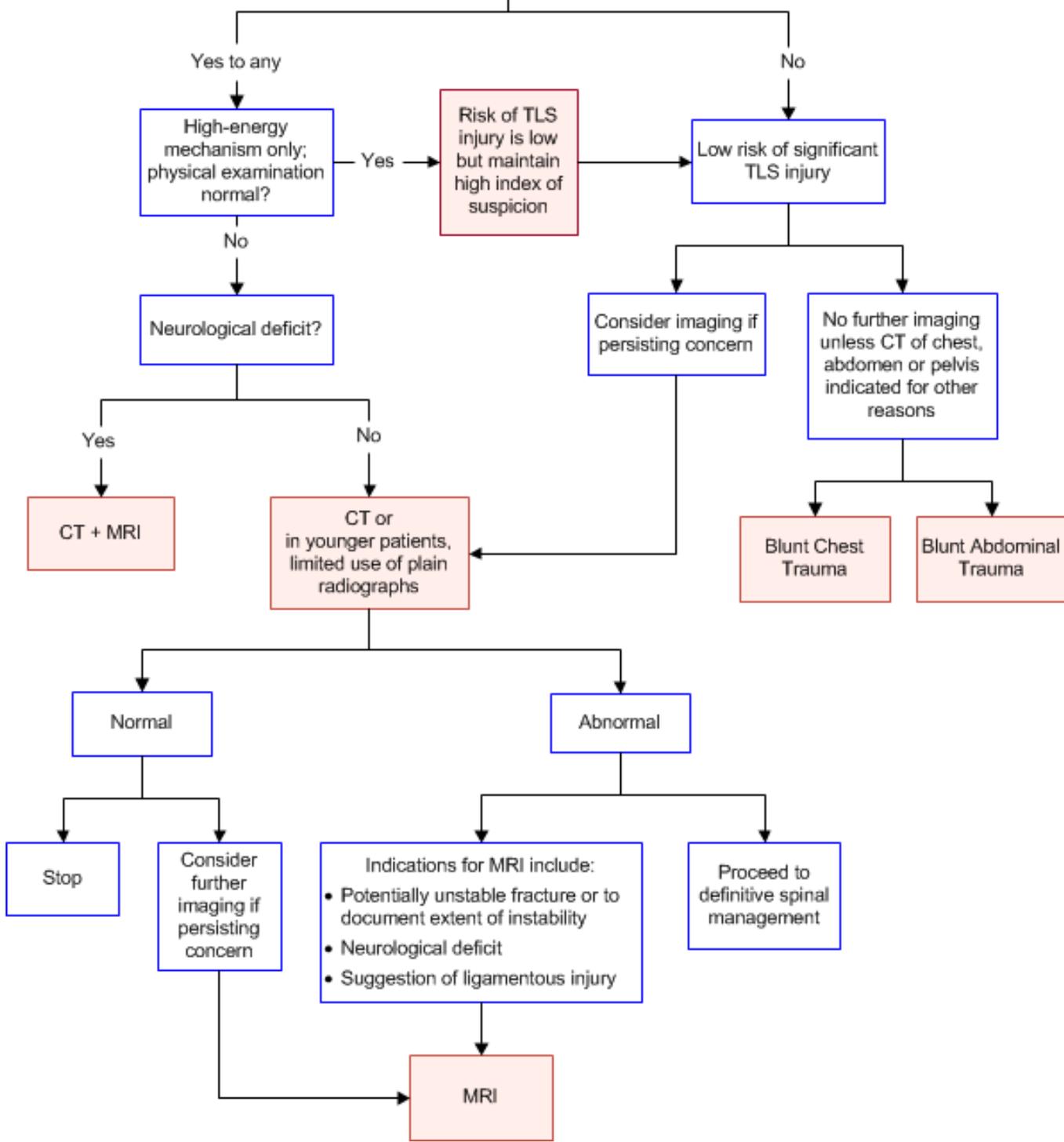
## THORACO-LUMBAR SPINE TRAUMA

Any of the following present?

- High-energy mechanism of injury\*
- TLS tenderness on examination
- Neurological deficits consistent with TLS injury
- Concomitant c-spine injury
- Altered mental state or intoxication
- Painful distracting non-spinal injury

\*High-energy mechanisms include:

- Falls >3m
- Motor vehicle crash with ejection or high-velocity
- Pedestrian vs motor vehicle
- Motor cycle crash
- Other high velocity injuries



## Image Gallery

*Note: Images coming soon.*

## Teaching Points

- Indications for imaging in thoracolumbar spine (TLS) trauma include:
  - High-energy mechanism of injury
  - Neurologic signs consistent with TLS injury
  - Back pain or pain on palpation
  - Concomitant c-spine injury
  - Altered mental status
  - Evidence of intoxication with ethanol or drugs
- High-energy mechanisms of injury include:
  - Falls from significant height (> 10 feet or 3m)
  - Motor vehicle crash with ejection or high-velocity
  - Motor cycle crash
  - Pedestrian vs motor vehicle
  - Other high-velocity injuries
- CT is now the preferred initial imaging modality for TLS
- Plain radiographs may be used in younger patients to avoid radiation exposure, followed by MRI where required
  - Targeted CT should be considered for imaging suspected injuries of the upper thorax, across the shoulder girdle or at the cervicothoracic junction as these may be missed on plain radiographs
- MRI is indicated for patients with neurologic deficits as well as when clinical suspicion is high despite a normal CT scan. MRI should be undertaken in consultation with a trauma specialist, including trauma surgeon, spinal surgeon or emergency medicine consultant

## Thoraco-Lumbar Spine (TLS) Injury

- Imaging is indicated for TLS injury with if any of the following are present: [1](#)
  - Back pain or TLS tenderness on examination
  - Neurologic deficits referable to the TLS
  - Concomitant cervical spine fracture
  - Altered mental state or intoxication
  - Distracting non-spinal injuries, **or**
  - Known or suspected high-energy mechanisms
- There is a high incidence of spinal injuries at multiple levels in blunt trauma patients. CT evaluation of the whole spine should be considered in patients with known injury to the cervical spine, or any other region of the spine [1](#)
  - Noncontiguous fractures occur in 10-30% of patients with a spinal column fracture; they are generally associated with other severe injuries and high-energy mechanisms [2-5](#)



- Of patients with c-spine fractures, up to 21.5% and 10% have concomitant thoracic and lumbar spine fractures respectively [2](#)
- However, concomitant occult injuries are rare when isolated C-spine fractures are sustained from low velocity trauma [6](#)
- It has been previously accepted practice to clinically clear the thoraco-lumbar spine in trauma patients with no spine tenderness, no altered mental status and no distracting painful injury. This method detects clinically significant TLS injuries with sensitivity 78.6-96.6% of and specificity 49.1-83.4% [7,8](#)
  - Up to 7-21% TLS injuries will have no tenderness, particularly thoracic fractures, [5,7,8](#) so there is evidence to support screening in all patients with high-energy mechanism regardless of examination findings [5,9-11](#)
  - Age over 60 years was also significantly associated with TLS injury [9](#)
- Mechanisms of injury that have been correlated with TLS fractures include falls greater than 10ft (3m), ejection from a motor vehicle, motorcycle crashes, high-velocity injuries and pedestrians struck by motor vehicles [1](#)
  - The mean collision speeds of patients sustaining thoracic and lumbar spine injuries has been reported as 40 km/h (compared with 17.3km/h mean speed of all motor vehicle accidents) [12](#)
- Nonspinal traumatic injuries may be a distraction to the physical examination of the spine, but also a marker of the severity of mechanism [1](#)

## Computed Tomography (CT)

- Multi-detector CT is the preferred imaging modality for TLS injury in trauma [1,13](#)
- Older studies have reported sensitivities of 95-100% for thoracic and lumbar fractures and specificities of 97-100%. [14-22](#) Newer CT scanners have even higher resolution with faster acquisition time
- In comparison, plain radiographs may miss fractures. Reported sensitivities range from 33-75% with specificities of 72-100%. [14-21](#) The sensitivity of radiographs is generally lower for thoracic fractures compared with lumbar fractures
- CT has the advantage of being able to evaluate multiple injuries, such as visceral and vascular injuries in the abdomen and thorax. If trauma patients with multiple injuries are undergoing contrast-enhanced CT scanning as part of an evaluation for visceral injury, the spine can also be evaluated with no additional scan time, radiation, or patient movement [23](#)
- Disadvantages include radiation exposure and cost. Intravenous contrast is not required for evaluation of bony structures but improves the evaluation of visceral injuries
- Infrequently injuries may be occult on CT but demonstrated on MRI. [24,25](#) If there is still clinical concern for a fracture despite normal CT, MRI should be considered

## Magnetic Resonance Imaging

- MRI is indicated to evaluate patients with neurologic deficits referable to a thoracolumbar spine injury, even if CT is unremarkable, and to further assess injuries on CT that are suggestive of neurologic involvement [1](#)
- CT and MRI are complementary examinations
- MRI is useful to evaluate soft tissues that are not well visualised by CT including the spinal cord, ligamentous injuries, haematomas and disc involvement as well as facet joint involvement [24,25](#)
- MRI does not involve exposure to ionising radiation

- Limitations:
  - Longer acquisition time, not suitable for unstable patients
  - Contraindicated in the presence of non-MRI compatible prostheses/implants
  - May not be tolerated by claustrophobic patients

## Plain Radiography

- Plain radiographs may be performed instead of CT in select cases, particularly in younger patients where avoiding radiation is desired, and where cross-sectional imaging of the chest/abdomen is not otherwise indicated to evaluate other injuries
- Plain radiographs may miss a small proportion of significant injuries [1](#)
- Because of this, normal radiographs should be followed by a screening MRI of the whole spine if there is persisting clinical concern
- Plain radiographs have a reported sensitivity of 33-75% for all thoracolumbar fractures, with specificities of 72-100%, compared with CT which has reported sensitivities of 95-100% and specificities of 97-100% [14-22](#)
  - The majority of fractures that are missed on plain radiographs are transverse or spinous process fractures, however there is a small proportion of unstable fractures that may be missed
- Importantly, plain radiographs are less sensitive for thoracic fractures than lumbar fractures. [15](#) In particular, vertebral body fractures may be missed in the upper thoracic region, across the shoulder girdle or at the cervicothoracic junction. Targeted CT should be considered if the injury is in this area
- Observational studies have suggested that plain radiographs are not required in patients in the absence of high-energy injury mechanism, back pain, neurological deficits, altered mental state or distracting injury [5,10,11](#)

## References

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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