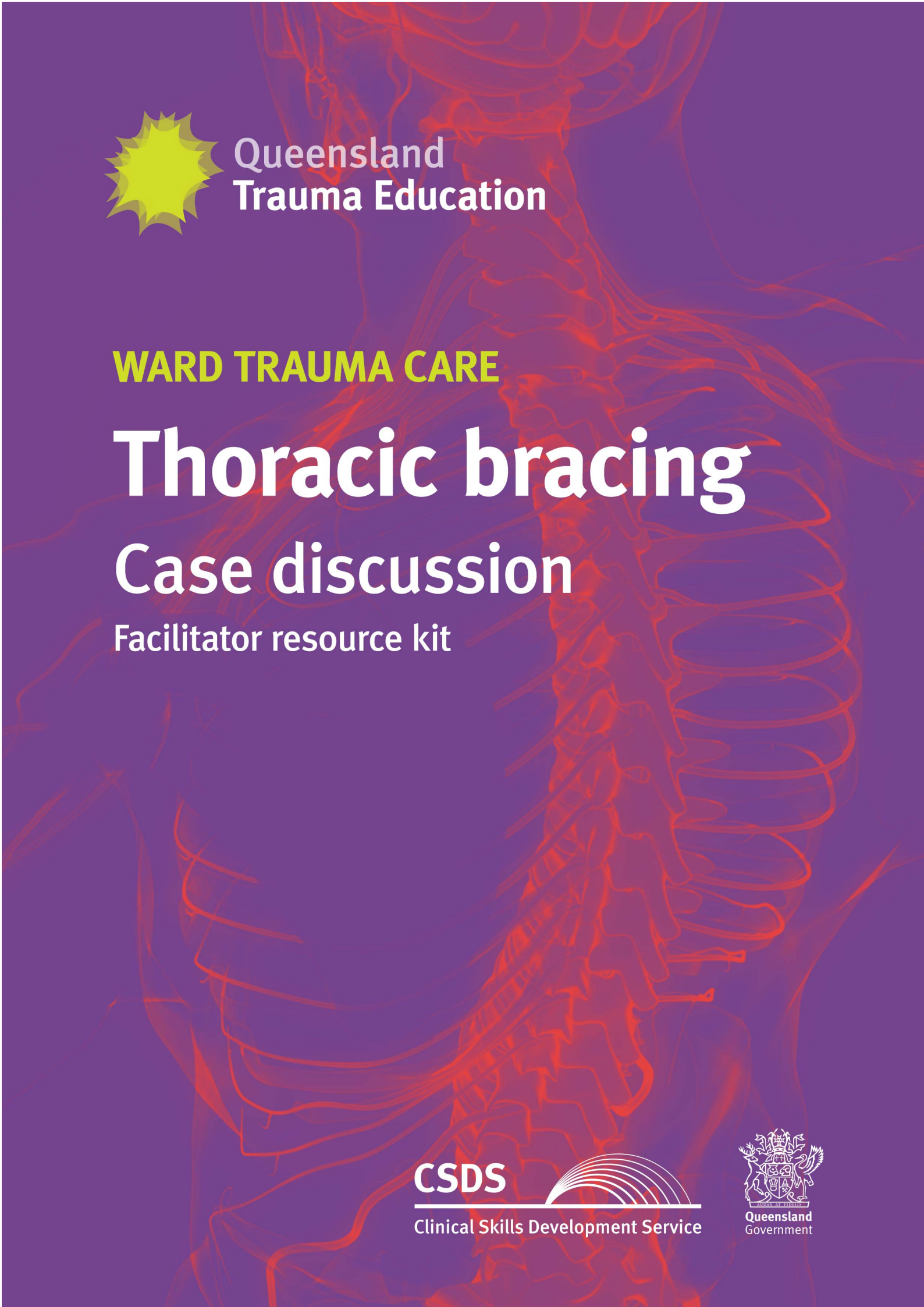

Queensland
Trauma Education

WARD TRAUMA CARE

Thoracic bracing

Case discussion

Facilitator resource kit

CSDS
Clinical Skills Development Service

Queensland
Government

Queensland Trauma Education

The resources developed for Queensland Trauma Education are designed for use in any Queensland Health facility that cares for patients who have been injured as a result of trauma. Each resource can be modified by the facilitator and scaled to the learners needs as well as the environment in which the education is being delivered, from tertiary to rural and remote facilities.

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Queensland Trauma Education
Ward trauma care – Thoracic bracing: Case discussion – Facilitator resource kit
Version 1.0

Published by the State of Queensland (Clinical Skills Development Service), 2022

An electronic version of this document is available via csds.qld.edu.au/qte

About this training resource kit

This resource kit provides the learner with knowledge for the choice and use of thoracic bracing with spinal column injury.

National Safety and Quality Health Service (NSQHS) Standards

Target audience

Ward medical, nursing, and physiotherapy clinicians

Duration

30 minutes

Group size

Suited to small group participation

Learning objectives

By the end of this session the participant will be able to:

- Identify imaging studies used in the diagnosis of thoracic injury
- Describe the importance of clinical examination on management decisions
- Discuss the options for thoracic brace types

Facilitation guide

1. Facilitator to use case discussion to explore thoracic spinal injury imaging and management.
2. Thoracic braces (if available) can be used to demonstrate the features and application on participants.

Overview of thoracic bracing for ward patients

One option for management of thoracic trauma is conservative, or non-operative, care. This may involve the use of bracing and support devices. The initial assessment involves clinical examination for high-risk features and utilisation of imaging studies to determine the most appropriate bracing method.

Further reading

Orthobullets Thoracic Spine	
Publication	Orthobullets
Link	https://bit.ly/3RiOVZu

Title of reading Thoracolumbar injury classification and severity score (TLICS)	
Organisation	Radiopaedia
Link	https://bit.ly/3ASLJMV

Case discussion

Case study

A 26-year-old female is admitted to the ward with a thoracic spine fracture after falling from her horse. She has no other identified injuries.

Question and answer guide

1. What is meant by 'spinal injury'?

Spinal injury can be defined as bony trauma or injury that involves the spinal cord. The initial clinical examination is important to delineate the likelihood of spinal cord injury in addition to bony fractures.

2. What imaging studies are used to identify spinal injuries?

For each patient, the most appropriate imaging studies will be chosen depending on the mechanism of injury, the clinical examination findings, the urgency of the investigations and availability. Each imaging study has different uses, indications and will deliver varied information.

- **Plain film / X-ray** is often used in low velocity trauma, including falls from standing. It may miss injury unless significant as subtle fractures are often hard to identify.
- **CT (Computed Tomography)** is the modality of choice for high velocity trauma and will delineate the injury profile including associated injuries. CT can provide basic information on disc pathology and arterial contrast is used in setting of potential vascular injury.
- **MRI (Magnetic Resonance Imaging)** is used to define ligamentous, disc and spinal cord injury. Whilst the most accurate imaging study, it takes time to acquire and is not used in acute multi-system trauma due to acquisition challenges.

3. What constitutes the 'thoracic' spine?

The thoracic spine is between the cervical and lumbar vertebrae. There are 12 thoracic vertebrae (T1-12).

Each thoracic vertebrae (t-spine) articulates with a rib at a costal facet. Vertebral body size increases from T1-T12.

The thoracic spine allows some rotation but minimal flexion and extension.

4. What mechanism of injury is likely to result in a thoracic spine fracture?

Burst fractures typically occur with axial load and flexion, most often occurring at T10-L2. Road traffic crashes and falls from height contribute around 65% of injuries (1).

5. What concurrent injury are common with thoracic fractures? [(1)]

Thoracic fractures are associated with other fractures of the spine in approximately 20% of cases and a high index of suspicion should prompt further imaging if identified.

Concurrent abdominal and chest trauma is most common with spinal injuries involving the cord and should prompt careful assessment if present. Burst fractures from road traffic crashes with lap belts are associated with abdominal visceral injury.

Additional long bone fractures are important to identify as they may impact on mobility and rehabilitation processes.

A thorough examination is undertaken to identify the investigations required to exclude other injury.

6. How are thoracic fractures managed?

Management decisions are determined by several factors including:

- Associated injuries
- Level of injury
- Neurological deficits
- Stability of fracture segments

Management can operative or non-operative. Often the decision is determined by the clinical examination (level of injury, identification of complete/incomplete injury, associated injury profile and co-morbid factors).

Non operative management is used when the fracture segment is determined to be stable and there are no neurological deficits. Mechanical stability occurs when the posterior ligament complex is intact. In this scenario bracing is used for comfort to allow mobilisation, as prolonged bed rest is associated with complications including pneumonia and DVT (Deep Vein Thrombosis). Neurological deficits are documented using the ASIA grading scale with an assessment of motor, sensory and perianal function.

Operative management involves instrumentation with or without decompression of fracture segments. Unstable fractures, as defined with posterior ligamentous complex disruption, or patients with significant multisystem trauma will be considered for operative management. Operative fixation with decompression is used in patients with spinal cord compression as demonstrated by neurological dysfunction.

Complications from operative management include entrapment or injury to nerves, pain, or infection.

7. What are the options for bracing when nonoperative management is utilised?

Thoracic bracing may be used independently or in conjunction with cervical spine bracing. Orthosis for isolated thoracic spine fractures is termed *Thoracic Lumbar Sacral Orthosis* (TLSO) and commonly stabilise the T7-L5 region. Examples include the Cash TLSO brace, Jewett TLSO and Bi-valved TLSO. These braces aim to reduce movement with trunk flexion and encourage extension of the spine. The brace type will be determined by

the spinal team, by considering the fracture type, patient body habitus and past medical history.

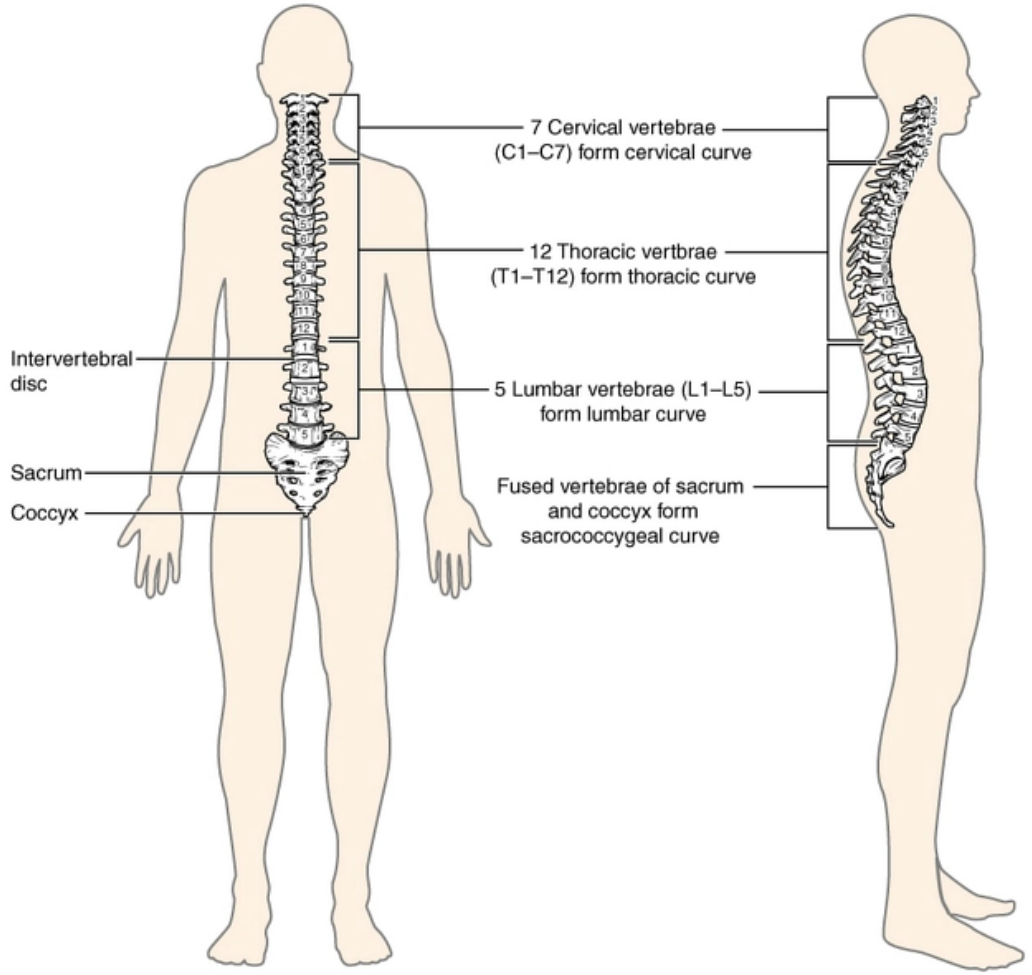
Supporting resources

The following supporting documents are provided for this case discussion:

1. Anatomical spinal drawing
2. Xray thoracic spine and CT thoracic spine demonstrating level
3. Xray demonstrating crush fracture and MRI demonstrating cord injury
4. ASIA grading scale
5. RBWH Spine Orthosis Selection guide

1. Anatomical spinal drawing

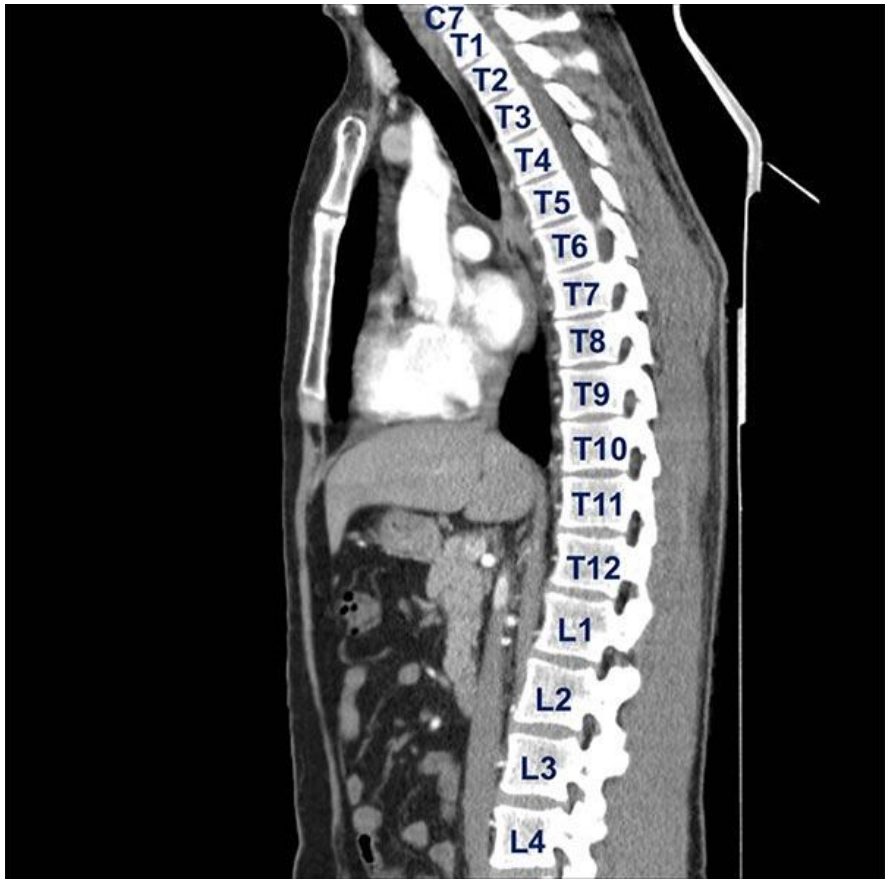
Case courtesy of OpenStax College, Radiopaedia.org, rID: 42770



2. Xray thoracic spine

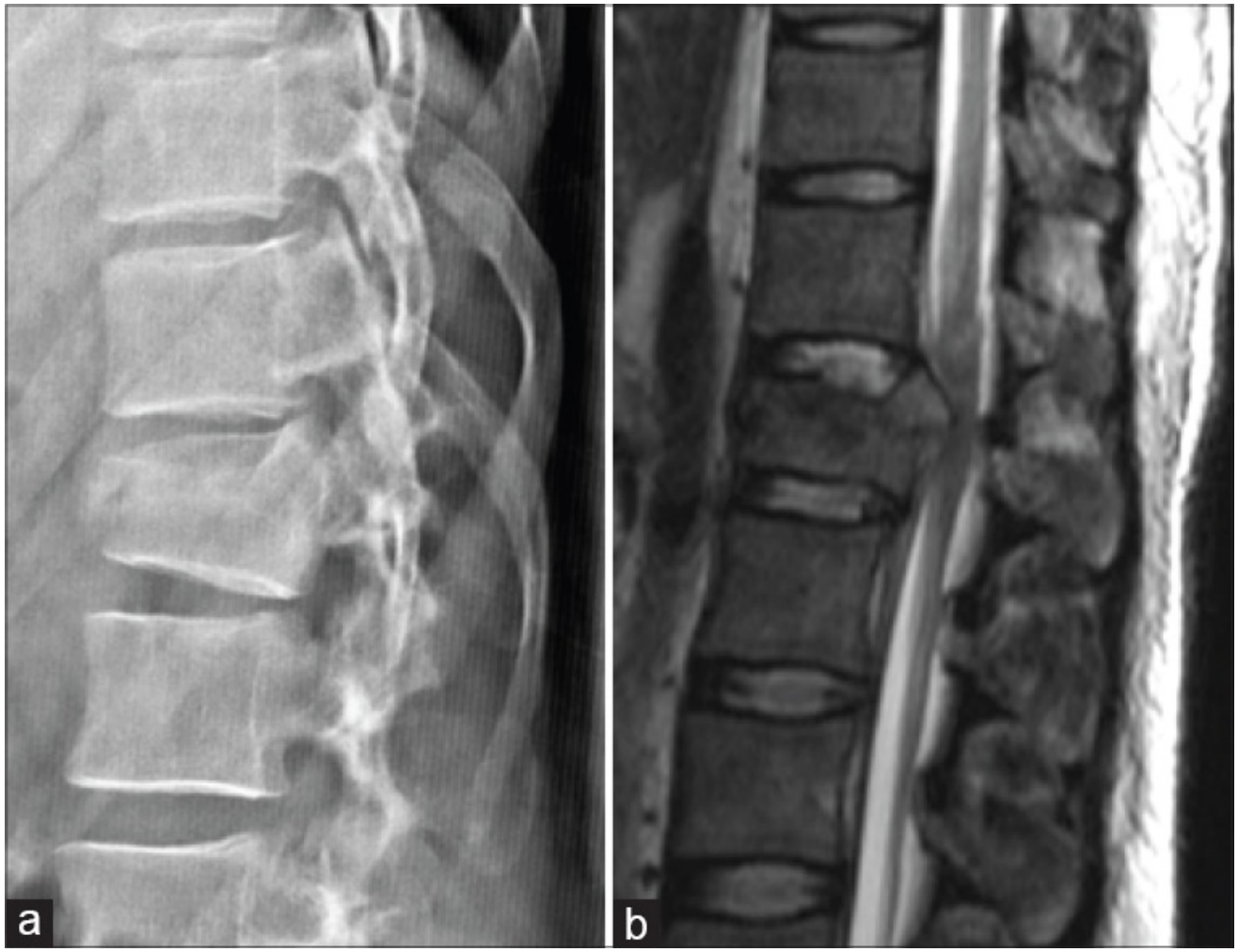
Reference: https://bit.ly/3SKtiCj

CT thoracic spine (level numbered)

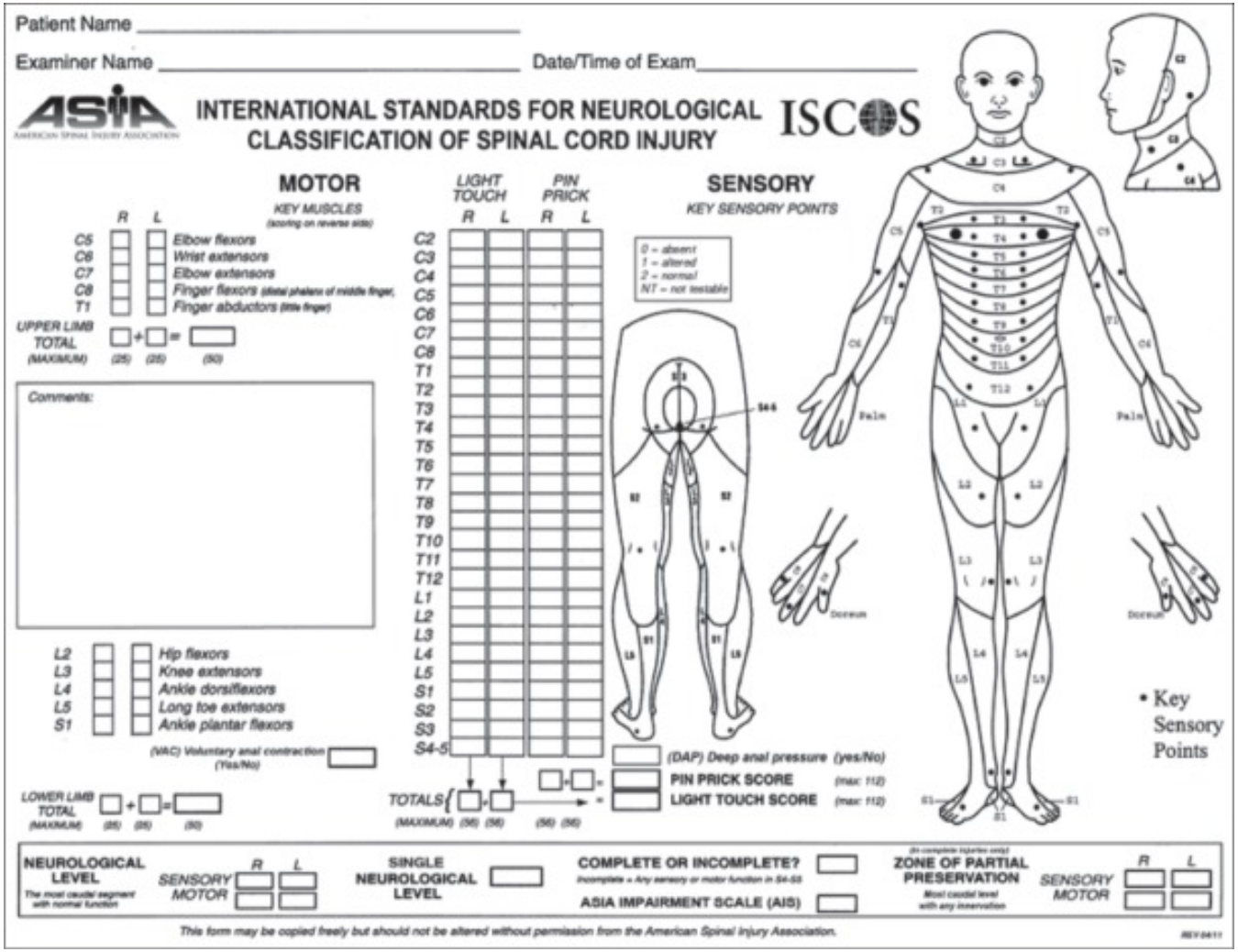


Reference: Rajasekaran S etal. Management of thoracolumbar spine trauma: An overview. *Indian J Orthop*. 2015;49(1):72-82. doi:10.4103/0019-5413.143914

3. **Xray thoracic spine demonstrating crush fracture** **MRI of same case with cord compression**



4. ASIA Scale


Patient Name
Examiner Name
Date/Time of Exam
INTERNATIONAL STANDARDS FOR NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY
ISCOS
MOTOR
KEY MUSCLES
SENSORY
KEY SENSORY POINTS
LIGHT TOUCH
PIN PRICK
R L
C5 Elbow flexors
C6 Wrist extensors
C7 Elbow extensors
C8 Finger flexors
T1 Finger abductors
UPPER LIMB TOTAL
Comments:
L2 Hip flexors
L3 Knee extensors
L4 Ankle dorsiflexors
L5 Long toe extensors
S1 Ankle plantar flexors
(VAC) Voluntary anal contraction
LOWER LIMB TOTAL
TOTALS
0 = absent
1 = altered
2 = normal
NT = not testable
(DAP) Deep anal pressure (yes/No)
PIN PRICK SCORE (max: 112)
LIGHT TOUCH SCORE (max: 112)
• Key Sensory Points
NEUROLOGICAL LEVEL
SENSORY
MOTOR
SINGLE NEUROLOGICAL LEVEL
COMPLETE OR INCOMPLETE?
ASIA IMPAIRMENT SCALE (AIS)
ZONE OF PARTIAL PRESERVATION
This form may be copied freely but should not be altered without permission from the American Spinal Injury Association.

5. RBWH Spine Orthosis guide

Spine Orthosis Selection - SOS document

RBWH Feb2020

The purpose of this document is solely to provide guidelines on the management of different spinal injuries and offer an overview of different orthotic spinal bracing options. This document is **not** intended to be a prescription guideline. Patients admitted to the Royal Brisbane and Women's Hospital (RBWH) following a suspected or confirmed spinal injury are often placed on spinal precautions which can involve movement or positional restrictions depending on the injury. In many cases the patient may require a spinal orthosis to protect the spine from further injury or to maintain the spine in a neutral alignment. Establishing the level of the fracture, whether it is stable or unstable, and determining which movements need to be controlled; will aid the clinician in determining the most appropriate orthosis. All orthoses are prescribed by the medical team and should be fit by an orthotist or other allied heath/nursing professional who has received the appropriate training.

Hard Cervical Collars

Aspen Vista Collar	Miami J Select	Philadelphia Collar
		
• Stabilises C2-C5 **Indications** • Limits flexion/extension, minimal rotation control • Stable C fractures/ ligamentous injuries • Adjustable chin height – one size fits most • Extra short/stout neck – may need different collar • Less pressure areas than a Philly • Attaches to Aspen CTO **Precautions** • "Unstable fractures" • $$	• Stabilises C2-C5 **Indications** • Limits flexion/extension, minimal rotation control • Stable C fractures/ligamentous injuries • Adjustable chin height – one size fits most • Extra short/stout neck – may need different collar • Less pressure areas than a Philly • Attaches to Miami JTO • Occian back available for pressure relief during prolonged bed rest. **Precautions** • "Unstable fractures" • $$	• Stabilises C2-C5 **Indications** • Limits flexion/extension, minimal rotation control • Stable C fractures/ligamentous injuries **Precautions** • Not adjustable – many different sizes • Risk of pressure areas - Short term option • Attaches to Philadelphia CTO • $

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Cervical Orthoses

Halo, Cervical Thoracic Orthoses (CTO) & Cervical Thoracic Lumbar Sacral Orthosis (CTLSO)

Ossur Halo Brace	Miami JTO	Minerva Brace	Bi-valved CTLSO
			
• Stabilizes C1-C7 **Indications** • Most restrictive C-spine orthosis • Commonly upper cervical injuries (C1-C2) • Aims to eliminate flexion, extension, rotation and lateral bending of C-spine • Unstable C-spine fractures or injuries • MRI compatible **Precautions** • Pin site infection, pin loosening, pin migration • Bone density (age >70, children) • Cognitive issues or co-morbidities (geriatrics) • Falls risk • Halo reviews required every 2 weeks – pin retention (regional patients) • Patient compliance – review appointments, pin site cleaning • Concomitant skull # with cervical involvement • $$$$	• Stabilizes C2-T2 **Indications** • Flexion/extension support • Mild – moderate rotation support • More comfortable and easier to don/doff than Minerva **Precautions** • Posterior section not attached to collar – compromising some stability • High level instability • $$$	• Stabilizes C2-T2 **Indications** • Flexion/extension support • Mild – moderate rotation support **Precautions** • High level instability • Increased risk of pressure areas & more difficult to don/doff • Frequent adjustments required. • $$$	• Stabilizes C2 – L5 **Indications** • Very restrictive/supportive CTLSO in all 3 planes • Maximum support to eliminate flexion/extension/lateral bending and reduce rotation • Total contact design – decreased movement • Custom moulded or prefabricated **Precautions** • Difficult to fit to "non-average" sized patients • Custom CTLSO – increased wait time • Patient will require assistance donning/doffing • Very hot • $$$$

Jewitts TLSO

Acronyms and abbreviations

Term	Definition
TLSO	Thoracic lumbar sacral orthosis
CT	Computed tomography
MRI	Magnetic resonance imaging

References

1. Rajasekaran, S., Kanna, R. M., & Shetty, A. P. (2015). *Management of thoracolumbar spine trauma: An overview*. Indian journal of orthopaedics, 49(1), 72–82. https://bit.ly/3RBg1L0

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