

ORTHOPAEDICS

FOR PRIMARY HEALTH CARE



Volume 2

Non-Emergency and Non-Trauma Pathology

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Cervical reduction

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Learning objectives

- Identify clinical features.
- Perform comprehensive examination.
- Analyse imaging studies.
- Identify indications for traction.
- Identify pre-requisites and contraindications to cervical spine reduction.
- Understand rationale for cervical traction.
- Understand urgency.
- Undertake pre-planning.
- Set up room, positioning and equipment.
- Apply procedure and reduction manoeuvres.
- Implement post-reduction care.
- Understand post-reduction considerations.

Clinical features

A high index of suspicion should always be maintained when dealing with trauma patients presenting with neck pain or injury mechanisms suggestive of potential cervical spine injury.

Inebriated patients or patients presenting with altered consciousness should have cervical spine injuries actively ruled out.

High-energy mechanisms, including road traffic accidents, falls and sport injuries, are some of the more common mechanisms of injury. Penetrating injuries, such as gunshot and stab wounds, are also common.

Common presenting complaints include neck pain, neck stiffness, changes in sensation and strength in the upper and lower limbs.

Comprehensive examination

Apply advanced trauma life support (ATLS) principles in initial evaluation of the patient. Do a thorough physical examination to assess spinal stability and neurological status, including log-roll to assess entire spine.

Spinal examination

Inspection: Log-roll and look for deformity, bruising or swelling around the spinal region.

Palpation: Whilst patient is log-rolled and maintaining cervical spine precautions, feel for tenderness, bogginess, steps, gaps or crepitus. Crepitus, gaps or steps on palpation of spinous processes indicate instability.

Movement: Assess ability to move limbs without exacerbating potential injuries.

Neurovascular examination

- Evaluate peripheral pulses in all extremities.
- Evaluate sensory function in all extremities and the trunk.
- Assess motor function and reflexes in the arms and legs.
- Tables for American Spinal Injury Association (ASIA) scores are a useful guide for assessing and tabulating findings.
- Rectal examination to assess for sensation and voluntary anal sphincter tone. Absence of bulbocavernosus reflex indicates spinal shock.

Investigations

X-rays: Anterior-posterior (AP), lateral, odontoid and Swimmer's views.

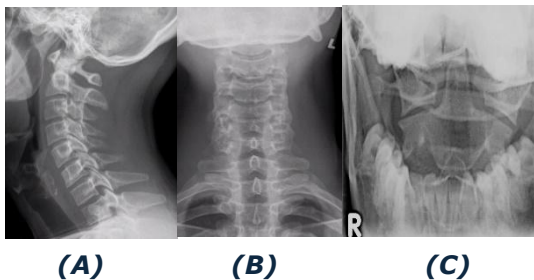


Figure 1: Cervical spine trauma series depicting (A) lateral, (B) AP, and (C) open-mouth view to assess the cervical spine

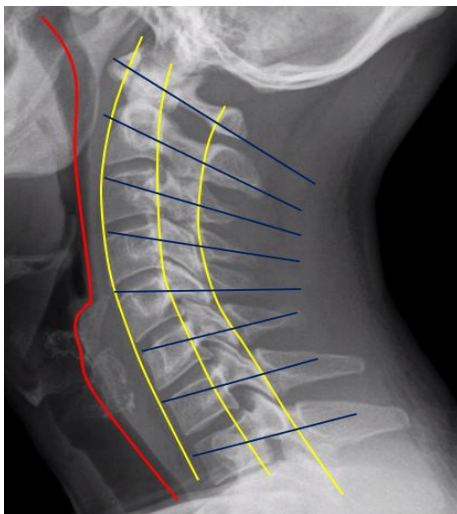


Figure 2: Cervical spine AP showing alignment lines

Computed tomography (CT): Provide detailed information about fractures, dislocations and canal dimensions.

Magnetic resonance imaging (MRI):

Demonstrate soft tissue details, including disc and spinal cord injuries and neural compression. With cervical dislocations, MRI is not normally recommended, as it may unnecessarily delay reduction which delays indirect spinal cord decompression.

Indications for skull cervical traction

Cervical skeletal traction has two main indications:

1. **Maintaining spinal alignment** with unstable or malaligned fractures, which require in-line light traction of 5kg.
2. **Active reduction process** with sequential increasing weight until facet joints are aligned (cervical dislocations).

Indications for spinal alignment traction

- Vertebral body fractures.
- C1/C2 rotatory subluxation.
- Displaced odontoid fractures.
- Hangman's fractures.
- Sub-axial cervical fractures with malalignment.
- A hard collar is inferior to traction to maintain alignment and usually 6 weeks of traction is followed by a further 6 weeks in hard collar.



Figure 3: Vertebral body fracture with malalignment of cervical spine

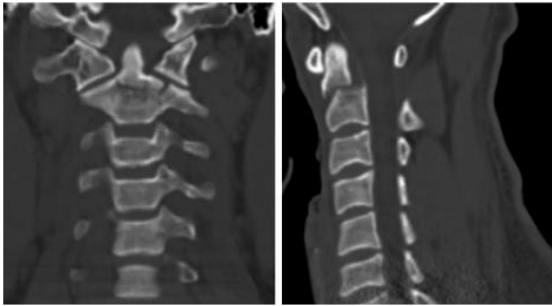


Figure 4: Displaced odontoid fracture

Cervical injuries needing an active reduction process

Facet joint injuries – unilateral and bilateral facet dislocations – need active reduction.

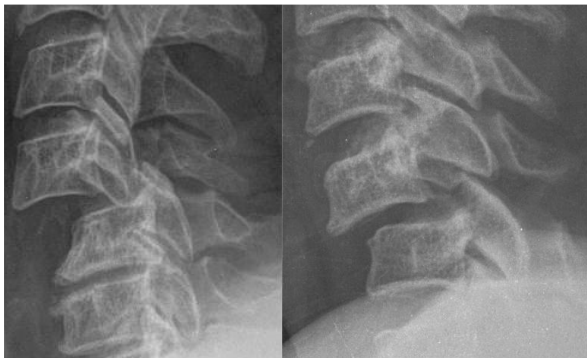


Figure 5: X-rays of bifacet and unifacet fracture dislocations requiring urgent and active reduction

Pre-requisites and contraindications for cervical spine reduction

Pre-requisites

- Awake, alert and cooperative patient.
- Constant neurological and physiological evaluation.
- Performed by experienced clinician with awareness of potential complications.
- Consent.

Contraindications

- Incorrect diagnosis.
- Skull fracture (relative contraindication). Technically only a displaced fracture of the petrous part of temporal bone is a contraindication (pin-site location).
- Infection or degloving scalp injury.
- Children.

Consent

Obtain consent and explain procedure to the patient. Explain patient responsibilities during procedure.

Understand urgency

Cervical reduction and alignment for dislocations is considered an emergency procedure. Reduction should be obtained as rapidly as possible to reduce the risk of irreversible spinal cord injury. In addition, there is a South African constitutional court ruling that cervical dislocations need to be reduced within 4 hours of injury.

These injuries normally remain permanently unstable, even with reduction, as it is a disco-ligamentous injury with little healing potential and a 30% re-dislocation risk.

MRI is not required nor recommended as it does not add to the safety of reduction and causes unnecessary delays.

Once the dislocation is reduced, compression on the spinal cord is removed and definitive surgical stabilisation can take place at a more convenient time. It is usually scheduled on the next available operating list. The standard operation is an anterior decompression fusion with a plate (anterior cervical discectomy and fusion [ACDF]).

Safety

Closed cervical reduction for cervical dislocations has a 80% success rate with less than a 1% chance of permanent neurological deficit and a 2–4% chance of transient neurological deterioration. It is very safe and every doctor needs to have the skill, if required in an emergency, to perform cervical reduction.

Rationale for cervical traction

- Indirect cord decompression.
- Maintain cervical alignment.
- Prevent secondary injury.
- Active reduction of dislocations.

Optimise neurological outcomes.

Closed reduction technique

Pre-planning

- Obtain manpower: nurses, assistants, porters, radiographer.
- Safe transfer of patient to reduction bed.
- Insertion of cones.
- Serial imaging during reduction.
- Definitive management.

Room, positioning and equipment set-up

Room: Emergency department, high care/intensive care unit (ICU), theatre, ward.

Positioning: Supine, neck in neutral, double mattress, bed in reverse Trendelenburg (10–20 degrees).

Equipment: Bed and double mattress, image intensifier, x-rays, pulley, weights, s-hook, orthopaedic rope/strong rope, intravenous (IV) line, analgesia, local anaesthetic, manpower.

Instruments: Callipers or tongs, surgical tray and blades.



Figure 6: Gardner-Wells tongs (top) and Cones callipers (bottom)

Application procedure and reduction manoeuvres

Key points in application of pins for skull traction with Cones callipers or Gardner-Well tongs:

1. Site should be in line with external acoustic meatus to line up with the cervical spine.
2. Positioned 2–3cm above tip of the ear.
3. Proximal to the equator of greatest head circumference.
4. Palpate temporal artery and masseter.
5. Shave the area superior to the ear where the pins will be inserted.
6. Clean with povidone iodine or chlorhexidine.
7. Inject local anaesthetic such as Marcaine with adrenaline; preferably down to the periosteum and infiltrate the skin over the proposed pin-site.
8. Vertical skin incision; avoid temporal artery and masseter.
9. Blunt dissection with scissors to periosteum.
10. Screw in the pin till it just perforates the outer table of the skull. Over tightening of pins can result in penetration of the inner table of the calvarium while under tightening will result in slippage on application of weights.
11. Tie in ortho rope.
12. Apply weights.
13. Apply dressing to pin sites.

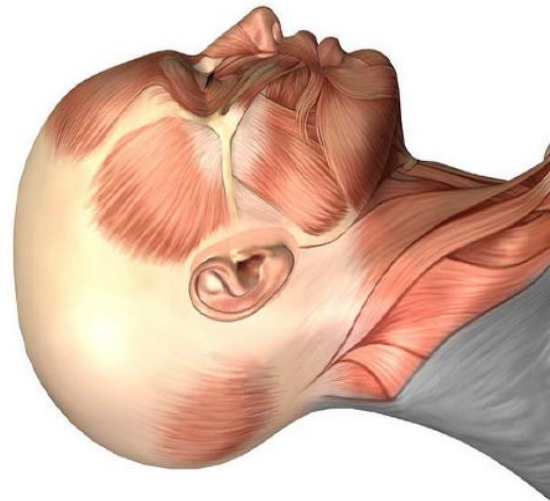


Figure 7: Positioning of pin



Figure 8: Pin insertion procedure

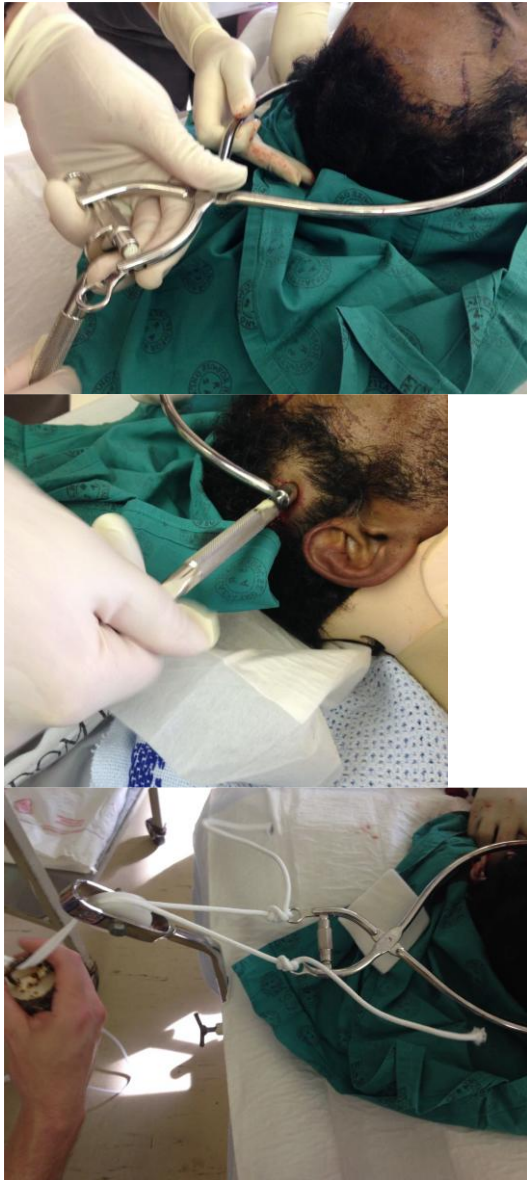


Figure 9: Tightening and application of weights

Reduction manoeuvres for facet injuries or dislocations

1. Start with 5kg weights and take a perfect lateral x-ray that is centred at the dislocation level.
2. Neck flexion 20–30 degrees.
3. Increase weights by 5kg every 5 minutes.
4. Neurological examination and x-rays each time weights are added. Patient to report if worsening neurology or extreme pain.

5. Do not exceed 45kg.
6. Reduction manoeuvre to be performed after facet has reached perched position (tip to tip).
 - Whilst maintaining the traction, extend the neck by lowering the swan-neck pulley until the neck is extended by 10 degrees.
 - Check on x-ray that the facets have reduced.
7. Once reduction is obtained, weights are reduced to 5kg. Neurology reassessed and documented and x-rays repeated.

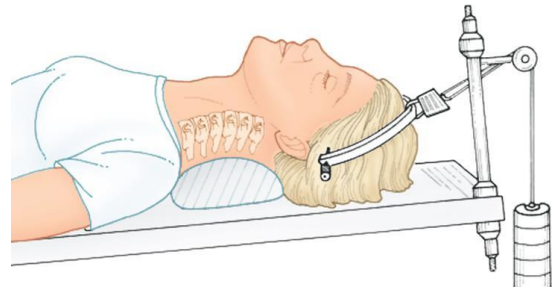


Figure 10: Correctly applied Gardner-Wells Tongs with Swan neck traction and weight

Endpoints

- Reduction obtained.
- Worsening of neurological status or intractable pain.
- Over distraction on x-rays.
- Impractical to add further weights.
- Failure of reduction.

Complications of closed reduction

- Vertebral fracture.
- Additional dislocation.
- Pin slippage.
- Failed reduction.
- Pin site sepsis.
- Squint from 6th cranial nerve fall-out.

- Pressure sore on scalp.
- Bleeding of temporal artery.

Post-reduction care (standard spinal cord injury care)

- Pressure care.
- Prophylaxis for peptic ulceration.
- Deep vein thrombosis (DVT) prophylaxis.
- Analgesia.
- Maintain blood pressure (BP) > 85mmHg (mean arterial pressure) and partial pressure of oxygen (PaO₂) sats > 99%.

Post-reduction considerations

- Further imaging.
- Definitive surgical management.
- Reassess neurology and document findings.
- Transfer to dedicated unit.

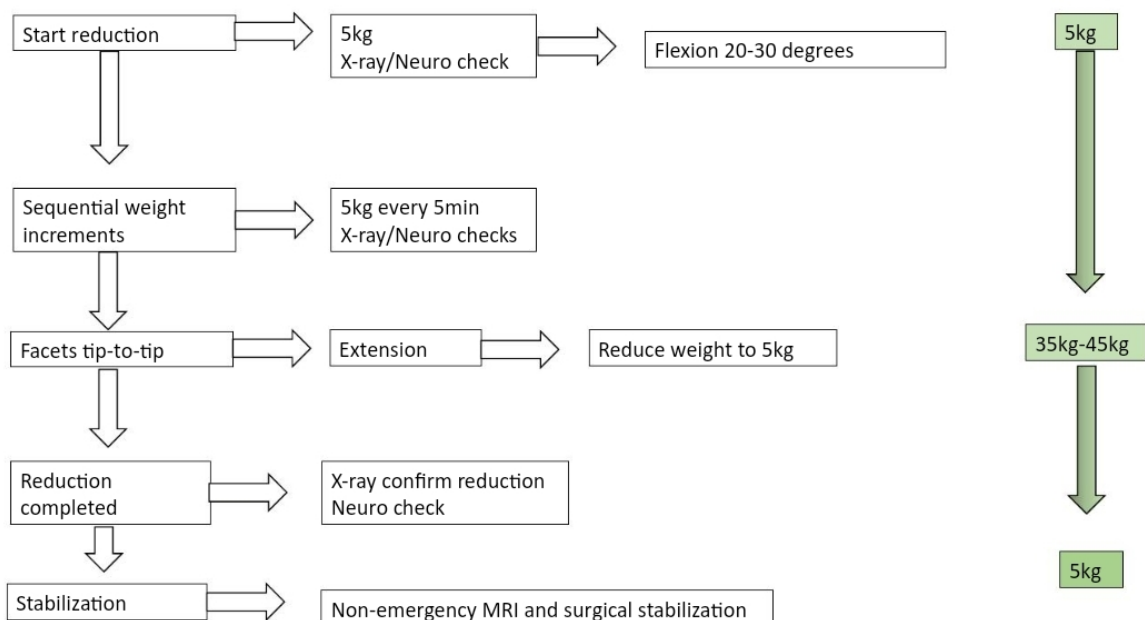


Figure 11: Visual summary of reduction process

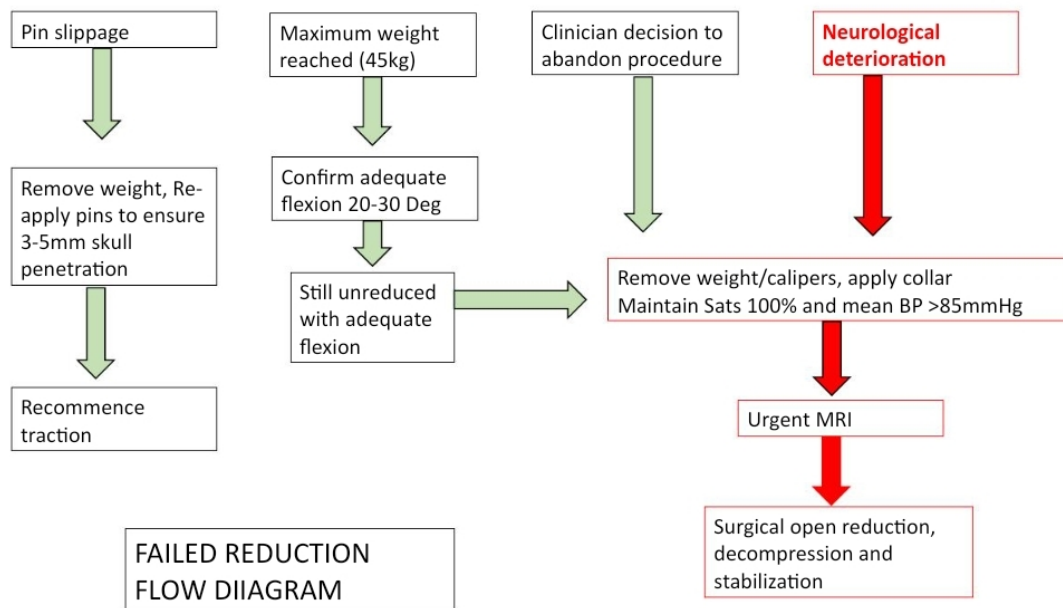


Figure 12: Visual representation of failed reduction flow

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Conceptualisation: Maritz Laubscher & Robert Dunn

Publishing Manager: Michelle Willmers

Cover design: Adapted from first edition cover design by Carlene Venter

Proofreading and page layout: Robyn Brown

ABOUT THE BOOK

This is the second volume of the *Orthopaedics for Primary Health Care* textbook edited by Michael Held, first published in 2021.

Most patients with orthopaedic pathology in low- and middle-income countries are tested by non-specialists. This book was based on a Delphi consensus study* with experts from Africa, Europe and North America to identify topics, skills and cases concerning orthopaedic trauma and infection that need to be prioritised in order to provide guidance to these health care workers.

The aim of this book is to be student-centred.

*Held et al. Topics, Skills, and Cases for an Undergraduate Musculoskeletal Curriculum in Southern Africa: A Consensus from Local and International Experts. JBJS. 2020 Feb 5;102(3):e10.



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This textbook is not intended as a substitute for the medical advice of physicians.

The information in this book is meant to supplement, not replace, orthopaedic primary care training.

The authors, editor and publisher advise readers to take full responsibility for their safety and know their limits. Before practicing the skills described in this book, be sure that your equipment is well maintained, and do not take risks beyond your experience, aptitude, training or comfort level.

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ACKNOWLEDGEMENTS

Thanks to the Orthopaedic Department in the Faculty of Health Sciences and the Centre for Innovation in Learning and Teaching in the Centre for Higher Education Development at the University of Cape Town for the support received in the development of this publication.