

Halo Thoracic Orthoses

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The Alfred

- Level 1 Trauma Centre
 - State Wide Service for Victoria
 - 60% Major Trauma
- In-house Orthotic Dept, 8 Orthotist & 2 Allied Health Assistants
- Halo Thoracic Orthosis
 - Since 2007 average 72 Halo applications per year
 - Peaked at 100 Halos in 2010/11 and 40 halos last year
- Application of Ossur Resolve Halo Thoracic Orthosis at The Alfred
- Halo review protocol at The Alfred

Application of a Halo at the Alfred

- Halo fitted on ward or in theatre.
- At least three staff required for Halo application
- Registrar injects local anaesthetic and head holds for the fitting procedure.
- Orthotist fits ring, tightens pins to correct tension (8lbs), fits jacket and secures jacket super-structure to the ring.
- Nurse looks after the patient, pain relief
- Spinal board and collar is used during application
- x-ray required to verify alignment
 - May use image intensifier to reduce displaced #'s
- Re-tension halo between 24 to 48 hours of fitting.



Patient Assessment

- Ring type
 - Closed or open ring
 - MRI compatibility
 - Surgical fixation
 - Neurology
- Ring Size
 - Size down
 - Sizing range
- Jacket size
 - Short
 - Tall (larger girth)

Jacket and Superstructure

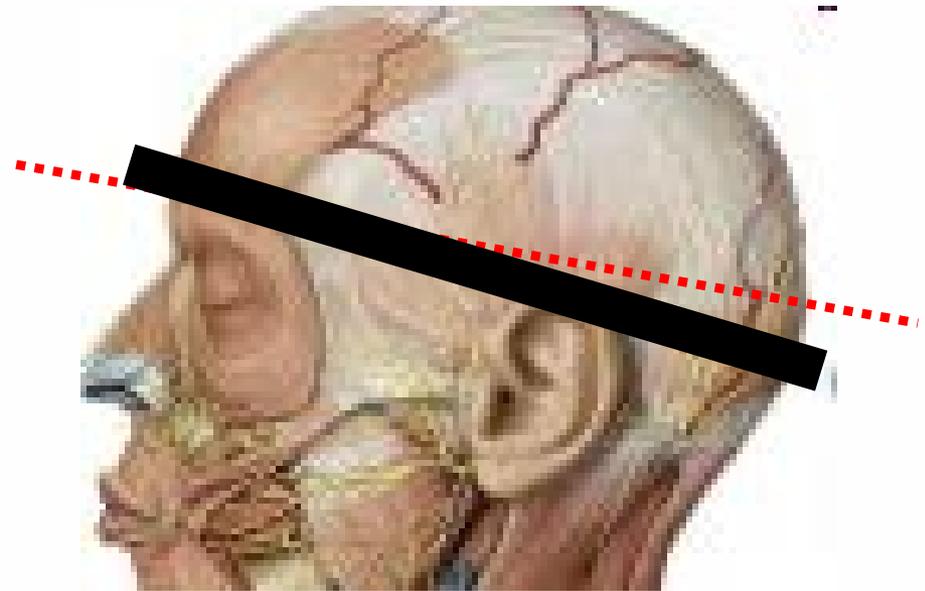
- Observe possible risk factors
 - Kyphosis
 - Pectus Excavatum
 - Pectus Carinatum
 - Skin Condition
 - Extended bed rest
 - Prominent Rib Cage
 - Sternal #

Selection of Pin Tension & Number of Pins

- Dependant on patient Hx
 - Age (> 65yo)
 - Osteoporosis
 - Mechanism of injury (Low impact injury)
- Optimum Pin Tension
 - 4 pins at 8lb/inch (Botte et al 1987)
 - Less complications
 - No increased risk of penetration
- Consider lower tension and more pins
 - 6 pins at 6lb/inch or
 - 8 pins at 4lb/inch

Optimal Ring Position

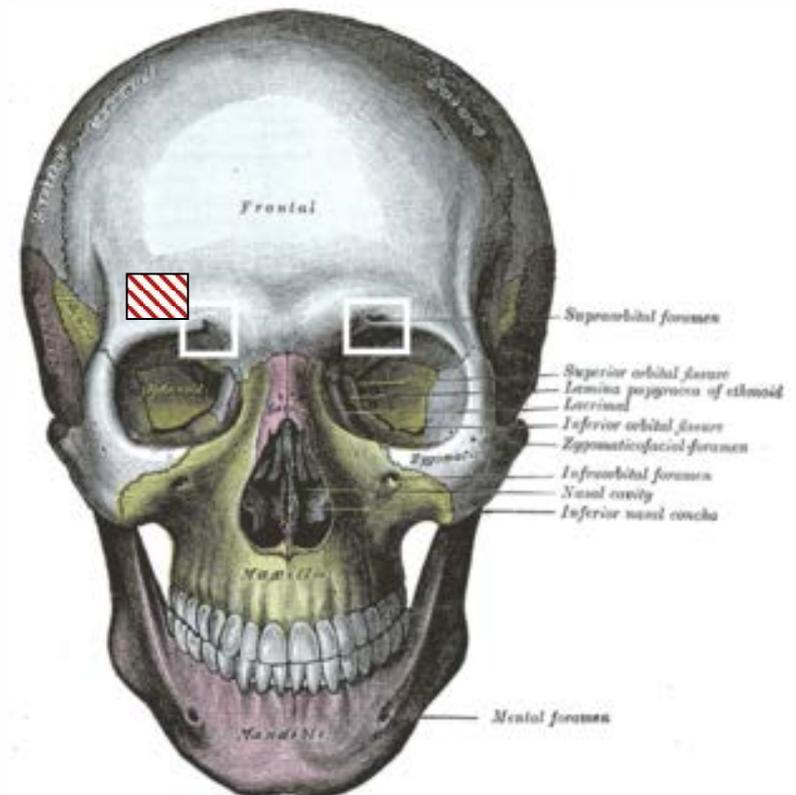
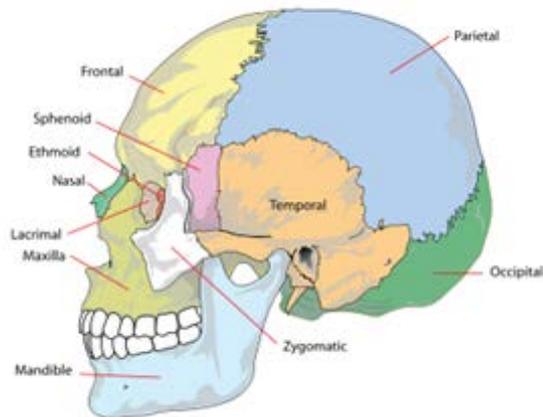
- The inferior border of the ring is positioned just superior to the eyebrows.
- Ring just touching the top of the ear.
- Inferior to the greater circumference of the skull posteriorly.
- Perpendicular to the forehead angle
 - Angled inferiorly for patients with a sloping forehead.



..... Greater Circumference of skull

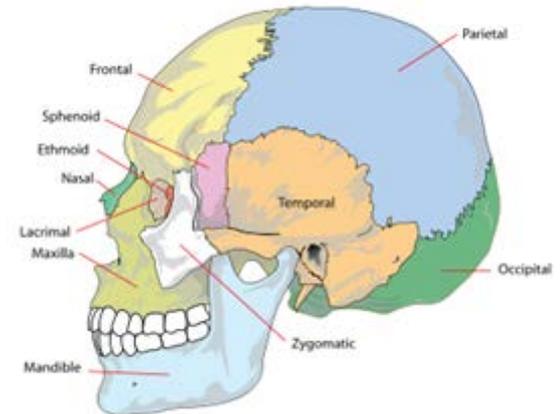
Optimal Pin Position -Anterior

- 1cm above the superior border of the orbit
- Lateral third of eyebrow
- Lateral to Superior Orbital foramen to avoid nerve impingement
- Medial to Sphenoid bone of skull
 - Bone density



Optimal Pin Position -Posterior

- Posterior to the ears
- Inferior to the **greater circumference of the skull**
 - Pin perpendicular to skull
 - In opposition to anterior pins
 - > further posterior = greater opposition
 - Pins which are too far posterior may cause pain as they impinge on Occipitalis, Semispinalis Capitus or Splenius Capitus



red



= optimal posterior pin position

Consequences of Incorrect Placement

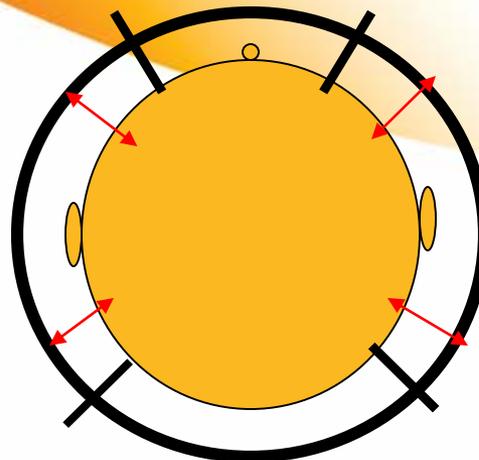
Anteriorly:

- Pin penetration
- Supra-orbital nerve damage
- Damage to Orbit if too inferior
- Ring Dislodgement if too superior

Posteriorly:

- Ring Dislodgement if too superior
- Impingement of Occipitalis, Semispinalis Capitus or Splenius Capitus if placed too posterior

Tensioning Procedure



- Local Anesthetic
 - Aim to achieve the greatest balance in pin tension
 - Work obliquely across the skull
 - Tension pins gradually (finger tight, 2lbs, 4lbs, 6lbs 8lbs)
 - Monitor ring position and tighten pins accordingly to maintain symmetry
 - Maintain an inferiorly directed tension on eyebrows
-
- Pins re-tensioned 24-48 hours post fitting

Positioning Spinal Board



Positioning Crown



Position and Finger Tighten Pins



Tension Pins



Apply Superstructure and Jacket

Attach transverse bars

- Parallel to the ground when standing

Posterior jacket

- Roll patient maintaining spinal board position
- Universal joint level with spine of scapular
- Distal edge, above distal margin of ribs

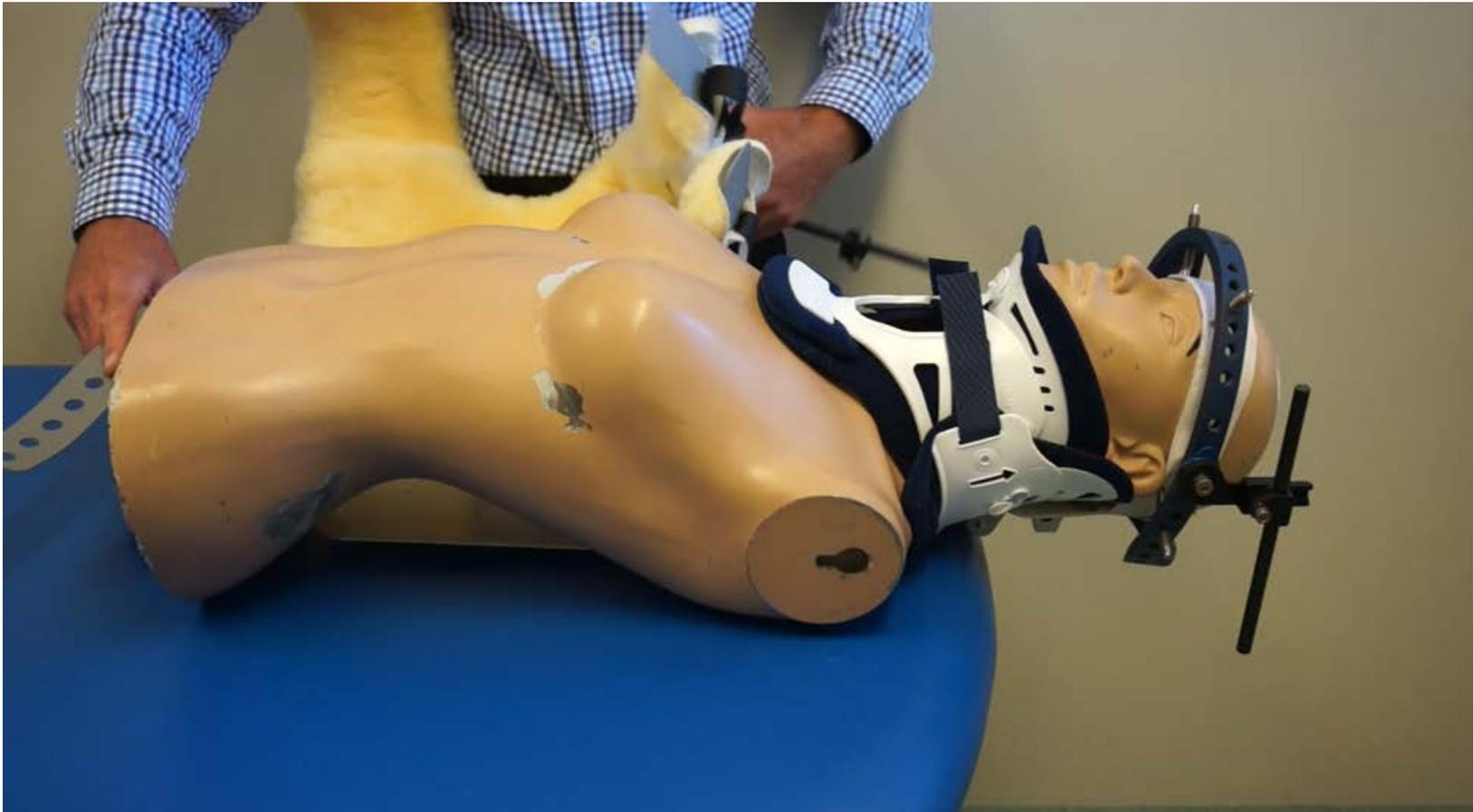
Anteriorly jacket

- Below sternal notch
- Above abdomen

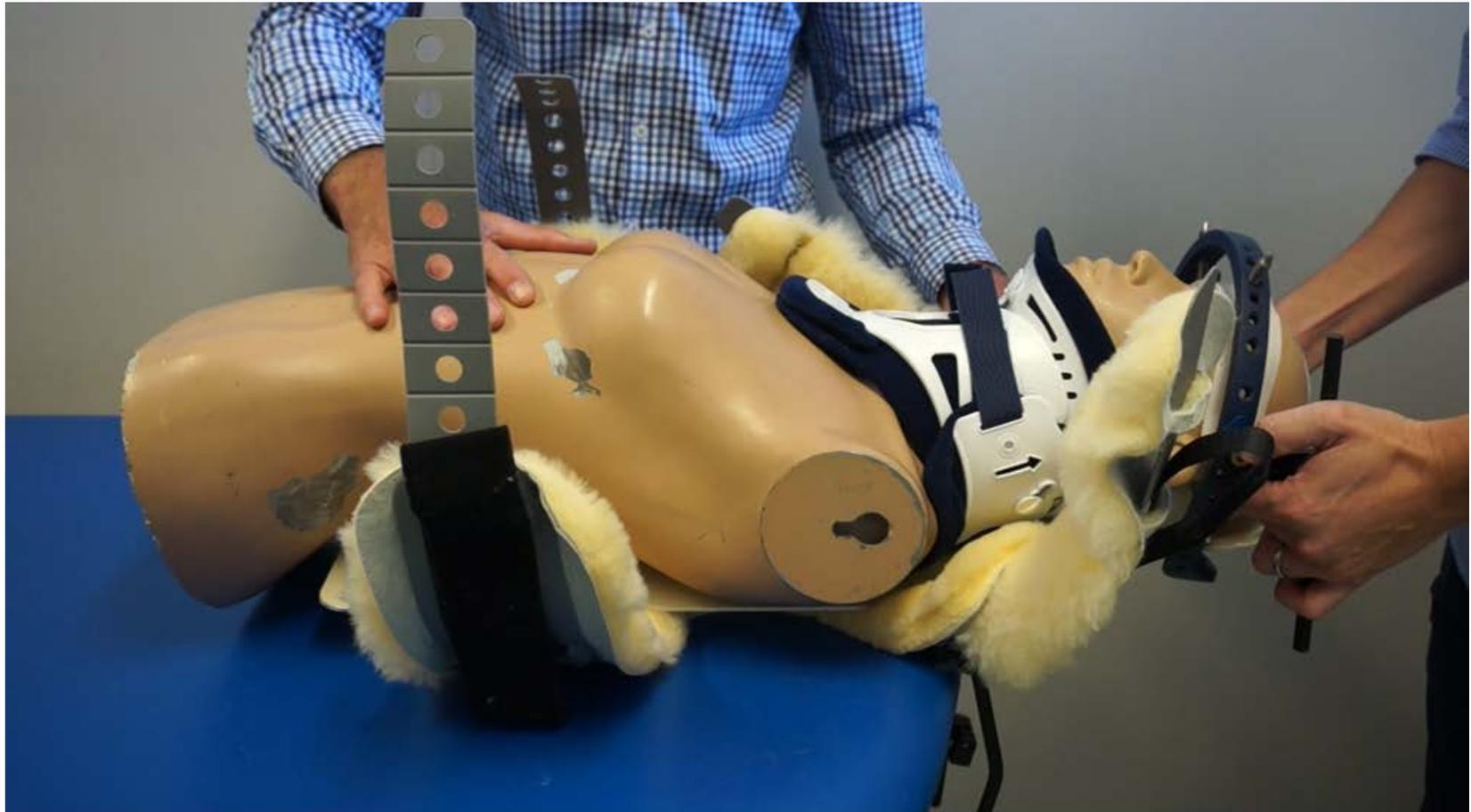
Attaching Transverse bars



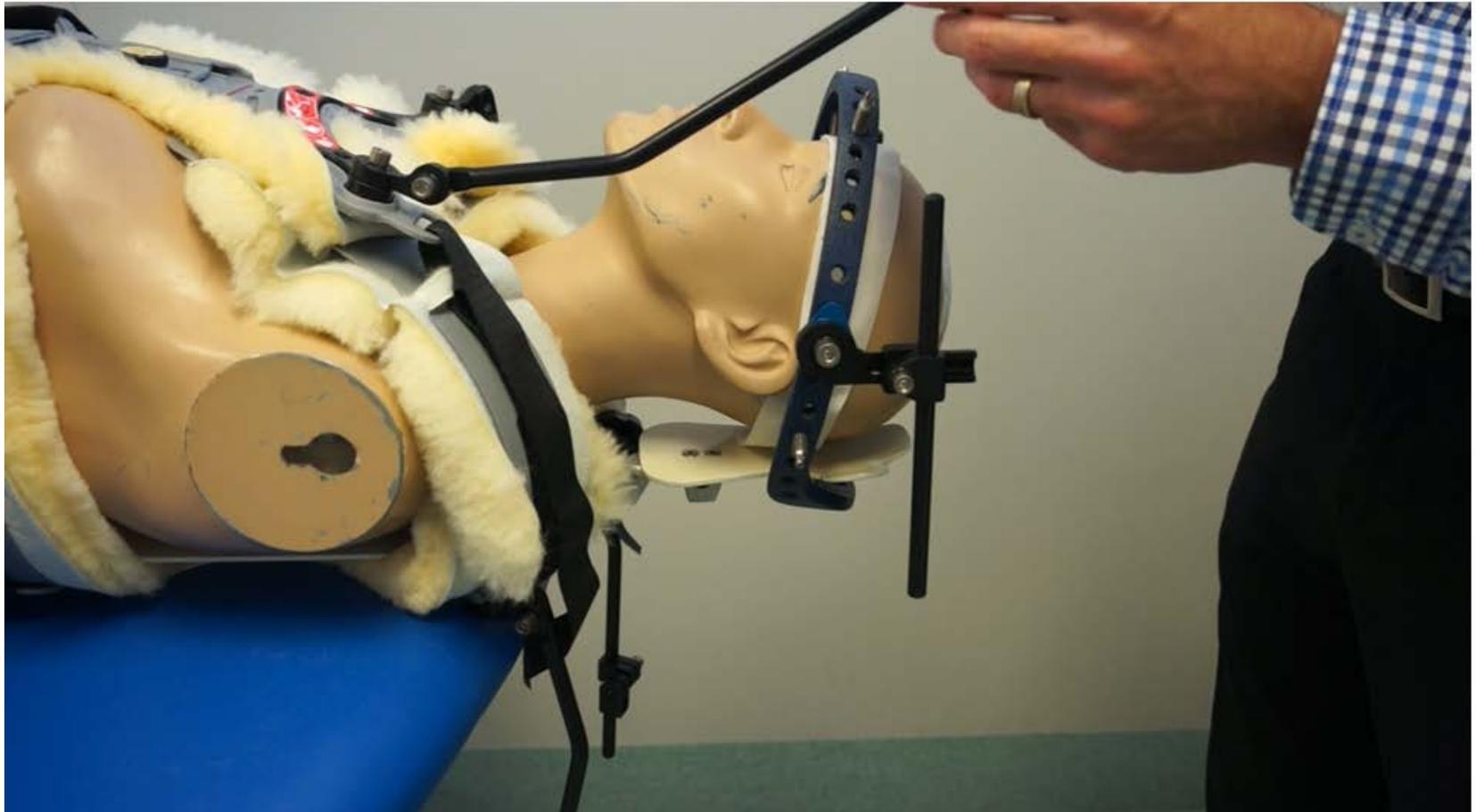
Positioning Posterior Vest



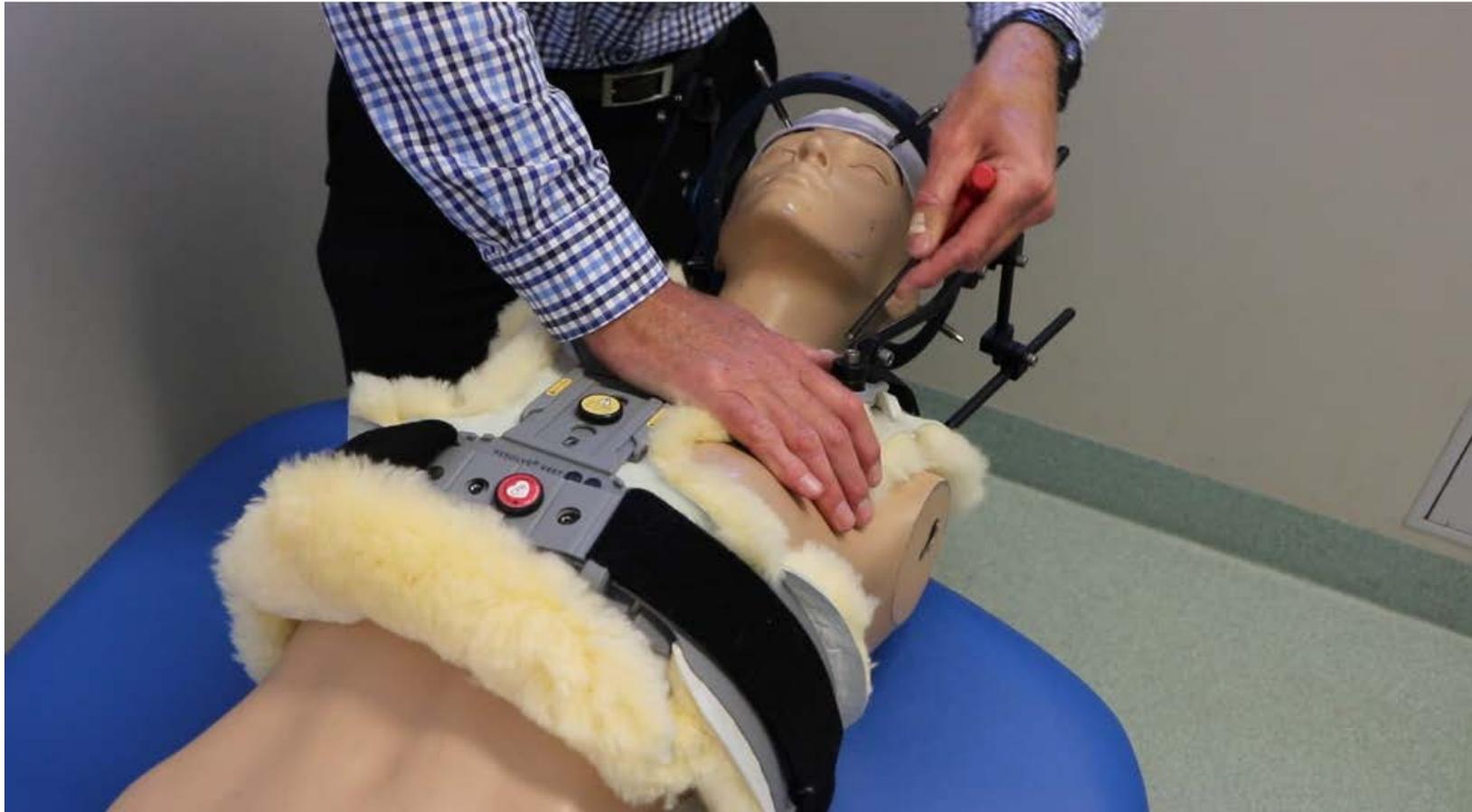
Positioning Anterior Vest



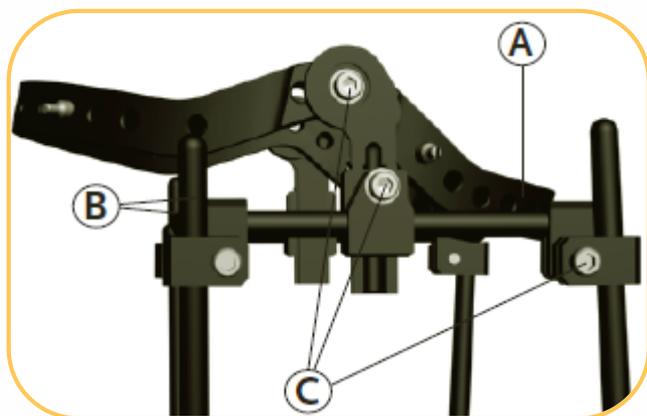
Connecting Superstructure



Tensioning Allen Screws

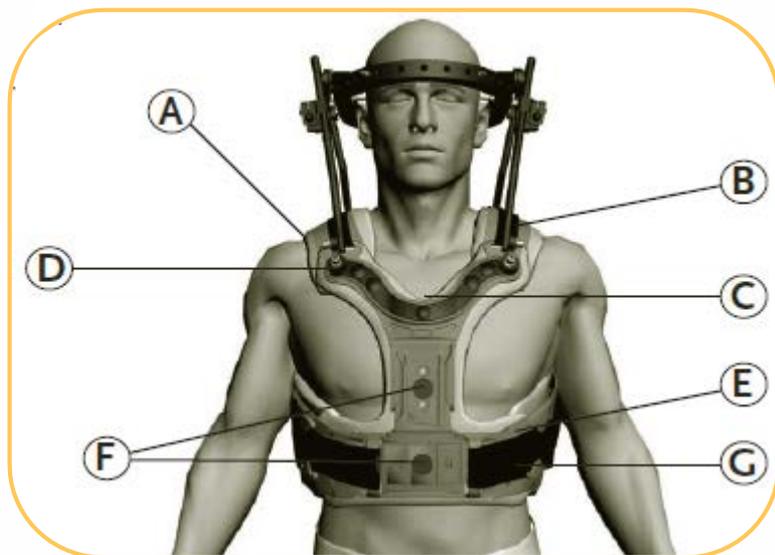


Fitting checks Superstructure



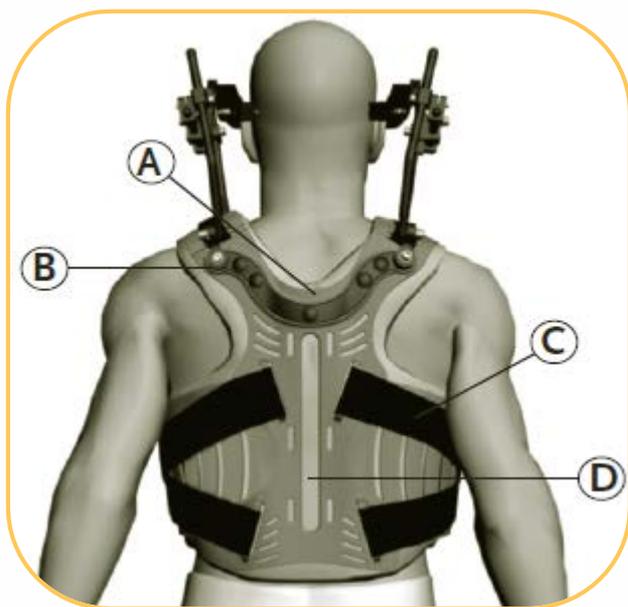
- A. Transverse bars parallel to ring and in the same plane
- B. Anterior upright rods out of peripheral vision and will not prevent pin access
- C. All bolts tightened

Fitting checks Anterior Vest



- A. Shoulder pieces in close contact with patient's shoulders
- B. Shoulder straps secure
- C. Vest below sternal notch and centered
- D. Superior lateral vest extension in firm contact with delto-pectoral groove, no contact on clavicles
- E. Waist stabilizers cover lower costal margins
- F. Threaded knobs secure
- G. Waist straps secure and in alignment tabs on waist stabilizers

Fitting checks Posterior Vest



- A. Upper edge of vest at the level of C7
- B. Ends of crossplate in firm contact with trapezius muscles not on the spine of the scapula
- C. Superior edges of waist stabilizers at level of xyphoid process
- D. Central relief opening in line with spinous processes

Fitting Summary

- Can be done on ward or in theatre
 - Ordered process
 - Requires 3 people
 - Have everything on hand
-
- Good / correct ring fit is essential for successful halo treatment!!

The Alfred Halo Review Process

Fortnightly Halo Review

Fortnightly Pin Review

- **Aim to reduce complications**
 - Pin tension measurements
 - Pin Re-tensioning
 - Pin site care
 - > Cleaning
 - > Hair trimming
 - Education
- Identification of pin complications
- Providing treatment for complications

Pin Tension Measurements

- Equipment Used:
 - CDI Torque Reading Device
- Provides:
 - Objective measure of pin tension
- Benefits:
 - Monitoring of pin condition
 - Aids in diagnosis of complications
 - Assists in pin re-tensioning



Variable Torque Reading Device



Pin Tension Measurements

- Alternative Methods:
 - Torque Wrench
 - > used to identify if pin tensions are less than their initial insertion values (Kuester et al. 2002).

Pin Re-tensioning

- Equipment Used
 - Torque Driver – Tohnichi RTD120CN
- Description:
 - Re-tension pins back to initial fitting tension each **fortnight**
 - Commence with pin of least resistance (as per tension measurements)
 - **Work obliquely** across skull
 - Resistance within one full revolution
- Benefits:
 - Decreases risk of pin loosening
- Risks:
 - Pin penetration

Pin Site Care



Pin site 2 weeks post fitting



Pin site post cleaning



Pin site with betadine applied

Summary

- Regular thorough halo review reduces complications
- Review should include:
 - Pin tension measurement
 - Pin re-tensioning
 - Pin site cleaning
 - Skin monitoring
 - Education
- Timely management of complications:
 - Reduces potential risk of further injury
 - Reduces degree of intervention required
 - Improves patient comfort

Summary

- Review halo patients fortnightly
 - Re-tension pins
 - Clean pin sites thoroughly
- } Reduced complication risk 😊

Thank-you

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