

# PRACTITIONER PRIMER



## OSSUR HALO SYSTEMS



Life Without Limitations®

# INDEX



## **PRE-APPLICATION** **Readiness pays.**

Prior to application, you will need: patient measurements, appropriate size ring and vest, application kit, two assistants, adjustable torque wrench, four halo pins, stockinette, and to select appropriate pin sites. Allow approximately 30 minutes for application.



## **VEST APPLICATION** **The foundation for immobilization.**

Raise patient 45 degrees from waist. Place posterior vest on back. *Alternative: lay the patient on side, and logroll onto vest.* Ensure shoulder straps are in close contact with shoulders. Cut slits in front and back of stockinette to pull shoulder pieces and front straps through. Position the anterior vest on chest. Adjust anterior vest as necessary for pendulous breasts or abdomen. Fasten all necessary straps. Vest adjustments.



## **RING APPLICATION** **The cornerstone of successful immobilization.**

Position head with bolster or Ossur Head Positioner. Clean and shave selected pin sites. Maintain sterile technique. Position ring on head with positioning pins. Apply local anesthetic to pin sites. Insert and tighten halo pins. Retighten after 30 minutes. Apply pin lock nuts.



## **SUPERSTRUCTURE APPLICATION** **The framework for immobilization.**

Align and attach SDA. Insert posterior rods through posterior universal clamps. Tighten hex bolts. Insert anterior rods through anterior universal clamps. Tighten hex bolts. Ensure transverse rods are even and parallel. Set desired flexion/extension. Final checklist: bolts tight, straps secure, parallel planes with ring and transverse rod.



## **AFTER-CARE** **More steps to a successful outcome.**

Explain information on daily care of halo to patient. 24-48 hr. follow-up visit to check pin tightness. 3-wk. visits for liner changes and pin site inspections. Remove posterior vest but not uprights. Remove and replace posterior liner. Remove and replace stockinette. Clean patient's back. Replace and reattach posterior vest. Remove anterior vest but not uprights. Remove and replace anterior liner. Clean patient's chest and stomach. Replace and reattach anterior vest.



## **PEDIATRIC APPLICATION** **Physiological considerations/restrictions.**

Skull thickness varies considerably—a preoperative CT scan is critical. Cranial sutures should be noted. Application under general anesthesia. 6-10 pins tightened to 2-4 in.lbs. Frequent follow-up visits.



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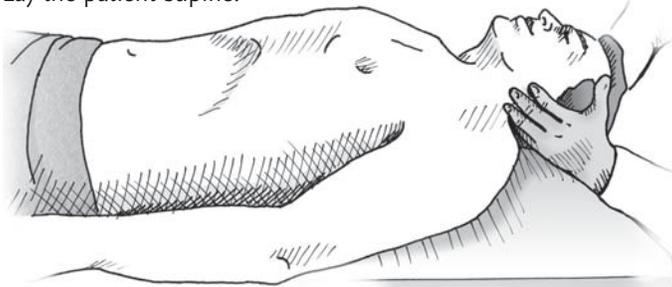


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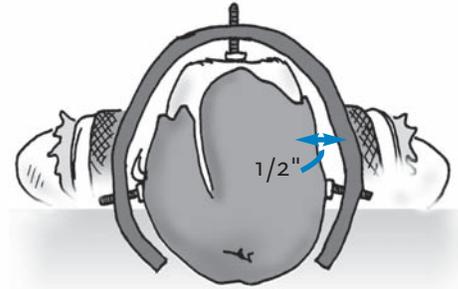
# PRE-APPLICATION

1 Lay the patient supine.



Ring should be large enough to allow for cleaning, with approximately 1/2" between ring and skull.

2 Measure patient's head circumference to determine ring size. Measure across greatest circumference of the skull (about 1/2" above the ears).



## SIZE CHART

Size	Head Circumference
SMALL	17" - 20" (43 CM - 51 CM)
STANDARD	20" - 23" (51 CM - 59 CM)
LARGE	23" - 26" (59 CM - 66 CM)



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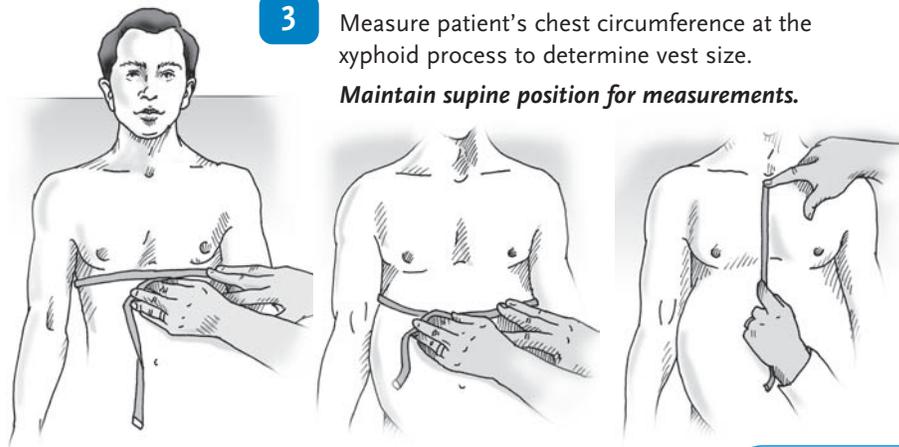


# PRE-APPLICATION

3

Measure patient's chest circumference at the xiphoid process to determine vest size.

**Maintain supine position for measurements.**



## SIZE CHART

Size	Chest Circumference
XSMALL	20" - 26" (50 CM - 66 CM)
SMALL	26" - 33" (66 CM - 84 CM)
SMALL/MEDIUM	32" - 36" (81 CM - 92 CM)
MEDIUM	33" - 40" (84 CM - 102 CM)
MEDIUM/LARGE	38" - 42" (96 CM - 107 CM)
LARGE	40" - 46" (102 CM - 117 CM)
XLARGE	46" - 52" (117 CM - 132 CM)



**Exception: with pendulous abdomen, measure around the widest part of the costal margin and the sternal length to ensure fit across this area.**

*(See Adaptations in Vest section).*





# PRE-APPLICATION

3

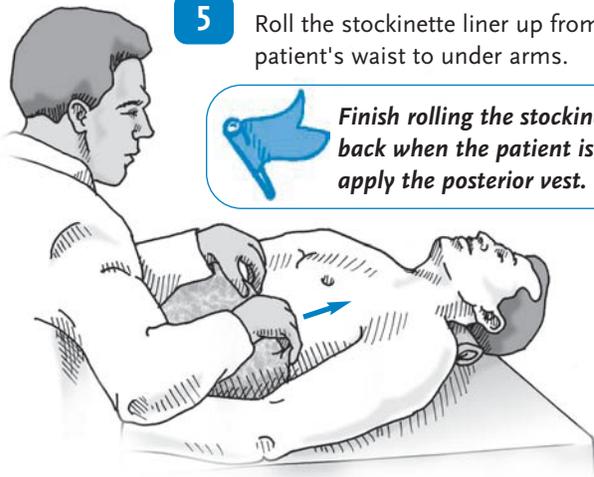
4

Bolster and secure patient head in desired treatment alignment.  
*Alternative: Use Ossur Head Positioner.*



5

Roll the stockinette liner up from the patient's waist to under arms.



**Finish rolling the stockinette in the back when the patient is raised to apply the posterior vest.**

**SAFE ZONE**



6

Select appropriate pin sites based on safe zone recommendations.



7

Shave the patient's head at the posterior pin sites.



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# VEST



Note: If not already separate, remove transverse rod from superstructure.

## POSTERIOR VEST APPLICATION

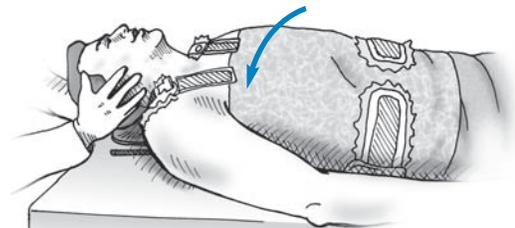
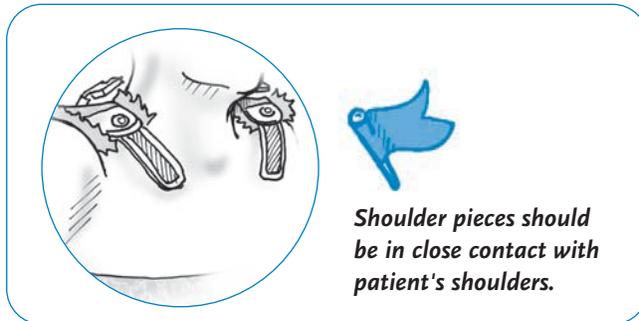
Requires one or two assistants.



- 1 Raise patient 45 degrees from the waist, one person holding head position at all times, two people on either side.



- 2 With the patient elevated, finish rolling up stockinette, place posterior vest on patient, and replace bolster at the top of vest piece.



- 3 Return patient to supine position.





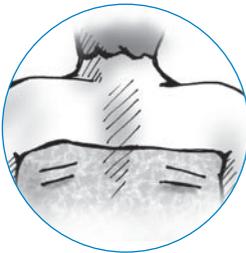
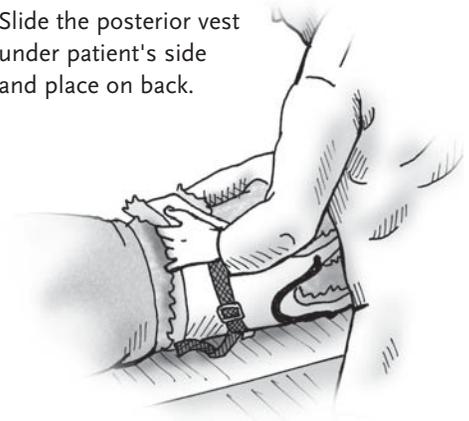
# VEST

## ALTERNATIVE POSTERIOR VEST APPLICATION

**4** Lay the patient on side, and finish rolling up the stockinette.



**5** Slide the posterior vest under patient's side and place on back.

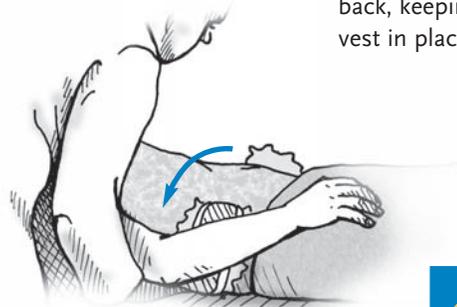


*To keep stockinette from rolling down during wear, cut four slits in stockinette.*



*Feed shoulder pieces of posterior vest through slits in stockinette.*

**6** Logroll the patient onto back, keeping posterior vest in place.

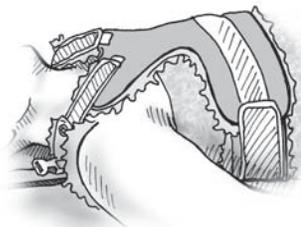




# VEST

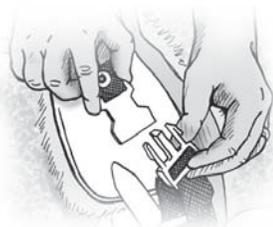
## ANTERIOR VEST APPLICATION

7 Place anterior liner on patient's chest.

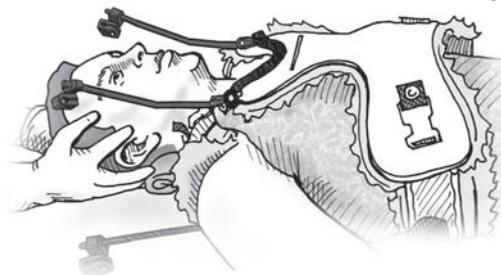


*Ensure that the sternal notch is clear, and there is no impingement on the clavicles.*

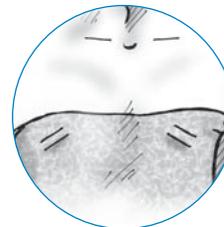
9 Place anterior liner on patient's chest.



8 Position the anterior vest on the liner, matching velcro sections.



*To keep stockinette from rolling down during wear, cut four slits in stockinette.*



*Feed shoulder straps of anterior vest through slits in stockinette.*

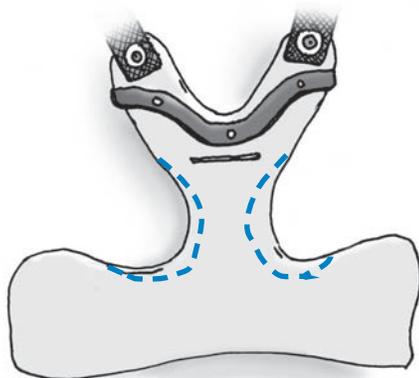




# VEST

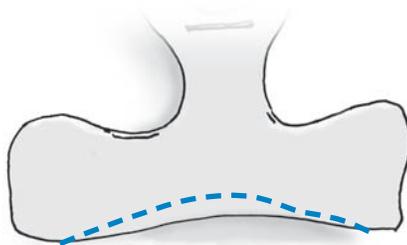
## PRACTITIONER ADJUSTMENTS TO ANTERIOR VEST

*Adjustments for large breasts and pendulous abdomen.*



**A** Trim middle vest plastic(keeping sheepskin intact).

**B** Fold sheepskin over to protect breast tissue.



Trim vest plastic as necessary to accommodate pendulous abdomen.



**Need a custom-sized vest? Call Ossur with the following measurements:**

- chest
- waist
- hip to shoulder



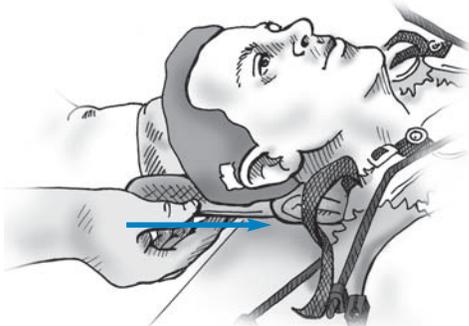


# RING



*Some situations may require application of ring BEFORE vest application.*

- 1** *Optional:* Maintain manual stabilization and secure head positioner.

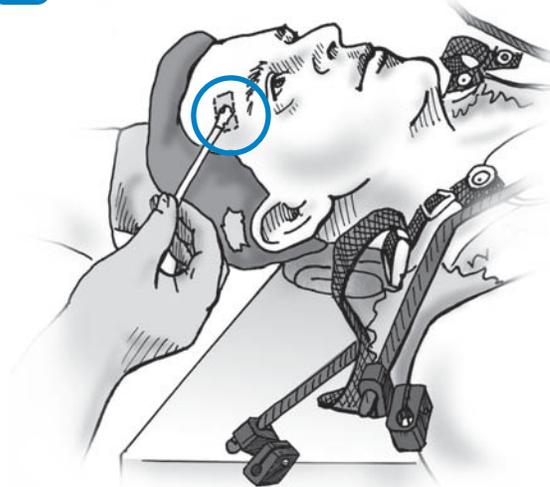


- 2** Put on gloves.

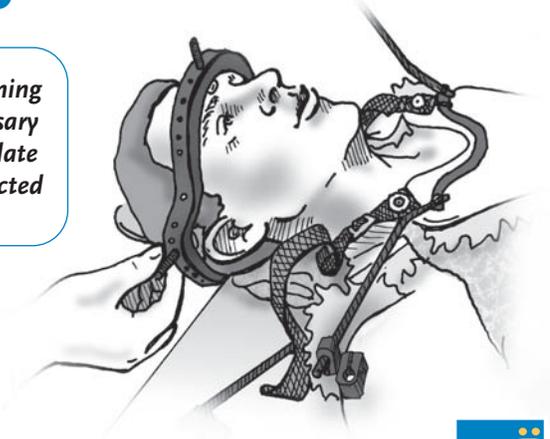


*Move positioning pins as necessary to accommodate access to selected pin sites.*

- 3** Use antiseptic swabs to clean pin site areas.



- 4** Position ring on head with the positioning pads provided.



*Use sterile technique!*

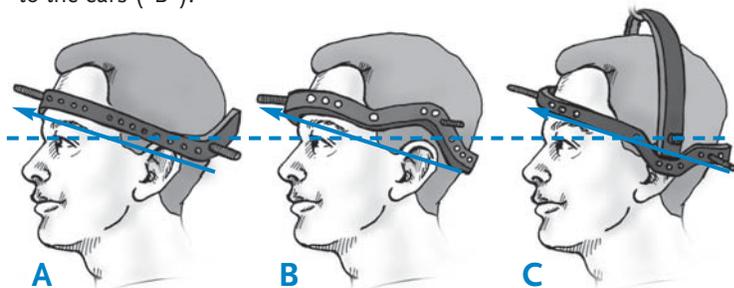




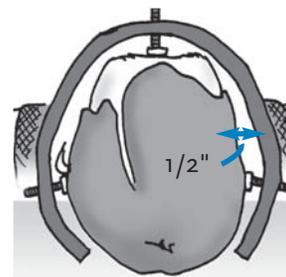
# RING

**5** Appropriate placement and slope of ring on head.

**Place ring low and tight on head** as shown: ("A" - closed back ring; "B" & "C" - open back ring). With use of tongs, orient V over ears to fit around base of tongs ("C"), otherwise invert V to allow access to the ears ("B").



**Important:** To keep the ring as low as possible, without touching the ears or eyebrows.



**6** Local anesthetic applied to sites through the ring.

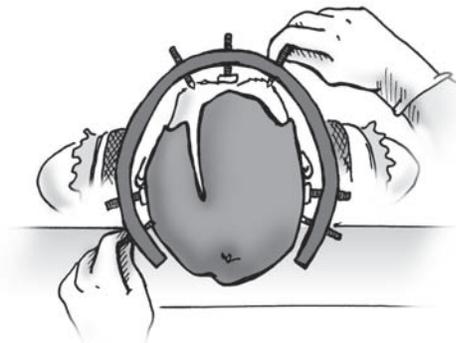
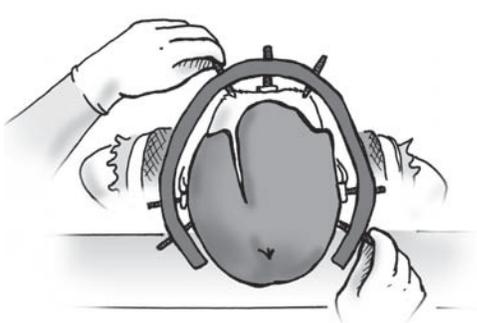


**Anesthetic without epinephrine should be used in order to avoid necrosis around the injection site.**



**Patient should close eyes for pin application to prevent skin bunching.**

**7** Insert pins, finger tighten in opposing pairs.

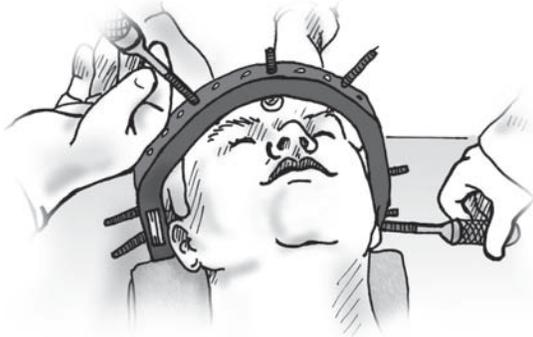




# RING

3

- 8 Torque driver tighten to 6-8 in.lbs. in opposing pairs (ideally with two people).

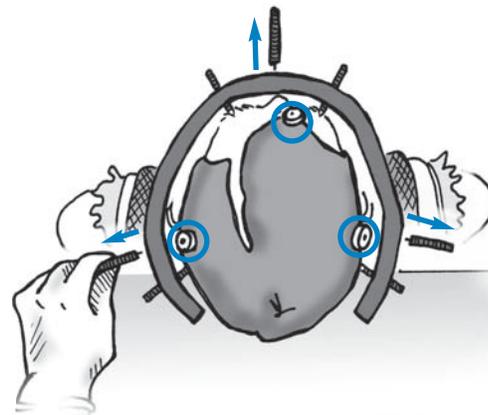


**Pins should be tightened to 6-8 in.lbs., as indicated by preset torque driver. If higher or lower torque is needed, use Ossur Adjustable Torque Driver #575S.**



- 10 Finger tighten supplied lock nuts.

- 9 Remove positioning pins/pads.



**Wait 30 minutes before checking pin tightness to allow periosteum to subside.**



- 11 Thirty minutes after application, loosen lock nuts, check pin torque, and retighten lock nuts.



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# SUPERSTRUCTURE

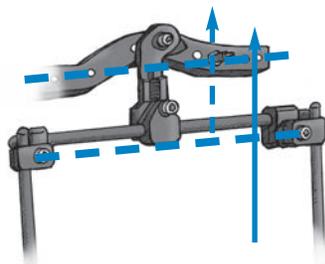
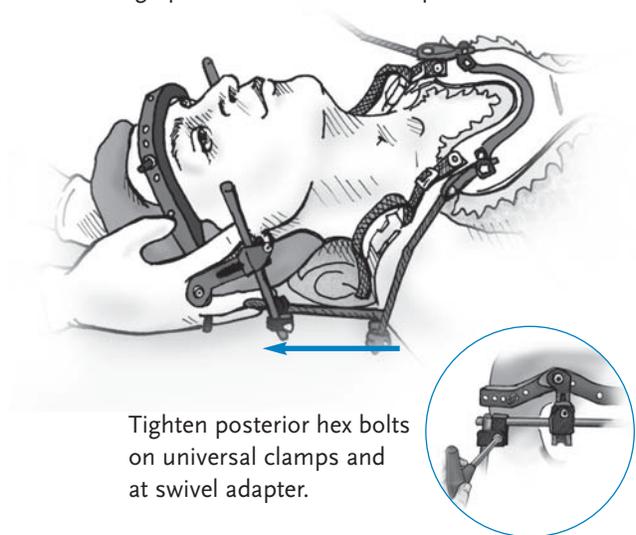


**Ensure upright rods are attached to posterior / anterior vest.**

- 1** Align and attach adjustable upright and transverse rod assemblies to halo ring.

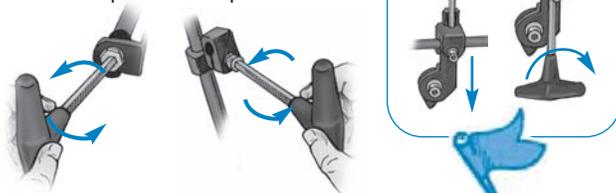


- 3** Maintain head position while inserting posterior rod through posterior universal clamps.



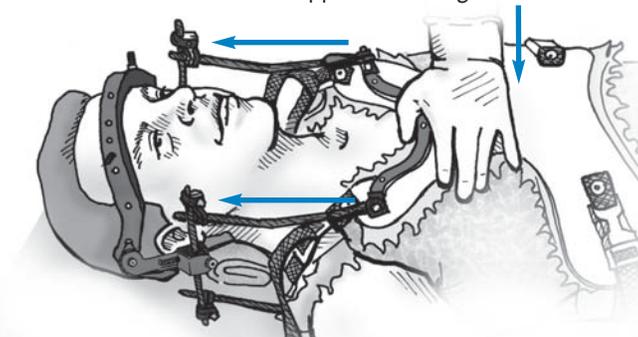
**Ensure transverse rods are parallel to each other in the same plane. Whenever possible, upright rods should be perpendicular to transverse rods.**

- 2** Loosen universal clamps on upright rods, and at swivel adapters on superstructure.



**The Adjustable Upright is adjustable in the vertical plane to allow for fine-tuning of distraction or compression.**

- 4** Lean on anterior vest while connecting anterior up-rights to transverse rod with universal clamps. Firmly re-tighten shoulder and waist straps to eliminate gaps and to obtain firm support of vest against sternum.



**Applying delto-pectoral pressure allows the anterior up-rights to slide into position, ensuring appropriate compression.**

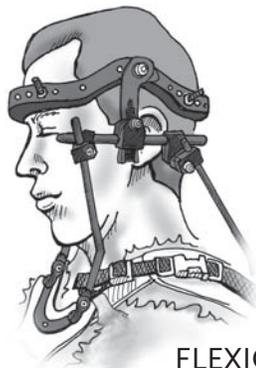
Tighten anterior hex bolts on universal clamps and at swivel adapter.



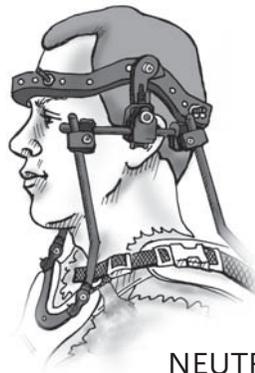


# SUPERSTRUCTURE

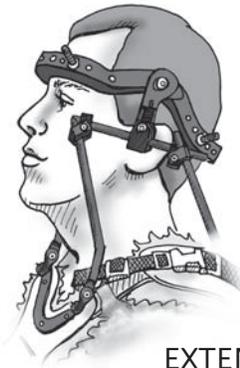
**5** Adjust placement of upright rods to accommodate desired neck position. Align universal clamps on posterior and anterior uprights with transverse rod.



FLEXION

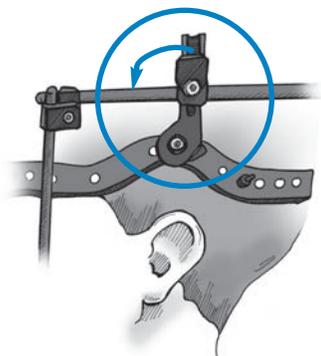


NEUTRAL

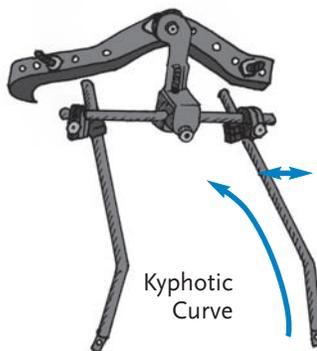


EXTENSION

## TIPS FOR ENHANCED EFFECTIVENESS



*Reversing the adjustable upright can bring the transverse rod higher, and clear the space in front of the ear; however, there may be height restrictions in the length of the superstructure.*

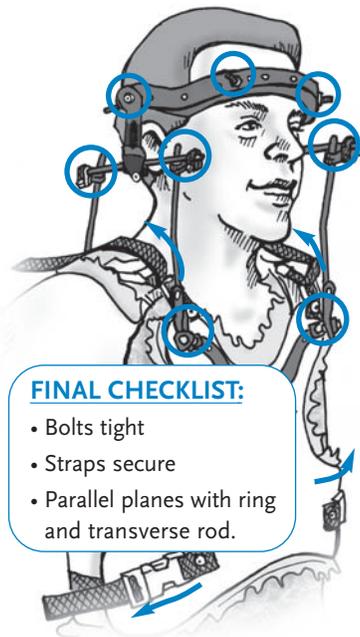


Kyphotic Curve



*Kyphotic patient? Reversing the direction of the posterior upright rods can accommodate for kyphosis, by following the existing curve.*

**6** Obtain x-rays and then check all attachments.



### FINAL CHECKLIST:

- Bolts tight
- Straps secure
- Parallel planes with ring and transverse rod.





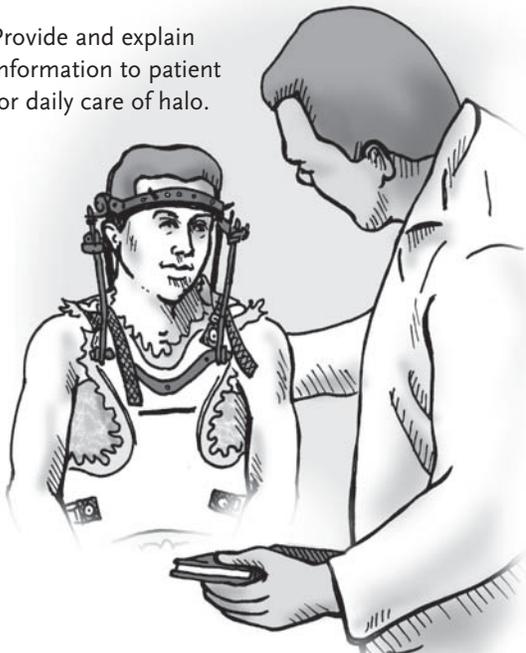
# AFTER-CARE



*Note: these instructions are directed towards practitioners/physicians applying halo, and are not intended as patient care instructions. Refer to Ossur Patient information Manual for patient home hygiene and care instructions.*

1

Provide and explain information to patient for daily care of halo.



2

24-48 hour follow-up visit post-application to check pin tightness and for signs of complications.

3

3 week visits for liner changes and pin-site inspections.



*In pin-site inspections, check for redness, discharge, or other signs of infection.*

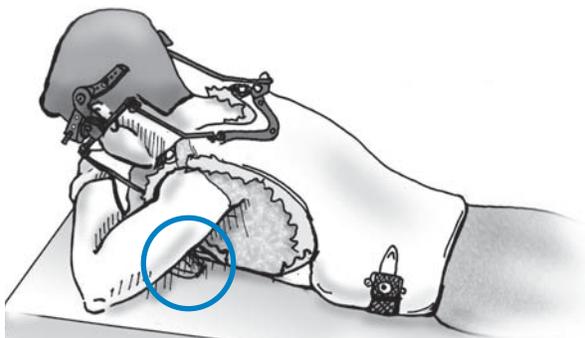


## PROTOCOL FOR POSTERIOR LINER CHANGE

*Per physician's prescription and established protocol only.*

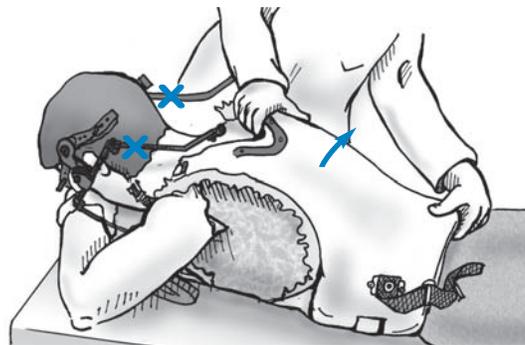
4

Place patient prone with chest bolstered slightly to raise face from table/bed.



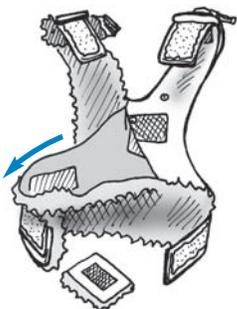
5

Remove posterior vest only. **Do not remove the uprights.**





# AFTER-CARE



**6** Remove dirty posterior liner.

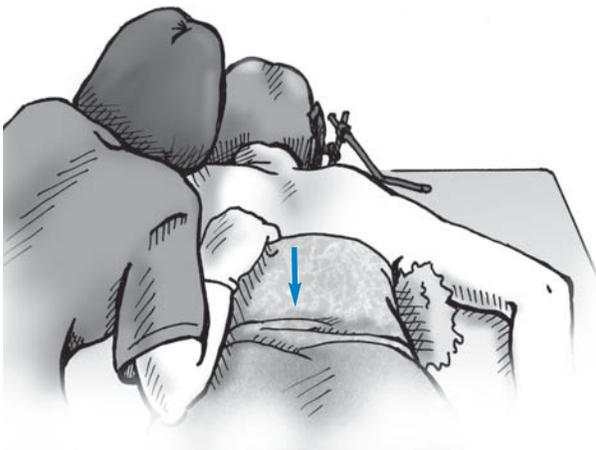


**7** Replace with a clean liner, matching velcro sections.

Review Vest Section for instructions on cutting slits in stockinette.



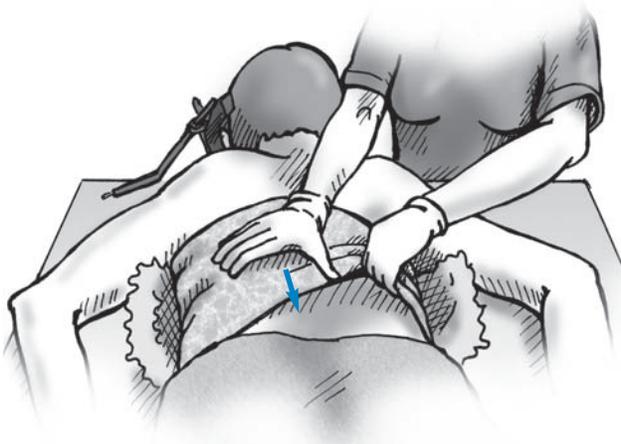
**8** Remove existing stockinette.



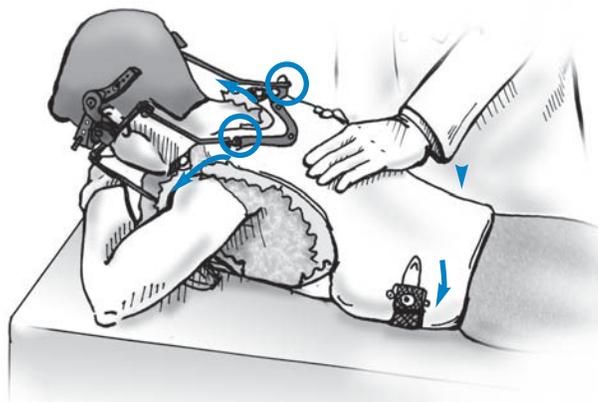
**9** Clean skin with hypoallergenic soap and water.



**10** Replace with a clean stockinette.



**11** Replace and reattach completely the posterior vest.

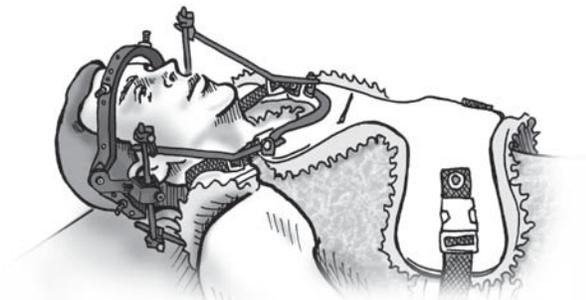




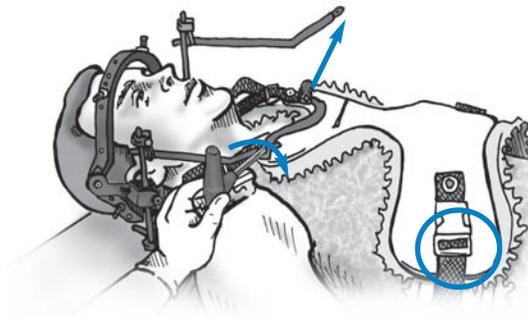
# AFTER-CARE

## PROTOCOL FOR LINER CHANGE

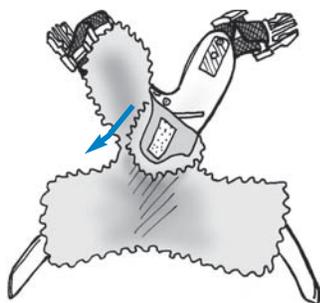
Per physician's prescription and established protocol only.



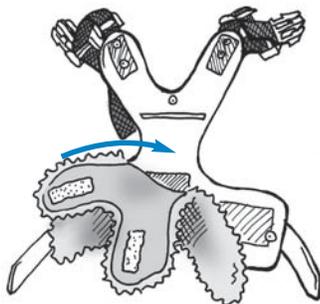
**12** Place patient supine.



**13** Remove posterior vest only.  
*Do not remove the uprights.*



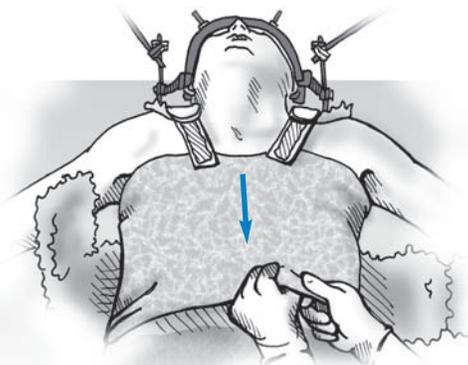
**14** Remove dirty anterior liner.



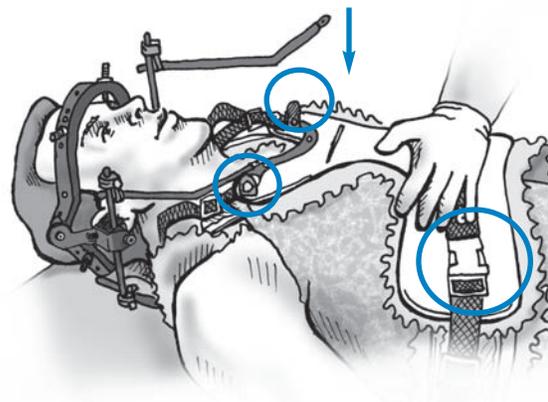
**15** Replace with a clean liner, matching velcro sections.



**16** Clean skin with hypoallergenic soap and water.



**17** Smooth out stockinette.



**18** Replace and reattach completely the anterior vest, ensuring proper deltopectoral pressure and coastal margin circumferential pressure.

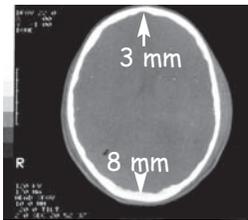




# PEDIATRICS

## PRE-APPLICATION

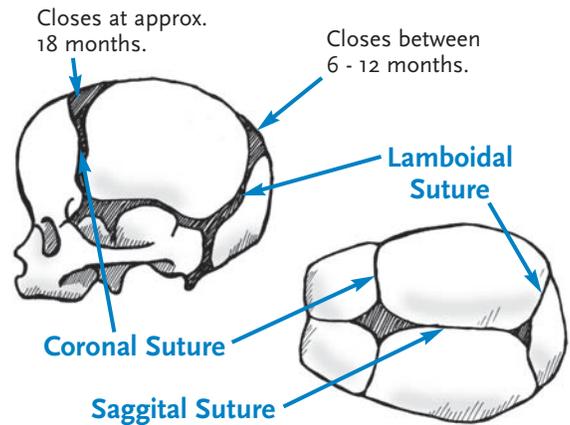
- 1 A pre-application skull CT scan is critical. Without one there is **NO SAFE ZONE** for pediatric application. A pre-application CT scan is a necessity to assess the skull thickness below the skull equator. Measurements should be obtained from a cut obtained on a line from 0.5 to 1.0 cm above the orbital rim and 1.0 to 1.5 cm below the maximum bi-parietal diameter.



Without one, there is **NO SAFE ZONE** for pediatric application.

Skull thickness can vary considerably regardless of age of child; even in the "safe areas" thickness can be as low as 2mm until age 10. After age 10, skull thickness is proportional to skeletal growth; by 16, adult skull thickness is reached.

- 2 Cranial sutures should be noted and avoided in pin placement, particularly the posteriorly located lambdoidal suture.



The skull sutures are highly mobile until fontanelle closure is complete, and remain slightly mobile until 24-30 months.

## RING APPLICATION

- 3 The cervical spine may be in an exaggerated position of flexion when the child is lying supine. Appropriate padding should be used to maintain cervical position. The **Occian™ AirWay PAD™** is pictured.



Neutral cervical position is best achieved by aligning the external auditory meatus with the sternum. In general, this is the most appropriate position of the cervical spine within the halo ring and vest.

- 4 Three or four individuals are recommended for positioning the patient and application of the halo, while maintaining a neutral cervical position.



The primary surgeon (1) is responsible for safely positioning the head and neck. Two assistants (2 & 3) apply the halo pins simultaneously with equal force in opposite directions while another assistant (4) prevents ring migration and ensures symmetrical application.

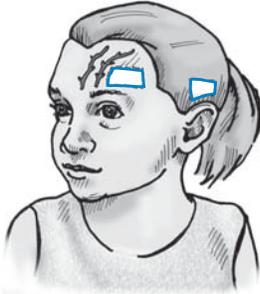
For detailed Vest Application Instructions, please refer to Vest section of Practitioner Primer.





## PIN CONSIDERATIONS:

- 5 Anterior pins should be placed 0.5 to 1.0 cm above the orbital rim and posterior pins should be placed 1.0 to 1.5 cm below the equator of the skull to avoid migration or dislodgment of the halo.



*Pin sites should be prepared by shaving and then cleaning with an antiseptic swab.*

**“Safe” Zones for pin placement** (dependent upon results of CT scan), avoiding anterior nerves, frontal sinuses, and temporalis muscles.

- 6 The number of pins to be applied varies based on the age of the child and the number of available pin sites.



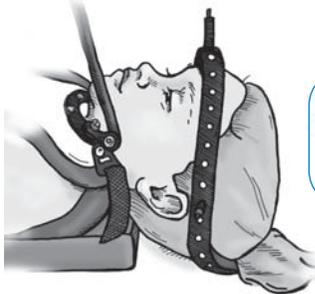
<4 yrs = 8 - 10 pins  
5-10 yrs = 6 - 8 pins  
>10 yrs = 4 - 6 pins



*By increasing the number of pins used, lower forces can be magnified over a greater surface for fixation.*

## RING PLACEMENT AND APPLICATION

- 7 Ring position should be carefully controlled to ensure consistent spacing between ring and skull. Pins should be applied with equal torque in opposite directions (diagonally) simultaneously.

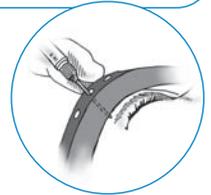


*Avoid resting the halo ring on the pinna of the ear.*

- 9 Three or four individuals are recommended for positioning the patient and application of the halo, while maintaining a neutral cervical position.



*To minimize pin discomfort post-application, a local anesthetic (without epinephrine) should also be applied to the pin sites.*



- 8 Pins should be applied to finger-tightness; torque wrenches are then used for final tightening.



**Insertion Torque:**  
- 1 in.lb/yr to age 5  
- maximum 6 in.lb/pin for ages 6+

Pins retightened **after 15 minutes**. Final torque check/pin retightening **after 24 hrs**.

## AFTERCARE

- 10 Meticulous follow-up care is recommended. Schedule frequent follow-up visits to ensure pin care is appropriate. Pin site infections may be treated with oral antibiotics; loose pins should be replaced and alternate sites selected.

