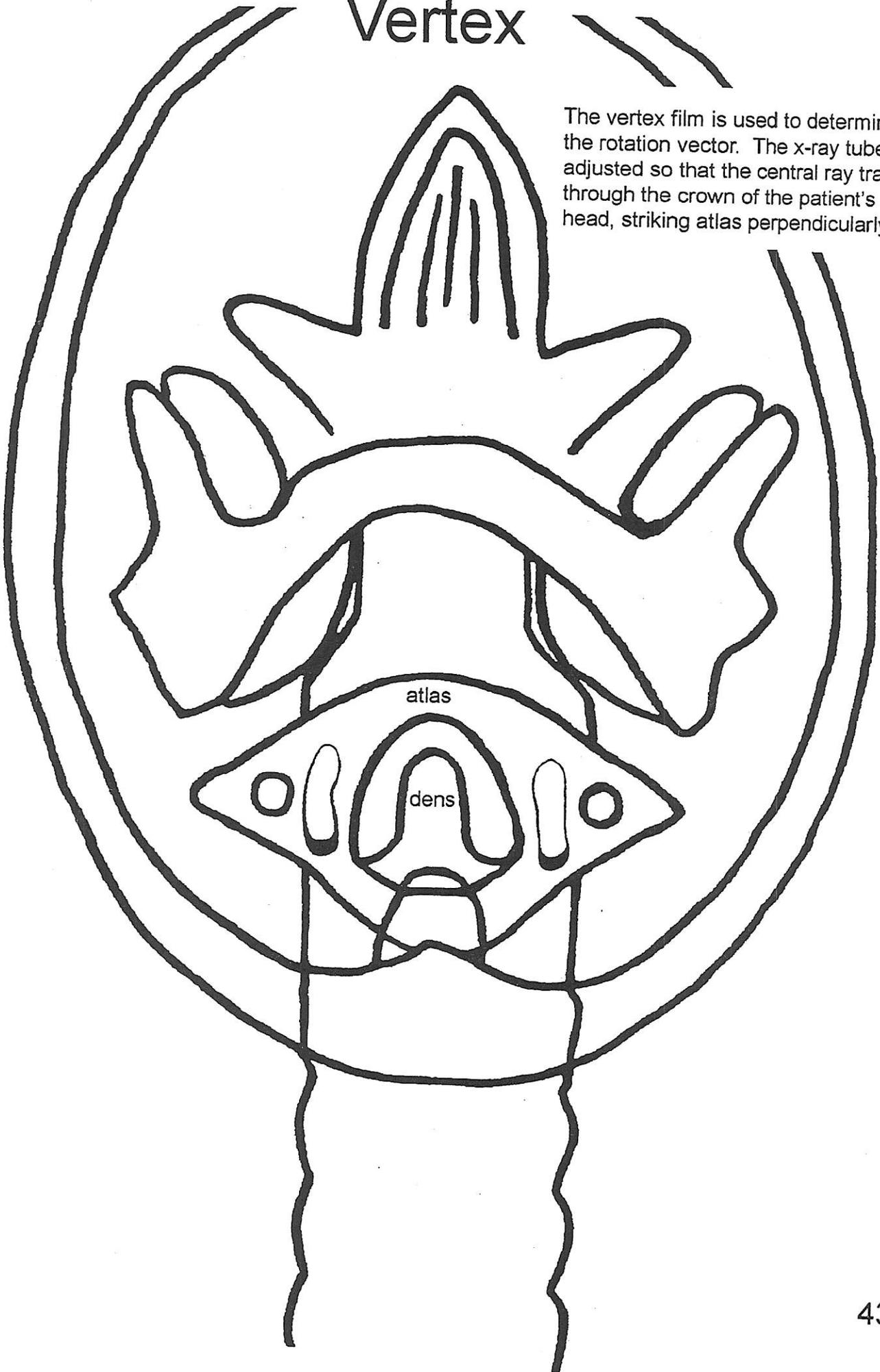
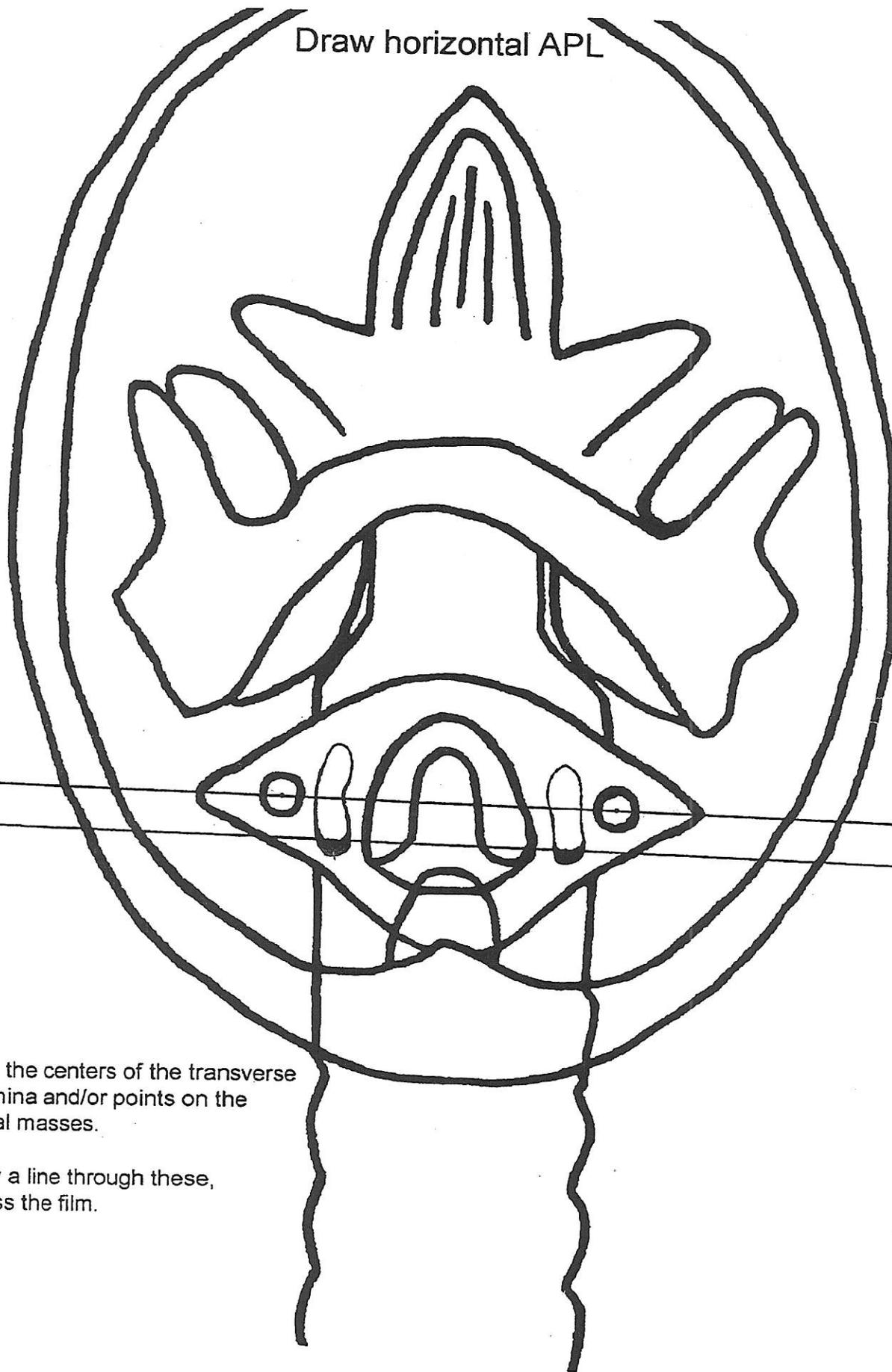


Vertex

The vertex film is used to determine the rotation vector. The x-ray tube is adjusted so that the central ray travels through the crown of the patient's head, striking atlas perpendicularly.



Draw horizontal APL

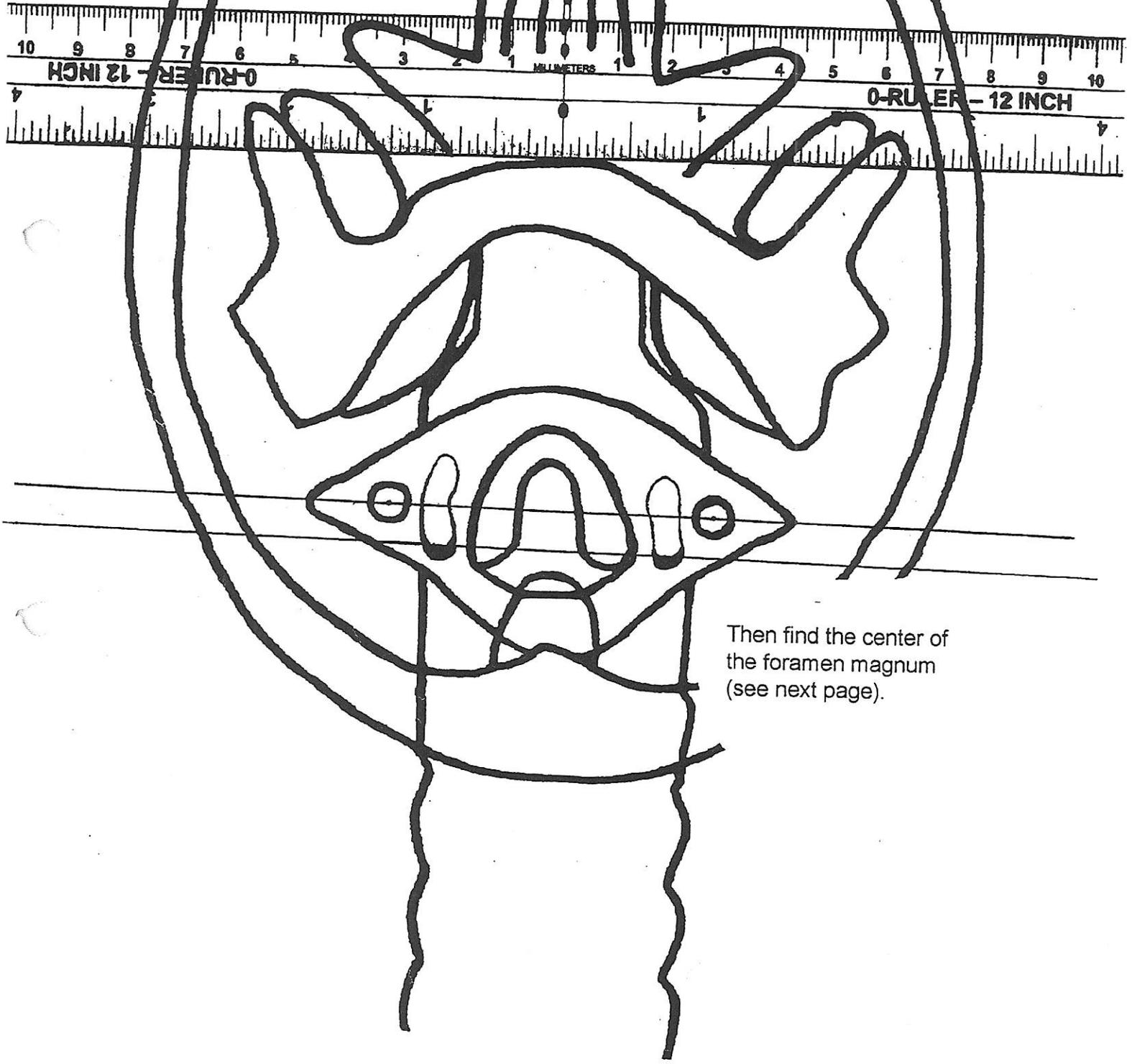


Mark the centers of the transverse foramina and/or points on the lateral masses.

Draw a line through these, across the film.

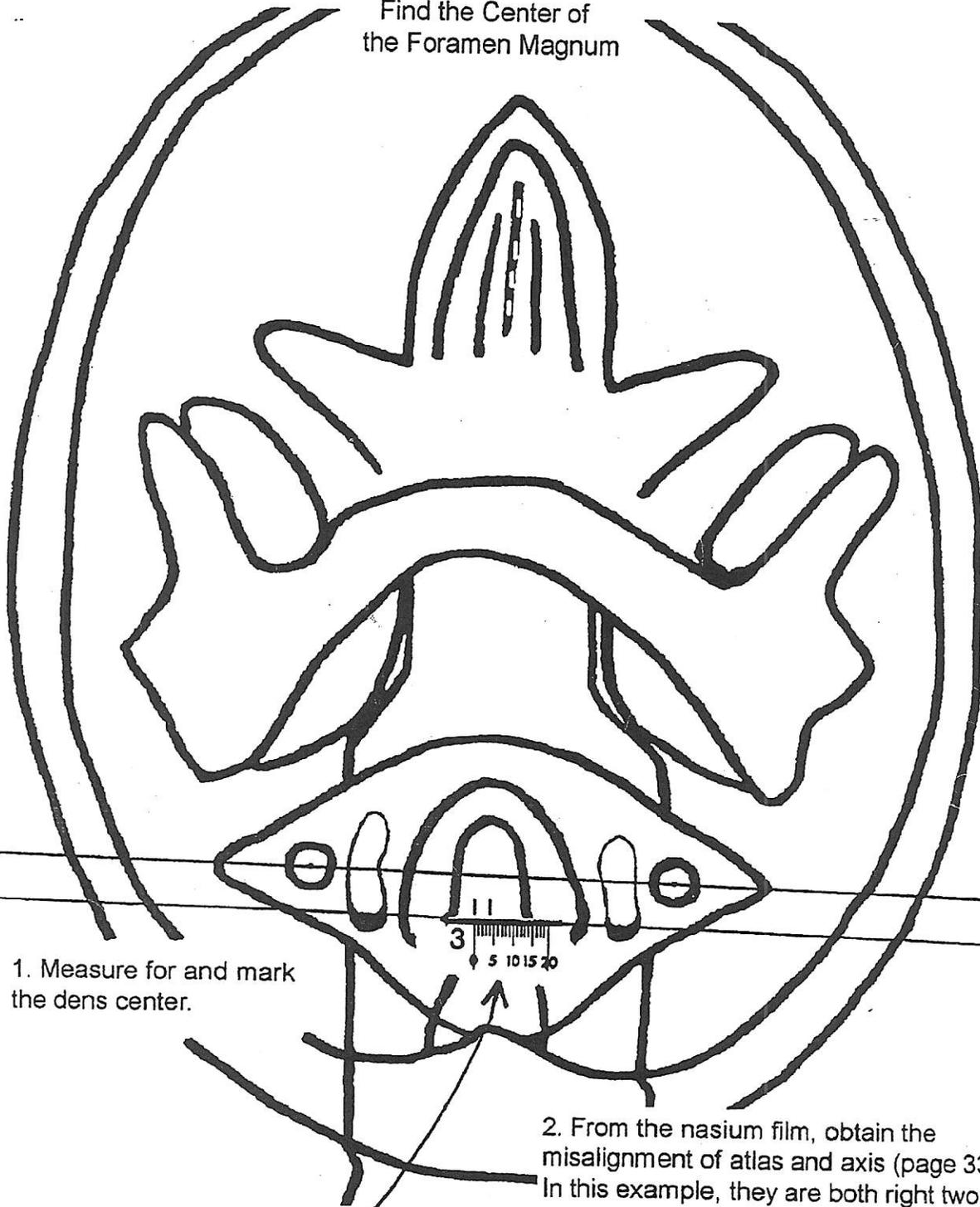
Mark the Center of the Skull

First mark the center
of the cribriform plate.



Then find the center of
the foramen magnum
(see next page).

Find the Center of
the Foramen Magnum



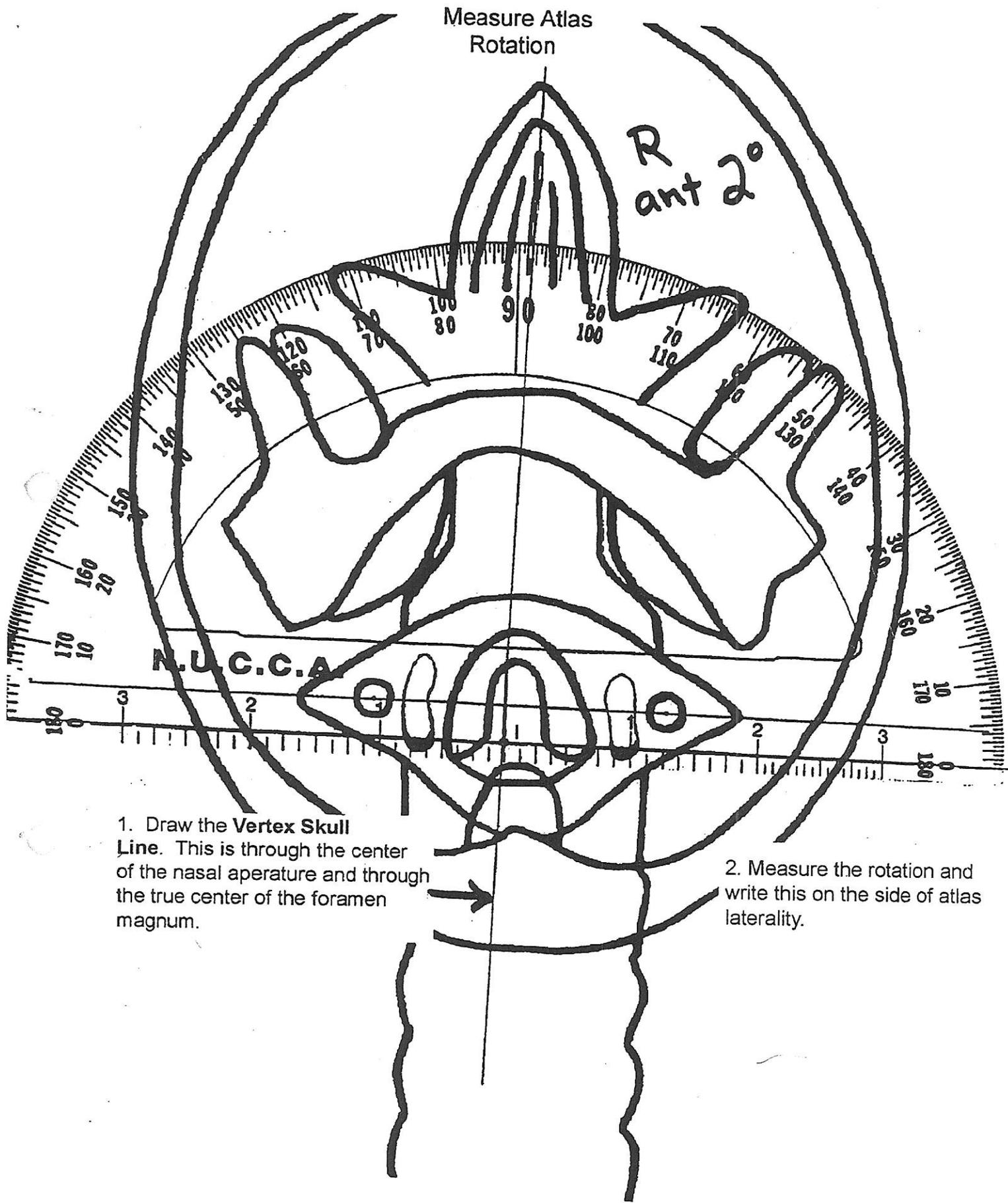
1. Measure for and mark
the dens center.

2. From the nasium film, obtain the
misalignment of atlas and axis (page 33).
In this example, they are both right two degrees:

3. Then, using the relatoscope scale,
measure in the opposite direction to find
the true center of the foramen magnum.

In this case go **left** 4 degrees.

at R2
od R2



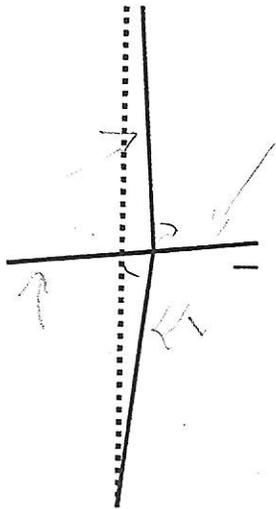
Biomechanics and Headpiece Setup

- Basic Types
- Headpiece setup

The head is the heaviest structure involved in the upper cervical adjustment, weighing approximately 12 pounds.

It is important to correctly place the head on the headpiece, so that this weight can be used to assist the adjustment.

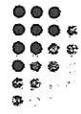
Basic type 1



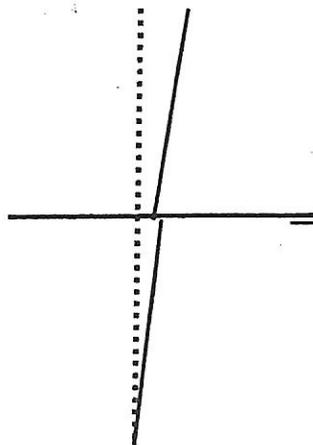
1) Head on or parallel to the vertical axis, or tilted away from laterality

2) High plane line on side of laterality.

3) Contralateral acute angles.



Basic type 4



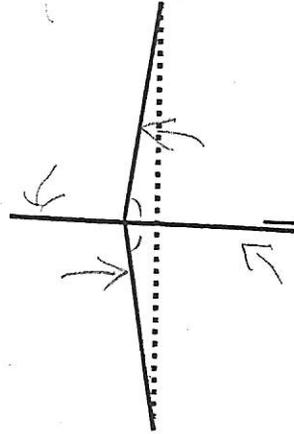
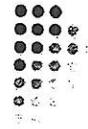
1) Head is tilted (z-axis) toward the side of laterality.

2) Plane line is high, level, or low.

3) Contralateral acute angles.

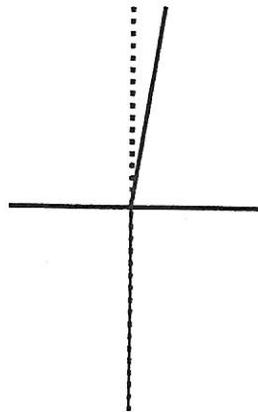


Basic type 2



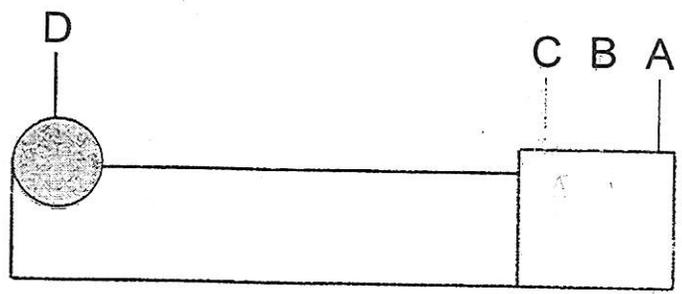
- 1) Head is turned (z-axis) toward side of laterality.
- 2) Plane line is level, slightly high, or slightly low on side of laterality.
- 3) Ipsilateral acute angles.

Basic type 3

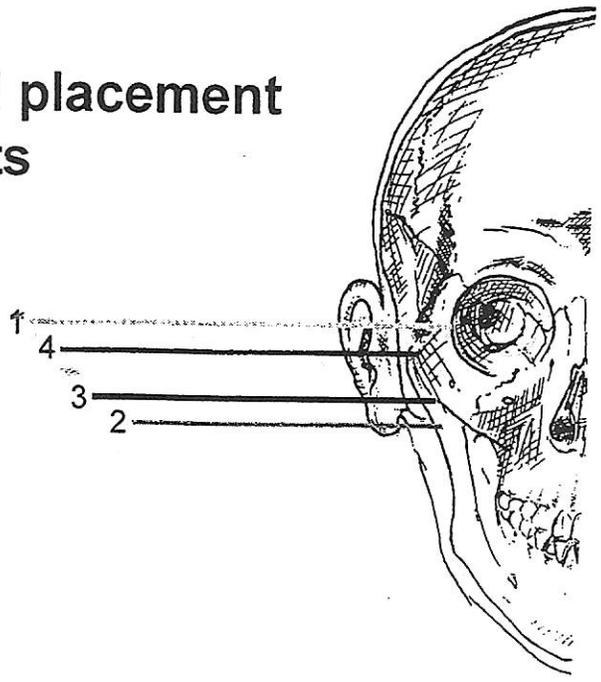


- 1) Head turning (z axis) creates the laterality.
- 2) Plane line is level, or slightly high or slightly low.
- 3) There is no lower angle.

The headpiece



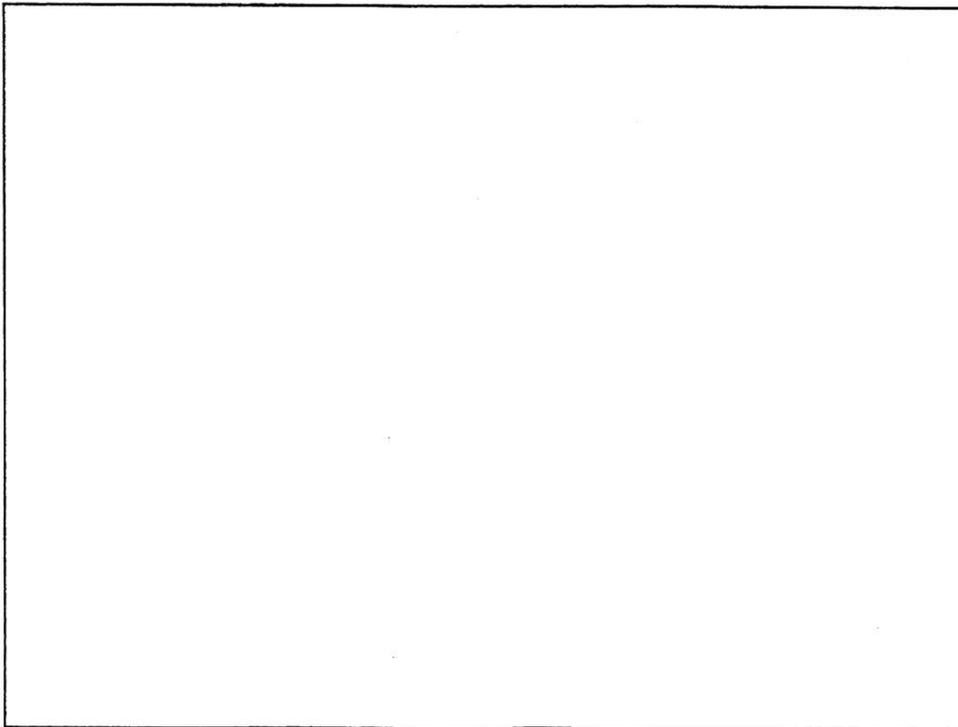
Head placement points

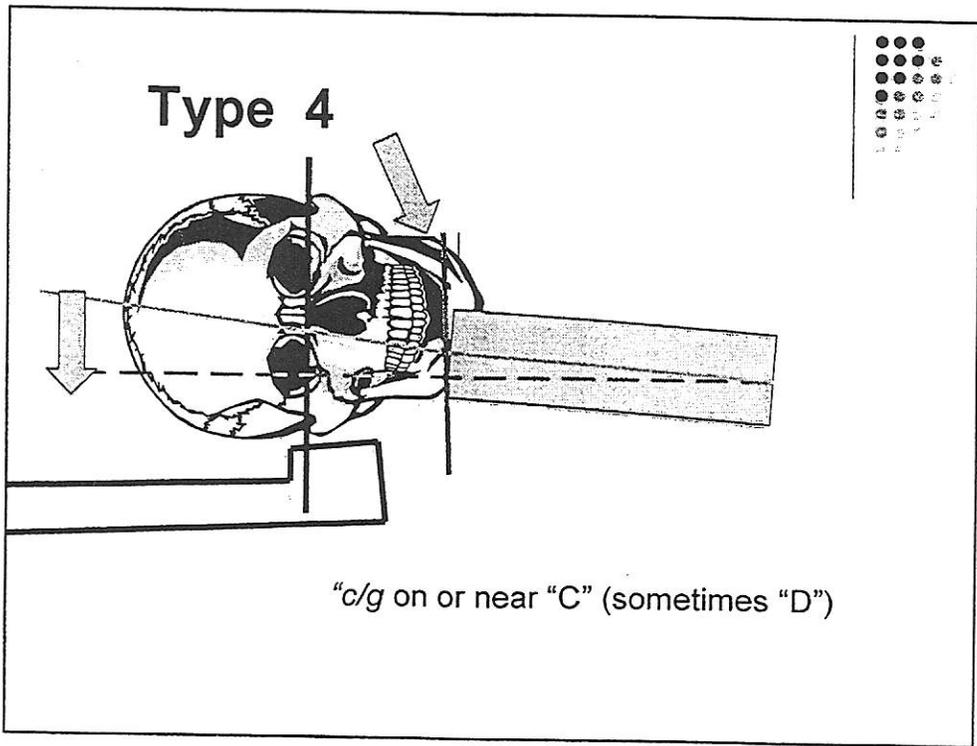
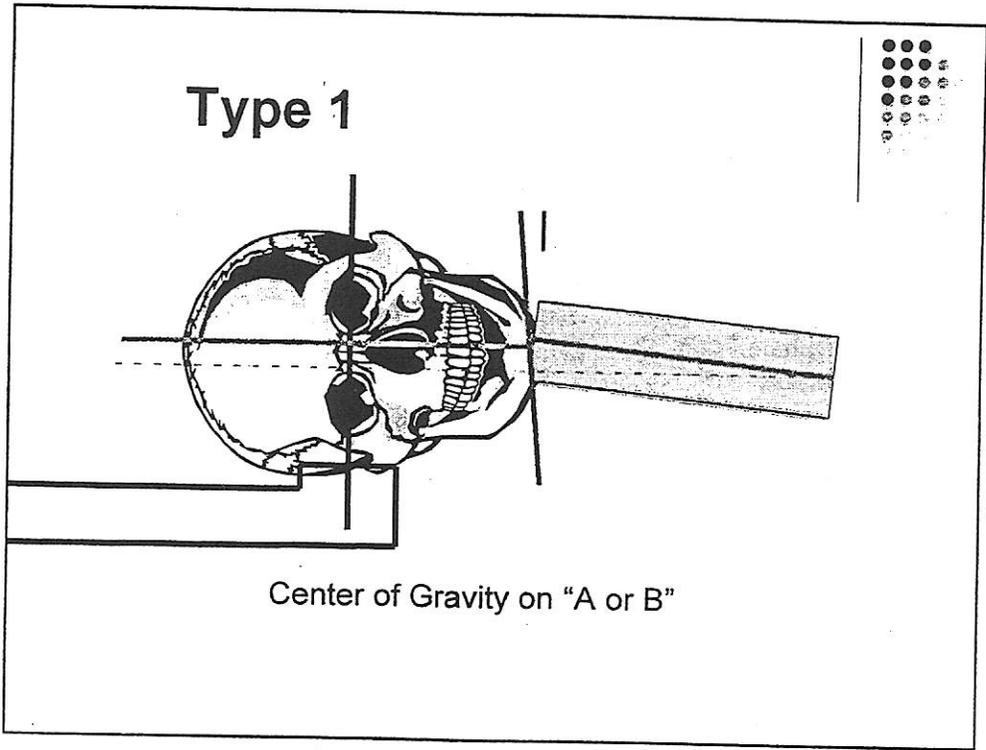


Headpiece Setup



Basic Types:	Type 1	Type 2	Type 3	Type 4
Headpiece Position	(A), B	D	D, (C)	C, (D)
Center of Gravity position (pupils)	c/g on A	Mastoid tip on D	Mastoid on D	c/g on or near C
Angle of Headpiece	Level	Down	Down	Some down





NUCCA Resources



Just the Facts

For the center-of-gravity (c/g) of the head, use the pupils, not the canthus of the eyes. This is more accurate.

To make the adjustment go more easily, take all the time needed to make sure patient is set-up correctly on the headpiece. Take several minutes, as this will reduce the number of triceps pulls or future difficult situations greatly. "Difficult situations" means accidentally changing the patient's type/listing or making them worse.

When placing the head, make sure the eyes are aligned exactly vertical. Feel free to lift and place the head several times to get everything right. Note sometimes the eyes are not symmetrical, which should be accounted for.

Occasionally the patient is overly uncomfortable when laying on their shoulder and arm. They may then tighten their neck muscles, making the adjustment difficult. You may try to pull their arm and shoulder forward so they are resting slightly on their back. If this makes them more comfortable, the adjustment may go easier.

Type I

- Use c/g on "A" or "B". Height vector should be at least $\frac{3}{4}$ " to 1" above the c/a number.

Type II

- Use "D" position on the mastoid tip, with some parietal tilt so the head has room to move. A hand's thickness is sufficient for clearance under the head.
- If you are having difficulty removing the head tilt, try the following:
 1. Keep head and neck in straight line
 2. Lower the headpiece so that the neck and head assembly are tilted down and that the top of the head is 2" or so lower than normal. Make sure head and neck are still straight, pivoting at the base of the neck.
 3. Keep the headpiece tilted "parietal down" so the head has some place "to go". I call this procedure "pre-down".

Type II Atypical

- Always use c/g on "B", **not** the mastoid tip.
- The "a-typical B" misalignments do not reduce consistently, patient to patient. Make sure you do the post film ASAP to see what has happened.

Type IV

- Usually start with "C" position on headpiece. If neck/lower angle is moving as intended, but not enough head tilt is being removed, slide patient so that the center of gravity (c/g) is up to $\frac{1}{2}$ inch past (superior to) the edge of "C".
- If $\frac{1}{2}$ " past C is not enough, try lowering the height vector 1" but using headpiece position A or B.
- Conversely if head tilt is been removed, but lower angle not reduced, slide patient so c/g is center of "C" or closer to "B".

- Note that above applies more if HT is due to C0-C1 misalignment, not so much if HT is due to C1-C2 misalignment (plane line).

Torque

Chapter 14 in the NUCCA textbook covers torque in two pages. Torque is applied during the adjustment to correct C2 spinous misalignment. When a spinous has misaligned laterally more than the dens, it rides up the facets. Therefore it has to be corrected down the facets toward neutral.

With NUCCA, a C2 spinous that has moved toward the atlas misalignment is considered inferior, because it has moved toward the side of atlas "inferiority". The atlas is inferior because the laterality angle on that side is less than 90°.

As an example, imagine C1 is 3° to the right of the CSL (central skull line), and the C2 spinous is 2° right. The C2 spinous still has to move back to center to become neutral. Therefore in NUCCA terminology, it is still an "inferior" spinous as it has moved to the side of laterality.

Due to the way the arm muscles are attached and work, the normal triceps pull automatically tends to correct an inferior spinous. This is usually an advantage with Types I's and IV's, as the C2 spinous often moves with atlas. If the desired torque is opposite and superior, it is important to apply superior torque.

If the patient is left side up and has an inferior C2 spinous, apply clockwise torque. With a right laterality and inferior spinous, go counter-clockwise. This works with vectors higher than zero, but not with low vectors. Another way to look at it is to consider the torque in relation to extension and flexion of the head. When using torque on a patient with an *inferior* C2 spinous, the movement of your adjusting arm should follow extension of the head.

With a *superior* C2 spinous, the movement of your adjusting arm should correlate with flexion of the head. Thus, with a patient left side up and a superior spinous, use CCW torque. For a patient right side up and a superior spinous, use clockwise torque.

Adjustment Check

Reliability of having an effective adjustment can be estimated by doing post checks. The following tests are commonly done, and are listed in their approximate order of importance.

1. Is the patient's head tilt corrected?
2. Are they balanced on the Spinemaster?
3. Supine leg check.
4. Have the hips been leveled?
5. Is their pelvis translation zero?
6. Is their head rotation reduced/eliminated?
7. Psoas check.
8. Are their neck muscles soft, with head supported?
9. Are their shoulders level? This change may take weeks or months to change dramatically.

NUCCA X-Ray Filming

	Blocker position in Bucky
Lateral	Bottom
Vertex	Bottom
Nasium	Bottom, on side

Note all films use 42" focal distance.

NUCCA Textbook and Website

NUCCA Protocols and Perspectives

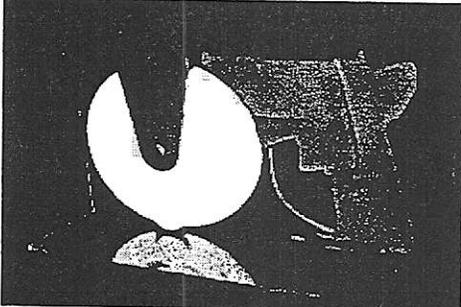
Michael D. Thomas, Editor

ISBN: 0-9716652-0-6

Also www.nucca.org has much information for both patients and doctors. At the website patients can view a 320 mph car crash, where the NUCCA technique was pivotal in the patient's recovery.



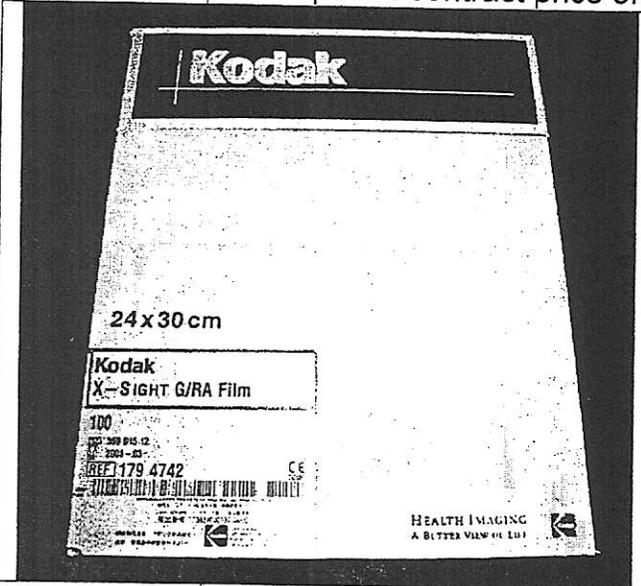
Resources

<p>NUCCA instruments</p>	<p>The set includes the cephalometer, circumscale with relatoscope, and the vertex square.</p>	<p>Buy these from www.nucca.org, or at a NUCCA conference.</p>
<p>Protractor</p>	<p>The Official NUCCA Protractor is also available from nucca.org. It is 8" in diameter, and easier to use than commercial protractors.</p>	
<p>T-square</p>	<p>The LCCW bookstore can order the 12" t-squares made by Helix. To use them on film, it is best to use an electric sander to remove the raised portion of the "T" end. Also the <u>C-Thru Ruler Company</u> makes a very nice one called the JR-12.</p> <p>T-squares are a big improvement over triangles for referencing the edge of film.</p> <p>Helix #20002 Plastic T-Square, 12" or C-Thru #JR-12.</p>	
<p>Clinometer</p>	<p>Made by Invicta Plastics Limited, in England. They have two clinometers. Only the original, #025000, will work for NUCCA. Order from Hope Education in Cheshire, England. A plastic base has to be fabricated for use with NUCCA.</p>	
<p>Zero-center ruler</p>	<p>Try Kovachiro.com, about \$3 each.</p>	<p>They also make elevating tables.</p>

Resources

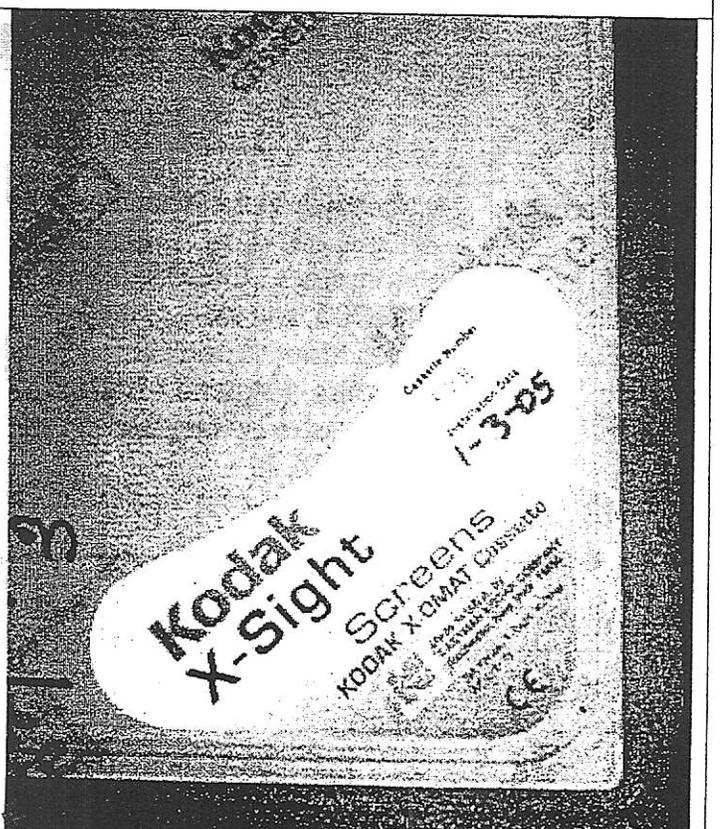
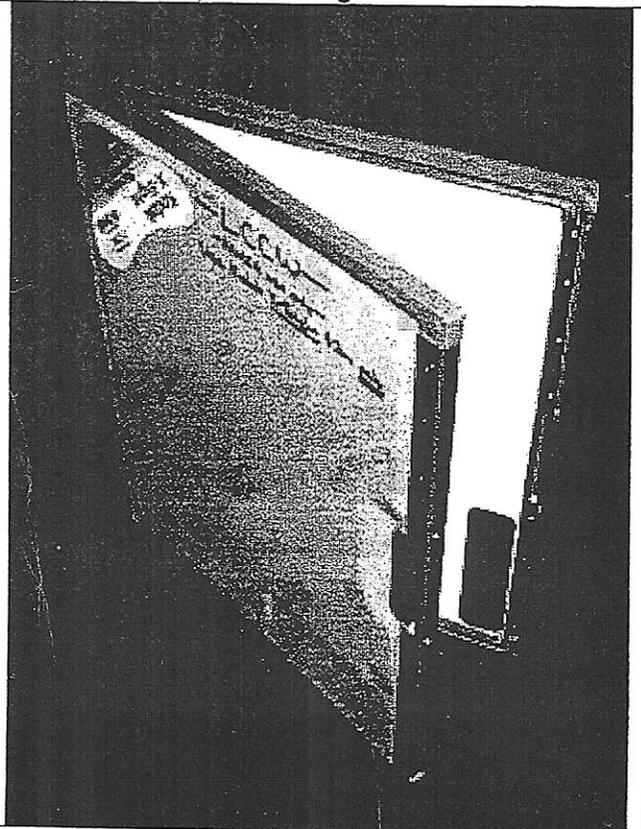
Film

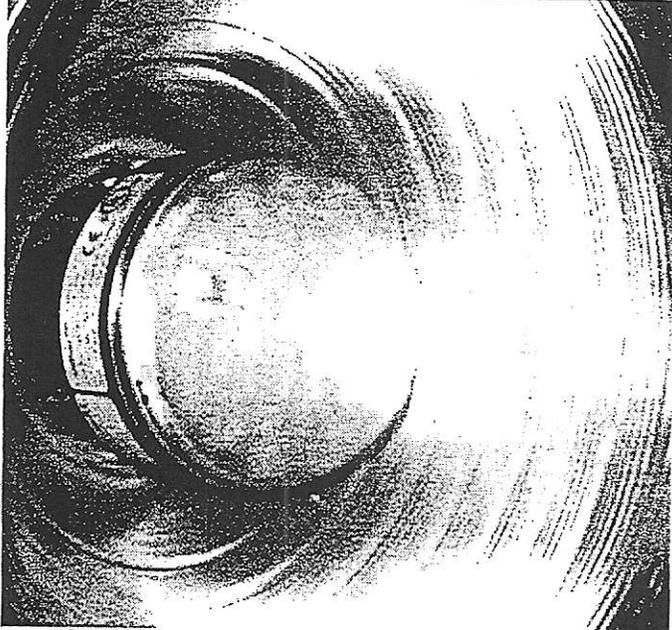
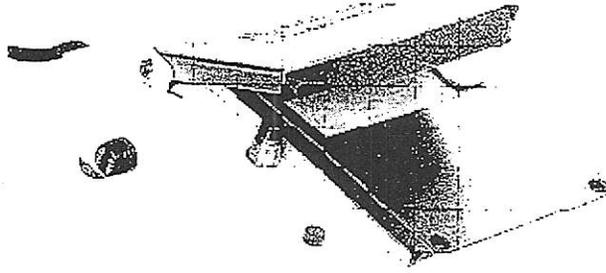
Kodak **X-Sight** system is currently the best for fine detail. The G/RA version is what you want. Use the full system, film and cassettes. SourceOneHealth.com has good prices on X-sight film. Kodak has arranged for a special contract price on X-Sight film to NUCCA professionals.



Cassettes

The nasium needs a cassette *without* a window, which is custom. This is so the right TP's are not obscured by the window. Call cassette repair companies for a quote on a custom cassette *without* a window but with the X-sight screens. The vertex and lateral films can be taken with a standard cassette with X-sight screens and film.



Cassette Repair Facilities	<p>Below are the main repair centers that can assemble X-sight screens into windowless cassettes. Call all three to obtain a fair price.</p> <p>Rochester Cassette Repair Center, Hilton, NY. (800) 528-6311</p> <p>Reina Imaging, Crystal Lake, IL. (800) 752-4918</p> <p>MXE, Inc., Culver City, CA. (800) 252-1801</p>	
Safelight	<p>Kodak has a LED safelight which is twice as powerful as a conventional system, but is the same exposure to the film. No matter what, do not buy a red light from a hardware store. LCCW has an LED lamp mounted in the ceiling of the darkroom, which is upstairs in the clinic.</p> <p>If using a conventional safelight, make sure you are using the Kodak GBX-2 (green/blue/x-ray) filter. This is safe for 400 and 800 speed systems. Use a 15 watt frosted white bulb for direct illumination.</p>	
View box	<p>Best to make your own. 30" long on the inside, 35° face to fit 12" high film. Use 1/8" thick "lighting white" plastic. Keep bright, unused areas to a minimum by limiting the length and width to film size or slightly smaller.</p>	<p>You will need:</p> <p>2: 24" cool white fluorescent lamps, size T12. 1: Electronic ballast, Advance #RCN2S40SC. 4: Lamp holders, Levitron 13353-OON.</p> <p>Also needed are one switch, a power cord, and white paint for a highly reflective inside.</p>
ID Stamper	<p>LCCW has two, one is really an ID camera. The camera is used with cassettes that have windows.</p> <p>The manual stamper is used with cassettes that do <u>not</u> have a window. Therefore use it on the nasium film.</p>	 <p>Manual Stamper</p>

NUCCA X-Ray Steps

---all 42" FFD---

10 x 12 film

Lateral

1. No tube tilt (usually), CR at atlas TP.
2. Collimate to just inside film size.
3. Set headclamps to center of forehead, and back of skull.
4. Adjust rotation and L-R alignment as needed, loosening headclamps before moving chair. Use glabella bar and mirror, or look from front.
5. Head tilt, leave in but tilt tube to match.
6. No filter.

Vertex

1. 20° bucky tilt, use chin centering device.
2. Raise bucky so that patient's chin is horizontal, and there is a 90° angle mandible to SCM.
3. Set VP, EOP and sacral S2 in a vertical line, no rotation.
4. Set headclamps to posterior of skull, cradling the occiput.
5. CR about 1" below vertex of skull, though atlas, to center of film.
6. Collimate slightly inside film size.
7. Use glabella bar and mirror to align, backing off clamps before moving chair, no rotation or head tilt. Remove shoulder rotation with chair.
8. Head tilt; take out by moving head with your hands.
9. Head rotation; remove by guiding patient's head with your hands.
10. Ensure that the neck is directly under the skull.
11. Vertex filter.

Nasium

1. Tilt bucky to hit the head and at least one shoulder.
2. Set CR along S-line, through atlas TP, not to somewhere on bucky.
3. Raise bucky to match CR.
4. Collimate to film size, note that tilt alters collimation effect on film. This is because film surface is 1" behind front of grid cabinet.
5. Set clamps to C1 TP's.
6. Center patient to glabella bar, being sure to back off clamps when moving chair.
7. Head tilt, leave in.
8. Head rotation, remove by turning chair to compensate.
9. Nasium filter

notes:

1. Measure patient with calipers, use technique chart.
2. Measure lateral at atlas TP's, not at base of neck.
3. Use stops in bucky to match cassette size.

NUCCA X-Ray Analysis

Nasium Film

Atlas plane line	<p>a. APL. Find attachment points where posterior arch attaches to lateral masses. IPALM. Mark lower points and draw across.</p> <p>b. Atlas Check Line. Find upper points, draw laterally from each point (SPALM).</p>
Skull division	<p>a. Mark squamosal sutures, and turn of skull (about 2" up).</p> <p>b. Center cephalometer on skull, mark three points</p> <p>c. Pivot cephalometer on lower point, and then work up, 1/4" at a time, marking midpoints of skull width.</p> <p>c. Re-center the cephalometer on top mark, and check your skull division going down. This is the "double pivot check".</p>
Circles	<p>a. Condyle: find articulation with C1 (bow tie), find 3" to 5" circle.</p> <p>b. Axis: (1) Mark outer edge of articulating surface. (2) Find spots just lateral to "para odontoid dips", move <u>down and perpendicular</u> to surface <u>1 1/2</u> sixteenths, and make 2nd pair of marks. Measure circle, between 4" and 12".</p>
C2 center	<p>a. Mark center of dens, at base.</p> <p>b. Mark bifurcation point of spinous (upside down Y). Helps to compare size and location with lateral film.</p> <p>c. Draw a line between, and mark midpoint.</p>
Lower angle line	<p>a. Find and mark fixed point, C7 best. Use midpoint of articular processes.</p> <p>b. Draw line from FP, through center of C2, up to APL.</p>
Relate C2 to C1	Center the Relatoscope on C1, using the attachment points and the APL. Compare center of dens to C1, and spinous to C1.
Vertical Axis Line	Drawn up from fixed point, perpendicular to bottom of film.
Plane line	Compare APL to true horizontal plane line, $3/16" = 1" \text{ vector } +/-$.
Height vector factors	<p>a. Plane line, see notes</p> <p>b. at/od: Compare C1 and dens misalignment, see notes.</p> <p>c. c/a: circle difference (round condyle down and axis up).</p> <p>d. angle: Upper and lower angles compared, see notes.</p>

Lateral

Posterior arch attachments	Mark two spots so attachment points show up dense and discrete on nasium. (IPALM).
S line	Draw line through attachment points, compare to chart in book.

Vertex

Horizontal APL	<p>a. Outline anterior edge of posterior portion of occipital condyles. Draw line across film, though marks on each condyle.</p> <p>b. Alternate: Mark center of atlas foramina, draw line across.</p>
Vertical line	Referenced from edge of film (new method).
Measure angle	Measure on atlas laterality side, degrees off of 90° anterior or posterior.