Al-Zahraa University for Women
College of Health and Medical Technology
Department of Radiology and Ultrasound Techniques

Lecture 3

Submento-vertical, Sella turcica & Optic foramina and jugular foramina

3rd class / First coarse

Radiographic Techniques for Head and Spinal Cord

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Submento-vertical

* Position of patient and image receptor
* The patient may be imaged erect or supine.
* If the patient is unsteady then a supine technique is advisable as this is a difficult position to maintain.

* **Supine:**
* • The patient’s shoulders are raised and neck hyperextended to bring the vertex of the skull in contact with the image receptor/gridded CR cassette (or X-ray table).
* • The head is adjusted to bring the EAMs equidistant from the image receptor.
* • The median sagittal plane should be at right-angles to the image receptor along its midline.
* • The orbito-meatal plane should be as near as possible parallel to the image receptor.

Submento-vertical

* Position of patient and image receptor
* **Erect:**
* • The patient sits facing the X-ray tube a short distance away from the vertical Bucky/ receptor.
* • The neck is hyperextended to allow the head to fall back until the vertex of the skull makes contact with the center of the vertical image receptor.
* • The remainder of the positioning is as described for the supine technique.

Submento-vertical

* Direction and location of the X-ray beam
* • *The collimated perpendicular beam is directed at right angles to the orbito-meatal plane and centered midway between them.*
* Essential image characteristics
* • An optimum projection will demonstrate the mandibular angles clear of the petrous portions of the temporal bone.
* • The foramina of the middle cranial fossa should be seen symmetrically either side of the midline.

Submento-vertical

Radiological considerations

- Erosion of the bony margins of the skull base foramina is an important indicator of destruction by tumor.
- Under/ over tilting or any rotation, reduces the visibility of these foramina.

- This is now an uncommon projection as CT imaging demonstrates fine bone detail of the skull base with the ability to produce 3D reconstructions.
- However, this may be used as an alternative projection to demonstrate the zygomatic arches in profile for facial injury.
- MRI offer multi-planar imaging with detail of the soft tissues as well as the skull base.



Fig. 8.16a SMV using supine technique.

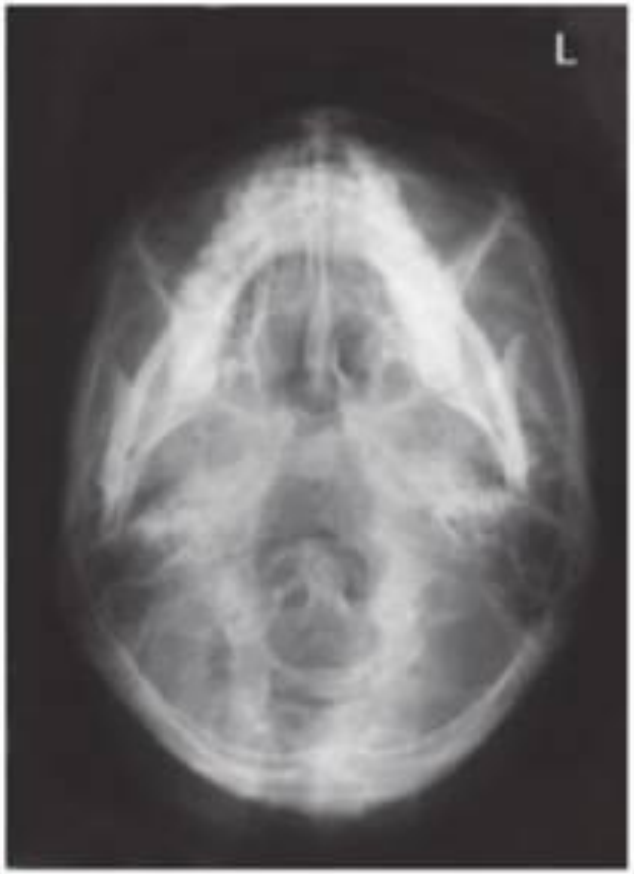


Fig. 8.16b SMV radiograph.



Fig. 8.16c SMV using skull unit.

Sella turcica – lateral

* Position of patient and image receptor
* • The patient sits facing the erect Bucky/image receptor and the head is then rotated such that the median sagittal plane is parallel to the image receptor and the inter-pupillary line is perpendicular to it.
* • The shoulders may be rotated slightly to allow the correct position to be attained and the patient may grip the image receptor for stability.
* • The head and image receptor heights are adjusted to enable centering as indicated below.
* • A radiolucent pad may be placed under the chin and lower face for support.

Sella turcica – lateral

* Direction and location of the X-ray beam

* • *A collimated horizontal beam is centered to a point 2.5 cm vertically above a point 2.5 cm along the baseline from the auditory meatus nearest the X-ray tube.*

Sella turcica – lateral

Radiological considerations

- This examination is increasingly uncommon, as in the presence of good clinical or biochemical evidence of a pituitary tumor, MRI or CT examinations along with other diagnostic tests will be undertaken.
- If these modalities are unavailable, evidence of sella expansion by a large lesion may be demonstrated by this projection.
- A double floor to the sella turcica may be a sign of smaller intra-pituitary tumor, but can also be a normal variant due to a slope of the sella floor or suboptimal positioning; this may be confirmed by use of a well-collimated OF20°↓ projection.



Fig. 8.17a Patient positioning.

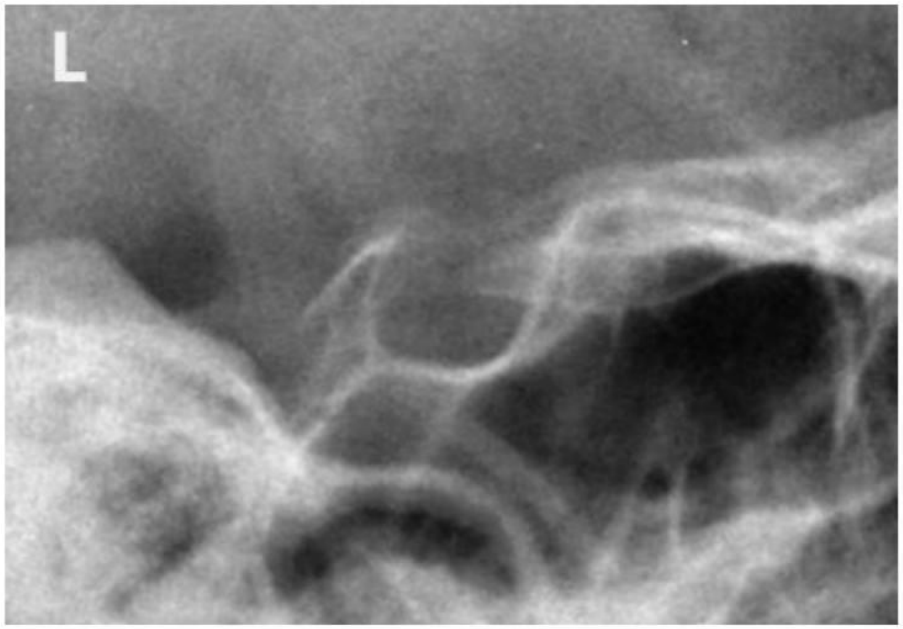


Fig. 8.17b Example of a collimated lateral sella turcica image.

Optic foramina and jugular foramina

* The main indication for imaging these foramina is detection of tumor (e.g. glomus jugular hyper vascular tumor, optic nerve glioma), which currently is best demonstrated by CT and/or MRI.
* These modalities demonstrate optimal specificity for these complex pathologies.

Optic foramina – postero-anterior oblique

* The optic canal opens posteriorly within the bony orbit at the optic foramen.
* The canal passes forwards and laterally at approximately 35° to the median sagittal plane and downwards at approximately 35° to the orbito-meatal plane, and therefore this is the path the central ray must take to demonstrate the foramen for imaging.
* Both sides are usually imaged separately for comparison.

Optic foramina – postero-anterior oblique

* Position of patient and image receptor

* The patient sits erect with the nose cheek and chin of the side being examined in contact with Bucky/image receptor.

* The centre of the orbit of the side under examination should coincide with the centre of the image receptor.

* The median sagittal plane is adjusted to make an angle of 35° to the vertical (55° to the receptor).

* The orbito-meatal baseline is raised 35° from the horizontal.

Optic foramina – postero-anterior oblique

* Direction and location of the X-ray beam
* • The collimated horizontal central ray should be centered to the middle of the image receptor.
* *This is to a point 7.5 cm superior and 7.5 cm posterior to the upper most EAM, so that the central ray emerges from the center of the orbit in contact with the image receptor.*
* • A side marker may be placed above the superior orbital margin.

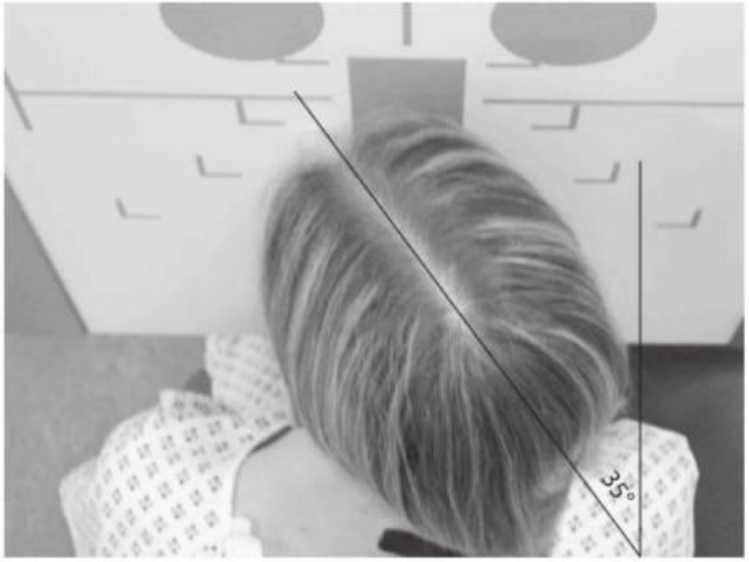


Fig. 8.18a Superior view of optic foramina projection showing MSP angle with film.



Fig. 8.18b Lateral aspect showing optic foramina positioning with OM base line superimposed.

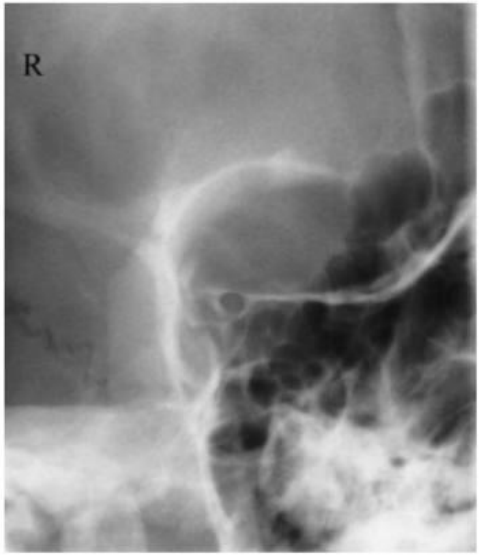


Fig. 8.18c Radiograph of correct positioning for optic foramina.

Jugular foramina – submentovertical 20° caudal

* The jugular foramina lie in the posterior cranial fossa between the petrous temporal and occipital bones on each side of the foramen magnum.

* Both sides are imaged simultaneously on a single image by undertaking a submento-vertical (SMV) 20° caudal projection.

Jugular foramina – submentovertical 20° caudal

* Position of patient and image receptor
* As per the SMV projection
  Supine:
* • The patient's shoulders are raised and neck hyperextended to bring the vertex of the skull in contact with the image receptor/gridded CR cassette (or X-ray table).
* • The head is adjusted to bring the EAMs equidistant from the image receptor.
* • The median sagittal plane should be at right-angles to the image receptor along its midline.
* • The orbito-meatal plane should be as near as possible parallel to the image receptor.

Jugular foramina – submentovertical 20° caudal

* Position of patient and image receptor
* **Erect**:
* • The patient sits facing the X-ray tube a short distance away from the vertical Bucky/ receptor.
* • The neck is hyperextended to allow the head to fall back until the vertex of the skull makes contact with the center of the vertical image receptor.
* • The remainder of the positioning is as described for the supine technique.

Jugular foramina – submentovertical 20° caudal

* Direction and location of the X-ray beam

* • Using a collimated horizontal beam, the central ray is angled caudally so that it makes an angle of 70° to the orbito-meatal plane and is centred in the midline to pass midway between the EAMs.

* Notes: alternative technique

* • With the patient's neck less extended the head can be positioned with the orbito-meatal plane at an angle of 20° to the Bucky/image receptor, in which case a horizontal central ray will make the required angle of 70° to the base plane.



Fig. 8.19a Patient positioning.

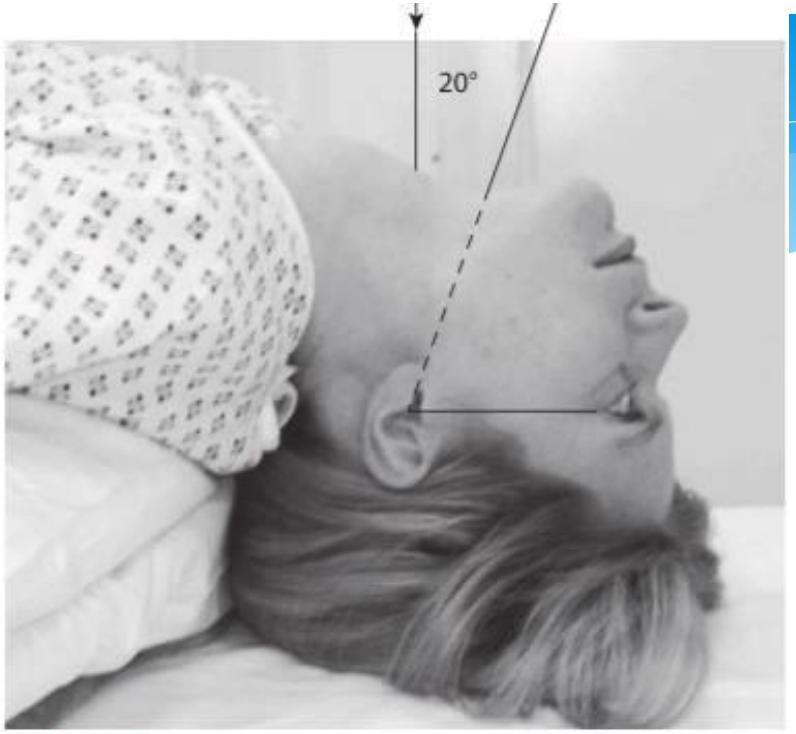


Fig. 8.19b Patient positioning.

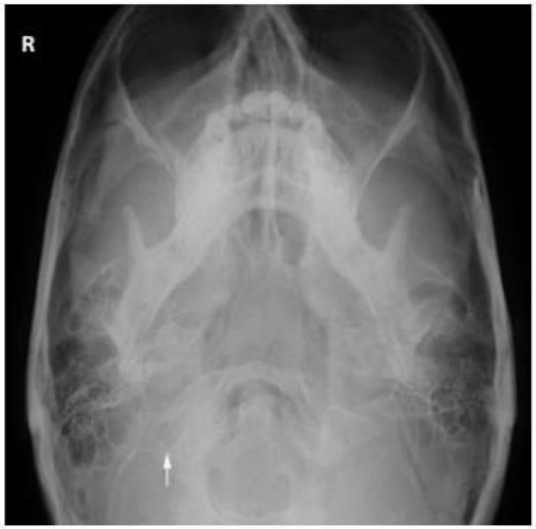


Fig. 8.19c SMV 20° with the jugular foramen arrowed.


THANK YOU