

# Petrous pyramid



The petrous part of the [temporal bone](#) is pyramid-shaped and is wedged in at the base of the [skull](#) between the [sphenoid](#) and [occipital bones](#). Directed medially, forward, and a little upward, it presents a base, an apex, three surfaces, and three angles, and houses in its interior, the components of the [inner ear](#).

The ventral surface of the [brain stem](#) is anatomically surrounded by the [clivus](#) anteriorly, brain stem posteriorly and by the [petrous pyramid](#) and [cranial nerves](#) from IIIrd to XIIth laterally in the deep [posterior cranial fossa](#).

The [endolymphatic sac](#) is located in a duplication of the dura of the posterior aspect of the petrous pyramid and is, therefore, in the surgical field of many neurosurgical operations performed on the posterolateral cranial base.

Surgical anatomy of the petrous pyramid has always been a challenge, especially in the beginning of the [training](#) process. Providing an easier, holistic approach can be of help to everyone with interest in learning and teaching skull base anatomy.

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Tawfik-Helika et al., from the Department of Neurosurgery, [Beaujon Hospital](#), [Pierre Wertheimer Hospital](#), Department of Surgery, University of [São Paulo](#) Sorbonne Université, [Paris](#), Department of Neurosurgery, [Addenbrooke's Hospital](#), presented the complex organization of the petrous pyramid anatomy using a new compartmental approach that is simple to understand and remember.

The contents of the petrous pyramid of eight [temporal bones](#) were exposed through progressive [drilling](#) of the superior surface.

The petrous pyramid is made of a bony container, while its contents were grouped into four compartments (mucosal, cutaneous, neural and vascular). Two reference lines were identified (mucosal and external-[internal auditory canal](#) lines) intersecting at the level of the [middle ear](#). The localization of contents relative to these reference lines was then described and two methods of segmentation; the X-method and V-method, were then proposed. This description was then used to

describe middle ear relationships, [facial nerve](#) anatomy and [air cell](#) distribution.

This new simple compartmental approach allows a comprehensive understanding of the distribution of petrous pyramid contents. Dividing it into anatomical compartments, and then navigating this mental map along specific reference points, lines, spaces, and segments could bring a useful tool to teach or learn its complex tridimensional anatomy <sup>1)</sup>.

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[Posterior petrous meningiomas](#) (commonly termed posterior pyramid meningiomas and/or meningiomas of the posterior surface of the petrous pyramid) are the most common meningiomas of the posterior cranial fossa.

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Drilling of the posterior pyramidal wall is facilitated on identification of the intersection of the petrous ridge with the most anterior portion of the bone ledge covering the sigmoid sinus (petrosigmoid intersection), the bony operculum of the endolymphatic sac, and the petrous ridge. Drilling may proceed rather safely at a minimum depth of 2.5 mm in an area 0.9 cm anterior and 1 cm inferior to the petrosigmoid intersection and petrous ridge, respectively. From there, identification of the vestibular aqueduct, genu, and horizontal portion is necessary to safely open the posterior wall of the internal auditory canal. The vestibular aqueduct represents the lateral and superior limits of drilling. The bone between these areas may then be safely drilled to a depth of at least 2.5 mm. A microneurosurgical dissection of the posterior pyramidal wall conducted in cadaveric material according to these guidelines did not violate any inner-ear structures <sup>2)</sup>.

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Transtemporal supralabyrinthine approach is a modified middle cranial fossa approach. It offers all the advantages of a middle cranial fossa procedure and avoids its disadvantages, mainly the extensive temporal lobe retraction and frightening complications. The principle of the approach is to gain sufficient access toward the internal auditory canal by removing bone from the roof of the petrous pyramid rather than by elevating the middle fossa dura away from it. Fifteen patients underwent this approach for decompression of paralysed facial nerve resulted from temporal bone fracture, Bell's palsy and herpes zoster oticus; for removal of facial neuromas and primary cholesteatomas in temporal bone and for sectioning of great superficial petrous nerve. Preliminary study showed good results <sup>3)</sup>.

## References

<sup>1)</sup>

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