

# Retrosigmoid transmeatal approach

Cushing (1917) on the other hand described a bilateral suboccipital access and stated the unilateral suboccipital approach as disadvantageous.

Although the lateral [suboccipital approach](#) associated to resection of posterior arch of [C1](#) is considered feasible, definitely, it is not the best way to achieve an adequate exposure of [vertebral artery](#), anterior and lateral medulla regions.

In order to perform a perfect exposure with minimal retraction of neural structures there have been purposed, adding to the lateral suboccipital approach, a partial [mastoidectomy](#) with lateral exposure of [sigmoid sinus](#) as well as the resection of the posterior arch of atlas and exposition of its transverse foramen beyond the neural and vascular structures inside the sub occipital triangle <sup>1)</sup>.

see [far lateral approach](#)

## Indications

Indications for this approach are variable such as resection of meningiomas, acoustic neuromas and epidermoid tumors, treatment of vascular lesions of vertebrobasilar system, vascular decompression of cranial nerves (V, VII, IX, X), cranial nerve neurectomies, and intrinsic lesions of the cerebellum and brainstem.

### Vestibular schwannoma

See [Retrosigmoid transmeatal approach for vestibular schwannoma](#)

### Retrosigmoid approach for cerebellopontine angle meningioma

see [retrosigmoid approach for cerebellopontine angle meningioma](#)

### Trigeminal neuralgia

Microvascular decompression (MVD) via lateral suboccipital craniotomy is the standard surgical intervention for trigeminal neuralgia (TN). For recurrent TN, difficulties are sometimes encountered when performing reoperation via the same approach because of adhesions and prosthetic materials used in the previous surgery.

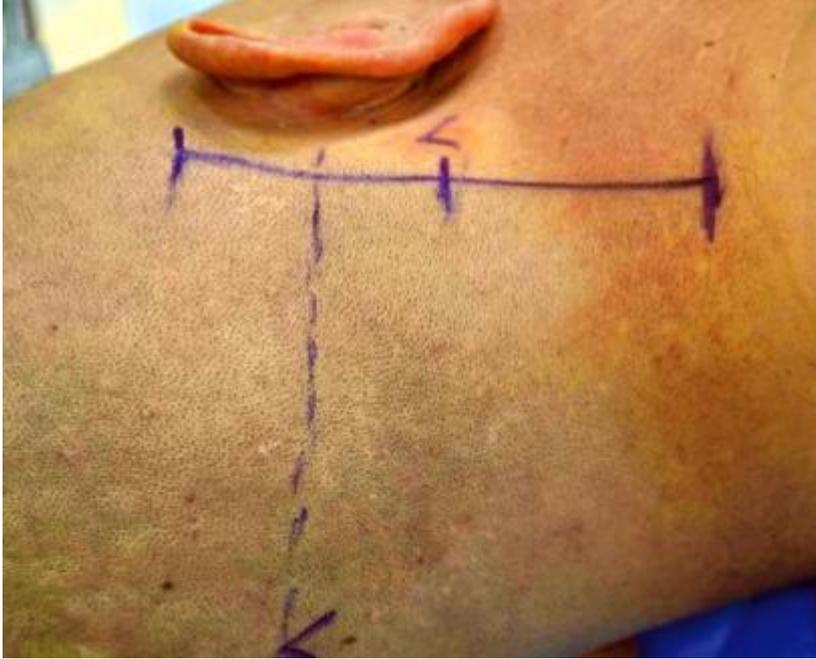
In this cases an alternative is a [subtemporal transtentorial approach](#) <sup>2)</sup>.

## Surgical technique

Normally in a [semisitting position](#) for the suboccipital lateral route.

The operation can also be carried out with the patient in a [lateral position](#) at the surgeon's discretion. After local shaving of the hair behind the pinna and disinfection of the surgical field.

## Skin incision



A 10-cm curvilinear incision is placed beginning 3 cm superior to the [asterion](#) and terminated 2 cm inferior to the level of the [digastric groove](#) to expose the squama of the occipital bone.

The nuchal muscles are split with the monopolar knife.

## Craniotomy

see [Retrosigmoid craniotomy](#).

## Margin of the transverse and sigmoid sinus

In this approach, it is important to expose the margin of the transverse and sigmoid sinus (T/s) safely and quickly. adequate exposure of these margins by placing a keyhole on the junction of the T/s junction minimizes bone loss. it is considered ideal if half of the T/s junction can be seen in the keyhole and many methods have been described for preoperative identification of the positions of the transverse sinus, T/s junction, and the sigmoid sinus based on external skull [bony landmarks](#) <sup>3) 4) 5) 6) 7) 8)</sup>.

## Identification of asterion

Historically, the asterion has been viewed as a landmark for the T/S junction <sup>9) 10)</sup>. However, the asterion is now seen as unreliable for this purpose because of difficulties with observation, palpation,

and anatomical variety.

Tubbs et al. suggested that the mastoid process and the zygomatic arch were more reliable landmarks for prospective identification of the T/s junction <sup>11)</sup>.

Methods for distinguishing the T/s junction from other superficial structures, including the semispinalis capitis muscle, superior nuchal line,inion, and mastoid process, have also been described.

## Osteoplastic craniotomy versus craniectomy

Osteoplastic craniotomy in retrosigmoid approaches to the cerebellopontine angle region has been suggested as an alternative to traditional osteoclastic craniectomy. It is important both for prevention of postoperative complications and for cosmetic purposes. It provides acceptable results both clinically and radiologically. More comparative studies are required to evaluate possible advantages of this technique over osteoclastic craniotomy <sup>12)</sup>.

## Extensions

The suprajugular extension of the retrosigmoid approach will permit removal of tumors located predominantly in the cerebellopontine angle but also extending into the upper part of the jugular foramen without any additional skull base approaches <sup>13)</sup>.

## Dural opening

The dura is opened under the microscope in semilunar fashion parallel to the course of the sigmoid sinus.

The internal auditory canal IAC can be open with a high-speed diamond drill from lateral to medial, opening the canal for 180° of its circumference <sup>14)</sup>.

Look for the safe zone of posterior semicircular canal resection in suboccipital retrosigmoid sinus approach for acoustic neuroma surgery <sup>15)</sup>.

The intrameatal part of the vestibular schwannoma is partially removed and the facial nerve identified. Thereafter, opening of the capsule and debulking of the tumor with an ultrasonic surgical aspirator in the cerebellopontine angle CPA. Once the tumor's mass is significantly reduced, a bimanual dissection of the cleavage plane between capsule and the surrounding arachnoid is performed. Starting from below, the capsule is elevated with a tumor grasping forceps and the arachnoid membrane is peeled off. Following the cleavage plane, the facial nerve is separated in a medial to lateral direction from the VS's capsule. Throughout the whole procedure the field is irrigated with warm Ringer's solution. Its important to seal the drilled posterior lip of the IAC as well as eventually opened mastoid air cells with a free muscle or fat patch <sup>16)</sup>.

Upon dural opening, the endoscope is inserted into the operative field along the petrotentorial junction. Cerebrospinal fluid drainage provides a wider space for introduction of the endoscope and surgical instruments by opening the [cerebellomedullary cistern](#) for cerebellar relaxation.

Traditional microsurgical techniques are used during the entire procedure.

A fully endoscopic retrosigmoid approach is a safe and effective procedure for cerebellopontine angle tumor resection and cranial nerve microvascular decompression <sup>17)</sup>.

see [Endoscope assisted retrosigmoid intradural suprameatal approach](#)

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The [retrosigmoid](#) intradural suprameatal approach includes the standard retrosigmoid [suboccipital](#) route with drilling of the petrous bone above and anterior of the internal auditory meatus, allowing for exposure of the trigeminal nerve within the Meckel's cave and of the middle fossa to approach the posterior cavernous sinus for microsurgery of, e.g., petroclival meningiomas and trigeminal schwannomas.

The extended retrosigmoid intradural suprameatal approach allows exposure of the posterior cavernous sinus and may be used to remove lesions of the posterior fossa extending into the Meckel's cave and into the cavernous sinus <sup>18)</sup>.

## Videos

[Retrosigmoid approach](#) for [cerebellopontine angle meningioma](#)

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<html><iframe width="560" height="315" src="https://www.youtube.com/embed/c9yZ4FbLCW4"
frameborder="0" allowfullscreen></iframe></html>
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### Video 0:15s

A slightly curved surgical incision is planned two fingers behind the ear extending from the level of the tip of the ear to 1 cm below the mastoid tip.

### Video 0:35s

Osseus exposure

### Video 1:00s

Asterion identification and burr hole placement

### Video 1:18s

Transverse sinus identification

### Video 1:26s

The retrosigmoid craniotomy in two steps

**Video 1:40s** Sigmoid sinus unroofing exposes the sinus knee, the inferior border of the transverse sinus, the medial border of the sigmoid sinus and horizontal segment of the occipital squama.

### Video 1:50s

Dural opening

## Video 2:05s

### Tumor removal

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A stepwise illustration of the retrosigmoid approach for resection of a cerebellopontine meningioma

<html><iframe width="560" height="315" src="https://www.youtube.com/embed/kISkYS16Brk" frameborder="0" allowfullscreen></iframe></html> <sup>19)</sup>.

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## Technique

A slightly curved surgical incision is planned two fingers behind the ear extending from the level of the tip of the ear to 1 cm below the mastoid tip. The retrosigmoid craniectomy exposes the sinus knee, the inferior border of the transverse sinus, the medial border of the sigmoid sinus and horizontal segment of the occipital squama. The dura is opened under the microscope in semilunar fashion parallel to the course of the sigmoid sinus. We open the IAC with a high-speed diamond drill from lateral to medial, opening the canal for 180° of its circumference. The intrameatal part of the vestibular schwannoma is partially removed and the facial nerve identified. Thereafter, we open the capsule and debulk the tumor with an ultrasonic surgical aspirator in the CPA. Once the tumor's mass is significantly reduced, a bimanual dissection of the cleavage plane between capsule and the surrounding arachnoid is performed. Starting from below, the capsule is elevated with a tumor grasping forceps and the arachnoid membrane is peeled off. Following the cleavage plane, the facial nerve is separated in a medial to lateral direction from the VS's capsule. Throughout the whole procedure the field is irrigated with warm Ringer's solution. We seal the drilled posterior lip of the IAC as well as eventually opened mastoid air cells with a free muscle or fat patch <sup>20)</sup>.

## Indications

The retrosigmoid transmeatal technique remains the approach of choice for hearing preservation during the removal of acoustic neuromas that protrude from the porus acusticus. However, encroachment into the [bony labyrinth](#) in an effort to remove the tumor in the lateral end of the internal auditory canal (IAC) continues to compromise hearing in certain cases. The limits in the safe removal of the posterior wall of the IAC are not generally agreed on. To address this problem,

Day et al, performed a morphometric analysis of 32 fixed cadaveric temporal bones by microsurgical dissection and measurement with fine-cut bone window computed tomographic (CT) scans. The morphometric relationships of identifiable surface landmarks were first determined. Fine cut bone window CT scans were next performed on each bone and the distances between the fundus, the vestibule, and the common crus (CC) with the internal auditory meatus (IAM) were determined. Additionally, the thickness of the bone overlying the posterior semicircular canal at the CC was measured. From a retrosigmoid trajectory, employing a 4-cm craniotomy, the posterior wall of the IAC was removed with a high-speed drill, limiting removal to the distance from the vestibule to the IAM, as determined by CT measurement. Preservation of the integrity of deep structures was confirmed by inspection. The length of the actual IAC unroofed was measured and was compared with the IAC length, from IAM to fundus, measured by CT. The average canal length by CT measured 10.0 mm +/-

1.8 (range, 6.6-14.0). The length of the canal uncovered averaged 5.9 mm +/- 1.4 (4.0-8.5).<sup>21)</sup>

1)

HT Wen, AL Rhoton Jr, T Katsuta, E Oliveira. Microsurgical anatomy of transcondylar, supracondylar and paracondylar extensions of the far lateral approach. *J Neurosurg* 1997;87:555-585.

2)

Ogiwara T, Goto T, Kusano Y, Kuroiwa M, Kiuchi T, Kodama K, Takemae T, Hongo K. Subtemporal transtentorial approach for recurrent trigeminal neuralgia after microvascular decompression via the lateral suboccipital approach: case report. *J Neurosurg*. 2015 Jun;122(6):1429-32. doi: 10.3171/2014.10.JNS132643. Epub 2014 Nov 28. PubMed PMID: 25423272.

3)

Day JD, Kellogg JX, Tschabitscher M, Fukushima T: surface and superficial surgical anatomy of the posterolateral cranial base: significance for surgical planning and approach. *Neurosurgery* 38: 1079-1083; discussion 1083-1084, 1996

4)

Lang J, samii a: retrosigmoidal approach to the posterior cranial fossa. an anatomical study. *Acta Neurochir (Wien)* 111: 147-153, 1991

5)

Day JD, Tschabitscher M: anatomic position of the asterion. *Neurosurgery* 42: 198-199, 1998

6)

Day JD, Kellogg JX, Tschabitscher M, Fukushima T: surface and superficial surgical anatomy of the posterolateral cranial base: significance for surgical planning and approach. *Neurosurgery* 38: 1079-1083; discussion 1083-1084, 1996

7) 10)

Ribas GC, rhoton aL Jr, Cruz or, Peace D: suboccipital burr holes and craniectomies. *Neurosurg Focus* 19: e1, 2005

8) 11)

Tubbs rs, Loukas M, shoja MM, Bellew MP, Cohen-Gadol aa: surface landmarks for the junction between the transverse and sigmoid sinuses: application of the "strategic" burr hole for suboccipital craniotomy. *Neurosurgery* 65(6 suppl): 37-41; discussion 41, 2009

9)

Rhoton aL Jr: The cerebellopontine angle and posterior fossa cranial nerves by the retrosigmoid approach. *Neurosurgery* 47(3 suppl): s93-129, 2000

12)

Li W, Wang H, Liang C, Li F, He H, Kang Z, Zou Y, Guo Y. An in situ repositioning bone flap in retrosigmoid craniotomy for cranial reconstruction. *J Craniofac Surg*. 2014 Jan;25(1):135-9. doi: 10.1097/SCS.0000000000000368. PubMed PMID: 24406566.

13)

Matsushima K, Kohno M, Komune N, Miki K, Matsushima T, Rhoton AL Jr. Suprajugular extension of the retrosigmoid approach: microsurgical anatomy. *J Neurosurg*. 2014 Aug;121(2):397-407. doi: 10.3171/2014.3.JNS132419. Epub 2014 May 2. PubMed PMID: 24785321.

14)

Tatagiba M, Roser F, Schuhmann MU, Ebner FH. Vestibular schwannoma surgery via the retrosigmoid transmeatal approach. *Acta Neurochir (Wien)*. 2014 Feb;156(2):421-5; discussion 425. doi: 10.1007/s00701-013-1915-6. Epub 2013 Nov 30. PubMed PMID: 24292774.

15)

Liu S, Tong D, Liu M, Lv D, Li Y. The safe zone of posterior semicircular canal resection in suboccipital retrosigmoid sinus approach for acoustic neuroma surgery. *J Craniofac Surg*. 2013 Nov;24(6):2103-5. doi: 10.1097/SCS.0b013e31829ad5cc. PubMed PMID: 24220416.

16)

Tatagiba M, Roser F, Schuhmann MU, Ebner FH. Vestibular schwannoma surgery via the retrosigmoid transmeatal approach. *Acta Neurochir (Wien)*. 2013 Nov 30. [Epub ahead of print] PubMed PMID: 24292774.

17)

Vaz-Guimaraes F, Gardner PA, Fernandez-Miranda JC. Fully endoscopic retrosigmoid approach for posterior petrous meningioma and trigeminal microvascular decompression. *Acta Neurochir (Wien)*. 2015 Apr;157(4):611-5. doi: 10.1007/s00701-014-2332-1. Epub 2015 Jan 18. PubMed PMID: 25596641.

18)

Koerbel A, Kirschniak A, Ebner FH, Tatagiba M, Gharabaghi A. The retrosigmoid intradural suprameatal approach to posterior cavernous sinus: microsurgical anatomy. *Eur J Surg Oncol*. 2009 Apr;35(4):368-72. doi: 10.1016/j.ejso.2008.02.011. Epub 2008 Apr 2. PubMed PMID: 18378110.

19)

Cıkla U, Kujoth GC, Başkaya MK. A stepwise illustration of the retrosigmoid approach for resection of a cerebellopontine meningioma. *Neurosurg Focus*. 2014 Jan;36(1 Suppl):1. doi: 10.3171/2014.V1.FOCUS13445. PubMed PMID: 24380520.

20)

Tatagiba M, Roser F, Schuhmann MU, Ebner FH. Vestibular schwannoma surgery via the retrosigmoid transmeatal approach. *Acta Neurochir (Wien)*. 2014 Feb;156(2):421-5; discussion 425. doi: 10.1007/s00701-013-1915-6. Epub 2013 Nov 30. PubMed PMID: 24292774.

21)

Day JD, Kellogg JX, Fukushima T, Giannotta SL. Microsurgical anatomy of the inner surface of the petrous bone: neuroradiological and morphometric analysis as an adjunct to the retrosigmoid transmeatal approach. *Neurosurgery*. 1994 Jun;34(6):1003-8. PubMed PMID: 8084384.

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