Microsurgical anatomy of the superior petrosal venous complex: new classifications and implications for subtemporal transtentorial and retrosigmoid suprameatal approaches

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Object. The purpose of this study was to define the patterns of drainage of the superior petrosal venous complex (SPVC) along the petrous ridge in relation to the Meckel cave and internal acoustic meatus (IAM) and to delineate its effect on the surgical exposures obtained in subtemporal transtentorial and retrosigmoid suprameatal approaches.

Methods. The patterns of drainage of the SPVC along the petrous ridge were characterized according to their relation to the Meckel cave and the IAM based on an examination of 30 hemispheres. Subtemporal transtentorial and retrosigmoid suprameatal approaches were performed in three additional cadavers to demonstrate the effect of the drainage pattern on the surgical exposures.

Conclusions. The SPVC emptied into the superior petrosal sinus (SPS) within a distance of 1 cm from the midpoint of the Meckel cave. The patterns of drainage of the SPVC were classified into three groups. Type I emptied into the SPS above and lateral to the boundaries of the IAM. The most common type, Type II, emptied between the lateral limit of the trigeminal nerve at the Meckel cave and the medial limit of the facial nerve at the IAM, within an area of approximately 13 mm. Type III emptied into the SPS above or medial to the Meckel cave. The ideal SPVC for a subtemporal transtentorial approach (with or without anterior extradural petrosectomy) seems to be a Type I. In SPVC Type III and those Type II cases in which the SPVC is located near the Meckel cave, the amount of working space is significantly limited in a subtemporal transtentorial approach. In contrast, the ideal type of SPVC for a retrosigmoid suprameatal approach would be a Type III, and the SPVC must be divided in the majority of Type I and II cases for a satisfactory surgical exposure along the Meckel cave and middle fossa dura. The proposed modified classification system and its effect on the surgical exposure may aid in planning the approach directed along the petrous apex and may reduce the probability of venous complications.

Key Words • acoustic neuroma • trigeminal neumroma • meningioma • superior petrosal vein • retrosigmoid approach • subtemporal approach

The most constant and prominent vein of the posterior fossa in the embryo, the ventral metencephalic vein, is the first to drain the infratentorial structures during embryonic development. This vein drains the anterior aspect of the brainstem and cerebellum and, at a later stage, becomes the vascular channel familiar to neurosurgeons under the name “petrosal vein.” The tributaries of the superior petrosal vein constitute one of the largest infratentorial venous channels, the SPVC, which is the most frequently encountered venous structure during approaches to the posterior fossa.

Although the description of the tributaries of the superior petrosal vein in relation to surrounding anatomic structures has been studied and a classification exists, the relationship between the SPVC along the SPS and the region of the Meckel cave is not clear. The stem and the tributaries of the SPVC run anteriorly to join the SPS and are relatively well visualized angiographically. Nevertheless, in defining the SPVC in this region, anatomical dissections are still superior to neuroradiologic examinations because the exact junctional point with the SPS may not be opacified or may be obscured by the petrous pyramid in some cases. The purpose of this study was to define the patterns of drainage of the SPVC to the SPS along the petrous ridge in relation to the Meckel cave and the IAM. In addition, we performed subtemporal transtentorial (with anterior extradural petrosectomy) and retrosigmoid suprameatal approaches to delineate how the pattern of drainage of the SPVC affects the surgical exposure.

Materials and Methods

The patterns of drainage of the SPVC along the petrous ridge were examined using magnifications of 3 and 40 in 30 hemispheres ob-
There may be two separate incisions. Consequently, incision and retraction of the subtemporal transtentorial and retrosigmoid suprameatal approach—cases along the petrous ridge were characterized according to their relation to the Meckel cave and the IAM. Nevertheless, the effect of the pattern of venous drainage of the SPVC on the amount of working space during subtemporal transtentorial approaches with or without anterior petrosectomy has not been delineated in any previous anatomical reports.

During the subtemporal approach, the cadaveric head was rotated laterally, so that the sagittal suture could be placed parallel to the floor with the vertex angled inferiorly to provide maximal visualization along the tentorial surface to the perimesencephalic cisterns. The zygomatic arch and the squamosal and petrous portions of the temporal bones were drilled to form a flat trajectory along the floor of the middle fossa. The dura mater was elevated from the floor of the middle fossa for an extradural medial petrosectomy. The dura over the lateral temporal lobe was opened in an inverted Y-shaped manner and the basal dural leaf was reflected anteriorly. The arachnoid trabeculae connecting the mesial temporal lobe to the tentorial edge were sharply dissected and removed to expose the underlying structures.

We used the modified tentorial incision described by MacDonald et al.,10 which involves two separate incisions along the superior petrosal sinus. Once the incisura was reached, the trochlear nerve was identified and dissected free of its arachnoid attachments toward the lateral mesencephalic sulcus and then followed anteriorly along the tentorial edge so that the tentorial incision could be initiated as anteriorly as possible. The first incision commenced at a point just behind the entry of the trochlear nerve along the tentorial edge and continued laterally and obliquely posteriorly, paralleling the superior petrosal sinus (Fig. 4). The second incision was made perpendicular to the first, beginning at the level of the Meckel cave, and was directed anteriorly and laterally to the lateral edge of the trigeminal nerve toward V3. The second incision traversed the superior petrosal sinus approximately at the lateral limit of the Meckel cave. The tentorial leaf with the trochlear nerve attachment was then tacked anteriorly with great care to identify and preserve the possible location of the SPVC.

In cases with SPVC Type III, where the SPVC emptied into the SPS above or medial to the boundaries of the Meckel cave, at a point medial to the lateral limit of the trigeminal nerve at its site of entry into the Meckel cave (three [9%] of 37 SPVCs).

Subtemporal Transtentorial Approach in Relation to the SPVC

The subtemporal approach with elevation of the temporal lobe is commonly used to expose lesions in the perimesencephalic cisterns around the tentorial incisura. An extradural transpetrosal approach through the middle fossa, the so-called "Kawase approach," in which the subtemporal transtentorial route is used, has been described to treat petroclival meningiomas and access lower basilar artery aneurysms. Consequently, incision and retraction of the tentorium are commonly required during these approaches to gain access to lesions extending into the posterior fossa and the interpeduncular and preopticine cisterns.

The tentorial sinuses and the temporal bridging veins may frequently be encountered during sectioning of the tentorium, and their variations have been studied in relation to the transpetrosal approaches. Nevertheless, the effect of the pattern of venous drainage of the SPVC on the amount of working space during subtemporal transtentorial approaches with or without anterior petrosectomy has not been delineated in any previous anatomical reports.

Of the 30 SPSs examined in our study, the SPVC emptied into the sinus as a single venous stem in 23 hemispheres and as two stems in the remaining seven. The average distance between the midpoint of the root of the Meckel cave and the site of entry of the SPVC into the SPS was 10.05 mm (range 3.39–27.34 mm) (Fig. 1A, Line A–B). We also measured the distances from the medial and lateral limits of the trigeminal nerve at its point of entry at the Meckel cave to the terminal tips of the cisternal portions of the abducent and facial nerves, where these cranial nerves penetrate the clival dura mater and the IAM (Fig. 1). The distance between the medial limit of the trigeminal nerve at its point of entry at the Meckel cave and the point of entry of the abducent nerve at the clival dura averaged 7.14 mm (range 5.02–8.94 mm) (Fig. 1A, Line E–F). The distance between the lateral limit of the trigeminal nerve at the Meckel cave and the medial limit of the facial nerve at its point of entry along the IAM was 12.76 mm (range 8.18–17.82 mm) (Fig. 1A, Line C–D). The fourth cranial nerve entered the tentorium an average distance of 7.22 mm (range 1.13–4.25 mm) from the midpoint of the roof of the Meckel cave (Fig. 1A, Line G–A).

The width of the Meckel cave was 8.45 mm (range 6.14–12.86 mm) and its height at the midpoint averaged 3.25 mm (range 2.52–4.08 mm) (Fig. 1B, Lines H–I and J–K). The width of the trigeminal nerve at the point of entry along the Meckel cave was 5.44 mm (range 4.24–7.6 mm) (Fig. 1B, Line L–M).

The patterns of drainage of the SPVC were classified into three groups based on the relationship between their site of entry into the SPS, the Meckel cave, and the IAM (Figs. 2 and 3). In Type I, the SPVC emptied into the SPS above or lateral to the IAM, at a point lateral and superior to the medial limit of the facial nerve at its point of entry at the IAM (seven [19%] of 37 SPVCs). In Type II, the SPVC emptied into the SPS between the lateral limit of the trigeminal nerve at its point of entry at the Meckel cave and the medial limit of the facial nerve at its point of entry at the IAM, within a distance of approximately 13 mm (27 [72%] of 37 SPVCs). In Type III, the SPVC emptied into the SPS above or medial to the boundaries of the Meckel cave, at a point medial to the lateral limit of the trigeminal nerve at its site of entry into the Meckel cave (three [9%] of 37 SPVCs).
into the SPS above or medial to the boundaries of the Meckel cave at a point medial to the lateral limit of the trigeminal nerve, it was impossible to continue the dissection medially and expose the prepontine cistern without sacrificing the venous complex. In the specimen with an SPVC Type II, where the SPVC emptied into the SPS between the lateral limit of the trigeminal nerve at the Meckel cave and the medial limit of the facial nerve at the IAM, the distance from the Meckel cave to the point of entry of the SPVC into the SPS is the most important determinant for the ultimate outcome of the venous complex. As this distance decreases,
the chance of preserving the SPVC reduces proportionally. In SPVC Type III and those Type II cases in which the SPVC empties into the SPS within 1 cm of the lateral limit of the trigeminal nerve at the Meckel cave, the amount of working space is significantly limited in the subtemporal transtentorial approach to the interpeduncular and prepon
tine cisterns. The ideal SPVC for a subtemporal transtento
torial approach with or without anterior petrosectomy would
be a Type I, in which the SPVC enters the SPS above or lateral
to the boundaries of the IAM, at a point lateral to the
medial limit of the facial nerve at the IAM (Figs. 2A and 4A).

Suprameatal Extension of the Retrosigmoid Approach

Tumors arising in the cerebellopontine angle that extend
into or involve the adjacent part of the middle fossa, Meckel
cave, or posterior cavernous sinus can be approached
through a retrosigmoid craniotomy and intradural drilling
of the bone above the porus of the IAM, the suprameatal tu
berecle.\textsuperscript{1,17–19} The retrosigmoid approach exposes the SPS
above the suprameatal tuberculosis in a shallow groove on the
derivative of the petrous ridge and in the dura mater forming the
upper margin of the porus trigeminus. The SPS extends
medially from the junction of the transverse and sigmoid si
nuses and joins the cavernous sinus medial to the porus tri
geminus.\textsuperscript{11,19}

During the suprameatal extension of the retrosigmoid
approach, the cadaveric head was rotated to the ipsilateral
side simulating the semisitting position, and the approach
was directed through a vertical scalp incision that crossed
the asterion. A craniectomy was performed, exposing the
transverse sinus superiorly, the sigmoid sinus laterally, and
the squamous part of the occipital bone inferiorly. The in
tradural exposure was directed down the plane between the
posterior face of the temporal bone and the petrosal surface
of the cerebellum (Fig. 5). The SPS was identified cours
ing above the suprameatal tuberculosis in the groove along the
derivative of the petrous ridge, and the SPVC was classified ac
ccording to its relation to the Meckel cave and the IAM. The
suprameatal tuberculosis was drilled along with the bone me
dial to the IAM until a satisfactory exposure of the Meckel
cave (~ 1 cm) and the posterior part of the middle foss
sa dura mater was achieved. Every effort was made not to
turb the SPVC at its junction with the SPS during drill
ing of the suprameatal tubercle. We found that detaching
the stem of the SPVC from the cerebellum or the tentorium
with sharp dissection, using the technique of Sugita et al.,\textsuperscript{20}
had a limited application for the SPVC because the tech
ical difficulty depended more on the location of the termi
nation of the venous complex than on its course along the
cerebellum.

In the specimen with an SPVC Type I, in which the
SPVC emptied into the SPS above or lateral to the IAM, it
was not possible to complete the drilling of the suprameatal
bone and achieve a satisfactory exposure along the Meckel
cave and the posterior fossa dura mater without sacrificing
the venous complex. In the specimen with an SPVC Type
II, where the SPVC emptied into the SPS between the lat
teral limit of the Meckel cave and the medial limit of the
IAM, it was not possible to preserve the SPVC while
drilling the suprameatal tubercle to achieve a satisfactory

![Fig. 3. Characteristics of the three types of drainage of the SPVC. A: A cadaveric dissection along the posterior sur
face of the left temporal bone. The cerebellum and the brainstem have been removed and the cranial nerves along with the
premeatal segment of the anterior inferior cerebellar artery (AICA) have been preserved to demonstrate their relation with
the posterior portion of the SPVC. The SPVC enters the SPS lateral to the IAM, at a point lateral and superior to the me
dial limit of the facial nerve at the IAM (SPVC Type I). B: Another specimen with an SPVC Type I, superolateral view.
The middle fossa dura has been elevated and the cerebellum has been retracted to expose the posterior surface of the left
temporal bone from above. The ninth, 10th, and 11th cranial nerves have been preserved and exposed. The SPVC enters
the SPS lateral and superior to the facial nerve. C: A superior view of the posterior surface of the left temporal bone show
ning an SPVC Type II in another specimen. The tentorium, except for the edge, has been removed. The SPVC empties into
the SPS between the lateral limit of the trigeminal nerve at its point of entry into the Meckel cave and the medial limit of
the facial nerve at its point of entry into the IAM. The tributaries of the SPVC—the veins of the cerebellopontine fissure
and middle cerebellar peduncle and the transverse pontine stem—have been preserved along with the cranial nerves of the
region. D: A superior view of another example of an SPVC Type II, in which the SPVC drains into the SPS between the
Meckel cave and the IAM. The SPS has been divided over the entrance of the Meckel cave to expose the trigeminal nerve
along the porus of the cave. The cerebellum has been retracted to display the course of the tributaries of the SPVC and the
cranial nerves. The transverse pontine stem drains the anterior part of the pons, then passes below the trochlear and trigem
inal nerves to join the SPVC. Small anastomotic venous channels of the middle cerebellar peduncle arise in the region of
the foramen of Luschka near the floculus and ascend to join the SPVC. The vein of the cerebellopontine fissure passes
medially to join the SPVC. E: An SPVC Type III and a superolateral view of the origin and course of the ninth, 10th,
and 11th cranial nerves on the left side of the cadaveric head. The terminal part of the SPVC empties into the SPS above
and medial to the boundaries of the Meckel cave (blue arrow). F: An SPVC Type III and a left-sided retrosigmoid expos
ure in another specimen. The cadaveric head was placed in a position simulating the three-quarter prone position. The
SPVC enters into the SPS at a point above and medial to the lateral limit of the trigeminal nerve at its site of entry into the
Meckel cave. G: An SPVC Type III and a combined supra- and infratentorial presigmoid exposure through a translaby
rinthine approach on the left side in another specimen. The tentorium has been cut, and the cerebellum has been retracted
to show the course and drainage pattern of the SPVC, which empties into the SPS above and medial to the Meckel cave,
mid facial limit of the trigeminal nerve at the Meckel cave (blue arrow). H: A superolateral view of the posterior
part of the left temporal bone in another specimen. The SPVC empties into the SPS as two separate stems. The SPVC Type
I enters the SPS lateral to the IAM at a point lateral and superior to the medial limit of the facial nerve at the IAM. The
SPVC Type II empties into the SPS between the lateral limit of the Meckel cave and the medial limit of the IAM. Cer. =
cerebellar or cerebello-; Fiss. = fissure; Jug. = jugular; Mid. = middle; Ped. = peduncle; Pon. = pontine; SCA = superior
cerebellar artery; Tent. = tentorium; Trans. = transverse; V. = vein; Vert. = vertebral. (Definitions of other abbreviations
can be found in the legends to Figs. 1 and 2.)
exposure of the middle fossa dura (Fig. 5). The ideal type of SPVC for a retrosigmoid suprameatal approach would be Type III, in which the SPVC enters the SPS above or medial to the boundaries of the Meckel cave.

**Discussion**

**New Classifications of the SPVC in Relation to the Meckel Cave and the IAM**

In a previous study on the veins of the posterior fossa, Matsushima and Rhoton and colleagues\(^5\) divided the superior petrosal veins into lateral, intermediate, and medial groups solely on the basis of the relationship of their site of entry into the IAM. In this study, the authors reported that 19 of 20 superior petrosal sinuses had veins of the medial type near the Meckel cave and that the majority of the superior petrosal veins were also of the medial type, located between the IAM and the Meckel cave. Huang and colleagues\(^3\) have emphasized that the superior petrosal vein (the vein of Dandy) usually drains into the SPS just posterior to the Meckel cave and, less frequently, above the IAM. Our observations on anatomical dissections led us to hypothesize that the stem of the SPVC empties into the SPS nearer to the Meckel cave than to the IAM in the majority of cases and, therefore, we revised the previous classification according to this observation.\(^15\)

We used cadaveric specimens to define the patterns of drainage of the SPVC into the SPS along the petrous ridge and classified the drainage pattern into three groups based on the relationship between their site of entry into the SPS, the Meckel cave, and the IAM. The most common pattern of drainage of the SPVC was Type II, in which the stem of the venous complex emptied into the SPS in an area between the lateral limit of the trigeminal nerve at the Meckel cave and the medial limit of the facial nerve at the IAM. The medial-to-lateral distance in this area measures approximately 13 mm. This pattern can be observed in approximately three quarters of cases. The SPVC Type I empties into the SPS above or lateral to the boundaries of the IAM, at a point lateral to the medial limit of the facial nerve at its point of entry into the IAM. The least common drainage pattern in our classification is seen in Type III, in which the SPVC empties into the SPS above or medial to the boundaries of the Meckel cave at a point medial to the lateral limit of the trigeminal nerve at the Meckel cave. The SPVC emptied into the SPS at a distance of approximately 1 cm from the midpoint of the roof of the Meckel cave (Fig. 1A, Line A–B).

**Implications for Subtemporal Transtentorial and Retrosigmoid Suprameatal Approaches**

The subtemporal transtentorial approach with an extradural anterior petrosectomy\(^7,8\) and the suprameatal extension of the retrosigmoid approach may both be used to resect the anterior part of the petrous pyramid and expose a similar surgical field, namely, the area between the Meckel cave and the IAM. The ideal lesions for both of these approaches are those arising in the cerebellopontine angle or the middle fossa that extend into both the middle and posterior fossae and pass through the Meckel cave, which interconnects the supra- and infratentorial spaces. The lesions that are most commonly encountered in this region and can be approached with either one of these approaches are meningiomas affecting the Meckel cave and schwannomas of the trigeminal nerve, followed by epidermoid cysts, chondrosarcomas, and chordomas.\(^18\) During both approaches, the surgeon is engaged with the SPVC early in the operation, and its site of entry into the SPS determines the working area.

Until now, no one has provided a definitive answer to the question of whether we can safely sacrifice the SPVC to increase the surgical exposure and reduce brain retraction.
Intraoperative SPVC occlusions do not frequently cause adverse sequelae, but the senior author (A.L.R.) has seen two patients with a transient cerebellar disturbance caused by a venous infarction and hemorrhagic edema after intraoperative occlusion of the SPVC lateral to the trigeminal nerve. In the cases in which no brain damage occurred as a result of SPVC occlusion, well-developed collateral circulation may have been a factor. Nevertheless, experimental models have demonstrated that vein sacrifice combined with brain retraction is more likely to induce brain damage than either vein sacrifice or brain retraction alone. Since preservation is still the best way to reduce the probability of venous complications due to SPVC occlusion, it is essential to evaluate the drainage pattern of this venous complex and adjust surgical strategy accordingly during the subtemporal transtentorial and retrosigmoid suprameatal approaches.

When performing a subtemporal transtentorial approach with or without anterior petrosectomy, incising the tentorium is one of the most critical steps for creating a wide exposure. The technical difficulty of this step depends on the venous drainage pattern of the SPVC. The interpeduncular and prepontine cisterns can be easily accessed via an anterior subtemporal transtentorial approach in cases with SPVC Type I. In SPVC Type I, which was observed in approximately 20% of our specimens, the SPVC empties into the SPS at the level of the IAM, and this pattern provides at least 1 cm of extra space lateral to the Meckel cave to access the cisterns following the second part of the tentorial incision in the subtemporal approach. In the SPVC Type III cases and those Type II cases in which the SPVC empties into the SPS within 1 cm of the lateral limit of the trigeminal nerve at the Meckel cave, the amount of working space during the subtemporal transtentorial approach with anterior petrosectomy is significantly limited and the exposure to the interpeduncular and prepontine cisterns is reduced. The subtemporal transtentorial approach with or without anterior petrosectomy necessitates the division of the SPVC in all SPVC Type III and some Type II cases in order to gain access above the porus of the IAM, and empties into the SPS just medial to the porus of the acoustic canal between the Meckel cave and the IAM. The inset shows the head position and the skin incision. B: The SPVC Type II empties into the SPS between the Meckel cave and the medial limit of the IAM. This drainage pattern was observed in approximately 72% of the specimens. The posterior wall of the IAM has been removed and the cleavage planes between the facial nerve and the divisions of the vestibulocochlear nerve can be distinguished. The SPVC has been preserved during opening of the posterior wall of the IAM, but the SPVC Type II significantly blocks access to the suprameatal area and the region of the Meckel cave. The best surgical exposure for drilling the suprameatal tubercle is achieved in cases with an SPVC Type III, in which the petrosal vein empties into the SPS above or medial to the boundaries of the Meckel cave. The inset shows the drainage pattern of the SPVC in this specimen. C: The SPVC has been divided to obtain sufficient working area for drilling the suprameatal tubercle, which has been removed. The removal of the suprameatal tubercle provided additional exposure of the middle fossa dura mater along the trigeminal nerve at the porus of the Meckel cave. Coch. = cochlear; inf. = inferior; N. = nerve; S.C.A. = superior cerebral artery; Sig. = sigmoid; Vest. = vestibular. (Definitions of other abbreviations can be found in the legends to Figs. 1–4.)
sufficient working space along the tentorium and access the interpeduncular and prepontine cisterns.

Seoane and Rhoton have mentioned that the superior petrosal vein entering the part of the SPS located above the suprameatal tubercle usually must be obliterated in accessing the suprameatal tubercle for drilling and exposing the Meckel cave and the posterior part of the middle fossa. According to Samii et al., the petrosal vein may be transected safely in the majority of the cases in which the suprameatal extension of the retrosigmoid approach is used for tumor resection because the vein is markedly displaced and/or compressed by the tumor and the collateral veins have already developed. The best surgical exposure for drilling the suprameatal tubercle and obtaining a wide working area along the Meckel cave is achieved in cases with an SPVC Type III. This is the least common type of drainage pattern, with the stem of the venous complex entering the SPS more anteriorly at the level of the Meckel cave. This type of drainage pattern allows safe drilling of the bone over the IAC without dividing the venous complex. On the other hand, it is almost impossible to preserve the venous complex in SPVC Type I and most Type II cases during drilling of the suprameatal tubercle. In the suprameatal extension of the retrosigmoid approach, the SPVC needs to be divided in approximately 90% of cases to achieve a satisfactory surgical exposure along the Meckel cave and middle fossa dura.

A detailed preoperative MR venogram or a venous phase CT angiogram (Fig. 6) demonstrating the site of entry of the SPVC into the SPS may be helpful in assessing the

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**Fig. 6.** Three-dimensional CT angiograms and MR venograms demonstrating different SPVC drainage patterns. A and B: Three-dimensional CT angiograms obtained in the same patient, demonstrating an SPVC Type I. A: Posterior view of the left petroclival area. The SPVC empties into the left superior petrosal sinus above the IAM. B: Oblique view demonstrating the relationship between the point of entry of the SPVC and the IAM. C: A 3D CT angiogram obtained in another patient. Two separate SPVCs empty into the superior petrosal sinus. The SPVC Type I joins the superior petrosal sinus above and lateral to the IAM, and the SPVC Type II empties into the sinus between the trigeminal impression and the medial limit of the IAM. D and E: Posterosuperior and oblique views of venous phase 3D MR angiograms obtained in a patient with a left tentorial meningioma. The SPVC empties into the superior petrosal sinus anterior to the lesion and above the IAM. The tributaries that drain into the SPVC can be recognized better in the oblique view. Note that it is difficult to evaluate the pattern of drainage of the SPVC on the venous phase MR angiogram because the exact location of the IAM cannot be shown clearly. Ac. = acoustic; Impress. = impression; Int. = internal; Mea. = meatus; Sin. = sinus. (Definitions of other abbreviations can be found in the legends to Figs. 1–5.)
drainage patterns prior to subtentorial transtentorial and retrosigmoid suprameatal approaches. Care should be taken to determine the correct type of SPVC, not only for planning the appropriate approach, but also for division of the SPS and the tentorium. The proposed classification system for the SPVC and investigation of how it affects the surgical exposure may aid in planning the approach directed along the petrosal apex and may reduce the risk of venous complications.

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