Supracerebellar transtentorial approach (SCTT)

see also Paramedian supracerebellar transtentorial approach.

The supracerebellar transtentorial approach to the ventricular atrium provides a minimally invasive corridor by traversing the medially located collateral sulcus, while minimizing cortical disruption by virtue of the sulcus’ anatomical proximity to the ventricular atrium.

With proper head positioning, this approach may involve minimal retraction of the cerebellum and the occipital lobe.

When compared with other conventional approaches to the atrium that involve various degrees of violation of eloquent cortex, this approach may result in a decreased incidence of postoperative deficits.

The rationale for using the collateral sulcus as a distinct entry plane stems from it being the most consistent landmark on the basal occipito temporal lobe.

In addition, the collateral sulcus has been shown to be the deepest of the sulci on the occipitobasal surface, thus bringing the surgeon relatively closer to the ventricle, when compared with a transgyral approach.

Indications

Medial Temporo-occipital Lesions

Operations on tumors of the posteromedial temporal region, are challenging to perform because of the deep-seated location of these tumors between critical cisternal neurovascular structures and the adjacent temporal and occipital cortices.

Traditional surgical approaches require temporal or occipital transgression, retraction, or venous sacrifice. These approaches may result in unintended complications that should be avoided. To avoid these complications, the supracerebellar-transtentorial (SCTT) approach to this region has been used as an effective alternative treatment in adult patients. The SCTT approach uses a sitting position that offers a direct route to the posterior fusiform gyrus and lingual gyrus of the temporal lobe. May be an effective alternative approach to lesions located in the medioposterior aspect of the atrium of the lateral ventricle in selected cases.

It is a safe alternative to resect lesions in the posteromedial temporal region (PMT) region in adults, but only 4 uses of this method have been previously reported on in pediatric patients.

The SCTT approach offers an alternative route to the PMT region, while avoiding the risks of injury to the superficial venous drainage of the temporal lobe and of injuries associated with temporal lobe retraction or with transgression through normal brain tissue. Thus, the SCTT approach may reduce the risk of producing surgery-related neurological deficits.

Lesions in relative proximity to the tentorium

To reduce these risks, the microscopic supracerebellar transtentorial approach with the patient in the sitting position has been previously described for lesions in relative proximity to the tentorium.
**Technique**

**Position**

The sitting position allows gravity to work in the surgeon’s favor by facilitating cerebellar retraction and reducing venous bleeding and pooling in the operative field. As an alternative, the approach can be performed in the three quarter prone position or Concorde position.

In a **Mayfield clamp** and flexed and rotated contralaterally, thus creating a direct access to the tentorium.

Incision in the **suboccipital region**.

Infiltration of **local anesthesia** with epinephrine.

Vertical linear incision extended above the superior **nuchal line** (above the transverse sinus) and down to the base of the occiput.

The muscle and soft tissues are dissected and held open with self-retaining retractors.

The craniotomy extension just above the transverse sinus, abutting the **superior sagittal sinus** and extending laterally to near the transverse-sigmoid junction. About two-thirds of the craniotomy extended to the suboccipital region but did not involve the foramen magnum.

The craniotomy is carried out to nearly the sigmoid sinus on the side of interest and across the midline on the contralateral side. This facilitates a more medial access and enabled removal of the lateral extents of the lesion.

The dura is opened in a V-shaped manner; the opening based superomedially, just inferior to the **torcula**, sometimes extending to the contralateral side across the **inferior sagittal sinus** and the lateral border extending to the limit of the cranial opening. Both cranial and dural openings made as wide as possible, to create a good working corridor and help avoid sacrifice of the bridging vein. The dural opening is limited superiorly by the transverse sinus, which is exposed to facilitate superior retraction of the dural flap. After opening of the dura, the occipital surface of the **cerebellum** is carefully retracted in the midline to drain CSF from the **cisterna magna**. This drainage significantly relax the cerebellum.

The bridging veins between the tentorial surfaces of the cerebellum and tentorium are coagulated and divided to further relax the cerebellum.

The tentorium is coagulated and incised laterally to the straight sinus in a radial manner, from lateral to medial. Bleeding edges are coagulated and the durotomy carried to the tentorial incisura by progressively coagulating the dural leaves. The tentorial incision allow placement of a retractor above the tentorium behind its petrous attachment. In addition, large tentorial lakes may be present, especially in very young children, and these were avoided whenever possible. Preoperative venous-phase MR angiography may be helpful in identifying large venous sinuses within the tentorium, and image guidance may be used to help avoid these sinuses during the operation. Importantly, the vein of Rosenthal may drain into the tentorium, and this should be considered a contraindication to the SCTT approach.
Care should also be taken to avoid sacrificing the paramedian tentorial bridging veins whenever possible. The midline tentorial bridging veins and the petrosal vein (laterally) must be preserved because they represent the predominant venous drainage of the posterior fossa.

Temporary arrhythmia or bradycardia, mediated through the trigeminal vagal pathway, has been reported during this step of tentorial manipulation; therefore, at this stage, communication with the anesthesiologist is important. The undersurface of the temporal lobe is visualized, and a self-retaining retractor is then placed through the tentorial opening into the supratentorial space to depress the tentorium in order to create a larger working corridor.

The quadrigeminal and posterior ambient cisterns is then exposed; this typically allow for visualization of the straight sinus and vein of Galen medially and of the basal vein of Rosenthal. Opening of the thick arachnoid of the quadrigeminal and posterior ambient (perimesencephalic) cisterns allow for visualization of the posterior cerebral arteries. The trochlear nerve should first be identified as it exits the posterior midbrain below the inferior colliculus and should be followed anteriorly as it travels the quadrigeminal and ambient cisterns until it tucks under and pierces the tentorium. The nerve extends below the tentorium before entering the dural canal, usually at the anteroposterior midpoint of midbrain (for example, at the posterior border of the cerebral peduncle). Thus, the safest location to incise the tentorium is posterior to the tectum of the midbrain.

As such, injury to the trochlear nerve is never a major risk. Frameless image guidance can greatly aid at this stage.

With the tentorium opened and retracted, the undersurface of the PMT lobe is visualized.

In the series of Weil et al. the tumor typically obscured the normal anatomy of the fusiform and parahippocampal gyri, allowing direct visualization of the tumor and of the infiltrated cortex. In cases where refractory epilepsy is the primary presentation, it is possible to place a subdural strip under the parahippocampal gyrus to perform electrocorticography (ECoG).

As intratumoral decompression is performed, care has to be was taken to respect the pial plane, which is sought medially, so as to avoid encountering the midbrain and vascular structures medially. Depending on tumor extent, the temporal horn of the ventricle is frequently entered.

Tumor removal is carried out with a combination of suction, bipolar coagulation, and ultrasonic aspiration. The limits of the resection are easily visualized with this approach, but this delineation required frequent repositioning of the operating microscope and the operating table for adequate resection.

After adequate tumor resection had been achieved and hemostasis had been secured, the tentorial retractor is removed and the cavity filled with irrigating fluid to remove as much air as possible. The tentorial edges not reapproximated, the convexity dura closed, and the bone replaced.

Case series

2015

Four consecutive patients harboring a medial temporo-occipital lesion are reported. All were operated on while in the sitting position using frameless navigation and a supracerebellar transtentorial approach. Tumor resection was performed by 2 surgeons with endoscopic visualization.

Pathologies included intraparenchymal metastatic melanoma, cavernous hemangioma, and ganglioglioma, as well as an intraventricular metastatic tumor. The distance from the tentorium to the...
lesion ranged from 1 to 4 mm. Gross total resection was achieved in 3 of the 4 patients. The patient with a metastatic melanoma had an intentional near-total resection given the tumor encasing a branch of the posterior cerebral artery. The patient with the intraventricular tumor sustained a small but symptomatic infarct of the lateral geniculate region, resulting in a visual field deficit.

This small series suggests that the endoscopic supracerebellar transtentorial approach with the patient in the sitting position can be a safe and effective approach for removing medial temporo-occipital lesions. It allows excellent tumor visualization, eliminates the need for brain retraction, minimizes parenchymal transgression, and improves surgical ergonomics. Significant experience in endoscopy and excellent neuroanesthesia support are recommended before undertaking this approach.

5 consecutive patients undergoing a paramedian SCTT approach between 2009 and 2014 in the park bench position was used in 3 boys and 2 girls with a mean age of 7.8 years (range 13 months to 16 years). All patients presented with a seizure disorder related to a tumor in a PMT region involving the parahippocampal gyrus and fusiform gyrus of the left (n = 3) or right (n = 2) temporal lobe. No procedure-related complications were observed. Gross total resection and control of seizures were achieved in all cases. Tumor classes and types included 1 Grade II astrocytoma, 1 pleomorphic xanthoastrocytoma, 1 ganglioglioma, and 2 glioneural tumors. None of the tumors had recurred by the mean follow-up of 22 months (range 1-48 months). Outcomes of epileptic seizures were excellent, with seizure symptoms in all 5 patients scoring in Engel Class IA.

The SCTT approach represents a viable option when resecting tumors in this region, providing a reasonable working corridor and low morbidity. The authors' experience in a cohort of pediatric patients demonstrates that complete resection of the lesions in this location is feasible and is safe when involving an approach that involves using a park-bench lateral positioning.

**Case reports**

A 40-year-old patient was admitted with a 9-month history of headaches and multiple episodes of generalized seizures. Investigations revealed a medial temporal epidermoid tumor that extended into the suprasellar region. The tumor was surgically resected using a lateral supracerebellar-transtentorial approach. The rationale for the surgical approach and its validity in this clinical situation is discussed.

**Videos**


2) Marcus HJ, Sarkar H, Mindermann T, Reisch R: Keyhole supracerebellar transtentorial transcollateral
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