



---

## TECHNICAL NOTE

# Infratentorial supracerebellar approach for microsurgical resection of large midline pineal region tumor: a technical note.

Ricardo Santos de Oliveira, MD, PhD<sup>1</sup> - Matheus Fernando Manzolli Ballestero, MD, MSc<sup>1,2</sup>  
Dinark Conceição Viana, MD, MSc

Received: 10 December 2019 / Published: 18 December 2019

### Abstract

Pineal region tumors pose certain challenges regarding to their resection: a deep surgical field, associated critical surrounding neurovascular structures, and narrow operative working corridor due to obstruction by the apex of the culmen. The authors describe a midline supracerebellar infratentorial approach that is routinely performed and was successfully used in the treatment of a large midline pineal region tumor in a 4 years old child. The surgeon achieved generous exposure of the caudal midline mesencephalon through a "cross-court" midline or oblique trajectory, while avoiding excessive retraction on the culmen demonstrating that large midline pineal region tumors can be removed through a suboccipital craniotomy. This approach is safe, may spare some of the midline vermian bridging veins, and may be potentially less invasive and more efficient than other surgical techniques.

**Key words:** Tumor, Pineal, Park bench, Superior cerebellar.

### Introduction

Pineal region tumors pose certain challenges regarding to their resection: a deep surgical field, associated critical surrounding neurovascular structures, and narrow operative working corridor due to obstruction by the apex of the culmen [1].

Contemporary surgical interventions for management of pineal region tumors through open microsurgery includes: occipital-transtentorial approach [2], infratentorial supracerebellar [3] approach with or without endoscope assistance [4], each technique has its own limitations, advantages and disadvantages [5].

The authors report in this paper a midline supracerebellar infratentorial approach that was successfully used in the treatment of a large (> 3 cm) midline pineal region tumor in a 4 years old child describing the technique, advantages, limitations and disadvantages.

### Case history

A 4 years-old-child presented with intracranial hypertension due to hydrocephalus. Neurological examination showed sign of Parinaud syndrome. Patient was submitted to an urgent endoscopic third ventriculostomy improving the signal and symptoms of intracranial hypertension. Brain MR scans showed a large (> 3 cm) midline pineal neoplasm (Fig.1). Patient underwent a supracerebellar infratentorial approach to resection of the tumor. The entire extent of the tumor was readily reachable through the supracerebellar route, gross-total resection was achieved and the with final pathological diagnose was

---

<sup>1</sup>Division of Pediatric Neurosurgery, Department of Surgery and Anatomy, University Hospital, Ribeirão Preto Medical School, University of São Paulo, Ribeirão Preto, Brazil

<sup>2</sup>Department of Medicine, Federal University of São Carlos, São Carlos, Brazil

To whom correspondence should be addressed: Ricardo Santos de Oliveira, MD, PhD [E-mail: [rsoliveira@gmail.com](mailto:rsoliveira@gmail.com)]

consistent with a mature teratoma. The child is asymptomatic after one year of post-operative follow up.

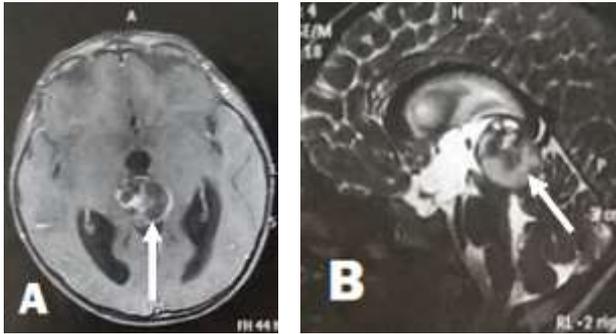


Figure. 1 – Pineal region mature teratoma (white arrow) A - Axial T1-weighted after gadolinium and B – Sagittal T2-weighted magnetic resonance (MR) images

## Surgical Methods

### Park Bench Position

It is a type of position where the patient is positioned in a park bench. The head is flexed until the chin is one centimeter from the sternum, rotated contra-laterally to the lesion, and flexed 30-degree laterally toward the contralateral shoulder, allowing to increase the angle between the atlas and foramen magnum.

The most common position for posterior fossa operations in adults is the lateral decubitus or “park bench” position; this approach has largely replaced the use of the sitting position for most procedures. After intubation and placement of a three-point head fixation device, the patient is turned on his side and the shoulder contralateral to the lesion supported by a roll in the axilla; the ipsilateral shoulder is rolled forward and pulled down with tape. Even in infants this surgical position is feasible (Fig. 2).

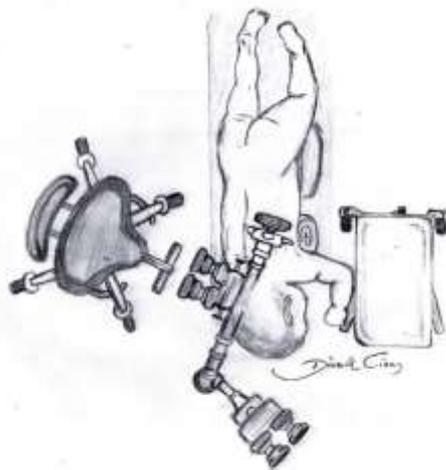


Figure 2. Park bench position for suboccipital approach in infant. A patient positioning and padding. Caution is necessary to avoid brachial plexus injury

The dependent arm can be suspended by a sling in the crook of the Mayfield attachment. All pressure points are carefully padded. In lesions of the cerebellopontine angle, the head is kept in a relatively neutral position and the body is slightly elevated (reverse Trendelenburg).

### Surgical Technique

A midline linear skin incision is made in the midline extending from 2–3 cm above theinion down to the foramen magnum.

To achieve both resection and reconstruction in a single surgical session, the patient was placed in the lateral decubitus position (park-bench position) (Fig. 2), and the upper half of the body was tilted upward by 30°, after orotracheal intubation. The patient’s head was rotated face down by 30°, the vertex tilted down by 15-30° and the chin was flexed down by 15° so that the nuchal muscles were extended adequately. The left shoulder and arm were positioned outside the operating table, and the arm was supported by a sling. The right arm was positioned on a stack of blankets and taped to the table. An axillary roll was positioned just caudal to the left axilla. A pillow was positioned between the legs, which were flexed. A Mayfield headrest was applied (Fig. 3).

A craniotomy that involves both cerebellar hemispheres and the torcula and transverse sinuses may be needed (Fig. 3). If the venous sinuses have to be exposed, burr holes can be placed close to the transverse and/or the sigmoid sinus in order to complete a craniotomy. Then the craniotomy is done from the burr holes to either side of the foramen magnum. The last cut is the one that crosses over the transverse or sigmoid sinuses. The bone overlying the sinuses can be drilled by means of a burr or removed with a rongeur. This maneuver is done to prevent the transection of the sinuses with the neurosurgical drill during the craniotomy.

In the midline suboccipital craniotomy, the dura can be opened in a C-shaped fashion. The superior limb of the dura extends to the inferior aspect of the transverse sinus. The inferior limb extends downwards to the foramen magnum. Care must be taken to avoid opening the venous sinuses. Large venous plexus and circular sinuses may be present in the foramen magnum area. Violation of those sinuses makes homeostasis more difficult and increases the risk of air embolism.

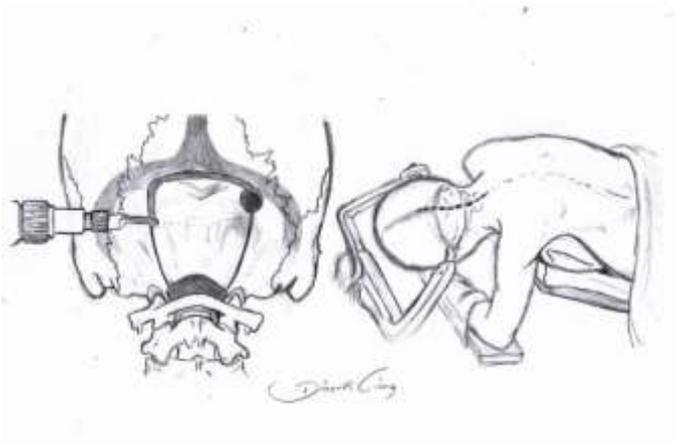


Figure 3. A midline craniotomy can be performed to approach the pineal lesions. A suboccipital approach is sufficient for localized lesion. extending to the pineal region, venous sinuses or supratentorial space. The torcula and transverse sinus may be exposed and a supracerebellar–infratentorial or supracerebellar–transtentorial approach can be implemented.

### Discussion

The use of the sitting or upright position for patients undergoing posterior neck and occipital surgery facilitates surgical access, but presents unique physiological challenges for the anesthesiologist with the potential for serious complications, especially in bone surgery [6]. These complications include haemodynamic instability, venous air embolism (VAE) with the possibility of paradoxical air embolism, pneumocephalus, quadriplegia and compressive peripheral neuropathy [7]. Alternative positions for surgical access to the occipital and nuchal region include the prone and lateral positions.

The surgeon achieved generous exposure of the caudal midline mesencephalon through a "cross-court" midline or oblique trajectory, while avoiding excessive retraction on the culmen (Fig. 4).

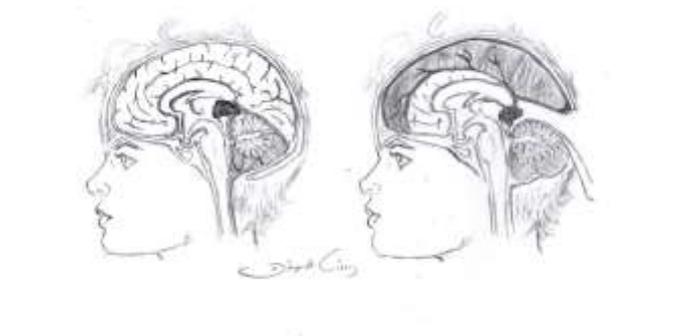


Figure 4. A supracerebellar and infratentorial approach. A generous exposure of the pineal region through a "cross-court" midline or oblique trajectory, while avoiding excessive retraction on the culmen.

### Conclusions

Infratentorial supracerebellar approach using park bench position is a feasible and safe technique to access the Pineal region allowing resection of lesions in this area and may spare some of the midline vermian bridging veins, being potentially less invasive and more efficient than other surgical techniques.

### Conflict of interest

The authors declare that they have no conflict of interest related to this article.

### References

1. Bruce JN, Stein BM. Surgical management of pineal region tumors. *Acta neurochirurgica*. 1995 Sep 1;134(3-4):130-5.
2. Lozier AP, Bruce JN. Surgical approaches to posterior third ventricular tumors. *Neurosurgery Clinics*. 2003 Oct 1;14(4):527-45.
3. Kodera T, Bozinov O, Sürücü O, Ulrich NH, Burkhardt JK, Bertalanffy H. Neurosurgical venous considerations for tumors of the pineal region resected using the infratentorial supracerebellar approach. *Journal of Clinical Neuroscience*. 2011 Nov 1;18(11):1481-5.
4. Gu Y, Zhang X, Yu Y, Hu F, Xu W, Xie T, Sun C. Endoscope-assisted microsurgical resection for pineal region tumors: Preliminary experience. *J Pediatr Oncol*. 2013;1:17-22.
5. Azab WA, Nasim K, Salaheddin W. An overview of the current surgical options for pineal region tumors. *Surgical neurology international*. 2014;5.
6. Rozet I, Vavilala MS. Risks and benefits of patient positioning during neurosurgical care. *Anesthesiology clinics*. 2007 Sep 1;25(3):631-53.
7. Gupta P, Rath GP, Prabhakar H, Bithal PK. Complications related to sitting position during Pediatric Neurosurgery: An institutional experience and review of literature. *Neurology India*. 2018 Jan 1;66(1):217.