



## Technical Notes

# Transglabellar resection of frontal sinus cholesterol granuloma extending cranially through cecum foramina: Technical note

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## ABSTRACT

**Background:** Cholesterol granuloma (CG) commonly occurs in the petrous apex; their occurrence in the anterior cranial fossa CGs is rare. Subfrontal approaches are the conventional surgical approaches for the resection of midline lesions of the anterior cranial fossa and frontal sinuses. In this article, we describe a successful minimally invasive approach for resection of a small midline anterior cranial fossa CG.

**Methods:** We report a rare case of frontal air sinus CG extending intradurally through the foramen caecum. The surgical management of this patient involved the use of a minimally invasive transglabellar approach and a butterfly incision and the patient outcomes at 1 year after the surgery.

**Results:** The lesion was totally resected with no complications and the patient was discharged on the 3<sup>rd</sup> postoperative day. A 1-year follow-up scan showed neither residual nor recurrence of the lesion.

**Conclusion:** The transglabellar approach through a butterfly incision offers a safe approach for the resection of a lesion extending from the frontal air sinuses to the anterior cranial fossa with no complications, shorter hospital stay, and good cosmetic results.

**Keywords:** Anterior skull base, Butterfly incision, Cholesterol granuloma, Foramen cecum, Frontal sinus

## INTRODUCTION

Cholesterol granulomas (CGs) are granulomatous reaction to cholesterol crystals. The mastoid air cells are the most common site for their occurrence. On the other hand, sino-orbital CGs are rare, but they are addressed sparsely in the literature.<sup>[8]</sup> However, intracranial-intradural extensions are very rare. Sino-orbital lesions are typically approached endoscopically or by oculoplastic open approaches.<sup>[2]</sup>

For sinus lesions with intracranial extension, subfrontal approaches are the standard of care and are associated with large scars, flaps, and craniotomies which all involve inherent risks of complications and prolonged hospital stays.<sup>[9]</sup>

In this article, we describe a rare case of frontal sinus CG extending intradurally through the foramen caecum and the minimally invasive approach used to treat this pathology.

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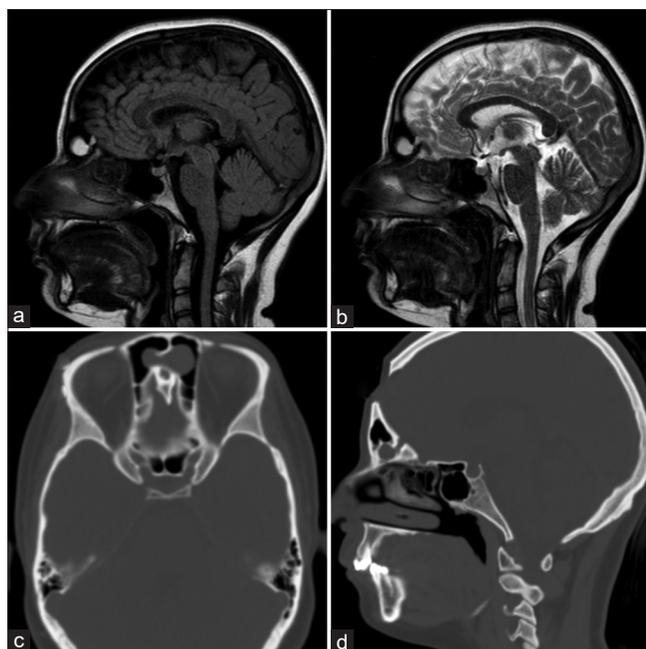
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## MATERIALS AND METHODS

A 17-year-old female patient, previously healthy, with a frontal headache for 6 months in duration before the presentation associated with nasal congestion, underwent computed tomography sinuses which showed an isodense lesion with calcified walls within the frontal air sinuses communicating through the enlarged foramen cecum with the intracranial compartment. Her brain magnetic resonance (MR) imaging scan showed a frontal sinus lesion extending intracranially with hypertense signal on both T1 and T2 sequences [Figure 1].

The patient was operated on under general anesthesia in the supine position. A butterfly incision was utilized and a flap was elevated [Figure 2a]. The anterior wall of the frontal sinus was drilled with a high-speed diamond drill ( $1 \times 1$  cm) [Figure 2b].

Under the microscope, the lesion was resected from the frontal sinus and its extension into the anterior skull base was identified. The edges of the foramen cecum were opened using a combination of a high-speed drill and a Kerrison punch. The dura was opened circumferentially around the lesion which was piercing the dura with visible arachnoid layers. After total resection, the dural edges were



**Figure 1:** (a and b) Fluid-attenuated inversion recovery and T2-weighted sagittal magnetic resonance scan, showing hyperintense lesion within the frontal air sinus extending to the intracranial compartment (c and d) Axial and sagittal cuts computed tomography sinuses showing isodense irregular lesion within the frontal air sinus, showing extension of the lesion through the right foramen cecum.

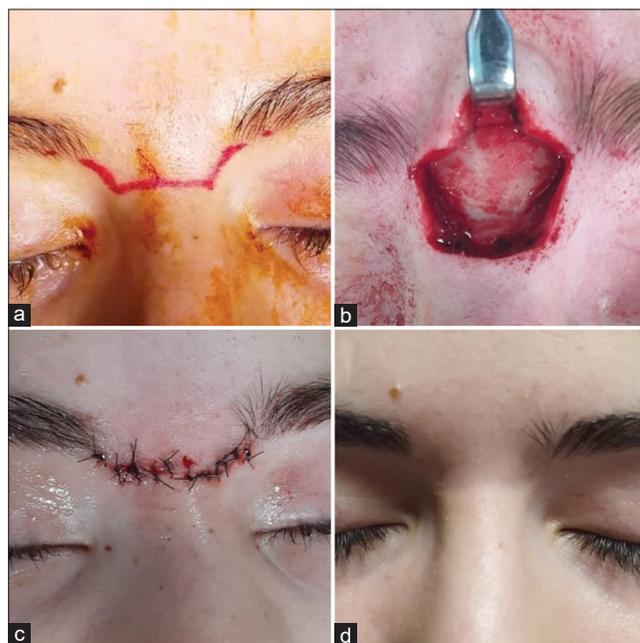
approximated with four stitches and a Tachosil was applied inlay followed by fascia Lata as overlay graft. A draining tube from the frontal air sinus to the nasal cavity was used and sutured [Figures 2c-d]. The anterior wall of the frontal air sinus was repaired by a low-profile mesh.

## RESULTS

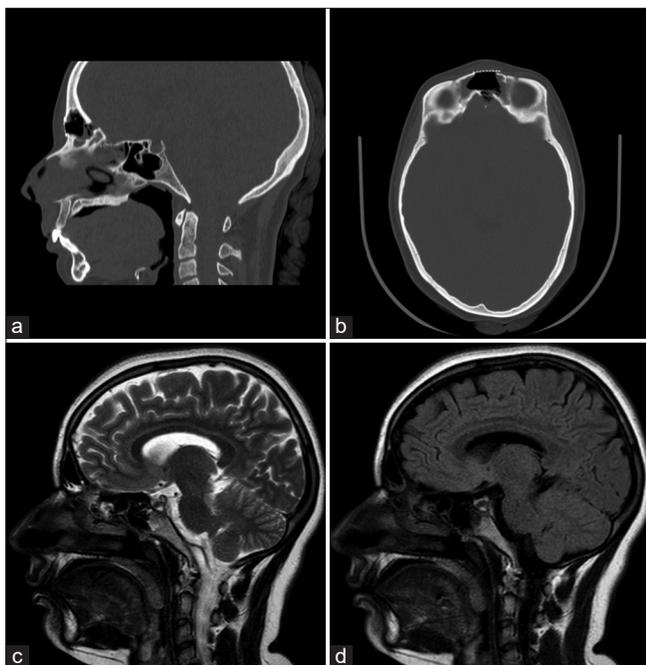
A gross total resection was achieved with no perioperative complications. The patient was discharged on the 3<sup>rd</sup> postoperative day and the draining tube was removed in outpatient clinic on the 7<sup>th</sup> postoperative day. A follow-up magnetic resonance scan 1 year later showed no evidence of recurrence [Figure 3]. The patient was satisfied with the cosmetic results [Figure 2] and she reported that her headaches had disappeared.

## DISCUSSION

The management of anterior cranial fossa tumors is a complex and challenging task for neurosurgeons.<sup>[4]</sup> The subfrontal approach remains the golden standard for most pathologies of the anterior cranial fossa.<sup>[1]</sup> For the subfrontal approach, unicoronal or bicoronal skin incisions are typically required. While these incisions provide sufficient exposure, they often come with disadvantages such as prolonged operation time, long scalp scar, alopecia, temporal hollowing, and extended hospital stay.<sup>[6]</sup>



**Figure 2:** (a) Butterfly incision is planned across the nasal bridge and connecting the two eyebrows. (b) Elevation of skin flap and exposure of the glabella and nasal bridge. (c) The wound after closure. (d) Scar at 1 year after surgery.



**Figure 3:** (a and b) Axial and sagittal computed tomography sinuses on the 2<sup>nd</sup> day after surgery showing widening of foramen cecum and the repair of the anterior frontal sinus wall by mesh (c and d) Sagittal T2 and fluid-attenuated inversion recovery at 1 year after surgery confirming total resection and no recurrence.

Another alternative approach for such a lesion would be the extended transcribriform endoscopic endonasal approach, which allows visualization from the frontal sinus, olfactory groove, and crista galli, along the floor of the anterior fossa to the anterior planum sphenoidale.<sup>[5]</sup> The risk of cerebrospinal fluid (CSF) leak is the main criticism to the extended endonasal approach; however, as we gain more experience with this approach; the risk has been reduced to 5–10%.<sup>[3]</sup> The advantage of endoscopic approaches is avoidance of facial or scalp scar.

In selected cases, with small midline lesions, the transglabellar approach is feasible and involves making a small incision in the skin between the eyebrows in the natural skin crease.<sup>[7]</sup> This approach allows neurosurgeons to access the anterior cranial fossa without disrupting the brain tissues. Furthermore, the procedure ensures minimal manipulation of the brain, reducing the risk of injury to the surrounding structures with better aesthetic results. It has a similar inherent risk of ascending infection from the sinus and CSF leak. The limited space makes watertight closure of the dura more challenging. However, the use of an endoscope facilitates the inspection of the surgical cavity and the dural closure.

Our experience with this approach is limited to this case and a case of anterior cranial fossa encephalocele. In both cases,

there were no complications, and the clinical and esthetic outcomes were satisfactory.

## CONCLUSION

The transglabellar approach through a butterfly incision is a safe and effective technique for the resection of anterior cranial fossa tumors. It offers a direct and precise route to the tumor with minimal brain manipulation, reducing the risk of postoperative complications. Moreover, it results in good esthetic outcomes and improved patient satisfaction.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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