



# Reconstruction of Anterior Skull Base After Cleaver Trauma: Combined Use of Fascia Lata and Middle Turbinate Flap in a Patient with Concha Bullosa

## Video Article

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## Abstract

This video article presents a 47-year-old male patient who presented to the emergency department after a cleaver bounced off the grinding wheel and lodged between his eyebrows. The patient complained of clear nasal drainage since the trauma. Computed tomography showed a comminuted displaced fracture starting from the right frontonasal recess and extending along the right ethmoid roof. The patient underwent surgery. The skull base defect was reconstructed with a free fascia lata graft in the first operation. In the second session, the reconstruction of the skull base was reinforced with a flap that was prepared from the middle turbinate with the concha bullosa. The patient was followed for eight months. The patient's symptoms resolved completely and there was no evidence of rhinorrhoea or any other complication at the control examination. No complications were seen on control magnetic resonance imaging.

**Keywords:** Trauma, skull base, cerebrospinal fluid leak, rhinology, endoscopic surgery, surgical flaps, turbinates

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## Introduction

Anterior skull base injuries resulting from trauma present a challenging scenario for reconstructive surgeons due to the complexity of the anatomical structures involved and the potential for cerebrospinal fluid (CSF) leakage, encephalocele, or meningocele. Traditional approaches to anterior skull base reconstruction include various techniques such as free tissue transfer, multilayered fascia lata grafts, and middle turbinate flaps. However, selecting the optimal reconstructive strategy requires careful consideration of the patient's specific injury pattern and anatomical variations.

## Case Presentation

A male patient in his late forties presented to the emergency department after the cleaver he was sharpening had bounced off the grinding wheel and lodged between his eyebrows. The patient reported a clear discharge from the right nostril that started immediately after the trauma. Computed tomography revealed a comminuted displaced fracture starting from the right frontonasal recess and extending along the right ethmoid roof. Pneumocephalus was evident in the right frontal region and along the midline of the anterior skull base. The patient was then taken to the operating room.



Endoscopic examination at the beginning of the procedure revealed the entrance point of the cleaver in the axilla of the middle turbinate. The operation started with an uncinectomy. Anterior and posterior ethmoidectomy were then performed. Pulsation of brain parenchyma could be seen through a defect at the time of ethmoidectomy.

Utilizing a 30-degree scope, it was observed that the frontal lobe was protruding from the dura defect. Following the completion of ethmoidectomy, the frontal recess was found. The frontal sinus ostium was enlarged. Bone fragments were removed, and the margins of the skull base defect were identified. A fascia lata graft, measuring approximately 4 cm in width and 5 cm in length, was harvested. At the lateral margin of the defect, the graft was tucked under the remaining bone margin, while at the medial border, the graft was laid in an overlay fashion in order not to damage the olfactory fibers. A second layer of fascia was placed on top of the first layer and the procedure was completed by supporting the reconstruction with nasal dressing.

In order to reinforce the reconstruction of the base of the skull, a second operation was carried out one week after the first one. Superior and inferior horizontal incisions made on the lateral surface of the middle turbinate were combined with the vertical incision on the anterior surface, and the lateral lamella was excised. The mucosa of the concha bullosa cell was meticulously peeled off. The superior attachment of the axilla was partially released so as not to make the middle turbinate completely unstable. The middle turbinate flap was rotated over the reconstruction (Video 1). A nasal dressing was then applied, and the procedure was completed.

The patient was followed for eight months. The patient's nasal drainage symptoms had completely resolved, and endoscopic examination showed that the reconstructed defect was completely lined with nasal mucosa with no evidence of CSF leak, encephalocele, or meningocele. There was also no evidence of CSF rhinorrhoea, meningocele, or encephalocele on postoperative magnetic resonance imaging.

## Discussion

The reconstruction of anterior skull base defects poses significant challenges due to the intricate anatomy and risk of CSF leakage. Various techniques have been described in the literature, including free tissue transfer, multilayered fascia lata grafts, and middle turbinate flaps (1). The size and location of the defect are the most important factors in determining the technique to be used for anterior skull base repair (2, 3). Free tissue transfer offers versatility in reconstructing large defects but may be associated with

donor site morbidity and prolonged operative times. The use of nasoseptal flaps is associated with very low postoperative CSF rhinorrhoea. However, the length of the flap may not always extend sufficiently anteriorly to the posterior tabula of the frontal sinus. It may also be associated with impaired mucociliary movement, decreased sense of smell, and decreased quality of life (4). Multilayered fascia lata grafts provide a durable option for reconstruction, however, the use of fascia lata alone may not always suffice, particularly in cases with extensive defects or underlying anatomical variations. In cribriform plate defects as in this case, placement of the fascia underlay is not feasible because of the risk of fracturing the intact edges and injuring the olfactory fibers while trying to detach the dura (4).

This operation demonstrated that a secure repair can be achieved for large defects using a free fascia lata graft and middle turbinate flap together. In addition, we believe that the middle turbinate flap technique is still feasible even in the presence of concha bullosa and that our method is innovative in terms of flap preparation technique.

In conclusion, the combined use of a fascia lata graft and a middle turbinate flap represents a valuable strategy for anterior skull base reconstruction in patients with penetrating trauma even in the presence of concha bullosa. This approach offers durable and vascularized coverage of the defect, with favorable outcomes in terms of symptom resolution and prevention of CSF leakage. Long-term follow-up is essential to monitor for complications and ensure optimal patient outcomes.

**Video 1.** Anterior skull base reconstruction after penetrating cleaver trauma

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**Informed Consent:** Informed consent was obtained from the patient.

## Authorship Contributions

Surgical and Medical Practices: S.M., M.C.E., Concept: S.M., M.C.E., Design: S.M., M.C.E., Literature Search: S.M., Writing: S.M.

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### Main Points

- This video article highlights the successful repair of large skull base defects using a combination of free fascia lata graft and middle turbinate flap.
- The innovative technique presented here demonstrates the feasibility of applying a middle turbinate flap in the presence of concha bullosa.
- The favorable outcome and absence of postoperative complications emphasize the effectiveness and safety of this combined approach for securing repairs of extensive skull base defects.

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