

Mini Review

Prevention of CSF leakage after endoscopic endonasal approach and effects of collaborative work

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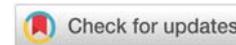
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Abstract

Endoscopic Endonasal Approach (EEA) has been used frequently in recent years, especially for the sellar pathologies. Although there is an increase in extent of tumor resection rates, the rates of CSF leakage appear to be high in patients undergoing EEA surgery. The use of pedicled nasoseptal flaps is gradually increasing for the prevention of rhinorrhea. In pathologies requiring an extended approach such as extensive skull base tumors, ENT surgeon and neurosurgeon collaborative works are considerable. In this way, both the exposure required for surgery can be achieved and postoperative nasal complications can be minimized by ensuring the protection of sinonasal structures.

Introduction

Pituitary adenomas are a common benign intracranial neoplasm comprising 10-15% of all primary intracranial neoplasms [1]. Among sellar pathologies, pituitary adenomas are the most frequent neoplasms. Surgical intervention is the first line treatment for most patients with pituitary adenomas. The pituitary gland, seated within the sella at the skull base, is difficult to access transcranially, so neurosurgeons have been using the sphenoid sinus approach for pituitary adenomas since Hermann Schloffer first did so in 1907 [2,3].

Transsphenoidal pituitary surgery may be performed either microscopically or endoscopically. Studies have shown that Endoscopic Endonasal Approach (EEA) has become the standard of care due to a higher rate of extent of tumor resection, lower incidence of perioperative complications, and shorter postoperative hospital stay when compared to microsurgical approaches [4]. While the EEA has demonstrated a remarkable decrease in overall complication rate, the need for large dural exposure and arachnoid openings may result in large skull base defects with moderate to high flow Cerebrospinal Fluid (CSF) leaks [5]. Except that, Sun and colleagues demonstrated that,

elevated BMI is predictive of postoperative CSF leak following EEA [6]. EEA require collaboration among the surgical team members, particularly the ENT surgeon and neurosurgeon who are required to understand the crucial nuances of each other's field. Anatomic variations of nasal structures, extensive skull base pathologies and also extended EEA require such collaborative work [7,8].

Repairing CSF leaks is crucial in preventing serious postoperative infectious complications. Intraoperative iatrogenic fistula between the subarachnoid space and nasal cavity carries the risks of bacterial spread from the nasopharyngeal cavity, potentially leading to ascending meningitis. To close the gap, some of the earliest techniques were using the tissue grafts from elsewhere in the body, including fascia, muscle, or fat [9]; however, this leads to additional incisions and surgical site complications, increased operative time, and further postoperative discomfort for the patient [3].

Nasoseptal and middle turbinate rotational flaps have been used since the 1950s, but these early flaps had a promiscuous blood supply and unfavorable arcs of flap rotation. Hadad and Bassagasteguy developed an improved, pedicled vascularized



regular nasoseptal flap in 2006 [10]. This relatively large flap significantly reduces the incidence of postoperative CSF leakage in extended endoscopic skull base approaches [11].

For the giant pituitary adenoma or skull base tumors expanding toward to suprasellar regions and cavernous sinus, surgeons could consider the application of extended transsphenoidal approach, which means remove the concha nasalis media of approaching side at the beginning of operation and prepare rescue flap well at choana for the reconstruction of base skull due to provide a wider space for EEA operation [12]. The common methods of endoscopic transnasal transsphenoidal pituitary adenoma resection for the treatment of lateral wall and nasal septum mucosa of sphenoid sinus include electrocautery pneumatolysis sphenoidal mucosa which is at the opening of sphenoidal sinus, small mucosal flap around the opening of sphenoidal sinus, submucosal approach of nasal septum and pedicled nasoseptal flap [13,14].

The complications of EEA vary, including sinonasal dysfunction, neurovascular injury, Cerebrospinal Fluid (CSF) leakage, central nervous system (CNS) infection, and damage to adjacent CNS tissue. Short-term sinonasal dysfunction includes epistaxis, sensation of nasal blockage due to mucosal swelling and destruction of nasal structures [15,16]. Synechia, septal perforation, and altered olfaction are also possible long-term complications. These complications can be prevented by minimally invasive surgical manipulation of nasal structures, preservation of the upper septal mucosa and managed by scheduled debridement and saline irrigation [17, 18]. It is important to protect nasal structures as much as possible in pituitary adenomas that do not have wide spread and invasion into deep vascular and neural structures [19,20].

Conclusion

The introduction of EEA for tumor resection has dramatically transformed the surgical treatment of complex pituitary tumors and extensive skull base pathologies. Skull base tumors necessitating extensive resection with following dural defects led to the improvement of more dural repair techniques, including free vascular grafts, free synthetic grafts, and vascularized pedicled nasoseptal flaps. The implementation of the flaps especially, pedicled nasoseptal flap for skull base reconstruction after EEA surgery for resection of giant pituitary adenomas has resulted in a significant decrease in the incidence of postoperative rhinorrhea. In terms of nasal complications, it is important to protect nasal structures as much as possible in pituitary adenomas that do not have wide spread and invasion into deep vascular and neural structures. The main conclusion to be drawn from this literature review is that collaboration should be established between ENT surgeon and neurosurgeon, especially for extended EEA approaches, in order to provide as much exposure as required for the neurosurgeon and to prevent unnecessary damage to sinonasal structures.

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