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Original Article

"NIMS" nasal mucoperiosteal flap for sublabial trans-sphenoidal surgical defect repair: A new technique under microscope

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Received : 15 May 2021
Accepted : 06 September 2021
Published : 11 October 2021

DOI
10.25259/SNI_483_2021

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ABSTRACT

Background: CSF rhinorrhea is a known complication that may occur after cranial base surgery, especially the trans-sphenoidal approaches to sellar tumors. It may occur following both microscopic and endoscopic procedures. Over a period, the balance has tilted toward endoscopy due to development of pedicled Hadad flap. Microscopic trans-sphenoidal surgery (TSS) continues to be performed in our institute as well as many other centers across the world due to familiarity of technique and unavailability of endoscopic equipment. Despite the fairly widespread use of this surgery, literature is devoid of any description of a local mucosal flap for repair of the surgical defect in microscopic TSS.

Methods: We herein described the procedure and our experience of harvesting such flap in 42 patients operated for pituitary adenomas in our department between September 2016 and February 2020, through microscopic sublabial TSS.

Results: All 42 of the patients included in this study underwent excision of pituitary tumors (macroadenomas). Thirty-nine (n = 39) patients were undergoing 1st time surgery, while three (n = 3) of these patients were undergoing second surgery following an earlier trans nasal trans-sphenoidal route. None of our cases have reported CSF leak postoperatively.

Conclusion: This study attempts to highlight to ardent/obligate microscopic surgeons that a local vascularized flap can be harvested for repair of skull base defect and prevent postoperative CSF leak in microscopic sublabial TSS.

Keywords: Endoscopic, Microscopic, Rhinorrhea, Trans-sphenoidal defect

INTRODUCTION

The debate over the superiority of endoscopic trans-sphenoidal surgery (ETSS) over microscopic trans-sphenoidal surgery (MTSS) does not seem to be near the close yet.[5,6] For now, the only conclusion that can be drawn is that the surgical approach is best chosen based on patient or tumor characteristics and equally importantly, surgeon's skill and comfort.

Irrespective of the equipment used, CSF rhinorrhea remains a troublesome complication of trans-sphenoidal surgery (TSS) and steps to prevent them are considered standard of care of surgery.

Various techniques of repairing the skull base defect produced in TSS have been described. As compared to the use of free grafts such as fat or fascia lata, local vascularized flaps provide viable cover of the defect. Repair of the anterior skull base defect using flaps from the nasal cavity mucosa (most popularly the Hadad-Bassagasteguy flap) has been consistently described in ETSS in literature.[6] Although the visibility and comfort for working in the midline are comparable in both endoscopic and microscopic methods, the freedom of dissection within the nasal cavity was thought to be higher in endoscopic surgery as compared to microscopic transnasal surgery wherein a nasal speculum usually restricts lateral access. However, studies contradicting this thought process are also available which have calculated a higher degree of freedom of movement in the sublabial microscopic approach.[1] Literature regarding local pedicled flaps for repair in MTSS is lacking.

Aim

This paper is our endeavor to describe a novel local nasal flap conveniently harvested at the beginning of microscopic sublabial TSS to provide effective cover for the sellar defect following pituitary adenoma excision.

MATERIALS AND METHODS

We describe our experience of harvesting such flap in all 42 patients operated for pituitary adenomas in the Department of Neurosurgery at NIMS between September 2016 and February 2020, through microscopic sublabial TSS. These were all operated in by single surgeon (RA).

Surgical technique

Flap was raised as the first step in the surgery.

1. Under general anesthesia with endotracheal tube fixed toward the left cheek and a ribbon gauze throat pack *in situ*.
2. The head is placed on a head ring/horse-shoe head rest, with mild neck flexion and tilt toward the right side.
3. Mucosa is prepared with multiple smears of povidone iodine solution followed by short duration packing of nasal cavity and upper sublabial space with swabs dipped in 0.5% xylometazoline.
4. A sublabial incision is given, close to the nasal floor, starting from the canine till the midline while an assistant retracts the patient's upper lip.
5. The incision is deepened till the bone and the nasal mucosa is stripped from the floor of the nasal cavity by subperiosteal dissection using a curved dissector held with the curve facing down. The harvesting of this mucosal flap then turns toward the midline over the septum. Bleeders are coagulated and divided. Raising of the flap is continued in the depth.
6. The flap is then cut along the anterior and inferior border thus entering the nasal cavity. Surgical technique described in [Video 1] [Figure 1].
7. The flap is then cut under direct vision on the lateral aspect below the inferior turbinate. Gentle traction is applied at the free end of the flap to help incise its superior-medial border until a pedicle is left superolateral.
8. The flap thus obtained can be stowed, through the choana, in the oropharynx to be retrieved at the end of surgery. The mucosal flap edges are raw but devoid of any major bleeder. This flap, although not harvested by the authors as based on any named artery, derives vascular supply from its attached base. Its viability is verifiable based on the healthy pink color of the flap as well the active ooze of blood from the cut edges.
9. The Hardy's speculum is now introduced displacing the nasal septum to the left. The sphenoid keel and the sinus ostia are identified.
10. The sphenoid sinus is entered by opening the anterior wall. The sinus mucosa is stripped off.
11. Sellar floor is opened. Dura is visualized and incised. Pituitary tumor is excised.
12. Hemostasis is achieved, sometimes using adjuncts like Surgicel/FloSeal.
13. The mucosal flap is on laid on the surgical site at the end of the tumor excision. The repair is reinforced with application of fibrin glue sealant (e.g. Tisseel) over and across the edges of the flap.
14. The septum is repositioned in the midline and the nasal cavities are packed with compressed polymer sponge (Merocel).
15. Sublabial incision [Video 1] describes surgical steps breifly is closed with 3-0 monocryl sutures (absorbable).

RESULTS

All 42 of the patients included in this study underwent excision of pituitary tumors (macroadenomas). Thirty-nine ($n = 39$) patients were undergoing 1st time surgery through the sublabial transnasal route, while three ($n = 3$) of these patients were undergoing second surgery through the transnasal trans-sphenoidal route. Intraoperative arachnoid breach and CSF leak occurred in four of these cases. All these patients underwent intraoperative sellar floor reconstruction using the above-described flap. One patient in whom recurrent/regrown tumor was operated through the trans-sphenoidal route with tumor found extending through the previous sellar floor defect and widening it, a high-flow CSF fistula was encountered intraoperatively. She had CSF rhinorrhea in the early postoperative period and was managed conservatively with bed rest and acetazolamide. She responded well and was eventually discharged with no further leak. One patient had

pituitary apoplexy, altered sensorium at presentation, and following hormonal stabilization was taken up for surgery. On the 2nd postoperative day, the patient had nasal bleed and reexploration in the operating room using an endoscope revealed diffuse oozing with no specific source of bleed from flap or donor site edges. The patient, unfortunately, eventually developed DIC and succumbed. However, the reason for DIC could be multifactorial including surgery. All the other patients did well postoperatively and were discharged without any CSF rhinorrhea. None of these patients had a CSF leak at discharge or at follow up. MRIs done at follow-up suggest a well-covered/healed skull base surgical site. Nasal endoscopy done at follow-up showed normal appearing roof of nasal cavity and sphenoid region suggesting good uptake of flap. There was no defect/CSF leak although synechiae were noted.

DISCUSSION

Although literature describes various methods of repair of anterior skull base defects in endonasal surgery, locally harvested vascularized pedicled flaps have been frequently described as the ideal method of repair. Reasonably enough, while obviating the need for distant incisions and expensive synthetic materials, these flaps provide living tissue to cover and physiologically heal the surgically created defect. ETSS with repair using local flaps has been shown to produce far lesser postoperative CSF leaks when compared to MTSS with repair using fat/fascia grafts.[4] The flaps that have been popularized thus far include the typical septal mucosal Hadad-Bassagasteguy flap,[2] the HB2 flap,[3] the Carrau-Hadad flap,[7] as well as other intra- and extra-nasal vascularized flaps.[8] The flap harvested by the technique described in this paper differs from all these aforementioned flaps in that a microscope was used as opposed to an endoscope. Another posteriorly pedicled flap described as the Carrau-Hadad flap[7] uses mucosa from the floor as well as the lateral wall of the nasal mucosa while the posteriorly pedicled flap described by us uses the nasal floor with the adjoining septal mucosa. [Figure 1] illustrates line of incision of our flap.

It has been insightfully commented that our reconstructive capabilities have lagged behind our extirpative capabilities in endonasal skull base surgeries.[7] If this can be said with respect to ETSS, a far stronger statement would be required to describe the reconstructive state of affairs in microscopic surgery. With the availability of endoscope, involvement of ENT surgeons and with the opinion that MTSS is an outdated method, with lower rates of tumor excision, interest in MTSS has dwindled among neurosurgeons. Given this, any development in methods of microscopic reconstruction of the anterior skull base defect is apparently nonexistent. In resource-limited settings where an endoscope is not available, where training in endoscopic surgery has a long way to go, MTSS remains the mainstay of pituitary adenoma management. Repair thus far has been done using grafts of fat from the abdomen or thigh and/or fascia lata, with materials like tissue glue thrown in. In cases where intraoperative CSF leak was encountered, these repair methods seemed precarious. Although we do not have the exact data on the CSF leaks before 2016, we had not faced any complication of CSF rhinorrhea following the use of this technique.

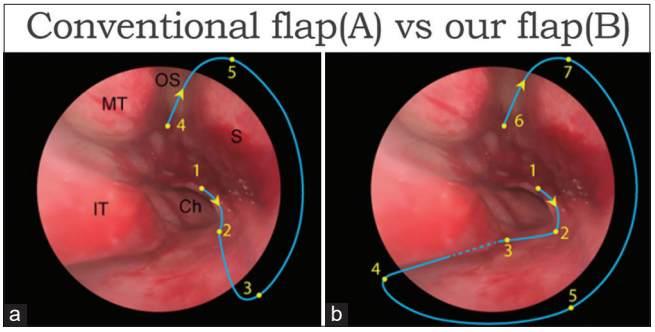

Figure 1: Incision lines for harvesting flap in conventional and our technique (a and b).

We have achieved good operative results with respect to prevention of CSF leaks after using the described flap cover.

CONCLUSION

This study attempts to highlight to ardent/obligate microscopic surgeons that a local vascularized flap can be harvested for repair of skull base defect and prevent postoperative CSF leak in MTSS.

Declaration of patient consent

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

Financial support and sponsorship

Publication of this article was made possible by the James I. and Carolyn R. Ausman Educational Foundation.

Conflicts of interest

There are no conflicts of interest.

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How to cite this article: Alugolu R, Rangan V, Ram R, Saradhi MV. "NIMS" nasal mucoperiosteal flap for sublabial trans-sphenoidal surgical defect repair: A new technique under microscope. Surg Neurol Int 2021;12:509.