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ORIGINAL STUDY

Direct Transnasal Dural Suturing After Endoscopic Hypophysectomy: Promising Outcomes

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Abstract

Background: **Endoscopic endonasal transsphenoidal surgery is the gold standard method for surgical management of pituitary adenomas; yet the troublesome issue is the potential of cerebrospinal fluid (CSF) leak with possible persistent leak and meningitis. Sellar reconstruction is a prerequisite to prevent postoperative CSF leak. Watertight dural stitching is a reliable method of closure of intraoperative defects, but this was always challenging due to the narrow and deep operative field and the need of special designs of surgical instruments. We present a simple, easy to use direct dural suture with no need to additional surgical instrument for closure of dural tear after endoscopic endonasal pituitary surgery.**

Patients and methods: **This technique was applied to 15 patients who underwent endoscopic endonasal hypophysectomy with inadvertent intraoperative arachnoid injury. Sutures were 6/0 PDS suture from a 13 mm 3/8 needle. Suture application of sutures was done using a straight Blakesly forceps and spinal needle. Postoperative observation for CSF leak was conducted for 2 months.**

Results: **Watertight suture was reported in 12 cases. Failure to do suturing and shifting to other methods of reconstruction was done in two cases. One case showed early CSF leak and the leak stopped conservatively after few days. No other case showed CSF leak.**

Conclusion: **This suture technique is a simple and efficient for the prevention of posttransnasal hypophysectomy CSF leak.**

Keywords: Cerebrospinal fluid leak, Dura, Pituitary surgery, Suture

1. Introduction

The transsphenoidal surgery (TSS) was first described by Cushing in the 1960s by approaching the sella turcica sublabially, with the use of a microscope for the visualization of deeper structures [1]. Jankowski et al. [2] later on added the use of endoscopy to TSS for pituitary adenomas, and since then it has been highlighted to be used. Endoscopic endonasal TSS is the gold standard procedure for surgical management of pituitary adenomas, for its less potential comorbidity to the patient. Yet the troublesome issue is the potential of cerebrospinal fluid (CSF) leak and subsequently possible complications such as leak persistence and meningitis.

The standard principles constitute wide safe exposure, maximal tumor resection, and anatomical restoration of the barriers between the subarachnoid space and the sinonasal tract. Many skull base reconstructive options can be considered in the repair of CSF leaks after TSS. Packing technique of the sella with autologous soft tissue grafting materials such as fat and muscle has been used. Dural reconstruction by fascia lata or synthetic materials are then applied as a deeper layer [3]. Commonly used afterwards is a hard tissue support, mostly autologous bone or cartilage or artificial ones as

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hydroxyapatite plates [4]. The use of tissue adhesives as fibrin glue and repeated lumbar puncture in the early postoperative days are other considerations that had also been recommended [5,6].

Pedicled vascularized flaps of the septum were described for pituitary adenomas [7,8]. Yet the morbidities of the sinonasal tract and the potential alternatives as grafting and adhesives have pushed surgeons to preserve these flaps to CSF leaks especially high flow or when associated with large dural defects [8].

Suturing techniques of the dura have been considered in TSS scarcely because of its technical difficulty. The standard suturing instrumentation (which normally functions in a horizontal plane) is inadequate for use through a deep and narrow limited field to work in.

2. Patients and methods

In the period between August 2015 and August 2017 in the tertiary skull base unit of the Neurosurgery Department, Mansoura University, a total of 15 patients underwent endoscopic endonasal hypophysectomy with inadvertent intraoperative arachnoid injury had a direct dural suture with 6/0 PDS suture from a 13 mm 3/8 needle.

A similar procedure to the rescue flap described by Rawal and colleagues [15] is being performed and the mucoperiosteum is elevated with identification of the sphenoid ostia. A high posterior minimal bony septectomy is performed few millimeters above the level of the most inferior portion of the sphenoid sinus face. This allows binostril 4-hand endoscopic work. The sphenoid septum was removed with caution not to be attached to the carotids. Widening of the sphenoid face follows. Partial middle turbinectomy was not done except in few cases with narrow endonasal corridors.

The bony opening of the posterior sphenoid sinus wall was widened by a 1 mm biting kerrison forceps. Care should be focused on performing a larger bony opening than the anticipated dural incision to a degree that permits successful direct dural suturing. In addition, a 'U'- shaped dural incision should be made without using the bovie to achieve healthy precise cut edges.

After completion of hypophysectomy, if a CSF leak was encountered, light packing of the sella with oxidative cellulose Surgicel was done to avoid further injury to the arachnoid recess. After adequate hemostasis, the edges of the dura are examined for having enough flap to be sutured. A straight Blakesley forceps is used to take the bites of the suture in an inside–outside technique to avoid unwanted deep injury by the needle. The Blakesley forceps can provide easy manipulation of the needle in depth. The sites of the dural suture bites are at 12 and 6 o'clock points, respectively, to stay away from lateral injury of carotids. The authors used 6/0 Ethicon PDS sutures with 13 mm needle length and 3/8 circle to be adjusted. The upper needle insertion was made first followed by the lower insertion. Then the needle is being taken out so that the two ends are outside the nose. A spinal needle was used to push the knots guided by endoscopy through the nasal corridor after being bent to have the shape of a 'clothes hanger.' One end of the suture is being slightly stretched than the other to allow the knot to slide deeply. Two knots are needed to ensure suture stability. Demonstration of the procedure is given in Fig. 1a–e.

3. Results

In this study, a total of 15 patients who underwent transnasal transsphenoidal hypophysectomy were included. In two cases surgeons were not able to obtain a direct suture because of thin flimsy dural edges. One case was a revision and the other was primary. Reconstruction was shifted to a nasoseptal flap in the revision case and middle turbinate flap in the other, both with the use of a fascia lata graft. Thus, a total of 13 patients; seven males and six females were enrolled in the study. There were two revision cases, one of them had a previous microscopic surgery and 11 primary cases. The middle turbinates were preserved in 10 cases and partially resected in two patients, while a revision patient had it removed from the prior surgery. No postoperative CSF leaks were reported in 12 patients; one patient showed a leak after merocel pack removal; his leak stopped conservatively within 1 week. Personal and surgical data are summarized in Table 1.

4. Discussion

The endonasal endoscopic transsphenoidal approach is the gold standard now in almost all centers performing hypophysectomy surgery [2]. Despite all the progress in surgical techniques and equipment, iatrogenic CSF leak is still representing a challenge with a potential to develop persistent leak and more seriously, meningitis [9]. In all settings, the successful sellar reconstruction, especially with evident intraoperative leak, has a crucial impact in preventing these devastating complications [9].

All earlier mentioned methods for reconstruction have been aimed to rebuild a barrier between the intracranium (subarachnoid space) and the sinonasal cavity. Various methods and materials of

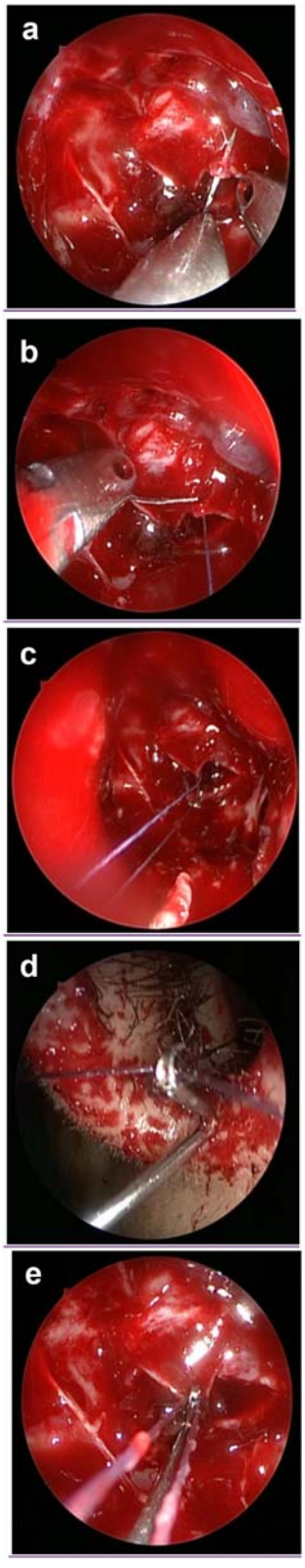

Fig. 1. (a–c) Stitch insertion in dural edges, (d–e) stitch knot.

Table 1. Personal and surgical data of studied cases

Number.	Age	Sex	Middle turbinate	Suprasellar extension	Surgery
1	47	F	Preserved	G2	Primary
2	54	M	Preserved	G2	Primary
3	23	M	Prior Removal	G2	Revision
4	38	F	Partially resected	G2	Primary
5	46	M	Preserved	G0	Primary
6	50	M	Preserved	G1	Primary
7	53	F	Partially resected	G1	Primary
8	49	F	Preserved	G2	Primary
9	58	M	Partially resected	G0	Primary
10	60	F	Preserved	G2	Revision
11	34	F	Preserved	G2	Primary
12	49	M	Preserved	G1	Primary
13	55	M	Preserved	G0	Primary

F, female; G, grade; M, male.

reconstruction were described. The use of natural and/or synthetic materials to rebuild the modified anatomy was mentioned with a rising trend toward multilayered reconstruction [3]. Doubtless, the multilayer reconstruction policy carries, despite occasionally minimal, morbidity burden of the harvested tissue site on the short and even the long term or an added cost. It was proven by Alobid et al. [10] that expanded endonasal approaches with vascularized septal flap has more sinonasal symptoms and impaction on QoL than routine pituitary surgery without flap reconstruction.

Dural repair had been evolved with many surgical options either by patch graft 'natural or synthetic,' with or without stitching, or by direct dural suturing. Limited trials of dural suturing have been attempted in the literature because of limitations such as defect size, high flow CSF, technical difficulties, or other factors. The narrow deep surgical field with inaccessible areas, the horizontal axis of movement of the routine stitch technique, and the need of preserving important structures (like nasal septum and turbinates) made the procedure demanding and required invention of sophisticated techniques and specially designed surgical instruments which are not available routinely in skull base centers.

Previous trials include Vanaclocha et al. [11] proposed using microscopic interrupted/running sutures using special instruments and a knot tying forceps. Nishioka et al. [11] pointed out that suturing the dura enhances its healing even if the sutures are not watertight.

In 2011, an 'easy slip-knot' has been introduced by Ishii et al. [12], and then they showed that they used it in combination of the nasoseptal flap. Sliding-

lock-knot was then suggested by Sakamoto et al. [13] to avoid the problem of stitch loosening. They publish this technique used in closure of large dural defect by rectus abdominis fascia patch graft after resection of a craniopharyngioma [13].

Tosaka et al. [14] considered suturing hard tissue as bone or cartilage to the defect site, placing two holes in to help place sutures. They also reported using hydroxyapatite plates with suture passing through its two holes [14].

Authors present a new method of direct dural sutures that, in our opinion, can be done simply in cases of intraoperative CSF leaks without the need of a special instruments or difficult technique. The straight Blakesely forceps and spinal needle are readily available and easy to use surgical instruments and the knot tying procedure does not need specific maneuver rather than pulling asymmetrically and steadily over one end with the help of the bent spinal needle. The technique proved efficacy in all cases in this case series; no case developed CSF leak except one case that stopped leaking conservatively within a week.

This technique does not need additional mucosal or mucoperichondrial flap like the middle turbinate or the nasoseptal flap. Exemptions of using these flaps carry the advantage of a better anatomical and physiological nasal environment with the availability to use in failed or recurrent cases.

Limitation of this study is the relative small number of cases and application in low flow CSF in almost all cases. A larger case series is required to ensure reliability of the technique and application in cases with high-flow CSF widen the spectrum of use. Skills are needed to smoothly perform this suture especially in short time; an element needs lab training before operative application.

5. Conclusion

Endoscopic direct dural suture with this simple technique represents an easy and efficient method of dural reconstruction for intraoperative CSF leaks in hypophysectomy surgery. Larger case series are needed for validation of this new technique.

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Conflicts of Interest

The authors have no competing interests to declare that are relevant to the content of this article.

References

[1] Cushing HIII. Partial hypophysectomy for acromegaly: with remarks on the function of the hypophysis. Ann Surg 1909; 50:1002–17.
[2] Jankowski R, Auque J, Simon C, Marchal JC, Hepner H, Wayoff M. Endoscopic pituitary tumor surgery. Laryngoscope 1992;102:198–202.
[3] Tabaee A, Anand VK, Brown SM, Lin JW, Schwartz TH. Algorithm for reconstruction after endoscopic pituitary and skull base surgery. Laryngoscope 2007;117:1133–7.
[4] Kubo S, Inui T, Hasegawa H, Yoshimine T. Repair of intractable cerebrospinal fluid rhinorrhea with mucosal flaps and recombinant human basic fibroblast growth factor: technical case report. Neurosurgery 2005;56:E627.
[5] Van Aken MO, Feelders RA, de Marie S, de Berge JV, Dallenga AHG, Delwel EJ, et al. Cerebrospinal fluid leakage during transsphenoidal surgery: postoperative external lumbar drainage reduces the risk for meningitis. Pituitary 2004;7:89–93.
[6] Casiano RR, Jassir D. Endoscopic cerebrospinal fluid rhinorrhea repair: is a lumbar drain necessary? Otolaryngol Head Neck Surg 1999;121:745–50.
[7] Harvey RJ, Parmar P, Sacks R, Zanation AM. Endoscopic skull base reconstruction of large dural defects: a systematic review of published evidence. Laryngoscope 2012;122:452–9.
[8] Horiguchi K, Murai H, Hasegawa Y, Hanazawa T, Yamakami I, Saeki N. Endoscopic endonasal skull base reconstruction using a nasal septal flap: surgical results and comparison with previous reconstructions. Neurosurg Rev 2010;33:235–41. discussion 241.
[9] Slot EMH, Sabaoglu R, Voormolen EHJ, Hoving EW, van Doormaal TPC. Cerebrospinal fluid leak after transsphenoidal surgery: a systematic review and meta-analysis. J Neurol Surg B Skull Base 2022;83(Suppl 2). e501–e513.
[10] Alobid I, Enseñat J, Mariño-Sánchez F, Rioja E, de Notaris M, Mullol J, Bernal-Sprekelsen M. Expanded endonasal approach using vascularized septal flap reconstruction for skull base tumors has a negative impact on sinonasal symptoms and quality of life. Am J Rhinol Allergy 2013;27: 426–31.
[11] NisHioka H. Recent evolution of endoscopic endonasal surgery for treatment of pituitary adenomas. Neurologia medico-chirurgica 2017;57(4):151–8.
[13] Sakamoto N, Akutsu H, Takano S, Yamamoto T, Matsumura A. Useful 'sliding-lock-knot' technique for suturing dural patch to prevent cerebrospinal fluid leakage after extended transsphenoidal surgery. Surg Neurol Int 2013;4:19.
[14] Tosaka M, Prevedello DM, Yamaguchi R, Fukuhara N, Miyagishima T, Tanaka Y, et al. Single-layer fascia patchwork closure for the extended endoscopic transsphenoidal transtuberculum transplanum approach: deep suturing technique and preliminary results. World Neurosurg 2021; 155:e271–84.
[15] Rawal RB, Kimple AJ, Dugar DR, Zanation AM. Minimizing morbidity in endoscopic pituitary surgery: outcomes of the novel nasoseptal rescue flap technique. Otolaryngology–Head Neck Surg 2012;147(3):434–7.