case report

Cerebrospinal fluid leakage after turbinate submucosal diathermy: an unusual complication

Abdulaziz H. Abobotain,[a] Abdulrazag Ajlan,[b] Saad Alsaleh[c]

From the [a]Department of Surgery, College of Medicine, King Saud University, Riyadh, Saudi Arabia; [b]Department of Neurology, Division of Neurosurgery, King Saud University, Riyadh, Saudi Arabia; [c]Department of Otorhinolaryngology, King Saud University, Riyadh, Saudi Arabia

Correspondence: Dr. Abdulaziz Abobotain · Department of Surgery, College of Medicine, King Saud University, Riyadh 11451, Saudi Arabia · abdulazizalbabtain@gmail.com · ORCID: http://orcid.org/0000-0002-6343-7643

Citation: Abobotain AH, Ajlan A, Alsaleh S. Cerebrospinal fluid leakage after turbinate submucosal diathermy: case report of unusual complication. Ann Saudi Med 2018; 38(2): 143-147 DOI: 10.5144/0256-4947.2018.143

Received: December 13, 2016

Accepted: January 7, 2017

Published: April 5, 2018

Funding: None.

Submucosal diathermy of the inferior turbinate (SMDIT) is a generally safe procedure to control inferior turbinate hypertrophy. We present a case of a cerebrospinal fluid (CSF) leak at the craniocervical junction after SMDIT done in another institution. A 27-year-old man presented 3 weeks after undergoing SMDIT with signs and symptoms of meningitis and postnasal rhinorrhea. Nasal endoscopy and imaging revealed a nasopharyngeal CSF fistula at the craniocervical junction. Transnasal endoscopic repair and reconstruction was performed with no recurrence on repeat imaging and clinical follow up. We describe the first reported case in the literature of an iatrogenic CSF fistula caused by SMDIT, an unusual and potentially fatal complication, and its surgical management.

SIMILAR CASES PUBLISHED: 0

CONFLICT OF INTEREST: None.

Submucosal diathermy of the inferior turbinate (SMDIT) is used to treat inferior turbinate (IT) enlargement secondary to chronic rhinitis when it is refractory to medical management and causes nasal obstruction. Coagulative currents are used to induce tissue necrosis, with subsequent fibrosis shrinking the turbinates. A diathermy probe (**Figure 1**) is inserted into the anterior end of the IT and advanced to the posterior end. The procedure is regarded as safe and minimally invasive procedure with complications being uncommon.[1-3] We present the case of a 27-year-old man who presented with a cerebrospinal fluid (CSF) fistula in the craniocervical junction and meningitis as a result of SMDIT.

CASE

A healthy 27-year-old man presented to another institution with complaints of chronic nasal obstruction. He underwent septoplasty and SMDIT with no issues in the early postoperative phase. Three weeks later he presented to the same institution with clear rhinorrhea, fever, neck pain and a severe headache for a few days. He was then started on intravenous antibiotics and transferred to our institution for workup. He was found to have nuchal rigidity and a positive Brudzinski sign. Lumbar puncture and complete blood works were obtained.

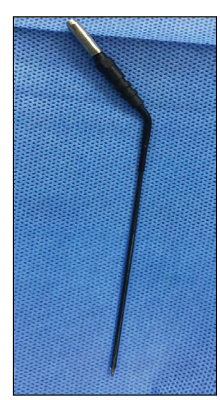

Figure 1. Submucosal diathermy probe.

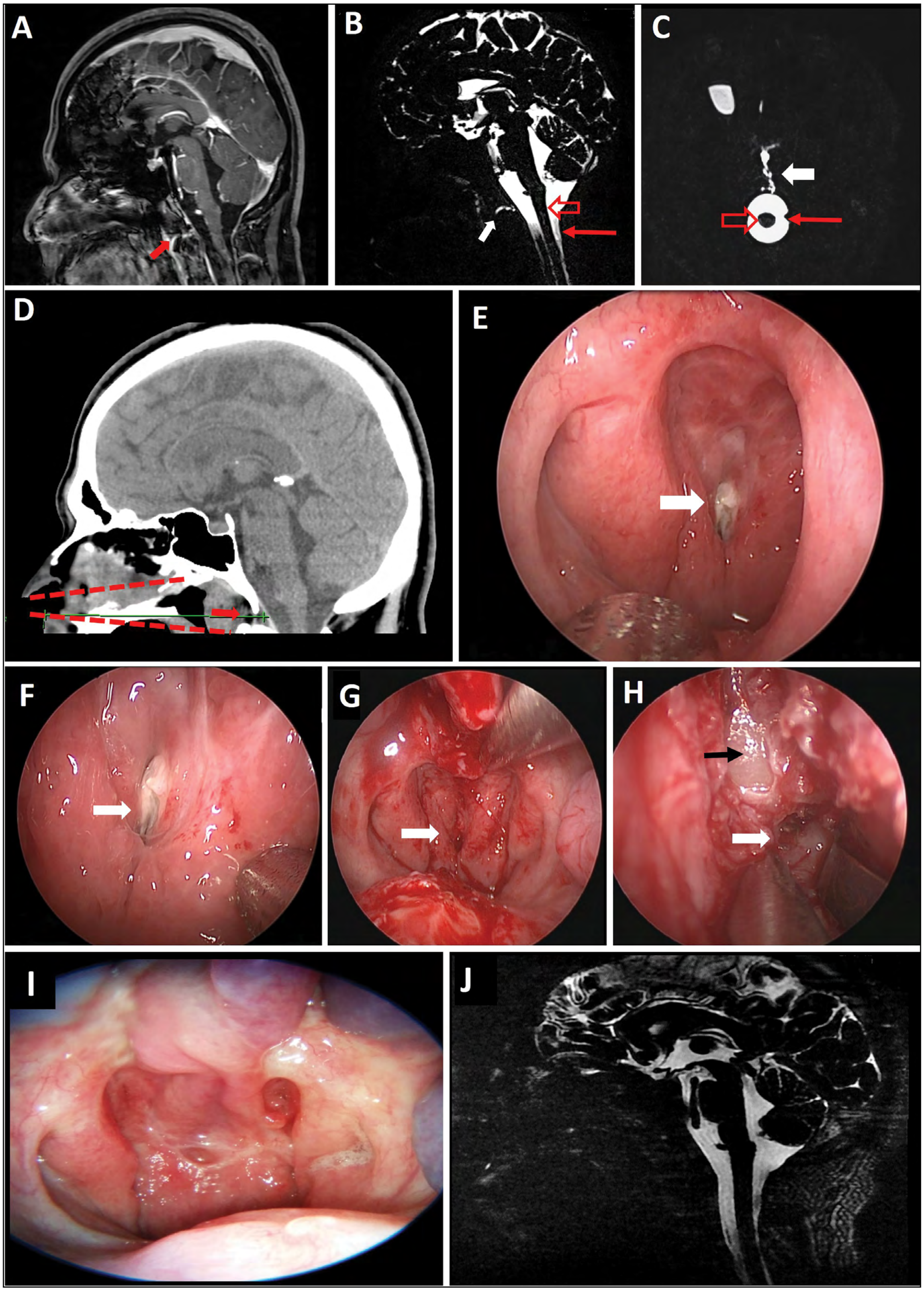

Figure 2. A. Sagittal T2 MRI showing CSF fistula (red arrow). **B.** Preoperative sagittal MRI cisternography showing CSF fistula (white arrow), spinal canal (solid arrow) and spinal cord (transparent arrow). **C.** Preoperative axial MRI cisternography showing CSF fistula (white arrow), Spinal canal (solid arrow) and spinal cord (transparent arrow). **D.** Sagittal CT showing probable SMD probe trajectory. **E.** Endoscopic view of fistulous tract (white arrow). **F.** Fistulous tract during Valsalva maneuver with resultant CSF gush (white arrow). **G.** Image after posterior septectomy and raising a nasoseptal flap. **H.** Midline nasopharngeal tissue dissection revealing the lower clivus (black arrow) and the fistula (white arrow) seen off the midline to the left at the craniocervical junction. **I, J.** Postoperative endoscopic and MRI images showing resolution of the fistula tract and complete healing of the nasoseptal flap.

CSF analysis showed a high white blood cell count (960/ĶL, 90% neutrophils, 10% leukocytes) with abundant polymorphonuclear cells and a protein level of 815 mg/dL. The CSF culture was negative. The preoperative CT obtained from the other institution showed a mild to moderate deviation of the nasal septum to the right anteriorly with a central posterior septum, clear sinuses, bilateral IT hypertrophy and a normal nasopharynx with no congenital abnormalities or skull base defects. The CT obtained during his admission showed evidence of a pneumocephalus, corrected lower nasal septum with the majority of the superior bony septum still present, normal IT size, minimal mucosal thickening of the right maxillary sinus and lower anterior ethmoid cells and no evidence of skull base fractures or defects.

Nasal endoscopy and MRI cisternography confirmed the finding of a CSF fistula between the mid-nasopharynx and craniocervical junction (**Figure 2 A,B,C**). Urgent surgical correction of the fistula was undertaken.

Operative technique

The fistula, located using endoscopy, was in the midline of the posterior nasopharyngeal wall at the level of the craniocervical junction. Detailed endoscopic inspection showed features of possible usage of cautery causing a whitish and necrotic appearing fistulous tract. An SMD probe was used during the procedure to test whether it could reach this area and it did with ease. A Valsalva maneuver was performed and a gush of fluid was seen emitting from the defect confirming the site (**Figure 2 D, E, F**).

A partial posterior septectomy was done after raising a nasoseptal flap as described by Haddad et al.[4] Nasopharyngeal mucosa was then removed using monopolar cautery. The tract was removed and paravertebral muscles were dissected to visualize the dural defect to the left of the midline at the craniocervical junction (**Figure 2 G, H**).

Multilayer reconstruction was performed using fat, fascia lata and the nasoseptal flap as the last layer. This was followed by nasal packing using an inflated Foley catheter against the reconstruction site posteriorly. No complications occurred. He was then transferred to the intensive care unit for post-operative observation. A lumbar drain inserted preoperatively was kept to drain 5-10 cc/hour postoperatively.

Postoperative course

Cessation of rhinorrhea was seen immediately postoperatively and the nasal packing was removed after 48 hours. The lumbar drain was removed the day after. After completing the course of intravenous antibiotics, he was discharged from hospital on saline nasal irrigation and oral antibiotics.

After nasal endoscopy and MRI cisternography 8 weeks later, there was complete resolution with no recurrence of CSF leakage and satisfactory healing of the reconstructed site (**Figure 2 I, J**). At more than 16 months beyond surgery date, the patient had no evidence of recurrence or complications.

A portion of the tract sent for histopathological examination and culture showed evidence of small areas of stratified squamous epithelium and did not grow any organisms.

DISCUSSION

SMDIT was first reported in 1907, and is practiced widely due to its simplicity and lack of major complications.1 Minor bleeding, crusting, scarring and recurrence of symptoms have been reported in multiple trials.[1-3] While the exact mechanism of injury is unknown, given the morphology of the fistula in this case, we hypothesize that the surgeon—using a headlight—tried to treat the most posterior portion of the IT on the right by blindly inserting the diathermy probe with a high current setting. The trajectory of the probe was most likely to the left of the midline explaining the axis of the fistula from the midline of the nasopharynx to the craniocervical junction on the left (**Figure 3**). It is physically and anatomically challenging to have the same axis if the probe was inserted through the left nostril.

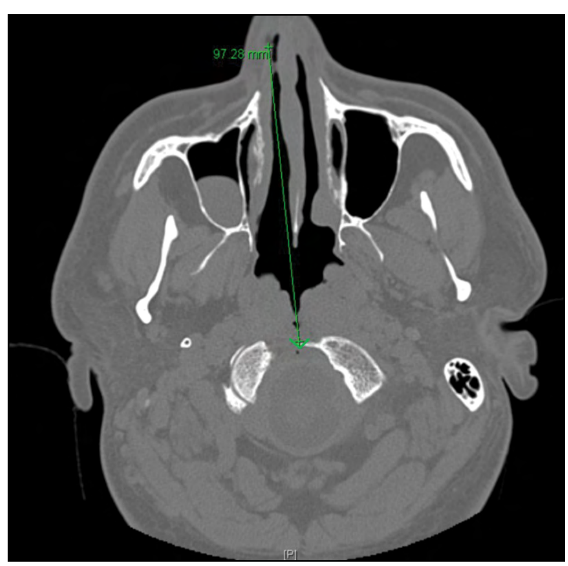

Figure 3. SMD probe proposed trajectory on axial CTof the paranasal sinuses and nasal cavity at the level ofthe CVJ and inferior turbinates done after admission.

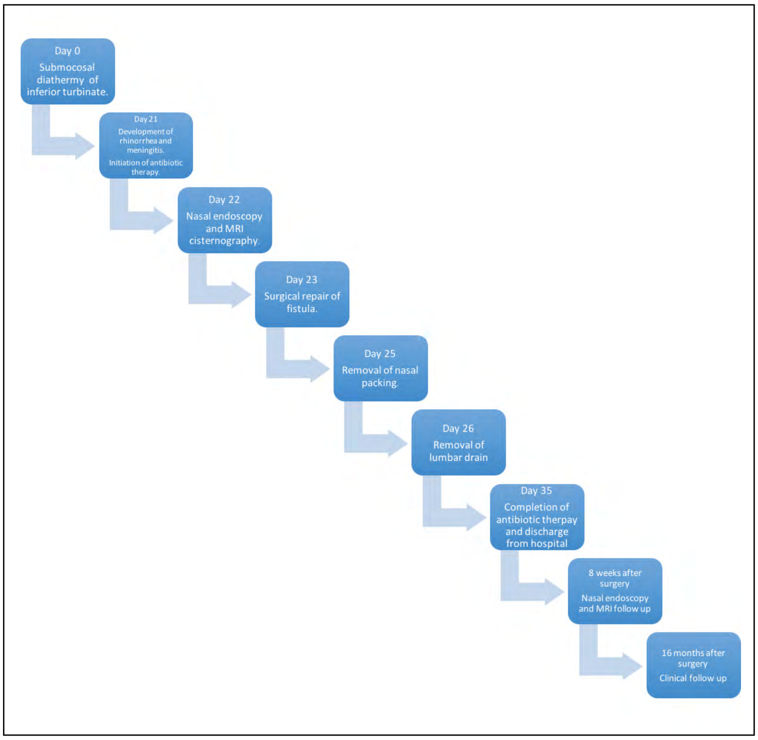

Figure 4. Case report timeline.

In previous studies the distance between the anterior choana and the basilar artery has been reported as 100-130 mm, with a mean of 110 mm.[5] This may explain the injury caused by the diathermy probe, which measures 10 cm. Had the probe been longer than 10 cm, a much more catastrophic outcome could have occurred. This event was due to poor surgical technique and cannot be explained otherwise, as the CT done prior to the septoplasty and SMDIT did not reveal evidence of any abnormality at the craniocervical junction. The use of endoscopy in turbinate surgery has seen a steady increase in the past two decades. However, there is scarce evidence to support its superiority to conventional techniques.[6] A higher incidence of complications is known to occur in right-sided sinus surgery compared to left-sided surgery, which may have been a contributory factor in this case.[7]

Minor nasopharyngeal procedures such as adenoidectomy have been previously implicated as the cause of CSF leakage in two cases. Extensive cautery to control hemorrhage was the cause in one case. Similar to the current case, the report also described postoperative meningitis and a fistulous tract seen at the level of the foramen magnum.[8] CSF leakage and secondary meningitis in the second case were attributed to overzealous curettage and injury to the medial aspect of the pterygopalatine fossa where the child had a congenital bony defect.[9]

Although rare, iatrogenic CSF leakage has been reported in seven cases postseptoplasty.[10] This would have been a better explanation for the CSF leakage in our patient; however, clinical findings and imaging studies did not reveal any cribriform plate defects with an obvious nasopharyngeal defect.

Skull base CSF leaks, meningoceles and meningoencephaloceles have been extensively studied, and a large number of surgical and grafting techniques have resulted in varying degrees of success. The transnasal endoscopic approach has proven to be one of the most successful, with minimal complications and reoperation rates. Nyquist et al reported a 93.8% success rate in closing CSF fistulas of the anterior skull base using endoscopic endonasal techniques, as opposed to 70-80% using the transcranial route. Besides a relatively higher recurrence rate, transcranial approaches also result in significant complications related to frontal lobe manipulation such as seizures, memory deficits, anosmia, and intracranial hemorrhage.[11]

Approaching the ventral craniocervical junction area is considered one of the most challenging tasks in skull-base surgery. The deep central location, complex anatomical relations to neurovascular structures, and unfamiliarity with the surgical anatomy are all contributory factors.[12] The transnasal approach to the ventral craniocervical junction has been used to treat ventral extradural tumors, removal of compressive lesions and simple biopsies.[13] Advantages over the transoral approach include better visualization of the deep surgical field, better mucosal healing, and shorter postoperative recovery. A limitation of this approach is the complexity and variation of the sinonasal anatomy which entails the need for a multidisciplinary team to collaborate on such cases with specialized endonasal endoscopic instruments and equipment.[13,14]

In conclusion, lessons learned include: blind manipulation in the nasal cavity can lead to disastrous complications even if the superior nasal cavity is avoided. Sound anatomic knowledge and preoperative detection of anatomical variations in the skull base are essential when performing any sinonasal procedure. The use of endoscopes in IT surgery may help prevent complications, yet more studies are needed to provide strong enough evidence of support. Compared to transcranial approaches, using an endonasal endoscopic approach to reconstruct skull base defects has proven to be a reliable and successful method with fewer postoperative complications. A multifaceted approach involving a multidisciplinary team (rhinology, neurosurgery, infectious diseases and neuroradiology services) proved crucial in the successful detection and timely treatment of the fistula in this case (**Figure 4**).

REFERENCES

1. Fradis M, Danino J, Gaitini L, Gershinski M, Malatskey S, Golz A, Goldsher M, Armush W: Inferior Turbinectomy versus Submucosal Diathermy for Inferior Turbinate Hypertrophy. Annals of Otology, Rhinology & Laryngology 2000, 109:1040-1045.
2. Willatt D: The evidence for reducing inferior turbinates. Rhinology Journal 2009, 47.
3. Nurse LDuncavage J: Surgery of the Inferior and Middle Turbinates. Otolaryngologic Clinics of North America 2009, 42:295-309.
4. Hadad G, Bassagasteguy L, Carrau R, Mataza J, Kassam A, Snyderman C, Mintz A: A Novel Reconstructive Technique After Endoscopic Expanded Endonasal Approaches: Vascular Pedicle Nasoseptal Flap. The Laryngoscope 2006, 116:1882-1886.
5. Lai LT, Morgan MK, Chin DC, Snidvongs K, Huang JX, Malek J, Lam M, McLachlan R, Harvey RJ. A cadaveric study of the endoscopic endonasal transclival approach to the basilar artery. J Clin Neurosci. 2013 Apr;20(4):587-92. doi: 10.1016/j.jocn.2012.03.042. Epub 2013 Jan 11.
6. Clement, W.A. and White, P.S.: Trends in turbinate surgery literature: a 35-year review. Clinical Otolaryngology & Allied Sciences 2001, 26: 124–128. doi:10.1046/j.1365-2273.2001.00450.x
7. W. Hosemann, and C. Draf: Danger points, complications and medico-legal aspects in endoscopic sinus surgery. GMS Curr Top Otorhinolaryngol Head Neck Surg. 2013; 12: Doc06.1. Published online 2013 Dec 13. doi: 10.3205/cto000098
8. Benítez L, Fernández A, Sánchez C: Cerebrospinal fluid leak after adenoidectomy: a case report.European Journal of Anaesthesiology 2013, 30:157-157.
9. Vassos G, Kong J, Hopkins C, Roberts D, Thomas N: Case Report: CSF Leak Developed after Adenoidectomy. J Neurol Surg B 2012, 73.
10. Venkatesan NN1, Mattox DE, Del Gaudio JM.Cerebrospinal fluid leaks following septoplasty. Ear Nose Throat J 2014, 93:43-6.
11. Nyquist G, Anand V, Mehra S, Kacker A, Schwartz T: Endoscopic endonasal repair of anterior skull base non-traumatic cerebrospinal fluid leaks, meningoceles, and encephaloceles. Journal of Neurosurgery 2010, 113:961-966.
12. Sen C, Sekhar L: Surgical management of anteriorly placed lesions at the craniocervical junction? an alternative approach. Acta neurochir 1991, 108:70-77.
13. Lee A, Sommer D, Reddy K, Murty N, Gunnarsson T: Endoscopic Transnasal Approach to the Craniocervical Junction. Skull Base 2010, 20:199-205.
14. Seker A, Inoue K, Osawa S, Akakin A, Kilic T, Rhoton A: Comparison of Endoscopic Transnasal and Transoral Approaches to the Craniovertebral Junction. World Neurosurgery 2010, 74:583-602.

erratum

In **Ann Saudi Med 2018; 38(1):** The printed issue started with page 481 and ended with page 560. It should have been labeled as pages 1 to 80.