



Delayed Traumatic Cerebrospinal Fluid Rhinorrhea from Frontal Sinus-Management *via* External Surgical Approach and Review of the Literature

Konstantina Chrysouli^{1,2*}, Vasileios Papanikolaou¹, Aristeidis Chrysovergis¹, Efthymios Kyrodimos¹ and Evangelos Giotakis¹

¹Department of Otorhinolaryngology, Head & Neck Surgery, University of Athens Medical School, Greece

²Department of Otorhinolaryngology, Head and Neck Surgery, Penteli Children Hospital, Greece

Abstract

Cerebrospinal Fluid (CSF) rhinorrhea is frequently encountered after a fracture of the skull base. Individual fractures of the posterior wall of the frontal sinus after brain injury are uncommon. We present a case of a 33 year-old- man with a distant history of skull base injury after a traffic accident; 12 years ago. He presented with intermittent rhinorrhea and reported 2 episodes of bacterial meningitis the last seven years since the injury. CSF leakage was confirmed with β 2-transferrin testing. CT and MRI imaging revealed a defect of the posterior and superior wall of the left frontal sinus and an ipsilateral meningoencephalocele. Meningoplasty and closure of the osseous defect with an osteoplastic flap was performed *via* an external surgical approach; however, patient who present with a short or/and distant history of traumatic brain injury should be evaluated for complication of a CSF leak.

Keywords: CSF rhinorrhea; Frontal sinus; Osteoplasty; Meningoencephalocele; β 2-transferrin; Skull base injury; Cerebrospinal fluid leak

Introduction

Cerebrospinal Fluid (CSF) rhinorrhea is frequently encountered after a fracture of the skull base. Meningitis develops in 3% of patients with traumatic CSF leaks and increases to 20% as long as rhinorrhea persists beyond 7 days. The most common CSF leaks sites are the lateral lamella of the cribriform plate, the roof of the posterior ethmoid cells and sphenoid sinus. Individual fractures of the posterior wall of the frontal sinus after brain injury are uncommon. Most symptoms of CSF leaks occur 48 h after the injury or within few days or weeks. However, patients with a distant history of traumatic brain injury have a high probability to develop symptoms consistent with a CSF leak [1]. Limited data exist for the management of such cases.

Case Presentation

We present a case of a 33 year-old- man with a distant history of brain injury after a traffic accident, 12 years ago. He presented with intermittent rhinorrhea and reported 2 episodes of bacterial meningitis the last seven years since the injury. CSF leakage was confirmed with β 2-transferrin testing of the nasal discharge. Imaging with computed tomography scan of the skull base and magnetic resonance of the brain revealed a defect of the posterior and superior wall of the left frontal sinus and an ipsilateral meningoencephalocele (Figure 1,2). Meningoplasty and closure of the osseous defect with an osteoplastic flap was performed *via* an external surgical approach (bone window) (Figures 3a-3c and 4,5). We repaired the defect of the posterior wall of the left frontal sinus using a combination of overlay and underlay technique. Femoral fascia from right thigh and fibrin glue were placed in order to cover the leak (Figure 6,7). Postoperatively, the patient remained in a Trendelenburg position. Wide spectrum antibiotics and acetazolamide (diamox) were administered intravenously. The patient left the hospital 3 days later. Recovery was uneventful.

The patient was reexamined for 12 months postoperatively without clinical recurrence or late complications (Figure 8,9).

Discussion

CSF rhinorrhea is a common complication after traumatic brain injuries. Subsequent meningitis can occur as a result of untreated skull base defects. Up to 85% cases of traumatic CSF rhinorrhea

OPEN ACCESS

*Correspondence:

Konstantina Chrysouli, Department of Otorhinolaryngology, Head & Neck Surgery, University of Athens Medical School, Athens, Greece,
E-mail: konstantinachr@hotmail.com

Received Date: 17 Oct 2020

Accepted Date: 13 Nov 2020

Published Date: 17 Nov 2020

Citation:

Chrysouli K, Papanikolaou V, Chrysovergis A, Kyrodimos E, Giotakis E. Delayed Traumatic Cerebrospinal Fluid Rhinorrhea from Frontal Sinus-Management *via* External Surgical Approach and Review of the Literature. *Am J Otolaryngol Head Neck Surg.* 2020; 3(7): 1111.

Copyright © 2020 Konstantina Chrysouli. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

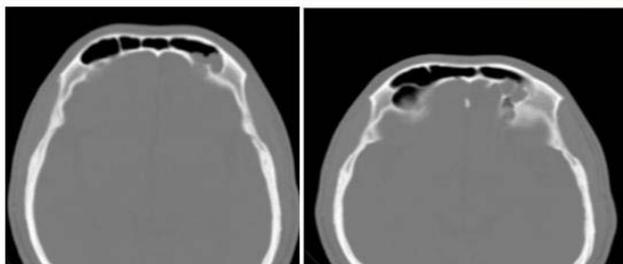


Figure 1, 2: Computed Tomography of the skull base (Transversal Section): A leak of the posterior and superior wall of the left frontal sinus and an ipsilateral meningoencephalocele.



Figure 3a-3c: Meningeoplasty and closure of the osseous defect with an osteoplastic flap via an external surgical approach (bone window).



Figure 4: Osteoplastic flap-external surgical approach (bone window).



Figure 5: Osteoplastic flap-external surgical approach (bone window).

resolve spontaneously and require only conservative treatment [2]. However, leaks that persist more than a few days surgical repair is necessary.

Many complications can occur years after the initial brain injury. For this reason management of traumatic CSF rhinorrhea remains controversial. Some authors encourage immediate surgical repair to minimize the risk of infection [3], while others suggest observation, if it is possible, especially in cases of asymptomatic and hemodynamically stable patients after skull base injury. Recently Functional Endoscopic Sinus Surgery (FESS) is widely used to repair fractures of the skull



Figure 6: Femoral fascia from right thigh.



Figure 7: Femoral fascia.



Figure 8, 9: CT (Transversal Section) after 12 months: Without osseous leak and/or meningoencephalocele.

base in cases of craniocerebral injury with high success rates [4-8].

Our patient presented with intermittent CSF rhinorrhea, the last seven years since the initial head injury.

Richard A et al. [9] referred to a similar case of a 61-year-old woman who had also intermittent clear rhinorrhea for 14-months [9]. She had a history of traumatic motor vehicle accident 12 years earlier with sphenothmoid skull base fracture and subsequent CSF rhinorrhea. She was treated conservatively with bed rest and observation. Four years later, she complained for headaches and vertigo. Magnetic Resonance Imaging demonstrated a cerebral aneurysm of hypophyseal artery adjacent to her sphenothmoid skull base fracture. She was without symptoms consistent with CSF leak until 7 years later when she presented with intermittent clear rhinorrhea like in our case. Computed tomography scan, showed air fluid levels in the left sphenoid and posterior ethmoid sinuses. The patient finally underwent endoscopic surgical repair of the suspected CSF leak. A left sphenoid sinus fracture line along the left superolateral sphenoid wall was detected, which was repaired with a pedicled nasoseptal flap.

The incidence of traumatic CSF rhinorrhea that occurs many years after the initial brain injury remains unspecified but may be

higher than is generally reported in the literature.

A previous retrospective analysis of 51 patients with traumatic CSF rhinorrhea leaks revealed that 16% of those patients had occult leaks and finally developed meningitis 6.5 years after the initial head injury [10-12].

CSF rhinorrhea as a late complication of skull base fracture has been reported to occur even after 48 years from the initial head injury [1,13,14].

In the literature we found that complication of CSF leaks after traumatic head injuries occurs more often days to few months from skull base injury [15]. A statistic analysis of 51 traumatic CSF leaks showed that only 8 of those patients presented with symptoms months to years after the initial injury [10].

The etiology for delayed rhinorrhea is unclear. Meningoencephalocele or localized inflammation often helps to close such leaks after small localized skull base fractures. Moreover, atrophy of the surrounding scar and changes of the adjacent to the leak tissues can potentially occur over many years and thus occult defects can be revealed. All the above increase the total risk for delayed and/or intermittent rhinorrhea.

Leung et al. [16] also reported a 37-year old patient with delayed CSF rhinorrhea which started 9 years after blunt brain trauma [16]. The patient later suffered from recurrent meningitis, clear rhinorrhea and seizures. A computed tomography imaging revealed a 1.5 cm bone defect localized in the cribriform plate of ethmoid bone, with an ipsilateral intraethmoidal meningoencephalocele. The patient underwent external surgical approach *via* limited transcranial repair.

Our case emphasizes the necessity of a long-term follow-up for patients with traumatic skull base fractures. Even patients which are asymptomatic after the initial injury should be suspected for delayed complications of CSF leaks such as, meningitis and meningoencephalocele. Pneumocephalus is a complication that is often obvious immediately after skull base injury.

Conclusion

The choice of approach to repair CSF rhinorrhea depends on the location of the lesion, the size of the leak and patient's specific adverse anatomic variations that restrict access. Functional Endoscopic Sinus Surgery (FESS) is widely used to repair fractures of the skull base in cases of craniocerebral injury with success rates of 85% to 97% [17-20].

However, some CSF leaks may require a different management attitude and endoscopic techniques could be inefficient or impossible. Open approaches remain valuable, representing a safe and straightforward method for adequate exposure.

Thus, external surgical approach with osteoplasty technique characterized by high success rates and low morbidity is helpful for repairing defects in the posterior wall and the lateral one-third of the frontal sinus (if we separate the frontal sinus with two imaginary vertical lines in three parts) [11,12,16]. However, patients with a distant history of traumatic brain injury can develop symptoms consistent with a CSF leak.

References

- Schick B, Weber R, Kahle G, Draf W. Late manifestations of traumatic lesions of the anterior skull base. *Skull Base Surg.* 1997;7(2):77-83.
- Bell RB, Dierks EJ, Homer L, Potter BE. Management of cerebrospinal fluid leak associated with craniomaxillofacial trauma. *J Oral Maxillofac Surg.* 2004;62(6):676-84.
- Loew F, Pertuiset B, Chaumier EE, Jaksche H. Traumatic, spontaneous and postoperative CSF rhinorrhea. *Adv Tech Stand Neurosurg.* 1984;11:169-207.
- Lee DH, Lim SC, Joo YE. Treatment outcomes of endoscopic repairs of sinonasal cerebrospinal fluid leaks. *J Craniofac Surg.* 2011;22(4):1266-70.
- Virk JS, Elmihyeh B, Saleh HA. Endoscopic management of cerebrospinal fluid rhinorrhea: The charing cross experience. *J Neurol Surg Part B Skull Base.* 2013;74(2):61-7.
- Gendeh BS, Wormald PJ, Forer M, Goh BS, Misiran K. Endoscopic repair of spontaneous cerebro-spinal fluid rhinorrhoea: A report of 3 cases. *Med J Malaysia.* 2002;57(4):503-8.
- Wang YY, Kearney T, Gnanalingham KK. Low-grade CSF leaks in endoscopic trans-sphenoidal pituitary surgery: Efficacy of a simple and fully synthetic repair with a hydrogel sealant. *Acta Neurochir (Wien).* 2011;153(4):815-22.
- Gerbino G, Rocca F, Benech A, Caldarelli C. Analysis of 158 frontal sinus fractures: Current surgical management and complications. *J Craniofac Surg.* 2000;28(3):133-9.
- Richard A, Guyer RA, Turner JH. Delayed presentation of traumatic cerebrospinal fluid rhinorrhea: Case report and literature review. *Allergy Rhinol.* 2015;6(3):188-90.
- Friedman JA, Ebersold MJ, Quast LM. Post-traumatic cerebrospinal fluid leakage. *World J Surg.* 2001;25(8):1062-6.
- Amin MU, Ghaffar A. Delayed appearance of posttraumatic cerebrospinal fluid fistula. *J Coll Physicians Surg Pak.* 2006;16(5):378-80.
- Gumussoy M, Ugur O, Cukurova I, Uluyol S. Recurrent meningitis and frontal encephalocele as delayed complications of craniofacial trauma. *J Craniofac Surg.* 2014;25(2):529-30.
- Devi BI, Panigrahi MK, Shenoy S, Vajramani G, Das BS, Jayakumar PN. CSF rhinorrhoea from unusual site: Report of two cases. *Neurol India.* 1999;47(2):152-4.
- Talamonti G, Fontana RA, Versari PP, Villa F, D' Aliberti, Car P, et al. Delayed complications of ethmoid fractures: A "growing fracture" phenomenon. *Acta Neurochir (Wien).* 1995;137(3-4):164-73.
- Lewin W. Cerebrospinal fluid rhinorrhoea in closed head injuries. *Br J Surg.* 1954;42:1-18.
- Leung GK, Chan KH, Hung KN. Growing skull fracture in an adult nine years after blunt head trauma. *J Clin Neurosci.* 2011;18(6):855-7.
- Bachert C, Verhaeghe B, van Cauwenberge P, Daele J. Endoscopic Endonasal Surgery (EES) in skull base repairs and CSF leakage. *Acta Otorhinolaryngol Belg.* 2000;54(2):179-89.
- Senior BA, Jafri K, Benninger M. Safety and efficacy of endoscopic repair of CSF leaks and encephaloceles: A survey of the members of the American Rhinologic Society. *Am J Rhinol.* 2001;15(1):21-5.
- Rohrich RJ, Hollier LH. Management of frontal sinus fractures. Changing concepts. *Clin Plast Surg.* 1992;19(1):219-32.