Microsurgical treatment of cerebrospinal fluid rhinorrhea in sphenoidal sinus

CUI Jing-yu 崔景余, WU An-hua 吴安华*, ZHANG Shi-gang 张世刚, QIN Xiao-fei 秦晓飞 and WANG Yun-jie 王运杰

【Abstract】Objective: To explore the clinical manifestation, diagnosis and surgical treatment of cerebrospinal fluid rhinorrhea in sphenoidal sinus.

Methods: Nine cases of cerebrospinal fluid rhinorrhea in sphenoidal sinus from 2007 to 2009 were retrospectively analyzed consisting of their possible etiological factors, clinical manifestations, localization of the leakage site and treatment methods. Among them, there were 3 cases of traumatic rhinorrhea, 4 postoperative rhinorrhea and 2 spontaneous rhinorrhea. All 9 patients underwent 3-dimensional CT scan in sellar region including all para-nasal sinus. Leakage site was identified and repairing procedure was performed through trans-sphenoidal approach.

Results: All cases were cured with the trans-sphenoidal microsurgical procedure. They were followed up for 9 months to 2 years. No recurrence, no infection and epilepsy complications were observed.

Conclusion: For the cerebrospinal fluid rhinorrhea at sphenoidal sinus, it is critical to identify the leakage site accurately and the trans-sphenoidal approach is a microinvasive and effective way to repair the leakage, which is worthy to be advocated.

Key words: Cerebrospinal fluid rhinorrhea; Sphenoid sinus; Microsurgery

Cerebrospinal fluid (CSF) rhinorrhea is frequently seen in diseases involved in the skull base area, especially common in the cranio-cerebral trauma accompanied with skull base fracture. Skull base tumor is another common reason for CSF rhinorrhea, however, spontaneous CSF fistula is rare. CSF rhinorrhea in sphenoidal sinus is relatively rare and is generally difficult to repair and liable to be recurred. Nine cases with CSF sphenoid sinus rhinorrhea were admitted in our department from 2007 to 2009 and all were cured by trans-sphenoidal repair. In this paper we reported our experience and compared with other studies in the literature.

METHODS

From January 2007 to January 2009, 9 patients diagnosed as having CSF rhinorrhea in sphenoidal sinus were admitted to our department, 4 males and 5 females, aged from 24 to 61 years, with the median age of 48 years. Three cases were caused by cranio-cerebral injury accompanied with skull base fracture involving sphenoidal sinus. For the 4 cases suffering from postoperative rhinorrhea, 3 cases received pituitary adenoma surgery through trans-sphenoidal approach (2 cases) or trans-craniotomy operation (1 case), and 1 case received resection of craniopharyngioma through transsphenoidal approach. Two cases had spontaneous rhinorrhea, including empty sella in 1 case (Figure 1) and epidermoid in sellar region in the other case. CSF leakage lasted from 4 weeks to 4 years.

For the postoperative rhinorrhea, the leakage began at 4-6 days after primary operation and the spontaneous rhinorrhea was caused by cough or sneeze. One case complained of salty fluid flowing from the nasal cavity onto the posterior pharyngeal wall when she was in supine position. The traumatic rhinorrhea usually accompanied with some symptoms of cranial nerve paralysis, which involved olfactory nerve in 2 cases and oculomotor nerve in 1 case. The leakage of all 9 cases lasted over 4 weeks. Overall 3 cases suffered meningitis and were cured by lumbar puncture drainage combined with antibiotic therapy. For diagnosis, all cases underwent skull base three-dimensional computed tomography (3D-CT) scanning. The images showed fluid
in single or multiple para-nasal sinus and bone defects (Figures 2 and 3) in sinus wall (range: 6-8 mm). For spontaneous rhinorrhea, the patients underwent enhanced magnetic resonance image (MRI) scan to identify the etiology of the rhinorrhea.

For newly occurred CSF rhinorrhea without meningitis, a conservative procedure was performed as follows. A patient was put in bed with head elevated for 20 to 30 degree, to avoid coughing and sneezing. Then 250 ml of 20% mannitol was given intravenously twice or three times per 24 hours, and antibiotic and nutrition were also administrated. When CSF rhinorrhea lasted over 4 weeks, surgical procedure was done to repair the leakage site. Previously, we usually performed transcranial repair, however, the leakage site was unable to be seen directly through the transcranial route because of the anatomic position of sella and sphenoidal sinus. In our study, one patient underwent transcra-niotomy repair twice, but failed. Finally the rhinorrhea was successfully cured by trans-sphenoidal approach repair. The trans-sphenoidal operational steps were described as follows briefly (similar to trans-sphenoidal pituitary adenoma surgery). A patient was positioned supine; after successful general anesthesia and disinfection, enter right nasal cavity, split mucosa of nasal septa at the level of middle turbinate, identify the orifice of sphenoid sinus, remove the anterior wall of sphenoidal sinus and clean mucosa in the sinus cavity, then identify the leakage site under the microscope (Figure 4). The leakage site was usually located on posterior or superior lateral wall. An artificial dura and muscle were used to cover the leakage site. An ECGlue Gelatin sponge was used to paste the muscle and the dura to the leakage site. A massive autogenous fat was then packed into sphenoidal sinus. The volume of the fat was about 3 cm×3 cm×2 cm and could be obtained from lateral anterior thigh or right inferior abdominal wall. It was continuously pressed with a cottonoid for about 5 minutes. If bone defect was larger than 2 cm in diameter, a piece of nasal septa bone was used to decrease the defect in order to prevent its content from prolapsing. Gauze band was packed into two nasal cavities at the end of the procedure and pulled out within 6 days after surgery. other managements such as dehydration, hemostasis, antibiotic therapy were also applied. No lumbar drainage was performed in 9 patients.
RESULTS

In this series, one case was diagnosed with multiple leakage and recurrence of rhinorrhea after two operations of trans-craniotomy repair, then the sphenoid sinus rhinorrhea was cured with trans-sphenoid repair. With trans-sphenoid repair, no severe pain and bleeding occurred within 3 days after operation. One case with spontaneous leakage complained of abnormal smell in the nasal cavity after operation, but the symptom disappeared without any intervention ten months later. All 9 cases were successfully treated with trans-sphenoid repair. They were followed up for 9 months-2 years and no recurrence occurred, no infectious and epilepsy complication appeared.

DISCUSSION

Head trauma is the leading cause of CSF leakage, followed by simultaneous dehiscence of skull base dura and bone due to operation, radiotherapy or other lesions in this region. Spontaneous rhinorrhea is rare, some erosion lesions such as tumor or osteomyelitis cause the tearing of dura and the defect of skull base bone. Consequently, small meningocele and intrasellar arachnoidocele formed gradually, which is a vital condition for CSF fistula and should be treated as soon as possible.

The key to a successful treatment of CSF rhinorrhea is the precise localization of the leakage site, which is usually achieved by radiological examination. Sometimes, the skull X-ray could reveal skull fracture. The 3D-CT skull base scan is very valuable for the localization of leakage site in every fistula case. Since skull base 3D-CT scan could show details about frontal, ethmoidal and sphenoidal sinus, we suggest the 3D-CT may be an essential and necessary examination for the diagnosis of CSF fistula. In addition, it could help to design the repair procedure. Someone localized the leakage site with radioactive isotopes intrathecially injected through lumbar puncture and followed by single photon emission computed tomography (SPECT) scanning. However, the result could be false negative and it is inconvenient. In recent years, MRI were used to localize the leakage site, it is indispensable for the diagnosis of the spontaneous fistula for its advantage to identify the site of brain hernia and the consecutive CSF flow from intracranial cavity to nasal sinus. In our research, all 9 cases underwent 3D-CT scan. The bone defect and nasal sinus effusion were found in total 9 cases.

Most of trauma-related CSF leakages resolve without surgical intervention. If the CSF fistula lasts over 4 weeks, or is complicated with intracranial infection, a repair procedure should be performed.

The repair material should be compatible and unabsorbed. For bone defects, bone wax or bone transplantation can be used. However, for the CSF leakage, repair of dura is the key, so autogenous temporal muscle piece, fascia lata and fat are usually used to repair the defect of dura, and biological glue EC was used to stick them. We put the artificial dura on the inner wall at the leakage site to protect brain tissue and improve the repair efficacy. The results were satisfactory, and no infection and other complications occurred in all 9 cases.

There are several operative methods to repair the CSF fistula, which can be classified as extra-cranial and intra-cranial operations according to the approach, or classified as direct and indirect means according to repair technique. Direct repair is adopted when the leakage site could be seen directly in the operative area, otherwise indirect repair should be used. In the past, indirect repair was performed for rhinorrhea located in sphenoidal sinus, in which the leakage site could not be found directly, the indirect repair always works. The indirect repair procedure is an important supplement for the direct repair. However, in some cases, especially for the rhinorrhea involved in sphenoidal sinus, the indirect method may lead to inevitable recurrence, thus the direct repair through trans-sphenoidal route is preferred. Trans-sphenoidal approach is an ideal approach to repair the sphenoidal sinus rhinorrhea. Someone used endonasal endoscopy to repair the rhinorrhea and obtained good outcomes, which further supported our results.

In conclusion, CSF rhinorrhea in sphenoidal sinus can be treated with trans-sphenoidal approach successfully, which is microinvasive and worthy to be advocated. For complex and multiple CSF fistulas, other repair procedures can be used at the same time.
REFERENCES


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