**Postoperative cerebrospinal fluid rhinorrhea with septic meningitis in a child-- A Case Report And a Review of the Literature**

***Abstract***

Cerebrospinal fluid rhinorrhea is a disruption of the hypopituitarism barrier that causes cerebrospinal fluid to flow through the arachnoid, dura mater and skull base into the nasal cavity or sinuses and out of the nostrils or nasopharynx exit. In patients with nasal leakage of cerebrospinal fluid, a We report a case of a boy who had intermittent and regular fever after surgery, which was treated with We report a case of a boy who had intermittent and regular fever after surgery, which was treated with oral medication but was not effective, accompanied by headache and diplopia, which resolved when the cerebrospinal fluid flowed through the nose. clinical practice, we often see febrile children and often report spontaneous or post-traumatic cerebrospinal fluid rhinorrhoea, which can allow As a paediatrician, the clinical signs are often atypical and nowadays children often suffer from allergic rhinorrhoea, which can be caused by the presence of bacteria, viruses or atypical pathogens to retrograde into the skull and cause meningitis. Nowadays children often suffer from allergic rhinitis with similar features to cerebrospinal fluid rhinorrhoea, which requires prompt clinical The clinical signs are often atypical and nowadays children often suffer from allergic rhinitis with similar

features to cerebrospinal fluid rhinorrhoea, which requires prompt clinical judgment and treatment.

Our case shows that in children with regular fever and a regular flow of clear fluid from the nasal cavity, we need to be alert for this disease and differentiate it from diseases such as allergic rhinitis.

Keywords: Cerebrospinal fluid rhinorrhoea; Meningitis; Regular fever

## Introduction

Cerebrospinal fluid nasal leakage is the flow of cerebrospinal fluid into the nose or sinuses through ruptures or defects in the arachnoid membrane, dura mater and skull base bone, and out through the nasal passages or nasopharynx. Causes of cerebrospinal fluid nasal leakage include head trauma, skull base surgery, increased intracranial pressure, arachnoid granulation, sequelae of malignant tumours or congenital malformations, skull base fractures due to trauma, spontaneous cerebrospinal fluid nasal leakage, transnasal skull base surgery and tumours invading the skull base in locations such as the skull base sinuses. Cerebrospinal fluid nasal leakage can cause recurrent intracranial infections, which can lead to serious complications and sequelae. Due to the rapid development of transnasal intracranial surgery in recent years, cases of postoperative cerebrospinal fluid nasal leakage have occurred and need to be identified and managed promptly after surgery.

**Case reports**

Medical history features

We report a case of an 8-year-old boy who was admitted to the hospital with "fever for 12 days and cough for 2 days", and was diagnosed with "suprasellar mucinous astrocytic glioma" on MRI due to headache. On 1 January 2022, the MRI was repeated and the diagnosis of "postoperative changes of suprasellar mucinous astrocytic glioma" was made. After the onset of symptoms, a clear, bright fluid flow was seen from the nasal cavity in large amounts, and the flow was position-dependent, lasting approximately 3-4 days, accompanied by regular fever and intermittent headache. The child's family took a clear nasal fluid and sent it to the laboratory for cerebrospinal fluid tests. The results showed: colourless, clear, lymphocytes 1%, protein qualitative ++++, protein quantitative 142.4 mg/dl, chloride 119 mmol/L, glucose 2.23 mmol/L, glutamate transaminase 40 U/L, creatine kinase 5 U/L, immunoglobulin The patient's thyroid function was 5: TT3 2.71nmol/L, FT3 7.25pmol/L, pituitary gonadal 8: cortisol 52.3ng/ml, LH 0.31mIU/ml, progesterone <0.20ng/ml, PCT 30.74ng/ml at the time of fever, and was seen in our hospital for further management. She was admitted to our hospital for further treatment.

**Physical examination**

The nasal mucosa is congested, the turbinates are enlarged, the nasal septum is deviated, the neck is slightly tonic, the pharynx is not congested, the breath sounds in both lungs are coarse and no dry rales are heard. The heart is in rhythm and the heart sounds are normal, no pathological murmurs are heard. The abdomen is soft, with no tenderness or rebound pain. The rest of the examination shows no significant abnormalities.

**Laboratory and imaging studies**

Initial diagnosis after admission: 1. fever to be investigated: central nervous system infection? Hematologic disorders? 2. postoperative astrocytic glioma of the suprasellar hairy mucus-like type. after admission, endocrinology, ophthalmology, neurology, and otorhinolaryngology were consulted. based on the clear nasal fluid that had been removed, laboratory tests showed a glucose measurement of 2.23 mmol/L. In addition, we could also identify cerebrospinal fluid nasal leak based on beta-microprotein and 2-transferrin, both of which could be identified[1]. the child's pituitary gonadal octet was seen Cortisol was reduced and luteinizing hormone was within normal limits. The cerebrospinal fluid rhinorrhea was associated with surgery, bilateral temporal hemianopsia and hypopituitarism were associated with the primary disease. Chest radiograph: both lungs were heavily textured; sinus CT: all groups of sinuses were well pneumatized, the pterygoid sinus was enlarged and soft tissue

nodular shadow was seen within it, with a size of about 2.2×2.3 cm; the opening of the right maxillary sinus was enlarged and no obvious abnormal density shadow was seen within it; the sinuses shown were mostly considered postoperative changes; blood routine: WBC: $14.98\times10^9$ /L, N 0.76, L 0.171, M 0.067. HB 133g/L, PLT $477\times10^9$ /L, RBC $4.7\times10^{12}$ /L; ESR 34mm/h; bacterial infection markers: hs-CRP >5mg/L, CRP 26.72mg/L, PCT 0.347ng/ml, IL-6 <1.5pg/ml, SAA >550mg/L; adrenal corticotropin (ACTH) 44.69pg/ml; two sex hormones: 17 α -hydroxyprogesterone: 0.31ng/ml, dehydroepiandrosterone sulfate (DHEA) 45.27ug/dl; plasma cortisol: 50ng/ml; human growth hormone HGH 1.93ng/ml; five thyroid functions (radiolucent): FT3 3.18pmol/L, TSH FT4, TGAb, TPOAb are normal; sex hormone six: FSH (follicle stimulating hormone) 0.4mIU/ml, LH (luteinizing hormone) 0.1mIU/ml, testosterone (Testo) <10ng/dl, prolactin (Prol), estradiol (E2), progesterone (Prog) are normal range; urine routine, blood culture, respiratory We started intravenous ceftriaxone, which is known to cross the blood-brain barrier, at a dose of 50 mg/kg/day, and the child's fever subsided. However, the fever recurred after 1-2 days and the child complained of dizziness and discomfort when standing and walking without headache, so we performed a lumbar puncture and sent the cerebrospinal fluid for testing, which indicated: Streptococcus pneumoniae, whose drug sensitivity test indicated: penicillin and cefotaxime were resistant, meropenem intermediary, vancomycin sensitive; colourless, clear, no coagulation network, erythrocytes $0\times10^9$ /L, nucleated cell count $0.182\times10^9$ /L, and Single nucleated

cells were predominant, cerebrospinal fluid protein Pro 869 mg/L, cerebrospinal fluid glucose N-GLU 2.75 mmol/L, cerebrospinal fluid chloride NJY-Cl 126 mmol/L; Gram stain and antacid stain were negative; cerebrospinal fluid bacterial culture: Streptococcus pneumoniae, drug sensitivity test: penicillin and cefotaxime were resistant, meropenem intermediary, vancomycin sensitive; novel Cryptococcus Cryptococcal podococcal antigen was negative. The diagnosis is: 1. septic meningitis; 2. cerebrospinal fluid rhinorrhoea; 3. postoperative glioma of the saddle area; 4. hypopituitarism; 5. bilateral temporal lobe hemianopsia. Considering that the child has had recurrent fever for a long period of time, it is recommended that the child be evaluated at an external hospital and that a skull base repair be performed.



**Discussion**

The cerebrospinal fluid nasal leak in this child was determined to be a sequela of a transnasal resection of a glioma. In healthy individuals, the barrier between the external environment and the brain, the intracranial cavity, the middle ear and the paranasal sinuses are sterile. After an upper respiratory tract infection, the child developed a high fever with one convulsion. Thereafter, the child had a clear fluid flow with every fever and a change in the nasal passage of the fluid with a change in position, accompanied by a headache and a slightly tense neck, which was relieved by a clear fluid leak from the

nasal cavity. The first consideration after admission was cerebrospinal fluid rhinorrhea combined with septic meningitis, but the outflow was clear fluid and did not correspond to septic meningitis. After lumbar puncture, cerebrospinal fluid tests were colourless, clear, without coagulation network, with a nucleated cell count of 0.182 x $10^9$ /L and a predominance of single nucleated cells. Cerebrospinal fluid chloride NJY-Cl 126mmol/L; cerebrospinal fluid bacterial culture: Streptococcus pneumoniae, still suggesting Streptococcus pneumoniae infection through the cerebrospinal fluid nasal leak skull base opening invasion intracranial formation of septic meningitis, after admission to the hospital to give ceftriaxone anti-infection and symptomatic treatment, but the child still have intermittent fever, accompanied by cerebrospinal fluid nasal leak once during the period, it is recommended to repair the skull base, continue to give antibiotics to cross the It is recommended that the skull base repair be followed by continued antibiotics to cross the blood-brain barrier in the treatment of septic meningitis. There is still some debate as to whether further repair of the cerebrospinal fluid nasal leak is necessary, and more data are needed to support whether the repair is a secondary procedure that can cause reinfection.

Normal values for luteinizing hormone in boys aged 8-10 years are 0.02 to 4.12 mcg/L. For males, luteinizing hormone contributes to the synthesis and release of testosterone from the interstitial cells of the testes. Testosterone, also known as testosterone, testosterone, testosterone or testosterone, is a

steroid hormone secreted by the testes in men and the ovaries in women, and to a lesser extent by the adrenal glands. It is mainly a male hormone and a bulking hormone, and in male children it mainly affects their immune function. This child has hypopituitarism mainly due to post-surgery. As the child is young and immature, he still needs all pituitary functions and should be reviewed regularly and interventions should be made if necessary.

In healthy people the barrier between the external environment and the brain, the intracranial cavity, the middle ear and the paranasal sinuses are in a sterile state. Under normal conditions, bacteria cannot cross the mucosa, periosteum, bone, dura mater and arachnoid, which are the main structures of hisbarier. [2] Because hisbarirrir bacteria cannot cross the mucosa, periosteum, bone, dura mater and arachnoid, the barrier is disrupted by surgery, thereby creating an opening between the intracranial space and the pneumatised space at the base of the skull, leading to the passage of Streptococcus pneumoniae through the barrier, which leads to meningitis and the flow of clear cerebrospinal fluid from the nasal tract, called cerebrospinal fluid nasal leakage. Spontaneous cerebrospinal fluid rhinorrhea (SCSFR) is one of the rarer cases of cerebrospinal fluid rhinorrhea. Recently, Li Changzeng et al. reported a case of spontaneous cerebrospinal fluid rhinorrhea in which there was only recurrent clear fluid flowing out of the nasal cavity without symptoms such as fever, and the case had previously been treated as allergic rhinitis with poor outcome[3]. The pathogenesis of the case is associated with thinning of

the skull base, increased intracranial pressure, obesity, etc. Clinically Cerebrospinal fluid rhinorrhea is very similar to rhinitis in that it is a clear, bright fluid flowing from the nose, and SCSFR accounts for 4% of all cerebrospinal fluid leaks. [4]

**Treatment**

We can determine the location of cerebrospinal fluid nasal leaks by nasal endoscopy, thin-section CT and MRI. In particular, spiral CT can play an important role in diagnosis and surgical guidance and can be used as a first choice and routine examination, and 3D reconstruction imaging can provide better visual support for surgery. [5,6] Patients with acute traumatic cerebrospinal fluid leaks without dural repair have an estimated cumulative risk of bacterial meningitis in excess of 85% at 10 years [7]. For the repair of complex cerebrospinal fluid nasal leaks, vascularized tissue flaps have good efficacy. A septal artery flap may also be an option when a posterior nasal septal artery flap is not available. Transendoscopic surgery for cerebrospinal fluid fistulas has low morbidity, high efficacy and is independent of the size, location and cause of the defect, but its long-term effectiveness and prevention of delayed meningitis requires further investigation. [8]For paediatricians, because of the atypical clinical symptoms in children, we need to differentiate and treat cerebrospinal fluid rhinorrhoea from rhinitis in a timely manner. The clinical symptoms are relatively similar, but the treatment is different. For nasal

discharge with regular headache and fever, we need to be alert to cerebrospinal fluid rhinorrhoea combined with meningitis and take the next step in a timely manner.

Reference.

[1]Bachmann-Harildstad G. Diagnostic values of beta-2 transferrin and beta-trace protein as markers for cerebrospinal fluid fistula [J].Rhinology,. 2008, 46(2): 82-85.

[2] Hegazy HM, Carrau RL, Snyderman CH. Transnasal endoscopic repair of cerebrospinal fluid rhinorrhea: a meta- analysis. Laryngoscope 2000; 110: 1166 -1172.

[3] Li CZ, Yu YM, Wang F, Cui YH. Report of a case of spontaneous cerebrospinal fluid nasal leakage[J]. Yunnan Medicine,2022,02:84-86.

[4]Zhu ZJ,Cheng L,Yang J.Transnasal endoscopic repair of adult spontaneous cerebrospinal fluid rhinorrhea with assis- tance of computer -assisted navigation systeman analysis of 21 cases[J].Eur Arch Otorhinolarygol.2019,276(10)2835-2841.

[5] Sun Jingwu, Wan Guanglun, He Shuangba, et al. Diagnosis and treatment of spontaneous cerebrospinal fluid rhinorrhea. Chinese Journal of Integrated Chinese and Western Medicine and Otolaryngology, 2007(3): 186-189.

[6] Chen GY,Ma L,Xu ML,Gao YFet al. Spontaneous cere- brospinal fluid rhinorhea:A case report and analysis[J].Medicine(Baltimore) 201897(5);9758

[7] Eljamel MS and Foy PM. Acute traumatic CSF fistulae: the risk of intracranial infection. Br J Neurosurg 1990; 4: 381-385.

[8] Hegazy, H M et al. "Transnasal endoscopic repair of cerebrospinal fluid rhinorrhea: a meta-analysis." The Laryngoscope vol. 110,7 (2000): 1166-72.