Postoperative cerebrospinal fluid rhinorrhea with purulent meningitis in a child -- A Case Report

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.[1] 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. （Informed consent was obtained from the child's parents for this report.）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.Cerebrospinal fluid analysis 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 was congested, the turbinates are enlarged, the nasal septum was deviated, the neck was slightly tonic, the pharynx was not congested, the breath sounds in both lungs were coarse and no dry rales are heard. The heart was in rhythm and the heart sounds were normal, no pathological murmurs were heard. The abdomen was soft, with no tenderness or rebound pain. The rest of the examination showed 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. (The child was diagnosed with a glioma and no other brain structures showed glioma changes, so he underwent a transnasal glioma resection at another hospital).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[2].

Laboratory examination	Results
Blood Count	WBC：14.98×10^9 /L N 0.76 L 0.171 M 0.067 PLT 477×10^9 /L
ESR	34mm/h
Bacterial infection markers	hs-CRP>5mg/L CRP 26.72mg/L PCT 0.347ng/ml SAA>550mg/L
ACTH	44.69pg/ml
17α-hydroxyprogesterone	0.31ng/ml
DHEA	45.27ug/dl
Plasma cortisol	50ng/ml
HGH	1.93ng/ml
Thyroid function	FT3 3.18pmol/L TSH、FT4、TGAb、TPOAb normal limits
Testo	<10ng/dl
Pituitary gonadotrophs	Decrease in cortisol
Luteinizing hormone、Urine routine、blood culture	normal limits

Imaging examination	Results
Chest X-ray	Heavy texture in both lungs.
Sinus CT	The sinuses in each group were well pneumatized, the pterygopalatine sinus was enlarged and soft tissue nodular shadow was seen inside, measuring about 2.2 x 2.3 cm; the opening of the right maxillary sinus was enlarged and no obvious abnormal density shadow was seen inside, most of the sinuses seen were considered postoperative changes.

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. The results show:

Cerebrospinal fluid test results

colourless, clear, no coagulation network

cerebrospinal fluid bacterial culture:
Streptococcus pneumoniae

erythrocytes	0×10^9 /L
nucleated cell count	0.182×10^9 /L
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

Drug sensitivity test:
penicillin and cefotaxime were resistant, meropenem intermediary, vancomycin sensitive; novel Cryptococcus
Cryptococcal podococcal antigen was negative.

Gram stain and antacid stain were negative.

The diagnosis was then revised to: 1. purulent 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.The child was discharged from hospital and was seen in an outside hospital for repair of a cerebrospinal fluid rhinorrhea.

Case discussion

This child's cerebrospinal fluid nasal leak 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. Following an upper respiratory tract infection, the child developed a high fever and had one convulsion. Thereafter, the child had a clear discharge of fluid from the nasal cavity with each fever, which changed with position and was accompanied by a headache and slight neck tension, which was relieved by the clear discharge of fluid from the nasal cavity. The first consideration on admission was cerebrospinal fluid rhinorrhoea combined with purulent meningitis, which, combined with the transparent fluid flow, was not consistent with purulent meningitis. We performed a cerebrospinal fluid aspiration and his bacterial culture was Streptococcus pneumoniae, confirming our initial presumption that the child had a cerebrospinal fluid rhinorrhoea combined with purulent meningitis.In combination with the nature of the child's cerebrospinal fluid and the fact that the virus could not be cultured, the child could not be ruled out for combined viral encephalitis.

With regard to gliomas, which are the most common primary central nervous system tumours in humans, surgery is still the main form of treatment.Gliomas are highly malignant, with a poor prognosis for some

tumours and a high recurrence rate, making them a very difficult tumour to treat.[3]In childhood glioma patients, H3F3A gene variants are important markers of poor prognosis.[4]Dysregulation of oncogene and proto-oncogene pathways is an important driver of glioma development.Prof. Zhang Niu's team discovered that the micropeptide MP31 can compete with LDH in mitochondria to break the oxidative phosphorylation cycle and thus inhibit the development of glioma in animal models.[5]The RNA-encoded SMO-193a.a protein was also found to mediate sustained over-activation of the Hedgehog signalling pathway in gliomas, both of which provide new ideas for targeted therapy.[6]The treatment of glioma is now evolving along the lines of targeted therapies, and there is still much trial and verification to be done.In addition to this there are immunotherapy and epidemic and other treatments.

Purulent meningitis also known as bacterial meningitis,is an infection of the central nervous system caused by the invasion of the meninges by toxins produced by pathogenic bacteria.It is characterized clinically by acute fever, agitation, disturbance of consciousness, convulsions, increased intracranial pressure and signs of meningeal irritation, and septic changes in the cerebrospinal fluid.The most common pathogens are S. meningitidis, Streptococcus pneumoniae and Haemophilus influenzae. Infants under 2 months of age, newborns and those with primary or secondary immunodeficiency are most commonly infected with E. coli.[7]Clinical treatment is based on antibiotics that can cross the blood-brain barrier.It is best to select specific antibiotics with a cerebrospinal fluid drug sensitivity test.Low age has been shown to be an independent factor in the poor prognosis of purulent meningitis. [8]It has been reported that children with purulent meningitis younger than 1 year of age have a significantly higher mortality and sequelae rate than older children.[9]May be due to the underdevelopment of the systems of young children that pathogens can easily spread and lead to systemic multi-system infections.The presence of an altered state of consciousness is an independent risk factor for purulent meningitis and its associated increased risk of death.[10]This is why we need to identify purulent meningitis and its severity early to reduce mortality and sequelae in children.

With regard to hypopituitarism,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 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.

Discussion

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. [11] 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[12]. 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. [13]The incidence of post-traumatic cerebrospinal fluid nasal leakage accounts for the majority of total cerebrospinal fluid nasal leakage.After a nasal leak of cerebrospinal fluid, bacteria or viruses can easily infect the meninges directly upstream through the fistula to form purulent meningitis or viral encephalitis.

Diagnosis and 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. [14,15] 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 [16]. 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.[17]

Summary

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.

FUNDING

(1) Shaanxi Province Key Research and Development Program in 2020 (International Cooperation) (Project No. 2020KW-052);

(2) Program of Shaanxi Province (International Cooperation Project . No.2022KW-13)

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