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CASE STUDY

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Meningitis Associated with Meningoencephalocele

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ABSTRACT

Meningitis in an infant is a frequent cause of admission in intensive care facilities. Immunological deficiencies and anatomical abnormalities comprise a majority of patients presenting with meningoencephalitis. We present a 22-month-old male infant admitted with bacterial meningitis that was refractory to medical treatment. On further evaluation with computed topography, a meningoencephalocele was revealed involving the anterior aspect of the left nasal cavity. It is presumed that this abnormality served as a reservoir for the offending bacteria. In situations when meningitis is refractory to treatment, we propose further investigation with cranial imaging to potentially identify an encephalocele.

Keywords: Meningoencephalocele, Meningitis, CT, MRI, Encephalocele

Abbreviations: CT: Computed Topography, MRI: Magnetic Resonance Imaging

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1. INTRODUCTION

The term encephalocele encompasses meningocele, encephalomeningocele, and hydroencephalomeningocele. A meningoencephalocele includes meninges, cerebrospinal fluid, and or brain extending beyond the brain cavity (Chen et al, 2005). A congenital encephalocele is estimated at 1:5,000 with an incidence of 0.1 to 0.5 of 1,000 births (Arbolay et al 2012; Singhal and Venna, 2013). In developed countries, this malformation is rare, but in developing countries, it is more frequently encountered. This may be due to nutritional deficiencies in pregnancy, such as folate, that result in neural tube defects (Kabre et al, 2015).

According to the location, meningoencephaloceles are classified anatomically: occipital, cranial vault, posterior fosse, and basal. Basal encephaloceles occur with an estimated incidence of 1 in 35,000 live births and have been further subdivided, depending on the location of the bone defect, into transethmoidal, sphenomaxillary, sphenoorbital, and transsphenoidal (Kumar et al, 2011). Depending on the location, different ranges of symptoms have been reported. In transethmoidal type, a defect on the cribriform plate is observed. Patients typically have swelling over the nose or inner canthus. Nasal CSF leakage, headache, and nasal obstruction, are frequently the chief complaints. In one reported case of bacterial meningitis, headache, fever, vomiting was reported with association of the lesion in the anterior cranial fossa in the right nasal cavity (Mahapatra, 2006). In tegmental meningoencephalocele, reports indicated symptoms of conductive hearing loss, CSF otorrhea, and temporal lobe seizures (Chen et al, 2005). With a basal encephalocele, a midline mass is usually present which leads to airway obstruction, difficulty feeding, apnea, and potentially meningitis (Lusk and Lee, 1986). Associated congenital anomalies like mid face malformations, orbital distortion or hydrocephalus can be seen in all types (David et al, 1984; Garg et al, 2005). Symptoms usually vary depending on the size and location of the lesion.

Meningocele:
Herniation of the meninges and CSF

Encephalomeningocele:
Herniation of the brain and meninges

Hydroencephalomeningocele:
Herniation of the brain, ventricles, and meninges

2. CASE REPORT

A 22-month-old male infant with no past medical history presented to the emergency room with fever, lethargy, nuchal rigidity, and vomiting. Patient was born at term gestation with no significant antenatal course. Physical exam was positive for nuchal rigidity and lethargy. No focal deficits were noted. Lumbar puncture was then performed. The patient was then started on vancomycin, ceftriaxone and IV fluids to correct mild hyponatremia. Patient was placed under droplet isolation. White blood cell count at time of admission was 42,000 units. CSF analysis was positive for strep pneumonia. UA was negative. On the second day of admission, the WBC count dropped to 35,000. Vancomycin was increased from 15 to 20 mg/kg. On third day of admission, the WBC count was at 32,000 units. The infant failed to improve on IV antibiotics and supportive management so subsequently, CT imaging of the head was ordered. Reports showed a possible mass suspicious for meningoencephalocele involving the anterior aspect of the left nasal cavity (Figure 1).Vancomycin trough was persistently low; the dose was subsequently increased to 25 mg/kg/dose.

Patient was seen by neurosurgery and then transferred to a tertiary care neurological center for removal of the mass. The surgery was uneventful and full recovery of the patient was made.

3. DISCUSSION

Encephaloceles most commonly originate from complications during embryologic neural tube folding. This fusion failure occurs around 21-26 days post conception. 70% of these cases were correlated with folate deficiencies. Maternal health and illnesses, environmental toxins and certain medications have also been linked to this condition (Campbell et al, 2009). The most suitable solution is a policy of prevention with folic acid treatment before and during pregnancy and following up adequate pregnancies (Kabre et al, 2015).

In most cases, anatomic defects appear at the skull base, and can be caused by trauma or more commonly, congenitally. The defects allow persisting communication between the subarachnoid space and the air filled cells of the temporal bone or the paranasal sinuses, and may offer a route of direct invasion of commensals such as streptococcus pneumonia (Yang et al, 2008). Furthermore, a study demonstrated that the type of organism causing the meningitis is associated with a specific origin. Pneumococcus and H. Influenzae suggests cranial dural defects, E. Coli or other gram-negative bacilli suggests spinal dural defects, and meningococci suggest immunologic deficiency (Dias and Dias, 2012).

When suspicion is high from physical exam or from refractory treatment, imaging shouldbe warranted. High resolution CT may be used to display the bone anatomy, however it poorly differentiates soft tissue swelling (Chen et al, 2005). The intracranial connection is best defined with MRI imaging. Pregadolinium and postgadolinium weighted magnetic resonance images also provide good differentiation of encephaloceles from cholesteatomas and inflammatory tissue (Chen et al, 2005). The extent of cerebral tissue in an encephalocele is also better defined with MRI imaging, which aids in prognosis and surgical planning. It is important to consider early neuroimaging for diagnosing these conditions and plan definitive treatment for successful outcome (Kumar et al, 2011). If an encephalocele is clearly diagnosed on MRI, then further demonstration of the bony defect with a CT scan is warranted

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only if the surgeon thinks that is necessary to help define the surgical approach (Lusk and Lee, 1986).

Pediatric nasal meningoencephaloceles with anterior skull base defects can be successfully repaired via a transnasal endoscopic technique, thus minimizing the complications associated with craniotomy and frontal lobe retraction. Endonasal endoscopic procedures and special development of extended endonasal endoscopic approaches have increased the interest on treating this kind of lesion. Triplanar computed tomographic and magnetic resonance imaging is paramount to evaluate the caliber of the skull base defect, consistency of the herniated intracranial contents, as well as the presence of cerebral vasculature (Kanowitz and Bernstein, 2006). Most commonly reported postoperative issue was a temporary CSF leak (Roux et al, 2007). Also, mental failure and hydrocephalus can occur impairing the prognosis.

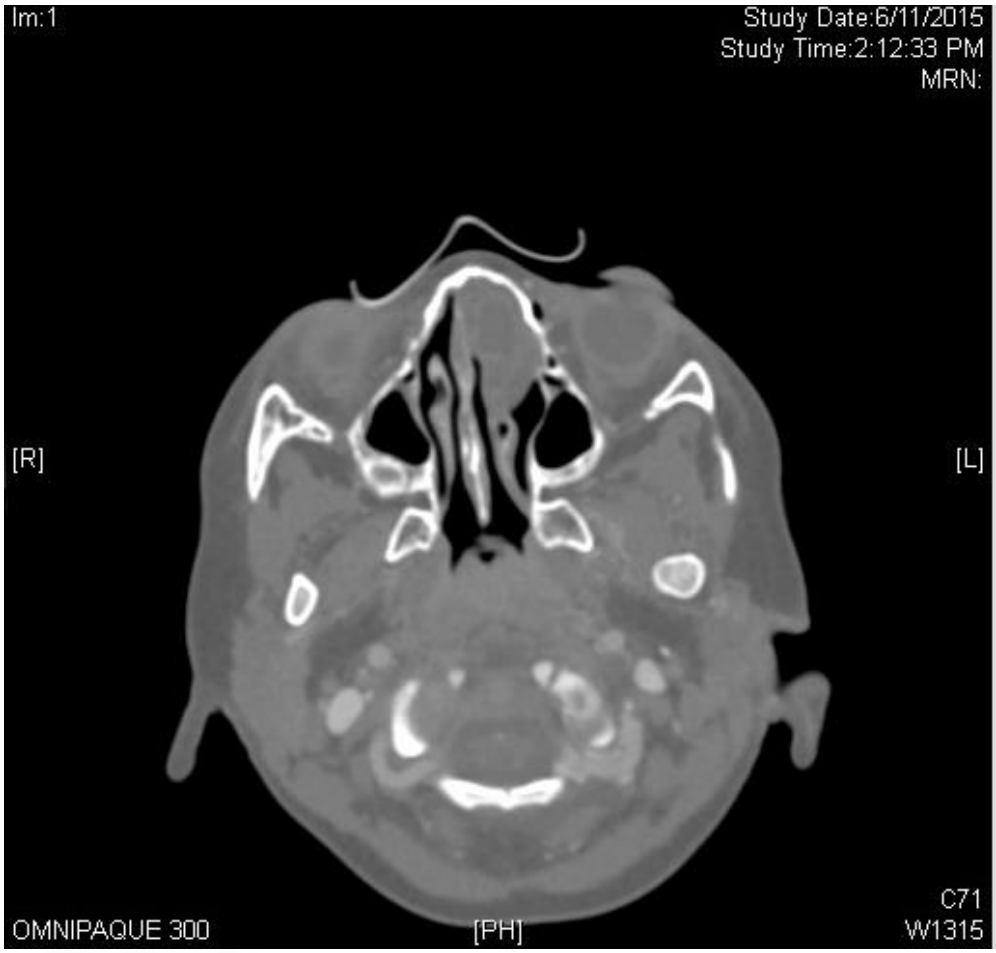

Figure 1 CT with contrast of head demonstrating meningoencephalocele involving the anterior aspect of the left nasal cavity

4. CONCLUSION

In conclusion, this case is unique because an infant presented with a typical presentation of meningitis and in turn, a rare neural tube defect was revealed. Further inspection with imaging should be warranted in those that are not responding to treatment adequately. Early detection with the imaging modalities of CT and MRI, with the latter being more adequate, has proven beneficial.

SUMMARY OF RESEARCH

This report aims to support the literature for appearance of encephaloceles in cases of meningitis refractory to treatment.

DISCLOSURE STATEMENT

There is no special financial support for this case report from any funding agency or conflicts of interest

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CONFLICT OF INTEREST

No conflicts of interest

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