Pediatric Middle Cranial Fossa Encephaloceles: Our Management Experience

Grace Anderson, BS[3]; Taylor Leavitt, MD[1]; Kaitlyn A. Brooks, MD[1]; Nathan R. Lindquist, MD[1,2];

1: Bobby R. Alford Department of Otolaryngology—Head & Neck Surgery, Baylor College of Medicine, Houston, TX
2: Division of Otolaryngology—Head & Neck Surgery, Department of Surgery, Texas Children's Hospital, Houston, TX
3: Baylor College of Medicine, Houston, TX

Introduction

Encephaloceles are herniations of brain parenchyma through dural and bony defects. Temporal encephaloceles (TEs) make up a small percentage of all encephaloceles. Etiologies can be congenital, iatrogenic, spontaneous, infectious, traumatic, or neoplastic/malignant. Sequelae of temporal encephaloceles are varied, and include CSF leak, meningitis, headaches, CHL, and seizures. The temporal lobe is the most common location for focal epilepsy, and encephaloceles can act as an epileptogenic focus. There is a paucity of literature on the incidence, etiology, and treatment of temporal encephaloceles in pediatric populations. **This study assesses pediatric encephaloceles at a tertiary center to compare adult and pediatric etiologies of TE's, assess possible risk factors and review treatment strategies.**

Methods

This study was approved by the Baylor College of Medicine IRB. We performed a retrospective review of temporal lobe encephaloceles between 2010-2015 at Texas Children's Hospital in Houston, TX using the electronic health record. A total of 85 pediatric patients were found to have encephaloceles, **8 of which had TEs**. Patient information and individual head imaging was reviewed for these 8 patients. Demographics, BMI, etiology, laterality, location within the temporal bone, seizure incidence, CSF leak incidence, and management, were reviewed and analyzed using Excel.

Table 1. Patient Characteristics

Patient Characteristic	n	P-value
Gender		*0.4795
Male	5	
Female	3	
Ethnicity		*0.801
White Non-Hispanic	2	
Black	1	
Hispanic/Latino	3	
Asian	2	
Age of Diagnosis		*0.26
0-5	0	
6-10	4	
11-15	2	
16-18	2	
Mean Age = 10.75		
BMI		**0.0039
Underweight (<5th)	0	
Normal Weight (5 - <85th)	2	
Overweight (>85th)	2	
Obese (>95th)	4	
Mean BMI (percentile) = 87		

*Chi-Square goodness-of-fit score; **One Sample Sign Test; median percentile is significantly higher than average median; BMI: Body Mass Index

Table 2. Encephalocele Characteristics

Encephalocele	n (%)	P-value*
Etiology		0.13
Congenital/Syndromic	2 (25)	
Cholesteatoma/Iatrogenic	3 (37.5)	
Spontaneous	3 (37.5)	
Infectious	0 (0)	
Malignancy	0 (0)	
Trauma	0 (0)	
Laterality		0.157
Left	6 (75)	
Right	2 (25)	
Location		0.172
Infratemporal Fossa	4 (50)	
Tegmen Mastoideum	3 (37.5)	
Tegmen Tympani	1 (12.5)	
Petrous Apex	0	
Seizure**	2 (25)	
CSF Leak	1 (12.5)	

*P-value calculated using Chi-square goodness-of-fit Test, **TE unlikely the epileptic focus, CSF = cerebrospinal fluid

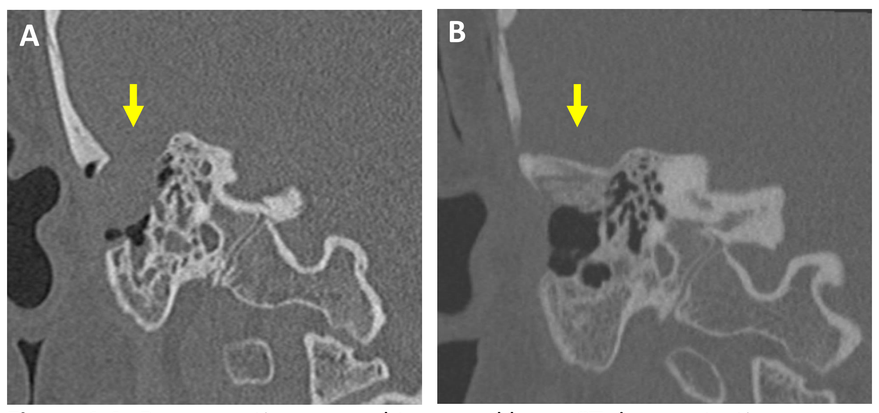

Figure 1 A. Pre-operative coronal temporal bone CT demonstrating tegmen mastoideum encephalocele. **B.** Post-operative imaging of same patient after multilayered repair.

Table 2. Location and Type of Management

Location	Surgery	Observation	P=0.091
Infratemporal Fossa	1	3	
Tegmen Mastoideum	3	0	
Tegmen Tympani	1	0	
Total	5	3	

Results

In this cohort of 8 patients with TE's, gender, ethnicity, and age of diagnosis had no significant correlation with TE diagnosis. **BMI had a strong correlation** with TE diagnosis (P = 0.0039), with the mean BMI in the 87th percentile. **75% of TEs were iatrogenic or spontaneous**. 2 patients had a history of seizures, but the epileptic focus was unlikely the TE. Treatment strategies varied, with infratemporal fossa encephaloceles undergoing observation in the absence of symptoms. All tegmen mastoideum and tegmen tympani encephaloceles were treated surgically. To date, no patients have known recurrence if treated surgically.

Discussion and Conclusions

In adults, increased BMI is associated with both spontaneous and iatrogenic TE's.[1] Based on this study, our pediatric cohort follows a similar pattern, as BMI is strongly correlated with TE incidence and the majority of TEs in this study were iatrogenic or spontaneous. Given the rarity of pediatric TE occurrence, larger studies are needed to establish a correlation between seizure incidence and TE occurrence, as the likely epileptic foci in the two patients in this cohort with seizures were not related to their respective TEs. Literature suggests that surgical management of TE's in drug resistant temporal lobe epilepsy is effective (80% seizure-free at 1-year follow up).[2] A multilayered approach including fascia, bone graft, bone plate, cartilage, gel-foam, and fibrin glue was the most common surgical management in our study, and is shown to be a reliable repair method.[3] Observation is also an appropriate course of action, especially in asymptomatic patients where the TE was diagnosed incidentally.

Contact

Nathan Lindquist, MD
nathan.lindquist@bcm.edu

Kaitlyn Aragon Brooks, MD
kaitlyn.brroks@bcm.edu

Taylor Dean Leavitt, MD
taylor.leavitt@bcm.edu

Grace E. Anderson, BS
grace.anderson@bcm.edu

References

1. Morone, Peter J.*; Sweeney, Alex D.†; Carlson, Matthew L.†; Neimat, Joseph S.*; Weaver, Kyle D.*; Abou-Khalil, Bassel W.‡; Arain, Amir M.‡; Singh, Pradumna‡; Wanna, George B.*†. Temporal Lobe Encephaloceles: A Potentially Curable Cause of Seizures. Otology & Neurotology 36(8):p 1439-1442, September 2015. | DOI: 10.1097/MAO.0000000000000825

2. Buraniqi E, Guerin JB, Miller KJ, Van Gompel JJ, Krecke K, Wirrell EC, Nickels KC, Payne ET, Wong-Kisiel L. Temporal Encephalocele: A Treatable Etiology of Drug-Resistant Pediatric Temporal Lobe Epilepsy. Pediatr Neurol. 2023 May;142:32-38. doi: 10.1016/j.pediatrneurol.2022.12.015. Epub 2022 Dec 31. PMID: 36898288.

3. Hernandez-Montero E, Caballero E, García-Ibanez L. Surgical management of middle cranial fossa bone defects: meningoencephalic herniation and cerebrospinal fluid leaks. Am J Otolaryngol. 2020 Jul-Aug;41(4):102560. doi: 10.1016/j.amjoto.2020.102560. Epub 2020 May 28. PMID: 32505907.