



Regional Skull Base Defects as Predictors of Encephalocele Formation in Spontaneous CSF Leak Patients



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Abstract

- Objective:** To determine if specific patterns of skull base defects (osteitic dehiscence) predict the presence of spontaneous encephaloceles.
- Methods:** We performed a retrospective review of 65 patients with spontaneous CSF leaks, analyzing imaging and operative findings to correlate defect sites with encephalocele formation.
- Results:** Encephaloceles were present in 70.8% of patients. Central sphenoid and tegmen defects were significantly associated with encephalocele formation ($p < 0.05$). It was also observed that defect locations predicted the location of the encephalocele: central sphenoid defects were linked to anterior encephaloceles ($p = 0.019$), and tegmen defects to lateral encephaloceles ($p = 0.002$).
- Conclusion:** Identifying skull base defect patterns can aid in early recognition, risk stratification, and targeted surgical planning for patients with spontaneous CSF leaks and possible encephaloceles.

Introduction

- Spontaneous CSF leaks and encephaloceles are increasingly linked to chronic intracranial pressure.
- While skull base defects are common, it is unclear which specific defects predict the formation of an encephalocele.
- We aimed to identify which patterns of bone defects best predict encephalocele presence to improve surgical planning.

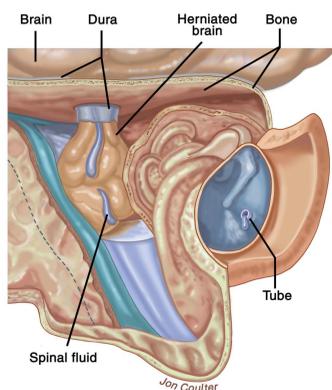


Figure 1. Anatomy of a Spontaneous Encephalocele (Illustration by Jon Coulter)

Methods and Materials

- We conducted a retrospective chart review of 65 patients presenting with spontaneous CSF leaks.
- Imaging and operative findings were analyzed to categorize skull base anomalies by anatomical site (see Figure 2).
- Statistical analysis correlated the presence of an encephalocele with the specific location of the bone defect.

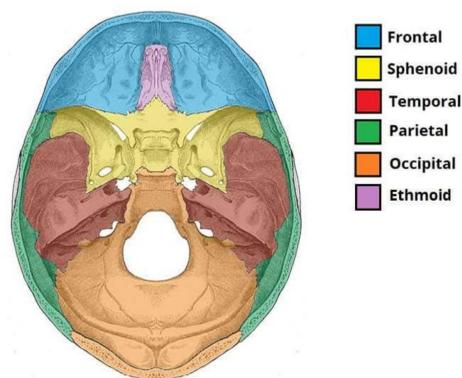


Figure 2. Anatomical Sites of Osteitic Dehiscence (Image courtesy of TeachMe Anatomy)

Results

- 70.8% of the cohort presented with an encephalocele.
- Multiple dehiscence sites were observed for certain patients ($n=22$).
- Central sphenoid and tegmen defects were significantly associated with encephalocele formation ($p < 0.05$).
- Cribriform plate defects were less common in encephalocele patients (30.4% vs 63.2%).
- Defect location was observed to predict the location of the encephalocele:
 - Central sphenoid defects were linked to anterior encephaloceles ($p = 0.019$).
 - Tegmen defects were linked to lateral encephaloceles ($p = 0.002$).

Overall Cohort	N (%)
Encephalocele Present	46 (70.8)
Encephalocele Absent	19 (29.2)

Dehiscence Site	Encephalocele Present		Encephalocele Absent		P-Value
	N	%	N	%	
Cribriform Plate	14	30.4	12	63.2	0.014
Central sphenoid	17	37.0	2	10.5	0.033
Tegmen	16	34.8	2	10.5	0.047

Table 1. Study Demographics and Key Statistical Findings

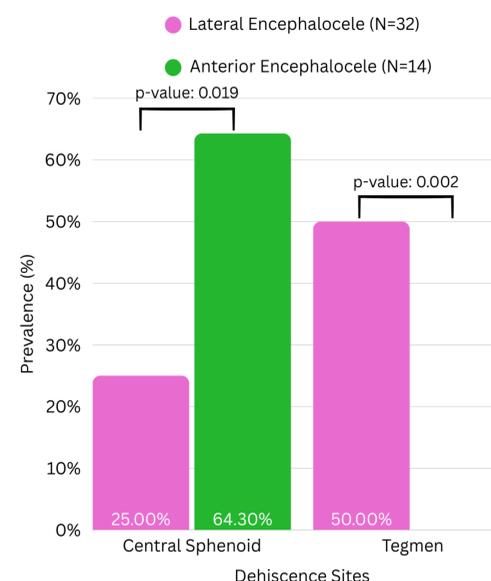


Figure 3. Association Between Dehiscence Site and Encephalocele Location.

Conclusion

- Central sphenoid and tegmen defects should raise suspicion for encephalocele, whereas cribriform plate defects are significantly less likely to be associated with this condition.
- These findings support early risk stratification and targeted surgical planning, highlighting that not all skull base anomalies confer equal risk.
- Future research should focus on prospective validation to establish standardized treatment algorithms based on these anatomical predictors.

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