

Imaging Findings Associated with Persistent IIH after CSF Leak Repair

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Background

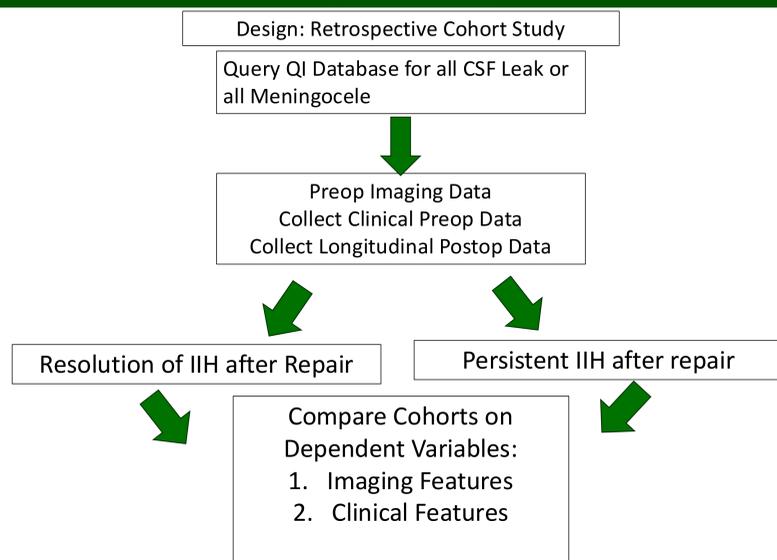
- Spontaneous cerebrospinal fluid (CSF) leaks are commonly associated with idiopathic intracranial hypertension (IIH).
- Surgical repair eliminates the CSF leak as a pressure “release valve” but does not address the underlying elevation in intracranial pressure (ICP)
- While some patients improve after repair, others experience persistent IIH symptoms or develop recurrent or new CSF leaks, and predictors of these outcomes are poorly defined.
- The prognostic value of imaging markers of elevated ICP—such as posterior globe flattening, optic nerve tortuosity, meningocele, and empty sella—remains unclear.
- This study evaluates whether preoperative imaging and clinical factors are associated with subsequent CSF leak recurrence and clinical outcomes in patients with spontaneous CSF leaks.

Objective

Aim 1: Compare preoperative imaging markers of elevated ICP between patients with persistent IIH after CSF leak repair and those without persistent IIH.

Aim 2: Compare preoperative clinical features associated with IIH between patients with persistent IIH after CSF leak repair and those without persistent IIH.

Methods



Clinical Variables		Radiographic Features	
OSA	ICP Medications	Empty Sella	Optic N. Sheath Dilation
Symptom Duration	BMI + BMI Change	Posterior Globe Flattening	Optic N. Tortuosity
Leak Size	Sociodemographics + Comorbidities	Transverse Sinus Stenosis	Slit-Like Ventricles
Ocular pressure	Recurrent CSF leak	Meckel's Cave Enlarged	Cerebellar Tonsil Descent
ICP	Repair type		

- IRB-approved exploratory retrospective cohort study of patients >15 yrs old who had idiopathic CSF leak repair from 1/2015-7/2025
 - Single tertiary academic center
- Exclude: CSF leak from trauma or tumor
- Collect: Sociodemographics, MRI findings, Clinical Features
- Analysis Plan:
 - Compare Recurrent leak vs nonrecurrent leak cohorts based on clinical and imaging factors
- Analysis Methods
 - Univariable analysis
 - Data was compared between 2 groups using Wilcoxon rank sum test; Fisher's exact test; Wilcoxon rank sum exact test
 - Clinical Significance *a priori* defined as a 10% change
 - Statistical significance was considered $p < 0.05$.

Table 1: Sociodemographics

Characteristic	All, N=70	Resolved, N=61	Persistent, N=9
Age, years	56 (sd= 13)	56 (sd= 13)	54 (sd=12)
Female sex	82%	52 (85%)	6 (66%)
Race/ Ethnicity*			
White	58 (83%)	53 (87%)	5 (56%)
Black	12 (17%)	8 (13%)	4 (44%)
Hispanic	27 (34%)	25 (41%)	2 (22%)
Primary Language			
Spanish	27 (34%)	25 (41%)	2 (22%)

Table 2: Comparison of Clinical Characteristics

Characteristic	Resolved	Persistent	Odds Ratio	95% CI
BMI >30	34	32	1.0	(0.8, 1.1)
Diuretics	36	8	4.8	(.8, 92.3)
Defect Size, mm[#]	5	14	1.2	(1.0, 1.3)
Duration, Weeks	19	4	0.9	(0.8, 1.0)

*Clinically Significant; # Statistically Significant

Results

The study included 70 IIH subjects with mean age 56 years, 82% women

Subjects with persistent CSF leak (n=9) included a higher frequency of Black subjects and a small proportion identifying as White or Hispanic

Clinical Characteristics: Univariable logistic regression comparing resolved vs persistent CSF leak, larger defect size was associated with leak persistence

- Each 1-mm increase in defect size was associated with a 16 % increase in the odds of persistent CSF leak (OR 1.16, 95% CI 1.04–1.32, $p = 0.01$).
- BMI, use of diuretics, and duration of symptoms were not significantly associated with CSF leak persistence (all $p > 0.05$).

Radiographic Characteristics: Univariable logistic regression comparing resolved vs persistent CSF leak did not demonstrate that any radiographic features of elevated ICP were associated with persistent CSF leak.

- Assessment of Transverse sinus stenosis was performed in 9 cases
- Transverse sinus stenosis and cerebellar tonsil descent were rare
- Other imaging findings, including empty sella, optic nerve tortuosity, optic nerve sheath dilation, Meckel's cave enlargement, and slit-like ventricles, were not significantly associated with leak persistence (all $p > 0.05$).

Table 3: Radiographic Characteristic Comparison

Imaging Characteristics	N	Resolved (reference)	Persistent	Odds Ratio	95%, CI
Posterior Globe Flattening	67	22(33%)	1(11%)	0.22	0.01, 1.3
Transverse Sinus Stenosis	9	6(66%)	0(0%)	00	
Empty Sella	67	53(79%)	8(89%)	1.10	0.2, 21.2
Optic N. Tortuosity	67	42(63%)	5(55%)	0.56	0.1, 2.5
Optic N. Dilation	67	34(51%)	6(66%)	0.97	0.2, 5.0
Meckel's Cave Enlargement	67	20(30%)	2(22%)	0.54	0.1, 2.5
Cerebellar Tonsil Descent	67	3(.04%)	0(0%)	00	
Slit-Like Ventricles	67	37(55%)	6(66%)	1.14	0.3, 5.8

Conclusions

Larger size of defect was significantly associated with higher risk of persistent leak after initial repair of CSF Defect. Although some imaging findings such as empty Sella, optic nerve tortuosity, optic nerve dilation are shown in patients with IIH, these features were not associated with the rate of persistent vs resolved CSF rhinorrhea after repair .

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