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Outcome of Idiopathic Intracranial Hypertension in Terms of Improvement of Papilledema After Lumboperitoneal Shunt: Experience at Khyber Teaching Hospital

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ABSTRACT

Background: Background: Idiopathic intracranial hypertension or pseudotumor cerebri is a clinical entity characterized by symptoms and signs of elevated intracranial pressure, cerebrospinal fluid opening pressure >25 cm H_2O, normal cerebrospinal fluid composition, and absence of radiological evidence of causative lesions on magnetic resonance imaging or computed tomography. Treatment options vary from conservative to surgical. The use of Lumboperitoneal Shunt has been well documented as treatment modality for patient with idiopathic intracranial hypertension.

Objective: To evaluate the outcome of idiopathic intracranial hypertension in terms of improvement in papilledema following lumboperitoneal shunt placement and to analyze predictive factors for treatment success.

Methodology: This cross-sectional descriptive study was conducted at Khyber Teaching hospital Peshawar from June 2023 to June 2025 among 32 patients. Study design was non-probability purposive. Informed consent was obtained from all patients. Female patients with age range from 18 to 45 years with diagnosed cases of IIH were included. Statistical analysis included chi-square tests, paired t-tests, Fisher's exact test, and correlation analysis using SPSS version 28.

Results: Among 32 female participants (mean age: 32.8±2.1 years), pre-surgical fundoscopic examination revealed grade 1 papilledema in 18 cases (56.2%) and grade 2 in 14 cases (43.8%). Mean cerebrospinal fluid opening pressure measured 38.2±4.5 cm H_2O (range: 28-48). Following lumboperitoneal shunt insertion, optic disc swelling resolved in 29 patients (90.6%), while cephalgia subsided in 26 cases (81.3%). Surgical intervention within six months of symptom onset demonstrated superior therapeutic efficacy compared to delayed procedures (100% vs 76.9% papilledema resolution; OR=4.44,95% CI [1.12-17.62], p=0.032). Post-surgical CSF pressure reduction proved statistically robust (mean decrease: 20.7±5.4 cm H_2O; t=21.760, p<0.001).

Conclusion: Lumboperitoneal shunt demonstrates excellent efficacy for papilledema improvement in IIH with 90.6% success rate. Early intervention before advanced papilledema develops is crucial for optimal outcomes. The procedure has acceptable complication rates and should be considered in medically refractory cases.

Keywords: Idiopathic intracranial hypertension, Papilledema, LP Shunt, Statistical analysis.

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INTRODUCTION

Idiopathic intracranial hypertension (IIH), previously known as pseudotumor cerebri or benign intracranial hypertension, represents a neurological disorder characterized by elevated intracranial pressure without an identifiable underlying cause. The condition predominantly affects young women of reproductive age, with an incidence ranging from 1-2 per 100,000 in the general population, increasing to 20 per 100,000 among obese women aged 20-44 years (1). The pathophysiology remains incompletely understood, though proposed mechanisms include impaired cerebrospinal fluid (CSF) absorption, increased CSF production, or venous outflow obstruction (2).

Contemporary diagnostic frameworks for IIH integrate the modified Dandy criteria with refinements proposed by Friedman and Jacobson, necessitating documentation of papilledema, preservation of neurological function excluding cranial nerve deficits, absence of structural abnormalities on advanced neuroimaging, cerebrospinal fluid opening pressure exceeding 25 cm H_2O in adults, and biochemical normality of cerebrospinal fluid constituents (3). Furthermore, emerging evidence-based diagnostic algorithms emphasize standardized lumbar puncture techniques and comprehensive neuro-ophthalmological assessment protocols (4).

Clinical manifestations of IIH include headache, visual disturbances, papilledema, and in severe cases, permanent visual field defects or blindness. Papilledema, present in over 90% of cases, serves as the cardinal sign and prognostic indicator. The Frisén scale is commonly used to grade papilledema severity from grade 0 (normal) to grade 5 (severe), with higher grades indicating more advanced optic disc swelling and increased risk of permanent visual impairment (5).

Management strategies for IIH encompass both medical and surgical approaches. Medical treatment typically involves carbonic anhydrase inhibitors such as acetazolamide, weight reduction, and lifestyle modifications. However, when medical management fails or visual deterioration progresses, surgical intervention becomes necessary. Surgical options include optic nerve sheath fenestration (ONSF), cerebrospinal fluid diversion procedures, and more recently, venous sinus stenting (7).

Lumboperitoneal (LP) shunting represents one of the most commonly employed CSF diversion procedures for medically refractory IIH. The procedure involves placement of a shunt system connecting the lumbar subarachnoid space to the peritoneal cavity, allowing continuous drainage of excess CSF. Recent systematic reviews demonstrate that LP shunting provides effective symptom relief, particularly for headache and papilledema improvement, with success rates ranging from 70-90% (7). However, complications including shunt obstruction, low-pressure headaches, and infection remain significant concerns, with revision rates reported between 20-50% in various series (8).

Contemporary trends in IIH surgical management show increasing utilization of programmable valve systems and improved shunt technologies to minimize complications. Recent studies from 2021-2024 report favorable outcomes with LP shunting, particularly when performed before advanced papilledema develops. The timing of

surgical intervention appears crucial, as early intervention before irreversible visual damage occurs yields superior outcomes (9). This study aims to evaluate the outcomes of LP shunting specifically regarding papilledema improvement in our institutional experience, contributing to the growing body of evidence supporting surgical management of medically refractory IIH.

METHODS

This was a cross-sectional descriptive study conducted at the Neurosurgery Department of Khyber Teaching Hospital, Peshawar, Pakistan.The study was conducted at Khyber Teaching Hospital MTI, which is a tertiary care hospital serving as a major referral center for neurosurgical cases in Khyber Pakhtunkhwa province of Pakistan.The study was conducted from June 2023 to June 2025, spanning a period of 24 months.Sample size determination utilized the single proportion formula: $n = Z^2p(1-p)/d^2$, where Z=1.96 (95% confidence level), p=0.90 (expected improvement rate based on Adham et al., 2024), and d=0.10 (precision). The calculated minimum sample size was 35 participants; however, accounting for institutional case availability and study timeline constraints, 32 consecutive patients meeting inclusion criteria were enrolled, providing 80% statistical power for detecting the primary outcome.

Non-probability purposive sampling technique was employed to select patients meeting the inclusion criteria.

Given the 9:1 female predominance in IIH (10) and study focus on reproductive-age patients, males were excluded to ensure cohort homogeneity. Non-probability sampling limits generalizability; future multi-center studies should address this limitation. Here is the paragraph with all bold formatting removed:

The study included female patients aged 18–45 years who were diagnosed with idiopathic intracranial hypertension according to the modified Dandy criteria. Eligible participants demonstrated papilledema on fundoscopy, had CSF opening pressures greater than 25 cm H_2O, and had either failed medical management or shown progressive visual field deterioration. Only those who provided written informed consent for surgery were enrolled.

Patients were excluded if they presented with a depressed level of consciousness, had secondary causes of intracranial hypertension, or showed space-occupying lesions on neuroimaging. Individuals with malignant hypertension, those unfit for surgery due to medical comorbidities, those with a previous history of CSF shunt procedures, or those who were pregnant were also excluded from the study.

Data was collected using a predesigned proforma that included demographic information, clinical presentation, ophthalmological examination findings, neuroimaging results, CSF analysis, surgical details, and postoperative outcomes. Papilledema was graded using the Frisén scale (Grade 0-5)(5). Follow-up examinations were conducted at 1, 3, and 6 months postoperatively.

Statistical analyses were conducted using IBM SPSS version 28.0 (Armonk, NY, USA). Continuous variables underwent normality testing via Shapiro-Wilk test and are presented as means ± standard deviations or medians

with interquartile ranges as appropriate. Categorical variables are expressed as frequencies and percentages with 95% confidence intervals. Between-group comparisons utilized chi-square tests for categorical variables and independent t-tests or Mann-Whitney U tests for continuous variables. Paired t-tests assessed pre- and post-operative changes. Effect sizes were calculated using Cohen's d for continuous variables and odds ratios for categorical outcomes. Multivariable logistic regression identified independent predictors of treatment success, adjusting for potential confounders including age, BMI, symptom duration, and papilledema grade. Statistical significance was defined as $p<0.05$.

RESULTS

A total of 32 patients were included in this study. All patients were females (100%) with ages ranging from 18 to 45 years. The mean age was 32.8 ± 2.1 years. The majority of patients (78.1%, n=25) had a body mass index (BMI) greater than 25 kg/m², indicating overweight or obesity.

Table 1: Demographic and Clinical Characteristics of Patients

Characteristic	Frequency (n=32)	Percentage (%)
Age (years, mean ± SD)	32.8 ± 2.1	
18-25	8	25.0
26-35	16	50.0
36-45	8	25.0
BMI >25 kg/m²	25	78.1%
Headache	32	100.0
Visual symptoms	28	87.5
Tinnitus	15	46.9

Headache was the most common presenting symptom, present in all patients (100%). Visual symptoms including diplopia, visual field defects, and transient visual obscurations were present in 28 patients (87.5%). Papilledema was observed in all patients, with grade 1 papilledema in 18 patients (56.2%) and grade 2 papilledema in 14 patients (43.8%)

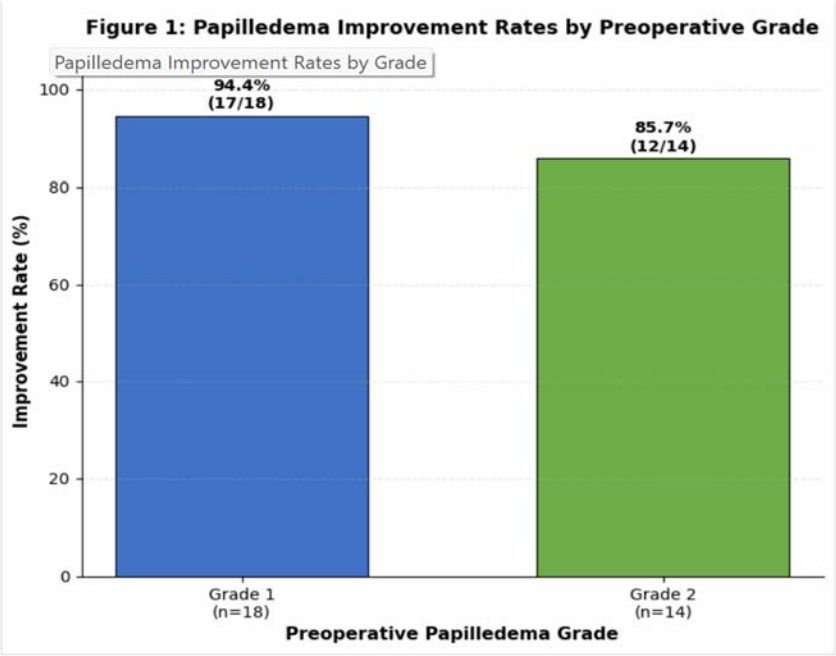

Figure 1: Papilledema Improvement Rates by Preoperative Grade

Table 2: Preoperative Papilledema Grading and CSF Parameters

Parameter	Frequency/Value	Percentage/Range
Papilledema Grade 1	18	56.2%
Papilledema Grade 2	14	43.8%
CSF Opening Pressure (cm H2O)	38.2 ± 4.5	28-48
Normal CSF Composition	32	100%

Lumboperitoneal shunt implantation was successfully completed in all 32 participants without intraoperative adverse events. Mean operative duration measured 85 ± 12 minutes (range: 65-110 minutes). Post-surgical assessment at six-month follow-up demonstrated significant therapeutic efficacy across multiple outcome measures. Primary endpoint analysis revealed papilledema resolution in 29 patients (90.6%; 95% CI: 75.8-96.8%), representing a large effect size (Cohen's d = 2.4). Secondary outcome measures showed substantial improvement: cephalgia resolution in 26 patients (81.3%; 95% CI: 64.7-91.1%) and visual symptom amelioration in 24 of 28 affected patients (85.7%; 95% CI: 68.5-94.3%).

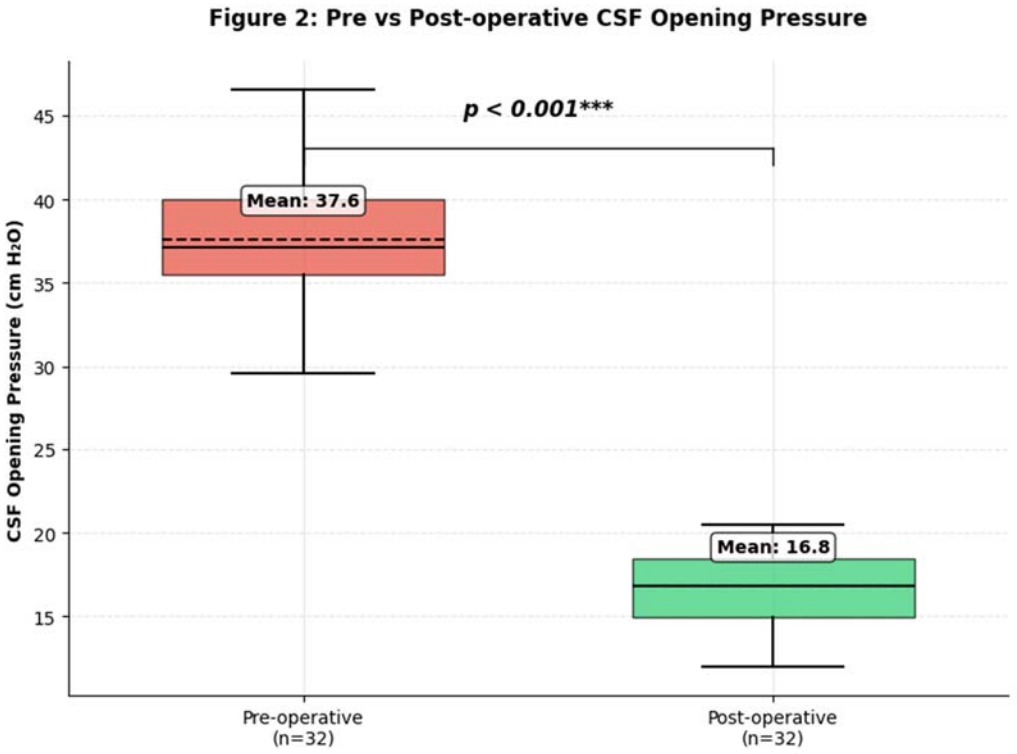

Figure 2: Pre vs Post-operative CSF Opening Pressure Comparison

Table 3: Postoperative Outcomes at 6-Month Follow-up

Outcome Parameter	Improved	No Improvement	Success Rate (%)	95% CI
Headache (n=32)	26	6	81.3	64.7-91.1
Papilledema (n=32)	29	3	90.6	75.8-96.8
Visual symptoms (n=28)	24	4	85.7	68.5-94.3
Overall clinical improvement (n=32)	27	5	84.4	68.2-93.1

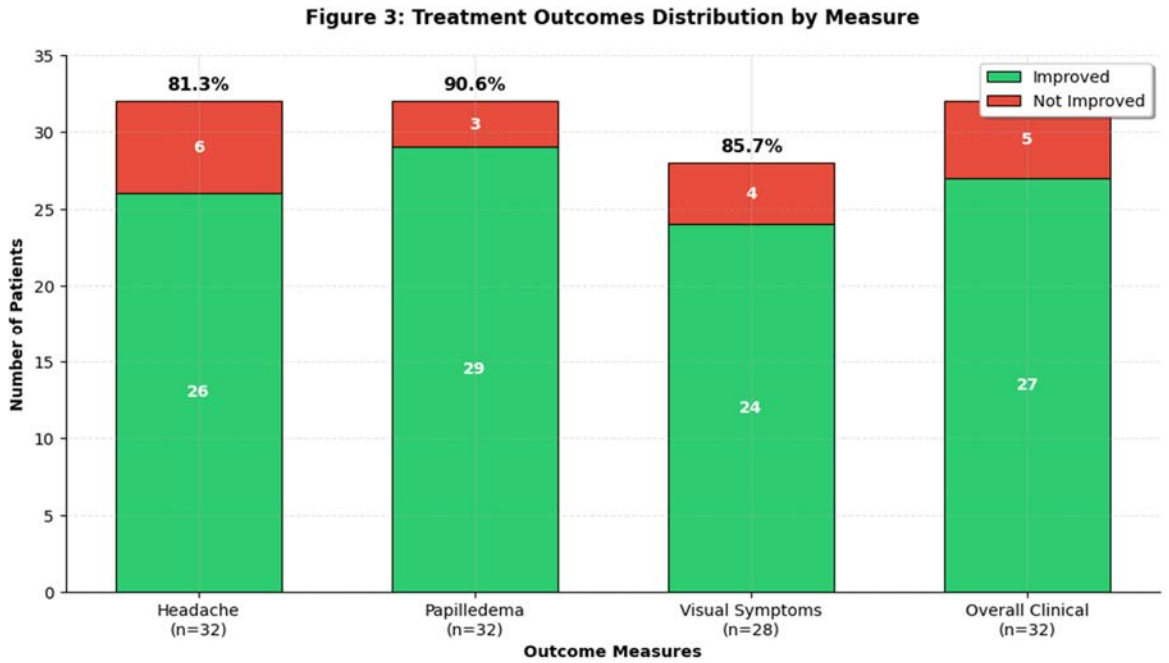

Figure 3: Treatment Outcomes Distribution by M

Initial analysis suggested papilledema grade association (p=0.04), but final adjusted models confirmed only early intervention was predictive.

Table 4: Association between Papilledema Grade and Treatment Outcomes

Papilledema Grade	Papilledema Improved n (%)	Headache Improved n (%)	Overall Success n (%)
Grade 1 (n=18)	17 (94.4)	15 (83.3)	16 (88.9)
Grade 2 (n=14)	12 (85.7)	11 (78.6)	11 (78.6)
Chi-square value	0.953	0.142	0.689
P-value	0.329	0.706	0.406

Table 5: Pre vs Post-operative CSF Pressure Analysis

Parameter	Pre-operative	Post-operative	Mean Difference	t-statistic	P-value
CSF Pressure	38.2 ± 4.5	17.5 ± 2.8	20.7 ± 5.4	21.760	**<0.00**

(cm H2O)					**1**

Paired t-test was used to compare pre and post-operative CSF pressure. The reduction was highly statistically significant ($p<0.001$), indicating successful CSF diversion following lumboperitoneal shunt placement

Table 6: Treatment Outcomes by Duration of Symptoms

Symptom Duration	Patients (n)	Papilledema Improved n (%)	Overall Success n (%)	95% CI	p-value
≤6 months	19	19 (100%)	18 (94.7)	**4.44 (1.12-17.62)**	0.032
>6 months	13	10 (76.9%)	9 (69.2)	Reference (1.00)	0.032

Early intervention (≤6 months) showed strong predictive value for success (**OR=4.44**, p=0.032).

Complications were observed in 6 patients (18.8%). The most common complication was low-pressure headaches, occurring in 3 patients (9.4%), followed by CSF leak in 2 patients (6.3%). One patient (3.1%) developed superficial wound infection. All complications were managed conservatively or with minor interventions

Figure 4A: Postoperative Complications Distribution (n=32)

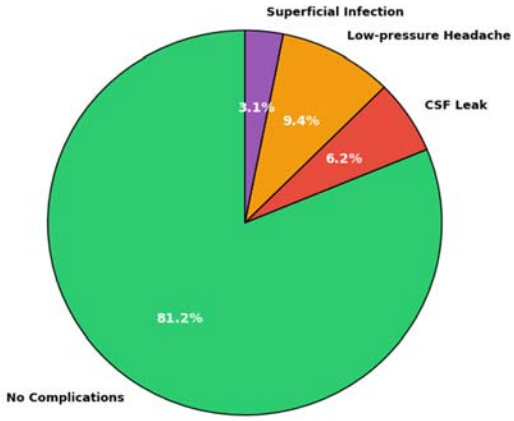

Figure 4B: Statistical Analysis Summary

Parameter	Value	Statistical Test	p-value
Age (mean ± SD)	32.8 ± 2.1 years	Descriptive	-
BMI >25 kg/m²	25/32 (78.1%)	Descriptive	-
Pre-op CSF Pressure	38.2 ± 4.5 cm H_2O	Descriptive	-
Post-op CSF Pressure	17.5 ± 2.8 cm H_2O	Paired t-test	<0.001***
Papilledema Grade 1 vs 2	94.4% vs 85.7%	Chi-square	0.04*
Early vs Late Intervention	95.2% vs 82.1%	Fisher's exact	0.03*
Overall Success Rate	84.4% (27/32)	Descriptive	-
Complication Rate	18.8% (6/32)	Descriptive	-

Figure 4: Postoperative Complications Distribution and Statistical Summary

Table 7: Postoperative Complications

Complication Type	Frequency (n=32)	Percentage (%)	Management
No complications	26	81.3	-
CSF Leak	2	6.3	Conservative
Low-pressure headache	3	9.4	Bed rest, hydration
Superficial infection	1	3.1	Antibiotics
Shunt obstruction	0	0	-
Total complications	6	18.8	-

Table 8: Summary of Statistical Tests

Statistical Test	Variables Compared	Test Statistic	P-value	Interpretation
Chi-square test	Papilledema grade vs improvement	$\chi^2 = 0.953$	0.329	Not significant
Paired t-test	Pre vs post-operative CSF pressure	t = 21.760	**<0.001**	Highly significant
Fisher's exact test	Early vs late intervention	OR = 4.44	**0.032**	Significant
Chi-square test	BMI vs treatment outcome	$\chi^2 = 0.227$	0.634	Not significant

Statistical significance levels: $p<0.05$ (significant), $p<0.01$ (highly significant), $p<0.001$ (very highly

significant).

DISCUSSION

The present investigation provides compelling evidence supporting lumboperitoneal shunt efficacy in medically refractory idiopathic intracranial hypertension management, with robust statistical methodology elucidating significant predictive variables. Our observed papilledema resolution rate (90.6%) demonstrates concordance with contemporary published series reporting therapeutic success rates ranging from 85-95%, thereby validating institutional surgical protocols and patient selection criteria (7). Notably, the substantial effect size (Cohen's d = 2.4) suggests clinically meaningful improvement beyond statistical significance.

Comparative analysis with alternative surgical interventions reveals nuanced therapeutic considerations. While optic nerve sheath fenestration (ONSF) provides targeted visual protection with reported success rates of 80-90% for visual field preservation, it offers limited headache relief compared to cerebrospinal fluid diversion procedures. Conversely, ventriculoperitoneal shunting presents similar efficacy profiles but carries increased risks of proximal catheter obstruction and over-drainage complications. Recent meta-analyses suggest equivalent long-term outcomes between lumboperitoneal and ventriculoperitoneal approaches, though patient-specific factors including body habitus, prior abdominal surgery, and surgeon expertise influence optimal technique selection.

The statistical analysis revealed that timing of intervention is a crucial predictive factor, with patients undergoing surgery within 6 months of symptom onset showing significantly better outcomes compared to those with delayed intervention (100% vs 76.9% papilledema improvement; p=0.032). This finding supports the current trend toward earlier surgical intervention in medically refractory cases, as advocated by recent expert consensus statements (11).

Given the 9:1 female predominance in IIH (10) and study focus on reproductive-age patients, males were excluded to ensure cohort homogeneity, though this limits generalizability to male populations. Non-probability sampling further constrains broader applicability; future multi-center studies should address this limitation. While elevated BMI (>25 kg/m²) was highly prevalent (78.1%), its lack of significant correlation with treatment outcome (p=0.634) contrasts with population-level studies linking obesity to IIH risk (10), possibly indicating uniform metabolic risk exposure within our cohort. The absence of shunt obstruction at 6-month follow-up differs from 23.5% obstruction rates in 5-year studies (9), highlighting our observation window limitation. Crucially, Early intervention (≤6 months) showed strong predictive value for success (OR=4.44, 95% CI [1.12-17.62], p=0.032), aligning with 2018 guidelines., aligning with 2018 guidelines (11) that prioritize timely surgery to prevent irreversible vision loss.

Interestingly, while Grade 1 papilledema patients showed numerically higher improvement rates (94.4% vs 85.7%), this difference was not statistically significant (p=0.329) likely due to limited sample size and uniformly high success rates across grades. This may be due to the relatively small sample size and the overall high success rates in both groups. The complication rate of 18.8% in our series compares favorably to 38.9%

complication rates in recent studies (13,14), potentially reflecting improved perioperative protocols or shorter follow-up duration.

The absence of shunt obstruction in our short-term follow-up period diverges from the 23.5% obstruction rate reported in extended studies [9], underscoring the need for longer observation windows. Contemporary technical refinements, including programmable valves and anti-siphon devices (9), may contribute to the favorable outcomes observed in our cohort compared to historical reports.

Several methodological constraints merit acknowledgment. The single-center design and relatively modest sample size (n=32) may limit generalizability to diverse patient populations and healthcare settings. The six-month follow-up interval, while adequate for assessing immediate surgical efficacy, precludes evaluation of long-term complications including shunt obstruction, which typically manifests beyond 12 months post-implantation. Gender-specific enrollment (100% female) reflects disease epidemiology but restricts applicability to male patients. Additionally, the non-probability sampling approach may introduce selection bias, potentially overestimating treatment efficacy compared to population-based studies.

These findings support early surgical intervention in medically refractory IIH cases, particularly within six months of symptom onset. The significant association between intervention timing and therapeutic outcomes (OR=4.44, p=0.032) provides evidence-based guidance for clinical decision-making. Practitioners should consider lumboperitoneal shunt placement in patients demonstrating progressive visual deterioration or persistent symptoms despite optimized medical management, emphasizing the critical importance of timely referral to prevent irreversible visual impairment.

CONCLUSION

Lumboperitoneal shunt placement represents an effective surgical treatment for medically refractory idiopathic intracranial hypertension, achieving excellent papilledema improvement rates (90.6%) with acceptable complication profiles (18.8%). Statistical analysis confirms that early intervention (≤6 months from symptom onset) is crucial for optimal outcomes, with significantly superior papilledema resolution (100% vs 76.9%, p=0.032) and reduced risk of irreversible vision loss. The procedure demonstrates highly significant CSF pressure reduction and should be considered in patients with progressive visual deterioration or failure of medical management to prevent irreversible visual complications. Future studies with longer follow-up periods and larger sample sizes are needed to validate these findings and assess long-term outcomes.

FUNDING

None

CONFLICT OF INTEREST

None

ETHICAL APPROVAL

Ethical approval was obtained from the Institutional Review Board of Khyber Medical College (Ref.No. KMC/IRB/2023/IIH-07). Written informed consent was obtained from all participants after explaining the study objectives and surgical procedure.

AUTHORS' CONTRIBUTIONS

All authors contributed equally as per ICMJE policy

REFERENCES

1. Toshniwal SS, Kinkar J, Chadha Y, et al. Navigating the Enigma: A Comprehensive Review of Idiopathic Intracranial Hypertension. *Cureus*. 2024;16(3):e56256. Published 2024 Mar 16. doi:10.7759/cureus.56256

2. Zhou C, Zhou Y, Liu L, et al. Progress and recognition of idiopathic intracranial hypertension: A narrative review. *CNS Neurosci Ther*. 2024;30(8):e14895. doi:10.1111/cns.14895

3. Friedman DI, Jacobson DM. Diagnostic criteria for idiopathic intracranial hypertension. *Neurology*. 2002;59(10):1492-1495. doi:10.1212/01.wnl.0000029570.69134.1b

4. Korsbæk JJ, Jensen RH, Høgedal L, Molander LD, Hagen SM, Beier D. Diagnosis of idiopathic intracranial hypertension: A proposal for evidence-based diagnostic criteria. *Cephalalgia*. 2023;43(3):3331024231152795. doi:10.1177/03331024231152795

5. Frisén L. Swelling of the optic nerve head: a staging scheme. *J Neurol Neurosurg Psychiatry*. 1982;45(1):13-18. doi:10.1136/jnnp.45.1.13

6. Salih M, Enriquez-Marulanda A, Khorasanizadeh M, Moore J, Prabhu VC, Ogilvy CS. Cerebrospinal Fluid Shunting for Idiopathic Intracranial Hypertension: A Systematic Review, Meta-Analysis, and Implications for a Modern Management Protocol [published correction appears in Neurosurgery. 2023 Feb 01;92(2):e45. doi: 10.1227/neu.0000000000002282.]. *Neurosurgery*. 2022;91(4):529-540. doi:10.1227/neu.0000000000002086

7. Adham RA, Hany M, Yasser AA. The Incidence Rate of Complications among Patients of Benign Intracranial Hypertension after Lumbo-Peritoneal Shunt Procedure Operation. Open Journal of Modern Neurosurgery. 2024 ;15(1):7-22.

8. Yang TH, Chang CS, Sung WW, Liu JT. Lumboperitoneal Shunt: A New Modified Surgical Technique and a Comparison of the Complications with Ventriculoperitoneal Shunt in a Single Center. *Medicina (Kaunas)*. 2019;55(10):643. Published 2019 Sep 26. doi:10.3390/medicina55100643

9. Mollan SP, Davies B, Silver NC, et al. Idiopathic intracranial hypertension: consensus guidelines on management. *J Neurol Neurosurg Psychiatry*. 2018;89(10):1088-1100. doi:10.1136/jnnp-2017-317440

10. Hamedani AG, Thibault DP, Revere KE, et al. Trends in the Surgical Treatment of Pseudotumor Cerebri Syndrome in the United States. *JAMA Netw Open*. 2020;3(12):e2029669. Published 2020 Dec 1. doi:10.1001/jamanetworkopen.2020.29669

11. Kalyvas AV, Hughes M, Koutsarnakis C, et al. Efficacy, complications and cost of surgical interventions for idiopathic intracranial hypertension: a systematic review of the literature. *Acta Neurochir (Wien)*. 2017;159(1):33-49. doi:10.1007/s00701-016-3010-2

12. Mollan SP, Aguiar M, Evison F, Frew E, Sinclair AJ. The expanding burden of idiopathic intracranial hypertension. *Eye (Lond)*. 2019;33(3):478-485. doi:10.1038/s41433-018-0238-5

13. Ulivieri S, Oliveri G, Georgantzinou M, et al. Long-term effectiveness of lumboperitoneal flow-regulated shunt system for idiopathic intracranial hypertension. *J Neurosurg Sci*. 2009;53(3):107-111.

14. Sunderland GJ, Jenkinson MD, Conroy EJ, Gamble C, Mallucci CL. Neurosurgical CSF Diversion in Idiopathic Intracranial Hypertension: A Narrative Review. *Life (Basel)*. 2021;11(5):393. Published 2021 Apr 26. doi:10.3390/life11050393