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# Should a VP or LP Shunt be Used for the Treatment of Pseudotumorcerebri in Adults?

**Hassan Kadri[1], Raed Abouharb[2], Rostom Mackieh[1], Rafik Haider[1], Tim Kadri[3]**

[1]Faculty of Medicine, Department of Neurosurgery, Damascus University, Damascus, Syria
[2]Faculty of Medicine, Department of Internal Medicine, Damascus University, Damascus, Syria
[3]Department of Statistics, MSRC, Damascus, Syria
Email: drkadri@yahoo.com

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## Abstract

**Introduction:** Pseudotumorcerebri(PTC) is a condition characterized by false brain tumor symptoms, caused by high intracranial pressure (ICP). Treatment options include medication, weight loss, surgery, and shunting. Shunting, either ventriculoperitoneal (VP) or lumboperitoneal (LP), emerged as the preferred method of treatment, but there is an ongoing debate as to which technique should be prioritized. The aim of this study is to gather additional evidence to determine the optimal type of shunt for treating PTC. **Materials and Methods:** Ninety patients with PTC were studied at Damascus University between 2016 and 2021. The study monitored symptoms before and after treatment, with improvement related to the technique used (VP or LP shunts). Of all patients, 83 were women and 7 were men. In addition, complications were analyzed. **Results:** Both shunts showed similar postoperative rates of symptom improvement, but VP shunts were utilized more frequently overall in this study. Patients who received LP shunt surgery had a higher rate of postoperative complications compared to those who received VP shunt surgery, but the chi-squared analysis did not provide sufficient evidence to confirm a significant relationship between the type of surgery and the occurrence of postoperative complications. **Conclusion:** Despite ongoing controversy about the optimal treatment for benign intracranial hypertension (BTC), most authors approved the trend of using VP (ventriculoperitoneal) shunts, given a lower rate of complications. However, there is no statistically significant difference between outcomes of VP and LP (lumboperitoneal) shunting techniques, according to our research.

## Keywords

Pseudotumorcerebri (PTC), Benign Intracranial Hypertension (BTC), Ventriculoperitoneal (VP) Shunt, Lumboperitoneal (LP) Shunt,

Cerebrospinal Fluid (CSF)

## 1. Introduction

Pseudotumorcerebri (PTC) is a condition that results in false brain tumor symptoms, caused by high intracranial pressure (ICP). It is most common in women between the ages of 20 and 50. Obesity, treatable diseases, and certain medications can lead to raised intracranial pressure and symptoms of pseudotumorcerebri [1].

Diagnosis is determined through medical history and physical examination, followed by close, repeated ophthalmologic exams. Treatments may include medication to reduce thecerebrospinal fluid (CSF), weight loss through dieting or surgery, and cessation of certain medications. In some cases, surgery may be required to remove pressure on the optic nerve, or therapeutic shunting may be necessary to drain excess CSF [2] [3]. The condition can lead to permanent vision loss, and may recur [4].

The shunt has become the preferred method of treatment for PTC, with options that include ventriculoperitoneal (VP) or lumboperitoneal (LP) shunts [3] [5]. Yet, there is debate regarding which technique should be standardized. The objective of this study is to provide evidence about the optimal choice in terms of shunt type.

## 2. Materials and Methods

This is a retrospective cohort study of 90 patients, admitted to two different departments of neurosurgery at Damascus University between 2016 and 2021. The age at diagnosis ranged from 33 to 67 years: all patients were diagnosed with PTC, based on brain magnetic resonance imaging (MRI) and multiple ophthalmological investigations. The follow-up period was from 3 months to 3 years.

All symptoms were monitored before and after the procedure, as improvement was related to the technique used. Of 90 patients, 83 (92%) were women, and 7 (8%) were men. Among the women, 60 had VP shunt and 23 had LP shunt. Among men, 3 had VP shunt and 2 had LP shunt. Complications such as infection, malfunctioning, poor positioning, overdrainage, secondary Chiari, lumbago, and death were also analyzed. We excluded patients who refused to participate in the study, those who did not receive surgical treatment, and those who were lost to follow-up.

## 3. Results

Given 90 patients who were diagnosed with benign intracranial hypertension (BTC), 65 (5 male, 60 female) received a VP shunt insertion, and 25 (2 male, 23 female) received the LP shunt. At diagnosis, 86 patients had headaches, 63 had visual deterioration, 23 had visual field narrowing, 88 had papilledema, and 25

had visual impairment (VI) nerve palsy. Table 1 shows the preoperative distribution of symptoms and subsequent surgical interventions.

Table 2 displays postoperative distribution of symptoms and subsequent surgical interventions.

Based on Table 1 and Table 2, it is difficult to determine the best shunt, as both VP and LP shunts appear to have similar rates of postoperative symptom improvement. However, VP shunts were utilized more frequently in this study (65 patients received them compared to 25 patients who received LP shunts).

P-values indicate the probability of identifying the observed chi-squared value or a more extreme value, assuming no significant association between the type of shunt and the presence or absence of symptoms. In addition, improvement occurred in both groups without a significant difference.

Regarding postoperative complications in patients after surgery, infection was encountered in 7, shunt malfunctioning in 23, catheter malpositioning in 6, over drainage in 3, secondary Chiari in 1, lumbago in 2, and 1 patient passed away. Table 3 below displays postoperative complications and surgical interventions.

It appears that patients who received LP shunt surgery had a higher rate of postoperative complications compared to those who received VP shunt surgery. However, assuming a significance level of 0.05, the critical value of the chi-squared distribution, with 6 degrees of freedom, was 12.59. Our calculated chi-squared value of 8.03 is less than the critical value, so no definitive conclusions about the relationship between the type of surgery and the occurrence of postoperative complications can be established (based on data provided in Table 3). This is a small dataset, so further analysis will be needed to confirm these findings.

**Table 1.** Preoperative distribution of symptoms.

| | LP shunt 25 | VP shunt 65 |
|---|---|---|
| Headaches | 23 (96%) | 62 (82.7%) |
| Visual deterioration | 18 (72%) | 45 (60%) |
| Visual field narrowing | 7 (25%) | 16 (21.3%) |
| Papilledema | 25 (100%) | 63 (84%) |
| VI nerve palsy | 8 (32%) | 17 (22.7%) |

**Table 2.** Postoperative distribution of symptoms.

| | LP shunt 25 | VP shunt 65 |
|---|---|---|
| Headaches | 1 (4%) | 2 (3%) |
| Visual deterioration | 4 (16%) | 6 (9%) |
| Visual field narrowing | 1 (4%) | 2 (3%) |
| Papilledema | 2 (8%) | 3 (4.5%) |
| VI nerve palsy | 1 (4%) | 2 (3%) |

**Table 3.** Postoperative complications and surgical interventions

| | LP shunt 25 | VP shunt 65 |
|---|---|---|
| Infection | 4 (16%) | 3 (4.5%) |
| Shunt malfunctioning | 13 (52%) | 10 (15%) |
| Catheter positioning | 2 (8%) | 4 (6%) |
| Overdrainage | 3 (12%) | 0 |
| Secondary Chiari | 1 (4%) | 0 |
| Lumbago | 1 (4%) | 0 |
| Death | 1 (4%) | 0 |

## 4. Discussion

The primary method of treating PTC by draining CSF is shunt surgery, which can be performed using a LP shunt or a VP shunt. However, LP shunts are associated with higher failure rates compared to VP shunts [6]. Nevertheless, there is a lack of consistency in the reporting of significant complications with each technique [7].

The aim of this study was to comprehensively understand rates of improvement and complications associated with the insertion of LP or VP shunts for PTC patients.

Several authors reported no difference between the efficacy of LP and VP shunt techniques [8]; these findings suggest that LP and VP shunts have comparable rates of failure and complications. Moreover, regardless of shunt type, a shorter time to the first shunt failure may predict subsequent shunt failures.

One study favored the use of VP shunts, concluding that VP shunt is associated with increased safety and lower rates of complications and re-interventions compared to LP shunts [9]. Another study reported the shunt revision rate as high as 40.9%, with increasing patient age as the only predictor of shunt revision. The study found that shunt malfunction was significantly higher in patients with LP shunts, while there was no significant difference in infection between the two techniques [10]. As such, some recommend the use of VP shunts for the treatment of PTC, as it is associated with a lower risk of shunt obstruction and revision compared to LP shunts [11].

Some authors raise concerns about the appropriateness of the LP shunt as a first-line treatment for PTC, due to its significant propensity for revision, longer period of hospitalization, and higher healthcare expenses, rendering it a costly procedure [12]. Conversely, some evidence suggests that both LP and VP shunts are effective in managing all clinical presentations of PTC in the early postoperative stage. Although VP shunts have slightly higher failure rates (14%) than LP shunts (11%), LP shunts tend to have higher revision rates (60%) than VP shunts (30%) [13].

There has been a suggestion to use the LP shunt as an alternative when the VP

shunt fails [14]. In addition, the use of a programmable LP shunt may potentially decrease complications compared to the conventional LP and programmable VP shunt systems, and thus avoiding brain injury and overdrainage [15].

VP shunt failure is a common complication, occurring at a reported rate of 18.7% [16]. In our study, despite the higher incidence of complications such as infection, shunt malfunction, catheter malpositioning, overdrainage, Chiari, lumbago, and death—in patients who underwent LP shunt placement, statistical analysis did not reveal a significant relationship between shunt type and postoperative complications. Thus, based on available data, no definitive conclusions can be drawn regarding the association between shunt type and postoperative complications.

## 5. Conclusion

While some data favors the use of VP shunts over LP shunts for treating PTC, no conclusions can be drawn regarding the association between shunt type and postoperative complications. The decision about which shunt technique to use must be made on a case-by-case basis, considering the patient's needs and potential risks, as well as the benefits of each technique. Our research found that despite ongoing controversy over the optimal choice for treating BTC, most authors favored VP shunts due to the lower rate of complications. Yet, we found no statistically significant difference in outcomes between VP and LP shunting.

## 6. Declaration

Ethical approval for research completion was obtained from Moassat University Hospital, Assad University Hospital, and the Faculty of Medicine of Damascus University. Our data is available in the Medical Record Department at the Faculty of Medicine, Damascus University.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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