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Should a VP or LP shunt be used for the treatment of pseudo tumor cerebri in adults?

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SUMMARY

Introduction: Pseudotumor Cerebri (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 Ventriculo Peritoneal (VP) or Lumbo Peritoneal (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 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 (Ventriculo Peritoneal) shunts, given a lower rate of complications. However, there is no statistically significant difference between outcomes of VP and LP (Lumbo Peritoneal) shunting techniques, according to our research.

Keywords: Pseudotumor Cerebri (PTC); Benign intracranial hypertension; Ventriculo Peritoneal (VP) shunt; Lumbo Peritoneal (LP) shunt; Cerebrospinal Fluid (CSF); For Benign Intracranial Hypertension (BTC)

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INTRODUCTION

Pseudo Tumor Cerebri (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 pseudotumor cerebri [1].

Diagnosis is determined through medical history and physical examination, followed by close, repeated ophthalmologic exams. Treatments may include medication to reduce the Cerebrospinal 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 Ventriculo Peritoneal (VP) or Lumbo Peritoneal (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.

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 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.

RESULTS

Given 90 patients who were diagnosed with PTC, 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 **(Tab. 1. and Tab. 2.)**.

Based on Tables 1 and 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 type of shunt and 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, overdrainage in 3, secondary Chiari in 1, lumbago in 2, and 1 patient passed away. Table 3 below displays postoperative complications and surgical interventions **(Tab. 3.)**.

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.

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 treatment of PTC, as it is associated with a lower risk of shunt obstruction and revision compared to LP shunts [11].

Tab. 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%)

Tab. 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%)

Tab. 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

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 over drainage [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 [17-21].

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.

DECLARATION

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CONFLICTS OF INTEREST

All Authors declare that there is no conflict of interest.

ETHICS APPROVAL

Ethical approval for this research was obtained from both CUH and AUH, as well as from the Faculty of Medicine at Damascus University.

CONSENT TO PARTICIPATE

All patients or legally authorized representatives provided consent for participation and for the publication of their medical data and images. Patients who did not consent to the anonymous publication of their medical data were excluded from the study

WRITTEN CONSENT FOR PUBLICATION

Informed consent was obtained from all subjects and/or their legal guardian(s).

AVAILABILITY OF DATA AND MATERIAL

All data and medical information used in this study are available in the archives of the Children's University Hospital in Damascus, Syria and can be verified upon request.

CODE AVAILABILITY

NA.

AUTHORS' CONTRIBUTIONS

Hassan Kadri wrote the main text.

Raed Abouharb reviewed the text.

Rafik Haider data collection.

Tim Kadri checked the statistic data.

REFERENCES

1. **Mallery RM, Friedman DI, Liu GT.** Headache and the pseudotumor cerebri syndrome. *Curr Pain Headache Rep*. 2014;18:1-8.
2. **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):2029669.
3. **Thurtell MJ, Wall M.** Idiopathic intracranial hypertension (pseudotumor cerebri): Recognition, treatment, and ongoing management. *Curr Treat Options Neurol*. 2013; 15:1-2.
4. **Ahmed RM, Zmudzki F, Parker GD, et al.** Transverse sinus stenting for pseudotumor cerebri: A cost comparison with CSF shunting. *Am J Neuroradiol.* 2014;35(5):952-958.
5. **McGirt MJ, Woodworth G, Thomas G, et al.** Cerebrospinal fluid shunt placement for pseudotumor cerebri—associated intractable headache: Predictors of treatment response and an analysis of long-term outcomes*. J Neurosurg*. 2004;101(4):627-632.
6. **Jusué-Torres I, Hoffberger JB, Rigamonti D.** Complications of lumboperitoneal shunts for idiopathic intracranial hypertension. *Cureus*. 2014;6(7).
7. **Brazis PW.** Clinical review: The surgical treatment of idiopathic pseudotumour cerebri (idiopathic intracranial hypertension). *Cephalalgia*. 2008;28(12):1361-1373.
8. **El Shafie RA, Paul A, Bernhardt D, et al.** Robotic radiosurgery for brain metastases diagnosed with either SPACE or MPRAGE sequence (CYBER-SPACE)—a single-center prospective randomized trial. *Neurosurg*. 2019;84(1):253-260.
9. De Oliveira AJ, Pinto FC, Teixeira MJ. Comparative study of the effectiveness of lumboperitoneal and ventriculoperitoneal shunting with neuronavigation in the treatment of idiopathic intracranial hypertension. Neurology India. 2020;68(5):1061.
10. **Sweid A, Daou BJ, Weinberg JH, et al.** Experience with ventriculoperitoneal and lumboperitoneal shunting for the treatment of idiopathic intracranial hypertension: A single institution series. *Oper Neurosurg*. 2021;21(2):57-62.
11. **McGirt MJ, Woodworth G, Thomas G, et al.** Cerebrospinal fluid shunt placement for pseudotumor cerebri—associated intractable headache: Predictors of treatment response and an analysis of long-term outcomes. *J Neurosurg*. 2004;101(4):627-632.
12. **Menger RP, Connor DE, Thakur JD, et al.** A comparison of lumboperitoneal and ventriculoperitoneal shunting for idiopathic intracranial hypertension: An analysis of economic impact and complications using the Nationwide Inpatient Sample. *Neurosurg Focus*. 2014; 37(5):E4.
13. **Abubaker K, Ali Z, Raza K, et al.** Idiopathic intracranial hypertension: Lumboperitoneal shunts *vs.* ventriculoperitoneal shunts–case series and literature review. *Br J Neurosurg.* 2011; 25(1):94-99.
14. **Marupudi NI, Harris C, Pavri T, et al.** The role of lumboperitoneal shunts in managing chronic hydrocephalus with slit ventricles. *J Neurosurg Ped.* 2018;22(6):632-637.
15. **Alkherayf F, Abou Al-Shaar H, Awad M.** Management of idiopathic intracranial hypertension with a programmable lumboperitoneal shunt: Early experience. *Clin Neurol Neurosurg.* 2015; 136:5-9.
16. **Brune AJ, Girgla T, Trobe JD.** Complications of ventriculoperitoneal shunt for idiopathic intracranial hypertension: A single-institution study of 32 patients. *J Neuroophthalmol*. 2021; 41(2):224-232.
17. **Kaye AH.** Essential neurosurgery. John Wiley & Sons; 2009.
18. Anne J. Moore and David W. Newell, eds. (2005). Neurosurgery Principles and Practice, London: Springer, 24:425-442.
19. **McGirt MJ, Woodworth G, Thomas G, et al.** Cerebrospinal fluid shunt placement for pseudotumor cerebri—associated intractable headache: Predictors of treatment response and an analysis of long-term outcomes. *J Neurosurg*. 2004; 101(4):627-632.
20. **Bynke G, Zemack G, Bynke H, et al.** Ventriculoperitoneal shunting for idiopathic intracranial hypertension. *Neurol.* 2004; 63(7):1314-1316.
21. **Tarnaris A, Toma AK, Watkins LD, et al.** Is there a difference in outcomes of patients with idiopathic intracranial hypertension with the choice of cerebrospinal fluid diversion site: A single centre experience. *Clin Neurol Neurosurg*. 2011; 113(6):477-479.