



Original Article

# Creating of “fascial sheath” around subcutaneous lumboperitoneal shunt catheters largely prevents postoperative subcutaneous shunt catheter migration

Tatsuya Tanaka<sup>1</sup>, Hirofumi Goto<sup>2</sup>, Nobuaki Momozaki<sup>3</sup>, Eiichiro Honda<sup>4</sup>

<sup>1</sup>Department of Neurosurgery, International University of Health and Welfare, School of Medicine, Narita, Departments of <sup>2</sup>Neurology and <sup>3</sup>Neurosurgery, Imari Arita Kyoritsu Hospital, Arita, <sup>4</sup>Department of Neurosurgery, Shiroishi Kyoritsu Hospital, Shiroishi, Japan.

E-mail: \*Tatsuya Tanaka - s96047@hotmail.com; Hirofumi Goto - h-goto@imari-arita-hp.or.jp; Nobuaki Momozaki - momozaki-n@imari-arita-hp.or.jp; Eiichiro Honda - e.honda@wk9.so-net.ne.jp



\*Corresponding author:

Tatsuya Tanaka,  
Department of Neurosurgery,  
International University of  
Health and Welfare, School of  
Medicine, Narita, Japan.  
s96047@hotmail.com

Received : 25 October 2022  
Accepted : 02 November 2022  
Published : 11 November 2022

DOI  
10.25259/SNI\_978\_2022

Quick Response Code:



## ABSTRACT

**Background:** Spinal catheter migration into the subcutaneous tissue is common after lumboperitoneal shunt (LPS) placement. This study proposed a new method (i.e., wrapping fascia around the catheter like a sheath) to prevent LPS spinal catheter migration.

**Methods:** After a LPS spinal catheter was inserted under routine fluoroscopic guidance, and the paravertebral muscle fascia was closed, the fascia was sutured to wrap the catheter like a sheath using intermittent sutures.

**Results:** Before the introduction of this technique, the rate of LPS spinal catheter subcutaneous migration was 4.6%. In this study, following LPS shunt placement in 18 consecutive patients with normal pressure hydrocephalus, no further spinal catheter migrations were observed.

**Conclusion:** This novel method of “wrapping the LPS catheter with intermittent suture like a sheath” was found to be safe and effective for preventing further spinal catheter subcutaneous migration.

**Keywords:** Complication, Lumboperitoneal shunt, Normal pressure hydrocephalus, Spinal catheter, Subcutaneous migration

## INTRODUCTION

A recent randomized and controlled trial reported that lumboperitoneal shunt (LPS) placement can be beneficial for patients with idiopathic normal pressure hydrocephalus (iNPH).<sup>[2]</sup> However, LPS spinal shunt catheter subcutaneous shunt migration is a common complication, we previously observed the incidence of 4.6%, whereas other studies reported the incidence of 1.1–1.9%.<sup>[1,2]</sup> Here, we introduce a novel method of wrapping the subcutaneous shunt catheter with intermittent fascial sutures to create a protective “sheath” for preventing LPS shunt migration.

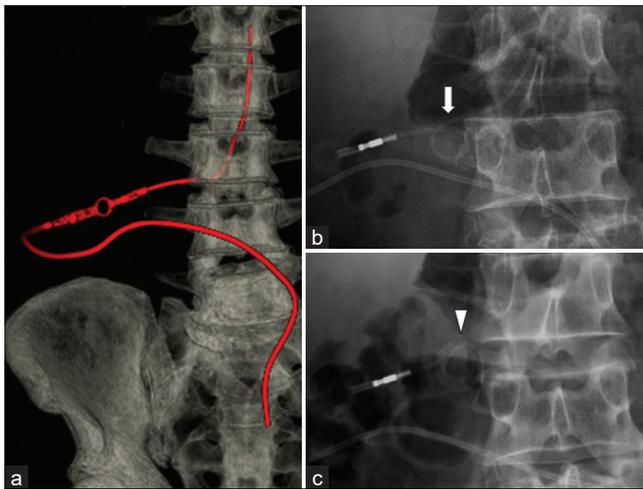
## MATERIALS AND METHODS

Overall, 18 consecutive patients underwent LPS placement for iNPH through our modified technique between 2018 and 2019. Based on our previous experience, LPS spinal catheter

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, transform, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

©2022 Published by Scientific Scholar on behalf of Surgical Neurology International

subcutaneous migration occurred in 4.6% of cases (five of 107 patients; 2011–2017) [Table 1]. One patient presented with gradual spinal catheter subcutaneous migration after >1 year of surgery [Figure 1]. In this study, LPS (i.e., pressure-programmable valves with anti-siphon devices) was routinely placed under fluoroscopic guidance. A programmable valve was then connected to the spinal catheter and implanted in the subcutaneous tissue above the paravertebral muscle/fascia [Figure 2a]. Subsequently, using intermittent sutures, the fascia was wrapped around the catheter to create a “sheath” to prevent future catheter migration [Figures 2b and c]. Postprocedural imaging of LPS placement was conducted using X-rays or computed tomography for a minimum of 1 postoperative year.



**Figure 1:** Case 4 - Postoperative three-dimensional computed tomography on day 50 shows correct placement of the spinal catheter (a). Postoperative anterior-posterior (AP) radiograph on day 295 shows catheter migration (b, arrow). Postoperative AP radiograph on day 502 shows catheter coiling (c, arrowhead).

### Preoperative clinical data

Overall, 10 enrolled patients were females and eight were males, and the mean age of the participants was 73.6 (45–85) years. Of these, 12, four, one, and one patients presented with iNPH, communicating hydrocephalus after subarachnoid hemorrhage, communicating hydrocephalus caused by dural arteriovenous fistula, and communicating hydrocephalus after head trauma.

### RESULTS

No spinal catheter-related complications were observed after the use of our method.

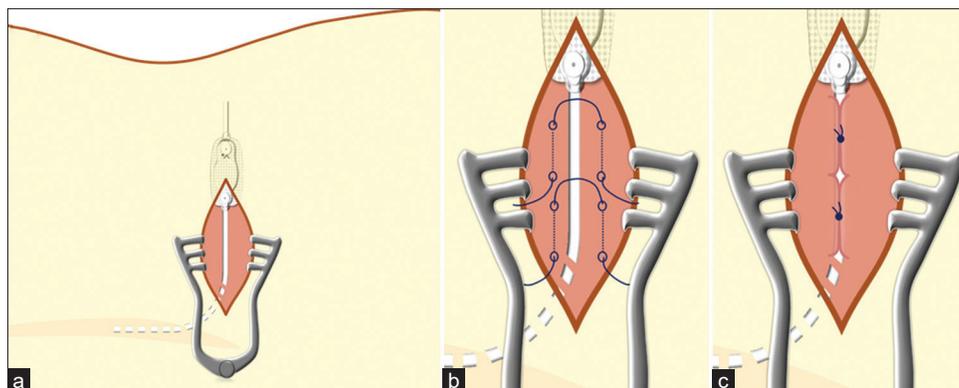
### DISCUSSION

Spinal catheter migration after LPS placement for NPH is a common complication occurring in 4.6% of patients based on our previous experience and 1.1–1.9% of patients according to the relevant literature.<sup>[1,2]</sup> Proposed mechanisms

**Table 1:** Summary of clinical manifestations of five patients.

Case	Age	Sex	Primary disease	Days from LPS to spinal catheter migration
1	78	M	Cerebellar hemorrhage	1
2	79	F	iNPH	46
3	80	F	iNPH	49
4	58	M	Traumatic brain injury	502
5	78	F	Subarachnoid hemorrhage	110

iNPH: Idiopathic normal pressure hydrocephalus, LPS: Lumboperitoneal shunt



**Figure 2:** The spinal catheter and the valve system posteriorly on the patient’s paravertebral spinal muscle are connected after achieving a lumbar puncture (a). The fascia is sutured to wrap the catheter with intermittent sutures like a sheath (b and c).

underlying catheter migration are as follows: (i) increased intraspinal canal pressure, pushing the tube out of the spinal canal; (ii) a wide subcutaneous free space surrounding the catheter, allowing for catheter redundancy and coiling; and (iii) retraction of the catheter by subcutaneous tissue during the movement of the trunk.

Our modified technique allows for the correct placement of the spinal catheter under fluoroscopic guidance to avoid the direct ejection force due to hyperflexion exerted on the catheter. In addition, we can minimize excessive dissection of the subcutaneous tissue, thereby reducing dead space and better anchoring the catheter to the paravertebral muscle/fascia using a protective sheath (i.e., interrupted sutures in the fascia) around the catheter itself.<sup>[3,4]</sup>

Notably, after the use of this modified “sheath technique” after LPS shunt placement in 18 consecutive patients with NPH, no further spinal catheter migrations were observed.

## CONCLUSION

We created a sheath around subcutaneous LPS spinal catheters for patients with NPH, and this prevented spinal catheter subcutaneous migration in the present case series.

## Declaration of patient consent

Patients’ consent not required as patients’ identities were not disclosed or compromised.

## Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Journal or its management. The information contained in this article should not be considered to be medical advice; patients should consult their own physicians for advice as to their specific medical needs.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest

## REFERENCES

1. Kawahara T, Tokimura H, Higa N, Hirano H, Bohara M, Hanaya R, *et al.* Surgical technique for preventing subcutaneous migration of distal lumboperitoneal shunt catheters. *Innov Neurosurg* 2013;1:169-72.
2. Kazui H, Miyajima M, Mori E, Ishikawa M, SINPHONI-2 Investigators. Lumboperitoneal shunt surgery for idiopathic normal pressure hydrocephalus (SINPHONI-2): An open-label randomised trial. *Lancet Neurol* 2015;14:585-94.
3. Tanaka T, Goto H, Momozaki N, Honda E. Incidence of radiculopathy following lumboperitoneal shunt placement without fluoroscopy for normal pressure hydrocephalus. *Surg Neurol Int* 2022;13:437.
4. Tucker A, Kajimoto Y, Ohmura T, Ikeda N, Furuse M, Nonoguchi N, *et al.* Fluoroscopic-guided paramedian approach for lumbar catheter placement in cerebrospinal fluid shunting: Assessment of safety and accuracy. *Oper Neurosurg (Hagerstown)* 2019;16:471-7.

**How to cite this article:** Tanaka T, Goto H, Momozaki N, Honda E. Creating of “fascial sheath” around subcutaneous lumboperitoneal shunt catheters largely prevents postoperative subcutaneous shunt catheter migration. *Surg Neurol Int* 2022;13:528.