



## From Wobble to Wisdom: Sharma-Devana PGI Modification of Hanging Loop Technique for Laparoscopic Peritoneal Dialysis Catheter Insertion

### Abstract

**Background:** Continuous ambulatory peritoneal dialysis (CAPD) is widely used for ESKD, but catheter migration remains a major cause of malfunction. The Santosh-PGI Hanging Loop Technique, introduced in 2015, minimized the need for intracorporeal suturing and reduced migration. However, this technique was marred by difficult clip placement on the anterior abdominal wall and consequent catheter migration. We describe a novel modification to further enhance catheter stability. **Materials and Methods:** Under general anesthesia, pneumoperitoneum was created via the Veress technique. A 5 mm camera and two 12 mm ports were employed, with the catheter placement port tunnelled obliquely for added anchorage. Initially, a modified epidural needle with a polypropylene loop was used; subsequently, the Carter-Thomason® Port Site needle facilitated easier passage of 2-0 polypropylene sutures around the catheter. Two snug subcutaneous loops were created to secure the catheter to the anterior abdominal wall while ensuring cuff positioning and catheter patency. **Results:** Eight patients underwent the procedure with an average operative time of 37.5 minutes and negligible blood loss. All catheters remained functional without migration, malfunction, or omental entrapment during follow-up. Two catheters were removed for peritonitis at 8 and 18 months, unrelated to migration. The Carter-Thomason needle simplified fixation and reduced operative time compared to the epidural needle technique. **Conclusion:** The Sharma-Devana PGI modification of the Hanging Loop Technique provides a reliable, minimally invasive solution to prevent CAPD catheter migration. It is reproducible, adaptable with locally available instruments, and may reduce the need for reoperations in patients with multiple comorbidities.

**Keywords:** Hanging loop, Laparoscopy, Minimal access, Peritoneal dialysis

### Introduction

Continuous ambulatory peritoneal dialysis (CAPD) is a common modality of kidney replacement therapy (KRT), with about 197,000 patients with ESKD utilizing it.<sup>1</sup> It is crucial for the peritoneal dialysis (PD) catheter to function optimally, allowing appropriate dialysate inflow and outflow during.<sup>2</sup> Catheter migration from the pelvis to the abdominal cavity and consequent malfunction remained a problem till 2015. The hanging loop technique, which uses pre-knotted polypropylene loops, eliminated the need for difficult laparoscopic intracorporeal suturing and proposed easy retrieval (if needed) by formation of a well-established tunnel between the two hanging loops.<sup>3</sup> However, the hanging loop made it difficult to place the Weck® Hem-o-lok® (Teleflex Inc., Pennsylvania, USA) clips to the anterior abdominal wall, that can lead to

catheter displacement due to a potentially loosened loop. To eliminate this possibility, we modified this technique, making it a valid and reproducible technique for PD catheter placement, minimizing the risk of catheter tip migration. The technique uses either a modified epidural needle with a Prolene suture loop or a Carter-Thomason® Port Site Closure System (Cooper Surgical Inc., Connecticut, USA) [Figure 1a and b]. The technique can be used primarily and in salvage for catheter migration.

### Materials and Methods

Under general anesthesia, a pneumoperitoneum is created using the Veress technique, and ports are positioned as shown [Figure 1c]. A 5 mm camera and two 12 mm working ports are used. The ports used for placement of the PD catheter are tunnelled obliquely through

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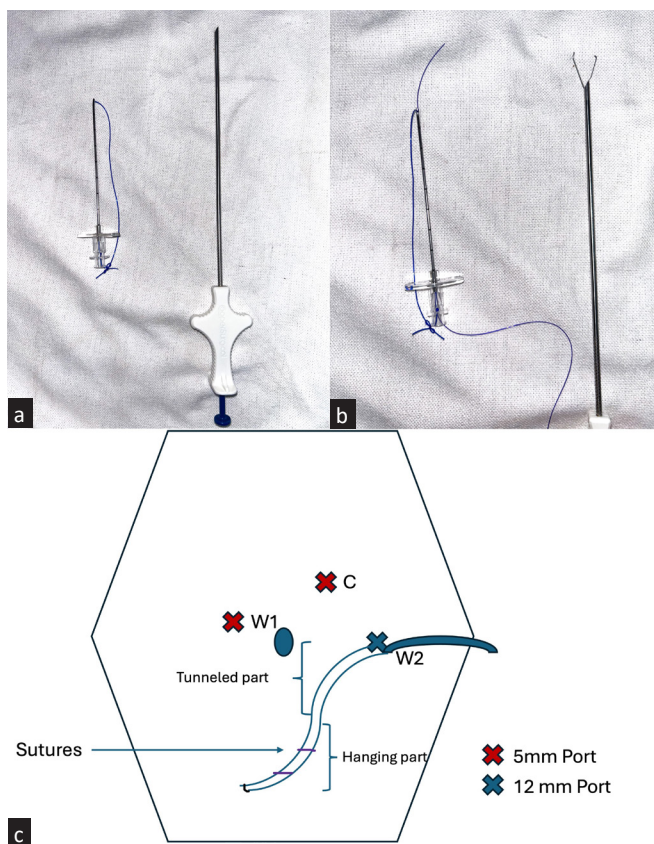
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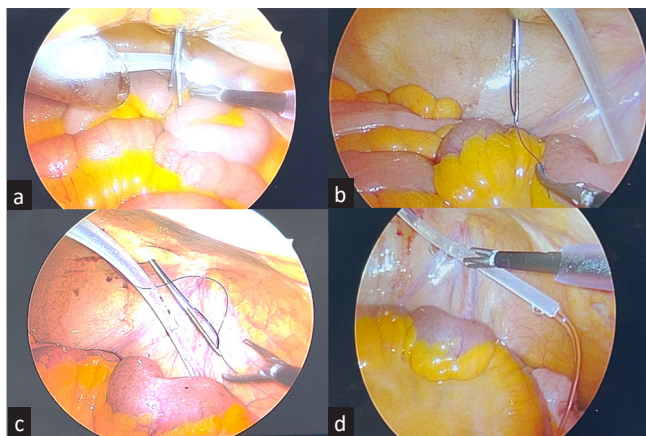


**Figure 1:** (a) Epidural needle with a Prolene loop and Carter-Thomason® Port Site Closure System (Cooper Surgical Inc., Connecticut, USA) needle closed. (b) Suture shown being passed through the epidural needle and Carter-Thomason needle in open. (c) Port placement for a modified hanging loop peritoneal dialysis catheter insertion. W1: Working port 1, W2: Working port 2, Blue oval: Umbilicus.

the abdominal wall to provide an added mechanism that prevents PD catheter slippage. The catheter is introduced through one of the working ports and positioned in the pelvis using the other working arm. Then, a Carter-Thomason® Port Site Closure System (Cooper Surgical Inc., Connecticut, USA) device is used via a separate stab incision, to pass a 2-0 polypropylene suture on one side of the catheter, and then is brought out from the other side using the same skin puncture site [Figure 2a]. The suture was tied to allow the knot to rest in the subcutaneous tissue. Earlier, the epidural needle and polypropylene loop were modified to pass the polypropylene suture [Figure 2b and c]. The Carter-Thomason suture-passer has further simplified this step and reduced operating time. The suture is tied snugly with care to prevent migration and avoid occluding the lumen. Another similar loop is made and tied at a further distal site on the catheter. The catheter is adjusted so that the cuffs are lying in the preperitoneal space and subcutaneous spaces. The inflow and outflow are confirmed [Figure 2d].

## Results

We have proposed and applied this modification using epidural needle/Carter-Thomason needle to eight patients, who remained free from catheter migration, and malfunction/omental entrapment [Table 1]. Average operative time was 37.5 minutes with negligible blood loss. Two patients required CAPD removal after 8 and 18 months, respectively, due to PD-associated peritonitis. No difficulty was encountered in the removal of any of these catheters.



**Figure 2:** (a) A:2-0 Prolene suture being pulled using Carter-Thomason® Port Site Closure needle, making a loop around the peritoneal dialysis catheter. (b) Epidural needle with Prolene loop being inserted and suture passed through. (c) Loop around the PD catheter made using Maryland forceps. (d) Final placement of PD catheter showing free flow of CAPD fluid. PD: Peritoneal dialysis, CAPD: Continuous ambulatory peritoneal dialysis

**Table 1: Patient distribution of modified laparoscopic hanging loop technique**

Age/Sex	Diagnosis	CAPD Insertion with hanging loop technique	Operative time (minutes)
64/Male	CKD V with HTN with DM and DCMP	Epidural needle	40
70/Male	CKD V with CAD	Epidural needle	45
65/Male	CKD V with prior percutaneous PD catheter displacement	Epidural needle	40
62/Male	CKD V with CAD on Pacemaker	Epidural needle	35
66/Male	CKD V with HTN	Epidural needle	40
45/Female	CKD V with post-LRRT with graft loss	Carter-Thomason needle	35
55/Male	CKD V with HTN	Carter-Thomason needle	35
38/Female	CKD V with HTN	Carter-Thomason needle	30

CKD: Chronic kidney disease, DM: Diabetes mellitus, DCMP: Dilated cardiomyopathy, LRRT: Live related renal transplant, CAD: Coronary artery disease, CAPD: Continuous ambulatory peritoneal dialysis, HTN: Hypertension, PD: Peritoneal dialysis

## Discussion

Physiological complexity in patients with a CAPD catheter inserted makes them unsuitable for repeated general anesthesia. Therefore, minimizing the number of operations needed for proper PD is crucial, especially due to the numerous comorbid conditions that patients with ESKD frequently endure.

The technique described here is very useful in preventing migration of the CAPD catheter. The two modifications were built upon the concept of the hanging loop technique published in 2015.<sup>3</sup> The drawbacks of the original technique include difficult placement of the Hem-o-lok® (Teleflex Inc., Pennsylvania, USA) clips on the anterior abdominal wall and potential for slippage of the catheter out of this loose hanging loop, potentiating consequent migration.<sup>3,4</sup> This migration leads to unnecessary surgical procedures for either PD catheter replacement or salvaging.<sup>4,5</sup> Thus, we designed the epidural needle loop for the first five cases. Later, when the Carter-Thomason needle became available, we started using it for carrying out this hanging loop. This modification helps in snugly fixing the PD catheter to the anterior abdominal wall and is proposed to prevent migration, as seen in the case series.

Although further studies are needed to validate these findings and adaptability to other centres, the results obtained so far have been encouraging in achieving the aim of PD catheter migration and malfunction.

The Sharma-Devana PGI modification of the hanging loop technique, using either a suture passer device or a modified epidural needle, effectively prevents PD catheter migration. In centres lacking access to advanced devices, the epidural needle variant remains a practical and reliable alternative.

**Conflicts of interest:** There are no conflicts of interest.

*The authors declare that no generative AI or AI-assisted tools were used in drafting, editing, or preparing this manuscript.*

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