



An Open Surgical Technique Allowing for Immediate Use of Peritoneal Dialysis Catheters upon Insertion

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Abstract

Traditional insertion techniques of Peritoneal Dialysis (PD) catheters usually mandate a waiting period prior to use, averaging between 2 to 4 weeks to avoid leakage upon peritoneal filling. We report an open surgical technique that allows for the immediate use of a PD catheter upon placement, and has the advantage of being feasible even in low resource settings. What distinguishes this technique is 1) the use of modified purse string sutures to create a fascial mound around the deep cuff and 2) the creation of a fascial bridge those aides in the watertight nature of the seal. It is particularly relevant to children with acute renal failure that is likely to be temporary.

Introduction

Peritoneal dialysis is underutilized both in the US and throughout the world [1]. Traditional insertion techniques usually mandate a minimum of two weeks prior to catheter use to minimize risk of leakage [2]. Leaks result in significant inconvenience to patients, and have been associated with exit site infections as well as peritonitis regardless of insertion method [3]. The delay in waiting for a catheter 'to mature' often results in patients having to undergo central line insertion for temporary Hemodialysis (HD) [1,3]. Laparoscopic insertion techniques may allow for quicker use, but many still require a 1 to 2 week maturation period and have the additional disadvantage of being more costly and unavailable in many low resource settings [3]. Open insertion methods have the advantage of requiring minimal equipment beyond a basic surgical tray, and are overall faster to place than laparoscopic methods [3]. Leak rates, despite insertion method, have ranged from 8% to 13% and as high as 30% [1,3-5]. Some studies have suggested much lower leak rates (around 2%) by using modified open surgical methods, which we further detail [4,5].

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Technical Report

We typically use a standard pigtail curled catheter with a double Dacron cuff. Patients are positioned supine and induced with general anesthesia, though local with sedation could be substituted. The patient is marked by placing the curled tip over the pubic symphysis and noting the natural position of the deep cuff cephalad. The catheter is slightly angled such that the deep cuff lays approximately 3 cm lateral to the midline. A small 2 cm to 3 cm transverse incision is made in the skin and dissection carried down. A self-retaining retractor (Weitlaner) facilitates exposure (Figure 1). The anterior rectus sheath is identified and sharply incised. The rectus muscles are gently split and retracted, exposing the posterior rectus sheath, which is grasped with clamps. A purse string suture is then placed in the posterior rectus sheath and clamped but not yet tied, and the needle left attached. The posterior sheath is incised and the intraperitoneal portion of the catheter is directed towards the pubis and slid off the stylet into the pelvic well. The deep cuff is brought to the pre-peritoneal space and the purse string is then tied (Figure 2). An additional, shallow, bite through only the cuff using the needle left attached, secures the deep cuff in place. Care must be taken not to penetrate the catheter. Following this, a series of wide, 'modified purse-string' bites are taken through the posterior sheath as demonstrated in Figure 3. When tied, these create 'fascial mounds' that buttress the entry point. This is the first of 2 key steps to achieving a leak-tight insertion. The proximal tip of the catheter is then tunneled and brought out of the anterior fascia 3 cm to 4 cm cephalad from the peritoneal entry point, thereby creating a natural 'fascial bridge' that further contributes to the water tight seal (Figure 4). This is the second key step. At this point, saline or dialysate is flushed through the catheter to ensure patency and no kinks. After this, the anterior sheath is closed either in an interrupted or a running fashion. The shallow cuff is left in the subcutaneous tissue. Scarpa's is closed with running suture. The skin is similarly closed with a running subcuticular suture (Figure 5).

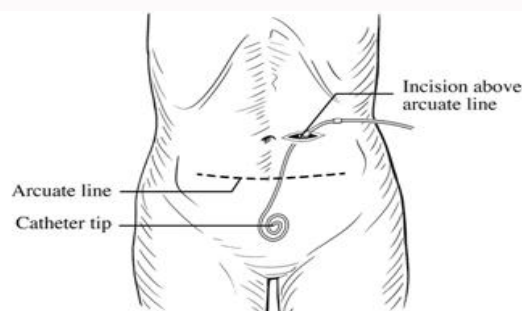


Figure 1: Insertion site is above the arcuate line.

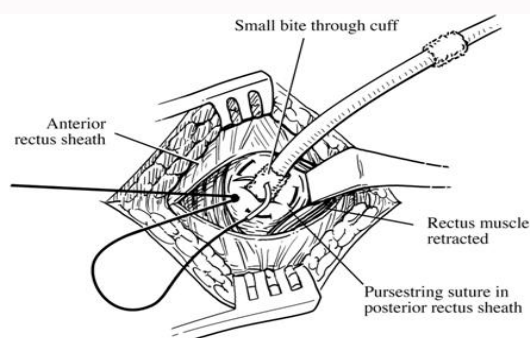


Figure 2: Purse string is placed but not tied until catheter is placed, after which the same needle is used to take a thin bite of the deep cuff to secure it in place.

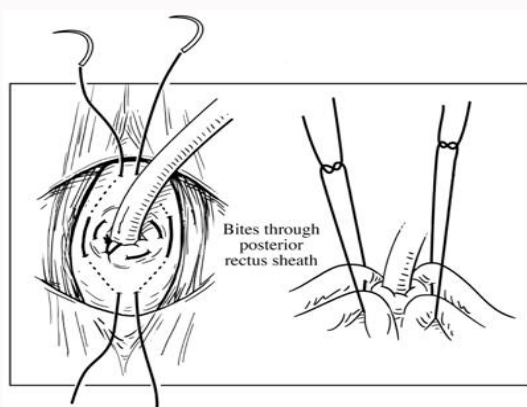


Figure 3: 'Modified purse string' sutures are taken as demonstrated through the posterior sheath, approximately 0.5 cm to 1cm from the insertion point that, when tied, create 'fascial mounds' around the deep cuff.

Discussion

We report this technique as an alternative to traditional insertion methods of PD catheters, which often necessitate a minimum of two weeks prior to use and still result in a leak rate of around 11% [2]. Two technical details distinguish this insertion method: 1) A second layer of 'modified purse string' sutures surrounding the deep cuff that creates a watertight 'mound' and 2) The creation of a natural 'fascial bridge' by first tunneling the catheter under the anterior rectus sheath prior to exiting through the subcutaneous tissue. This ensures that the entry site into the peritoneal cavity is spatially distinct from the exit site of the catheter. This technique allows even those patients with acute renal failure to

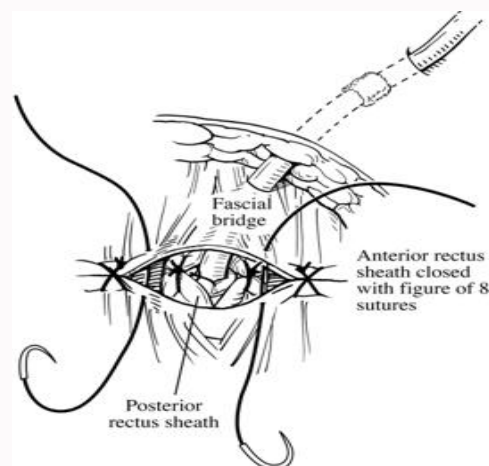


Figure 4: Proximal catheter is brought out 3 cm to 4 cm cephalad from the insertion point to create a 'Fascial bridge.' The shallow cuff is left in the subcutaneous tissue. The anterior sheath is closed with interrupted or running suture.

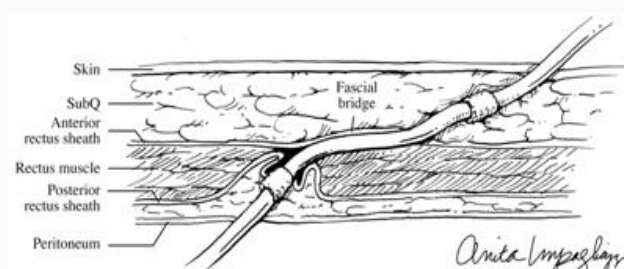


Figure 5: Final position demonstrating lie of catheter. Note the posterior sheath mounds and the fascial bridge.

enjoy many of the advantages of peritoneal dialysis when clinically appropriate, and many patients at our institution have bypassed the need for temporary HD as they were able to begin dialysis immediately. While we have used this technique for over 25 years with excellent results, more study is needed to determine the true leak rate. We believe that this technique will find particular use and applicability in low resource settings that may lack access to laparoscopy or hemodialysis.

Conclusion

Peritoneal dialysis catheters can be used immediately upon insertion via an open surgical technique by employing two technical modifications: the use of 'modified purse string' sutures surrounding the deep cuff, and the creation of a 'natural fascial bridge' while tunneling the catheter. Patients with temporary renal failure can sometimes avoid hemodialysis altogether by utilizing PD without having to wait for tract maturation.

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