



Tension-free mesh repair of inguinal hernia in patients on continuous ambulatory peritoneal dialysis

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Abstract

Background: Peritoneal dialysis (PD) is the first-line renal replacement therapy for end-stage renal failure patients in Hong Kong. Abdominal wall hernia is a common mechanical complication of PD, and early surgical repair has been advocated to reduce complications. This study aims to review the outcomes of tension-free mesh repair of inguinal hernia in PD patients.

Methods: All PD patients who underwent elective repair of inguinal hernia from 2009 to 2015 were identified from a single centre for retrospective analysis. Primary outcomes included surgical complications, perioperative dialysis technique and recurrence.

Results: Twenty-one patients with a total of 26 inguinal hernia repairs were included in this 7-year retrospective study. All were males, and the mean age was 68 ± 10 years. Diabetic nephropathy ($n = 9$, 42.9%) and glomerulonephritis ($n = 7$, 33.3%) were the two most common causes of renal failure. All hernias were detected after the initiation of PD, and the mean duration of PD to hernia detection was 16 months (range 1–65 months). Lichtenstein open mesh repair was performed in all patients. Complications included seroma ($n = 3$, 11.5%) and ischaemic orchitis ($n = 1$, 3.8%). There were no mesh infection or recurrence. Twenty patients (95.2%) received intermittent peritoneal dialysis post-operatively and returned to continuous ambulatory PD in 15 to 30 days. Only one patient (4.8%) required bridging haemodialysis due to Tenckhoff catheter blockage.

Conclusions: Tension-free mesh repair is associated with low morbidity and low recurrence rates in PD patients. Timely management and close collaboration with renal physicians are essential to continue PD after repair.

Keywords

Inguinal hernia, mesh repair, peritoneal dialysis, renal failure

Introduction

Hong Kong is the first region that implemented the peritoneal dialysis (PD)-first policy,¹ in which end-stage renal failure (ESRF) patients are put on PD rather than haemodialysis (HD) unless contraindicated. This has been due to economic concerns as PD incurs a lower cost than HD, while PD has also been shown to confer better initial survival, able to preserve residual renal function and has low infection rates.^{2,3} In 2013, 76.2% of patients requiring dialysis in Hong Kong were on PD.⁴

The prevalence of abdominal hernia in patients on PD was estimated to be around 10–25%, which is higher than the general population.⁵ This may be accounted by an increased intra-abdominal pressure and weakened connective tissue in renal failure patients. Among the hernias in PD patients,

umbilical hernias^{5,6} and inguinal hernias^{7,8} were the most common. Inguinal hernias account for up to 48.5% of all hernia types.⁸ Patients may present with groin swelling or discomfort, bowel strangulation or ineffective PD due to sequestration and leakage of dialysate.⁶ Hernias detected prior to initiation of PD should be repaired; it has been recommended for the repair to be done in the same session with

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Figure 1. CT peritoneogram showing right inguinal hernia with dialysate (arrow).
CT: computed tomography.

the insertion of a Tenckhoff catheter.⁹ As for hernias that developed during the course of PD, they were associated with a higher risk of PD withdrawal⁸; therefore, timely repair is essential to improve ultrafiltration of PD.

Primary suture repair of inguinal hernia has fallen out of favour, with tension-free mesh repair using Lichtenstein method being the current gold standard for open repair.¹⁰ However, its efficacy and potential complications in PD patients remain unclear, such as the theoretical concern on potentially higher infection rate due to immunocompromised status. Previous studies demonstrated a low recurrence rate after mesh repair in this group of patients^{5,11,12}; however, there is no consensus on the perioperative dialysis regimen: bridging HD or switching to other types of PD apart from continuous ambulatory peritoneal dialysis (CAPD) in the perioperative period and whether PD can be resumed after repair.^{6,11–18} The aim of this study is to review the outcomes of Lichtenstein repair of inguinal hernia in patients receiving PD.

Methods

ESRF patients on PD who underwent elective inguinal hernia repair at Tung Wah Hospital, Hong Kong, from 2009 to 2015 were included, and data were retrospectively reviewed. Inguinal hernia was diagnosed either clinically or by imaging with ultrasonography or computed tomography (CT) peritoneography (Figure 1). Patients who presented with complications including incarceration or strangulation were excluded.

After diagnosis of hernia, patients were advised by renal physician to reduce the exchange volumes of CAPD. However, if they remained symptomatic, they would be switched to intermittent peritoneal dialysis (IPD) until the hernia has been repaired.

A standardized perioperative management protocol was implemented. All patients were assessed in a pre-anaesthetic clinic (PAC) for fitness of surgery. In

general, patients on CAPD were switched to IPD in the early postoperative period, which increased the frequency of dialysate exchange to prevent long-standing high intra-abdominal pressure. All hernia repairs were done either under general anaesthesia or under spinal anaesthesia. Dialysate was drained just before operation. One dose of intravenous antibiotics was administered on induction of anaesthesia in all instances, with most patients receiving augmentin (amoxicillin/clavulanate) 1.2 g. For patients with allergy to penicillins or cephalosporins, alternatives included levofloxacin (500 mg), clarithromycin (500 mg) or ciprofloxacin (200 mg). Care was taken to avoid opening of hernial sac during dissection and hernial sac was inverted. Polypropylene mesh was inserted in accordance with the Lichtenstein technique to reinforce the posterior wall of the inguinal canal in the extraperitoneal plane.¹⁹

Post-operatively, patients were reassessed by renal physicians and IPD was arranged in the renal centre at 2 to 3 days after repair. IPD was performed in-centre with a cycler at 2-hourly cycles with 2 litres of dialysate fluid for each exchange and for 12 exchanges each session. This IPD regimen was scheduled twice per week and lasted for 2–4 weeks. Patients remain recumbent during IPD, while their peritoneal cavities were kept dry in between the sessions. The usual CAPD regimen was then resumed if there were no wound or mesh complications. Patient demographics, operative findings, post-operative complications, including seroma, haematoma, wound infection, mesh complication and recurrence, as well as preoperative and post-operative PD status were recorded.

Statistical analysis was performed using SPSS 20.0 (IBM Corp, Armonk, New York, USA). Categorical variables were analysed using the Fisher's exact test. Continuous variables were analysed using the *t*-test. A *p* value of <0.05 was considered statistically significant.

Results

Twenty-one patients were identified during the study period, in which a total of 26 hernias were repaired. One patient underwent unilateral hernia repair, followed by repair of the contralateral side 3 years later. Four patients underwent bilateral hernia repairs. The mean age at hernia repair was 68 ± 10 years, and all were males. Patient characteristics are listed in Table 1. The most common presenting symptom was groin or genital swelling ($n = 11$, 42.3%), followed by groin discomfort ($n = 8$, 30.8%) and ineffective PD ($n = 7$, 26.9%). Eleven (42.3%) hernias were diagnosed on CT peritoneography. Among the 26 repairs, 2 were recurrent hernias that recurred after the commencement of PD. Diabetic nephropathy ($n = 9$, 42.9%) and glomerulonephritis ($n = 7$, 33.3%) were the two most common causes of renal failure. All hernias occurred after the commencement of PD, and the median duration of PD before the emergence of hernia was 16 months (range 1–65 months). Sixteen (61.5%) hernias were

Table 1. Patient characteristics.

Patient characteristics	n = 21
Age of diagnosis (years), mean \pm SD (range)	68 \pm 10 (50–85)
Smoker, n (%)	0
Body mass index (kg/m ²), mean \pm SD (range)	22.0 \pm 2.8 (16.2–26.3)
Duration of PD before hernia emerged (months), mean \pm SD (range)	16 \pm 17 (1–65)
Co-morbidities, n (%)	
Diabetes mellitus	9 (42.9)
Hypertension	9 (42.9)
Ischaemic heart disease	9 (42.9)
Pulmonary disease (chronic obstructive pulmonary disease/asthma)	1 (4.8)
Liver disease	2 (9.5)
Cause of renal failure, n (%)	
Diabetic nephropathy	9 (42.9)
Glomerulonephritis	7 (33.3)
Polycystic kidney disease	2 (9.5)
Hypertensive nephropathy	1 (4.8)
Renal artery stenosis	1 (4.8)
Idiopathic	1 (4.8)

PD: peritoneal dialysis.

Table 2. Operative findings.

Unilateral repair, n (%)	18 (81.8)
Bilateral repair, n (%)	4 (18.2)
Mode of anaesthesia, n (%)	
Spinal anaesthesia	15 (68.2)
General anaesthesia	7 (31.8)
Hernia type, n (%)	
Direct	6 (23.1)
Indirect	16 (61.5)
Pantaloon	4 (15.4)
Operation time (min), mean \pm SD (range)	47 \pm 13 (30–80)
Length of hospital stay (days), mean \pm SD (range)	5.7 \pm 2.1 (3–9)
Perioperative IPD duration (days), mean \pm SD (range)	26 \pm 7 (15–30)

IPD: intermittent peritoneal dialysis.

indirect inguinal hernias and four (15.4%) were a combination of indirect and direct hernias, also known as pantaloon hernias. Mean operation duration was 47 \pm 13 min. The mean length of hospital stay was 5.7 days (range 3–9 days) (Table 2).

Seroma was the most common complication that occurred in three patients (11.5%). One patient (3.8%) who underwent recurrent hernia repair developed ischaemic orchitis, which was managed conservatively. There were no wound infection or mesh complications (Table 3). Twenty patients (95.2%) had bridging IPD post-operatively (two sessions per week) and could resume CAPD within 15–30 days after operation. One patient

Table 3. Surgical complications.

Complications	n (%)
Seroma	3 (11.5)
Haematoma	0
Ischaemic orchitis	1 (3.8)
Wound infection	0
Mesh complication	0
Recurrence	0
30-day Mortality	0

(4.8%) switched to temporary HD for 120 days due to Tenckhoff catheter blockage. Three patients had IPD/CAPD peritonitis within 6 months of surgery, with one of them occurring at post-operative 3 weeks. PD fluid culture grew *Pseudomonas aeruginosa*, which was initially treated conservatively with intraperitoneal antibiotics. However, there was a relapse of peritonitis, eventually requiring removal of the Tenckhoff catheter at post-operative 2 months. The other two patients had CAPD peritonitis occurring at post-operative 10 and 12 weeks, respectively, and were treated conservatively. At a mean follow-up of 48 \pm 24 months, no recurrence of hernia was identified. Fourteen patients (66.7%) were able to be maintained on PD in the long run. Seven patients (33.3%) inevitably required switching to HD for reasons unrelated to the hernia repair including recurrent CAPD peritonitis and poor ultrafiltration, which occurred at 6.5–60 months postoperatively, among which one patient (4.8%) subsequently underwent renal transplant. Thirteen patients (61.9%) eventually deceased due to medical illnesses.

Discussion

Inguinal hernias occurring in PD patients may present as groin swelling/pain, genital swelling and/or ultrafiltration failure. As hernia is only more prominent during CAPD and may be subtle at clinic follow-up, it may be difficult for renal physicians to pick up. Ultrasound, CT peritoneography^{20–22} and peritoneal scintigraphy²³ are modalities to identify hernia in this group of patients. Non-ionic contrast media is added to the dialysate in CT peritoneography, while technetium-99m sulphur colloid is added to the dialysate in peritoneal scintigraphy. In performing these studies, the patient is required to remain ambulatory after dialysate infusion for 30–60 min to allow peritoneal mixing, so that the labelled dialysate could exit through any peritoneal defect. CT peritoneography is the preferred investigation modality as it provides additional information on hernia anatomy and facilitates preoperative planning.²⁴ In the current study, a significant number (42.3%) of hernias were diagnosed by CT peritoneography.

In our centre, since 2015, the waiting time for surgery has been shortened due to simplified logistics. PD patients diagnosed with abdominal wall hernias are directly referred to PAC, where they are seen by the surgeon and

anaesthetist to assess fitness for surgery. Patients are generally admitted 1 day prior to surgery to be assessed by renal physicians and undergo one session of IPD after hernia repair before being discharged.

This study reported the largest cohort of inguinal hernia repair in CAPD patients, demonstrating that Lichtenstein's repair remains the gold standard in this patient subgroup. Hernia recurrence is an important concern in CAPD patients due to the persistent increase in intra-abdominal pressure and relatively poor healing ability. There were no hernia recurrences in our cohort, which corresponded to the findings of similar studies.^{5,12,15}

With the frequent instillation of peritoneal dialysate and the presence of mesh as a foreign body, the operative site is predisposed to a higher risk of infection, which is detrimental as it could lead to cessation of PD. Antibiotic prophylaxis is important in PD patients and was given upon induction in our practice. There was no mesh infection identified in our group of patients, which was compatible with the finding of a similar cohort.¹² In another study involving 13 patients with mesh repair of inguinal hernia, 1 patient was reported to have dialysate infection at 1 month post-operatively and could be accounted by PD instead of surgery.¹¹ Similarly in our study, of the three patients who developed IPD/CAPD peritonitis within 6 months of hernia repair, the infection was likely to be due to PD, given the time interval between the surgery and the onset of infection (3, 10 and 12 weeks). One patient who underwent repair for recurrent inguinal hernia complained of testicular pain 3 days after operation. Doppler ultrasound showed absent vascular flow, which was compatible with ischaemic orchitis and he was treated conservatively. Repair of recurrent inguinal hernia is a well-known risk factor of developing ischaemic orchitis,²⁵ and dissection of scar tissue is encountered and may result in devascularization of the testicle, with a prevalence of 3% in Lichtenstein's repair.²⁶

For the perioperative dialysis regimen, IPD differs from CAPD in that patients only require two IPD sessions per week with higher frequency of dialysate exchanges and shorter dwelling time. The dialysate is drained from the peritoneal cavity after each session. Perioperative IPD plays a vital role in the success of hernia repair as it reduces the duration of high intra-abdominal pressure, allowing enough time for tissue ingrowth to take place within the mesh during the early post-operative period. Only one patient required bridging HD due to blockage of the Tenckhoff catheter. Hence, bridging HD is generally not necessary, and the potential complications associated with HD and central line insertion could be avoided.

All of our patients could resume effective CAPD after repair. In the literature, there was no consensus on the optimal timing to resume CAPD after surgery.^{11–16,18} A survey revealed that some centres converted to temporary HD post-operatively with a median time of resuming CAPD at 4 weeks.¹³ On the contrary, patients in another cohort were

able to resume CAPD on post-operative days 1 to 3 with lower volume and higher frequency exchanges, while returning to usual dialysis regimen in 2 to 4 weeks.¹⁵ One study recommended a switch to IPD in the first 2 weeks post-operatively, followed by CAPD with higher frequency and lower volume exchanges for two more weeks before resumption of the usual regimen.¹⁸ Another report only advocated a switch to IPD in the first 2 weeks after hernia repair,¹⁷ which was similar to our cohort of patients who were switched to IPD for 2–4 weeks before returning to CAPD. A standardized perioperative IPD protocol is the key to success in the management of these patients.

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