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Mini Review

Non-Catheter Related Abdominal Surgeries in Patients on Peritoneal Dialysis

Talha H Imam*

Division of Nephrology, Kaiser Permanente, USA

***Corresponding author**

Talha H Imam, Division of Nephrology, Kaiser Permanente, 9961 Sierra Ave, Fontana, California 91784, USA. Tel: 9094277521; Fax: 9094274291; Email; thimam@hotmail.com

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Abstract

Peritoneal dialysis (PD) incidence is slowly increasing in United States (US). In order to help increase the rate of PD and help maintain patients who already are on PD, it is imperative that all attempts be made to avoid interruption of PD. Abdominal surgeries are one of those conditions when temporary hemodialysis (HD) is utilized. This can have negative consequences. Due to the frequency at which abdominal surgeries are done in patients on peritoneal dialysis, it is important that a system be established whereby minimally invasive procedures like laparoscopy are performed by experienced surgeons who have knowledge about managing surgical aspects of PD patients. Alongside, the nephrologists have to know about the available evidence about managing such patients in the perioperative period and the timing and process of re-initiating PD in such patents, after these abdominal surgeries. This will minimize the use of HD via HD catheters, along with its associated risks. A review of available literature about such best practices is presented here.

PERITONEAL DIALYSIS STATISTICS

The 2013 United States Renal Data System (USRDS) report [1] shows that for2011, there was a decline of 1.5% in the number of those new patients starting HD. This was the first decrease in more than three decades. However there was a 6.6% rise amongst those starting PD. This number has been rising for three years in a row. The major reason cited for this is the new bundled payment system in US. This has raised major incentives for starting patients with end stage renal disease (ESRD), on PD. In 2011 there were 31,684 prevalent patients on PD. A decade ago in 2001 this number was 25,202 [2].

The trends in overall mortality rates in ESRD patients show that between 2003 and 2010, rates fell more than 16%, while second year death rates declined 21 % between 2002 and 2009. Despite improvements in health care, only 52 % of HD patients, and 61 % of PD patients are alive after three years of starting their renal replacement therapy (RRT) in 2006.

So with incentives of bundled payments and improved survival of patients on PD, more and more surgeons will come across patients who have PD catheters in their abdomen, and who will need abdominal surgeries that may also require opening the peritoneum.

COMPLICATIONS OF HIGH INTRA-ABDOMINAL PRESSURE (IAP) IN PD

Complications of peritoneal dialysis include those that are related to increased intra-abdominal pressure (IAP). Instillation of fluids in the abdominal cavity causes rise of IAP with higher pressures with higher volumes [3]. However no direct correlation between increased risks of developing hernia with increased fill volume has been found by others [4,5]. Other factors that can increase IAP in these patients include multiparous women, physical activities and those with large kidneys due to polycystic kidney disease (PKD) [6,7]. The processus vaginalis, patent at birth in 90% of males, but patent only in 20% of females, can be re-opened with increased IAP from dialysate fluids. Wasting due to malnutrition can further weaken abdominal wall. Patients with small size and weight of less than 60 kg develop hernias more than heavier patients as even 2 L fluid can generate high IAP in smaller abdominal cavities. Previous laparotomies and multiple pregnancies can further enhance effects of stress on abdominal wall with the presence of dialysate fluid in the peritoneal cavity.

RATE OF HERNIA DEVELOPMENT

Hernias are amongst the most common non-catheter related complications of PD. Time for hernia development does not correlate with time on PD and it varied from 1 to 50 months in another study [5]. Incidence of hernia was much small at 12% in those who used cyclers compared to 26% amongst those on CAPD [4]. Another report from 1985 showed a prevalence of 14% for inguinal hernias in patients undergoing chronic ambulatory peritoneal dialysis (CAPD) [8]. In a review of 404 patients in 1998, 11 % developed hernias, mostly umbilical. Most remained on PD, post-surgery [5]. In a retrospective analysis of 140 patients on

CAPD, 5% developed abdominal wall hernia, mostly umbilical, followed by inguinal [9]. However with improvements in surgical techniques and early intervention, this number is expected to be much lower presently.

Besides causing physical unsightliness, these hernias can lead to complications of incarceration and strangulation. Umbilical hernias have been shown to be most common amongst those who develop incarcerated hernia [10].

LAPAROSCOPIC CHOLECYSTECTOMY IN PD PATIENTS

Patients on dialysis can be at an increased risk of perioperative complications like leakage of dialysate, delayed wound healing or dehiscence, and incisional hernias. So minimally invasive procedures, like laparoscopy are more beneficial for these patients. Benefits include quick post-surgical resumption of PD and lesser chances of development of subsequent intra-abdominal adhesions and incisional hernia.

Potential thickening of peritoneum and peritoneal adhesions may impede laparoscopic procedure requiring conversion to open procedure. Still multiple reports have confirmed that PD is not a contraindication for laparoscopy. Exceptions include those patients with major abscess, active peritonitis, or those who have prior known severe intra-peritoneal adhesions.

Amongst the first case report of laparoscopic cholecystectomy in CAPD was published in 1992. The authors resumed low fill CAPD on second post-operative day with no complications [11]. Another patient on CAPD resumed PD on third post-operative day [12]. As early as in 1994, a series of 5 CAPD patients who underwent laparoscopic cholecystectomies, was published. PD was resumed immediately in 1 patient and within 10-24 hours in others. Their regimen consisted of intermittent PD (IPD) with 30-60 minutes dwell time, 1-1.5 L fill volume for 7-12 hrs. CAPD was continued thereafter [13]. One patient did have hemoperitoneum and leak [13,14]. The recommendation then for such post-surgical patients was to do IPD after 12 hours of rest.

Despite above noted successes, during initial days of laparoscopy, increased incidence of PD related peritonitis was reported by a group Missouri, USA, in 1998, after cholecystectomies and gastrostomy tube placement. Subsequent to that, they had adopted a policy of temporary cessation of PD for 2 weeks post laparoscopic procedures, while dong HD [15].

However after that, more case reports have shown that it is still a safe procedure if done by experienced surgeons, with proper suturing of peritoneum and fascia and use of glue in some cases [16]. Subsequently PD can be resumed with lower volumes. In a series of three patients who underwent laparoscopic cholecystectomy, there were no complications [17]. In a series of 11 patients on PD who underwent laparoscopic cholecystectomy, in comparison to 33 patients without ESRD, it was shown that this procedure had low complication rate. No patient in PD group developed peritonitis [18].

Laparoscopic cholecystectomy is now mostly considered a safe procedure in PD patients with resumption of PD, without need for temporary HD in most cases.

HERNIA REPAIR IN PD PATIENTS

The first paper about abdominal surgery in patients on PD was published in 1982. The protocol at that time for chronic PD in these patients, were session of 22-hrin center dialysis per week. It was a series of 19 patients including those with bowel perforation and strangulated hernia. Complications included dialysate leakage, wound dehiscence and there were deaths in 26.6% of patients. They also noted that all patients who had ventral hernias, their herniation occurred from previous insertion of permanent PD catheter [19].

A set of proposed guidelines from a group of transplant surgeons in United Kingdom in 1998 suggested transfer to HD for 4 weeks post inguinal hernia repair and use of mesh was not recommended as method of choice at that time [20]. However in 1994 Imvrios et al, reported use of prosthetic mesh repair of large recurrent abdominal hernias (epigastric, inguinal, peri-catheter) in 35 CAPD patients with continuation of CAPD post dialysis in all patients, using gradual increase in dialysate volume [21]. Another series of 12 patients who were already on PD, had repair of hernias under local anesthesia with anterior-tension-free mesh. CAPD was resumed same day in all with low volumes with only one patient developing unrelated candida infection peritonitis one month later [22]. In another series of 11 patients with abdominal hernias including bilateral inguinal hernias, PD was commenced within 24 hours with no leakage after repair with mesh [23]. This was true in those also who had required opening of the peritoneum to excise the hernia sac.

In a report of 21 abdominal wall hernias with polypropylene mesh repair, there was no recurrence [24]. There was also 0% recurrence after mesh hernioplasty, in a report of 30 patients with mean follow up of 34 months [25], and another report of 4 year retrospective review of 58 hernia repairs [26]. Crabtree recommended low-tension buttressed hernioplasty with only mesh to repair umbilical hernias. He showed no dialysate leakage and no need for interruption of PD [27].

The use of mesh has not been shown to increase any chance on infection if placed in pre-peritoneal space [21]. Peritoneal regeneration has been shown after implant of a composite prosthesis in the abdominal wall in rabbits [28]. Even if mesh is placed intra-peritoneally, it will develop a neo-peritoneum that can createa barrier. But there is a possibility of mesh getting infected from peritonitis if infection occurs before the development of neo-peritoneum [29] and hence it is advisable to avoid placing mesh in direct contact with peritoneal cavity [27]. However in these surgeries, a dose of antibiotic, mostly a cephalosporin, has been recommended pre-operatively.

Shah et al., reported on a 10-year retrospective review of prospectively collected data [30]. They confirmed that in elective surgeries in 50 patients, none of the patients had leakage, surgical dehiscence, or immediate recurrence of hernia due to early resumption of PD [30]. The latest most noteworthy protocols for immediate post-surgery PD are from Shah et al. and Crabtree. These protocols use IPD (intermittent peritoneal dialysis) nightly with initial 1 L fill volume to start [27-30].

OTHER SURGERIES

Various case reports of different types of abdominal surgeries have been published. In a case of laparoscopic transperitoneal nephrectomy, CAPD was reinstated with a break of 10-14 days while using temporary HD [31]. In another case, laparoscopic colectomy for colon cancer in PD patient has been reported with interruption of PD for 4 weeks, but without removal of catheter [32].

Bariatric surgery (sleeve gastrectomy) has also been reported in a PD patient with resumption of IPD next post-operative day without any complications [33]. In a series of 5 cases (4 including Roux-en-Y gastric bypass) all resumed PD by second post-operative day with low volumes and had no infections thereafter. However the authors noted that hemodynamically and metabolically stable patients may delay re-initiation of PD for few days. Similarly in cases of extensive and complex laparoscopic procedures, delay to initiate PD in the post-surgical period, may be prudent.

PREVENTION

73% of hernias in PD patients have been found to occur before actually starting dialysis [35]. Most of such hernias are asymptomatic. Thorough examination of anterolateral abdominal wall is required to very carefully look for hernias in pre-operative settings and to correct those intra-operatively along with PD catheter insertion. If so done, then the chances of developing hernia after being on PD decrease to 4.9% [35]. Early surgical repair is recommended even if asymptomatic, as those have been associated with increased morbidity and mortality [5].

Staying upright further increases IAP. So keeping patients who are at risk of abdominal hernias, mostly supine during the time fluid is in their abdominal cavity, will reduce leaks and hernias. Avoiding activities that increase IAP like heavy weight lifting, and needs to be avoided. Those on large volume CAPD can be transferred to night time cycler.

CONCLUSION

It has been noted that there appear to be many surgeons who are convinced that a patient on PD undergoing abdominal surgery like hernia, must be switched to HD after, and in some cases even before the surgery [29]. Resting of the abdomen by holding PD for few weeks and switching temporarily to HD, is still practiced. But there are major well known implications to switching to HD in terms of morbidity and mortality by temporary HD catheters.

Review of literature shows that if done with adequate technique, abdominal surgeries, mostly laparoscopic, can be done in patients on PD without any significantly higher risk of infection. Many reports have come out suggesting many of these patients can return to PD without interruption with HD. Paying full attention to details in producing a watertight surgical seal closure and the use of initial low volume intermittent automated PD, permitsquick resumption of PD in many such patients [27-30]. However in those with viscus perforation, strangulation, and those who have high risk of peritonitis, a temporary switch to HD may be unavoidable. Surgical repair before the start of PD is best to avoid repair after initiation of PD.

Use of tension free polypropylene mesh should now be the standard of care for abdominal wall hernias in PD patients. These are very safe and only one case of mesh infection has been noted in literature [36].

It is hoped that in future, most patients should be able to continue doing PD after most abdominal surgeries especially those or hernias. However appropriate surgical techniques will need to be followed [27,37].

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