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# HERNIA REPAIR WITHOUT DELAY IN INITIATING OR CONTINUING PERITONEAL DIALYSIS

The relative frequency at which abdominal wall hernias occur in patients on peritoneal dialysis (PD) emphasizes the importance of developing effective management strategies to avoid delays in initiating or continuing dialysis. Despite recommendations to the contrary (1–3), it is still not an uncommon community practice to stage hernia repairs as a separate procedure prior to catheter placement (4–6). Furthermore, protracted healing times are regularly imposed after hernia operations before commencing or returning to PD (4,6–12). Often, the effects of increased hydrostatic pressure from PD on the abdominal wall and impaired wound healing in uremic patients are not adequately considered during surgical repair, leading to an unacceptable rate of recurrent hernias (1,3,10).

Conventional hernia repairs performed by suture closure of the abdominal wall defect using native tissues are associated with a recurrence rate of 10% – 15% in the general population (13,14). Attempting to pull the fascial defect together with sutures can result in excessive tension on the repair that ultimately leads to reopening of the defect and hernia recurrence. Add to this the effects of increased hydrostatic pressure on the abdominal wall from peritoneal dialysate and it is no surprise that the reported incidence of hernia recurrence following conventional repairs is 22% – 29% (1,3,10).

In this issue of *Peritoneal Dialysis International*, the article by García-Ureña *et al.* (15) describes the management of common abdominal wall hernias in PD patients. The authors underline the importance of employing prosthetic mesh to produce tension-free hernioplasty. They observed no recurrences, dialysate leaks, or infection in a prospective case series of 24 repairs in 21 patients (2 umbilical hernias were not operated). Excepting unusual circumstances, the hernia repairs were accomplished simultaneous with catheter placement. The clear descriptions and illustrations of their techniques regarding umbilical and other midline hernia repairs will serve as a valuable reference.

In their report, García-Ureña *et al.* recommended a 4-week healing period following hernia repair before starting PD in new patients, and a 10-day wait before resuming dialysis in established patients; however, 4 patients who could not be transferred to hemodialysis were allowed to start PD on the first postoperative day because of the urgent need for treatment. No leaks were observed in this subgroup. Presumably, the remainder of the patients requiring therapy were managed by temporary transfer to hemodialysis; although, this is not clearly stated in their paper. On the contrary, if appropriate attention is given to producing a watertight closure during hernia repair, the expectation should be that patients could safely commence or resume PD postoperatively without delay (16–18). The discomfort, inconvenience, complications, and expense associated with vascular catheter placement for temporary hemodialysis can be avoided.

As pointed out by García-Ureña *et al.*, the hernia sac, whether inguinal or midline, should be dissected free of adjacent structures, without opening it, and inverted through the fascia. If the sac is inadvertently opened or requires excision, careful watertight closure with an absorbable suture should be performed. Umbilical hernias, the most common hernias encountered in PD patients (3,8,10,12,19), are usually associated with a small fascial defect, although the bulging sac can be impressive. As observed by García-Ureña *et al.*, dissecting the hernia sac free of small defects without violating the integrity of the peritoneum can be more challenging than with sacs of larger defects. This is complicated by the fact that the peritoneum is often very thin and fragile in the periumbilical area, and attempts to close holes with a suture may produce further rents in the sac. It can be difficult to assure that a watertight closure has been achieved when working through these small defects. This becomes an issue only when immediate postoperative PD is planned as opposed to allowing a protracted period of peritoneal rest for healing, as advocated by García-Ureña and associates.

An alternative to the preperitoneal mesh hernioplasty and H mesh hernioplasty for small umbilical hernias as recommended by García-Ureña *et al.* is a low-tension buttressed hernioplasty with mesh onlay that permits a reliable watertight closure (Figure 1). Fortunately, most umbilical defects are small (≤2 cm) in established PD patients; otherwise, the hernias should have been evident at the time of catheter placement. Transverse closure of small defects creates minimal tension. The pull of the fibers of the abdominal wall musculature is in a

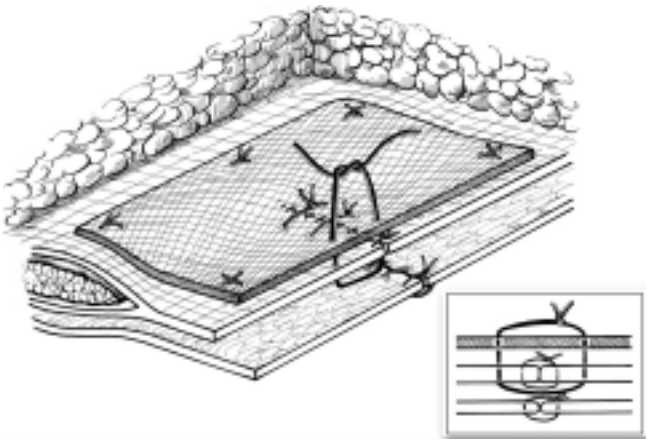

Figure 1 — Median sagittal views of buttressed umbilical hernioplasty using polypropylene mesh onlay with watertight closure of peritoneum and fascia.

transverse direction; therefore, increased intraperitoneal pressure tends to diminish the size of the defect, with transverse approximation of the edges (13). Furthermore, the line of sutures in a transverse closure is at right angle to the direction of the aponeurotic fibers, thus increasing the holding power of the stitches. The strength of the repair is enhanced by passing the fascial stitches through polypropylene mesh and tying the sutures on the surface of the screen to approximate the edges of the defect and buttress the repair. The onlay mesh must be allowed to overlap the fascial closure for a distance of at least 3 cm and tacked to the fascia circumferentially with interrupted sutures.

The buttressed hernioplasty with onlay mesh permits two opportunities to achieve a watertight closure: the first at the level of the peritoneum and the second at the level of the fascia (Figure 1). The peritoneal sac is either inverted without opening it, or repaired with a running 3-0 polygalactic suture if excision of a portion of the sac was required. If reliable repair of the opened sac cannot be achieved as a separate layer, then it is included with the fascial closure. After the 0-polypropylene fascial sutures are placed, watertight closure of the fascial level is obtained by running the transverse closure with 3-0 polygalactic suture. The polypropylene fascial stitches are passed through the mesh and tied on its surface. The stiffness of the polypropylene suture material facilitates threading the fascial repair stitches through the mesh without the use of a needle. Circumferential tacking of the overlapped mesh with interrupted polypropylene sutures completes the repair. Optionally, application of fibrin glue (Tiseel; Baxter Healthcare, Deerfield, Illinois, USA) or surgical adhesive (BioGlue; CryoLife, Atlanta, Georgia, USA) can further enhance the integrity of the peritoneal and fascial closures.

The buttressed hernioplasty with onlay mesh has been used by the author to repair umbilical hernias of 34 PD patients, 13 repairs of which were performed after commencing dialysis therapy. These latter patients were continued on PD postoperatively without interruption using a low volume, automated, intermittent PD protocol to be described. No dialysate leaks occurred. With an average of 23.7 months (range 1.1 – 95.4 months) of follow-up for these 34 cases, there has been one recurrence in a patient, whose repair was performed early in the series, with the recognized chief cause being insufficient overlap of the mesh around the defect. However, to avoid problems caused by excessive tension on the repair, umbilical and midline defects larger than 2 – 3 cm are more reliably repaired using tension-free techniques such as described in this issue by García-Ureña *et al.* and in the paragraph to follow.

Polypropylene mesh hernioplasties have been used effectively to treat large incisional hernias in new and established PD patients, permitting immediate dialysis. Guzmán-Valdivia *et al.* (16) repaired 50 incisional hernias using tension-free principles. The hernia sac was dissected free but its integrity was preserved. At 5 cm from either side of the fascial defect, the anterior rectus sheath was incised longitudinally the length of the hernia, and the deep face of the aponeurosis was separated from the muscle laterally for 3 – 4 cm. The mesh was placed over the hernia defect and sutured to the deep face of the mobilized fascia on both sides. This is similar to the retromuscular sublay technique described in the present issue by García-Ureña *et al.*, except that Guzmán-Valdivia *et al.* positioned the mesh as an antemuscular sublay. All patients resumed PD postoperatively with no occurrences of dialysate leak. During an average follow-up of 2 years (range 2 months to 4 years), there were no hernia recurrences. The strength of the tension-free repairs described by García-Ureña and Guzmán-Valdivia is enhanced by widely overlapping the mesh beyond the margins of the defect and placing the edges in a layer between the muscle and fascia. This provides for better fixation of the mesh and wide distribution over its surface of any physical stresses exerted on the repair (20).

Imvrios *et al.* (17) reported polypropylene mesh abdominal wall hernioplasties in 5 patients with large recurrent incisional hernias. The peritoneal hernia sac and fascia were closed as separate layers in the midline with absorbable and nonabsorbable suture respectively. Fibrin glue (Tiseel) was applied over the suture line of each layer. Polypropylene mesh was used to reinforce the abdominal wall as an overlay. The mesh extended from just below the costal margins to near the inguinal ligaments and to beyond the anterior axillary lines on both sides.

The dialysis catheter was inserted through the abdominal wall and emerged through a hole cut in the mesh. Peritoneal dialysis was started a few hours following the procedure, using a low volume protocol that was gradually incremented to a standard regimen over a 3-week period. One patient experienced dialysate leakage through the hernioplasty during the early postoperative period but was successfully managed by decreasing the dialysate volume. During an average follow-up of 13 months (range 3 – 21 months), there were no hernia recurrences. Although the fascial closure described by Imvrios *et al.* results in a high-tension suture line, the excellent results can be attributed to the extent to which the mesh was applied as a wide overlay beyond the margins of the closed defect. When extensive mobilization of the skin has been performed to widely expose the fascial margins, closed suction drains should be employed to prevent seroma formation.

Indirect inguinal hernia sacs are successfully managed by watertight high ligation and excision (2,18), or inversion of the unopened sac through the internal inguinal ring with (21) or without (18) insertion of a prosthetic plug. Direct inguinal hernia sacs are inverted (2,15). Whether dealing with an indirect or a direct inguinal hernia, the floor of the inguinal canal is best supported with the Lichtenstein tension-free hernioplasty (15,18,22). In most instances, femoral hernias in established dialysis patients can be successfully repaired using a tensionless technique through a subinguinal approach by inversion of the unopened sac and insertion of a prosthetic plug into the femoral canal (13). Pericatheter hernias, caused by midline approaches and faulty wound closure, are most reliably managed by simultaneous implantation of a new catheter at a paramedian location using techniques proven to prevent insertion-site hernias (23), removal of the old catheter, and mesh hernioplasty.

Prosthetic materials are occasionally placed in direct contact with the visceral peritoneum during repair of abdominal wall defects in nondialysis patients. As expressed in the report by García-Ureña, there is concern that prosthetic materials exposed to the peritoneal cavity in PD patients may become seeded by bacteria during a dialysis-related infection. Moreover, exposed polypropylene mesh may produce dense adhesions and even fistulization into the intestines (20). Alternative use of expanded polytetrafluoroethylene sheeting minimizes adhesions and even permits development of a mesothelial-lined neoperitoneum within weeks following implantation in laboratory animals (24). However, in the event of a dialysis-related peritonitis, it is not known whether this neoperitoneum is a sufficient barrier to bacterial seeding of the prosthesis. Until further study is performed, it would seem advisable to avoid placing prosthetic materials in direct contact with the peritoneal cavity in PD patients. In addition, it is suggested that a prophylactic antibiotic be administered prior to implantation of prosthetic materials (20), a recommendation that applies to PD catheters as well (25).

Previously undetected inguinal hernias may become manifest with the appearance of genital edema after commencing PD. Distinguishing inguinal hernia from other causes of genital edema (*e.g.*, pericatheter, umbilical, incisional hernia) may be difficult due to soft tissue swelling, small size of the hernia sac, or obesity (26,27). Frequently, the patient is subjected to a reduced dialysis regimen or is temporarily transferred to hemodialysis in a wasted effort to see if PD can be resumed without recurrence of genital swelling (4,28). The patient may even suffer an unproductive surgical exploration for a dubious diagnosis (29). Instead, prompt investigation should be performed using imaging techniques that employ a marker added to the dialysate solution (27,29,30). Peritoneal scintigraphy is performed with 2 mCi of $^{99m}$technetium sulfur colloid added to 2 L of dialysate, followed by gamma camera scanning to detect the site of peritoneal leak (Figure 2). Alternatively, 100 mL of nonionic contrast medium (61% iopamidol; 65% iodixanol) is added to 2 L of dialysate and a computerized tomographic (CT) scan is used to demonstrate the presence of a hernia sac (Figure 3). In both imaging techniques, it is imperative that the patient be ambulatory for 30 to 60 minutes after instillation of the dialysate with the added imaging

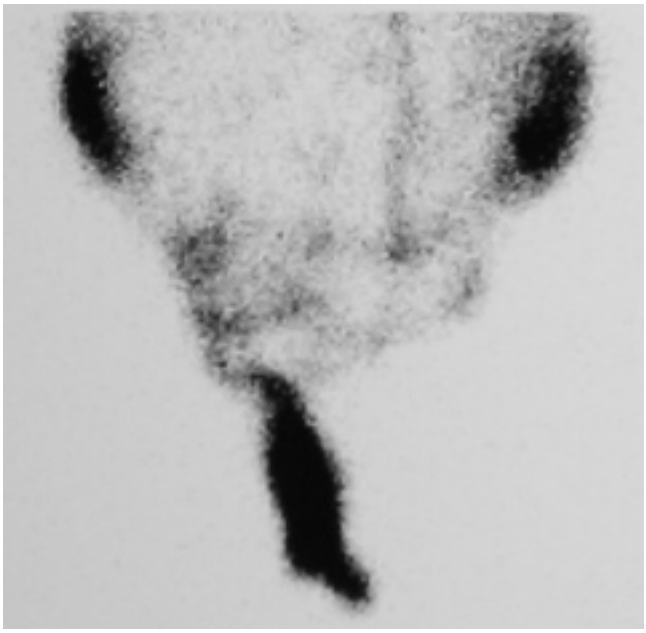

Figure 2 — Peritoneal scintigraphy post-drain image demonstrating right inguino-scrotal fluid collection.


Figure 3 — Computed tomographic peritoneography showing dye around the cord structures in the upper scrotum on the right side (arrow) at the level of the root of the penis.

marker to promote intraperitoneal mixing and to raise intra-abdominal pressure to drive the contrast into the source of the leak. It is advisable to coordinate the diagnostic study with the PD nursing staff to perform the addition of the marker to the dialysate and to make the tubing connections to prevent transluminal contamination of the catheter by health care personnel who may be unfamiliar with dialysis technique.

Following hernia repair, the risks of leaks from immediate reinstitution of PD can be diminished by the use of low volume automated exchanges using an intermittent PD protocol (Table 1). Typically, dialysis is started on the evening of the day of surgery with the understanding that the patient must remain supine while there is dialysate in the abdomen. The cycler is programmed for no last bag fill at the end of the session to permit a dry peritoneal cavity during ambulatory periods. The initial fill volumes of 1 L are graduated to 1.5 L the second week, with resumption of usual dialysis regimen thereafter. The protocol in Table 1 serves as a guideline and may be adjusted according to the patient's residual renal function and peritoneal membrane transport characteristics.

TABLE 1
Protocol for Postoperative, Low Volume, Automated, Intermittent Peritoneal Dialysis

| | |
|---|---|
| First week | |
| | 1 L, 10 exchanges over 10 hours while recumbent |
| | Dry abdomen while ambulatory |
| Second week | |
| | 1.5 L, 10 exchanges over 10 hours while recumbent |
| | Dry abdomen while ambulatory |
| Third week | |
| | Resume usual dialysis regimen |

Other sources of mechanical stress should be avoided in the postoperative period. Particularly during the first few weeks following hernia repair, the patient should guard against forceful coughing, straining, lifting, bending over, squatting, or stair climbing. Stool softeners (docusate) and laxatives (sorbitol 70% solution, lactulose) are recommended to avoid constipation, especially in view of analgesic use and sedentary activities during the postoperative period. The use of a Velcro abdominal binder during ambulatory periods following repair of umbilical and midline hernias is suggested.

In summary, preoperative evaluation for PD catheter placement should include a careful search for abdominal wall hernias. Repair of diagnosed hernias is accomplished simultaneously with catheter placement. A single preoperative dose of intravenous antibiotics providing anti-staphylococcal coverage should be administered. Acquired hernias in established PD patients require timely repair to alleviate discomfort, assure adequacy of dialysis, and prevent conventional hernia complications. When an occult symptomatic hernia is suspected, peritoneal scintigraphy or CT peritoneography should be used to facilitate early diagnosis and repair. Because of the high recurrence rate in PD patients, even small hernias should be repaired using prosthetic material, preferably with tension-free or minimal-tension techniques. When significant wound dead space exists, closed suction wound drains should be employed to prevent seroma formation. Attention to details in producing a watertight closure and the use of low volume intermittent PD permits immediate resumption of therapy after hernia repair and avoids the need for temporary hemodialysis.

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