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THE USE OF THE LAPAROSCOPE FOR DIALYSIS CATHETER IMPLANTATION: VALUABLE CARRY-ON OR EXCESS BAGGAGE?

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The use of the laparoscope to guide peritoneal dialysis (PD) catheter implantation antedates the modern surgical laparoscopic era by almost a decade. In 1981, Ash *et al.* (1) reported the use of a laparoscopic system to insert PD catheters under local anesthesia in a non operating-room environment. Using a hand bulb to insufflate the abdomen with room air and a peer-through-the-eyepiece laparoscope equipped with an overlying plastic sleeve, a clear space in the peritoneal cavity was identified. The scope was withdrawn, leaving the valveless sleeve in place to serve as a conduit for blind passage of the dialysis catheter toward the identified area.

The advent of laparoscopic cholecystectomy in 1989 ushered in the age of contemporary surgical laparoscopy. Laparoscopic camera images projected onto video monitors, automatic gas insufflators, and pneumatically competent port devices through which instruments could be introduced provided unprecedented vision and ability to perform complex procedures. Development of a laparoscopic version of nearly every conventional open abdominal operation followed. Similarly, there was an explosion of interest in applying the laparoscope to PD access. Since 1989, laparoscopic catheter insertion has dominated the medical literature compared to other conventional methods of catheter placement (Figure 1) (1–159).

There are no reliable data to indicate what proportion of catheter insertions are currently performed by laparoscopy. In 2007 the Current Procedural Terminology Editorial Panel of the American Medical Association

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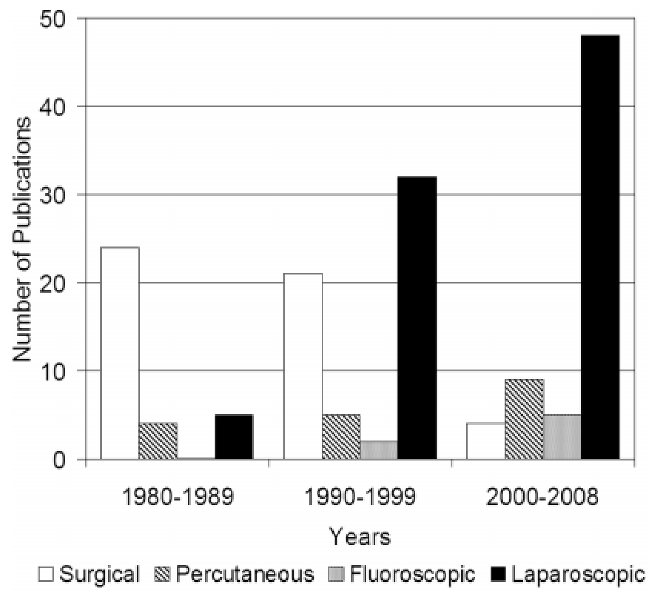

Figure 1 — Bar graph shows the number of English-language journal reports describing catheter placement techniques and/or comparative experiences of catheter insertion methods for chronic peritoneal dialysis according to the decade of publication. Abstracts, reviews, papers focusing on catheter design, and books were excluded. Comparative experiences were classified based upon the methodology supported by the authors' conclusions.

implemented a new procedure code specific for laparoscopic dialysis catheter implantation. Due to the approximately 9-month lag in the public availability of data from the Centers for Medicare and Medicaid Services for each preceding year, the 2007 figures for what proportion of peritoneal access claims used this code were unavailable at this writing.

As with any new application of a modality, laparoscopy for catheter insertion is still undergoing procedure-specific adaptation. The number of catheter placements performed by individual surgeons is usually small; thus it takes longer to accrue experience and expertise than for more common laparoscopic procedures. Surgeons are often unfamiliar with best-demonstrated practices in catheter implantation and, born of necessity, it is not uncommon for surgeons to modify the use of available in-house equipment to enable the laparoscopic procedure. The inevitable consequence of these practice traits is that there are almost as many laparoscopic techniques for placing catheters as there are surgeons performing them. Moreover, these conditions of performance explain the wide variability in reported outcomes, giving substance to the question of worthiness of the laparoscope as a standard tool for catheter placement.

LAPAROSCOPY LIMITED TO POSITIONING THE CATHETER

Simply using the laparoscope to help position the catheter during insertion has failed to show clear benefit over conventional open placement methods. Only two randomized clinical trials compare the two modalities used in this fashion. In 1999, Wright *et al.* (93) reported no significant difference in outcomes in a prospective randomized comparison of catheters placed by laparoscopic and conventional approaches. No laparoscopic interventions were described by Wright beyond confirmation of catheter position in the pelvis. Although Wright's study is often cited by the antagonists of laparoscopy, the probability for type II error is great in that subject numbers were small (21 laparoscopic and 24 conventional catheters) and average follow-up was short (12.6 and 15 months respectively). Prevalence of prior surgery, indicating risk of adhesions, was higher in the laparoscopic group (52% vs 21%). The authors indicated that this demographic difference was insignificant (Yate's continuity corrected chi-square test, $p = 0.058$) but a more appropriately applied Fisher's exact test confirms this disparity in his study groups to be statistically meaningful ($p = 0.035$). A history of abdominal surgery is recognized to significantly increase the risk for mechanical catheter complications (143,160). The absence of mechanical dysfunction in either of his subject groups is atypical for studies of this sort and compels caution in assessing the value of laparoscopy by these results.

Also in 1999, Gadallah *et al.* (83) reported the results of their prospectively randomized comparison of laparoscopic ($n = 76$) and open surgical ($n = 72$) placement of catheters. Gadallah used the laparoscopic approach originally described by Ash *et al.* (1) that identifies a clear space within the peritoneal cavity to which a catheter is directed. The prevalence of previous abdominal surgery was 49% and 45.8% for the laparoscopic and open surgical groups respectively. The incidence of mechanical malfunction leading to catheter loss was not statistically different for the two groups (7.9% for laparoscopic and 11.1% for open surgical). Average duration of follow-up was not mentioned. If it were not for inexplicably excessive pericatheter leakage and peritonitis rates in the open surgical group, Gadallah would not have been able to show improved survival benefit for his laparoscopically placed catheters.

Two additional studies reported comparative analyses between laparoscopy (limited to catheter positioning) and conventional open catheter insertion, but in a nonrandomized prospective case series design. In 1998, Eklund *et al.* (74) compared Ash's laparoscopic technique ($n = 65$) to open surgical placement ($n = 43$) over a short-term follow-up period averaging only 8.4 and 9.1 months respectively. As in the Gadallah study, Eklund reported inexplicably excessive pericatheter leakage and peritonitis rates, but in the laparoscopic group instead. Without this aberration, Eklund would not have been able to show a difference in catheter survival between the two groups.

In 2005, our institution reported a nonrandomized prospective case series comparing laparoscopic and conventional open catheter placement procedures (134). The study included a group designated as "basic laparoscopy" in which the use of the laparoscope was essentially limited to confirming catheter position. The prevalence of prior surgery was significantly higher in the basic laparoscopic group than the open surgery group (55.1% vs 30%). Mean follow-up was 26.9 and 23.3 months for the basic laparoscopic ($n = 78$) and open placement groups ($n = 63$) respectively. Limited use of the laparoscope did not produce a statistically significant difference in the occurrence of catheter flow obstruction (12.8% for basic laparoscopy and 17.5% for open surgery). The probability of type II error existed from differences between the groups for prior surgical history and small patient numbers; nevertheless, as noted in the above studies, simply using the laparoscope to position the catheter did not appear to significantly diminish the risk of mechanical catheter dysfunction.

Two comparative analyses employing laparoscopy as described by Ash are not included in this discussion due to incomplete demographic characterization of study groups and failure to report or segregate data on catheter flow dysfunction (40,42). Moreover, the surgical groups either had significant history of prior surgery or insertion techniques prone to produce the measured adverse events were employed. While Ash's laparoscopic approach was favored by both studies, the huge bias against the conventional surgical groups precludes meaningful comparison.

PROGRESSIVE LAPAROSCOPIC PRACTICES

The potential strength of laparoscopy is that it allows an opportunity to proactively address problems that adversely affect catheter outcome, specifically, catheter tip migration, peritoneal adhesions, omental or other tissue entrapment, and diagnosis of previously unsuspected abdominal wall hernias. Preemptively identifying and attending to these problems at the time of the implantation procedure are the likely advantages of surgical laparoscopy over other catheter insertion techniques.

Catheter Tip Migration: Various laparoscopic techniques have been derived to promote pelvic orientation of the catheter tip and to prevent migration. Many of these methods represent more effective and less invasive versions of previously described open surgical procedures that tacked the catheter to the abdominal wall (6,7,11,26,63,147) or created obliquely angled tissue tunnels to encourage catheter direction toward the pelvis (8,12,37,45,48,60–62). The most direct laparoscopic approach was to place a catheter anchoring stitch to the bladder, uterus, or pelvic sidewall to keep the catheter tip at home in the pelvis (68,86,92,100,103,120,136, 137,139,158). The problems with this technique were that it required extra laparoscopic ports to place the stitch and the suture sometimes failed by pulling out of the tissues, but, at other times, its secure hold complicated catheter removal. A modification of this approach was to fashion a suture sling (87,141) or to construct a tissue sling by suturing a fold of peritoneum over the tubing (71) at a site caudal to the catheter insertion point, which fixed a segment of the catheter to the back of the anterior abdominal wall in a craniocaudal alignment toward the pelvis.

A more attractive and effective method of minimizing catheter tip migration takes advantage of the natural toughness and craniocaudal direction of the rectus sheath fascial envelope. Laparoscopy is utilized to guide implantation of the catheter through a long rectus sheath tunnel in its passage to the peritoneal cavity. Craniocaudal immobilization of the catheter in the rectus muscle and sheath not only promotes a pelvic course for the catheter but also reduces the risk of pericatheter leakage and eliminates the possibility of pericatheter hernias (134). While several techniques have been described to accomplish this laparoscopic maneuver, all employ modifications of existing laparoscopic ports (84,96,98,103,112,113,124,125,134,136,156), stylets (133,135,140), trocars (155), and other devices (72,154) that depart from their intended use. Clearly, this is an area where catheter implantation science could benefit from the development of a dedicated apparatus specifically designed to insert peritoneal catheters through a long rectus sheath tunnel in a simple, safe, accurate, and reproducible fashion while maintaining pneumatic competence and visibility during laparoscopy.

Peritoneal Adhesions: Laparoscopy is the only practical way to reliably investigate the suitability of the abdominal cavity for PD in patients with adhesions from prior surgery and peritonitis. In contrast, very little can be seen or felt through the limited exposure provided by the peritoneotomy of conventional open catheter placement approaches. Extension of the open procedure to a formal laparotomy and adhesiolysis has been described but it was accompanied by prolonged hospitalization and the necessity of more vigorous postoperative irrigation to clear bloody drainage (6).

The pneumoperitoneum of laparoscopy allows minimally invasive inspection of the peritoneal cavity in a setting that simulates the dialysate filled abdomen. The site of catheter insertion can be modified to avoid adhesions and the catheter may be directed through or around adhesive scar tissues into a location of good drainage function. Alternatively, adhesions that interfere with catheter placement or produce compartmentalization that might impede dialysate drainage can be divided by laparoscopic adhesiolysis using ultrasonic shears or electrosurgical devices that minimize bleeding. The use of adhesiolysis as an adjunctive tool during catheter placement was described by 37 of the 85 (43.5%) laparoscopic reports cited herein.

Omental Entrapment: Catheter blockage and dislocation by the greater omentum is a common mechanical complication. In an attempt to avoid this problem, omentectomy was recommended at the time of the catheter insertion procedure in 14 of 49 (28.6%) conventional open surgery reports cited in this review. During open placement, as much omentum as possible was resected by delivering it through the peritoneotomy incision or through a separate midline incision. In 1985, as a substitute for omentectomy, McIntosh *et al.* (23) described suturing the omentum to the upper abdominal wall region (omentopexy) during open catheter insertion. There is no indication that omentopexy gained any favor during the conventional catheter placement era.

Even with laparoscopic approaches to catheter implantation, many surgeons still tease the omentum out through the laparoscopic port site and perform an open partial omentectomy (87,102,106,152,158,159). Laparoscopic omental resection has been performed; however, it adds significant procedure time and is rarely carried out (149). Since 1994 our institution has employed laparoscopic omentopexy during catheter rescue procedures to prevent recurrence of omental obstruction (161). In 1997, Heithold *et al.* (71) first described the use of laparoscopic omentopexy during the catheter implantation procedure to prevent omental entrapment. Reports followed with recommendations to perform omentopexy during all catheter placement procedures (88,104,121,135) or to selectively apply the omental tack-up procedure only when redundant omentum was observed to extend to the pelvis (96,113,134,149). Recently, Goh (162) recommended an alternative method of laparoscopic omentopexy for catheter rescue consisting of folding the omentum upon itself and suturing it into this position, a procedure that can be equally exploited during catheter insertion.

Other Tissue Attachment: Excessively long epiploic appendices of the rectosigmoid colon, a redundant floppy sigmoid colon, and uterine tubes are infrequent causes of catheter blockage (163). Laparoscopic resection of the epiploic appendices and tacking up of redundant colon along the left lateral abdominal wall (colopexy) has been performed during the catheter placement procedure (71). Salpingectomy and ovariopexy to prevent obstruction by the Fallopian tubes during laparoscopic catheter insertion have been described (73,158).

Abdominal Wall Hernias: The reported incidence of abdominal wall hernias in PD patients ranges from 9% to 31% (164). Peritoneography has been used during conventional catheter placement in the pediatric population to detect asymptomatic hernias (2,60). Laparoscopy permits a unique opportunity to perform an internal abdominal wall examination to look for previously unsuspected hernias. All identified hernias should be repaired at the time of the catheter placement procedure (102,109,121,159).

EFFECTIVE USE OF LAPAROSCOPY

Many of the clinical studies extolling the merits of laparoscopy for peritoneal access consist of too few subjects with an insufficient period of observation. Almost half the published reports were comprised of 15 or fewer laparoscopic catheter insertion procedures (Figure 2) and, in over three fourths of these studies, the average duration of postoperative follow-up was less than 12 months or not stated (Figure 3). These limited clinical experiences are unlikely to deliver a convincing argument about the value of laparoscopy.

Moreover, few studies involve one or more of the progressive laparoscopic practices discussed above or appreciate the synergism of combining these techniques. Maintaining pelvic orientation of the catheter is important to keep it out of reach of the omentum; therefore, catheter immobilization techniques alone produce better outcomes than when they are not used (100,158). Even so, a significant number of patients have redundant omentum that extends to the pelvis and that can still produce blockage despite correct catheter position (147,155,156). Treating the omentum alone produces a better outcome than when it is not done (21,41,121, 158); however, an unsecured catheter tip can migrate to a position of poor drainage function or become ensnared in an omental remnant (23,54,149). Combining the progressive laparoscopic practices of immobilization of the catheter toward the pelvis and omental treatment (omentectomy or omentopexy) produces an outcome that is better than when the procedures are performed individually (Table 1).

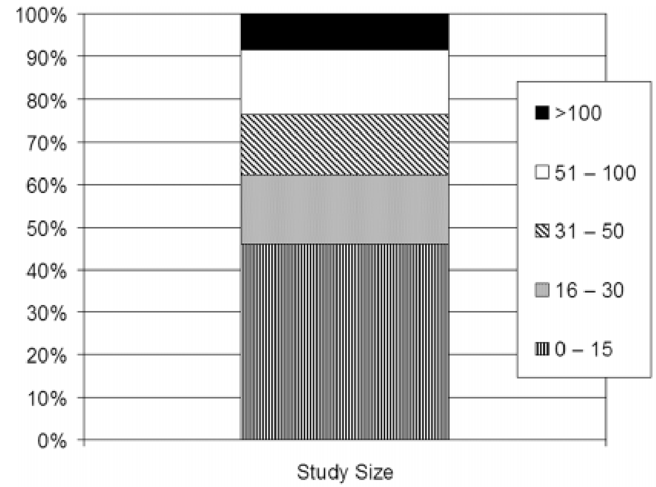

Figure 2 — Distribution of 85 laparoscopic journal articles according to the number of laparoscopic catheter placement procedures reported.

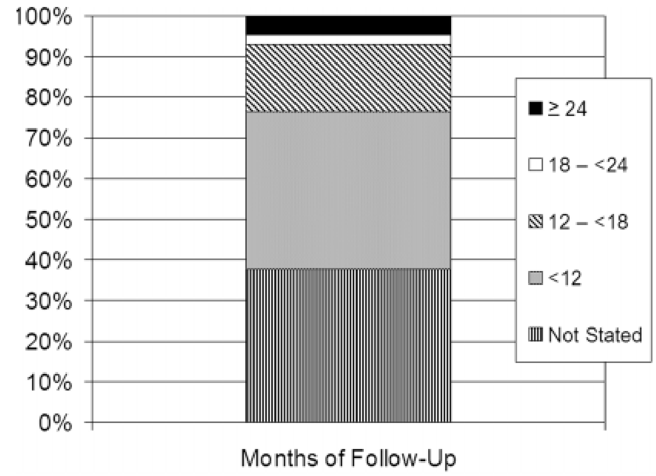

Figure 3 — Distribution of 85 laparoscopic journal articles according to mean postoperative catheter follow-up in months. For the intent of this illustration, reported values for median follow-up were assumed to approximate mean follow-up.

TABLE 1
Literature Survey Demonstrating the Synergism of Combining Progressive Laparoscopic Practices of Catheter Immobilization and Omental Treatment[a]

Implantation method Author, year (Ref.)	Catheters (*n*)	Mean follow-up (months)	Method of catheter fixation	Method of omental treatment	Flow dysfunction
Catheter immobilization only					
Krug *et al.,* 1997 (72)	25	12.9	Rectus tunnel	None	4.0%
Soontrapornchai *et al.,* 2005 (136)	50	26	Rectus tunnel and tacking	None	6.0%
Schmidt *et al.,* 2007 (154)	47	17	Rectus tunnel	None	6.4%
Maio *et al.,* 2008 (156)	100	22.4	Rectus tunnel	None	6.0%
Keshvari *et al.,* 2008 (155)	175	14.6	Rectus tunnel	None	8.6%
Omental treatment only					
Haggerty *et al.,* 2007 (149)	31	14	None	Omentectomy and omentopexy	6.5%
Combined catheter immobilization and omental treatment					
Ogunc, 2005 (135)	44	17.4[b]	Rectus tunnel	Omentopexy	0%
Crabtree *et al.,* 2005 (134)	200	21	Rectus tunnel	Omentopexy	0.5%

[a] Published reports of adult laparoscopic catheter implantations using a paramedian insertion site with the deep cuff within the rectus sheath. The survey required an experience of greater than 15 catheters and mean follow-up of 12 months or longer.
[b] Median follow-up (months).

There are no prospective randomized studies comparing laparoscopic catheter placement techniques employing the previously discussed progressive practices to either laparoscopic approaches not using them or other conventional catheter insertion methods. Since the effective use of laparoscopic techniques clearly produces better outcomes, it may be ethically difficult to justify performing a randomized controlled comparison with conventional catheter placement procedures. However, two previous case series studies are available that compare the combined use of progressive laparoscopic practices with control groups. Ogunc (135) performed laparoscopic catheter implantation in 44 subjects in whom there was a 20.5% prevalence rate of previous abdominal surgery. All patients underwent rectus sheath catheter tunneling and omentopexy. Adhesiolysis was required in 11.4% of patients to facilitate catheter placement. During a median follow-up of 17.4 months, there were no occurrences of catheter flow dysfunction. In a group of 35 open implantation procedures performed during the preceding 5-year period, 22.8% were complicated by omental entrapment.

In the study from our institution previously introduced under the section on laparoscopy limited to catheter positioning, there was a third group designated as "advanced laparoscopy" (134). In this group of 200 catheter procedures with a 53% prevalence rate of prior surgery, rectus sheath tunneling was performed in all cases, omentopexy was selectively applied in 14.5% of procedures when omentum was found in the pelvis, and adhesiolysis was required on 7% of occasions. With a mean follow-up of 21 months, the incidence of flow obstruction was only 0.5%, compared to 12.8% and 17.5% for basic laparoscopy and open dissection groups respectively ($p < 0.0001$).

LAPAROSCOPY AND PRACTICE GUIDELINES TOWARD OPTIMAL PERITONEAL ACCESS

In 1998, the International Society for Peritoneal Dialysis published a comprehensive report describing best-demonstrated practices toward optimal peritoneal access (165). The guidelines and principles detailed in this report are applicable regardless of the catheter insertion method employed. Each laparoscopist should critically evaluate their catheter placement technique against these guidelines and either amend their approach or seek to validate their variance by scientific study. Undoubtedly, new laparoscopic-related guidelines and principles will be added as laparoscopic catheter implantation methodology evolves. A brief review of techniques that depart from accepted practice will be presented.

Corroborating the wisdom of the philosopher George Santayana, "Those who cannot remember the past are condemned to repeat it," many laparoscopic surgeons have perpetuated the error of using the midline for catheter placement. Seventeen of 85 (20%) laparoscopic reports described midline catheter insertion. Historically, midline implantation of dialysis catheters was preferred because less dissection was required to reach the peritoneal cavity and the risk of bleeding was lower. However, the relative thinness of the fascia and peritoneum in the midline infraumbilical region makes it difficult to achieve a good seal around the catheter, resulting in an unacceptable rate of pericatheter leaks. Due to the limited fascial attachments and compromised tissue ingrowth of the deep catheter cuff, there is a higher incidence of external displacement of the transmural segment of the catheter tubing, resulting in late pericatheter leaks, hernias, and extrusion of the superficial cuff through the exit wound (14,22,25,29,38,63,78). Instead, the catheter should be inserted at a paramedian site through the body of the rectus muscle, with the deep cuff positioned within the muscle.

Subcutaneous tunneling of the catheter from the insertion incision to the skin exit site with a hemostat clamp or using the laparoscopic port wound for the catheter exit site creates a patulous tissue tract and skin hole that predisposes the patient to exit-site and tunnel tract infection (166). These inferior practices were used in 22 of the 85 (25.9%) reviewed laparoscopic reports. A 5-mm laparoscopic port does not provide a satisfactory skin hole for 5-mm catheter tubing. The 5-mm designation of the port refers to the diameter of the instruments that can be passed through it, not the outside diameter of the port conduit, which typically measures 6.6 mm to 8.1 mm, depending on the vendor. In addition, wrenching the port around during the course of the procedure stretches and contuses the skin edges, further making it an unsatisfactory exit wound. Instead, the catheter should be exited through the skin with a tunneling guide that does not exceed the diameter of the catheter tubing and that can be passed in the direction from the paramedian insertion incision to the exit site. The exit wound should be the smallest hole possible that leaves the skin snug around the catheter. The Faller stylet (Faller tunneling stylet; Covidien AG, Mansfield, MA, USA) is specifically constructed for this purpose and can be advanced through the exit-site skin without making a prior incision.

Despite the stern warning against the use of catheter anchoring stitches by Tenckhoff himself in 1968 (167), this bad habit has managed to survive into the laparoscopic era (55,70,84,123–125). A suture should never be used to anchor the catheter. Sutures left in for several weeks commonly produce stitch pustules or abscesses that risk early exit-site and tunnel tract infection. It is appropriate to immobilize the catheter to prevent motion at the exit wound and accidental displacement during the first several weeks following implantation until sufficient time has been allowed for exit-site healing and catheter cuff fixation by tissue ingrowth. This is best accomplished by securing the catheter to the skin adjacent to the exit wound with medical adhesive tincture and sterile adhesive strips (8,134). Further immobilization of the catheter is obtained with a dressing that covers the entire device. The surgeon can help avert catheter dislodgement accidents by making postoperative dressing changes the exclusive purview of the PD nursing staff.

Many laparoscopic surgeons remain married to the umbilicus and appear hopelessly unable to divorce themselves from this cicatricial birthmark for Veress needle and laparoscope placement. Thirty-five of 85 (41.2%) laparoscopy papers employed this approach. Just as in the case of midline catheter placement, midline port sites are prone to leaks and hernias (92,120,136,139, 149,154). The elevated hydrostatic pressure associated with PD plays no small part in the development of port site hernias. Moreover, the conventional periumbilical region for laparoscope placement is too close to the catheter insertion site to be practical. This close proximity results in port conflict, poor visibility, and frustration with the procedure. For optimal visualization and ergometric use of laparoscopic instruments, the laparoscope and accessory ports should be placed 16 – 18 cm from the target area (168). Thirteen of the 85 (15.3%) reviewed laparoscopic experiences found that lateral insertion of the Veress needle and laparoscopic ports provided excellent safety and visualization for catheter implantation procedures, especially in patients with prior lower abdominal surgery. In the remainder, 18 (21.2%) used a paramedian puncture for Ash's one-port laparoscopic approach, 12 (14.1%) performed a paramedian entry with secondary insertion of lateral accessory ports, and 7 (8.2%) entered at a non periumbilical midline location.

COST OF LAPAROSCOPY

A familiar argument against the routine use of laparoscopy for implantation of PD catheters is the high cost of endoscopic equipment. To address this concern, a brief study of endoscopic costs is necessary. For this analysis, a complete modern-day endoscopic platform will be taken to include the following equipment: flat panel primary and secondary viewing monitors, high flow gas insufflator, camera control unit, camera head, laparoscope with accompanying sterilization tray, light source, digital capture device with printer, cart for primary video tower, roll stand for secondary monitor, and all necessary hardware and cables for equipment operation. While the price tag for such equipment is high, one of several viewpoints for correctly considering this expense is the cost per use. A fair analysis of cost must also include opportunity costs of capital to acquire the equipment, usable lifetime, and costs of operation and maintenance.

With the above considerations in mind, the annual economic cost of equipment is calculated by amortizing the initial investment expense over the lifetime of the equipment (169). A 5-year lifetime of the endoscopic equipment is assumed and the opportunity cost can be approximated by the real market interest rate using a conservative value of 5%. Annual operating and maintenance costs are estimated at 10% of purchase price (170). Applying the full retail values provided by three vendors that market in the USA, the average acquisition cost in 2008 for the aforesaid endoscopic platform is $141,750. Using this purchase price, the estimated annual economic cost is $32,741, with annual operating and maintenance costs of $14,175. The per procedure cost is estimated as the sum of the annual economic and operating and maintenance costs divided by the number of procedures performed per year. In the modern era of surgery, the endoscopic platform is used by most surgical specialties (general surgery, pediatric surgery, cardiothoracic, vascular, orthopedics, gynecology, urology, neurosurgery, plastics, and head and neck) to perform a wide variety of procedures. Metropolitan centers have an expected annual volume of 400 – 500 cases per endoscopic platform. Using this range of procedures, the estimated cost of the endoscopic platform per use varies from $94 to $117.

The above estimated per procedure cost was based upon state-of-the-art equipment at full retail value when, in fact, vendors routinely apply deep discounts to the list price. Performing the above calculations using my institution's purchase price for the above equipment in 2008 and average case volume per endoscopic platform for the preceding 12 months, the per procedure cost is $43. Add to this cost per use of endoscopic equipment another $130 for a disposable Veress needle and two laparoscopic ports, and $38 for the economic cost (estimated using 3-year lifetime for surgical instruments), operating and maintenance outlay, and reprocessing expenses of a reusable laparoscopic instrument tray. At any rate, the total cost attributable to the laparoscopic component of the peritoneal access procedure is still less than some of the popular peritoneal catheter devices being implanted (*e.g.*, the $155 – $179 cost of a coiled tip, 2-cuff, preformed arc bend catheter with a $141 – $151 titanium catheter adapter as supplied by two major USA vendors).

The expense of laparoscopy must also be considered from the standpoint of cost-effectiveness. Facilitated by techniques not available to other catheter placement methods, laparoscopy produces a lower incidence of complications that are expensive to fix or result in costly transfer to hemodialysis (171). Since laparoscopy provides an effective way of dealing with adhesions, more patients that ordinarily might not be considered PD candidates because of prior abdominal surgery or peritonitis are offered this effective and lower cost modality of renal replacement therapy (160). As a side note for those that are critical of laparoscopy because of the necessity of general anesthesia, this increase in the PD candidate pool of patients provided by laparoscopy more than offsets the small fraction of high-risk individuals excluded from a general anesthetic by reason of hemodynamic instability.

VALUABLE CARRY-ON OR EXCESS BAGGAGE?

As the focus of the modern surgical era shifts toward minimal invasiveness, a growing number of surgical specialties have embraced the value of endoscopy. In the field of PD, the transition from conventional catheter placement methods to laparoscopic implantation is inevitable. When applied effectively, the laparoscopic modality can both prevent and resolve many of the common mechanical problems that complicate insertion of PD catheters. Simply using the laparoscope as glitzy gadgetry to only witness the position of the catheter is blatant underutilization of this modality and represents unacceptable practice. If the laparoscope is brought along for the ride, genuine use ought to be made of it; otherwise, it is nothing more than excess baggage. The carry-on values that laparoscopy brings to the catheter implantation procedure that minimize the risk of catheter migration, pericatheter leak and hernia, omental entrapment, and flow obstruction include the progressive practices of rectus sheath tunneling, omentopexy, adhesiolysis, epiploectomy, salpingectomy, and colopexy. Enabled by these techniques not available to other catheter placement methods, laparoscopy provides the highest probability of achieving successful long-term peritoneal access.

DISCLOSURE

The author has no conflict of interest to declare.

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