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Laparoscopic insertion of Tenckhoff catheter for continuous ambulatory peritoneal dialysis

Continuous ambulatory peritoneal dialysis (CAPD) is proved to be an effective method of treatment of patients with end stage chronic renal failure. It has become possible since the Tenckhoff catheter has been introduced (12).

The positioning of the catheter may be performed using blind insertion via small infraubilical incision, percutaneously – with Seldinger technique, by the open surgical technique, peritoneoscopy and recently laparoscopy. Percutaneous technique is associated with high risk of visceral damage (11). Peritoneoscopy, provides visual control, which is, due to technical reasons, very limited and may be not sufficient for appropriate inspection of the peritoneal cavity (8). Open, surgical insertion of the catheter gives adequate inspection and enables additional procedures like removal of adhesions or resection of the excessive omentum if necessary, which are crucial for satisfactory function of the catheter. However, open techniques were reported to have a significant morbidity due to malposition, omental entrapment, dialysate leak, peritonitis and wound infection (4, 10).

Among all these techniques, the laparoscopic insertion of Tenckhoff catheter as a minimally invasive procedure seems to be a very beneficial and safe method of the catheter placement (3, 5, 9, 13).

The purpose of this study was to present the technique of laparoscopic insertion of the Tenckhoff catheter and describe the early and late results of the procedure.

MATERIAL AND METHODS

Between 2001 and 2004, in the Department of General Surgery of The Queen Elizabeth Hospital, Adelaide, Australia and the Department of Vascular Surgery and Angiology of the Medical University of Lublin, Poland the total number of 32 Tenckhoff catheters were inserted laparoscopically with a new technique. The group of patients consisted of 13 men and 15 women with end-stage renal failure, qualified by nephrologist and surgeon for CAPD. Mean age was 52 years (range 36–74 years).

We adapted the method described by Pole and Tervit (9). The procedure is conducted under general anaesthesia with antibiotic prophylaxis. Transverse, small skin incision is made 3 cm laterally to umbilicus, usually on the left side. Peritoneotomy is performed with Hasson technique and then pneumoperitoneum is achieved. Pursestring sutures are placed on the abdominal muscles and peritoneum to facilitate the closure at the end of operation. Then 10-mm camera port is inserted. Patient is tilted to Trendelenburg position enabling the accurate assessment of the lower part of the peritoneal cavity. The second 5-mm port is introduced through a skin puncture site, midway between the *pubis symphysis* and *umbilicus*, in the left midclavicular line, and then

directed obliquely, medially and downwards through the rectus muscle under visual camera control. The port punctures the peritoneum and enters the abdominal cavity close to the midline, just above the bladder. The third 5-mm port is placed laterally and inferiorly in the right iliac fossa, on the level of the peritoneum puncture performed by the previous port. Subsequently, an inspection of peritoneal cavity is conducted. Eventual adhesions are removed. Excessive part of the omentum may be lifted and sutured to the back of anterior abdominal wall, excised with electrocauterization or resected with Endo-GIA® stapler (Auto Suture, USA) if necessary.

A grasper is passed through the third port and out the second port which is then removed. The double cuffed Tenckhoff catheter is pulled into peritoneal cavity with the grasper, through the tunnel created by the second port. The tip of the catheter is located behind the urinary bladder with the proximal cuff of the catheter positioned just above the peritoneum puncture. This way proximal cuff occludes the part of the tunnel in the place of peritoneum perforation. The tip of the catheter was not secured by the suture in the Douglas or rectovesical pouch as it was described by Lu et al. (7), which subsequently enabled easy removal of the catheter if required, without the necessity of relaparoscopy. The distal part of the Tenckhoff catheter with the second cuff is tunnelled laterally under the skin with a curved metal trocar. Subcutaneous course of the tunnel should be a smooth curve with a skin exit site directing the outside part of the catheter downwards. The distal cuff seals the subcutaneous tunnel 3–4 cm before the skin exit site.

After repositioning of the patient from Trendelenburg position into supine one, a grasper and the third port are removed and the abdomen cavity desuflated. 100 ml of normal saline is infused through the catheter to check its patency and outflow. The first 10 mm-port is then removed and peritoneum and the anterior rectus sheet are closed with pursestring sutures placed at the beginning of the procedure. Skin incisions and punctures are closed with subcuticular dissolvable suture. The catheter is flushed and the peritoneal cavity lavaged at a few days' intervals until the CAPD is commenced.

RESULTS

The median follow-up was 28 months, ranging from 6 to 40 months. In the follow-up period we observed two deaths unrelated to the procedure and due to progression of associated diseases. Four patients received renal transplant, one patient switched to hemodialysis due to personal preferences, two patients dropped out from follow up in its late phase. Mean time of operation was 26 min. (range 18–62 min). Mean stay in the hospital was 2.1 days (range 1.4–3 days).

Early and late complications included: injury of the inferior epigastric artery, early leakage of dialysate, local peritonitis, infection of skin exit site, late migration of the tip of the catheter resulting in poor drainage, catheter blockage.

In one case the inferior epigastric artery was lacerated intraoperatively, but the bleeding was controlled laparoscopically. There was no need for conversion to open procedure. We observed early leakage of dialysate through the subcutaneous tunnel in two cases. After the reduction of the volume of dialysate and increasing the daily frequency of peritoneal dialysis the leakage gradually subsided. Local peritonitis occurred in two cases. In one case peritonitis was treated successfully with intraperitoneal infusions of antibiotics. In one case the catheter was removed and after peritonitis had resolved, the catheter was reimplanted laparoscopically on contralateral side. We had three infections of skin exit sites. One case was treated conservatively. One case required local excision of the skin exit site and subsequent relocation of distal cuff subcutaneously. In one case the catheter was removed and after infection was treated the catheter was reinserted laparoscopically on the contralateral side. One late migration of the catheter tip resulting in poor drainage was managed by repositionig of the tip of the catheter by means of stiff guidewire under the fluoroscopy guidance. Two catheters were blocked by intraabdominal adhesions ensheating the catheter and required removal and subsequent laparoscopic reinsertion. Nineteen implanted or reimplanted Tenckhoff catheters are still in use. In total number of 32 laparoscopic implantations (including four reimplantations) we observed 11 (34.4%–32/11) early or late complications. But it is worth to say that only four (14.3%–4/28) catheter removals and subsequent reinsertions were

required. Seven remaining complications could be managed conservatively or by radiological or minor surgical procedure.

DISCUSSION

Review of the literature shows that laparoscopic insertion of the Tenckhoff catheter is safe and time-effective procedure (5, 7, 9). It enables correct positioning of catheter under visual control and simultaneous diagnosis of preexisting intraabdominal pathologies such as adhesions, abdominal hernias or superfluous omentum, which may influence the function of the catheter (2, 6). Adhesions can be laparoscopically released and excessive part of the omentum may be lifted and sutured to the back of anterior abdominal wall, excised with electrocauterization or resected if necessary. Umbilical and other abdominal occult hernias can be repaired laparoscopically as well, during the same procedure.

Reasuming, when compared to open techniques where failure rate is reported even up to 56% (4, 10), laparoscopic insertion seems to have better success rates (1, 3). Lower morbidity, lower incidence of obstruction and a longer catheter survival is showed when compared retrospectively with catheters inserted with open methods (1, 3, 5, 13). We recommend an open Hasson laparoscopy technique since the insertion of Veress needle is associated with high risk of visceral laceration and blood vessels injury (1). Long run of the catheter in the created muscle-subcutaneous tunnel prevents infections and leakage of dialysate, especially after the surrounding tissue grows into its cuffs. Peritoneal dialysis may be commenced even after 24–48 hours after the procedure. Small skin incisions decrease the rate of infections, are less painful in comparison to laparotomy wound, which enables early mobilization and therefore shortens the length of the stay in the hospital postoperatively (5).

CONCLUSIONS

Laparoscopic insertion of Tenckhoff catheters for continuous ambulatory peritoneal dialysis is gaining popularity due to its advantages in comparison to other techniques and can be recommended as the first choice method.

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SUMMARY

The aim of the study was to popularize the new technique of laparoscopic insertion of Tenckhoff catheter for continuous ambulatory peritoneal dialysis. Between the years 2001–2004 the total number of 32 Tenckhoff catheters was inserted by the minimally invasive laparoscopic method. In the follow-up period we observed two deaths unrelated to the procedure and due to progression of associated diseases. Nineteen implanted or reimplanted Tenckhoff catheters are still in use. Four patients received renal transplant, one patient switched to hemodialysis due to personal preferences, two patients dropped out from follow-up in its late phase. In the total number of 32 laparoscopic implantations (including four reimplantations) we observed 11 (34.4%–32/11) complications. Early and late complications included: injury of the inferior epigastric artery, early leakage of dialysate, local peritonitis, infection of skin exit site, late migration of the tip of the catheter resulting in poor drainage, catheter blockage. It is worth to say that only four (14.%–4/28) catheter removals and subsequent reinsertions were required. Seven remaining complications could be managed conservatively or by radiological or minor surgical procedure. Laparoscopic insertion of Tenckhoff catheters for continuous ambulatory peritoneal dialysis is gaining popularity due to its advantages in comparison to other techniques and can be recommended as a first choice method.

Laparoskopowe zakładanie cewnika Tenckhoffa do ciągłej, ambulatoryjnej dializy otrzewnowej

Celem pracy jest popularyzacja nowej metody laparoskopowego umieszczania cewnika Tenckhoffa w jamie otrzewnej do ambulatoryjnej dializy otrzewnowej. W latach 2001–2004 założono łącznie 32 cewniki Thenckhoffa do dializy otrzewnowej z wykorzystaniem minimalnie inwazyjnej techniki laparoskopowej. W okresie obserwacji dwóch pacjentów zmarło z powodu postępu chorób towarzyszących. Czterech pacjentów otrzymało przeszczep nerki, jeden pacjent przeszedł na hemodializę, z dwoma pacjentami utracono kontakt w późnej fazie obserwacji. Dziewiętnaście implantowanych bądź reimplantowanych cewników jest ciągle w użyciu. W 11 z 32 (34,4%) przypadków obserwowaliśmy wczesne bądź późne powikłania. Powikłania obejmowały: śródoperacyjne uszkodzenie tętnicy nabrzusznej dolnej, wczesny wyciek płynu dializacyjnego, miejscowe, ograniczone zapalenie otrzewnej, zakażenia skóry w okolicy miejsca wyjścia cewnika z tunelu podskórnego, późne przemieszczenie się końca cewnika upośledzające prawidłową wymianę płynu dializacyjnego, niedrożność cewnika. Należy zaznaczyć, że tylko w czterech przypadkach (14,3%–4/28) wystąpiła konieczność usunięcia cewnika i jego ponownej reimplantacji. Siedem pozostałych powikłań leczono zachowawczo lub z zastosowaniem interwencyjnej procedury radiologicznej bądź małej korekty chirurgicznej położenia podskórnego części dystalnej cewnika. Laparoskopowe umieszczanie cewnika Tenckhoffa w jamie otrzewnej w celu prowadzenia ambulatoryjnej dializy otrzewnowej jest techniką zdobywającą coraz szersze uznanie ze względu na wieloaspektową przewagę nad innymi metodami i może być polecone jako metoda pierwszego wyboru.