Laparoscopic peritoneal dialysis catheter insertion using rectus sheath tunnel and selective omentopexy significantly reduces catheter dysfunction and increases peritoneal dialysis longevity

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Background. *Success of peritoneal dialysis depends on the durability of the peritoneal dialysis catheter, which in turn depends on insertion technique. Catheter-related complications are among the main reasons for peritoneal dialysis failure. Techniques showing evidence of improved catheter function include rectus sheath tunnel, selective omentopexy, and adhesiolysis.*

Methods. *Single-institution retrospective review of consecutive peritoneal dialysis catheter insertions was performed between 2004 and 2014. Of 235 procedures, the open technique was utilized in 63, basic laparoscopy with selective adhesiolysis in 80, and advanced laparoscopy utilizing rectus sheath tunnel, selective omentopexy, and adhesiolysis in 92. Primary outcomes included catheter dysfunction, catheter dysfunction-free, and overall survival.*

Results. *Mechanical catheter dysfunction occurred in 4 patients (4.4%) in the advanced laparoscopy group, 14 (17.5%) in the basic laparoscopy group, and 20 (31.8%) in the open group (*$P < .01$*). The advanced laparoscopy group had the highest rate of dysfunction-free and overall catheter survival. The rectus sheath tunnel was protective independently of dysfunction free catheter survival. The rate of switch to hemodialysis also was significantly lower in the advanced laparoscopic group (*$P = .031$*).*

Conclusion. *Advanced laparoscopic peritoneal dialysis catheter insertion using rectus sheath tunnel, selective omentopexy, and adhesiolysis is associated with decreased catheter dysfunction rates, improved dysfunction-free and overall catheter survival, and lowest rate of switch to hemodialysis. (Surgery 2016;160:924-35.)*

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Benefits of continuous ambulatory peritoneal dialysis compared with hemodialysis have been established widely and include improved patient autonomy and quality of life,[1,2] preservation of residual renal function,[3,4] slight survival advantage within the first 2 years of dialysis initiation,[5,6] and lower dialysis costs.[7-10] Despite these benefits and improved peritoneal dialysis (PD) outcomes over time, PD has been underutilized in the United States. Between the mid-1980s and 2010, PD utilization experienced a steady decline from 15% to 8%.[11,12] Although evidence shows a slight increase in recent incident PD cases in the United States to 9%, the PD utilization rates are well below other countries.[8,12]

Success of PD depends largely on the functionality and durability of the PD catheter, which in turn depends on the insertion technique. Not surprisingly, PD catheter-related mechanical complications are among the main reasons for PD failure and subsequent transfer to hemodialysis, second only to infection and accounting for 19.6% of failures.[13,14] Inflow and outflow obstruction of the catheter commonly occur due to compartmentalization from adhesions, omental entrapment, and catheter tip migration. Over the years catheter insertion techniques have been modified in attempt to address these issues.[15]

Traditional open PD catheter insertion utilizing a minilaparotomy has been associated historically with catheter dysfunction rates up to 36% because the catheter is placed blindly into the pelvis and lysis of adhesions is not possible. The use of laparoscopy was incorporated to visualize the abdomen, perform lysis of adhesions when necessary, and place the catheter tip in the pelvis. We now consider this basic laparoscopic insertion, and it is associated with dysfunction rates of up to 14%.[15-19] To lower catheter dysfunction rates and thus improve PD failure rates, additional maneuvers such as catheter fixation and omentopexy have been used individually or in combination, and this is considered advanced laparoscopic technique. Catheter fixation maneuvers include suturing the tip in the pelvis or using a rectus sheath tunnel to maintain the catheter tip position. Although these 2 have never been compared with each other, rectus sheath tunnel does not require additional ports or equipment and in retrospective series seems to be associated with a lower rate of catheter dysfunction.[15] Data comparing open, basic laparoscopic, and advanced laparoscopic insertion techniques in terms of catheter dysfunction and longevity is conflicting, sparse, and difficult to compare between studies due to the heterogeneity of the insertion techniques used. However, the use of advanced laparoscopic techniques in combination have been shown to decrease dysfunction rates significantly in a small number of retrospective studies.[20,21]

We began using advanced laparoscopic techniques of rectus sheath tunnel and selective omentopexy in 2008 in an attempt to lower our dysfunction rates. The aim of this study is to investigate and compare PD catheter dysfunction rates, catheter survival, and perioperative complications among open, basic laparoscopic, and advanced laparoscopic insertion techniques using strict technical definitions and rigorous data collection to strengthen the available but limited evidence on the topic.

PATIENTS AND METHODS

Study design. The study was conducted under approval from the NorthShore University HealthSystem Institutional Review Board. The electronic medical records of eligible patients undergoing open, basic laparoscopic, and advanced laparoscopic peritoneal dialysis catheter insertion at the NorthShore University HealthSystem were queried retrospectively. The NorthShore University HealthSystem is an academic-community medical center in Illinois consisting of Evanston Hospital, Glenbrook Hospital, Highland Park Hospital, and Skokie Hospital. Data from 5 high-volume, minimally invasive surgeons and 1 vascular surgeon performing routine PD catheter insertion were used.

Patients. This retrospective case series investigated outcomes of 235 consecutive PD catheter insertions from February 2004 to November 2014. Patients were required to have at least 1 month of postoperative follow-up and evidence of postinsertion catheter use during this time to be included in the study. Patients without at least 1 month of follow-up or without evidence of catheter use were excluded. Database information included patient demographics; preoperative health status, including comorbidities, reason for renal replacement therapy, prior renal replacement therapy, and prior abdominal operations; intraoperative data included details of operative technique, complications, and additional operative interventions; postoperative data included complications, catheter dysfunction (inflow/outflow obstruction, migration, pericatheter leak), need for and reason for catheter revision/removal, and duration of follow-up.

Endpoints and definitions. We focused on 3 primary endpoints: primary PD catheter dysfunction rates, primary PD catheter dysfunction-free survival, and overall PD catheter survival. PD catheter dysfunction was defined as inflow or outflow obstruction that prevented normal dialysis. Patients who experienced primary catheter dysfunction and underwent a same-side catheter replacement procedure were considered to have reached our primary outcome of interest and were not included in the subsequent follow-up. Catheter dysfunction-free survival was defined as total duration of time of primary catheter use (ie, PD catheter survival from time of insertion to revision or removal due to mechanical catheter malfunction), with censoring for catheter removal other than mechanical issues (wound infection, peritonitis, patient preference for HD, clinical PD failure), as well as loss to follow-up, return of renal