Non-Infectious Catheter/Mechanical Complications

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OBJECTIVES

- To review common catheter complications
- To review considerations for catheter salvage
- To discuss the importance of surgical technique for prevention
Background

- Work in a multi-disciplinary team
  - General Surgeons – UWMC and HMC
  - Nephrologists – UWMC and HMC
  - Nurses – UWMC, HMC, Northwest Kidney Center

- Place PD catheters laparoscopically according to a technique taught to us by Dr. John Crabtree (Kaiser Permanente, CA)
Catheter complications

- Many techniques to place catheters (laparoscopic, open, peritoneoscopic, percutaneous) and many differently trained providers placing them

- Infectious complications
  - Exit site infections (2-41%)
  - Peritonitis (2-30%)

- Non-infectious complications
  - Catheter-related
  - Abdominal-wall hernias
Non-infectious complications

- Catheter-related
  - Problems with flow – obstruction, migration, kinking
  - Peri-catheter leak

- Abdominal wall hernias
  - Umbilical > Inguinal > Incisional, Epigastric
  - Peri-catheter hernias
# Laparoscopic versus Open Peritoneal Dialysis Catheter Insertion: A Meta-Analysis

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<table>
<thead>
<tr>
<th>Complication</th>
<th>Laparoscopic (%)</th>
<th>Open (%)</th>
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<tbody>
<tr>
<td>Obstruction*</td>
<td>4.7</td>
<td>12.2</td>
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<tr>
<td>Pericatheter Leak</td>
<td>4.6</td>
<td>8.1</td>
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<tr>
<td>Migration*</td>
<td>1.3-5.4</td>
<td>7.6-17.1</td>
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<tr>
<td>Intervention</td>
<td>7.9</td>
<td>23.4</td>
</tr>
<tr>
<td>Removal</td>
<td>13.3</td>
<td>19.3</td>
</tr>
<tr>
<td>Survival at 1 year*</td>
<td>94</td>
<td>75</td>
</tr>
<tr>
<td>Survival at 2 years*</td>
<td>71</td>
<td>49.2</td>
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Mechanical Flow

- Confirm the diagnosis – Hx, PE, radiology
  - Consider peri-catheter leakage

- Outflow >> inflow
  - Obstruction – extra-luminal (constipation, bladder distension, organs) or intra-luminal (fibrin plugging, omental intrusion)
  - Catheter kinking
  - Catheter malposition – migration
Work-up of Issues with Flow

- Rule out constipation, bladder distension, fibrin plugging

- Initial diagnostics – AXR, bladder scan, catheter study
  - AXR – constipation, tube displacement (suggestive of omental entrapment or adhesions)
  - Catheter study – rule out catheter leakage, may suggest evidence for entrapment or adhesions

- Fibrin plugging – urokinase, alteplase
Images of Malpositioned/Migrated catheters
Catheter salvage

- Techniques utilized for de-plugging or for re-direction of catheters
  - Endoluminal brushes, fogarty balloons, fluoroscopic guide wire manipulation

- Laparoscopy
  - Extra-luminal obstruction
  - Intra-luminal obstruction from omental intrusion
  - Catheter-tip migration
  - Kinking (replacement)
My Approach to Laparoscopy

- Review their pre-operative Hx, PE, imaging studies, existing operative reports
- Supine positioning with both arms tucked
- Access the abdomen opposite the side the catheter was inserted on
- Achieve pneumoperitoneum via the technique one most comfortable with/most appropriate for the case
  - Consider using the existing PD catheter to insufflate
Findings

- Omental wrapping ± tip migration
  - Perform or re-do omentopexy

- Adhesions ± tip migration
  - Adhesions from bowel, fallopian tubes, epiplioicea etc.
    - Try to leave the adhesions in place and reposition the catheter

- Angulation through the abdominal wall or related to tube memory
  - May be best to replace the catheter

- Fibrin plugging
  - Catheter stripping, use of fogarty balloons or brushes
LAPAROSCOPIC FINDINGS OF PERITONEAL DIALYSIS CATHETER MALFUNCTION AND MANAGEMENT OUTCOMES

Tuncay Yılmazlar,¹ Turkay Kirdak,¹ Serpil Bilgin,¹ Mahmut Yavuz,² and Mustafa Yurtkuran²

- 40/197 pts (20.3%) evaluated for catheter malfunction and 46 laparoscopic procedures performed to attempt catheter salvage
  - 16 pts – tip migration alone; 12 pts – tip migration + omental/bowel adhesions; 4 pts – adhesions alone; 8 pts – other
  - 3 pts required catheter removal, 3 required replacement and the remaining were corrected laparoscopically

- Catheter malfunction recurred in 12 patients of 37 patients (32.4%) at a mean time of 12.4 months.

- 97.2% catheter patency at 3 months for the 37 patients, 62% at 12 months.

- Mean catheter survival 19.9 months.
Pericatheter leaks

- Pericatheter leakage – outflow < inflow with signs of leakage from the exit site, subQ swelling, peripheral or genital edema
  - Highly variable reported incidence due to varying techniques, though rates tend to be less with embedded catheters
  - Tends to occur early after surgery in the setting of high dialysate volumes
  - Late leaks are more often associated with factors predisposing to a weak abdominal wall (pericannular hernias) or are caused by occult tunnel track infections
    - Hydrothorax – (1-2% of PD pts), less likely to resolve with disruption of PD and best success rates with thorascopic pleurodesis (3)

- Diagnosis – CT peritoneography or peritoneal scintigraphy
- Treatment – Typically will seal with temporary disruption of PD
Peritoneal-Pleural Leaks Demonstrated by CT Peritoneography

Tian Xu, Jingyuan Xie, Weiming Wang, Hong Ren, and Nan Chen

[Images of X-rays showing chest]
Hernias

- PD is a known risk factor for the development of hernias, with reported incidences of 2-25% (4-6). ESRD pts will also have pre-existing hernias. This is considered a contraindication to PD and therefore must be fixed prior to starting PD.

- General principles:
  - Reduce the peritoneal sac without entering it
  - Mesh repairs in a tension-free manner with mesh placed outside the peritoneal cavity and with wide overlap
    - Onlay, intraparietal, pre-peritoneal
    - Alternative?: IPOM w/ Zenapro
  - Hernia repairs are done at the same time as PD catheter placement (7)
  - If needed, can start PD immediately at low volumes w/ apparent good outcomes (8-10)
Umbilical hernias

- Most common acquired hernia in PD patients (11-16)

- < 1 cm – My practice - primary repair at time of procedure with an Endoclose

- 1 - 3 cm – Onlay mesh hernioplasty (17) versus pre-peritoneal or H mesh hernioplasty (11)

- > 3 cm – Retro-rectus type repair (8)
PREVALENCE AND MANAGEMENT OF HERNIAS IN PERITONEAL DIALYSIS PATIENTS

Miguel Ángel García-Ureña, César Remón Rodríguez, Vicente Vega Ruiz, Francisco Javier Carnero Hernández, Evaristo Fernández-Ruiz, Jose Manuel Vazquez Gallego, and Miguel Velasco García

Figure 1 — Dissection of the hernia sac and preperitoneal space in a midline hernia.

Figure 2 — Coronal section of a preperitoneal mesh hernioplasty for an umbilical hernia.
HERNIA REPAIR WITHOUT DELAY IN INITIATING OR CONTINUING PERITONEAL DIALYSIS

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

- Less data regarding this specific complication

- A number of different techniques have been reported to successfully repair incisional hernias
  - Intraparietal (antemuscular) (8)
  - Onlay (9)
Inguinal

- Open repair with mesh concurrently with PD catheter placement
  - Avoid intra-parietal mesh and making rents in the peritoneum with a TEP or TAPP
  - Avoid disrupting the space used for catheter tunneling
Pericatheter hernias

- These catheters must be replaced and the hernia fixed according to the principles discussed
Low Volume PD for Early Starts

- Has been suggested by authors to wait a period of time after hernia repair to start PD. However, in those patients currently on PD where the decision was made not to wait, results have been favorable without dialysate leaks using a low volume protocol (11, 18)

- “Our” protocol:
  - Supine, low volume PD (~1L) 3-5 times per week for 2 weeks prior to transitioning to home
**Prevention!!!**

- Utilize a technique developed and taught by Dr. John Crabtree – adopted by all surgeons at UWMC/HMC
- Preoperatively mark creases/pants line, check handedness
- Laparoscopic approach using 5 mm camera and 2nd 5 mm port
- Check for hernias initially and repair concurrently if found
- Perform an omentopexy for every patient
- Place the catheter with a preperitoneal tunnel using a 7/8 mm Versaport
- Downward facing exit site
- Check inflow/outflow and additionally flush with heparinized saline
References


