Preventing Infections in Peritoneal Dialysis

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Infection Rates Reduced In PD
As Innovations and Protocols Are Introduced

Bender FH et al. Kidney Int, 2006;70(suppl):S44-S54.

Peritonitis Episodes Per Dialysis Year
Adjusted admissions for principal diagnoses, by RRT modality

Figure 6.5, ADR 2007
Peritonitis

- The Most Common Infection with PD
- The Achilles’ heel of PD
- A major cause of morbidity and mortality

Causes of technique failure in long-term cohort studies of PD

<table>
<thead>
<tr>
<th>Recurrent peritonitis</th>
<th>UF failure</th>
<th>Solute removal</th>
<th>Choice not coping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maiorca et al., 1991</td>
<td>48.8%</td>
<td>22.1%</td>
<td>13%</td>
</tr>
<tr>
<td>Lupo et al., 1994</td>
<td>29%</td>
<td>16.4%</td>
<td>11%</td>
</tr>
<tr>
<td>Maiorca et al., 1996</td>
<td>37%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Kawaguchi et al., 1997</td>
<td>13.6%</td>
<td>23.5%</td>
<td>-</td>
</tr>
<tr>
<td>Davies et al., 1998</td>
<td>54%</td>
<td>27%</td>
<td>-</td>
</tr>
</tbody>
</table>

Davies et al, KI (54), 2207-2217, 1998; and Han et al, PD(27), 410-412, 2007

Peritonitis in the CANUSA Study

- Caused 15% – 35% of hospital admissions
- Major cause (40% – 45%) of transfer to hemodialysis,
- Associated with 7% – 10% of deaths

Peritonitis: most common infection in PD

- major cause of hospitalization
- cause of catheter loss
- cause of technique failure/dialysis failure
- damage to peritoneal membrane
- protein and amino acid losses

Presumed Etiologies of Peritonitis

Prevention of peritonitis

- Prevent contamination
  - patient/caregiver training
- Home visits
- Catheter placement issues
- Antimicrobial prophylaxis
- CQI
Prevention of Peritonitis

- Prevent contamination
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Recommendations for Aseptic Technique:

- Clean work area thoroughly before starting exchange
- Gather supplies and have catheter out of clothing and available
- Close doors, windows, turn off fans, and close vents to prevent drafts in work area
- Face masks, before hand washing, for anyone in the room at the time of the exchange
- Three minute hand scrub, using a pump soap, followed by thorough drying of the hands with paper towels
- Do not use dialysate bag if expiration date has passed
- 5 minute betadine soak to medication ports on both the dialysate bags and the medication vials if IP medication is to be administered

Prevention of Peritonitis — training

- Prevent contamination
  - patient/caregiver training
  - Retrain whenever necessary
Prevention of Peritonitis

- Prevent contamination
  - patient/caregiver training
- Home visits
  - Catheter placement issues
  - Antimicrobial prophylaxis
  - CQI
Prevention of Peritonitis

- Prevent contamination
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Pre-operative assessment

- Physical exam for hernias, abdominal wall weakness
  - Correct prior to catheter placement
- Determine and mark appropriate exit site placement
  - Avoid belt line, skin folds, scars
  - Ensure patient will be able to see exit site
  - Determine exit site in upright position

Upper Abdominal Catheter

Immobilize catheter
- tape
- waist band (ensure no trauma)

Prevention of Peritonitis
- Prevent contamination
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Perioperative antibiotics reduce PD infections

• At the time of catheter placement
  – Single dose of IV cefazolin or vancomycin
  – Evidence of reduced catheter exit-site colonization, wound infection, and exit-site infections following perioperative antibiotics

4 RCT’s

Antibiotic Prophylaxis – peri-procedure

• Dental Procedures
  – Amoxicillin 2.0 gm 2 hours before
  – AHA guidelines

• Colonoscopy or GYN procedures:
  – Aminoglycoside overnight + Oral Metronidazole or ampicillin 1 gram PO
  – Fluconazole added in GYN procedures?
  – Perform with dry abdomen, try to be dry for a day afterwards

Prevention of Peritonitis

• Prevent contamination
  – Patient/caregiver training
• Home visits
• Catheter placement issues
• Antimicrobial prophylaxis
  – Eradication of exit site colonization
• CQI
The Association of *Staph Aureus* Nasal Carriage With Exit Site Infection

- 140 incident PD patients swabbed for SA nasal carriage
- carriers had higher incidence of SA exit site infection
- all SA peritonitis was in nasal carriers


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Randomized Trial of Mupirocin vs Placebo in Nasal Carriers on PD

- SA carriers randomized to mupirocin nasal ointment twice daily for 5 days every 4 weeks vs placebo ointment
- no difference in total number of exit site infections
- fewer SA exit site infections in mupirocin group vs placebo ointment

Mupirocin Study Group, J Am Soc Nephrol 1996

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Mupirocin at the Catheter Exit Site

- randomized trial of 600 mg cyclic oral rifampicin vs daily mupirocin at the exit site
- no difference between the 2 therapies
- SA catheter infections and peritonitis reduced compared to historical controls

Bernardini et al, AJKD 1996
**Application of Mupirocin to the Catheter Exit Site – Toronto**

- Mupirocin applied to the exit site either daily or 3 X week
- Significant reduction in staph aureus exit site infection and staph aureus peritonitis
- No difference daily vs 3 X week mupirocin

Thodis et al. Perit Dial Int 1998

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**Approaches to Reduce Exit-Site Infections**

*Mupirocin Prophylaxis = Less S. aureus Infection in PD*

<table>
<thead>
<tr>
<th>Year</th>
<th>Reduction in Relative Risk of Exit Site Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>~67%</td>
</tr>
<tr>
<td>Mupirocin Study Group</td>
<td>~68%</td>
</tr>
<tr>
<td>Thodis 1 1996</td>
<td>~60%</td>
</tr>
<tr>
<td>Thodis 2 1998</td>
<td>10%</td>
</tr>
<tr>
<td>Overall</td>
<td>~62%†</td>
</tr>
</tbody>
</table>

*Risk of exit-site infection: mupirocin vs without mupirocin. †P<0.001 vs placebo or no treatment.


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**Gentamicin vs Mupirocin at the Catheter Exit Site**

- Double-blind randomized controlled study of gentamicin vs mupirocin cream at the exit site
- Incident and prevalent PD patients
- Some statistical problems
- Gentamicin associated with equivalent staph aureus infection, but much lower gram negative infection rate

Approaches to Reduce Exit-Site Infections

Gentamicin Prophylaxis reduces rates of exit-site infections


Fewer Gram-negative Infections in PD

*P < 0.01 vs mupirocin

0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Incident Patients Prevalent Patients

Exit site infections per patient-year

Gram Negative *Peritonitis* Rate reduced with exit-site gentamicin

Bernardini et al J Am Soc Nephrol 2005 Slide courtesy of Joanne Bargman, M.D.

Prospective study of topical antibiotic in PD:
mupirocin v. gentamicin (data for 81 pts)


No significant difference
MP3 study

- Multicenter, randomized, double blinded in the greater Toronto area
- 200 pts, 18 month f/u
- Primary Outcome = time to first catheter related infection
- Mupirocin vs. Polysporin triple antibiotic ointment

Sarbjit V. Jassal, Charmaine E. Lok the MP3 Study Group

No polysporin around PD catheter

- No difference in the time to first event was seen for polysporin triple and mupirocin (13.2 +/- 0.7 and 14.0 +/- 0.7 months, respectively).
- Twice as many patients with redness at the exit site in the polysporin-triple group (16 vs 8).
- Seven patients in the polysporin group had fungal exit site cultures, compared with none of the patients in the mupirocin group (P = .01)

Fungal Peritonitis With and Without Prophylaxis

<table>
<thead>
<tr>
<th>Reference</th>
<th>Prophylaxis</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrepo</td>
<td>Fluconazole qod, RCT</td>
<td>4.39 vs 0.88</td>
</tr>
<tr>
<td>Wong</td>
<td>Nystatin qid</td>
<td>0.019 vs 0.011</td>
</tr>
<tr>
<td>Zaruba</td>
<td>Nystatin S &amp; S tid</td>
<td>0.29 vs 0.03</td>
</tr>
<tr>
<td>Robitaille</td>
<td>Nystatin or ketoconazole</td>
<td>0.14 vs 0</td>
</tr>
<tr>
<td>Wadhwia</td>
<td>Fluconazole qod</td>
<td>0.08 vs 0.01</td>
</tr>
<tr>
<td>Lo</td>
<td>Nystatin qid</td>
<td>0.02 vs 0.01</td>
</tr>
<tr>
<td>Thodis</td>
<td>Nystatin qid</td>
<td>0.02 vs 0.02</td>
</tr>
<tr>
<td>Williams</td>
<td>Nystatin qid</td>
<td>0.01 vs 0.01</td>
</tr>
</tbody>
</table>
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Infection – CQI practices

**TABLE 1**
Methods for Examining Peritoneal Dialysis-Related Infections (Peritonitis, Exit-Site Infections) Ref. (4a)

1. As rates (calculated for all infections and each organism):
   a. Number of infections by organism for a time period, divided by patient-years’ time at risk, and expressed as episodes per year
   b. Months of peritoneal dialysis at risk, divided by number of episodes, and expressed as interval in months between episodes
2. As percentage of patients per period of time who are peritonitis free
3. As median peritonitis rate for the program:
   a. Calculate peritonitis rate for each patient
   b. Obtain the median of these rates

Piraino et al. PDI 25(2); 2005

Infection - CQI

- Infection rate should be no more than 1 every 18 months (0.67 per year at risk)
  0.67 infections/year = 0.67 infections/12 mo

- Overall rates as low as 1:41 to 1:52 months have been reported, and should be a goal (0.29 to 0.23/year )

\[
\frac{0.67 \text{ infx}}{12 \text{ mo}} = \frac{1 \text{ infx}}{X \text{ mo}} \rightarrow X \text{ mo} = \frac{12}{0.67} = 18 \text{ months/ inflection}
\]
Infection Rates Reduced In PD
As Innovations and Protocols Are Introduced

Bender FH et al. Kidney Int. 2006;70(suppl):S44-S54.

Peritonitis Episodes Per Dialysis Year

Peritonitis episodes/patient year

• Thank you.