

8. Prophylactic antibiotics for insertion of peritoneal dialysis catheter

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Guidelines

(Include recommendations based on level I or II evidence)

Antibiotic prophylaxis with a first generation cephalosporin should be used at peritoneal dialysis catheter insertion to reduce the incidence of peritonitis. (Level II evidence) Although vancomycin prophylaxis has also been demonstrated to be effective (Level II evidence), its routine use is not recommended because of the potential development of resistant micro-organisms such as vancomycin-resistant enterococci (VRE) and vancomycin-resistant *Staphylococcus aureus*.

Suggestions for clinical care

(Suggestions are based on level III and IV sources)

- No recommendation.

Background

Prophylactic antibiotics for the insertion of a peritoneal dialysis (PD) catheter may reduce the incidence of early infectious complications such as peritonitis.

Search strategy

Databases searched: MeSH terms and text words for PD for both antibiotic prophylaxis and preoperative care were combined with MeSH terms and text words for peritonitis. The search was carried out in Medline (1966 – October Week 5 2002). The Cochrane Renal Group Trials Register was also searched for trials not indexed in Medline.

Date of search/es: 25 November 2002.

What is the evidence?

Randomised controlled prospective studies

Wikdahl et al (1997) randomised 38 patients to receive either cefuroxime 1.5 gm IV preoperatively and 250 mg IP in the first 1 litre dialysis bag (18) or no antibiotics (20). Of those who received antibiotics, no patient had peritonitis within 10 days or had microbial growth from the dialysate fluid which was collected if there was a positive Multistix test for leukocytes (15×10^4 leukocytes/L), or findings of fibrin veils and threads. In the control group, 6 patients had microbial growth and 4 of these developed peritonitis (*Staphylococcus epidermidis*, *S. aureus*, *alfa-Streptococcus*, *Clostridium fragilis*, Diptheroid rods and a combined culture of *S. epidermidis* and *Enterobacter spp.*). No statistical information was published in this study (ie. no p value).

Gadallah et al (2000) randomised 221 patients over 6 years to receive either prophylactic vancomycin 1 gm IV 12 hours before catheter placement (86), cefazolin 1 gm 3 hours before the procedure (85) or no antibiotics (50). There was significantly less peritonitis at 14 days in the vancomycin group and the cefazolin group compared with the group not given antibiotics (1% vs 7% vs 12%, $p = 0.02$). Single-dose vancomycin was superior to single-dose cefazolin, however, peritonitis was only documented for the first 14 days.

Lye et al (1992) randomised 50 patients and showed no benefit from antibiotic prophylaxis with single-dose cefazolin and gentamicin (administered within 60 minutes before catheter insertion), compared with no antibiotics, on the incidence of peritonitis up to 3 months post catheter insertion.

Bennett-Jones et al (1988) randomised 26 patients and showed that gentamicin administered at the time of catheter insertion (1.5 mg/kg) reduced peritonitis from 46% to 8% ($p < 0.05$) in the first 4 post-operative weeks, compared with no antibiotic prophylaxis. Similarly, there was a significant reduction in exit-site infection (ESI) (53% vs 0%, $p < 0.01$). The study was stopped after the interim analysis (26 patients had completed 28 days) due to the significant difference between the 2 groups.

Summary of the evidence

There are four randomised prospective studies addressing the issue of whether prophylactic antibiotics before the insertion of PD catheters reduce peritonitis. Of these, three show a significant reduction in the incidence of peritonitis, with short follow-up periods of less than 4 weeks. One of the studies shows an advantage of prophylactic vancomycin compared with cefazolin.

Retrospective studies

The United States Renal Data System (USRDS) 1992 Data Report showed in 3366 patients on home PD in 1989 that there was no difference in peritonitis between patients who had received antibiotic prophylaxis or not.

Classen et al (1992) documented that in elective abdominal surgery (not PD patients) prophylactic antibiotics administered 2 hours before, or during the 3 hours after the incision, had a significantly lower risk of surgical-wound infections. The incidences were 0.6% and 1.45% respectively, compared with antibiotics administered 2 to 24 hours before and 3 hours after surgery, which were 3.85% and 3.8%, respectively.

Golper et al (1996) in the Tristate Renal Network 9 Study assessed 1,930 patients on PD in North America from January 1, 1991 to December 31, 1992 with 1,168 episodes of peritonitis. The authors found that the relative risk of peritonitis was reduced by 39% by the use of prophylactic antibiotics (RR 0.71, $p = 0.0001$). Prophylactic antibiotics also reduced the risk of combined peritonitis and ESI or tunnel infection (RR 0.62, $p = 0.0004$). No details were given as to which antibiotics were administered.

Sardegna et al (1998) retrospectively showed a benefit for prophylactic antibiotics in a paediatric dialysis population. Antibiotics (cefazolin, cefuroxime, ceftriaxone, vancomycin, ampicillin), or nafcillin/gentamicin) were administered in 61 of 89 catheter insertions (less than 12 hours preoperatively and less than 3 hours post-operatively). Peritonitis was found to be less common than in those who did not receive perioperative antibiotics (6/61 vs 7/16, $\chi^2 = 12.5$, $p \leq 0.001$). This was confirmed with step-wise logistic regression analysis ($p < 0.005$). A separate analysis was done on those who received antibiotics greater than 3 hours post-operatively ($n = 6$) and this also significantly reduced peritonitis ($p < 0.001$).

What do the other guidelines say?

Kidney Disease Outcomes Quality Initiative: No recommendations.

British Renal Association: No recommendations.

Canadian Society of Nephrology: No recommendations.

European Dialysis and Transplant Association-European Renal Association:

Antibiotic prophylaxis perioperatively with a first generation cephalosporin is advisable (Level C).

International Society for Peritoneal Dialysis 2000: Prophylactic antibiotics given before catheter placement decrease the risk of subsequent infection. A first-generation cephalosporin has been most frequently used in this context. Routine use of vancomycin should be avoided in this setting.

Implementation and audit

1. Individual renal units should have a protocol for antibiotic prophylaxis prior to peritoneal dialysis catheter insertion which provides suitable cover for the bacteria

isolated in that unit.

2. All renal units should document the use or not of antibiotic prophylaxis and the type of antibiotic administered in addition to data on all PD-related problems including exit-site infections, tunnel infections, peritonitis, catheter malfunction rates and catheter survival times. This data should be submitted to the ANZDATA registry.

Suggestions for future research

A multi-centre randomised controlled trial assessing the role of a first-generation cephalosporin in MRSA and non-MRSA carriers may be helpful.

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References

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Appendix

Table 1 Characteristics of randomised controlled trial evidence

Study ID (author, year)	N	Study Design	Setting	Participants	Intervention (experimental group)	Intervention (control group)	Follow up (months)	Comments
Bennett-Jones et al 1988	27	Randomised controlled clinical trial	Teaching hospital	Patients undergoing insertion of Tenckhoff catheter for CAPD, including new patients or patients who were undergoing catheter replacement; none diabetic	Gentamicin (i.v.) 1.5 mg/kg of body weight at time of catheter placement	No treatment	1	None
Gadallah et al* 2000	221	Randomised controlled clinical trial	University	Patients undergoing PD catheter placement; 23% diabetic	Vancomycin (i.v.) 1000 mg 12 h before catheter placement or Cefazolin (i.v.) 1000 mg 3 h before catheter placement	No treatment (no antibiotic for at least 1 week prior to the procedure)	0.5	None
Lye et al 1992	50	Randomised controlled clinical trial	University	ESRD patients undergoing Tenckhoff catheter insertion for CAPD; 40% diabetic	Cefazolin (i.v.) 500 mg and gentamicin (i.v.) 80 mg 1 hour before catheter placement	No treatment before surgery	3	None
Wikdahl et al 1997	38	Randomised controlled clinical trial	University	Patients entering PD program, 34% diabetic	Cefuroxime (i.v.) 1.5 g at time of catheter placement + 250 mg i.p. in first dialysis bag	No treatment	0.3	None

*Trial with three arms

Table 2 Quality of randomised trials

Study ID (author, year)	Method of allocation concealment	Blinding			Intention-to- treat analysis	Loss to follow up (%)
		(participants)	(investigators)	(outcome assessors)		
Bennett-Jones et al 1988	Unclear	No	No	No	No	0
Gadallah et al 2000	Inadequate	No	No	No	No	0
Lye et al 1992	Inadequate	No	No	No	Yes	0
Wikdahl et al 1997	Unclear	No	No	No	Yes	0

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Table 3 Results for dichotomous outcomes

Study ID (author, year)	Outcomes	Intervention group (number of patients with events/number of patients exposed)	Control group (number of patients with events/number of patients not exposed)	Relative risk (RR) [95% CI]	Risk difference (RD) [95% CI]
Bennett-Jones et al 1988	Early peritonitis (< 1 month of catheter placement)	1/13	6/13	0.17 (0.02 to 1.20)	-0.38 (-0.69 to -0.08)
	Early exit-site/tunnel infection (< 1 month of catheter placement)	0/13	7/13	0.07 (0.00 to 1.06)	-0.54 (-0.82 to -0.26)
	Catheter removal	0/13	1/14	0.36 (0.02 to 8.06)	-0.07 (-0.25 to 0.11)
Gadallah et al 2000	Early peritonitis (< 1 month of catheter placement)	7/148	10/73	0.25 (0.14 to 0.87)	-0.09 (-0.18 to 0.00)
Lye et al 1992	Early peritonitis (< 1 month of catheter placement)	2/25	1/25	2.00 (0.19 to 20.67)	0.04 (-0.09 to 0.17)
	Early exit-site/tunnel infection (< 1 month of catheter placement)	6/25	7/25	0.86 (0.34 to 2.19)	-0.04 (-0.28 to 0.20)
	All-cause mortality	1/25	1/25	1.00 (0.07 to 15.12)	0.00 (-0.11 to 0.11)
Wikdahl et al 1997	Early peritonitis (< 1 month of catheter placement)	0/18	2/20	0.12 (0.01 to 2.13)	-0.38 (-0.69 to -0.08)

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