11. Peritoneal dialysis catheter–related infection: exit site and tunnel

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Guidelines

No recommendations possible based on Level I or II evidence

Suggestions for clinical care
(Suggestions are based on Level III and IV evidence)

- An ESI is present when there is a purulent discharge in association with pericatheter swelling, redness or tenderness. An isolated finding of erythema or serous discharge may not require antibiotic treatment.

- All ESIs need to be treated with appropriate antibiotics but no antibiotic regimen has proven to be superior to another.

Background

Exit site infection (ESI) has been defined as clinically apparent infection at the exit site with or without a positive culture. Included in this definition is catheter tunnel tract infection. Clinical signs of infection include purulent drainage, redness, swelling, warmth and tenderness over or around the exit site. Exit site and tunnel infections are a significant cause of morbidity and are responsible for a significant proportion of patient dropout from peritoneal dialysis (PD) (Ibels et al 1997). The bacteria that colonise the exit site are the same as those responsible for ESIs, but somewhat different to those that cause peritonitis (Scalamogna et al 1991). However, failure to resolve exit site and/or tunnel infection contributes to 50% of the incidence of peritonitis in most reported cases (Scalamogna et al 1991).

There are various stages in the development of an infected exit site, which include serous and purulent drainage, abscess formation and tunnel infection. Early identification and diagnosis of the various infection stages are vital for the initiation of prompt and effective therapy.

The treatment of ESI should be directed by the different stage of infection present. Both antibiotic and antimicrobial agents and dressing technique play important roles in the survival of the PD catheter.

Search strategy

Databases searched: MeSH terms and text words for PD catheters were combined with MeSH terms and text words for tunnel and exit site and then combined with MeSH terms and text words for peritonitis. The search was done in Medline (1966 – Week 1 November 2002). The Cochrane Renal Group Register of randomised controlled trials was also searched for trials not indexed in Medline.

Date of search/es: 3 December 2002.

What is the evidence?

Randomised controlled trials (RCTs) on this topic are limited. Two RCTs were found that evaluated therapy for exit site/tunnel infection.

Flanigan et al (1994) reported a randomised, prospective study comparing intraperitoneal vancomycin plus oral rifampin or oral trimethoprim/ sulfamethoxazole for Gram-positive catheter infections. There were 126 recorded catheter infections resulting in a rate of 0.67 episodes per patient year of exposure. The cure rate of Gram-positive catheter infections treated with vancomycin plus rifampin (86% cured) was indistinguishable from that achieved with oral trimethoprim/sulfamethoxazole (89% cured; p = 0.99). Precautions need to be considered to retard the development of vancomycin-resistant enterococcus (VRE), if prolonged use of vancomycin is planned.

Plum et al (1997) in a prospective randomised study, showed there is evidence for the greater efficacy of the intraperitoneal (IP) application of clindamycin as a first-line antibiotic compared with the oral route for the treatment of tunnel infections. The results showed no significant difference in pericatheter fluid along the catheter at study entry, with 4 mm (median; range: 2-6 mm) in the oral group and 4 mm (range: 2-4 mm) in the IP group. The IP treatment resulted in a decrease to 0 mm (range: 0-2 mm) after 28 days ($p < 0.05$), while the diameter was still 2 mm (range: 0-10 mm; ns) in the oral group. The disappearance of ESI also occurred earlier in the IP group (51 vs 15 days; ns). Catheter removal occurred once in the IP group and twice in the oral group within 6 months of study entry. There was a greater efficacy of IP application of antibiotic as a first-line antibiotic compared with the oral route for the treatment of tunnel infections. However, this study was conducted between 1993 and 1995 and further studies need to be conducted.

Summary of the evidence

There are no RCTs comparing the different classification and evaluation systems for ESI.

There are two RCTs that have compared antibiotic therapy for exit site/tunnel infection. One study compared IP vancomycin plus oral rifampin or oral trimethoprim/sulfamethoxazole for Gram-positive catheter infections. There was no difference with either treatment on catheter infection cure rate. The second study

showed that there is greater efficacy with the IP application of clindamycin as a first-line antibiotic compared with the oral route for the treatment of tunnel infections.

Evaluation of the exit site/tunnel and diagnosis of infection

Twardowski and Prowant (1996, 1997) performed 565 evaluations of healed exit sites in 56 patients. A new classification was developed with six distinct categories of exit site appearance: acute infection, chronic infection, external cuff infection, traumatised exit etc. The outcomes in each category were correlated with treatment measures in a 5-year longitudinal study. A cross-sectional study was conducted with 45 patients, using loupe and magnifier evaluations. Ninety-one percent (41/45) of the evaluations were in agreement.

Vychytil et al (1999) investigated indications and outcomes of 728 ultrasound examinations of the PD catheter tunnel. The research team concluded that tunnel ultrasonography is useful to assess whether tunnel infection is present, and the severity of involvement. By using ultrasonography, a therapeutic regimen can be evaluated and reviewed.

Evidence from other non-randomised studies

Keane et al (2000) reported a summary of treatment recommendations for ESI from a consensus panel of experts. The treatment recommendations for Gram-positive purulent drainage at the exit site are 2-4 weeks of a cephalosporin or vancomycin combined with oral rifampicin in the case of persistent infection, and ciprofloxacin for the treatment of Gram-negative infections.

Ibels et al (1997) conducted a survey in 1995 of 35 peritoneal dialysis units in Australia. In all units, a swab culture was obtained at the first sign of PD catheter ESI and exit site care procedures were reviewed with patients. Exit site infection rates were monitored, data collated, and procedures evaluated routinely in two thirds of units. While the antibiotics used varied, most used vancomycin or oral flucloxacillin. Catheter exit site and tunnel infections accounted for 12% and 6%, respectively, of the principal indications for removal of the peritoneal catheter. No correlations were undertaken between practices and outcomes.

Turner et al (1992) randomised 66 patients into one of three catheter groups: immobilizer, tape or non-immobilized group. The incidence of ESI over 347 patient months was recorded. The results show no significant difference in infection rate between the three groups. While the findings of the study point to a need for a better quality immobilizer, the short duration of the study precluded any definitive conclusion being drawn.

Scalamogna et al (1990, 1991, 1995) reported data on surgical intervention, such as external cuff shaving in tunnel infections. Shaving the cuff as a rescue treatment was effective for almost 50% of patients with antibiotic-resistant *Staphylococcus aureus* ESI. The catheters of the remaining patients were removed because of peritonitis associated with tunnel infection.

What do the other guidelines say?

Kidney Disease Outcomes Quality Initiative: No recommendation.

British Renal Association: No recommendation.

Canadian Society of Nephrology: No recommendation.

European Dialysis and Transplant Association–European Renal Association (2002): Exit site infection should be treated according to the guidelines of the International Society for Peritoneal Dialysis (Gokal et al 1998). Adjustments can be considered depending on the sensitivity patterns of microorganisms in the unit. (Evidence C)

Topical treatment may be applied in equivocal cases or as adjuvant therapy. (Evidence C)

International guidelines - International Society for Peritoneal Dialysis 2000: The diagnosis of a catheter exit site infection should be made in the presence of a purulent discharge from the sinus tract, or marked pericatheter swelling, redness, and/or tenderness, with or without a pathogenic organism cultured from the exit site. Infectious symptoms should be rated according to an objective scoring system.

Antibiotic treatment of a catheter exit site infection should be started after culture results have been obtained, unless signs of severe infection are present. The antibiotic should be chosen according to the susceptibilities of the cultured organism. Treatment duration should be 2-4 weeks.

Implementation and audit

Collect exit site data to ensure correct classification of data on treatment outcomes.

Suggestions for future research

1. Prospectively gather data to allow better prediction of outcomes after an ESI or tunnel infection. This should include more specific data than is currently collected, including symptoms, history of previous infection, and mode of contamination.

2. Perform an RCT of antibiotic treatment for exit site and tunnel infection.

3. Run a diagnosis study such as using ultrasound examinations of the peritoneal catheter tunnel and classification of exit site infection.

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
Flanigan et al 1994	93	Randomised controlled clinical trial	University	CAPD patients with catheter infection	Intraperitoneal vancomycin 500 mg on day 0, 5 and 10 plus oral rifampin 300 mg/day x 14 days	Oral trimethoprim/ sulfamethoxazole 160/800 x 2/day x 14 days	45	
Plum et al 1997	16	Randomized controlled clinical trial	University	CAPD patients with clinically and ultrasound-proven tunnel infection	Oral antibiotic (clindamycin 20 mg/kg body weight x 3 times/day) (or oxacillin 4 g/day or ciprofloxacin 500 mg/day)	Intraperitoneal antibiotic (clindamycin 20 mg/kg body weight x 4 times/day) (or oxacillin 4 g/day or ciprofloxacin 200 mg/day)	24	

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)		
Flanigan et al 1994	Unclear	No	No	No	Unclear	0
Plum et al 1997	Unclear	No	No	No	Unclear	12.5

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]
Flanigan et al 1994	NA*	NA	NA	NA	NA
Plum et al 1997	Disappearance of exit-site infection	4/7	7/8	0.65 (0.33 - 1.31)	-0.30 (-0.74 - 0.13)
	Relapse of tunnel infection	3/7	1/8	3.43 (0.45 - 25.93)	0.30 (-0.13 - 0.74)

* Results presented by type of antibiotic (vancomycin, vancomycin and rifampin, trimethoprim/sulfamethoxazole) rather than by oral versus intraperitoneal administration as outlined in the research question of the trial