

# To tunnel or not to tunnel catheters for parenteral nutrition

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## Summary

The effect of subcutaneous catheter tunnelling on the incidence of catheter sepsis and on catheter life span in the absence of a nutrition team was determined in a prospective controlled clinical trial. Eighty one patients who received 92 courses of parenteral nutrition had 110 catheters inserted. Alternate catheters were tunnelled. Four patients who received parenteral nutrition for less than 48 hours were excluded from the study. Catheter related sepsis occurred in one tunnelled (1.8%) and 4 non-tunnelled catheters (7.6%) ( $P > 0.05$  NS). Mean life span of tunnelled catheters was 21 days (range 5–37 days) compared to 12.6 days for non-tunnelled (range 3–19 days) ( $P < 0.05$ ). Six non-tunnelled catheters became displaced, a complication which did not occur with tunnelled catheters ( $P < 0.01$ ). In conclusion subcutaneous tunnelling of silicone catheters prolongs catheter life span but does not significantly influence catheter sepsis.

## Introduction

Catheter related sepsis remains a considerable clinical problem which occurs in up to 25% of patients receiving total parenteral nutrition in centres where a team approach is not in operation (1). Since organisms are most likely to gain access at the skin/catheter junction it has been suggested that subcutaneous catheter tunnelling by increasing the distance between the skin entry site and the vein would diminish the migration of bacteria (2). As increased catheter life is not associated with an increased risk of sepsis (3) it is desirable that a catheter should remain *in-situ* for the duration of intravenous feeding in order to avoid the technical complications of re-insertion which occur in 4–20% of cases (1). We have compared tunnelled and non-tunnelled silicone catheters with regards to septic complications and catheter life span.

## Patients and methods

A total of 110 silicone catheters (Vygon Nutricath S) were inserted in 81 patients, who received 92 courses of parenteral nutrition over a 2 year period. Catheters were inserted into the subclavian vein and alternate catheters

were tunnelled subcutaneously using the technique described by Powell-Tuck (2). Forty nine patients (60%) had concurrent internal sepsis and were receiving parenteral antibiotics through an alternative intravenous route. Four patients who received parenteral nutrition for less than 48 hours were excluded from the study (1 tunnelled, 3 non-tunnelled). The protocol for catheter management and the feeding regimens utilized have previously been reported (5). Catheter related sepsis was defined as an episode of clinical sepsis for which no other cause could be identified and which resolved upon removal of the catheter (4). Confirmatory evidence was provided by a positive blood culture and positive culture of the catheter tip. On suspicion of catheter sepsis the catheter was removed and the tip was cultured. In addition a peripheral blood sample was cultured. All catheters removed electively were also cultured. Catheters which had ceased to infuse and which could not be flushed with saline were regarded as blocked and were replaced. Statistical analysis was performed using the Yates modification of the  $\chi^2$  test and the unpaired Student's *t* Test.

## Results

The indications for catheter removal are outlined in Table 1. The overall catheter sepsis rate was 4.7% (5

TABLE 1 Indications for catheter removal

Indications for catheter removal	Tunnelled (n=54)	Non-tunnelled (n=52)	P
Termination of intravenous nutrition	36 (66.6%)	25 (48%)	<0.05
Death of patient	9 (16.6%)	8 (15.3%)	NS
Suspected catheter sepsis	6 (11.1%)	6 (11.5%)	NS
Confirmed catheter sepsis	1 (1.8%)	4 (7.6%)	NS
Displaced catheter	0	6 (11.5%)	<0.01
Blocked catheter	2 (3.7%)	3 (5.7%)	NS

catheters – 1 tunnelled). Positive catheter cultures were obtained in all 5 cases (*Staphylococcus epidermis* 4, *Candida albicans* 1) and positive blood cultures were obtained in 3 patients (*Staphylococcus aureus* 2, *Candida albicans* 1). The mean life span of tunnelled catheters (21 days, range 5–37 days) was significantly greater than non-tunnelled catheters (mean 12.6 days, range 3–19 days,  $P<0.05$ ) and a significantly greater proportion of tunnelled catheters were removed electively, (66.6% Vs 48%  $P<0.05$ ).

### Discussion

The aetiology of catheter related sepsis is controversial (5–7). Although a qualitative relationship between skin flora at the catheter insertion site and the micro-organisms cultured from the tip of the catheter has been demonstrated a quantitative relationship does not exist (8).

It has been shown that tunnelling polyvinyl catheters does not decrease the sepsis rate (9). The intrinsic properties of the catheter cause the formation of a granulation tissue tract, which may allow the migration of micro-organisms as a result of pressure changes induced by catheter movements (9). In contrast the healthy viable tissue surrounding tunnelled silicone catheters acts as a barrier to the migration of micro-organisms (10). Tunnelled silicone catheters demonstrated a significant increase in life span and reduction in catheter sepsis compared with non-tunnelled polyvinyl catheters (11). However, in the only controlled trial that has compared tunnelled and non-tunnelled silicone catheters, the latter group were associated with a significantly higher incidence of septic complications prior to the arrival of a nutrition nurse (12). Our result would suggest that in the absence of a nutrition team the critical factor in minimizing complications is meticulous adherence to an established successful protocol (4). In addition our findings which suggest that concurrent internal sepsis did not influence the development of catheter sepsis are consistent with previous reports where pathogens implicated came from superficial sites (5).

A significantly greater proportion of tunnelled catheters were removed at the conclusion of parenteral nutrition. The longer life span of these catheters was influenced by the fact that six non-tunnelled catheters displaced, although more tunnelled catheters were removed for suspected, but unconfirmed catheter sepsis. Increased life span would suggest that the subcutaneous

tunnel adds stability, possibly by preventing small degrees of catheter movement. In this study no patient developed a complication as a result of tunnelling.

In conclusion, tunnelled silicone catheters should be used for parenteral nutrition because of their longer life span and the possibility that they may diminish catheter related sepsis where nursing care is suboptimal (12).

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