Follow-up of Tunneled Dialysis Catheters: Femoral vs Jugular vs Subclavian Catheters

Vesna Gerasimovska, A. Oncevski, P. Dejanov, B. Gerasimovska – Kitanovska
Department of Nephrology, Clinical center, Medical Faculty, University "Ss. Cyril and Methodius" Skopje

Tunneled dialysis catheters placed in a central vein are used frequently in hemodialysis patients as a temporary vascular access until an arteriovenous fistula or a vascular graft is ready for use. In addition, dialysis catheters are used as a permanent vascular access in some patients where all options for placement of a fistula or graft are exhausted. As compared with fistulas and grafts, tunneled dialysis catheters offer the advantage of ease of placement and the ability to be used immediately for dialysis. However, they suffer from several disadvantages, including poor blood flow, frequent thrombosis and infection, risk of central vein stenosis and limited longevity. Lot of studies implicate tunneled dialysis catheters as important causes of serious infections in hemodialysis patients.

Double - lumen cuffed tunneled dialysis catheters were placed by experienced nephrologists from the Vascular Access Unit at the Department of nephrology, Clinical centre in Skopje, R. Macedonia, for the time period December 1999- December 2002.
The study monitored 123 patients - pts on regular hemodialysis program (71 females, 52 males, aged 16-78 years), who had 181 tunneled dialysis catheters (TDC), divided in three groups:

1. Tunneled femoral catheters (TFC) -103
2. Tunneled jugular catheters (TJC) - 41
3. Tunneled subclavian catheters (TSC) – 37

Catheters were removed when no longer required (a permanent vascular access was provided), or when a significant complication occured. Every patient with TDC with symptoms suggesting infection was considered to have possible bacteremia.
All patients with suspected bacteremia (temperature >38^0 C, chills, during, or after the hemodialysis) had blood culture drawn from the catheter (BCC) and peripheral vein (BCP) concomitantly, and when the catheter was removed, BCC and BCP were correlated with semi-quantitative cultures of catheter tip(CT). Catheter associated bacteremia (CAB) was defined by the association of fever (38^0 C and higher) and the isolation of an identical microorganism from cultures of blood and catheter tip in the absence of alternative source of infection.

A total of 181 tunnelized catheters for hemodialysis were inserted in 123 patients .
Group 1. TFC One hundred and three tunnelised femoral catheters were inserted in 77 pts, remained in situ for cummulative total of 9899 days . Duration time of catheters was 5-542 days, average 139 days. Infective rate was 4.1 episodes/1000 catheter days. During follow up period 21 catheters had 41 episodes of infection effectively treated with antibiotics. Only 6 catheters were removed under the suspicion of catheter-associated bacteriaemia, and in five we have a microbiological confirmation.
Group 2. TJC Forty one tunnelised jugular catheters were inserted in 24 pts, remained in situ for cummulative total of 10 719 days. Duration time of catheters was 4-1704 days, average 429 days. Infective rate was 2,8 episodes/1000 catheter days. During follow up period 7 catheters had 30 episodes of infection, effectively treated with antibiotics. Four catheters were removed under suspicion of CAB, and infection was confirmed. One of catheters also had an exit site infection.
Group 3 TSC Thirty seven tunnelized subclavian catheters were inserted in 22 patients, remained in situ for cummulative total of 9454 days. Duration time of catheters was 4-1607 days, average 350 days. Infective rate was 3,6 episodes/1000 catheter days. During follow up period 14 catheters have 32 episodes of infection, effectively treated with antibiotics. Only one catheter was removed under suspicion of CAB.
Patients had a different duration on chronic hemodialysis program, between 1 month and 263 months. All TDC have different catheter status at a final follow up. (Table 1)

Correspondence to: Vesna Gerasimovska, Department of Nephrology, Vodnjanska 17, Skopje 1000, R. Macedonia
tel:++3892147676, fax:++3892114093, vgerasimovska@yahoo.com

Table 1. Catheter status at final follow-up

Catheter status	TFC	TJC	TSC
Functioning catheters	8	12	8
Pts death with functio.cath.	9	1	1
Lost to follow up	13	2	1
Death conect with catheter	2	1	/
Elective catheter removal			
Mature AVF	12	2	3
Mature VG	2	/	1
Transplantation	2	1	/
Patient recovered	1	/	/
Removed for malfunction			
Poor flow	30 (29%)	14(34%)	15(40%)
High venous pressure	/	2	/
Clot or fibrin sheath	13	/	5
Broken catheter	1	2	2
Blooding around cathet	2	/	/
Thrombophlebitis (leg)	2	/	/
Suspected CAB	6 (5,8%)	4(9,7%)	1(2,7%)
TOTAL	103	41	37

At the patient with signs of infection, we took BCC and BCP and started with systemical antibiotic therapy (AB) and instillated concentrated antibiotic solution into the catheter lumen (antibiotic lock). The signs of infection usually disappeared after 2-3 days upon the commencement of the AB therapy. Most often isolated microorganisms were: Staphylococcus coagulasa negative, Staphylococcus aureus and Enterococcus.(Table 2) Statistically significant difference between three groups of TDC was found only in the analysis of CT (chi-square test, $p<0,05$). The antibiotics that were frequently used are: Cefotaxim, Ciprofloxacin, Vancomycin. For exit site infections Garamycin was used only locally. According to antibiogram we continued with the started AB, or changed it. Only 11 TDC from 181 were removed under suspicion of CAB, while all other catheteter-related infections were succesfully resolved with antibiotics, and the catheters were used subsequently.

The difference in the infective rate between three groups of catheters was not very impresive, so tunnelized femoral catheters can be used more frequently, because infection and thrombosis were not more frequent in this group than in TJC and TSC.

Table 2. Most frequent microbiological findings from BCC, BCP and CT at three groups of catheters

BCC

Group	TFC	TJC	TSC	χ^2
Sterile	10 (20%)	7 (46.67%)	12 (46.15%)	0.01
CONS	22 (44%)		4 (15.38%)	
S.aureus	10 (20%)	4 (26.67%)	3 (11.54%)	
Enterococcus	3 (6%)	2 (13.33%)	1 (3.85%)	
Total	45	13	20	

BCP

Group	TFC	TJC	TSC	χ^2
Sterile	22 (36,67%)	9 (60%)	17 (73.91%)	0.02
CONS	16 (26.67%)		3 (13.04%)	
S.aureus	17 (28.33%)	2 (13.33%)	1 (4.35%)	
Enterococcus	3 (5%)	2 (13.33%)	1 (4.35%)	
Total	60	15	23	

CT

Group	TFC	TJC	TSC	χ^2
Sterile	11 (27.5%)	3 (27.27%)	7 (35%)	0.001506
CONS	20 (50%)	2 (18.18%)	11 (55%)	
S.aureus	9 (22.5%)	4 (36.36%)	1 (5%)	
Total	40	9	19	

Statistically significant difference between three groups of TDC was found only in the analysis of CT (chi-square test, $p<0,05$)

We concluded that there is no significant difference between the incidence of infection among the three types of TDC- TFC, TJC, TCS.The antibiotic therapy when we had a suspicion of infection was successful in achieving a clinical and bacteriologic cure of catheter-associated bacteriaemia, without requiring catheter replacement. Tunnelized femoral catheters, usually are blamed for most infection, but this was not confirmed with our study.

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