Our Experience with Tunneled Cuffed Hemodialysis Catheters

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Abstract

Background. We introduced the use of tunneled cuffed vascular catheters for long-term vascular access in our dialysis unit in the beginning of 2004.
Methods. Here we report the outcomes assessed after 2.5 years. A total number of 51 catheters were implanted in 49 patients. 9 patients were lost to follow-up.
Results. 23 patients were alive at the end of the observation period, 17 with a functioning catheter, another 6 had the catheter explanted due to a newly created arteriovenous fistula in 3 patients, start of peritoneal dialysis in 2 patients and recovering of kidney function in one patient. 17 prevalent patients died, of which 15 with a functioning tunneled catheter, one with a functioning arteriovenous fistula and one with a noncuffed catheter. We additionally analyzed the mortality in all prevalent hemodialysis patients in our center and found that it was comparably high reaching 25% of all prevalent patients per year.
Conclusions. We conclude that tunneled cuffed dialysis catheters are a valid alternative for the treatment of all dialysis patients who need hemodialysis but in whom native arteriovenous fistula cannot be created.

Key words: Vascular access, Tunneled cuffed dialysis catheters

Introduction

Tunneled cuffed dialysis catheters are increasingly used for long-term vascular access for hemodialysis worldwide (1, 10, 13). They are used in up to 28% of all patients beginning hemodialysis treatment in the United States (1, 6), and in about 10-12% of the prevalent patients in Europe, while the NKF-DOQI guidelines have recommended that tunneled dialysis catheter use should be restricted to not more than 10% of the dialysis patient population. These catheters became increasingly popular in Bulgaria for vascular access during the last 5 years. Such catheters are used in patients with exhausted all possibilities for creation of a native arteriovenous fistula (AVF) (2), or even in patients who are awaiting placement or maturation of a native vascular access (3). We introduced the use of tunneled dialysis catheters in our dialysis unit in January 2004 as means for long-term vascular access in patients with exhausted other possibilities. In a centralized dialysis care provided exclusively by the government cuffed dialysis catheters started to be supplied by the government only to the amount of 20% of the needs of the patients since the beginning of 2005. The rest of the patients purchased their catheters with their own funds.
With the new technique introduced for the treatment of patients with end-stage renal disease requiring dialysis we became concerned with the outcomes in terms of method and patient survival. Higher morbidity and mortality has been reported by others in patients with tunneled catheters and arteriovenous grafts compared with patients with native arteriovenous fistulas (4, 5).

Patients and methods

51 double-lumen cuffed catheter implantations were performed to 49 prevalent hemodialysis patients (mean age 57±13 years, 26% diabetic), who were on chronic hemodialysis treatment for more than 3 months. 9 polyurethane (Hemo-Flow^{TM}, Medcomp, USA) and 42 silicone (Gamcath^{TM}, Gambro, Europe) double-lumen cuffed catheters were used. All catheters were introduced using a split-sheath technique. Ultrasound guidance for locating the internal jugular vein was not used. The majority of the catheters were placed in the right internal jugular vein. The latter could not be accessed in 5 cases and required subclavian placement in 2 patients and left internal jugular placement in 3 patients. Post-procedural radiological control was utilized instead of fluoroscopy during the procedure. Standard care was applied to the catheter in each patient: sterile dressings were applied over the exit site during every haemodialysis session. For polyurethane catheters povidione-iodine was used to treat the exit site during exchange of sterile dressings, while only hydrogen peroxide was applied around silicone catheters. 9 of the 49 patients were lost to follow-up, the most common reason being patients form other dialysis centers. All patients who received cuffed tunneled dialysis catheters were assessed by the vascular surgeon as patients with absent possibility for creation of a native arteriovenous fistula for chronic vascular access. Synthetic vascular grafts were only rarely used in such patients in our hemodialysis center. Likewise, such patients were only rarely switched to peritoneal dialysis for the above reasons. The number of prevalent dialysis patients and their death rate was analyzed from the annual registry reports of the dialysis unit.

Results

Out of 40 hemodialysis patients who were not lost to follow-up 23 patients were alive at the end of the observation period, 17 with a functioning catheter. Another 6 had the catheter

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explanted due to a newly created arteriovenous fistula in 3 patients, switch to peritoneal dialysis in 2 patients and recovering of kidney function in one patient. 17 prevalent patients died, of which 15 with a functioning tunneled catheter, one with a functioning arteriovenous fistula and one with a noncuffed catheter. The causes of death are shown on Table 1.

Table 1. Causes of death in patients with implanted tunneled cuffed dialysis catheters

Number of patients	Cause of death
17	all causes
1	sepsis
1	volvulus peritonitis
1	hyperkalemia
3	stroke
1	pancreas cyst
1	liver cirrhosis
1	heart failure
1	suicide
2	cardiac arrest
5	unknown

At the end of the study period in our dialysis unit there were 11 prevalent dialysis patients with a tunneled dialysis catheter as their long-term vascular access, out of 108 prevalent patients overall. This represented a 10% rate of utilization of tunneled catheters in all prevalent hemodialysis patients. The same rate has been reported in other larger studies (1). The 30-day catheter primary patency rate was 86%. Infection-free survival could not be assessed reliably due to a low number of cases detected: we observed only 5 cases of catheter-related infections: 2 cases of tunnel infections (one staphylococcus aureus and one bramhamella case) and 3 cases of exit-site infections during the observation period. The tunnel infections were accompanied by catheter-related bacteremia and required catheter removal, while the exit-site infections were treated with systemic antibiotics. We observed 9 cases of partial thrombosis and 2 cases of complete thrombosis and performed 2 successful attempts for thrombolysis using recombinant TPA or streptokinase.

We looked at the annual registry reports from our dialysis unit to compare the mortality of all prevalent dialysis patients with that of the patients with tunneled dialysis catheters. The summarized reports for 2004 and 2005 are shown in Table 2. From these reports an annual death rate of 25% is evident among prevalent hemodialysis patients. Figure 1 shows the survival of patients with tunneled cuffed dialysis catheters in our cohort. A 25% death rate at 270 days projecting towards around 30% death rate at 1 year is evident.

Table 2. Summary from the annual reports for 2004 and 2005 of the university dialysis center in Varna

	2004		2005	
	HD	CAPD	HD	CAPD
Number of hemodialysis machines	21		21	
Prevalent ESRD patients at beginning	105	19	103	13
Incident ESRD patients	60	6	60	2
Incident ARF patients	17		11	
Patients who died during the period	53	5	40	1
Prevalent HD patients (HD>3 months) who died during the period	28		24	
HD patients HbSAg positive	4		4	1
HD patients HCV positive	24		21	

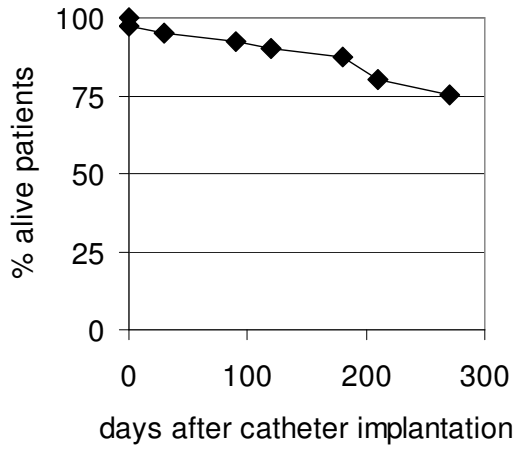

Figure 1. Survival of patients with tunneled cuffed dialysis catheters in our dialysis cohort during the 2.5 years study period since the beginning of 2004

Discussion

Morbidity and mortality in patients with tunneled cuffed hemodialysis catheters has been reported to be higher than in the general dialysis population. A recent analysis of the Australian and New Zealand Dialysis and Transplant Association Registry demonstrated significantly higher mortality in new dialysis patients beginning their dialysis therapy with a dialysis catheter or arteriovenous graft than those beginning with an AV-fistula (4). In particular, the death rate among incident (new) dialysis patients was reported around 86 patient deaths per 1000 patient years in patients with a native AV-fistula, 146 in patients with arteriovenous graft and 261 patient deaths per 1000 patient years in patients who have been dialyzed with a catheter in the first 6 months of their dialysis therapy, which was significantly higher (4). In another study in patients from the United States, mortality was found to be higher in both prevalent and incident dialysis patients who were dialysed with a central venous catheter or an arteriovenous graft

compared with a native AV-fistula (5). This study showed a 1-year survival rate of about 85% in prevalent diabetic patients with AV-fistulas, and about 75% survival rate in patients with a central venous catheter. The reasons for this increased mortality have been sought in the specific complications of tunneled catheters, namely infections and thrombosis (7-8, 11, 12). However, looking at the specific circumstances in our patients we found that a significant number of them could not have a native arteriovenous fistula created as a result of systemic illnesses such as liver cirrhosis (2 patients), heart failure (2 patients), malnutrition (3 patients), obesity (3 patients), or ankylosing spondylitis (1 patient). In another group of patients the possibilities for native vascular access were exhausted as a result of long dialysis vintage and multiple past failed accesses. In both of the above groups morbidity and mortality is increased due to the present comorbidities and therefore increased morbidity and mortality cannot be attributed solely to the use of tunneled cuffed catheters. The latter fact may also be appreciated from Table 1 enumerating the causes of death in these patients. In addition, mortality among all of our prevalent haemodialysis patients was high per se at the rate of 25% per year. This is notably higher than that reported from the Australian and New Zealand registry cited above, but our data refer to prevalent, and not incident dialysis patients. Moreover, our observations were based on a patient population with a very low rate of kidney transplantation and long dialysis vintage. Therefore, mortality due to the use of tunneled cuffed dialysis catheters may not be really higher than that of the general dialysis population, especially if the management of catheter-related complications such as infections and thrombosis is prompt and adequate.

Conclusion

Tunneled dialysis catheters have become an unavoidable part of our instrumentation to treat end-stage renal disease and while practices vary from center to center, the analysis of method and patient survival over time is an essential guide to their appropriate utilization.

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