ORIGINAL ARTICLE

Two Years Experience using Permanent Catheter for Haemodialysis

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ABSTRACT

Aim: To review retrospectively our two years experience with Permcath.
Methods: This retrospective study was carried out in 100 patients. 96 patients had chronic end stage renal failure and four had acute renal failure. Catheters were inserted in patients awaiting the creation or maturation of an arteriovenous fistula, or patients in acute renal failure. Catheters were also inserted in patients in whom other forms of access were unavailable or had failed and where the duration of access was to be indefinite. End points of the study were catheter removal, death of a patient or completion of the study period. The minimum follow up period after catheter insertion was 16 months. Patients' outcome was studied regarding survival, complications and failure rates.
Results: 97(97%) of the 100 patients were successfully managed with the catheter. The most common complications were partial obstruction or inadequate flow and catheter infection. Other complications were catheter thrombosis, central venous thrombosis, tunnel abscess, catheter damage, pneumothorax and haemothorax. A total of 51 patients developed catheter related complications over the period of two years. Out of these, catheter was removed and reinserted at different site in 43 patients. Two patients died due to catheter related complications, and 14 patients died with functioning catheter during the study, due to primary disease. In 30 patients, catheter was removed electively as a result of not needed any more (AV fistula maturation, renal transplant, recovery of renal functions or death of patient with functioning catheter). 51 patients were alive with functioning catheters at the end of two years.
Conclusion: Permcath remain a reliable method for short term vascular access when the other access modalities are unavailable. It may offer a valuable alternative for long term haemodialysis.
Keywords: Permcath, catheter obstruction, catheter infection, catheter thrombosis

INTRODUCTION

Definitive access for patients requiring haemodialysis is ideally achieved by the use of an arteriovenous fistula (Brescia-cimino fistula) in the arm[1]. At initial presentation, or while waiting for a fistula to mature, many patients urgently require short term vascular access. In addition, some patients, who have no vessels suitable for creation of an arteriovenous fistula or in whom there have been multiple failed attempts, need an alternative form of long term vascular access.

The perm catheter is a radio-opaque, soft silicone rubber catheter, designed for right atrial placement via central veins and subcutaneous tunnel. The standard catheter is 36 cm in length; a dacron cuff is situated 19 cm from the tip, serving to anchor the catheter in its tunnel by the in growth of fibrous tissue. In cross section the catheter is elliptical with external diameter of 5.9 mm. There are two parallel lumens, each with an internal diameter of 2 mm and priming volumes of 1.6 and 1.7ml per lumen. The proximal (arterial, red) lumen ends 2.5 cm from the tip to minimize recirculation. Distal lumen (venous, blue) ends at the tip of the catheter. At the periphery of the catheter is a hub from which the channels diverge, ending in colour coded locks, red for arterial (outflow) and blue for venous (inflow). There is attached clamp on each channel.

The first report demonstrating the effectiveness of these catheters was published by Schwab et al, in 1988[2]. In 1990, there has been a shift towards an increased reliance upon these semi permanent catheters as a means of permanent access in patients on chronic haemodialysis[3]. The reason of this reliance was increase number of old and diabetic patients, in whom vessels were not suitable for AV fistula formation and ease of insertion of semi permanent catheters. Also; patients, doctors and nurses accepted it well because there was no need of needling the fistula every time and catheter was used by simply opening the port.

However with these catheters it is difficult to obtain adequate blood flow, there is a higher incidence of thrombosis and it is necessary to reverse the ports, with an increase in recirculation[4,5,6].

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It has been noted that longer the catheter in place, adhesions to the central veins would be more probable[7]. Also it is presumed that all types of complications are more in females due to their smaller venous caliber[8]. In addition, the patient is more prone to bacteremia while the concomitant increased use of broad spectrum antibiotics[9, 10]. The latter, in turn, has contributed to the emergence of vancomycin resistant Enterococcus and Staph. epidermidis as well as the wide spread flourishing of methicilline resistant Staph. aureus, and Clostridium difficile[10, 11].

We have been using the perm catheter not only in patients requiring short term vascular access but also in some patients in whom alternative methods of access have failed.

SUBJECTS & METHODS

This retrospective study was carried out in vascular surgical department, Arar Central Hospital, Kingdom of Saudi Arabia over a period of two years, from November, 2010 to October, 2012. A total of one hundred patients were included. There were 52 male and 48 female patients. Age ranges from 13-95 years. 96 patients had chronic end stage renal failure and four had acute renal failure. Catheters were inserted in patients awaiting the creation or maturation of an arteriovenous fistula, or patients in acute renal failure. Catheters were also inserted in patients in whom other forms of access were unavailable or had failed and where the duration of access was to be indefinite.

Catheter insertion was done in the operation theatre throughout the study period under local anesthesia by Seldinger technique. In few cases intravenous sedation was used. Site of insertion was internal jugular, subclavian and femoral veins in different patients (Table 1). In 100 patients 112 catheters were placed for vascular access. In most patients single catheter was inserted in internal jugular or subclavian vein. In seven patients two catheters were inserted, and in two patients three catheters were inserted. In two patients femoral catheterization was done and in one patient catheter was inserted in external jugular vein. Catheter insertion was avoided in the extremity which had been involved in multiple previous venous access attempts.

End points of the study were catheter removal, death of a patient or completion of the study period. The minimum follow up period after catheter insertion was 16 months. Patients' outcome was studied regarding survival, complications and failure rates. Catheter failure was defined as non elective removal of a catheter for a complication, including inadequate flow for dialysis (<200ml/min).

RESULTS

97(97%) of the 100 patients were successfully managed with the catheter. Catheterization was unsuccessful in 3 patients even after multiple attempts. A total of 51 patients developed catheter related complications over the period of two years. Out of these, catheter was removed and reinserted at different site in 43 patients. Two patients died due to catheter related complications.

The most common complication was partial obstruction or inadequate flow in 26(26%) patients. Catheter was flushed with heparin mixed saline solution, but it was successful in only in 6 patients and in 20 patients catheter has to be removed. Three patients developed central venous thrombosis, and catheter was removed. Out of these one patient died with superior vena cava thrombosis. In 4 patients catheter was removed due to catheter thrombosis.

Catheter infection was suspected because of unexplained fever in 18 patients. Blood sample was taken for culture and sensitivity and empirically antibiotics started. Six patients improved with systemic antibiotics and infection subsided, so catheter was not removed. In the other 12 patients, catheter was removed due to non response to antibiotics, eight of which had positive blood culture. Tunnel infection with abscess formation was found in two patients and catheter was removed. One patient died due to catheter related sepsis.

Catheter damage (crack or fracture of the catheter) occurred in two patients at an average about 18 month, and catheter was removed. In one patient catheter removal became difficult after dissection of teflon cuff, because the tip of catheter was adherent to vein wall. The patient was taken to operation room, internal jugular veinotomy done under general anesthesia and catheter was successfully removed. Other complications like pneumothorax in one patient and haemothorax in one, were managed by inter costal tube drainage without catheter removal (Table 2)

Fourteen patients died with functioning catheter during the study, due to primary disease. In 30 patients, catheter was removed electively as a result of not needed any more (AV fistula maturation, renal transplant, recovery of renal functions or death of patient with functioning catheter). 51 patients were alive with functioning catheters at the end of two years.

Table 1: Site of catheter insertion

Site of insertion	No. of catheters
Rt. Internal Jugular Vein	63
Lt. Internal Jugular Vein	18
Rt. Subclavian Vein	10
Lt. Subclavian Vein	3
Femoral Vein	2
External Jugular Vein	1
Total	97

Table 2: Complications

Complications	=n	Catheters removed
Partial Obstruction	26(26%)	20
Catheter Thrombosis	4(4%)	4
Central Venous Thrombosis	3(3%)	3
Catheter Infection	18(18%)	12
Tunnel Abscess	2(2%)	2
Haemothorax	1(1%)	0
Pneumothorax	1(1%)	0
Catheter Damage	2(2%)	2
Total	51(51%)	43

DISCUSSION

Permcath was first introduced in 1984 and since that time it has been extensively used for short term and occasionally for long term access for haemodialysis[2,12,13,14]. It is noted in this series that 97% of patients were successfully managed using the catheter and 51% had catheter functioning without complications at the end of two year.

Although we do not recommend use of catheter as a first choice in patients requiring long term access, in cases where other forms of access failed, it should be considered as an important alternative. Others have observed that some patients, particularly the elderly, often elect to continue using the catheter indefinitely as it is relatively painless form of access without the need of percutaneous needle pricks[15]. Percutaneously placed subclavian catheters have been used with acceptable results[12,14]. However there is higher incidence of immediate local complications such as haemothorax, pneumothorax, haematoma and nerve damage[13,16,17,18]. Subclavian catheters have also been associated with perforation of the superior vena cava[19,20] and right atrium[21].

Because of the more direct route to the heart, these complications occur less frequently with catheters inserted by internal jugular vein[12, 17]. In our study one patient developed haemothorax, one developed pneumothorax, two patients developed central venous thrombosis and one patient developed superior vena cava thrombosis. Central venous thrombosis and stenosis is a major problem with percutaneously placed subclavian catheters[22,23]. The venous obstruction may remain subclinical until an arteriovenous fistula is created. The resultant venous hypertension predisposes to the early thrombosis and failure of arteriovenous fistula[22, 23].Preoperatively doppler ultrsonography or venography[22] are thus advised by many authors before creating an A.V. fistula in patients who have undergone previous subclavian catheterization.

The main complications in our study were partial obstruction and infection. In our study 18% patients developed catheter infection and another 2% tunnel abscess. Infection associated with haemodialysis catheters has emerged as one of the most serious complications and significant cause of morbidity and mortality in dialysis patients[24].

CONCLUSION

Permcath remain a reliable method for short term vascular access when other access modalities are unavailable. It may offer a valuable alternative for long term haemodialysis.

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