

# Placement of double lumen central venous catheter for hemodialysis patients: an experience

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## ABSTRACT

**Introduction:** Percutaneous cannulation of central vein gain immediate access for haemodialysis and become an attractive alternate to femoral catheter. This study reviewed the placement of subclavian double lumen central venous line. Like any other invasive procedure central venous cannulation has also potential complication.

**Methods:** Sixty seven patients required for haemodialysis with mean age 48.58 with male:female ratio 3:2 were included in this study.

**Results:** In our study, the duration of catheter remain in situ was 30.7 days. The complication related to catheter and unrelated to catheter were comparatively less than studies done by various authors. The overall complications related to catheter were 8.95% and unrelated to catheter was 14.92%.

**Conclusion:** The placement of central venous catheter is becoming more and more a routine procedure nevertheless complication of catheterization has improved only marginally in terms of safety. Central venous catheterization is only a feasible and accessible mean of securing venous access for haemodialysis.

**Key words:** central venous catheter, haemodialysis

## INTRODUCTION

Percutaneous insertion of a central venous catheter has become an important procedure in hospital providing immediate intravenous access. The need for urgent access is often necessitated by failure of peripheral vascular approach<sup>1</sup>. Erben in 1969 first cannulated the subclavian vein temporarily to provide hemodialysis<sup>2</sup>

and Uldall in 1979 developed a subclavian catheter designed to remain in place for an extended period<sup>3</sup>. Since then many variations of catheters have been designed for this purpose.

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At present, it is a valuable temporary vascular access having supplanted the external arterio-venous shunt and we are reporting our experience in double lumen catheter.

Hemodialysis is necessary as an emergency procedure in majority of cases with severe clinical picture and needs the rapid venous access<sup>4</sup>.

Despite greater than 30years of routine use, as well as unique position of subclavian vein, it is the most common invasive procedure performed in the hospitals in the United State but the complication of catheterization has improved only marginally in terms of safety<sup>5-19</sup>. Fortunately, mal-positioned catheters; especially with tip terminating in the right atrium rarely cause complication<sup>6-7</sup>. However, when atrial perforation occurs it is typically fatal. The safety of central venous catheterization specifically with regard to tip location appears to have improved over time with use of ultra sound guidance<sup>8</sup>.

Hemodialysis catheter can be inserted in internal jugular, subclavian or femoral veins. Even though femoral vein is easy to cannulate, site being difficult to care and limits ambulation. More over, due to high prevalence of infection and phlebothrombosis, it is reserve only for temporary access. Because of above complications, it was almost completely abandoned and only recently reconsidered again<sup>9-10</sup>.

Compared to the femoral approach, the subclavian access is comfortable to the patients for easy ambulation and catheter has an extended functional life, on the

other-hand subclavian vein cannulation is associated with more complication than femoral access even with the skilled hand<sup>4</sup>. Percutaneous internal jugular vein cannulation is technically more difficult because of the anatomical landmark. The successful placement of catheter using landmark localization depends upon multiple factors, including the normal anatomic location of vein, venous patency and venous caliber<sup>4</sup>. It is often very difficult to have access to the internal jugular vein using landmark technique in patients, who are obese or having swelling of neck and have had surgery of neck or multiple prior placement of venous catheter<sup>4</sup>.

## MATERIALS AND METHODS

This study was carried out by department of anesthesia and hemodialysis unit of medicine in Nepal Medical College teaching hospital. Sixty seven patients needed of haemodialysis included in the study dated from 2006 may to 2007 April 23. Total 67 central venous catheters were inserted.

The procedure was done in ICU for the safty purpose. The catheter used was Teflon double lumen subclavian cannula (B. Brown) of 12 French sizes with 15 cm length. All patients attended in haemodialysis for acute and chronic renal failure were enrolled in the study.

After informed consent, patient was put supine on bed, slightly tilted head and turned to contralateral side. Catheter was inserted using aseptic technique. Part is prepared with betadine solution providing two minute time for antiseptic action and draped. The point of insertion located one finger below the medial 2/3 and lateral 1/3 from manubrium sternum

to the acromio-clavicular joint. Then the skin over the landmark was infiltrated with 2% xylocaine without adrenaline. A 16 Gauge needle is inserted and gentle aspiration was done during advancement of needle. The insertion of the needle into the vein was confirmed when dark red blood appeared in the lumen. The guide wire was inserted and needle was removed. A dilator was advanced with gentle pin rolling movement to enlarge the tract. After that, the dilator was removed and the catheter was fed with the guide wire and inserted again with pin rolling movement with seldinger's technique. Catheter was anchored with suture; lumen of catheter was filled with heparinized saline and dressing was applied. After the procedure, Chest x-ray was done to all patients to look for the position of tip of the catheter and to see any other complications like haemothorax or pneumothorax.

## RESULTS

This study consist of 67 patients out of which 47 male and 20 female with male female ratio was 2.3:1 and age range from 20 to 90 years with mean 48.58years (Table-1).

Age	Sex	
	Male	Female
21-30	4	0
31-40	4	2
41-50	22	11
51-60	8	6
61-70	7	0
71-80	1	1
81-90	1	0

The successful cannulation in first attempt was done in 59.7% (40) patients, in second attempt 14.92% (10) patients and in third attempts in (14.92%)(10) patients. However in 10.44% (7) cases, we had to attempt many times to place a catheter in vein (Table-2). Nevertheless, we were not unsuccessful to cannulate the vein even in single case.

No of attempts	No of patients (n=67)
First	40 (59.7%)
Second	10 (14.92%)
Third	10 (14.92%)
Fourth & more	7 (10.44%)

Table-3 depicts the catheter-associated complications during canulation. We encountered less than 8.95% complications which include penetration of artery, jugular mal-positioning and catheter kinking. No pneumothorax, or hemothorax encountered. Poor blood flow was observed in 5 patients (7.46%).

The other complications observed were infection, dislodgement and thrombosis. The infection was noticed in 7.46 % (5) patients. The exact organism was not determined and catheter was removed after the notification of fever. A course of oral anti microbial was given for 7 to 21 days depending upon the severity of the symptoms. In one patient catheter

was removed due to kinking and unsuccessful straightening.

<b>Table-3:Complications associated and unassociated with catheter</b>			
Related with Catheter	No.of patient (%)	Unrelated with catheter	No.of Patient (%)
Penetration of artery	1 (1.49%)	Poor flow	5 (7.46%)
Jugular mal position	4 (5.97%)	Infection	5 (7.46%)
Pneumothorax	0 (0%)	Dislodgement	0 (0%)
Hemothorax	0 (0%)	Thrombosis	0 (0%)
Catheter kink	1 (1.49%)		

## **DISCUSSION**

Percutaneous cannulation of central vein gain immediate access for hemodialysis has become an attractive alternate to femoral catheter<sup>11</sup>Subclavian catheter placements allow unimpeded ambulation and have normal activities.

The large bore catheters allow adequate flow, for ultrafiltration and have been reported to produce fewer complications<sup>12-13</sup>. The expediency of providing this means of temporary access allows a smoother and less disruptive transition to chronic hemodialysis for new patients and acutely ill patients. The insertion can be done at the bedside with relatively short time, which is more economical than procedure done in the operating room<sup>1</sup>. We have used ICU for the procedure, which was economical than procedure done in the operating room.

Eisen 2006 and William 2006 stated that increase in complications was associated with multiple percutaneous sticks and the data suggested that if the central vein is not accessed rapidly within the first two vein punctures complication is likely to increase<sup>5,15</sup>. Whereas in our study, the attempt of insertion varies from first to more than four but not failed even in a single case. Though the recommended time interval for catheters to remain in situ is 1-2 weeks<sup>16</sup>,the duration of catheter remained in place for an average of 30.7 days and no patients were lost to follow up for dialysis during our study period. There is high risk of acquiring infection when leaving catheter for longer period.

We did not encounter the complication of pneumothorax and hemothorax. But unfortunately, we detected a catheter tip kinking in one patient for which we tried to manipulate with guide wire but were unsuccessful. The study done by Terry and colleagues reported that arterial

penetration observed in 7 patients, misdirection of catheter to jugular vein in two subjects, pneumothorax in one case and entirely failed to cannulate jugular and subclavian vein in two cases<sup>1</sup>. They have not mentioned about the incidence of hemothorax. Whereas in similar study done by Kamanran reported that aerial puncture in 10.7%, inability to cannulate vein in 16.5%, hemothorax in 0.5%, early infection in 15% and delay infection in 39% of cases<sup>16</sup>.

The commonest complication not related to catheter placement is poor blood flow. This is confirmed by presence of flow rate less than 200ml/min and can not improve by irrigating the catheter with saline. This may be because of the cannula inclining against the wall of venacava or heart valve<sup>17</sup>. In our study we observed poor blood flow in 7.46% (5) patients, infection in 7.46% (5) patients. Where as similar study done by Mickly 2002 stated that all late complications unassociated to catheter insertion varies from 1 to 40-50%<sup>14</sup>.

The study done by Kamanran et al reported that 21.9% of catheter had to remove due to various complications like thrombosis, infection or catheter kinking<sup>16</sup> whereas a study done by EL Minshawy et al 2004 noticed 45.45% of infection rate.

Complication of catheter insertion was observed in 14.92% subjects in our study which was low or similar rate reported by others.

In our experience, the rate of infection was not high compared to other reports.

Because we removed catheter early as soon as the appearance of fever rather than loose time awaiting culture report.

Angiography is one of the best tools for detecting of the formation of thrombus causing obliteration of central vein. However, the central vein catheter is safe, feasible and accessible means of securing venous access for hemodialysis.

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