



COST EFFECTIVENESS OF TUNNELED DOUBLE LUMEN TO NON-TUNNEL DOUBLE LUMEN DIALYSIS CATHETERS.

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Article received on:
15/06/2019

Accepted for publication:
25/10/2019

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ABSTRACT... Objectives: To ascertain the cost-effectiveness of tunneled catheters to non-tunneled catheter in dialysis patients of a tertiary care hospital. **Study Design:** Retrospective cross-sectional study. **Study Design:** Department of Nephrology, Pak Emirates Military Hospital Rawalpindi. **Period:** Jan 2016 to Jan 2019. **Material & Methods:** The sample population comprised of 500 patients, being divided into two groups and followed over a period of 03 yrs. Group A had tunneled double lumen and group B had non tunneled double lumen. Dialysis was started on the same day in both groups. Both groups were compared in terms of cost effectiveness. Cost effectiveness included price of catheter, procedure cost, treatment of infection (if any), and change of catheter in case of catheter malfunction. The amount spent on each patient was added and then an average was calculated. **Results:** Out of 600 patients, 300 were in group A and 300 patients were in group B. The two groups were analogous in gender (male: 52.8% vs 57.8%, $p=0.35$) age (41 years vs 49 yrs, $p=0.71$) hypertension and diabetes as the main causes of ESRD (51% vs 39%, $p=0.08$ and 32% vs 34%, $p=0.38$, respectively). Total incurred cost of tunneled double lumen was Rs.19000.00, with average infection free patency time being three months during which Arteriovenous fistula formed. In comparison, non-tunneled double lumen in 300 patients, average cost incurred was Rs.30000.00 including cost incurred on treating sepsis and in two –three insertions in few cases. There was no procedure related mortality. **Conclusion:** The cost-effectiveness of Tunneled double lumen catheters and clinical benefit of reduction in patency failures and also access related infections make them the first choice for dialysis patients in majority of dialysis centers of our country but large randomized control trials needed as the sample size quite less to detect a difference from the newer agents.

Key words: Chronic Kidney Disease, Cost Effectiveness, Dialysis, Non-tunneled Double Lumen Catheter, Tunneled Double Lumen Catheter.

Article Citation: Tahir T, Afzal M, Khan MNA, Raja KM, Wahaj, Batool. Cost effectiveness of tunneled double lumen to non-tunnel double lumen dialysis catheters. Professional Med J 2019; 26(12):2192-2195.
DOI: 10.29309/TPMJ/2019.26.12.3821

INTRODUCTION

End stage renal disease is a hefty health problem worldwide and its prevalence is increasing at an unprecedented rate, afflicting about 12.5% of Pakistani population.¹ and requiring hemodialysis which is a life sustaining procedure. About 1.5 million people are on maintenance hemodialysis worldwide with their number growing at a rate of about 7%.² Although all guidelines recommend AV fistula as the preferred form of hemodialysis access on the basis of lower infection rate and other complications as compared to other forms of vascular access.³ But the cost of a procedure is one of the major constraints in our society for the creation of AV fistula. A good doctor is

capable of advising not only the most appropriate procedure but the one which is not a burden on the patient financially so they do not have second thoughts about the cure due to financial constraints. Keeping this responsibility in mind, to help Nephrologists around the globe a research on cost effectiveness of two similar double lumen insertion techniques namely tunneled double lumen and non-tunneled double lumen was necessary as the number of people suffering from Renal Failure is increasing by the day and a dialysis unit is becoming an integral part of any good hospital.

There are mainly two types of catheter devices

available, short term non-tunneled non-cuffed catheters and long term tunneled cuffed catheters (TCC). NCC (non-tunneled, non-cuffed catheters) should only be used for in-hospital managements and for a period not more than 02 week for internal jugular vein and 05 days for femoral catheters. For patients who are dialysis dependent for more than 02 week, TCC are the preferred vascular access due to boon of higher blood flow rates and lower rates of infections and accidental removal.^{4,5,6}

The rationale of this study is to ascertain the cost effectiveness of tunneled cuffed catheters to non-tunneled catheters in dialysis patients of a tertiary care hospital.

It is hypothesized that tunneled dialysis catheters would provide less expenditure when compared to no tunneled dialysis catheter in terms of price of catheter, procedure cost, treatment of infection (if any), and change of catheter in case of catheter malfunction ,which will ultimately quell the robust financial burden in developing countries like Pakistan.

SUBJECTS AND METHODS

This retrospective study included 600 patients, aged 18-65 yrs, male or female, who were being started on hemodialysis from Jan 2016 to Jan 2019 at a dialysis center of a tertiary care hospital were included in the study. Patients with chronic kidney disease (CKD5ND) who were not on dialysis and those who did not give consent to participate in the study were excluded.

Procedure

We collected data of 600 patients by non-consecutive purposive sampling in 3 years suffering from chronic kidney disease irrespective of the cause, a deduction was made and proven that non tunneled hemodialysis catheter is cheaper than tunneled hemodialysis catheter. Two groups were made. Patients were randomly divided into two groups –both group A and B had 300 subjects, Group A was passed tunneled double lumen for hemodialysis and Group B was passed non tunneled double lumen for hemodialysis.

The patients had been counselled for possible complications of the double lumen catheter insertions which included bleeding, infection, trauma to surrounding tissue and blockade:

Both groups were compared in terms of cost effectiveness. Cost effectiveness included price of catheter, procedure cost, treatment of infection (if any), and change of catheter if blockade. Dialysis was started on the same day in both groups.

All statistical analysis was performed using Statistics Package for Social Sciences version 21.0. Continuous variables were presented as means and standard deviation while discrete variables as frequency and percentages. A 2 tailed z test Fisher's exact test was used to do primary analysis by comparing two groups. A P value of less than.05 was considered to be statistically significant.

RESULTS

A total of 600 patients of CKD commencing on dialysis were approached to participate in the study. Of these, tunneled catheter was passed in 300 patients and non-tunneled catheter also in 300 patients. The mean age was 41 years in the group 1 and 49 years in the second group. All other characteristics of the study groups mentioned in the Table-I.

In group 1 patients, total incurred cost of tunneled double lumen was Rs.19000.00, with average infection free patency time being three months during which Arteriovenous fistula formed.

In comparison, non-tunneled double lumen in 300 patients, average cost incurred was Rs.30000.00 including cost incurred on treating sepsis and in two –three insertions in few cases No episode of procedure related complication observed.

After applying z test analysis, it was observed that there is significant statistical difference between the 02 groups in terms of their cost-effectiveness, however, no statistical difference observed in terms of side effect profile.

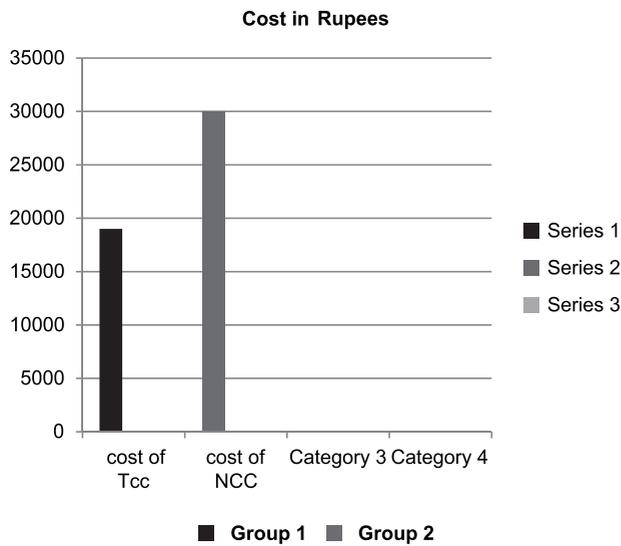


Figure-I. Cost of tunneled vs non-tunneled catheters

Characteristic	Group 1 (n-300)	Group 2 (n-300)	P-Value
Sex			
Male	52.8	57.8	0.35
Female	06	09	0.30
Mean age	41	49	0.71
Underlying disease			
Hypertension	51	39	0.38
Diabetes	32	34	0.08
DM/HTN	9	11	0.5
Chronic GN	5.33	14	0.01
ADPKD	0	01	0.7
Others	3.33	0	0.32

Table-I. Characteristics of the study group

DISCUSSION

To understand the main objective of this research we first need to know what is meant by a tunneled hemodialysis double lumen catheter and by a non-tunneled hemodialysis double lumen catheter. These are non-permanent short term procedures for hemodialysis purposes. In a tunneled double lumen catheter technique it is passed through a vein in the neck preferably Internal Jugular Vein (IJV), since it has proven to have caused the least complications⁷, tunneling underneath the skin, it's one end is kept outside the skin at a site in the shoulder or chest. Intra venous (IV) infusions and medication can be easily given to

the patient through this catheter as well as blood samples can be taken without having to prick the patient again. Tunneled technique fastens the catheter to its place and lessens the chance of different microorganisms from entering to cause infections.⁶ An AV fistula is the preferred permanent procedure for patients of renal failure who have to undergo dialysis frequently⁸ but a tunneled or non-tunneled catheter must be placed during the time the AV fistula is made and is ready for use or for patients who's condition is contraindicated for an AV fistula.^{9,10}

A Non-Tunneled double lumen hemodialysis catheter is kept outside the skin and inserted exactly at the point where it enters the vein under consideration, the catheter is not passed through a pathway under the skin as done in tunneled. Due to its efficiency Nephrologist in Canada have been using the Non tunneled catheter technique.¹¹In patients of Acute Kidney Injury (AKI) non tunneled catheters are opted for immediate access to the vasculature.¹²It is an easier approach to providing medications and performing hemodialysis in emergency situations but it is not the type which is recommended due to increased number of complications it has caused therefore long term use of non-tunneled double lumen catheter is discouraged.^{13,15} To the author's best knowledge not much work has been put into the comparison between the cost of the two procedures previously hence comparison with any other research was not possible. Today, 89% of patients of rena failure undergo hemodialysis while the remaining 11% of the patients undergo peritoneal hemodialysis. Our research concluded in three years' time that an average of PKR 30,000/- was spent on the patients (Group B) with non-tunneled double lumen catheter and an average of PKR 19,000/- was spent on the patients (Group A) with tunneled double lumen catheter. The data collected also pointed out that the rate of infection in tunneled type of double lumen catheter was lesser than the non-tunneled approximately with an interval of three months and the non-tunneled catheter insertion had to be frequently changed sometimes as frequent as 3 times per patient.

CONCLUSION

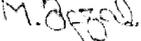
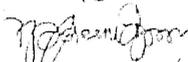
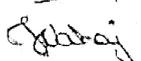
Tunneled double lumen insertion in renal failure patients is not only safe with lower infection rate but also is cost effective for the patient in comparison to non-tunneled double lumen catheters.

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