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Complications of Central Venous Catheterisation

KEYWORDS: Central venous catheterization, mechanical complication

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ABSTRACT **Introduction**-*Central venous catheterization is associated with risk of various complications .We conducted the present study to analyse various complications of central venous catheterization done by the landmark technique.***Materials and methods-** *It is a retrospective observational study . Patients, admitted in medical ICU, who underwent central venous catheterization ,using the landmark technique were included in the study. Complications were looked for, during and after the of the CVC insertion.***Results-** *Total 116 patients were included .Complications due to CVC insertion were observed in 11 patients(9.5%). The common complications encountered were , hematoma formation (5), arrhythmias (4), while complication like carotid artery puncture and catheter site infection were found in 1 patient each.***Conclusion-***The commonly encountered complications of CVC are mechanical. Precautions taken during and after CVC insertion will help reduce these complications. Also, the use of ultrasound guided catheterization should be considered wherever possible.*

Introduction-

Central Venous Catheter (CVC) insertion is essential in everyday medical practice, especially in treating patients in the intensive care units (ICU). CVCs are used for parenteral nutrition, administration of blood derivatives, antibiotics and chemotherapy, for measuring the central venous pressure and other diagnostic procedures. The application of these catheters is associated with the risk of complications, such as those caused during the CVC insertion, infections at the location of the insertion, sepsis and others (1).

Despite the advent of ultrasound-guided vascular catheterisation, which has reduced the incidence of insertion complications significantly (2,3) , many hospitals in India still rely on the landmark-based technique for central venous catheterisation, which has a reported success rate of 75–99%. We undertook the present study to look at the incidence of complications of central venous catheterization done by the landmark technique.

Materials and methods-

It is a retrospective observational study done at the Smt. Kashibai Navale Medical College, Pune, Maharashtra, over a period of 12 months from June 2015 to May2016. All adult patients, admitted in medical ICU, who underwent central venous catheterization, using the landmark technique were included in the study. The site, side of procedure done and type (single, double or triple lumen) of CVC were noted. Complications were looked for, during and after the CVC insertion. All the above data was entered into an excel sheet and was analysed.

Results-

The common indications for admission to our intensive care unit (ICU) are sepsis, shock, alcoholic liver disease related complications, cerebrovascular accident (stroke) and acute coronary syndrome. Total 116 patients were included in this study, 52 females and 64 males. Age range was 18 to 76 years and maximum patients were in the 41-60 year age group. (Table1) In 109 patients, CVC was inserted in right internal jugular (IJ) vein, in 3 patients left IJ vein and in 2 patients, in subclavian and femoral vein each. Complications due to CVC insertion were observed in 11 patients (9.5%). Type of catheter used in these patients were single lumen in 26 patients, double lumen in 32, triple lumen in 45 and dialysis catheter inserted in 13 patients. The common complications encountered were hematoma formation (5 patients), arrhythmias (4 patients), while complication like carotid artery puncture and catheter site infection were found in 1 patient each.(Table2) No patient suffered from pneumothorax, sepsis, venous thrombosis as a result of the procedure.

Table 1- Profile of patients in the study group.

		No.of patients	%
Age Group	13-40 years	31	26.7
	41-60 years	51	44
	> 60 years	34	29.3
Gender	male	64	55.2
	female	52	44.8
Site of CVC insertion	Right IJ vein	109	94
	Left IJ vein	3	2.6
	Subclavian vein	2	1.7
	Femoral vein	2	1.7
Type of catheter	Single lumen	26	22.4
	Double lumen	32	27.6
	Triple lumen	45	38.8
	Dialysis catheter	13	11.2

Table 2. Complications observed due to central venous catheterization.

	No of patients	%
Hematoma	5	4.3
Arrhythmias	4	3.4
Catheter site infection	1	0.9
Carotid artery puncture	1	0.9
Total	11	9.5

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Discussion-

Central venous catheterization was first described in 1952. This time tested procedure is one of the commonest procedures performed in medical intensive care units, major indications of which are monitoring central venous pressure, administration of medications, nutritional support and blood products.

There are multiple approaches for CVC insertion in internal jugular vein, subclavian vein and femoral vein. Many hospitals in India still rely on the landmark-based technique for catheter insertion. Reported success rate of this technique is 75-99%.(3) In our study group, commonest site used for central venous catheterization was right IJ vein and technique used was landmark based.

Unfortunately this procedure is associated with many adverse events like mechanical, infections, thrombotic etc, which have a major impact on the course of hospitalization of patients due to the increased morbidity, mortality and hospital cost.(4) Reported literature states that complications occur in about 12-20% of patients who undergo central venous catheterization.(1,5) The incidence in our study group was 9.5%.

Overall rate of mechanical complications are reported to occur in 5 to 19 percent of patients.(1) Most common mechanical complications described are arterial puncture, hematoma or pneumothorax. Overall rate of mechanical complication is found to be similar in IJ and subclavian vein catheterization, while pneumothorax is more likely with subclavian vein and arterial puncture is more in IJ vein. Femoral vein catheter insertion is commonly associated with hematoma and arterial puncture. (1,5,6). Mechanical complications (carotid artery puncture, hematoma and arrhythmias) were the most common complications encountered in our patients. Even in the study conducted by Kaur and Mathai from an institute in Northern India reported mechanical complications to be most common (7). Thorough knowledge of the surface and deep anatomy of the site is very necessary to minimise the complications associated during insertion procedure.

Other than hematoma, common complication we encountered in our study group was arrhythmia. Overinsertion of guidewire during procedure causes cardiac stimulation thereby producing cardiac arrhythmias. One study also suggested that patients with acute renal failure are at increased risk for cardiac arrhythmias during central venous catheter procedures. (8,9)

Of 116, only 1 patient in our study group had catheter site infection. Infectious complications are reported in various studies ranges from 5 to 26 percent (1,5). Earlier studies reported lower risk of catheter related blood stream infections in IJ and subclavian vein access compared with femoral site access. But in subsequent studies there are no significant differences between these three sites (10).

For reducing the rate of mechanical complications during CVC insertion, use of ultrasound to localize the vein and measure its depth beneath the skin, has been promoted. However its use in subclavian vein catheterization has mixed results probably due to anatomical location (2,3)

Conclusion –

The commonly encountered complications of CVC are mechanical. Precautions taken during and after CVC insertion will help reduce these complications. Also, the use of ultrasound guided catheterization should be considered wherever possible.

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