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# **Original Research**

## Assessment of complications of central venous catheterizations

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#### ABSTRACT:

**Background:** In the intensive care unit (ICU), central venous catheters (CVCs) are a necessary component of patient treatment. The present study was conducted to assess complications of central venous catheterizations. **Materials & Methods:** 120 central venous cathetercases of both genderswere divided into 2 groups of 60 each based on central venous catheterizations (CVCs) using internal jugular venous; and subclavian vein. Parameters such as APACHE II score, characteristics of insertion, complications, etc. were recorded. **Results:** The mean APACHE II score was 16.5 and 16.2 for patients in groups I and II respectively. Characteristics of insertionwere right side in 32 and 28,  $\geq$ 2 insertion attempts were seen in 18 and 24 and failed attemptswere seen in 10 and 8 patients in groups I and II respectively. The difference was significant (P< 0.05). Common complications recorded were hematoma in 4 and 1, arterial trauma in 3 and 2, catheter tip malposition in 6 and 4, and guidewire kinking in 1 and 0 patients in group I and group II patients respectively. The difference was significant (P< 0.05). **Conclusion:** Complications from infections and mechanical issues related to CVCs occur frequently. In comparison to the SCV route, the IJV route is linked to more bleeding mechanical difficulties. **Keywords:**central venous catheters, intensive care unit, APACHE II

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#### **INTRODUCTION**

In the intensive care unit (ICU), central venous catheters (CVCs) are a necessary component of patient treatment.1 Nevertheless, about 15% of patients experience CVC-related problems, the most common of which are mechanical (5–19%), infectious (5-26%), and thrombotic (2-26%). As a result, there is a rise in hospital expenses, morbidity, and mortality, as well as an extension of ICU and hospital stays.<sup>2</sup> Although the introduction of ultrasound-guided vascular cannulation has significantly decreased the risk of insertion difficulties, many hospitals in underdeveloped nations, including India, still use the landmark-based technique for cannulation, which has a claimed success rate of 75-99%. On the incidence of complications connected to CVC insertion and use, particularly infectious complications, very little information has been published from adult Indian ICUs.3

One of the most significant complications is catheterrelated bloodstream infection (CRBSI). Bacteria can enter the bloodstream through the catheter, leading to systemic infections. Prevention measures such as proper hand hygiene, aseptic insertion techniques, and catheter care protocols can help reduce the risk of infection.<sup>4</sup>Central venous catheters can cause blood clots to form within the vein where the catheter is placed. This can lead to partial or complete blockage of the vein, increasing the risk of complications such as pulmonary embolism or catheter malfunction.<sup>5</sup> Anticoagulant therapy may be used to prevent thrombosis in some cases.Improper placement of the catheter can result in its tip being located in inappropriate locations such as the arterial system, which can lead to complications like arterial puncture, bleeding, or organ damage.<sup>6</sup>The present study was conducted to assess complications of central venous catheterizations.

#### **MATERIALS & METHODS**

The present study consisted of 120 central venous cathetercases of both genders.

Data such as name, age, gender, etc. was recorded. Central venous cannulations were performed only when the platelet count was more than 50,000/cumm and the prothrombin time international normalized ratio was less than 1.5 seconds, as per the ICU protocol. Patients were divided into 2 groups of 60 each based on central venous catheterizations (CVCs) using internal jugular venous; and subclavian vein. Parameters such as APACHE II score, characteristics of insertion, complications, etc. were recorded. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS	
<b>Table I Baseline</b>	parameters

Parameters	Variables	Group I (IJV)	Group II (SCV)	P value
APAC	HE II score	16.5	16.2	0.52
Characteristics of	Right side	32	28	0.05
insertion	$\geq 2$ insertion attempts	18	24	
	Failed attempts	10	8	

Table I shows that the mean APACHE II score was 16.5 and 16.2 for patients in group I and II respectively. Characteristics of insertion was right side in 32 and 28,  $\geq 2$  insertion attempts were seen in 18 and 24 and failed attempts was seen in 10 and 8patients in group I and II respectively. The difference was significant (P< 0.05).

#### **Table II Assessment of complications**

Complications	Group I (IJV)	Group II (SCV)	P value
Haematoma	4	1	0.15
Arterial trauma	3	2	
Catheter tip malposition	6	4	
Guidewire kinking	1	0	

Table II, graph I show that common complications recorded were hematoma in 4 and 1, arterial trauma in 3 and 2, catheter tip malposition in 6 and 4, and guidewire kinking in 1 and 0 patients in group I and group II patients respectively. The difference was significant (P < 0.05).



#### **Graph I Assessment of complications**

#### DISCUSSION

Mechanical complicationsinclude catheter kinking, migration, or dislodgement, which can impair catheter function and cause pain or discomfort to the patient. Careful handling and securement of the catheter can help prevent such issues.<sup>7</sup> The introduction of air into the venous system can occur during catheter insertion

or removal, leading to air embolism, which can be fatal. Proper techniques to prevent air entry, such as using an aseptic technique and priming the catheter tubing, are crucial.Inflammation of the vein where the catheter is inserted can occur, leading to pain, redness, and swelling along the vein.<sup>8</sup> This is often caused by irritation from the catheter or by infection.Rarely,

catheters can break, leaving a fragment in the bloodstream. This can cause embolism or migration of the fragment to other parts of the body, leading to serious complications.<sup>9</sup>The present study was conducted to assess complications of central venous catheterizations.

We found that the mean APACHE II score was 16.5 and 16.2 for patients in groups I and II respectively. Characteristics of insertion were right side in 32 and 28,  $\geq$ 2 insertion attempts were seen in 18 and 24 and failed attempts were seen in 10 and 8 patients in groups I and II respectively. Kaur et al<sup>10</sup> examined the frequency of mechanical and infectious complications following CVC insertions; and compared the rates of these complications between subclavian vein (SCV) and internal jugular vein (IJV) accesses. A total of 481 central venous catheterizations (IJV route, 241 and SCV route, 239) were examined. 86 patients (17.9%) experienced mechanical difficulties; there were 48 cases of bleeding issues, 27 catheter-related complications, and 11 cases of pneumothorax. A considerably increased incidence of bleeding problems was linked to the IJV route (P=0.009). Infectious complications, such as catheter-related bloodstream infections (CRBSIs) (n = 8), exit site infections (n = 17), and catheter tip infections (n =22), were observed in forty-seven patients (9.79%). Particularly with IJV cannulae, the odds of infectious problems rose dramatically (P=0.009) if the CVC remained in place for more than seven days.CVC tip infections had an incidence density of 7.67 per 1000 catheter days, while CRBSIs had an incidence density of 2.79 per 1000 catheter days.

We found that common complications recorded were hematoma in 4 and 1, arterial trauma in 3 and 2, catheter tip malposition in 6 and 4, and guidewire kinking in 1 and 0 patients in group I and group II patients respectively.Ramritu et al<sup>11</sup> in their study twenty-three studies were included. The strategies that reduced catheter colonization included the insertion of central venous catheters in the subclavian vein rather than other sites, the use of alternate skin disinfection solutions before catheter insertion, and the use of Vitacuff in combination with polymyxin, neomycin, and bacitracin ointment. Strategies to reduce catheterrelated bloodstream infection included staff education multifaceted infection control programs and performance feedback.

Schummer et al<sup>12</sup>analyzed 1794 (1017 right- and 777 left-sided CVAP), of which 87.7% were accomplished without adverse events. More than one cannulation attempt was a risk factor for failed catheterization, and other mechanical complications but not for malposition. Complications/malpositions were encountered in 220 CVAPs.In 51 CVAPs (2.8%) the cannulation failed at the attempted site, here 18 CVAPs were accompanied by further complications (35.3%). Otherwise, the rate of mechanical complications was low (3.3%). The most common mechanical complications (n = 127) were arterial

punctures (n = 52; 2.9%), including four arterial cannulations (0.2%), and pneumothorax (n = 9; 0.6%). There was a significant risk for arterial puncture with the internal jugular vein approach in comparison to the innominate vein (p = 0.004), but not to the subclavian vein (p = 0.065). Male patients had a lower risk for failure (2.1%) than females (3.8%, p = 0.028). One-hundred-twenty-one central venous catheters were malpositioned (6.7%) of which 35 were related to the left internal jugular vein.

The limitation of the study is the small sample size.

#### CONCLUSION

The authors found that complications from infections and mechanical issues related to CVCs occur frequently. In comparison to the SCV route, the IJV route is linked to more bleeding mechanical difficulties.

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