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COMPARATIVE EVALUATION OF SUBCLAVIAN VEIN CATHETERIZATION BY SUPRACLAVICULAR AND INFRACLAVICULAR APPROACH

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ABSTRACT
The present study was conducted in Department of Anaesthesia, Sardar Patel Medical College and PBM Hospital, Bikaner, with the aim of comparative evaluation of subclavian vein catheterization by supraclavicular and infraclavicular approach. There are three common routes of central venous catheterization i.e. subclavian, internal jugular and the femoral. Hence in our study we have done a comparative evaluation of supraclavicular and infraclavicular approach for SCV catheterization with primary objective of successful catheterization of SCV using anatomical landmark technique and secondary objective of first attempt success rate, time taken for cannulation and also record the incidence of complications related to either approach. In our study, 60 patients enrolled were randomly divided into two groups of 30 patients each. In Group A Infraclavicular SCV catheterization and in Group B Supraclavicular catheterisation was performed using anatomical landmark approach. Successful catheterization, first attempt success rate, time taken for venous access and catheterization, catheter malfunction or any other complication were recorded. In group A (IC) Maximum 63.33% were inserted in single attempt whereas minimum 10% required 3 or more attempts while in group B (IC) maximum 93.33% were inserted in single attempt whereas minimum 3.33% needed 3 or more attempts, and the difference was found statistically significant. Overall successful catheterization was 90% in Group A and 96% in Group B while 93 % when combined for both groups. Mean time taken for insertion was observed more (6.67 ± 1.44 min.) in group A whereas less (4.47 ± 1.01min.) in group B, and the difference was found statistically highly significant. We conclude that SC approach of SCV catheterization is better as comparable to IC approach in terms of landmarks accessibility, success rate, time taken and rate of complications.

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INTRODUCTION

With the use of invasive monitoring technologies and aggressive hemodynamic resuscitation, to gain rapid and accurate vascular access, central venous cannulation has become an imperative skill. Central venous access is indicated when peripheral veins are inaccessible, for volume resuscitation, administration of potent vasoactive drugs, frequent blood sampling, total parenteral nutritional support, hemodynamic monitoring, transvenous cardiac pacing, and administration of long term chemotherapy. Central lines are typically introduced into the internal jugular, subclavian, femoral vein or peripherally via basilic vein .Advantages of subclavian venous catheterization include a lower risk of infection as compared with internal jugular or femoral sites, ease of insertion in trauma patients who may be immobilized in a cervical collar, less interference with airway management during cardiopulmonary cerebral resuscitation (CPCR) and less patient discomfort, especially for long-term intravenous therapy such as hyper alimentation and chemotherapy It also carries a lower risk of thrombosis.

Infraclavicular (IC) approach and supraclavicular (SC) approach are the two techniques of subclavian venous catheterization. IC approach is most widely practiced technique among the two but the SC approach to the SCV catheterization has some distinct advantages. a shorter distance from skin to vein and a straighter path to the superior vena cava, less proximity to the lung and fewer complications of arterial or pleural puncture, i.e., less chances of pneumothorax. Furthermore, fewer incidence of malposition are reported with SC approach. The present study is designed to compare two approaches supraclavicular and infraclavicular for subclavian vein catheterization in terms of successful catheterization using anatomical landmark technique. This study also takes into consideration the first attempt success rate, time taken for venous access and catheterization, catheter malfunction, catheter malposition.

MATERIALS AND METHODS

This study was performed in the Department of Anaesthesia, Sardar Patel Medical College and Associated Groups of Hospitals. Informed written consent was obtained from all the patients.

STUDY DESIGN

Hospital based Prospective, randomized, interventional study.

The study was conducted in the following two groups of patients. Each group consisted of 30 patients. (n=30)

1. Group A –Infraclavicular approach CVC (n=30)
2. Group B -Supraclavicular approach CVC (n=30)

SELECTION OF PATIENTS

Inclusion Criteria	Exclusion Criteria
1. ASA Grading I, II, III	1. Morbidly obese patients in whom landmarks were difficult to identify
2. Medical, surgical and neurosurgical patients	2. Infection at the site of insertion
3. Patients requiring CVP monitoring and infusion of vasopressors	3. Trauma to ipsilateral neck/clavicle/first rib or deformities
4. Patients requiring long-term fluid management in the ICU	4. Coagulopathy
	5. Age < 18 years

SAMPLE SIZE

Sample size of 18 cases required each group at 80% study power and alpha error 5%.It is round of 30 cases for present study expecting approximately 50% drops out. MEDCALC statistical software was used for sample size.

Data Analysis

To collect required information from eligible patients a pre-structured pre-tested proforma was used. For data analysis Microsoft excel and statistical software EPI info was used and data was analyzed with the help of frequencies, figures, proportions, measures of central tendency, appropriate statistical test.

RESULT & DISCUSSION

We have put SCV catheter by anatomical landmark technique with an overall success rate of 93.33%. In group B (Supraclavicular) its 96.67% and 90% in group A (infraclavicular).

In group A Maximum 63.33% were inserted in single attempt whereas minimum 10% inserted in 3 or more attempts and in group B maximum 93.33% were inserted in single attempt whereas minimum 3.33% inserted 3 or more attempt, and the difference was found statistically significant. ($p<0.05$)

Skin Puncture Attempt

Skin Puncture Attempts	Group A		Group B		Total	
	No.	%	No.	%	No.	%
1	19	63.33	28	93.33	47	75
2	8	26.67	1	3.33	9	21.67
>3	3	10.00	1	3.33	4	3.33
Total	30	100	30	100	60	100
P value	0.017					

Distribution of cases in both groups According to 1st attempt success rate

Skin Puncture (Attempts)	Group A	Group B	Total
Success in 1st attempt	19	28	47
Number of total attempts	50	33	83
Success rate	0.38	0.84	0.56
p Value	0.046		

In group A Maximum 63.33% were inserted in single attempt whereas minimum 10% inserted in 3 or more attempts and in group B maximum 93.33% were inserted in single attempt whereas minimum 3.33% inserted 3 or more attempt, and the difference was found statistically significant. ($p<0.05$) Successful catheterization defined as success with less than 3 attempts. Over all successful catheterization was 93 % combined in both group while group A 90% and Group B 96%.Success rate of 1st attempt was more 0.84 in group B (Supraclavicular) then group A (infraclavicular) and the difference was found to be statistically significant. ($p<0.05$).

According to Time taken

Time (min)	Group A	Group B	Total
Mean ± SD	6.67 ± 1.44	4.47 ± 1.01	5.57 ± 1.65
P value	0.0001*		

Mean time taken for insertion observed more (6.67 ± 1.44 min.) in group A whereas less (4.47 ± 1.01min.) in group B, and the difference was found statistically highly significant. ($p<0.0001$).

Distribution of cases in both groups According to Success rate

Success	**Group A**		**Group B**		**Total**	
	No	**%**	**No**	**%**	**No**	**%**
Yes	27	90.00	29	96.67	56	93.33
No	3	10.00	1	3.33	4	6.67
Total	30	100.00	30	100.00	60	100.00
p value	0.605					

Successfully completed procedure was more (96.67%) in group B (Supraclavicular) then in group A (infraclavicular) (90%) and the difference was found to be statistically insignificant. ($p>0.05$)

Distribution of cases in both groups according to failure/malfunction

Failure **(N = 30)**	**Group A**		**Group B**		**Total**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Malfunction	1	3.33	0	0.00	1	1.67
Can't locate vein	2	6.67	1	3.33	3	5.00

In group A out of 30 procedures 3 were failed in which 2 (6.67%) were can't locate vein and 1 (3.33%) was due to malfunction of catheter. In group B out of 30 procedures only 1(3.33%) was failed due to inability to locate vein.

CONCLUSION

The present study was conducted in Department of Anaesthesia, Sardar Patel Medical College and PBM Hospital, Bikaner, with the aim of comparative evaluation of subclavian vein catheterization by supraclavicular and infraclavicular approach. The study was conducted on 60 subjects comprising of 30 by Infraclavicular approach subclavian vein catheterization and 30 by Supraclavicular approach subclavian vein catheterization, Study group comprises of patients age between18-65 years with both sexes. All patients were randomly selected irrespective to their caste and creed. Central venous catheterization was done on the request of their treating doctors on the basis of indications and patients selected to our study if they meet our inclusion and exclusion criteria.

Proper well informed written consent taken from patient and their relatives after explaining all details and complications and risk factors associated with central line catheterization by subclavian vein catheterization infraclavicular or supraclavicular approach. We have put SCV catheter by anatomical landmark technique with an overall success rate of 93.33%. In group B (Supraclavicular) its 96.67%and 90% in group A (infraclavicular). Mean time taken for the SCV catheterization by SC approach is 4.47 ± 1.01min and mean time taken for SCV catheterization by IC approach is6.67 ± 1.44 min. and the difference was found statistically highly significant. ($p<0.0001$)

In IC approach first attempt catheterization in 19 subjects and two attempts were taken for 8 subjects and where as in SC

approach first attempt catheterization was done in 28 subjects and in one subject two attempts were taken. Statistically in group A (IC) maximum 63.33% were inserted in single attempt whereas minimum 10% inserted in 3 or more attempts while in group B (SC) maximum 93.33% were inserted in single attempt whereas minimum 3.33% inserted 3or more attempts, and the difference was found statistically significant (p value : 0.017).

In group A out of 30 procedures 3 were failed in which 2 (6.67%) can't locate vein and 1 (3.33%) due to malfunction of catheter. In group B out of 30 procedures only 1(3.33%) was failed due to can't locate vein.

We observed only 1 complication in our study. Hematoma was observed in IC group and it was well managed. From our study, we conclude that SC approach of SCV catheterization is better as comparable to IC approach in terms of landmarks accessibility, success rate and rate of complications. SC approach offers some distinct advantages like less chance of malposition due to shorter skin to vein distance. Access time in SC approach is less as compared to IC approach which is important where quick as well as immediate access to the central venous system is required.

FINANCIAL ASSISTANCE
Nil

CONFLICT OF INTEREST
The authors declare no conflict of interest

AUTHOR CONTRIBUTION
Gaurav Joshi contributed in conceptualizing, data curating and formal analysis. He also contributed in writing original draft. Kiwi Mantan contributed in investigation and supervision of whole study. Sandeep Kothari contributed in writing, reviewing and editing the manuscript. Shiva Tanwar, Jinesh Baid and Satyaprakash contributed in accessing resources and reviewing and editing the manuscript. All authors read and approved the manuscript.

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