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Pattern of superficial venous arrangement in cubital fossa among preclinical Nepalese MBBS students at Birat Medical College Teaching Hospital

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ABSTRACT

Background: The superficial veins of the cubital fossa are frequently variable in existence and arrangement. Many clinical procedures, such as reconstructive microsurgery and arterial bypass surgery, as well as intravenous injections or therapy, require the use of superficial veins. **Aims and Objective**: The aim of the study was to observe and describe the variations in anatomical distribution of the superficial veins of the cubital fossa in Nepalese pre-clinical medical students. **Materials and Methods:** The cross-sectional study included a total of 98 students between 18 to 24 years of age. A total of 196 anterior aspects of both arms were examined for cubital venous pattern. A tourniquet was applied at the mid-arm and drawing of the pattern of veins was made on a separate unglazed paper. The venous patterns in the cubital fossa were then categorized based on their gender. **Results:** Six patterns of superficial veins of the cubital fossa were observed. The commonest pattern in both genders was type I pattern. No statistical significant difference was observed between patterns of superficial veins on the right and left cubital fossa (P = 0.728 and 0.825 respectively) in both male and female subjects. **Conclusion:** Our research showed six venous patterns of superficial veins at the cubital fossa in Nepalese population. Understanding the common anatomy, patterns and variations of superficial vein anastomosis is imperative as this knowledge would help those needing venous access for various medical procedures.

Key words: Cubital fossa; Gender; Nepalese; Patterns; Superficial veins

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INTRODUCTION

The superficial veins of the cubital fossa in man have been a topic of interest to anatomists, morphologists and anthropologists as well, for health care professionals.[1] The superficial veins consist of cephalic, basilic, median cubital and antebrachial veins along with their tributaries.[2] The cephalic vein usually forms over the 'anatomical snuffbox' from the radial end of the dorsal venous arch. It curves proximally around the radial side of the forearm to gain its ventral aspect. The basilic vein starts medially in the dorsal venous network of the hand. It ascends posteromedially in the forearm, travels forwards to the anterior surface distal to the elbow, where it is joined by the median cubital vein. Superficially, the cubital fossa appears as a depression on the anterior aspect of the elbow. Deeply, it is a space anterior to the most distal part of the humerus and elbow joint that is filled with a variable amount of fat.[3] The cubital fossa is a common site for venous blood sampling, transfusion, and intravenous therapy. The venous pattern in the cubital fossa varies significantly. Different patterns and percentages of occurrence of superficial cubital veins have been reported in various races,[4-7] with only one study in Caucasians.[8]

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In an emergency, every clinical professional should know where to collect blood from the arm. The cephalic, basilic, median cubital and median antebrachial veins are frequently chosen for venipuncture (drawing blood) because of its characteristics: a thick lumen and an easily visible confirmation. These veins are commonly used because they are well supported by muscle and connective tissue, are visible, and are easy to palpate. However, relatively rare, but potentially serious complications including nerve injury and mistaken arterial punctures have been reported.[9,10]

Cubital veins are also used to introduce cardiac catheters from cardiac chambers to obtain blood samples and for cardio-angiography.[11] To plan dialysis access in a given patient, it's essential to understand the anatomy patterns of the cubital superficial veins.[12] Furthermore, in some superficial venous pattern types, arteries and nerves are located near or beneath the superficial veins and missed injections could be extremely dangerous to the underlying structures. Therefore, the anatomical characteristics of the sites at which venipuncture is performed need to be clearly understood to prevent these complications. In the event of occlusion, different patterns can provide collateral venous pathways. Because of the variability and clinical significance of superficial veins of the cubital fossa, this study was conducted to identify and describe variations in the anatomical distribution of superficial veins of the cubital fossa in healthy preclinical medical students of BMCTH.

MATERIALS AND METHODS

This is a cross-sectional observational study conducted at the department of Anatomy of Birat Medical College Teaching Hospital, Morang; Nepal over a period of six months from March 2021 to July 2021.The ethical clearance certificate (Reference number: IRC-PA-104/2077-78) was obtained from the Institutional Review Committee before commencement of the study. The pattern of superficial venous arrangement in the cubital fossa was studied in 196 anterior aspects of the arms among 98 Nepalese pre-clinical MBBS students (118 arms in 59 males, 78 arms in 39 females). Each healthy Nepalese student between 18-24 years of age providing written consent was included in the study. Students with thick tissue layer or having any wound in the cubital region or small veins measuring (less than 1 mm) and students not providing consent were excluded in this study. A Tourniquet, Skin marker/tailors chalk, A4 size unglazed sheet of paper was used as data collection tool. The superficial veins of the cubital fossa were made prominent by applying a tourniquet about 10 cm proximal to the crease of the elbow and by active movements of the hand. The veins were marked on the skin, and the vein pattern on the right and left sides of each subject's hand was diagrammed separately on an unglazed sheet of paper. All the drawings obtained were carefully studied and analyzed. Data collected was entered in Microsoft Office Excel 2010 and further analyzed using SPSS version 20. The chi-square test was applied to compare the significant difference between the venous arrangements of superficial veins with gender. A p value <0.05 was considered as significant.

RESULTS

In the present study the total sample consisted of 98 subjects (Males: 59; Female: 39). A total number of 196 anterior aspects of the arms (right and left) were examined for superficial venous patterns at cubital fossa. The age of the subjects ranged between 18 -24 years. In our study six types of superficial venous patterns were observed (Table 1). The order of arrangement of the patterns was Type I > Type II > Type III > Type IV > Type VI > Type V. Figure 1 and 2 shows patterns of superficial veins of the cubital fossa in males and females which was observed in our study.

Table 2 shows the gender-based patterns of superficial veins in right cubital fossa. Type I pattern was the commonest pattern in both the gender found in 20(33.8%) males and

Table 1: Observation and distribution of superficial venous pattern in cubital fossa

Pattern	Observation	Percentage
Type-I	Median cubital vein arising from the cephalic vein joins the basilic vein.	38.7%
Type-II	Median antebrachial vein giving two branches in the cubital fossa joins basilic and cephalic vein.	30.6%
Type-III	No communication between the cephalic and the basilic veins	15.3%
Type-IV	Cephalic vein and the basilic vein connecting by an arching vein proximally.	5.1%
Type-V	Only presence of the basilic vein	4.2%
Type-VI	Two median cubital veins join the cephalic and basilic vein.	5.9%

Table 2: Gender distribution of superficial veins of right cubital fossa

Type	Male	Female	Total	P value
Type I	20(33.8%)	18(46.1%)	38(38.8%)	0.728
Type II	18(30.5%)	12(30.8%)	30(30.6%)	
Type III	9(15.3%)	5(12.8%)	14(14.3%)	
Type IV	5(8.5%)	1(2.6%)	6(6.1%)	
Type V	3(5.1%)	1(2.6%)	4(4.1%)	
Type VI	4(6.8%)	2(5.1%)	6(6.1%)	
Total	59	39	98	

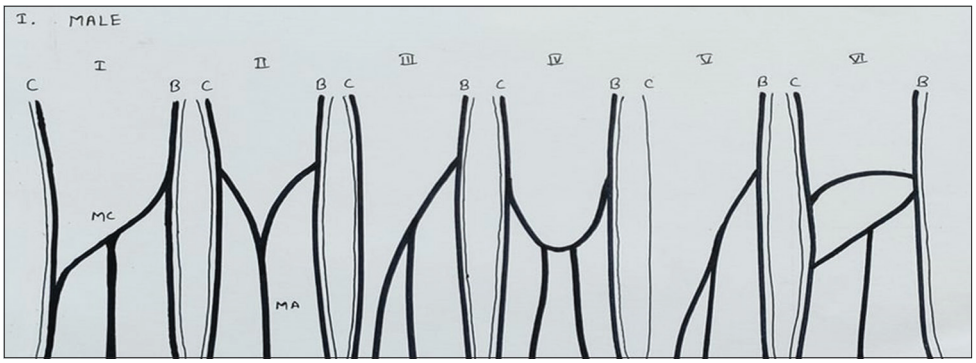

Figure 1: Showing patterns of superficial veins of the cubital fossa in males. C= Cephalic vein, B=basilic vein, M= median cubital vein, M= median antebrachial vein.

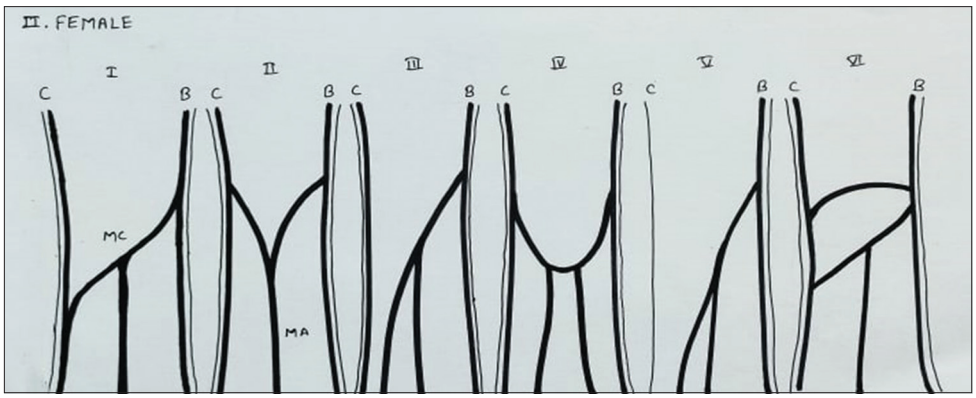

Figure 2: Showing patterns of superficial veins of the cubital fossa in females. C= Cephalic vein, B=basilic vein, M= median cubital vein, M= median antebrachial vein.

18(46.1%) females respectively. Type II pattern was the second most common pattern consisting of 18(30.5%) in males and 12(30.8%) in females. However, the other patterns (type IV, V and VI) were recorded below 10% in both genders. Using Pearson Chi-Square test, there was no statistical significant difference between patterns of superficial veins on the right cubital fossa and gender. P = 0.728

Table 3 shows the type I pattern was also the most common pattern in the left cubital fossa, with 20 (33.8%) and 16 (41%), respectively, in males and females. Type II pattern was the second most common pattern occurring in 18(30.5%) of males and 12(30.8%) of females. Type III pattern was seen in 9(15.3%) of males and 7(17.9%) females. Type IV, V and VI venous patterns were found in small percentage ranging from 2.6% to 6.8%. There was no statistically significant difference in patterns of superficial veins of left cubital fossa and gender (P = 0.825).

Table 3: Gender distribution of superficial venous pattern of left cubital fossa

Type	Male	Female	Total	P value
Type I	20(33.8%)	16(41%)	36(36.7%)	0.825
Type II	18(30.5%)	12(30.8%)	30(30.6%)	
Type III	9(15.3%)	7(17.9%)	16(16.3%)	
Type IV	4(6.8%)	1(2.6%)	5(5.1%)	
Type V	4(6.8%)	1(2.6%)	5(5.1%)	
Type VI	4(6.8%)	2(5.1%)	6(6.1%)	
Total	59	39	98	

DISCUSSION

In this study, six patterns of superficial venous patterns of cubital fossa were observed. Type 1 pattern in which the median cubital vein crossing from cephalic to basilic vein was the most common pattern in both genders. The incidence of occurrence of this pattern in males was (33.9%) and in females was (43.6%). Different patterns of superficial cubital veins and percentages of occurrence have been reported in various races. This pattern was present in (62.4%) of males and (78.8%) of females.[13] The percentage of this pattern was higher compared to our study. A study on three major ethnicities in Malays, Chinese and Indians this pattern was found in 34% males and 32.5% females.[14] The second common pattern in our study was Type II pattern in which the medial ante brachial vein branching in two in the cubital fossa ending in basilic and cephalic vein. The incidence of occurrence of this pattern was almost even in both genders accounting 30.5

% in males and 30.8 % in females. This figure differs from the percentage found in an Iraqi study, which found this pattern in 59.7 % of males and 48.5 % of females. The percentage of this pattern was quite higher as compared to our study.[15] This pattern was also observed as the second most common pattern by Dharap AS et al.,[13] seen in 18.8% of males and 11.5 % females. A Jordanian study [16] observed similar findings of this pattern in 18.2% of males and 16.6% of females. The percentages of this pattern were quite low in comparison to our study. The third common pattern in our study was that the median vein does not join the cephalic and the basilic veins i.e., Type III. The occurrence of this pattern was observed in 15.3 % of both sexes. Dharap et al.,[13] identified this pattern in 8.8 % of males and 7.3 % of females. The incidence of this pattern was reported by Wasafi et al., [15] in 16.5 % of males and 11 % of females. The Type IV pattern was the cephalic vein and basilic vein connected by an arching vein proximally, accounting for 5.1 % of the total. The lower percentage of this pattern is comparable to 4% in a Nigerian and 4.5 % in a Malaysian study.[6,14] The fifth pattern was that only presence of the basilic vein present in 5.9% of males and 2.6% of females. In Malays this pattern was seen in 2.9% males and 1.0% females which is lower than the percentage found in the current study.[12] In Jordanians this pattern was found in 5.3% males and 13.6% females.[16] The sixth pattern was that in which median cubital veins join the cephalic and basilic veins found in 5.9% in both sexes. In a Malay study, however, this pattern was seen in only one male subject (0.6%) and none of the females.[13] In adult Jordanians it was observed in two male subjects (1.5%) but none in females.[16] As shown in our study, there was no statistically significant difference between superficial venous patterns of the cubital fossa and gender in any of the previous studies. [13-16]

LIMITATIONS OF THE STUDY

In our study, we used a non-invasive procedure to identify the various pattern of superficial cubital veins among medical students. In order to understand more about variability of cubital veins in the future, fine dissection of cadavers will be required. A better understanding of the venous pattern types in different ethnicities could help people become more aware of these unusual cubital venous patterns, as well as perform safer medical procedures.

CONCLUSION

Cubital venous patterns vary in number and frequency across populations, as evidenced by our research. Understanding the common anatomy and patterns of superficial vein anastomosis at the cubital fossa is vital. Many medical procedures like venous blood sampling, transfusion, infusion, intravenous therapy, placement of dialysis access would benefit from understanding the variations of superficial veins at cubital fossa. In our research, we discovered six different types of superficial venous patterns. The type I pattern was the most common pattern in males and females followed by type II pattern. There was no significant difference in the patterns of superficial veins in the cubital fossa when compared with gender.

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SKS-Concept and design of the study, prepared first draft of manuscript, preparation of manuscript, interpretation of the results; **ST-**Reviewed the literature, statistical analysis and revision of the manuscript; **RKC-**Concept, coordination and data compilation; **RKS**-Data acquisition; **UKM-** reviewed the literature.

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