

AN OBSERVATIONAL STUDY OF PATTERN OF SUPERFICIAL CUBITAL VEINS AMONG STUDENTS OF RAMA UNIVERSITY

Medha Das^{*1}, Shirin Jahan², Pranjal Pankaj³, Gajendra kr Sah⁴.

^{*1} Professor, Dept of Anatomy, Rama Medical College, Mandhana, Kanpur, India.

² Professor, Dept of Anatomy, Rama Medical College, Mandhana, Kanpur, India.

³ Professor, Dept of Medicine, Rama Medical College, Mandhana, Kanpur, India.

⁴ Student ,M.Sc. Anatomy, , Rama Medical College, Mandhana, Kanpur, India.

ABSTRACT

Background: Cubital fossa is a superficial depression on the anterior aspect of elbow. Superficial veins of cubital region are the most commonly used veins clinically for the purpose of venipuncture done for blood sampling ,blood transfusion , blood donation & intravenous injections . The different pattern of superficial cubital veins is studied by many researchers over the time. The variations are reported in different ethnic groups and races by many such studies.

Objective: The aim of the current study was to observe and describe the different patterns of arrangement of superficial veins among male students of Rama University and to find the most common pattern among students and to correlate the data with other such studies especially on Indian population.

Results: One hundred and ninety eight male students of medical and paramedical streams of Rama University of 2017 and 2018 batch were observed for pattern of superficial cubital veins.Ten types of venous pattern arranged in six groups were noted. The most common pattern observed in our study was type A .

Conclusion: The most common type of pattern observed in our study was type A resembling alphabet M ,which is different from the results deduced by other such studies on indian population. The knowledge about the commonly found pattern will be helpful to the clinicians and also to the paramedical staff especially under emergency circumstances where time is limited and crucial.

KEY WORDS: Superficial cubital veins, Variations , Venipuncture, Blood transfusion.

Address for Correspondence: Dr Medha Das, Professor, Department of anatomy, Rama Medical College Hospital & Research Institute, Mandhana, Kanpur – 209217, India.

E-Mail: drmedhadas@rediffmail.

Access this Article online	Journal Information
Quick Response code  DOI: 10.16965/ijar.2019.238	International Journal of Anatomy and Research ICV for 2016 90.30 ISSN (E) 2321-4287 ISSN (P) 2321-8967 https://www.ijmhr.org/ijar.htm DOI-Prefix: https://dx.doi.org/10.16965/ijar 
	Article Information
	Received: 30 May 2019 Peer Review: 31 May 2019 Revised: None
	Accepted: 08 Jul 2019 Published (O): 05 Aug 2019 Published (P): 05 Aug 2019

INTRODUCTION

Veins of upper limb are conveniently grouped as superficial and deep. The deep veins comprise of veins formed by the venae comitantes accompanying the large arteries and the axillary vein. The superficial vein lie in the superficial fascia of arm. They are not paired with any artery and their anatomical disposition

varies widely unlike the deep veins, which accompany arteries between the muscles in the limb with the same named artery close by and are more or less constant in position. The superficial venous return from the upper limb follows two or three major superficial veins, which are extremely variable. The major superficial veins of the upper limb include the Cephalic, Basilic,

Median Cubital, and Antebrachial veins. Most of these veins originate in the subcutaneous tissue on the dorsum of the hand from the Dorsal venous arch [1].

The superficial veins are close to the surface of the body, i.e., they are subcutaneous in the superficial fascia. The network of superficial veins on the dorsum of hand forms dorsal venous arch. The dorsal digital veins unite to form three dorsal metacarpal veins which form a dorsal digital network over the metacarpus [2].

The arch drains upwards into lateral cephalic vein and medial basilic vein. The cephalic vein crosses the anatomical snuff box and winds around the anterior aspect of the forearm. It then crosses the cubital fossa, enters the arm on the lateral aspect of biceps and ends by piercing deep fascia in lateral pectoral groove and draining into axillary vein. The basilic vein arises from medial end of dorsal venous arch and ascends on medial side of forearm. It crosses the cubital fossa and enters the arm on medial side of biceps. In the upper arm it pierces the deep fascia to join the brachial vein. The median cubital vein unites the basilic and cephalic veins superficial to bicipital aponeurosis in the roof of cubital fossa [3].

The cubital fossa is seen superficially as a depression on the anterior aspect of the elbow. Superficial veins of cubital fossa are very important for day to day clinical practice as they are commonly used for venipuncture, transfusion, intravenous injections and cardiac catheterisation. During state of shock the superficial veins are not easily visible as they are collapsed, so a clinician must have the knowledge about the common patterns and variations of superficial veins of cubital fossa prevalent in that region; which is a site of choice for venipuncture. The median basilic vein or basilic vein is the vein of choice for central venous catheterisation, because the diameter of basilic vein increases from the cubital fossa until it reaches the axillary vein and is in direct line with axillary vein. The valves of axillary vein may cause trouble, but abduction of shoulder joint may permit the catheter to pass past the obstruction [1]. The arrangement of the superficial veins in the cubital fossa is subjected to considerable variation. Different patterns of

superficial cubital veins and percentages of their occurrence have been reported in various races. The aim of current study was to observe and describe the variations in anatomical distribution of the superficial veins of the cubital fossa among the selected group of students of Rama University.

Classification of superficial venous patterns of cubital fossa: The superficial veins of cubital fossa had been studied by many researchers over the time and many researchers have proposed different classifications of pattern of superficial veins in cubital fossa. Patuere in 1951 described four classical patterns based upon their resemblance to the respective alphabet as suggested by the names of the different patterns. According to him different types were M-type, Y-type, N-type and W-type. [4] Other researchers who also proposed classification are Sohier et al in 1964, Tewari et al in 1971, Singh in 1982, Sol et al in 2007 and Ukhola et al in 2013. In this study the patterns found were grouped into different type according to the classification proposed by Sol et al. According to this classification the cubital veins are classified into six main groups. Most of these groups have been further divided into subgroups depending upon presence of minor variations [5-8].

Type A: In this type the pattern of arrangement of superficial veins at the cubital fossa resembles alphabet M. Type A1 is the typical M shaped pattern where median antebrachial vein divides into the median cephalic and median basilic veins, which join the cephalic and basilic vein respectively. Type A2 is a variation where the median cephalic vein does not join the cephalic vein.

Type B: In this type the pattern of superficial veins resembles alphabet N in the cubital fossa. Type B1 is a variation in which the cephalic vein springs from the median cubital vein and joins the basilic vein. Type B2 is other variation in which the cephalic vein continues superomedially as the median cubital vein, which drains into the basilic vein. Median antebrachial vein drains into the basilic vein, and proximal part of cephalic vein does not exist. Type B3 is a variation of N shaped pattern in which the cephalic vein is present.

Type C: In this type the pattern of superficial veins of cubital fossa resembles alphabet H where BV and CV form long vertical limbs of H on medial and lateral side respectively and the short horizontal limb is formed by the median antecubital vein joining the two.

Type D: In this type only the basilic vein and cephalic veins are present and there is no communication between these two veins.

Type E: In this type veins run superomedially from the lateral aspect of forearm to the medial aspect of the cubital fossa. Type E1 is a variation in which the cephalic vein runs from lateral to medial and continues as the basilic vein. In Type E2 a number of veins run superomedially from the lateral aspect of the forearm to the medial side of cubital fossa.

Type F: Pattern in which median antebrachial vein is doubled.

MATERIALS AND METHODS

The present work purely observational in nature, was carried out in the department of Anatomy, Rama Medical college, Mandhana, Kanpur. Total one hundred and ninety eight male students of 2017 and 2018 batch of medical and paramedical streams were selected for study. Study was done exclusively in male students because of the fact that superficial veins are more prominent and clearly visible in males as already been established by many studies. The study was observational and descriptive in nature. Both right and left arms of all the subjects were observed for the pattern of arrangement of superficial veins, making the total number of arms to be examined three hundred and ninety six.

The students with prominent veins in cubital fossa were included in the study. Those students with thick subcutaneous tissue in the cubital fossa or any disfigurement in the cubital fossa which can affect the observation were excluded from the study. The age of the subjects were in the range 19 to 25 years.

All the subjects were either standing or sitting, with each arm placed on a table. The subject had a tourniquet tied around his arm at approximately the mid arm level. The tourniquet was firm enough only to occlude the veins, but not

to interfere with blood flow in the radial artery. Three to five minutes after application of tourniquet, the occluded superficial veins became prominent. Both Cubital fossa of each subject were photographed with a digital camera. Age of each subject was recorded. The clear visualization of the veins was enhanced by some manueurs like holding the arms pointing downwards before application of tourniquet, Clenching of the fist on and off to increase venous return towards the proximal part of the arm and gentle tapping of the forearm to promote vasodilatation.

Prior permission to conduct the study was taken from the Ethical Committee of the college. Inclusion criteria – Male student without any disfigurement in the region of cubital fossa which can affect the observation

Exclusion criteria – female, any disfigurement in the region of cubital fossa which can affect the observation

RESULTS

The pattern of cubital veins were classified into six main groups (type A to type F) based on the classification of Del Sol et al. These groups were further subdivided into subgroups depending upon minor variation.

One hundred and ninety eight male students of medical and paramedical streams of Rama University of 2017 and 2018 batch were observed for pattern of superficial cubital veins. Both right and left arms of all the subjects were observed for the pattern of arrangement of superficial veins, making the total number of arms to be examined three hundred and ninety six.

Ten different types of patterns of superficial veins were observed in the studied group. These were classified into six major types and few subgroups representing minor variations.

Among the three hundred and ninety six arms examined, the most common pattern found was type A (33.58%) followed by type E (27.02%) [Table No – 1].

In type A median antebrachial vein was present on anterior aspect of forearm which divided into median basilic and median cephalic joining basilica and cephalic veins respectively in cubital fossa [Fig No – 1,2]. The typical M

Table 1: Distribution of different types of pattern of superficial cubital vein.

Type	Total (right +left arm)	Number of right arm with the type	Number of left arm with the type	Percentage
A	133	66	67	33.58
B	93	43	50	23.48
C	22	10	12	5.55
D	17	9	8	4.29
E	107	64	43	27.02
F	24	6	18	6.06

Table 2: Distribution of different subtypes of type A.

Type	Total (right +left arm)	Number of right arm with the type	Number of left arm with the type	Percentage
A1	117	59	58	29.54
A2	16	7	9	4.04

Table 3: Distribution of different subtypes of type B.

Type	Total (right +left arm)	Number of right arm with the type	Number of left arm with the type	Percentage
B1	44	19	25	11.11
B2	31	12	19	7.82
B3	18	12	6	4.54

Table 4: distribution of different subtypes of type E.

Type	Total (right +left arm)	Number of right arm with the type	Number of right arm with the type	Percentage
E1	40	27	13	10.1
E2	67	37	30	16.91

Fig. 1: type A 1.



Fig. 3: type B.



Fig. 2: type A 2.



Fig. 4: type C.



Fig. 5: type D.



Fig. 6: type E.



Fig. 7: type F; Double ACV



formation was seen in one hundred and seventeen arms . Among these one hundred and sixteen were present bilaterally in fifty eight subjects examined. A variation of type A in which median cephalic was not seen joining cephalic vein , was present in sixteen arms. fourteen of which were present bilaterally in seven subjects examined . In one subject the pattern of superficial vein on right cubital fossa was typical M (type A) and on left cubital fossa was its variant A2 [Table No- 2].

Type B with pattern of superficial veins resembling alphabet N was seen in ninety three arms [Fig No – 3] . Out of these B1 pattern was found in total forty four cubital fossa examined ; nineteen on right side and twenty five on left side. B2 variant was present in twelve right cubital fossa and nineteen left cubital fossa. B3 variant was present in twelve right arm and six left arm [Table No – 3].

Type C in which venous arrangement resembles alphabet H was present on ten right cubital fossa and twelve left cubital fossa making total twenty two arms with this arrangement [Fig No – 4].

Type D in which there is no communication between basilic and cephalic vein , was found in total seventeen arms ; nine on right side and eight on left side [Fig No – 5]

Type E 1 in which cephalic vein ascends from lateral side of forearm to medial side of cubital fossa, to continue as basilic, was seen in total forty cubital fossa; twenty seven on right side and thirteen on left side [Fig No – 6]. E 2 variant where a number of vein run from lateral side of forearm to medial side of cubital fossa, was found in sixteen cubital fossa; thirty seven on right side and thirty on left side [Table No – 4].

Type F in which median antebrachial vein is duplicated; was found in total twenty four cubital fossa examined, six on right side and eighteen on left side [Fig No – 7]

When findings of both sides were compared, the most common pattern on right side was type A; type E was the second most common type. The same hold true for the left side also.

DISCUSSION

Our study was done exclusively on male subjects due to the fact that study was purely observational and descriptive in nature and more prominent veins in males facilitated the study. Though it limited the scope of the study at the same time but the inference deduced from our study still has significant role for the clinicians and emergency staffs. Among the three hundred and ninety six arms examined, the most common pattern found was type A (33.58%) followed by type E (27.02%). When findings of both sides were compared, the most common pattern on right side was type A (33.33%); type E was the second most common type (32.32%). The same hold true for the left side also.

In a metaanalysis by Yammine & Eric (2016), total eight types including two less common types are described. The “M” (or “Y” or classical) shaped arrangement was called type 1. The prevalence range of type 1 was reported to be 0.78– 54.13%. In this study type B & C of sol’s classification is included together in type 2 with a prevalence ranging from 9% to 98%. Similarly type D of sol’s classification where there is no communication between CV & BV is type 3 with a prevalence ranging from 1.1% to 37%.^{6,18} Type 4 is a pattern where the CV drains into BV, and MAV drains into CV or BV below the cubital fossa while the CV is poorly developed or missing; prevalence of this type ranges between 1.6% and 32%.^{23,24}. In rare instances, the MCV is

doubled (type 5) with a frequency of 0.6–8.5%.^{16,25} similar to sol’s type F. Type 6 is a pattern where the CV and BV are joined by an arched vein, with a proximally oriented concavity into which two or more veins are drained from the Forearm; its prevalence ranges between 2% and 10.6%. Few authors identified two additional types. The “M”-like type (type 7) where MCV does not link to CV or when the CV is divided into MCV and MBV.

In that case MCV drains into the accessory CV. Prevalence of this type ranges between 5.2% and 30%.^{19,26} Type 8 is very rarely described in literature; it includes nonclassifiable patterns such as an absent antebrachial BV or a doubled brachial CV with a frequency Type 2 was the commonest pattern (44–60%) followed by type 1 (20–25%), then type 7 (13%), type 3 (4–11%), type 8 (8%), type 6 (4.5%), type 4 (3–4%), and type 5 (2.4%). Types 1 and 7 were significantly more prevalent in men and type 3 more prevalent in women while no sex-based significance was found for all other types. No significant difference was found between right and left sides and that for all types. The Indian and Japanese populations showed significantly lesser frequencies of type 1 and significantly higher occurrence of type 2 when compared to other ancestries; no overlapping in confidence intervals. Type 3 was significantly more frequent in Malay population whereas type 4 in Indian ancestry. The investigation was clinical or cadaveric. The gender difference in relation to type “M” and “I” along with the clear association between pattern type and ethnicity would highly suggest a genetic base to the observed pattern frequencies [10].

In another study by Ukoha et al (2013), the most common pattern of cubital venous arrangement was type A. This group has a general incidence of 33%; Thirty five percent and 27.1% in males and females respectively. Type B had general incidence of 28.1%, in males the incidence was 28.5% and in females 27.1%. This displays a sexual dimorphism. The incidence of type B3 was significantly higher in males (10.5%) than in females (8.6%) and type B2 is higher in females (8.6%) than in males (8%). However, type B1 shows equal distribution of 10% in both sexes. Type E2 has an incidence of 22% in males

and 14.3% in females. Type E1 has an incidence of 5.3% with females having higher values of 10% than males (3.5%). Type C recorded an incidence of 2.6% in the total sample, and of this males had 3.5% while females recorded none. Types A, B, C, and E were more common in males [10].

In yet another study by Bekel et al on a subgroup of Ethiopian population the prevalence of type 1 and 2 superficial venous arrangements in cubital fossa were found to be more in females than males. The reverse holds true for type 3 and 4 superficial venous arrangements, which are prevalent in cubital fossae of male [11].

Lee et al in 2015 studied the superficial cubital veins using illuminator. According to this study, the most common type in male and female was different as type I was more common among males, (49.3%) and type II among females (56.0%). However, different frequency of the type of a superficial vein between men and women was not significant [12].

CONCLUSION

Though our study has limited the scope due to the fact that it was done only on male subjects and is unable to ascertain the gender difference in occurrence of the common patterns of cubital veins; but at the same time it still has significant role for the clinicians and emergency staffs in decreasing the morbidity of patients due to repeated venipuncture. Especially under emergency conditions where veins are collapsed or prolonged intravenous access is needed; the knowledge of common patterns of superficial cubital veins will be very helpful for the clinicians.

ABBREVIATIONS

BV – Basilica vein

CV – Cephalic vein

MCV - Median cubital vein

Conflicts of Interests: None

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How to cite this article:

Medha Das, Shirin Jahan, Pranjal Pankaj, Gajendra kr Sah. AN OBSERVATIONAL STUDY OF PATTERN OF SUPERFICIAL CUBITAL VEINS AMONG STUDENTS OF RAMA UNIVERSITY. Int J Anat Res 2019;7(3.2):6835-6840. DOI: 10.16965/ijar.2019.238