

Observation on the Anatomical Pattern of Superficial Cubital Veins in the People of BiharAmrita Kumari¹, Rekha Sinha², Vivekanand³, Birendra Kumar Sinha⁴¹Assistant Professor, Department of Anatomy, PMCH, Patna²Assistant Professor, Department of Anatomy, PMCH, Patna³Assistant Professor, Department of Anatomy, PMCH, Patna⁴Professor & Head, Department of Anatomy, PMCH, Patna

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Abstract:

Background and Objectives: Venipuncture for obtaining a blood sample is one of the most common procedures in the emergency room. It is performed by various medical practitioners such as physicians, nurse, emergency medical technician. For inexperienced health workers, it can be the most frustrating and most important task for building rapport with patients. Many variations of superficial cubital veins were observed by different researchers of anatomy and various articles were also published in different periods of time to state the anatomical patterns and variations of superficial cubital veins.

Materials and Methods: This research is an observational study, which is purely descriptive and was done with the purpose of examining the pattern of superficial veins of the cubital fossa among randomly selected volunteers from the staff and medical students in PMCH Patna.

Conclusion: “M” shaped or type A pattern of arrangement of superficial veins at the cubital fossa, was the most commonly observed pattern seen in people of Bihar. It was seen in 35% of the living subjects, whereas in the cadavers it also accounted for 35%. Subtype A, the variant of “M” shaped pattern of superficial cubital veins, with subtype A₁ showing the most common pattern of arrangement accounting for 30% whereas subtype A₂ accounting for only 5% of cases. Consent was taken from the volunteers and further study was initiated. A total 40 subjects were chosen aged between 20-27 years irrespective of their sex.

Keywords: Venipuncture, Variations Of Superficial Cubital Veins, Dorsal Venous Arch.

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Introduction

Venipuncture for obtaining a blood sample is one of the most common procedures in the emergency room. It is performed by various medical practitioners such as physicians, nurse, emergency medical technician. For inexperienced health workers, it can be the most frustrating and most important task for building rapport with patients. Despite the importance of the approaching superficial veins, however, students in the health care system usually have rare opportunities to observe actual human superficial vein, including anatomy cadavers. Furthermore, application of educated anatomical knowledge to the practical venipuncture procedure is difficult work because of variation of the anatomy of superficial vein. [1] One of the most common site for venipuncture is the superficial vein in the cubital fossa of upper limb, which include the cephalic, basilic, median cubital and antebrachial veins and their tributaries. Because of the wide variations of these superficial veins, it has been reported that adverse effects such as bruising, hematoma, and sensory change occurred

by mispuncture in various health care system. For the accomplishment of venipuncture of these superficial veins without such accidents, it is important to understand the courses of the superficial veins. Due to the numerous variations of the superficial cubital vein, it is important to master the anatomy of the superficial veins of the cubital fossa for clinical procedures such as venipuncture, transfusion, infusion, cardiac catheterization, or placement of dialysis access. [2] Additionally, arteries and nerves that lie near or below these superficial veins could be at risk for missed punctures. The medial and lateral antebrachial cutaneous nerves which lie superficial to basilic vein, cephalic vein, median cubital vein and median basilic vein in the cubital region are susceptible to injury during phlebotomy. On the other hand, different vein patterns existing in the cubital fossa can provide collateral venous pathways in case of occlusion. [3] The Superficial venous return from the upper limb follows two or three major superficial veins, which are extremely variable. The superficial

veins include the cephalic, basilic, median cubital and antebrachial veins and their tributaries. The superficial veins lie in the superficial fascia. They have a tendency to run away from the pressure sites, hence they are absent in palm, along the ulnar border of the forearm, and back of elbow. There are two major superficial veins, one along the preaxial border and the other along the postaxial border of the limb [4]. The dorsal venous arch is a network of veins on the dorsum of hand. It presents irregular arrangement of veins usually with its transverse element, which lies 2-3 cm proximal to the heads of metatarsals [5].

Objectives

variations of superficial cubital veins were observed by different researchers of anatomy and various articles were also published in different periods of time to state the anatomical patterns and variations of superficial cubital veins.

Material and Method

This research is an observational study, which is purely descriptive and was done with the purpose of examining the pattern of superficial veins of the cubital fossa among randomly selected volunteers from the staff and medical students in Patna medical College and Hospital Patna, Bihar. A total 40 subjects were chosen aged between 20-27 years irrespective of their sex. This study was also conducted on 10 cadavers which were managed in Anatomy.

All the subjects with prominent superficial veins were included in the study. Excluded were those with thick subcutaneous tissue layer or having cut or wound within the cubital region.

While standing or sitting with each arm placed on a table, the subject had a tourniquet tied around the arm at approximately the mid arm level. The tourniquet was firm enough to occlude the veins, but allow for pulsation of the radial artery. Three to five minutes after applications of tourniquet, the occluded superficial veins, now conspicuous, were diagrammatized and photographed with a camera. The cadaver was placed in supine position. Skin incision "S" is made as shown in the figure. The skin was removed, leaving the superficial fascia undisturbed. Here blunt dissection was done to demonstrate the superficial veins of the arm and forearm. Probe was used to follow the cephalic and basilic veins proximally, freeing them from the surrounding fat and connective tissue.

The cephalic and basilic veins were seen joined across the cubital fossa by the median cubital vein.

This pattern was variable, hence observed on other cadavers also. Probe was used to elevate the superficial veins. Perforating veins were observed penetrating the deep fascia and connecting the superficial veins to deep veins.

Results

Ten types of venous arrangements were observed for the studied population. These were classified into six major groups and some with subgroups representing minor variations. The major types are A, B, C, D, E and F with the main features of "M" shaped pattern, "N" shaped pattern and "H" shaped pattern. These respectively represented patterns in which only the cephalic and basilic veins are present. Pattern in which veins run superomedially from lateral aspect of the arm, and pattern in which median antebrachial vein is doubled.

The cubital veins are classified into six main groups based on the classification of Del Sol et al. most of these groups have subgroups consisting of minor variations based on the following criteria :-

Type A

"M" shaped pattern of arrangement of superficial veins at the cubital fossa, consisting of minor "M" variation:

Type A₁: is the typical "M" shaped pattern formed by division of median antebrachial vein into the median cephalic and median basilic veins, which join the cephalic and basilic veins respectively.

Type A₂: is a variation where the median cephalic vein does not link with the cephalic vein.

Type B

Variations of "N" shaped pattern of arrangement of superficial veins in the cubital fossa.

Type B₁: is a variation of the "N" shaped arrangement in which the cephalic vein springs from the median cubital vein, which joins the basilic vein.

Type C

"H" shaped pattern of arrangement of superficial veins in the cubital fossa.

Type D

Pattern in which only the basilic vein and cephalic veins are present and there is no communication between the two veins.

Type E

Pattern in which veins run superomedially from the lateral to the median aspect of the forearm.

Type E₁: is a variation in which the cephalic vein runs from lateral to medial where it continues as the basilic vein.

Table 1: Distribution of superficial cubital veins in the people of Bihar type A.

	Type	Number per right arm	Number per left arm	Total per type for both arms	Total number of arms	Percentage of total type
In living subjects	A	16	12	28	80	35
In Cadavers	A	4	3	7	20	35

Table 2: Distribution of superficial cubital veins in the people of Bihar A.

	Sub-type	Number per right arm	Number per left arm	Total subtype for both arms	Total number of arms	Percentage subtype
In living subjects	A ₁	14	10	24	80	30
	A ₂	2	2	4	80	5

Table 3: Distribution of superficial cubital veins in the people of Bihar B.

	Types	Number per right arm	Number per left arm	Total per type for both arms	Total number of arms	Percentage of total type
In living subjects	B	13	10	23	80	28.75
In Cadavers	B	3	2	5	20	25

Table 4: Distribution of superficial cubital veins in the people of Bihar B.

	subtype	Number per right arm	Number per left arm	Total subtype for both arms	Total number of arms	Percentage subtypes
In living subjects	B ₁	5	3	8	80	10
	B ₂	2	5	7	80	8.75
	B ₃	2	6	8	80	10

Table 5: Distribution of superficial cubital veins in the people of Bihar C.

	Types	Number per right arm	Number per left arm	Total per type for both arms	Total number of arms	Percentage of total type
In living subjects	C	1	1	2	80	2.5
In Cadavers	C	0	1	1	20	5

Table 9: Distribution of superficial cubital veins in the people of Bihar E.

	Types	Number per right arm	Number per left arm	Total per type for both arms	Total number of arms	Percentage of total type
In living subjects	E	11	9	20	80	25
In Cadavers	E	2	2	4	20	20

In type E veins run superomedially from the lateral to the median aspect of the forearm. In living subjects 11 right arms, 9 left arms with total of 20 (25%) showed this pattern. Whereas in cadavers 2 right arms and 2 left arms, with total of 4 (20%) showed this arrangement.

Table 12: Distribution of superficial cubital veins in the people of Bihar F.

	sub-type	Number per right arm	Number per left arm	Total subtype for both arms	Total number of arms	Percentage subtypes
In living subjects	F ₁	2	2	4	80	5

Type F₁ is a pattern in which the median antebrachial vein is duplicated. Cephalic vein and basilic veins are diminished or absent. 2 right arms, and 2 left arms, on the whole 4 (5%) cases had this arrangement.

Discussion

Hyunsu lee, Sang-Hoon-Lee et al [6] (2015), studied the variations of the cubital superficial vein investigated by using intravenous illuminator, 200 subjects were studied and type A was found in 42.5% of females and in 49.3% of

males. It was the second most common type found in this study. Kaissar-Yamine and Mirela Eric [7], 2016 in their research showed 20-25% of prevalence of type A and was more prevalent in men. L Faraj Albustami and his team 2014, observed this pattern in 9.8% in males and 12.8% in female. U.U. Ukoha and his team, 2013 in their study noted that the most common pattern observed was the median antebrachial vein, dividing into median cephalic and median basilic veins, which join the cephalic and basilic vein respectively, with a variation. This

group has a general incidence of 33% and 35% in males and 27.1% in female respectively [8].

Hossein Hemmati and his team, 2016 India research, the incidence of type A, 62.7% was higher than other types. A.S. Dharap [9] and his team 1994, in their study found the pattern more frequent in males (18.8%) than in females (11.5%). Edgar Giovanni and his team, 2014 in their study the prevalence of type A was higher and found in 30% of the cases. A. Halim and S.H.H. Abdi, [10] 1974 in their study stated the most common pattern as type A in their research accounting for 67.5%. Vasudha T.K., 2013 in the journal stated the pattern found in 88% of the cadavers and 96% of the living subjects. Sol Calderon et al, 1988, in their study in 20 children found equal patterns of type A and type B arrangement i.e., 30% of incidence. It is the variations of "N" shaped pattern of arrangement of superficial veins in the cubital fossa. Hyunsu Lee, Sang-Hoon-Lee and his team 2015 published an article stating the most common type of presentation (50.1%) was type B. Kaissar-Yammine and his team (2016) showed that "N" shaped arrangement was the most commonest pattern, followed by "M" shaped arrangement. L. Faraj Al Bustami and his team 2014 stated type B was more common in males (51.5%) than in females (45.4%). This pattern was most common than other patterns. U.U. Ukoha et al (2013) in their study stated this pattern as second most common, with most common pattern being "M" shaped arrangement. A.S. Dharap et al (1994) in their research stated type B was the most common pattern found. This pattern was more common in females (78.2%) than in males (62.4%) [11].

It is the "H" shaped pattern of arrangement of superficial veins in the cubital fossa. L. Faraj AlBustami et al, 2014 observed this pattern in 1.5% of cases. A.S. Dharap et al, 1994 in the study stated this pattern of arrangement in one male subject (0.6%) out of 170 males, no female subject showed this pattern of arrangement.

L Faraj AlBustami et al, [12] 2014 observed this pattern in only 1.5% of cases. AS Dharap et al, 1994 in their research found this pattern in 2.0 % of females and 6.5% of males. Hanafi Bin Abdul Hamid et al, 2009 stated "H" type of anastomosis observed was 25% on the right and 20.6% on the left cubital fossa. Edgar Giovanni Corzo Gomez et al, 2014 in their research sample including 885 people (438 men and 437 women), stated the second most common pattern, 26% was type C. A. Halim et al, 1974 showed pattern type C accounting for 6% of cases. Vasudha TK [13], 2013 in his journal stated this pattern in 2% of cadavers and 4% of living subjects. In this pattern of arrangement only the basilic vein and cephalic veins are present and there is no communication between the two veins. Kaissar-Yammine et al, 2016 observed this pattern was significantly higher in Malay population. L

Faraj Al Bustami et al, 2014 in their study stated that the less commonly observed pattern was the absence of communication between basilic and cephalic veins (in 13.6% males and 12.8% females). Hossein Hemmati et al, 2016 stated the presence of this pattern in 5.9% of cases. A.S Dharap et al [14], 1994 studied this pattern of arrangement in 1% of females and in 2.9% of males. Vasudha T.K., 2013 observed this pattern in 2% of living subjects. Sol Calderon et al, 1998 in the study observed this pattern of arrangement in 5% of cases.

Conclusion

M" shaped or type A pattern of arrangement of superficial veins at the cubital fossa, was the most commonly observed pattern seen in people of Bihar. It was seen in 35% of the living subjects, whereas in the cadavers it also accounted for 35%. Subtype A, the variant of "M" shaped pattern of superficial cubital veins, with subtype A₁ showing the most common pattern of arrangement accounting for 30% whereas subtype A₂ accounting for only 5% of cases. "N" shaped or type B pattern of arrangement of superficial cubital vein was the second most common pattern observed in the people of Bihar. The living subjects showed this pattern in 28.75% of cases and in cadavers this pattern was present in 25% of the cases. Type D pattern of arrangement of superficial cubital veins were elicited in 3.75% of living subjects and in 5% of cadavers.

References

1. Abdul Hamid HB, Suhaimi BAA, Nooh BMN, et al. A cross-sectional study on the anatomical variations of the superficial veins of the upper limb among the preclinical medical students in UniKL-RCMP. Report, University of Kuala Lumpur, Royal College of Medicine Perak, Malaysia, November 2009.
2. AlBustami, F, Altarawneh, I, Rababah, E. Pattern of superficial venous arrangement in the cubital fossa of adult Jordanians. *J Med J.* 2014; 48: 269–274.
3. A.K. Datta: Essentials of Human Anatomy (4th edition).
4. AlBustami, F, Altarawneh, I, Rababah, E. Pattern of superficial venous arrangement in the cubital fossa of adult Jordanians. *J Med J.* 2014; 48: 269–274.
5. A.S. Dharap, My Shaharuddin. Patterns of superficial veins of the cubital fossa in Malays, *Med J Malaysia.* Sep. 1994;49(3).
6. Baptista-Silva, JCC, Dias, AL, Cricenti, SV. Anatomy of the basilic vein in the arm and its importance for surgery. *Braz J Morphol Sci.* 2003; 20: 171–175.
7. Basmajian JV, Slonecker CE. Grant's method of Anatomy (8th edn) Baltimore, Williams and Wilkins. 1989.

8. Berry, P. Venipuncture nerve injuries. *Lancet*. 1977; 1: 1236–1237
9. Berry, RJ, Newton, HAS. A study of the superficial veins of the superior extremity in 300 living subjects. *Anat Anz*. 1908; 33: 591–601.
10. Bruce Sir J., Walmsley R & Rors, J.A.: *Manual of surgical anatomy*, E & S Livingstone Ltd, Edisberg & London. 1967.
11. Charles CM. On the arrangement of the superficial veins of the cubital fossa in American white and American negro males. *Anat Rec*. 1932; 54: 9-4.
12. Da Silva, KF, Pereira, KF, Albuquerque, KP. Morphological study of the medial cubital vein. *Arq Ciênc Saúde UNIPAR, Umuarama*. 2013; 17: 37–42.
13. Del Sol, M, De Angelis, MA, Bolini, PDA. Formacoes venosas de fossa cubital crianca. *Pediatr Mod*. 1988; 23: 225–231.
14. Del Sol, M, Lagos Mardones, M, Torres Bustos, E. Venous formations in the cubital fossa of Mapuche. *Bioscopy study. Int J Morph*. 2007; 25: 885–894.