

A Study of Variations in the Superficial Veins of Cadavers of Human Upper Limbs in North Karnataka

Amarendra M Kabadi¹, Fazal Mehmood Gahlot², Veereshkumar S Shirol³

How to cite this article:

Amarendra M Kabadi, Fazal Mehmood Gahlot, Veereshkumar S Shirol. A Study of Variations in the Superficial Veins of Cadavers of Human Upper Limbs in North Karnataka. Indian J Anat. 2020;9(1):79-84.

Author's Affiliation: ¹Assistant Professor, ²Associate Professor, Department of Anatomy, Karnataka Institute of Medical Sciences, Hubballi, Karnataka 580022, India. ³Professor, Department of Anatomy, Jawaharlal Nehru Medical College, KLE University, Belgaum, Karnataka 590010, India.

Corresponding Author: Fazal Mehmood Gahlot, Associate Professor, Department of Anatomy, Karnataka Institute of Medical Sciences, Hubballi, Karnataka 580022, India.

E-mail: fazalgahlot@yahoo.co.in

Received 24.10.2019 | Accepted 03.01.2020

Abstract

Context: Superficial veins of upper limbs play an important role in vascular surgeries and in diagnostic and therapeutic procedures. These veins are clinically important for venipuncture, transfusion and cardiac catheterization.

Aim: To study variations in the superficial veins of cadavers of human upper limbs.

Settings and design: Institution based cross sectional study was carried out at Anatomy Department, JN Medical College, Belgaum.

Methods: The findings observed among 25 cadavers were site of origin of the vein, course of the vein, termination of the vein, variations of the vein and length of the vein. Appropriate procedures were followed and due respect was given to all cadavers.

Statistical analysis: The data analyzed using mean, standard deviations. Students t test was used to test the differences in the mean values.

Results: Average length of veins in left upper limbs of female and male cadavers for cephalic was 52.7 and 50.9 cm, basilic vein 51.1 and 49.8 cm, median cubital vein 8.9 and 9.4 cm and median vein of forearm 13.9 and 17.4 cm respectively. Average length of veins in right upper limbs of female and male cadavers for cephalic was 53.9 and 52.1 cm, basilic vein 48.7 and 49.6 cm, median cubital vein 8.6 and 9.8 cm and median vein of forearm 18.2 and 17.4 cm respectively. All these differences were statistically not significant.

Conclusion: Mean length veins in right and left upper limbs were similar for both males and females. Type III Dorsal venous pattern was the most commonly seen and all cases were seen only in males.

Keywords: variations, superficial veins, cadavers, human, upper limbs

Introduction

The superficial veins of the upper limbs play an important role in vascular surgeries and in diagnostic and therapeutic procedures. These veins are clinically important for venipuncture, transfusion and cardiac catheterization.¹

The cephalic vein is useful in preparation for the construction of an arteriovenous fistula at the wrist.² An approach y cephalic vein is helpful in pacemaker and intra-cardiac defibrillator implantation.³

The median cubital vein is used for blood sampling, blood transfusion and intravenous injections.⁴

For central venous catheterization basilic vein or median basilic vein are chosen because basilic vein progressively increases in size as it runs through the arm and is in direct line with the axillary vein.⁵

The median cephalic vein and median basilic vein are used to obtain blood and for giving intravenous injections.⁶

There is a lot of variation in the origin, course and pattern of superficial veins of upper limbs. A good knowledge of variations of these superficial veins is very helpful to the clinicians. In a study, done on 96 cadavers, the origin, branches and anastomoses of nutrient vessels of the cutaneous nerves and superficial veins of the forearm were observed. Their relationship with the blood supply of adjacent muscle, bone and skin were assessed. The results suggested that nutrient vessels of the cutaneous nerves and superficial veins of the forearm have the same origin as those of the nutrient vessels of adjacent muscles and skin of the forearm.⁷

In a study done on 20 cadavers, arms were dissected. Cephalic and basilic veins were examined for size, distribution of valves and to determine optimal incisions for obtaining a suitable valve containing segment of the vein which was used for transplantation to a lower extremity vein. The result showed that a medial incision along middle one third of the arm exposing a basilic vein is recommended as optimal approach for vein harvesting in vein valve transplantation.⁸

Present study is an attempt to know more about the course, patterns and variations of superficial veins of the upper limbs in the cadavers.

Materials and Methods

Study design: Institution based cross sectional study.

Settings: The material for the study was about 25 cadavers obtained from the Anatomy Department of J. N. Medical College, Belgaum.

Sample size: During the study period of two years, it was possible to include 25 cadavers. Thus, a total of 50 upper limbs (25 left upper limbs and 25 right upper limbs) of 25 cadavers.

Ethical considerations: Initially the protocol was submitted to the Institution Ethics Committee and after approval, the study was initiated. But before that, permission from the Head of the Department of Anatomy, J.N. Medical College was obtained. Due respect was given to the cadavers while conducting the study.

Inclusion criteria

1. All cadavers available for the study during the study period

Exclusion criteria

1. Deformed limbs
2. Traumatized limbs

Materials used

The scalpel, blunt and toothed forceps, painting material, painting brush, Indian ink, and camera were used as materials for carrying out the present study.

Procedure adopted

In cadavers, incisions were taken on the thorax and on the upper limb. The skin, superficial fascia was dissected and reflected. The deep fascia in the deltopectoral groove was dissected to uncover the cephalic vein. The cephalic vein was traced above and below by separating carefully the fascia attached to it. The cephalic vein was traced down till it originated from lateral end of dorsal venous network in the anatomical snuff box.

The elbow the cephalic vein was connected to basilic vein through median cubital vein. The median cubital vein was dissected and traced. The basilic vein was dissected in the arm above until it formed the axillary vein and below where it would originate from the medial end of dorsal venous network.

The median vein of forearm was dissected and traced. On the dorsum of the hand the skin was reflected to note the dorsal metacarpal veins which form the dorsal venous network.

The findings observed were site of origin of the vein, course of the vein, termination of the vein, variations of the vein and length of the vein.

Statistical analysis

The data was entered in the Microsoft Excel Worksheet and analyzed using mean and standard deviations. Students t test was used to test the differences in the mean values. *p* value of less than 0.05 was taken as statistically significant.

Results

Table 1 shows comparison of the length of the veins in cm in right and left upper limbs observed in 25 cadavers. The mean length of cephalic vein in the left upper limb was 51.44 cm and the right upper limb was 52.63 cm. The mean length of basilic vein in the left upper limb was 50.21 cm and the right upper limb was 49.36 cm. The mean length of Median cubital vein in the left upper limb was 9.25 cm and the right upper limb was 9.5 cm. The mean length of Median vein of forearm in the left upper limb was 16.4 cm and the right upper limb was 17.66 cm.

Table 2 shows comparison of length of veins in cm in right and left upper limbs among the male and female cadavers. The mean length of cephalic vein in female cadavers in left upper limb was 52.7 ± 2.8 and in the right upper limb was 53.9 ± 3.9 and the difference was not statistically significant. The mean length of basilic vein in female cadavers in left upper limb was 51.1 ± 5.6 and in the right upper limb was 48.7 ± 2.1 and the difference was not statistically significant. The mean length of median cubital vein in female cadavers in left upper limb was 8.9 ± 3.3 and in the right upper limb was 8.6 ± 3.1 and the difference was not statistically significant. The mean length of median vein of forearm in female cadavers in left upper limb was 13.9 ± 5.1 and in the right upper limb was 18.2 ± 6.3 and the difference was not statistically significant. The mean length of cephalic vein in male cadavers

in left upper limb was 50.9 ± 3.5 and in the right upper limb was 52.1 ± 5.1 and the difference was not statistically significant. The mean length of basilic vein in male cadavers in left upper limb was 49.9 ± 4.6 and in the right upper limb was 49.6 ± 4.6 and the difference was not statistically significant. The mean length of median cubital vein in male cadavers in left upper limb was 9.4 ± 2.1 and in the right upper limb was 9.8 ± 1.8 and the difference was not statistically significant. The mean length of median vein of forearm in female cadavers in left upper limb was 17.4 ± 5.7 and in the right upper limb was 17.4 ± 6.9 and the difference was not statistically significant.

Table 3 shows comparison of dorsal venous network pattern in cadavers in right upper limbs among males and females. Type III pattern was the most commonly seen and all cases were seen

Table 1: Comparison of the length of the veins in cm in right and left upper limbs observed in 25 cadavers

Limb	Vein	Mean length in cm	Standard deviation
Left upper limb	Cephalic vein	51.44	3.7
	Basilic vein	50.21	4.79
	Median cubital vein	9.25	2.41
	Median vein of forearm	16.40	5.59
Right upper limb	Cephalic vein	52.63	4.76
	Basilic vein	49.36	4.01
	Median cubital vein	9.5	2.23
	Median vein of forearm	17.66	6.64

Table 2: Comparison of length of veins in cm in right and left upper limbs among the male and female cadavers

Vein	Left upper limb		Right upper limb		T value	p value
	Min-max	Mean+SD	Min-max	Mean+SD		
Length in female cadavers in cm						
Cephalic vein	49.6-56.5	52.7+2.8	48.5-60.5	53.9+3.9	1.297	0.219
Basilic vein	44-60	51.1+5.6	46.5-53.4	48.7+2.2	2.013	0.067
Median cubital vein	5.6-15.5	8.9+3.3	5.5-13.4	8.6+3.1	0.321	0.761
Median vein of forearm	8.5-15.5	13.9+5.1	8.5-26.6	18.1+6.3	1.304	0.218
Length in male cadavers in cm						
Cephalic vein	38.8-56.5	50.9+3.5	35.5-58.5	52.1+5.1	1.101	0.278
Basilic vein	41.5-61.5	49.9+4.6	39.5-55	49.6+4.6	0.151	0.881
Median cubital vein	5.5-15.5	9.4+2.1	5-11.5	9.8+1.8	0.693	0.493
Median vein of forearm	8.5-26.5	17.4+5.7	8-28.5	17.4+6.9	0.004	0.996

Table 3: Comparison of dorsal venous network pattern in cadavers in right upper limbs among males and females

Pattern	Male	Female	Total
Type I	3	1	4
Type II	3	1	4
Type III	6	0	6
Type IV	1	1	2
Type V	2	0	2
Type VI	1	1	2
Type VII	0	1	1
Type VIII	1	0	1
Type IX	0	1	1
Type X	0	1	1
Type XI	1	0	1

Table 4: Comparison of dorsal venous network pattern in cadavers in left upper limbs among males and females

Pattern	Male	Female	Total
Type I	4	0	4
Type II	3	1	4
Type III	2	1	3
Type IV	2	1	3
Type V	3	0	3
Type VI	1	1	2
Type VII	2	0	2
Type VIII	1	1	2
Type IX	0	1	1
Type X	0	1	1

only in males. Type I, II, III, V, VIII and XI was seen predominantly in males compared to females. While in females Type VII, IX and X were seen which was not observed in males. Type IV, and VI were seen equally in males and females. Overall type I, II, III were found to be the most common types followed by type IV, V and VI.

Table 4 shows comparison of dorsal venous network pattern in cadavers in left upper limbs among males and females. It was found that type I was seen only in males and overall also it was the most common type. It was not seen in females. Type II also overall there were four cases out of which majority i.e. three were seen in males and only one case was seen in females. Type III there were three cases out of which two were in males and one was in female. Type IV there were three cases out of which two were in males and one was in female. Type V there were three cases out of which two were in males and one was in female. Type VI there were two cases out of which one was in males and one was in female. Type VII there were two cases out of which both were in males. Type IX there was only one case which was seen in female. Type X there was only one case which was seen in female.

Discussion

The frequency of variations in the arrangement of vessels in any part of the limb is well known. Most of the embryonic veins arise from these capillary plexuses which increase by sprouting and anastomoses and then fuse and enlarge forming fewer and larger channels. Genetic and hydrodynamic factors play an important role in final pattern of arrangement of veins which present maximum variations.⁹

In a study done on 300 persons on arrangement of superficial veins in cubital fossa in Indian subjects they found that in 51% of the cases the cephalic vein

and the basilic vein were connected to the median vein of the forearm by a median basilic vein and median cephalic vein. In 10.5% of the cases the median cephalic vein did not join the cephalic vein. The median basilic vein did not join the basilic vein in 3% of the cases. In another 3% of the cases there was double Y shaped arrangement present. Inverted Y shaped arrangement was observed in 1.5% of the cases. In 1% of the cases one of the two limbs of Y joining either the basilic vein or the cephalic vein was found to be double. Thus, the median vein of forearm was present in one form or the other in 70% of the cases in this study.⁹

In another study done on patterns of superficial veins in cubital fossa in 300 Nigerian subjects, they found that median vein of forearm dividing into two and joining the basilic and cephalic vein.¹⁰

In our study superficial veins were studied in 25 cadavers.

In the study done on 300 persons on arrangement of superficial veins in cubital fossa in Indian subjects they found that cephalic and basilic veins were connected by the median cubital vein in H shaped pattern in 16.5% of the cases. Single median cubital vein was present in 12% of the total cases. Double median cubital vein was present in 4.5% of total cases. In two cases a venous arch was connecting the basilic and cephalic veins above the bend of the elbow.⁹

In a study done on 170 males and 96 females on arrangement of superficial veins in cubital fossa in Malays there was presence of two median cubital veins (in one male only).¹¹

In our study the cephalic vein was connected to the basilic vein by median cubital vein in majority of the cases. In one case of cadaver the median cubital vein was observed. No other variations were observed.

In a study done on 300 persons on arrangement of superficial veins in cubital fossa in Indian subjects they found that in 10% of the cases there was no

cross connection between the cephalic and basilic vein i.e. absence of median cubital vein.⁹

In a study done on 170 males and 96 females on arrangement of superficial veins in cubital fossa in Malay, there was absence of communication between the basilic and cephalic veins (in 7.3% of females and 8.8% of the males).¹¹

In our study such observation was made in 2% of the cases.

In a study done on 300 persons on arrangement of superficial veins in cubital fossa in Indian subjects they found that in 3% of the cases cephalic vein was absent and veins in the fossa ran medially and joined the basilic vein.⁹

In another study done on cephalic vein, absence of cephalic vein was seen in two specimens (5%) of 40 shoulders in deltopectoral groove.¹²

In our study absence of cephalic vein was not seen.

In a study done on 300 persons on arrangement of superficial veins in cubital fossa in Indian subjects they found that in 0.5% of the cases basilic vein was absent and veins in the fossa ran laterally and joined the cephalic vein.⁹

In our study absence of basilic vein was not seen.

In another study done on 536 Indian subjects on superficial venous patterns in cubital region, they observe that more than one median vein of forearm. These either ended as such or joined one or more loops attached to the median cubital vein.¹³

In our study no such variations were observed.

In another study done on 536 Indian subjects on superficial venous patterns in cubital region, they observe that the cephalic vein itself turned medially to join the basilic vein. The brachial portion of cephalic vein was either absent (15 cases), rudimentary (11 cases) or taken by an accessory cephalic vein (78 cases). In one dissection a deep vein pierced the deep fascia in front of the elbow joint and extended upwards.¹³

Conclusion

The mean length of the cephalic vein, basilic vein, median cubital vein and the median vein of the forearm in right and left upper limbs were similar or statistically not significantly different for both males and females. Type III Dorsal venous pattern was the most commonly seen and all cases were seen only in males. Type I, II, III, V, VIII and XI was seen predominantly in males while in females Type VII, IX and X were seen. Type I & II Dorsal venous

pattern was the most commonly seen and all cases were seen only in males.

Key messages

This data plays an important role as a guide or tool to the surgeons and anesthetist who are directly benefitted from this.

Prior publication: Nil

Support: Nil

Conflicts of interest: Nil

Permissions: All necessary permissions have been taken

Source(s) of support: Nil

References

1. Snell RS. Clinical Anatomy, 4th ed. Philadelphia: Lippincott Williams and Wilkins; 2004
2. Mendes RR, Farber MA, Marston WA, Dinwiddie LC, Keagy BA, Burnham SJ. Predictors of wrist arteriovenous fistula maturation with pre-operative vein mapping with ultrasonography. *J Vasc Surg* 2002;36(3):460-3.
3. Chen JY, Chang KC, Lin YC, Chou HT, Hung JS. Pre procedure duplex ultrasonography to assist cephalic vein isolation in pacemaker and defibrillator implantation. *J Interv Card Electrophysiol* 2005;12(1):75-81.
4. Standring S. *Grays Anatomy*, 39th ed. Edinburgh: Churchill Livingstone; 2005.
5. Ramesh Babu CS. *Essentials of clinical Anatomy*, 1st ed. New Delhi: Academia Publishers; 2004.
6. Decker GAG, Duplessis DJ. *Lee mcGregors synopsis of surgical anatomy*, 12th ed. Bombay: Varghese Publishing House; 1999.
7. Zhang FH, Topp SG, Zhang WJ, Zheng HP, Zhang F. Anatomic study of distally based pedicle compound flaps with nutrient vessels of the cutaneous nerves and superficial veins of the forearm. *Microsurgery* 2006;26(5):373-85.
8. Edward S, Purvis II, Gordon LH, Peck D. Anatomy of arm veins: significance for vein valve transplantation. *Clin Anatomy* 1992;5(1):45-9.
9. Tewari SP, Singh SP, Singh S. The arrangement of superficial veins in cubital fossa in Indian subjects. *J Anat Soc India* 1971;20(2):99-102.
10. Singh JD. Patterns of superficial veins of the cubital fossa in Nigerian subjects. *Acta Anat (Basel)* 1982;112(3):217-9.
11. Dharap AS, Shaharuddin MY. Patterns of superficial veins of the cubital fossa in Malays. *Med J Malaysia*. 1994;49(3):239-41.

12. Radkowski CA, Richards RS, Pietroban R, Moorman CT. An anatomic study of the cephalic vein in the deltopectoral shoulder approach. Clin Orthop Relat Res. 2006 Jan;442:139-42.
13. Halim A, Abdi SHM. Superficial venous patterns in cubital region of Indians. Anat Rect 1974;178:631-6.

