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Original Research Article

Study of formation of dorsal venous arch of the hand in both sexes

Ramesh P., Dhinesh Kumar T., Deepa C., Kalyani T.*, Anupama D.

Department of Anatomy, St Peter's Medical College, Hospital and Research Institute, Hosur, Tamil Nadu, India

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***Correspondence:**
Dr. Kalyani T.,
E-mail: tkalyani1412@gmail.com

ABSTRACT

Background: The dorsal venous arch (DVA) is a superficial venous network of the hand. It is formed by the union of four dorsal metacarpal veins in the middle of the dorsum of the hand. Medially and laterally the dorsal venous arch continues as basilic and cephalic veins respectively. Commonly, these veins are chosen for intravenous procedures, the most prominent being the dorsal metacarpal veins. The present study aims to study the different types of formation of dorsal venous arch in both the sexes.
Methods: 100 hands of voluntary participants were studied (50 male hands, 50 female hands) in St Peter's Medical College, Hospital and Research Institute, Hosur, Tamil Nadu. The rubber tourniquet was tied 1 hand breadth above the wrist to make the veins prominent and observed the pattern of formation of DVA with laterality and sex being noted.
Results: In the present study, the formation of dorsal venous arch, commonly type 2 pattern in males and type 1 pattern in females were observed. The prominent venous pattern was observed in males and on the lateral side of the dorsal metacarpal veins.
Conclusions: The present study carried out to enlighten the vascular surgeons, postgraduates, interns, paramedics and nurses regarding the knowledge of different types of the formation of dorsal venous arch of hand, so that hassle free procedures can be carried out on these superficial veins of hands at the time of routine and emergency situations.

Keywords: Dorsal venous arch, Dorsal metacarpal veins, Cephalic vein, Vene puncture

INTRODUCTION

The skin over the dorsum of hand is thin, hairy and moves freely. It has superficial fascia and deep fascia. Superficial fascia contains dorsal venous arch (DVA) and dorsal digital nerves. DVA is included in superficial venous network. It is the key vascular supply of hand as most of the blood from hand drains into the arch.[1,2] The dorsal digital veins from adjacent sides of fingers join in the inter digital clefts to form 4 dorsal metacarpal veins which unite with each other and form DVA or dorsal venous network. Due to poor venous drainage of the palm, palmar digital veins drain into dorsal venous network. Hence increased pressure during grasping will not occlude palmar venous return.[3]

Blood from the lateral/radial side of the arch drains into cephalic vein and from medial/ulnar side of the arch drains into basilic vein. Sometimes, an accessory cephalic vein drains the central part of dorsal venous arch into cephalic vein near mid-forearm. Cephalic vein, basilic vein and median cubital vein are the parts of superficial veins of upper limb.[4]

Cephalic vein which is one of the contents of anatomical snuff box is considered to be the ideal vein for vene puncture in obese people or during emergencies like shock and in therapeutic procedures in emergencies where other superficial veins are difficult to be found.[5]

Since superficial veins of upper limb are clinically very important and most commonly used for various surgical procedures or interventions, it is important that these veins should have a normal origin. If there is any variation in the arch or if obstructed by blood clots, tumors or injury it may hamper the course or normal anatomy of superficial veins (cephalic and basilic veins) of upper limb which in turn may interfere with surgical interventions, blood transfusion, blood collection, intravenous injections etc.[6-9] Very few studies have been carried out on dorsal venous arch. Hence, we carried out this study to enlighten vascular surgeons, undergraduate and postgraduate students and nurses regarding the knowledge of variant anatomy of dorsal venous arch of hand, so that hassle free procedures can be carried out on these superficial veins of hands.

Aim and objectives

To study the different types of formation of dorsal venous arch of hand in both the sexes. To compare the different types of formation of dorsal venous arch of hand in both the sexes.

METHODS

The present cross sectional observational study was carried out in 100 hands of voluntary participants (50 male hands, 50 female hands) of St. Peters Medical College Hospital and Research Centre, Hosur, Tamil Nadu. The study was conducted after getting the approval from the institutional ethical committee and consent from the participants; the consent form contains the details of the study and procedure well explained prior to the observation of pattern of arch on the participants. The participants who were included in our study are lean individuals with well visualized venous pattern of hand. Those who are all obese and old age are excluded from our study. For collecting the data, we tied the rubber tourniquet at junction of upper two third and lower one third of forearm, waited for thirty seconds for the venous network to enlarge on the dorsum of the hand and better visualisation over the skin. The types of formation of dorsal venous arch are noted and photographed adequately. Also collected hand laterality and sex of the participants (50 hands male and 50 hands of female). We repeated the data collection after a week for cross checking and the final confirmation of the types of formation of DVA was done. Further, the details of final data were entered into the excel sheet and cross checked again to avoid the data entry error. We analysed the data through descriptive analytical methods and the results were presented in the form of tables and bar diagrams.

RESULTS

We noted that the dorsal venous arch is 4 types depending on the variation in its formation and origin of cephalic and basilic veins. Type 1: Arch is formed by the union of 4 dorsal metacarpal veins. Type 2: Arch is formed by the union of medial 3 dorsal metacarpal veins and continues as basilic vein, 4th metacarpal vein and lateral marginal vein joins with lateral end of arch and continues as cephalic vein. Type 3: Medial arch is formed by the union of medial 2 dorsal metacarpal veins and medial marginal vein and continues as basilic vein, Lateral arch is formed by union of 3rd and 4th metacarpal vein with lateral marginal vein, the lateral end of arch continues as cephalic vein. An anastomotic vein joins the medial arch with cephalic vein or the lateral arch with basilic vein. Type 4: Arch is formed by the union of 4 dorsal metacarpal veins and an anastomotic vein joins middle of the arch with basilic and cephalic veins.[10,11]

Table 1: The different types of formation of dorsal venous arch of hand in males.

DVA	Male (n=50)	Percentage (%)
Type 1	11	22
Type 2	31	62
Type 3	2	4
Type 4	6	12
Total	50	100

In our study, type 2 pattern of formation of dorsal venous arch was observed most commonly in males (62 percentages).

Table 2: The different types of formation of dorsal venous arch of hand in Females.

DVA	Female (n=50)	Percentage (%)
Type 1	28	56
Type 2	16	32
Type 3	2	4
Type 4	4	8
Total	50	100

In the present study, type 1 pattern of formation of dorsal venous arch was observed most commonly in females (56 percentages).

In the comparison of formation of DVA of hand, we observed type 2 and type 4 patterns were more in males than females. Type 1 pattern was more in females but type 3 patterns was same in both the sexes in our study.

Table 3: The comparison of different types of formation of dorsal venous arch of hand in both the sexes.

DVA	Male	Female	%
Type 1	11	28	39
Type 2	31	16	47
Type 3	2	2	4
Type 4	6	4	10
Total	50	50	100

DISCUSSION

The aim of the present study was to identify the most common type of dorsal venous arch of hand in both the sexes. Elmegarhi et al in 2018 studied the dorsal metacarpal veins (DMCV) and its anatomical variations. They classified the dorsal metacarpal veins of hands as different anatomical patterns instead of considering them as a network of venous channel for the first time. However, this study was not helpful to identify the most prominent dorsal metacarpal veins however the patterns were identified as 8 based on the arrangement of the connections between dorsal metacarpal veins. This helped us to frame the types of formation of DVA based on our study results. Mostly types 1-4 were matched with our study results.[11]

Salameh et al in 2019 conducted the study on the dorsal metacarpal veins to determine the most prominent DMCV. For the first time, this study identified the most common location of the most prominent dorsal metacarpal vein to be in the fourth inter metacarpal space. They obtained data on sex, sidedness and handedness too. There was a significant relation between both females and males in the most prominent dorsal metacarpal vein. In our study the formation of dorsal venous arch of type 2 pattern was prominently observed in which 4th dorsal metacarpal vein was more prominently seen. Males hands had prominent type 2 pattern was in our study. In females type 1 pattern was observed to be more in number and prominent.[12]

Zhang et al study reported that lateral side dorsal metacarpal veins are more prominent and forming the arch and contributing to the formation of the cephalic veins similar to our study results. Therefore, veins of lateral side of hands are prominent and useful for venae puncture. In the present study, the types of dorsal venous arch formation help to determine the side of the most prominent veins (located on lateral side) of the hand and in males.[13]

Limitations

We conducted this study in limited sample size. We planned, further studies of similar kind with larger samples, which includes measurement of the length, diameter and thickness of dorsal venous arch can be used for hassle free vena puncture.

CONCLUSION

The present study was carried out to enlighten the vascular surgeons, postgraduates, interns, paramedics and nurses regarding the knowledge of different types of the formation of dorsal venous arch of hand, so that hassle free procedures can be carried out on these superficial veins of at the time of routine and emergency situations. We found that type 2 pattern of DVA was most commonly seen in males and type 1 pattern was more commonly seen in females. Also we observed more prominent dorsal metacarpal veins and on the lateral side of the hand (3rd and 4th DMCV) in males.

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