A study on superficial veins of upper limb

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Abstract

Background: It is quite common to find many variations in the distribution of superficial veins in the body. Veins of the upper limbs are variable in number and position. The superficial veins are clinically important and are used for venaepuncture, transfusion and cardiac catheterization. Aim: The present study was mainly concentrated on cephalic, basilic and median cubital veins. The purpose of this study is to review the origin, course, termination and variations of these veins, as these veins play an important role in diagnostic, therapeutic and surgical procedures. Material and methods: The material used for the present study included twentyfive cadavers, from the department of Anatomy, Narayana Medical College (NMC), Nellore, and one hundred first MBBS students of NMC, Nellore. The data obtained from present study was compared with similar studies available in literature. Result: The various patterns of venous anastomoses observed in cubital fossa could be grouped into five types i.e., Type I to Type V. Type I - was found in 88% of the cadavers and in 96% of living subjects. Type II -was found in 4% of the cadavers, Type III- in 2% of cadavers, and 4% of living subjects, Type IV- was found in 4% of cadavers, ans Type V- in 2% of living subjects. Conclusion: Knowledge of the patterns of superficial veins in cubital fossa is essential for clinicians, since they play an important role in diagnostic as well as therapeutic procedures.

Key words: cubital fossa, cephalic vein, basilic vein and median cubital vein, venous anastomosis

Introduction

Venous blood from upper extremity is drained through two sets of veins: the deep and the superficial. The deep veins follow the arteries, as venae-comitantes, whereas superficial veins run in the superficial fascia. The main superficial veins of the upper limb are cephalic and basilic veins1. Like superficial veins elsewhere, those of the upper limbs are subject to numerous variations2. These superficial veins accompany the superficial lymphatics of the upper limb3. According to ancient documents the superficial veins like cephalic, basilic and median cubital veins were used in bloodletting for different diseases4. Currently both veins are utilized in numerous medical procedures. The cephalic vein lies fairly constant in the superficial fascia, it begins immediately posterior to the styloid process of the radius from the lateral end of dorsal venous arch. It runs along the lateral border of forearm and along the lateral border of biceps in the arm, and finally in the deltopectoral groove and opens into the axillary vein after piercing claviceps fascia. In deltopectoral triangle, it frequently communicates with the external jugular vein by a small vein that cross in front of the clavicle. Fracture of the clavicle can result in rupture of this communicating vein, with the formation of a large hematoma5. The cephalic vein cut down at the deltopectoral groove is preferred, when superior venacaval infusion is necessary6. Basilic vein begins at medial end of dorsal venous arch, runs along the medial border of the forearm pierces deep fascia of arm and finally continues as axillary vein. These two veins communicate with each other in the cubital region by median cubital vein(fig.1). It is important for clinicians to know the common sites, at which these veins are found, in order to expose them (venae section) for transfusing blood to a patient in state of shock, when the superficial veins of such patients are in a collapsed state and therefore invisible7. Cannulation via the basilic vein is more liable to be successful, because basilic vein becomes the axillary vein without angulation, and its caliber also increases as it ascends8. In case of chronic
renal failure, for haemodialysis, surgeons create arterio-
venous fistula to achieve permanent internal vascular
access. To create an arterio-venous fistula, either
cephalic or basilic veins are used. In some lymphatic
abnormalities, lymph venous anastomosis is established,
using basilic vein. In case of chronic venous insufficiency,
basilic vein is used to create veno-venous
anastomosis. These veins also play an important role in
plastic surgeries. To diagnose and treat superficial
thrombophlebitis, which usually occurs at the site of
medical intervention, knowledge of superficial veins is
necessary.

The aim of the present study was to analyze the types
of venous connections occurring in the cubital fossa.

Material and Methods

The material used for the present study was
twentyfive cadavers (12 male and 13 females-50 upper
limbs), from the department of Anatomy, Narayana
Medical College (NMC), Nellore, and one hundred
students (42 females and 58 males-200 upper limbs) of
MBBS of NMC, Nellore.

Cunningham’s manual of practical anatomy was
followed for exposing the veins by dissection in cadavers.
In living subjects, tourniquet method was used, after
taking ethical committee clearance & written consent
from each student. Tourniquet was tied over the upper
limbs, one after another, at different levels, to make
superficial veins prominent and observations were
recorded using schematic diagrams.

Results

Results of the the present study with reference to
the site of origin, course, termination and anastomosis
between superficial veins, especially in cubital fossa as
observed in cadavers and living subjects are presented
below:

Cephalic vein

In cadaver: The cephalic vein was found to originate
from radial end of dorsal venous network in all 50 upper
limbs. Course and termination was found to be similar in
48 limbs, i.e., after running in deltopectoral groove
cephalic vein pierced clavipectoral fascia and opened
into axillary vein (Type I). In one cadaver cephalic vein
was found to be draining directly into the basilic vein. A
small separate vein from arm was found coursing in the
deltopectoral groove and opening into the axillary vein
(Type II). In living subjects: Cephalic vein was seen
with normal course, when traced up to tourniquet tied
in the mid arm.

Basilic vein

In cadaver: The basilic vein was found originating
from ulnar end of the dorsal venous arch in 24 cadavers
and continued as axillary vein. In one cadaver, multiple
veins were found in place of basilic vein in the forearm
which united in the arm as a single channel (Type IA).

In living subjects: Basilic vein was traced up to
tourniquet tied at mid arm. No significant variations
were found.

Median cubital vein

In cadaver: In one cadaver it was replaced by
median basilic and median cephalic vein (Type III). In
another cadaver there was no direct communication
between basilic and cephalic veins, instead both veins
were connected to a deep vein through separate
perforators (Type IV).

In living subjects: Two subjects showed
replacement of median cubital vein by median cephalic
and median basilic vein, they inturn drained into cephalic
and basilic veins, respectively (Type III). In two other
subjects, there was reversal of median cubital vein, i.e.,
connecting the cephalic vein proximal to elbow with
the basilic vein distal to elbow (Type V).

Median vein of forearm: This vein originated
from palmar venous net work and terminated by
joining with either the medial cubital or cephalic vein.
In the present study it was found that, in one cadaver
and in two living subjects this vein was divided into
median cephalic and median basilic vein and draining
into cephalic and basilic veins respectively, replacing
median cubital vein. The various patterns of venous
anastomosis observed in cubital fossa are depicted in
the schematic diagrams (see figs).

Variations in superficial veins of upper limb - Vasudha

**Table 1 : Types of venous anastomoses in cubital region.**

<table>
<thead>
<tr>
<th>Type</th>
<th>In cadaver (50 upper limbs) in %</th>
<th>In living subjects (200 upper limbs) in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>88</td>
<td>96</td>
</tr>
<tr>
<td>Type II</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Type III</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Type IV</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Type V</td>
<td>-</td>
<td>2</td>
</tr>
</tbody>
</table>

**Discussion**

Variations in the superficial veins of upper limb are well known. In embryonic life the veins arise from capillary plexus, which increase by sprouting and anastomosing and then fuse, enlarge forming fewer and larger channels. Genetic and hydrodynamic factors play an important role in the final pattern of arrangement of veins, which may result in variations. Tiwari, Singh and Singh, in their study on arrangement of superficial veins in cubital region carried out on 500 Indian subjects, found that, median basilic and median cephalic veins replace median cubital vein in 51% of cases (similar to Type III of present study). In 10.5% of cases the median cephalic vein did not join the cephalic vein and in 5% of cases median basilic vein did not join the basilic vein. They also found in 3% of cases double Y shaped arrangement. In 1% of cases, one of the two limbs of Y shaped arrangement joining either basilic vein or cephalic vein was found to be double11. Thus the median vein of the forearm was present in one form or the other in 70% of cases.

In another study carried out by Singh on patterns of superficial veins of cubital fossa in Nigerian subjects, found that in 24 - 30% of cases, out of 300 subjects, the...
median vein of forearm divided into two and join the cephalic and basilic veins\textsuperscript{13}.

In the present study the median vein of forearm was seen dividing into two as median cephalic and median basilic veins, respectively in 4\% of cadavers and 2\% of living individuals. Double Y pattern was not found and case with absence of basilic vein was also not found.

In a study carried out by Halim and Abdi on superficial venous pattern in cubital region of 536 Indian subjects, both living and in cadaver, three types of arrangement were observed\textsuperscript{13}.

Type I: Median cubital vein joining cephalic and basilic vein in cubital region in 67.5\% of subjects. Type II: The cephalic vein itself draining into the basilic vein in 19.5\% of subjects. Type III: Absence of direct communication between the cephalic and basilic veins in the cubital region. Again this type III was of 2 subtypes. Type IIIA: The median vein of forearm joined either of the cephalic or the basilic vein in 6\% of subjects. Type IIIB: The median vein of forearm after bifurcating into median cephalic and median basilic veins joined the cephalic and the basilic veins respectively in 6.5\% of the subjects\textsuperscript{13}.

In the present study some of the patterns resembled the types observed by Halim and Abdi and there were no significant differences found in the patterns of superficial veins between male and female subjects.
Variations in superficial veins of upper limb - Vasudha

Conclusion

Variations in the pattern of venous anastomosis are important for clinicians and also for vascular surgeons, as veins especially of the upper limbs, are used for venae puncture, transfusion, cardiac catheterization and also in establishment of arteriovenous fistula in chronic renal failure for dialysis and also in pedicile flaps, grafting etc.

Lack of knowledge about these different patterns and their variations may lead to complications. So report of such variations will enhance the anatomical knowledge and reduce the complications.

Acknowledgement

The author sincerely thanks the staff and students of Narayana Medical College, Nellore, Andhra Pradesh for their support. The author also expresses her heartfelt thanks to Dr. Ratnabali Sen Gupta and to Late Dr. Gajendra, for their guidance.

References


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