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Patterns of superficial veins the cubital fossa among young adults in Tanzania

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Abstract

Background
The cubital fossa can be seen superficially as a depression on the anterior side of elbow. It is a common site for removal of blood for analysis, for blood transfusion and intravenous therapy. The superficial veins of upper limbs follow three major veins which are cephalic, basilica and median cubital veins which are variable among individuals.

Objectives
The aim of the study was to observe and describe patterns of superficial veins in the cubital fossa of MUHAS students, and to assess if there were variations of patterns between left and right cubital fossas, also between male and female participants.

Methodology
The cross sectional study was designed. Convenient sampling was used to select 170 participants among Muhimbili University students ranging from 21-34 years of age who had visible superficial veins at the cubital fossa. A tourniquet was tied at mid arm level and superficial veins in the cubital fossa were photographed and described into various patterns.

Results
The commonest pattern was Type A which is N shaped, where median antebrachial vein divides to median cephalic and median basilica which joins cephalic and basilica veins respectively with the percentage of 37.6%. Incidences of type B, C, D, E and F were 17.1%, 26.5 %, 1.8%, 15.3% and 1.8% respectively on the left cubital fossa. There were variations between left and right cubital fossa patterns among same individual in some participants and no variations between male and female superficial venous patterns of cubital fossa.

Conclusion
Understanding various patterns of superficial veins in the cubital fossa is important in clinical practices since it helps easy locating of common superficial veins in procedures such as venipuncture, blood transfusion, intravenous therapy and arteriovenous fistula. Also there are few studies done in Africa and no studies done in Tanzania about superficial venous patterns in the cubital fossa.

Key words: superficial veins, cubital fossa, patterns**.**

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Introduction

The superficial venous return from the upper limb follows major superficial veins, which are extremely variable. The superficial veins include the cephalic, basilic, median cubital, and antebrachial veins and their tributaries. Most of these veins originate in the subcutaneous tissue on the dorsum of the hand from the dorsal venous network (1). The cubital fossa is seen superficially as a depression on the anterior aspect of the elbow. Deeply, it is a space filled with a variable amount of fat anterior to the most distal part of the humerus and elbow joint. The three boundaries of the fossa are superiorly an imaginary line connecting the medial and lateral epicondyles, medially the mass of the flexor muscles of the forearm arising from the common flexor attachment on the medial epicondyles, most superficially the pronator teres, laterally, the mass of extensor muscles of the forearm arising from the lateral epicondyles and superior condylar ridge, and most superficially the brachioradialis (6). The floor of the cubital fossa is formed by the brachioradialis and supinator muscles of the arm and forearm overlying the capsule of the elbow joint respectively (7). In the study which was done in Nigeria in 2003, ten types of venous arrangements were observed for the studied population. These were classified into six major groups and, In the present study, the most common pattern of cubital venous arrangement is type A, where the median cephalic and median basilic veins join the cephalic and basilica vein respectively. This group has a general incidence of 33% and 27.1% in males and females respectively (4). Also the result from same study in Nigeria showed that gender influences the distribution of superficial venous patterns. This proposition is based on comparative studies among populations and between sexes in which some venous patterns are highly distributed in a given race than in the other or more common in a particular sex than in the other. The result also showed bilateral difference between the incidence of each type in males and females with the male (4).

According to another study done in Malaysia in 1994, they observed six patterns of arrangement of superficial veins of the cubital fossa and there was no significant difference between the venous patterns on the right and left sides in males or in females.

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In pattern, the median cubital vein arose from the cephalic vein a few centimeters below the elbow, joined the basilica vein a few centimeters above the level of the elbow joint and received tributaries from the front of the forearm. This pattern was more common in females 78.2 than in males 62.4 % (3). In the study done in Jordan in 2014, a pattern where the median cubital vein arose from the cephalic vein a few centimeters below the elbow joined the basilic vein a few centimeters above the level of the elbow joint and received tributaries from the front of the forearm. This pattern was more common in males 51.5% than in females' 45.4%. Second common Pattern consisted of one median antebrachial vein branching into two in the cubital fossa with one branch ending in the basilic vein and the other branch in the cephalic vein. This pattern was also more frequent in males 18.2% than in females 16.6%. In pattern C seen in 12.8% females and 13.6% males, there was no communication between the cephalic and the basilic vein (5). Very few studies have been done in Africa about superficial venous pattern in the cubital fossa and none is from Tanzania and this study will help add data and knowledge about superficial venous patterns in the cubital fossa among Tanzanians.

Materials and methods

This was a descriptive cross sectional study which was done among 170 students of Muhimbili University, Tanzania.121 and 49 were males and females respectively who ranged from 21-34 years of age. Only those with prominent superficial veins were included in the study. The cubital superficial venous pattern was classified according to six major groups based on Del sol et al classification as follows; (8) Type A was the N -shaped pattern of superficial veins at the cubital fossa whereby the cephalic vein springs from the median cubital veins which joins the basilica vein few centimeters below the elbow. Type B was the M -shaped pattern of superficial veins at the cubital fossa, whereby the median antebrachial veins divide into the median cephalic and median basilica veins which join cephalic and basilica veins respectively Type C, Pattern in which on the basilica and cephalic veins are present, no communication between them. Type D, Pattern whereby the cephalic and basilica veins were joined by arching vein with concavity of the

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arch facing proximally into which drained two or more veins from forearm. Type E, Pattern in which only the basilica vein was present, and no cephalic vein. Type F, Pattern in which the two median cubital veins were seen joining cephalic and basilica veins (8).

The tourniquet was tied to each arm placed forward at mid arm level with the participant making a fist to make the veins more prominent. Superficial veins were tapped slowly so as to make them more prominent, then about 30 seconds, the superficial veins of left and right cubital fossas were photographed with a camera so as to be observed and studied which type of pattern they were. Every participant had two photos of superficial veins of right and left cubital fossa respectively with their sex and age recorded. With the help of female assistant, data were collected among females' participants. Statistical analysis was done using software program Statistical Package for the Social Sciences (SPSS) version 20 were the frequencies of different patterns were obtained ,and assessing differences of patterns of superficial veins on the left and right cubital fossa and variations between males and females .Ethical clearance was obtained from Muhimbili University of Health and Allied science and consent was taken from each participant before obtaining the data and title of research and procedure of data collection were explained to participants and confidentiality was observed .

Results

In this study 170 Tanzanian adults were studied as in **table 1** below with total 340 upper limbs and among those, 121(71.2%) and 49(28.8%) were males and females respectively. The results showed six types of superficial venous patterns in the left and right cubital fossa. Type A, the N shaped pattern was the commonest pattern of superficial veins in the right and left cubital fossas with 61(37.6%) and 64(35.9%) respectively. Type C whereby there is no communication between cephalic and basilica veins at the cubital fossa was the second common pattern with 45(26.5%) and 43(25.3%) on the left and right cubital fossa respectively and was followed by Type B which is the M shaped pattern with the incidences of 29(17.1%) and 41(24.1%) on left and right cubital fossa respectively.

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Type D where the cephalic and basilica veins were joined by arching vein with concavity of the arch facing proximally into which drained two or more veins from forearm, also called the H pattern. and Type F where two median cubital veins join basilic and cephalic veins had the least incidence of 3(1.8%) in the left cubital fossa and 2(1.2%) and 1(0.6%) respectively in the left cubital fossa. Type E, whereby only basilic vein is present, no cephalic vein had incidences of 26(15.3%) and 22(12.6%) in the left and right cubital fossa respectively and was the third common type of pattern.

This study showed no difference in patterns of superficial veins of left cubital fossa and the right cubital fossa between males and females with the commonest pattern Type A with incidences of 41(58%) and 20(69.3%) in males and females respectively. However, the second common pattern in males was Type C with 31 (43.5%) and for females was Type B with 12 (45.1%.). Also some participants in the study had variations of patterns of superficial veins in their left and right cubital fossas whereby, as examples include participant who had Type C on the left cubital fossa and Type A on the left cubital fossa and the other participant had Type A on the left cubital fossa and Type B on the right cubital fossa, therefore few participants had different patterns of the left and right cubital fossas respectively. There was no difference in patterns of superficial veins of right cubital fossa between males and females with the commonest pattern Type A with incidences of 45(63.2%) and 19(65.9%) in males and females respectively. Type C was the second common pattern in both gender with incidences of 33 **(**46.3%**)** males and 12(41.6%) females. The commonest pattern was the same in both right and left cubital fossa with few participants who had different patterns on the left and right cubital fossa.

Table 1

SEX	TYPE A %	TYPE B %	TYPE C %	TYPE D %	TYPE E %	TYPE F %	TOTAL ARM
MALE RIGHT	45 **(**63.2**)**	20 **(**28.0**)**	33 **(**46.3**)**	2 **(**2.8**)**	18 **(**25.2**)**	3 **(**4.2**)**	121
MALE LEFT	41 (58.0)	28 (39.3)	31 (43.5)	2 (2.8)	18 (25.2)	1 (1.4)	121

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FEMALE RIGHT	19 (65.9)	9 (31.2)	12 (41.6)	1 (3.4)	8 (27.7)	0 (0)	49
FEMALE LEFT	20 (69.3)	13 (45.1)	12 (41.6)	0 (0)	4 (13.8)	0 (0)	49
TOTAL RIGHT	64 (37.6)	29 (17.1)	45 (26.5)	3 (1.8)	26 (15.3)	3 (1.8)	170
TOTAL LEFT	61 (35.9)	41 (24.1)	43 (25.3)	2 (1.2)	22 (12.9)	1 (6)	170
TOTAL ARMS	340						

Figure 1 shows examples of few participants who had variations of patterns of superficial veins in their left and right cubital fossas whereby, the first participant had Type C on the left cubital fossa and Type A on the left cubital fossa and the other participant had Type A and Type B on the left and right cubital fossa respectively.

Figure 1

Discussion

In the present study, the commonest pattern among participants was Type A, the N - shaped pattern of superficial veins whereby the cephalic vein springs from the median cubital veins which joins the basilica vein with 61(37.6%) and 64(35.9%) in the left and right cubital fossas, which varies from the study done by Ukoha et al in Nigeria whereby the commonest type was the M shaped type with incidence of 33% and 27.1% in males and females (4). The study results show no variation of patterns of superficial veins in the

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cubital fossa among males and females however in the study done by Ukoha et al in 2004 in Nigeria showed that gender influences the distribution of superficial venous pattern at the cubital fossa (4). The present study shows no variation of patterns of superficial veins in the cubital fossa among males and females There is a clear contrast as in the study done by Ukoha et al in 2004 in Nigeria showed that gender influences the distribution of superficial venous pattern at the cubital fossa (4). In the present study the second common pattern is the M shaped pattern whereby in right cubital fossa in males with incidence of 28.1 % which is similar to the study done in Nigeria 2014 however the is a clear contrast in females as in the current study the second common pattern in females was Type C with 46.3%as in the study done in Nigeria 2014, the second commonest patterns in the right cubital fossa in females was N shaped pattern with 28.5%. (4)

This study identified that there were few differences between venous patterns on the right and left side in same participant and this is in contrast with study done in Jordan in 2014, were it was just reported that there were no statistical differences between the venous patterns on the right and left sides in males or females. In the same study. (5) The commonest pattern was Type A in the same study done in Jordan in 2014, which is similar to this study. Also this study identified that there were few differences between venous patterns on the right and left side in same participant and this is in contrast with study done in Jordan in 2014, were it was just reported that there were no statistical differences between the venous patterns on the right and left sides in males or females. In the same study. (5) The commonest pattern was Type A that the median cubital vein arose from the cephalic vein with incidences in males (51.5%) males in females (45.4%) which are in consistent with this study (5). The results showed no difference in patterns of superficial veins of right cubital fossa between males and females with the commonest pattern Type A with incidences of 45(63.2%) and 19(65.9%) in males and females respectively. Type C was the second common pattern in both gender with incidences of 33 **(**46.3%**)** males and 12(41.6%) females. The commonest pattern was the same in both right and left

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cubital fossa with few participants who had different patterns on the left and right cubital fossas. The results were comparable with the study done in Malaysia 2014 in which there was no statistical differences between patterns in the right and lest cubital fossa and the commonest pattern was median cubital vein joins basilic and cephalic veins with lesser incidences of 33.3% in males and 34.0% in females as compared to this study(2) .The results of the present study show that the second common patterns of superficial veins in the left cubital fossas was Type C in which the is no communication between cephalic and basilica veins with 33 **(**46.3%**)** males and 12(41.6%) females respectively .This was higher incidence as compared to the study done on Jordan whereby the incidence of Type C were 18(13.6%)in males and 17(12.8%) in females. This difference in distribution of patterns could be due to different ethnicities between Tanzanians and Jordanians. (5)

The present study classifies patterns of superficial veins in to six types and the commonest pattern was the N shaped pattern with incidences of 45(63.2%) and 19(65.9%) in males and females respectively. In the right cubital fossa, Type C where there is no communication between basilic and cephalic vein was the second common pattern in both gender with incidences of 33 (46.3%) males and 12(41.6%) females. There is a similarity with the study done in Korea 2014 of variations of superficial veins of cubital fossa using intravenous illuminator (Accuvein) where and they were classified into four types according to the presence of the median cubital vein or median antebrachial vein. The pattern, presenting the both cephalic and basilic vein connected by the median cubital vein, was most common (177 upper limbs, 50.1%) which is similar to the present study. Also there was a clear contrast as, in the present N shaped pattern was the commonest in males and females with 61(37.6%) and 64(35.9%) respectively. This is in contract with the study done in Korea 2014 whereby the most common type in male and female was different as the presence of median antebrachial vein which is the M shaped pattern was common in males (108 upper limbs, 49.3%) and N shaped pattern in females 75 upper limbs, 56.0%. (9)

Conclusion and Recommendation

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The summary of the results is Type A was the most common type with incidence of 37.6% and incidences of type B, C, D, E and F were 17.1%, 26.5 % ,1.8% ,15.3% and 1.8% respectively on the left cubital fossa and also, there were variations between left and right cubital fossa patterns among same individual in some participants with no variations between male and female superficial venous patterns of cubital fossa. Therefore, I would recommend physicians and other medical professions to have knowledge on various common and uncommon patterns of superficial veins at the cubital fossa will help a medical worker make a direct approach in case of difficult visible veins especially in emergency cases and reduces the risk of missing the veins. Also with advancement of technology, I would recommend physicians not only to understand patterns of veins at the cubital fossa but also to get vein finders such as veinlite, accuvein, illuminated vein finders which help allocate difficult veins in venopuncture procedures in conditions such anasarca, premature babies, in pediatrics as well as in emergency centers as they are available at optimum cost and minimizes error and difficulty in venopuncture procedures.

Abbreviations

MUHAS, Muhimbili University of health and allied sciences

SPSS, Statistical Package for the Social Sciences

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