

## Pattern of Superficial Venous of the Cubital Fossa among Volunteers in a Tertiary Hospital

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### Abstract

**Background:** The cubital fossa can be seen superficially as a depression on the anterior side of elbow. The arrangement of the superficial veins in the cubital fossa varies from race to race.

**Objective:** The aim of the study was to observe and describe the variations in anatomical distribution of the superficial veins of the cubital fossa among three major ethnic groups in Malaysian population.

**Methodology:** A cross sectional study was designed to examine the pattern of superficial veins of the cubital fossa among the randomly selected volunteers in Hospital Kuala Lumpur. A total of 300 volunteers including both staff and medical students belonging to three major ethnicities i.e. Malays, Chinese and Indians aged from 18 years or above were selected for cited purpose. Consent was taken and duplex ultrasound was performed using a single ultrasound machine from Philips manufacturer. The venous pattern of the cubital fossa from the right and left cubital force in each subject was drawn on a separate observational sheet. Based on gender and ethnicity the categorization of venous patterns in the cubital region among the volunteers was done.

**Results:** Six patterns of superficial veins of right and left cubital fossa were observed and the commonest pattern in both genders was median cubital vein joined from cephalic to basilica vein. Using Pearson Chi-Square test, it is shown there was no statistical significance difference between patterns of superficial veins on the right and left cubital fossa with gender since *p* value was 0.498 and 0.999 respectively. However, a pattern of superficial veins on the right and left do have a relationship with ethnicity since its *p* values were 0.040 and 0.008 respectively.

**Conclusion:** There were significant associations between the pattern of superficial veins on the right and left cubital fossa with the ethnicity.

**Keywords:** Cubital fossa; Superficial veins; Ethnicity; Gender

### Introduction

Veins are conveniently grouped as superficial and deep, but these are widely interconnected; both groups have valves, which are numerous in deep veins [1]. The categories 'superficial' and 'deep' in veins are based on the relationship to the veins to 'deep fascia'; the former category of veins are superficial to the deep fascia while the latter category is deep to the deep fascia. The superficial veins are close to the surface of the body, i.e., they are subcutaneous in the superficial fascia; it is used to differentiate veins that are far from the surface, known as deep veins [1]. The cubital fossa is seen superficially as a depression on the anterior aspect of the elbow [2]. Superficial veins of cubital fossa are commonly used for blood sampling, transfusions and intravenous injections under emergency conditions [3]. The arrangement of the superficial veins in the cubital fossa is subjected to considerable variation [4-6]. Different patterns of superficial cubital veins and percentages of occurrence have been reported in various races [7-10]. The aim of current study was to observe and describe the variations in anatomical distribution of the superficial veins of the cubital fossa among multiethnic groups in Malaysia.

### Methodology

A cross-sectional survey had designed for the purpose of examining the pattern of superficial veins of the cubital fossa among randomly selected volunteers from the staff and medical students in Hospital Kuala Lumpur. A total of 300 volunteers from three major ethnicities i.e. Malays, Chinese and Indians aged from 18 years or above were included in current study. Subjects were consented and duplex

ultrasound was performed using a single ultrasound machine from Philips manufacturer. The program was set at the upper extremities vein and probe LI 5-7 io used at the frequency of 110 Hz with 3 cm focus. The venous pattern of the cubital fossa from the right and left cubital fossa in each subject was drawn on a separate observation sheet. The smaller veins (less than 1mm) were ignored. Subsequently, categorizing of venous patterns in cubital region seen in the volunteers was done according to gender and ethnicity.

### Results

In present study, six types of venous patterns were observed in the cubital fossa (Table 1). Table 2 shows the gender based patterns of superficial veins of the cubital fossa in right arm. The common patterns of superficial veins of the right cubital fossa in female and male were type 1 with 33.3% and 34.0% respectively. Type 3 pattern come in second with 26.0% of male and 26.7% of female. Type 2 patterns

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Venous Pattern	Observation
Type 1	Median cubital vein joins cephalic to basilic vein
Type 2	Median antecubital vein joins median cubital vein
Type 3	Median antecubital vein forms median cephalic and median basilic vein
Type 4	Median antecubital vein joins basilic vein
Type 5	Cephalic vein joins basilic vein
Type 6	Absence of anastomosis

Table 1: Observation of venous patterns in the Cubital Fossa.

Gender	Pattern of right arm						Total (%)	p value <sup>a</sup>
	Type 1 n (%) <sup>b</sup>	Type 2 n (%) <sup>b</sup>	Type 3 n (%) <sup>b</sup>	Type 4 n (%) <sup>b</sup>	Type 5 n (%) <sup>b</sup>	Type 6 n (%) <sup>b</sup>		
Female	50 (33.3)	38 (25.3)	40 (26.7)	6 (4.0)	6 (4.0)	10 (6.7)	150(100.0)	0.498
Male	51 (34.0)	37 (24.7)	39 (26.0)	11 (7.3)	8 (5.3)	4 (2.7)	150 (100.0)	

<sup>a</sup> Pearson Chi-Square; <sup>b</sup> Count(percentage)

Table 2: Patterns of superficial veins of right cubital fossa in different gender.

were found in 25.3% of female and 24.7% of male. However, the other patterns (type 4, 5 and 6) were recorded below 10% in both genders. Using Pearson Chi-Square test, it shows that there was no statistical significance difference between patterns of superficial veins on the right cubital fossa and gender since *p* value was 0.498 (*p*>0.05).

From the Table 3, it was revealed that the *p* value was 0.999 (>0.05) hence there was no statistically significant difference in patterns of superficial veins of left cubital fossa and gender. On the left arm, type 1 also the most common type of pattern in male and female with 34.0% and 32.0% respectively. Similar to right arm result, type 3 also the second most common pattern in left arm of male (27.3%) and female (28.0%). Type 2 was seen in 23.3% of female and 22.7% of male. Type 4, 5 and 6 were only found in small percentage ranging from 4.0 to 6.0%.

Table 4 showed that, the patterns of superficial veins of right cubital fossa and ethnicities had a significant difference with *p* value 0.040 (*p*<0.05). The Malays had type 1 pattern (40.0%) as the most common cubital fossa pattern on the right arm followed by type 2 pattern (24.0%). The Indians followed the same pattern as Malays with type 1 (36.0%) followed by type 2 (31%) pattern. Whereby in 38.0% of the Chinese, type 3 pattern of cubital fossa showed the highest proportion followed by 27.0% of type 1 anastomosis. The least patterns observed in all races were of type 5 and 6.

Table 5 represents the left cubital fossa patterns in different ethnicities. It shows the similar pattern as that of the right cubital fossa. Type 1 pattern was the most common among Malays and Indians. The percentage was 37.0% and 41.0% respectively. The Malays had more type 3 (21%) than type 2 (19%) on the left hand contrary to the right cubital fossa. The Indians had the similar pattern like right cubital fossa which followed by type 2 patterns (24%) and type 3 patterns (22%). The Chinese had the type 3 pattern (40%) as the commonest type of pattern on the left cubital fossa followed by type 1 (21.0%). It was noted that type 6 was slightly more in Malays on the left cubital fossa which comprised of 11%. There was a significant difference in between patterns of left cubital fossa and different ethnicity with a *p* value of 0.008 (<0.05).

## Discussion

In present study, male and female patients were equally distributed. There were hundred fifty male and another hundred fifty female volunteers which accounting 50.0% on each arm. The majority of them were medical students and hospital staff. In spite of that, only a few studies which had looked into the gender preponderance. Majority

of the volunteer lies in the age groups in between 20 to 30 years old, while mean age was 27.9 years. This could be due to the fact that the veins in young adult would be large, well developed and undisturbed by surgery.

The volunteers in current study were equally distributed among three major ethnicities in Malaysia; the Malays, Chinese and Indians. It is known that the superficial venous pattern varies among different races [8]. There was no study available in Malaysia which includes multi ethnic groups. A previous study by Dharap and Shaharuddin, (1994) recruited more Malays because of the population in Kelantan were predominantly by Malays. In this study location, volunteers consist of different gender and race that make up Malaysia's diverse population [11].

In this study, type 1 pattern in which median cubital vein crossing from cephalic to basilic vein was the most frequently seen patterns in male and female. Previous studies showed no significant difference between gender and superficial venous patterns of cubital fossa as shown in this study [11,12]. The percentage of this pattern in current study was lower than the percentage found in previous study [11]. It was found 25.3% in females and 24.7% in males on right cubital fossa while 23.3% in females and 22.7% in males on left cubital fossa. However, the incidence of type 1 pattern was not mentioned among Iraqis [12].

Type 2 pattern was found as third commonly seen in both genders for both arms. On the contrary, smaller percentage of this pattern was seen among Iraqi males (16.0%) and females (17.5%) [12], while 11% was seen in Nigerians [9]. However, study done among Malays, type 2 was the commonest pattern for gender, males (62.4%) and female (78.2%) which is higher than current study [11].

In superficial veins type 3 where median antecubital vein forms median cephalic and median basilic vein, the highest incidence found among Chinese. This pattern was observed slightly more on the left side and females (38.0% of right and 40.0% of the left cubital fossa). The prior study also indicated that the incidence of this pattern was high among Indians [10], Iraqis male (59.75%) and female (48.5%) [12] and among Nigerians (40.0%) [9]. In contrast to the current study, the finding of this study was different with the finding in America, Whites (27.5%) and 12.1% of Negros [8], in British (16.0%) [7], in Japanese (1.0%) [13], in Colombians (4.0%) [14], which was a lower incidence than current study.

Type 4 pattern was found in 5.0% on the right and 8.0% on the

Gender	Pattern of left arm						Total (%)	p value <sup>a</sup>
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6		
	n (%) <sup>b</sup>	n (%) <sup>b</sup>	n (%) <sup>b</sup>	n (%) <sup>b</sup>	n (%) <sup>b</sup>	n (%) <sup>b</sup>		
Female	48 (32.0)	35 (23.3)	42 (28.0)	9 (6.0)	7 (4.7)	9 (6.0)	150 (100.0)	0.999
Male	51 (34.0)	34 (22.7)	41 (27.3)	9 (6.0)	6 (4.0)	9 (6.0)	150 (100.0)	

<sup>a</sup>Pearson Chi-Square; <sup>b</sup> Count (percentage)

**Table 3:** Patterns of superficial veins of left cubital fossa in different gender.

Gender	Pattern of right arm						Total	p value <sup>a</sup>
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6		
	n	n	n	n	n	n		
Malay	40	24	18	5	5	8	100	0.040
Chinese	27	20	38	7	4	4	100	
Indian	36	31	21	5	5	2	100	

<sup>a</sup>Pearson Chi-Square

**Table 4:** Patterns of superficial veins of right cubital fossa among different ethnicities.

Gender	Pattern of left arm						Total	p value <sup>a</sup>
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6		
	n	n	n	n	n	n		
Malay	37	19	21	8	4	11	100	0.008
Chinese	21	26	40	4	5	4	100	
Indian	41	24	22	6	4	3	100	

<sup>a</sup> Pearson Chi-Square

**Table 5:** Patterns of superficial veins of left cubital fossa among different ethnicities.

left cubital fossa in Malays. In Chinese, it was found 7.0% on the right 4.0% on the left cubital fossa while in Indians, it was 5.0% and 6.0% on the right and left cubital fossa respectively. It was found in 10.0% of Nigerian subjects [9], 0.7% in British [7], 8.2% in Americans [8] and 6.0% of Indians from India [15]. This pattern was noted in 11.5% of male and 16.5% female Iraqis, 14.5% in Japanese [13], and 24.0% in Mapucheans from Chile which are demonstrated slightly higher percentage [12].

In this present study, type 5 pattern was demonstrated 5.0% on the right and 4.0% on the left cubital fossa among Malays and Indians. Around 4.0% on the right and 5.0% on the left were demonstrated in Chinese. This pattern was found in 0.3% in British [7] 1.6% in Americans [8], 19.5% in Indians [15], 20.0% in Nigerians [9], 12.0% in Columbians [14] and 4.3% in Chileans [16], 6.0% of males and 6.5% in females Iraqis [12]. This pattern was not demonstrated in Japanese [13]. Dharap and Shaharuddin, found 2.9% and 1.0% in Malaysian males and females respectively which was smaller than the percentage observed in current study [11].

Type 6 pattern was found in 8.0% on the right and 11.0% on the left in Malays, 4.0% on the right and left in Chinese and 2.0% on the right and 3.0% on the left cubital fossa in Indians. It was found in 10.0% in Nigerians [9]. This pattern, which was the absence of anastomosis in cubital fossa was not demonstrated among Malays in Kelantan [11] and among Iraqis [12].

There was a significant difference between the venous patterns and ethnicity in the current study. Type 1 pattern was most common among Malay and Indian. These results were comparable with the previous study done in Britain (53.0%) [7], American (70.0%) [8], Japanese (84.5%) [13], India (67.5%) [15]. However, it was only found in 16.5% among Indians [10]. However, this pattern was not mentioned in previous study [9,11,12], There were no other variations noted like reversed or double median cubital vein as noted in Nigerians [9].

## Conclusion

- The understanding of the common anatomy and patterns of anastomosis of superficial veins at cubital fossa is very important. Even though text books had explained about the common patterns but this study had revealed some uncommon patterns.
- It was found that, the volunteers were possibly grouped into 6 distinct types of superficial venous pattern. There was no significant difference between the gender and patterns of superficial veins at cubital fossa.
- Both males and females had type 1 pattern the most. This was followed by Type 3 pattern. Superficial veins of the cubital fossa show considerable racial variation.

Malays and Indians shared the same type 1 as the commonest pattern. On the contrary, the Chinese had type 3 as the most frequent pattern. There was a significant difference between patterns of superficial veins and ethnicity.

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