The Position of Superficial Veins in the Anterior Region of the Elbow and the Relations Among These Veins in Fetus Cadavers

Fetus Kadavralarında Dirsek Ön Yüzü Yüzeyel Venlerinin Konumu ve Bu Venler Arasındaki İlişkiler

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ABSTRACT Objective: Venipuncture (obteining blood) is performed in just about all areas of modern medicine and is generally regarded as a harmless procedure. Neighboring arteries, veins and peripheral nerves have been reported to be damaged during the process. Obese patients, intravenous drug users, patients receiving intravenous chemotherapy and infants and premature infants may all exhibit venipuncture or intravenous pathway difficulties. Our study was intended to describe the types and positions of superficial veins in the anterior region of the elbow. **Material and Methods:** The study was performed by measuring the anterior region of the elbow in 38 upper extremities of 14 female and seven male fetus cadavers. Fetus cadavers, aged between 17.9-35.8 gestational weeks by foot lenght and preserved in 10% formaldehyde were used. The locations and positions of superficial veins were described. Lengths between the medial epicondyle-basilic vein (B), lateral epicondyle-cephalic vein (C), basilic vein-cephalic vein (D) and elbow width (A) were measured in all fetuses. The values obtained were analyzed separately for right and left arms and for male and female fetuses, in total and between the sexes. **Results:** The most common superficial vein types were N1 (61.0%), followed by O type (18.20%), M type (11.95%) and N2 type (8.68%). Left side D/A, C and C/A measurements were significantly greater than right side D/A, C and C/A measurements ($p= 0.009$, $p= 0.021$, $p= 0.026$, respectively). **Conclusion:** Venipuncture is a procedure frequently performed in infants and premature infants to open a venous access or to obtain samples. Since the cephalic vein and basilic vein are more prominent and are seen in a greater proportion of the cases, these should be the veins selected for venipuncture in the anterior region of the elbow. The basilic vein in this region must be preferred in infants and premature infants. The cephalic vein and basilic vein should be sought immediately on the external borders of the central part 1/3 of the length of the transverse line passing over the medial and lateral epicondyles (A). It should still be borne in mind that the cephalic vein, basilic vein and median cubital vein can still be present in different forms and positions, and all these differences should be considered when planning entry to the veins of the anterior region of the elbow.

Key Words: Phlebotomy; forearm; veins

ÖZET Amaç: Venipunktur (damarın çeşitli amaçlarla cerrahi olarak delinmesi) modern tıbbın hemen her alanında kullanılır ve genellikle zararsız olarak kabul edilir. Komşu arterler, venler ve periferik sinirlerin bu işlem sırasında zarar gördüğü bildirilmiştir. Obez hastaların, intravenöz ilaç kullananların, intravenöz kemoterapi alan hastaların, süt çocuklarının ve premature bebeklerin hepsinde damar yolu açılması çeşitli zorluklar gösterebilir. Çalışmamızda dirsek ön yüzü yüzeyel venlerinin tiplerinin ve konumlarının tanımlanması tasarlanmıştır. **Gereç ve Yöntemler:** Çalışmada 14 kız, Yedi erkek fetus kadavrasına ait 38 üst ekstremitenin dirsek ön yüzünde ölçümler ile yapıldı. Yaşları ayak uzunluklarına göre 17.9-35.8 gestasyonel haftalar ile ilişkilendirilen ve %10'luk formaldehid ile tahnit edilmiş fetus kadavraları kullanıldı. Yüzeyel venlerin yerleri ve konumları tanımlandı. Tüm fetuslarda epicondylus medialis-v.basilica (B), epicondylus lateralis-v.cephalica (C) ve v.basilica-v.cephalica (D) arasındaki uzunluklar ve dirsek genişliği (A) ölçüldü. Elde edilen değerler toplamda ve cinsiyet ayrımı yapılarak sağ-sol kollar için ve erkek-kadın fetuslar için ayrı ayrı değerlendirilmiştir. **Bulgular:** Yüzeyel venler en sık olarak N1 tipi (%61.0) daha sonra O tipi (%18.20), M tipi (%11.95), ve N2 tipi (%8.68) şeklinde sıralanmaktaydı. Sol tarafta D/A, C ve C/A ölçümleri sağ tarafındaki D/A, C ve C/A ölçümlerinden belirgin olarak daha büyük bulundu. **Sonuç:** Venipunktur bebeklerde ve prematüre bebeklerde venöz yol açmak için veya örnek almak için sıklıkla uygulanan bir işlemdir. V.cephalica ve v. basilica daha belirgin ve büyük oranda mevcut olmaları nedeniyle venipunktur için dirsek ön yüzünde tercih edilen venler olmalıdır. Özellikle infant ve premature bebeklerde bu bölgede basilic vein ilk tercih edilmesi gereken vendir. Cephalic vein ve basilic vein, dirsek genişliğinin (A) 1/3 orta parçasının hemen dış kenarlarında aranmalıdır. Yine de v.cephalica, v. basilica ve v.mediana cubiti'nin değişik şekillerde ve yerlerde bulunabileceği de göz önünde bulundurulmalı ve tüm bu farklılıklar dirsek ön yüzü venlerine girişim yapılması planlandığında dikkate alınmalıdır.

Anahtar Kelimeler: Flebotomi; önkol; ven

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Venipuncture is usually a harmless procedure used in just about all areas of modern medicine.[1-3] The veins selected are generally the superficial and visible ones in the upper and lower extremities. The veins frequently used for venipuncture in the upper extremity are positioned on the dorsal face of the hand, the forearm and in the anterior region of the elbow.[4-8]

Standard anatomy texts for the upper extremity show that, with elbow extension, the veins at the dorsum of the hand and at the anterior region of the elbow and forearm that are commonly used for venipuncture. These superficial veins include the cephalic, basilic, median cubital and additional antebrachial veins and their tributaries.[5] Venous blood from the dorsal part of the fingers drains into three dorsal metacarpal veins with the dorsal digital veins. The dorsal metacarpal veins constitute the venous network on the dorsal surface of the hand.[4-8]

One small part of the basilic vein divides from the dorsal venous network to the medial while the remaining larger part constitutes the cephalic vein by dividing towards lateral. The venous blood from the palmar surface of the fingers combines with the palmar digital veins and the branches extending from the palm to the dorsal digital veins to constitute the median vein of the forearm.[5]

The diameter of veins increases as they approach the anterior region of the elbow. When the forearm muscles are contracted, blood flow in the deep veins, which is directed toward the superficial veins, becomes more visible and apparent.[4,5,7] These veins are frequently chosen for intravenous injection, blood sampling, blood transfusion and cardiac catheterization.[5]

Cephalic or basilic veins are frequently employed for central venous catheters, while the use of ultrasonografically guided deep brachial and basilic veins has also increased.[5,6,9-12]

Infancy, obesity, intravenous drug abuse, shock, post-chemotherapy and a variety of other conditions may make peripheral intravenous insertion difficult.[9] In long-term hospital stays, peripheral blood vessels may have to be cannulated for use at any moment.[13]

There are also many examples of transposition of the cephalic vein or, if this is not of the requisite thickness, the basilic vein for the establishment of arteriovenous fistulae for reasons such as chronic kidney disease.[14-16]

Although venipuncture is a widespread procedure and one that is regarded as generally harmless, the literature does contain cases of neighboring structures being damaged during the process. In particular, cutaneous nerves following a course neighboring on veins, arteries and similar structures may all be harmed by the needle or the drugs injected. Causalgias (complex regional pain syndrome Type 2) arise because of damage to cutaneous nerves.[1,2,13,14,17]

This study was intended to describe the types and positioning of cephalic and basilic veins in infants and premature babies, in whom it is difficult to open up a peripheral venous pathway, between the medial and lateral epicondyles. We also investigated whether there was a right and left arm and gender-related bias in the positioning of these veins.

MATERIAL AND METHODS

The study was performed between October 2007 and April 2009 in Karadeniz Technical University Department of Anatomy. Twenty-one fetus cadavers (14 females, seven males) aged between 17.9-35.8 gestational weeks (gw) by foot length with no visible external abnormalities and preserved in 10% formaldehyde were used.[18]

Measurements were performed in 38 upper extremities (male; 6 right, 7 left; female; 13 right, 12 left). Four extremities were excluded as they had already been dissected. Fetuses with no external pathologies or abnormalities were obtained from the Trabzon Maternity and Children's Hospital between 1992 and 1998. Written consent from the families and the approval of the Ethics Committee of the Karadeniz Technical University Faculty of Medicine were obtained prior to the commencement of the study (decision no. 2008/03/07 date Jan 14, 2008).

Distances between the medial epicondyle and lateral epicondyle were measured. An incision was

made along the line joining the medial epicondyle and lateral epicondyle in the anterior region of the elbow. Another incision was then made from the mid-point of this incision to the mid-point of the most distal crease on the wrist. Skin and superficial fascia were released. The incision in the anterior region of the elbow was expanded and the subcutaneous fatty tissue cleared in such a way that the superficial veins were visible. The veins here (cephalic vein, basilic vein, median cubital vein and median vein of forearm) were exposed and described.[19] The positions of the cephalic vein, basilic vein and median cubital vein in the anterior region of the elbow were examined and then reviewed in the light of the literature.

The following measurements and definitions were employed (Figure 1, 2, Table 1, 2):

A (Elbow width): Length of the transverse line passing over the medial epicondyle and lateral epicondyle (with the arm in extension) (using a divider and a vernier digital caliper).

B: Distance between the medial epicondyle and the lateral edge of the basilic vein (This measurement was taken after dissection, and parameters were obtained using dividers and a vernier digital caliper).

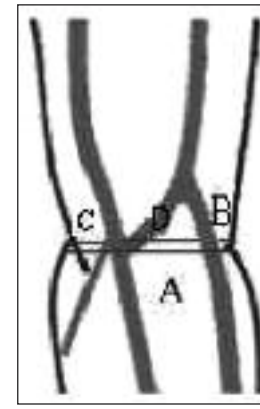

FIGURE 1: Measurement lines in the anterior region of the elbow.
A: Length of the transverse line passing over the medial and lateral epicondyles..
B: Distance between the medial epicondyle and the lateral edge of the basilic vein.
C: Distance between the lateral epicondyle and the lateral edge of the cephalic vein.
D. Distance between the medial edges of the basilic vein and cephalic vein.

C: The distance between the lateral epicondyle and lateral edge of the cephalic vein (This measurement was taken after dissection, and parameters were obtained using dividers and a vernier digital caliper).

D: The distance between the basilic vein and medial edges of the cephalic vein (This measurement was taken after dissection, and parameters were obtained using dividers and a vernier digital caliper).

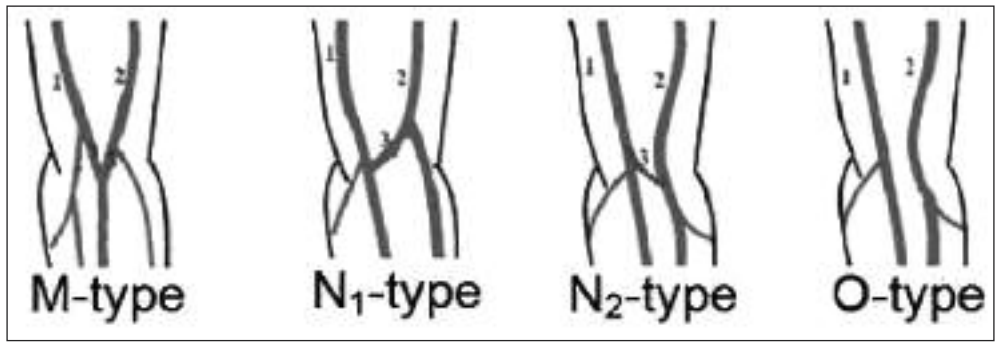

FIGURE 2: Superficial vein types in the anterior region of the elbow.
Type M: The situation arising when the median vein of forearm divides into two, the median cephalic vein and the median basilic vein on reaching the anterior region of the elbow, and the median cephalic vein joining with the cephalic vein and the median basilic vein with the basilic vein.
Type N1: When the median cubital vein extends from the cephalic vein to the basilic vein.
Type N2: When the median cubital vein extends from the basilic vein to the cephalic vein.
Type O (others): Situations other than those in types M and N.
1- Cephalic vein.
2- Basilic vein.
3- Median cubital vein.

TABLE 1: Measurements performed for the anterior region of the elbow and superficial veins, means, standard deviations of right and left sides in females and males and total subjects.

Measurement	Right sides (Mean ± SD)			Left sides (Mean ± SD)			Total (Mean ± SD)
	Female n=13	Male n=6	Total n=19	Female n=12	Male n=7	Total n=19	n (38)
A	18.67 ± 6.59	19.23 ± 5.07	18.84 ± 6.01	19.25 ± 6.37	18.21 ± 5.68	18.86 ± 5.99	18.85 ± 6.0
B	11.85 ± 5.99	11.40 ± 3.24	11.71 ± 5.19	10.74 ± 4.55	11.25 ± 4.75	10.93 ± 4.50	11.32 ± 4.85
C	9.88 ± 3.41	10.88 ± 2.07	10.19 ± 3.03	11.57 ± 3.45	10.03 ± 4.33	11.00 ± 3.76	10.6 ± 3.4
D	8.26 ± 3.39	8.62 ± 4.95	8.37 ± 3.81	9.87 ± 3.25	6.98 ± 3.09	8.75 ± 3.40	8.56 ± 3.61

Abbreviations:

A: Length of the transverse line passing over the medial and lateral epicondyles.

B: Distance between the medial epicondyle and the lateral edge of the basilic vein.

C: Distance between the lateral epicondyle and the lateral edge of the cephalic vein.

D. Distance between the medial edges of the basilic vein and cephalic vein.

TABLE 2: Measurements performed for the anterior region of the elbow and superficial veins, means, standard deviations and statistical comparison of right side and left sides in females and males.

Measurement	Female (Mean ± SD)		Male (Mean ± SD)					
	Right	Left	Right	Left	p 1	p 2	p 3	p 4
B/A	0.62 ± 0.15	0.56 ± 0.17	0.65 ± 0.33	0.63 ± 0.24	0.523	0.917	0.661	0.612
C/A	0.54 ± 0.11	0.62 ± 0.16	0.60 ± 0.21	0.54 ± 0.18	**0.026**	0.753	0.930	0.447
D/A	0.44 ± 0.11	0.51 ± 0.99	0.41 ± 0.17	0.37 ± 0.08	0.082	0.600	0.861	**0.009**

Bold p values are statistically significant.

p1 for female right vs left.

p2 for male right vs left.

p3 female right vs male right.

p4 female left vs male left.

B/A: Ratio of B length to A length.

C/A: Ratio of C length to A length.

D/A: Ratio of D length to A length.

A: Length of the transverse line passing over the medial and lateral epicondyles.

B: Distance between the medial epicondyle and the lateral edge of the basilic vein.

C: Distance between the lateral epicondyle and the lateral edge of the cephalic vein.

D. Distance between the medial edges of the basilic vein and cephalic vein.

B/A: Ratio of distance B to distance A

C/A: Ratio of distance C to distance A

D/A: Ratio of distance D to distance A

Measurements were performed three times using digital calipers, sensitive to 0.05 mm, and means and standard deviations were calculated using SPSS 13.0. Normal distribution of data was confirmed using the one sample Kolmogorov-Smirnov test. Differences between sex groups were determined using the Mann-Whitney U test for odd, and Student's t test for normally distributed data. Differences between right and left measurments in each sex were determined using the Wilcoxon sign rank test for odd, and Paired t test for normally distributed data. A p value < 0.05 was considered as statistically significant.

The positioning of veins and the resulting patterns were defined as follows (Table 3):

M type: The situation resulting from the division of the median vein of forearm into the median cephalic vein and the median basilic vein on reaching the anterior region of the elbow, the median cephalic vein and the median basilic vein. The median cephalic vein draining into the cephalic vein and the median basilic vein into the basilic vein.

TABLE 3: Vein position and visibility levels in the anterior region of the elbow.

Type	Total %			Female %			Male %		
	Total	Right	Left	Total	Right	Left	Total	Right	Left
M	11.95	4.5	19.40	11.05	0	22.20	12.80	9.00	16.60
N1	61.00	70.65	51.35	61.05	77.70	44.40	60.95	63.60	58.30
N2	8.68	11.80	5.55	8.30	5.50	11.10	9.05	18.10	0
O	18.20	12.80	23.60	19.40	16.60	22.20	17.00	9.00	25.00

Abbreviations:

Type M: The situation arising when the median vein of forearm divided into 2, the median cephalic vein and the median basilic vein on reaching the anterior region of the elbow, and the median cephalic vein joining with the cephalic vein and the median basilic vein with the basilic vein.

Type N1: When the median cubital vein extends from the cephalic vein to the basilic vein.

Type N2: When the median cubital vein extends from the basilic vein to the cephalic vein.

Type O (others): Situations other than those in types M and N.

N type: The situation resulting from the basilic vein, cephalic vein and the median cubital vein connecting the two,

N1 type; when the median cubital vein extends from the cephalic vein to the basilic vein,

N2 type: when the median cubital vein extends from the basilic vein to the cephalic vein,

O type (others): refers to situations other than those applying in types M and N.

RESULTS

Measurements were performed on 38 upper extremities (male; 7 right, 6 left; female; 13 right, 12 left) of 21 fetuses (7 males, 14 females) calculated at 17.9-35.8 gw according to foot length.[18]

Fetuses had a mean age of 28.07 ± 4.95 gw; 28.55 ± 4.90 gw for females and 27.11 ± 5.29 gw for males. No difference was determined between fetus ages according to gender (p= 0.502). Male and female fetus groups were similar in terms of intrauterine age.

Distance between the medial epicondyle and lateral epicondyles in all fetuses irrespective of gender (A= elbow width) was 18.85 ± 6.0 mm. There was no difference in left and right A lengths (p= 0.992) (Table 1). Furthermore, A lengths were similar at comparisons of female fetus right and left extremities, male fetus right and left extremities and right and left extremities of different genders (p= 0.497, p= 0.528, p= 0.661 and p= 0.800, respectively) (Figure 1) (Tables 1, 2).

The distance between the medial epicondyle and basilic vein (B) was 11.32 ± 4.85 mm in all fetuses irrespective of gender . No difference was determined between right and left B lengths and the ratio of B length to A length (B/A) (p= 0.623 and p= 0.555, respectively) (Table 1, 2). In addition, values obtained from comparisons of B lengths in female fetuses' right and left extremities, male fetuses' right and left extremities and the different genders' right and left extremities and the ratio of these values to A lengths were all similar [(p= 0.256, p= 0.600, p= 0.930 and p= 0.866, respectively, for measurements) (p= 0.523, p= 0.917, p= 0.661 and p= 0.612 for ratios)] (Figure 1) (Tables 1, 2).

The length between the lateral epicondyle and cephalic vein (C) was 10.60 ± 3.4 mm in all fetuses, irrespective of gender (Table 1). No difference was determined between right and left C measurements and ratio of C length to A length (C/A) (p= 0.471, and p= 0.519, respectively) (Table 1, 2). Additionally, values obtained for C lengths in female fetuses' right and left extremities, male fetuses' right and left extremities and comparison of the different genders' right and left extremities, and the ratios of these values to A lengths were not all similar [(*p= 0.021, p= 0.917, p= 0.357 and p= 0.447 for measurements) (*p= 0.026, p= 0.753, p= 0.930 and p= 0.447 for ratios)] (Figure 1) (Tables 1, 2).

The distance between the basilic vein and cephalic vein (D) was 8.56 ± 3.61 mm in all fetuses, irrespective of gender. There was no difference between left and right D measurements and D

length to A length ratios (D/A) (p= 0.748 and p= 0.554, respectively) (Table 1, 2). In addition, comparisons of D lengths in female fetuses' right and left extremities, male right and left extremities and right and left extremities in the different genders and ratios for these values by A length revealed similar, results with one exception* (the female fetus left-male fetus left/A ratio) [(p= 0.099, p= 0.600, p= 0.861 and p= 0.108 for measurements), (p= 0.082, p= 0.600, p= 0.861 and *p= 0.009 for ratios)] (Figure 1) (Tables 1, 2).

For basilic, cephalic and median vein pattern types inside the anterior region of the elbow in all fetuses, irrespective of gender, 11.95% of fetuses were M type, 69.98% were N type (61.00% N_1 and 8.68% N_2) and 18.2% were O type (Table 3). These were also analyzed according to gender and extremity. N1 type was the most common in all individuals. This was followed by O type, M type and N2 type, in that order (Figure 2) (Table 3).

DISCUSSION

The anterior region of the elbow provides the easiest access to the veins in the upper extremities.[1,2,4-8]

The superficial veins in this region exhibit different positions and patterns and neighbor to nerves, arteries and muscles in the region. When ingress to the veins in the anterior region of the elbow is planned, the location of the cephalic vein, basilic vein and median cubital vein along with length A is determined. In regions subjected to tourniquet more proximally, the veins become visible under the skin by attaining a specific plenitude. When the forearm muscles are contracted, blood flow in the deep veins, which is directed towards the superficial veins, becomes clearly visible.[1,2,5,20-22]

Although venipuncture is a simple and very widely used procedure, it can still pose difficulties for the practitioner under certain circumstances, as Mills et al. reported in their study. These appear in infants in case of obesity, intravenous drug abuse, shock and post-chemotherapy.[9] For these reasons, there are a number studies on superficial veins and their positions investigating regional veins, their formations and patterns.[23-27]

For example, in a study published in 1997, Tacar et al. determined seven different types in the arrangement of superficial veins when they examined 400 anterior elbow regions, and compared these findings among adult males and females.[23]

In addition, in a study published in 2003, Jasinski and Poradnik. examined the region anatomically in order to determine basilic and cephalic vein anastomoses and types, and then classified the veins into types O M, N, Y and I.[24] Yamada et al. investigated the relations between the superficial veins in the anterior region of the elbow and their neighbors. They defined vein positioning in terms of Types I, II, III and IV.[25] These two studies examined adult subjects.

We examined the superficial veins by dissecting the anterior region of the elbow and classified the veins into four groups -types M, N (N1 and N2) and O. Type O includes all the conditions other than those described as types M and N.

In all studies, M type has been described as the forearm median vein (median vein of forearm) dividing into two, the median cephalic vein and median basilic vein, and the median cephalic vein combining with the cephalic vein and the median basilic vein with the basilic vein.[23-25] N type, on the other hand, consisted of the cephalic vein and basilic vein and the median cubital vein that establishes a link between these two veins and extends downward. We divided N type into two subgroups; N1, in which the median cubital vein extends from the cephalic vein to the basilic vein, and N2 in which the median cubital vein extends from the basilic vein to the cephalic vein. All other patterns were described as O type.

Tacar et al. reported type M as 55% in males, equal for right and left sides whereas it was seen in of 52% of females with a greater incidence in the left arm.[23] Jasinski and Poradnik reported the incidence of type M as 30% in the right arm and 35% in the left, irrespective of gender.[24] Yamada et al. described our type M as Type I and reported a Type I prevalence as 41.7%.[25] The results of our study revealed differences between males and females and between right and left sides. Type M vein formati-

on was observed in 11.95% of all subjects.. Divided by gender and right and left arms, prevalence was 4.50% in the right arm and 19.40% in the left arm, and 11.05% in female fetuses and 12.80% in males. This type was not encountered in the right arm in female fetuses, while there was a prevalence of 22.20% in the left. In male fetuses, type M vein formation was observed in 9.09% of right arms and 16.6% of left arms.

In their study, Tacar et al. described type Y as having no connection between the cephalic vein on the lateral side of the arm and the basilic vein on the medial side, the median vein of forearm being attached to the basilic vein. They determined the incidence of type Y as 17.5% in males and 10.5% in females, with a greater incidence in the left arm in both genders.[23] Similar prevalences were reported by Jasinski et al. They determined a prevalence of 17.5% in the right arm and 15.00% in the left.[24] Yamada et al. described this type as Type III with a prevalence of 1.7%.[25]

Tacar et al. reported that they defined the cephalic vein, basilic vein and the positioning of the median cubital vein between these two veins as type N and that these cases exhibited some variety.[23] Their type N and its subgroups are equivalent to the type N and subtypes N1 and N2 described by us. In the first of the cases, observed in two different forms, the median cubital vein extends from the cephalic vein to the basilic vein. The authors reported a prevalence of 6.0% in males and 5.50% in females; in the second it extends from the basilic vein to the cephalic vein, with a prevalence of 7.0% in males and 26.50% in females. The prevalence of the second type in females is much higher than males.[23] In addition, Jasinski et al. determined prevalence of type N as 45.0% in the right arm and 42.5% in the left, and reported that type N was more common than other vein formations in both upper extremities.[24] Yamada et al. defined this type as Type II and reported an incidence of 56.7%.[26]

In terms of prevalences of cases defined as type N, these are higher in Jasinski and Poradnik's, Yamada et al.'s study compared to that of Tacar et al.[23-25] In our study, type N1 was observed in 61.00% of all subjects of which 70.65% in the right arm and 51.35% in the left, and of 61.05% in female fetuses and 60.95% in male fetuses. In addition, type N1 was encountered at a rate of 77.70% in the right arm in female fetuses and of 44.40% in the left arm, and of 63.60% in the right arm in male fetuses and 58.30% in the left arm. Type N2 was observed in 8.68%, of all subjects of which 11.80% in the right arm and 5.55% in the left arm, in 8.30% of female fetuses and 9.05% of males, in 5.5% of right arms and 11.10% of left arms in female fetuses and in 18.10% of right arms in male fetuses but 0% of left arms (Table 3). These figures are higher than those of Tacar et al. and closer to those of Jasinski and Yamada. As with other results in our study, levels of type N1 were greater than those of type N2. The fact that type N1 was the most common in our study suggests that the basilic vein should be preferred in venipuncture in newborns and infants.

Tacar et al. determined a greater number of male cases (2%) with no connection between the cephalic and basilic veins in the anterior region of the elbow compared to female cases (0.5%) and that this situation was seen more frequently at greater levels in the left arm in both genders.[23] Such intermediate types were classified under type O in our study. Tacar et al. reported that type M was the most common. The prevalence of the other types varies in males and females -types N and Y in females and Y and N in males. They reported that other types were less common in both genders.[23] Jasinski and Poradnik cited the prevalence of type I as 7.5% in the right arm and 7.5% in the left. The fact that similar rates were determined is particularly noteworthy.[24] Yamada et al. reported that they encountered no cases in which there was no connection between the cephalic vein and basilic vein.[25]

In our study, type O was observed in 18.20% of total cases, in 12.80% of right arms and 23.60% of left arms, in 19.40% of female fetuses and 17.00% of male fetuses, in 16.60% of right arms in female fetuses and 22.20% of left arms in female fetuses, and in 9.00% of right arms and 25.00% of left arms in male fetuses.

We observed similar prevalences for N1, N2, M and O in the anterior region of the elbow in

male and female fetuses; type N1 was the most common in the right and left arms in both groups and that the subsequent order of prevalence in male and female fetuses was O, M and N2. Type M is the most common type reported in the literature.[23,25] However, type N has a high total prevalence as well. Indeed, there are series in which type N was frequently observed.[24]

Similar distributions appear in the literature on the basis of division by right and left arms and by gender, and the greater detail increased the number of groups in some studies. Similar levels were obtained when the groups in these studies were matched to ours.[23-25] The orders vary in very small percentages.

In our study we also measured the distances of the veins in the anterior region of the elbow to specific points. The groups were identical in measurements made irrespective of gender among all fetuses. When we compared males and females, the proportion of the distance between the cephalic vein and basilic vein in the left arm and then elbow width at the anterior regionwas different (D/A) (P= 0.009). When we compared females for the distance between the medial edges of the basilic vein and cephalic vein, and proportion of C lenght to A lenght, the differences were significant (C and C/A) (p= 0.021, p= 0.026 respectively) (Table 2) Left side D/A, C and C/A measurements were significantly greater than right side D/A, C and C/A measurements. Other measured values and ratios were similar (Tables 1, 2).

In addition to neighboring structures, many studies have been conducted on the superficial veins of the upper extremities themselves. Some have reported several anatomical variations of the veins in the arm, and particularly the cephalic vein. They have reported that this structure does not exist or is very fine in 20% of cases, or the cephalic vein comes to a direct or indirect end in the basilic vein.[9,20,28-35] The cephalic and basilic veins were present in all cases in our study.

Since the cephalic vein and basilic vein are more prominent and present at greater proportion of the cases, these should be the veins selected for venipuncture in the anterior region of the elbow. The basilic vein in this region must be preferred in infants and premature infants. The cephalic vein and basilic vein should be sought immediately on the external borders of the central part 1/3 of the length of the transverse line passing over the medial and lateral epicondyles (A). It should still be borne in mind that the cephalic vein, basilic vein and median cubital vein can still be present in different forms and positions, and all these differences should be considered when planning entry to the veins of the anterior region of the elbow.

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