ANATOMICAL VARIATIONS OF VEINS OF LOWER EXTREMITIES

Anatomical variations of veins often play a crucial role in formation of thrombotic changes in superficial and deep veins of lower extremities. The aim of this study was to determine the frequency of the dominant type of the lower extremity superficial veins, and to determine the eventual influence of such variations to the formation of superficial and deep vein thrombosis (DVT). Material and methods: The sample used in this study consisted of 180 patients subjected to ascending contrast phlebography of lower extremities. The total sample was divided into following groups: patients with and without variations of the lower extremity superficial veins.

Results and discussion: Dominant type of the superficial veins (without variation) consisted of 97 patients (53.89%), while the rest of 83 patients showed some kind of anatomical variation (46.11%). The most frequent variation was the duplicated form of v. saphena magna in 53.85%, while this percentage in women was 57.89%. Most frequent variations of duplicated v. saphena magna were: simple duplicated form, closed loop form, branching form and combined form. Topographical variation of saphenopopliteal junction besides fossa poplitea in the group of men showed percentage of 53.85%, while in the group of women that value accounted 63.16%.

Conclusion: The percentage of varicose veins was more frequent in men and women without variations, but deep vein DVT showed higher frequency in patients with anatomical variations of superficial veins of lower extremities. Keywords: phlebography, thrombosis, varicose veins.

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1. INTRODUCTION

The anatomy and pathology of the lower extremity venous system has been a neglected thematics in scientific circles for a long period of time. Nowadays, thrombosis has become an interdisciplinary thematics in diagnostic fields of medicine such as transfusion medicine and radiology, as well as therapeutic fields such as internal medicine and vascular surgery.

The anatomy of veins of lower extremities is quite variable in certain regions, but at the same time shows constant distribution in other parts (1). In traditional books of anatomy, venous system of lower extremities shows continuous flow in veins without duplication (2). Nevertheless, it has been proved many times that only one of six patients has this normal vein distribution (3). Most frequent variations can be observed in superficial femoral veins where 6% to 46% of patients show duplicated or even multiple blood vessels (5). Other localisations of variations can be observed in v. saphena magna, v. saphena parva and v. femoralis system.

It is presumed that the existence of multiple superficial femoral veins leads to the increase of the blood volume in venous pool and consequently decreases the velocity of blood in veins, which represents a predisposition for deep vein stasis and thrombosis.

Duplication of v. saphena magna is an anatomical variation that is very common in surgical and radiological literature. The incidence of duplicated form of v. saphena magna varies from 1-86% (6). The results of studies show that the duplicated form of v. saphena magna is not rare and occurs in 50% of cases, while such duplications are evident generally in the femoral region in the form of „closed loop“ (7).

Sample of 1400 observed lower limbs showed anatomical variations of these veins. Femoral segment of v. saphena magna consisted in 67% of cases of one simple course, total duplicated system in 8% of cases, branched duplicated system in 18% of cases and closed loop in 7% of all cases (8). In a study published 1986., which included 256
patients who underwent ascendent contrast phlebography, with and without symptomatology of DVT, certain anatomical variations had been observed. Thrombotic changes were observed in calf region in 44% of asymptomatic and 17% symptomatic patients. In 31% of patients multiple superficial femoral veins were observed, and 40% of those extremities showed evidence of DVT (11).

2. PATIENTS AND METHODS

Visualisation of superficial veins of lower extremities was performed using contrast phlebography in the Clinic for Radiology IZU UKC Tuzla with IMPAX system for interactive visualisation of radiological findings. Contrast phlebography was used to determine topographical location and variability of veins and eventual presence and location of thrombotic processes in superficial and deep veins of lower extremities. Statistical analysis was performed by using statistical methods: mean value x, standard error SEM, standard deviation SD.

3. RESULTS

In classical anatomy books dominant type of distribution of lower extremity superficial veins is described as a simple vein course without duplication and without major differences in anatomical locations of the vein course itself. From the total of 180 patients in the study, 97 of them showed dominant type of vein course without duplication (53.89%). Group of patients without duplications consisted of 33 men, mean age 48.61 ± 15.46 and 64 women mean age 55.39 ± 12.92.

The rest of 83 patients in the group had variations of superficial veins of lower extremities (46.11%). This group accounted 26 men, mean age 54.65±11.77 and 57 women, mean age 52.16 ± 15.49. In the group of men 14 cases of duplicated v. saphena magna were identified. Duplication of v. saphena magna in the group of men was the most common variation with 53.85% of all variations of superficial veins of lower extremities. Duplication of v. saphena magna in the group of women accounted 57.89% of all observed variations. Topographical variations of saphenopopliteal junction accounted 63.16% cases in the total sample. All forms of duplicated v. saphena magna veins in both men and women are demonstrated in Table 1.

Duplicated forms of v. saphena magna were mostly present in calf or femoral region or both. Other localisations of variations and their procentual distribution in the group of men and women are shown in Table 2.

The percentage of varicose veins was higher in men and women without variations, but DVT showed 50% higher frequency in patients with anatomical variations of superficial veins of lower extremities (Figure 1 and Figure 2).

4. DISCUSSION

Superficial veins of lower extremities are a common localisation of varicose and thrombotic processes, as well as a region for constructing arterial coronary grafts and potential location of massive injuries which, due to dense arterial and venous net, can lead to fatal haemorrhages.

Most frequent localisations of variations can be seen in v. saphena magna, v. saphena parva and v. femoralis system. V. saphena magna generally shows variations in the form of duplication in the calf and femoral region, while in only a few cases it is completely absent. V. saphena parva is rarely variable on the back of the calf region, except for its variability in the proximal segment, where it joins v. poplitea in most of the cases in fossa poplitea, while the rest of these junctions are located above and beneath fossa poplitea. The most frequent variation of v. femoralis is also a duplicated form in different segments of its course in the femoral region.
Group of patients without variations accounted 53.89% of all patients, while the rest with variations accounted 46.11%. Those results do not correlate with results of previous studies according to which only 16% of individuals showed classical, normal vein distribution without duplication (4). Variation with evidently highest procentual representation among patients was the duplication of v. saphena magna with 53.85% among men and 57.89% among women in the total sample. These results concord with results published by Shah et al. in 1986, according to which variants of duplicated veins made 55% in the calf region, and 35% in the femoral region. Saphenopopliteal junction also showed evident variability in both groups of patients. Comparing the results of our study with results of previous studies, it can not be stated with confidence the frequency of saphenopopliteal localisation can be put into some already formed procentual frame. The most frequent localisation of saphenopopliteal junction was definitely fossa poplitea in its anatomical borders, which correlates with the results of study performed by De Maeseneer et al., 1993. Incidence of thrombosis strongly correlates with age: it is almost absent in children (1 to 100 000 per year) and it grows almost for 1% to every year of age (12). Results of our study showed higher procentual part of female population in each group, with and without symptoms of varicose veins or DVT. That can be argumented by hormonal changes during menopause, hormone contraception, obesity and passive life style. The results of this study proved increased frequency of DVT in the group of patients with variations of lower extremities superficial veins for 50%, which is a significant difference compared to the results of a study conducted in 2010., where only 0.4% of patients showed thrombotic changes inside duplicated veins of lower extremities (13).

5. CONCLUSION

Although anatomical variations of superficial veins of lower extremities are not described in detail in classical anatomy books, the frequency of their appearance is not so rare. The results of this study proved increased frequency of DVT in the group of patients with variations of lower extremities superficial veins, while the presence of varicose veins was not influenced by such variations.

Profund knowledge of variable anatomy of superficial veins of lower extremities, presence of possible anomalies in distribution and topographical location of veins, manner of communication with the deep venous system, and affiliation to DVT will contribute to more detailed and precise interpretation of modern diagnostic findings.

Conflict of interest: none declared.

REFERENCES