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Research Article

Vascular Ultrasound Exam for Varicose Veins. Importance of Patient Positioning

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Abstract

Objectives: Demonstrate alterations of measurements in the vascular ultrasound exam for varicose veins when performed in standing or decubitus exam positioning.

Method: Varicose veins patients (67 limbs) were examined using vascular ultrasound first in 30° reverse Trendelemburg (decubitus) and then in a standing position in the same patient. The results of the measured parameters (diameter and velocities) and reflux type were then compared.

Results: Measurements changed very much from decubitus to standing examining positions. All measured parameters values increased when examined in the standing position compared to the decubitus. The venous diameter augmented from 41 to 44%; reflux time increased from 75 to 97% and maximal velocity of reflux (MVR) increased from 2, 8 to 3,5 times. Also, in 33 of the examined limbs (49,25% of the total), a change in reflux pattern occurred.

Conclusions: Standardization of ultrasound varicose veins exam is imperative.

ABBREVIATIONS

CEAP: Varicose Veins Clinical Classification, Based On Clinical Features (C), Etiology (E), Anatomy (A) And Pathophysiology (P); SFJ: Sapheno Femoral Junction; DT: Distal Tight; MVR: Maximum Venous Reflux; LSV: Long Saphenous Vein

INTRODUCTION

In order to get a good exam comparison for any purpose, standardization is a necessity [1,2]. In the study of varicose veins using ultrasound techniques, the standards published are not well defined, particularly in relation to patient positioning for the exam [3-7]. Despite the majority of data indicate that the exam should be made in the standing position [8-24], some publications point that the patients can either be examined in the standing or in decubitus (Trendelenburg reversed) [25-30]. Since patient positioning alters so much the venous hemodynamic [31], this seems to be conflicting. In order to better understand the issue we´ve decided to exam the same patients with varicose veins in two different positions comparing venous measurements.

MATERIALS AND METHODS

From January to July 2015 in our private clinic, we´ve examined a total of 67 extremities (in 36 patients, 24 had bilateral and 19 unilateral varicose veins) with medically significant venous insufficiency were examined for varicose veins treatment. Vascular ultrasound was performed in all patients using Phillips HD 11 equipment with an L8-4 transducer. The patients were first examined in a 30º reverse Trendelemburg position (decubitus) and immediately after in a standing position. The manouver used to evoke reflux was distal calf manual compression [6]. The same measurements were taken in the decubitus as well as in the standing position in all patients at the same anatomical location, performed by the same physician. Measurements were taken in the great saphenous vein at the saphenous femoral junction (SFJ) and at the distal tight (DT) just proximal to the level of the knee. Measurements were: venous diameter, reflux duration, maximum venous reflux (MVR) (Table 1). Reflux patterns were classified as described by Engel horn [21] and is presented in (Figure 1). We feel that the classification of reflux types are not so important to the study results since we´ve taken in account only the changes in reflux patterns when the exam was done in standing or in decubitus position.

RESULTS

The numerical measurements made are listed on Table (1) and were significantly changed if taken in the decubitus or in the standing position. The measurement that changed the least

was the venous diameter (from decubitus to standing position), but even so had an increase of 41% when taken in the SFJ site and of 44% when measured at DT site (Table 1). The reflux time increased by 97% (when measured in decubitus or standing positions) when taken at the SFJ site and increased by 75% when taken in the DT site (Table 1). The measurement that changed the most (from decubitus to standing position) was the maximal velocity of reflux (MVR) that changed 3,5 times when measured at the SFJ and 2,8 times when measured at the DT site (Table 1). In addition, great differences were seen in the pattern of venous reflux if the exam was performed in decubitus or in the standing positioning (Figure 1, Tables 2 to 4). Only in 14 of the limbs (21% of the total) (Table 3) there was no change in the pattern of reflux when the exam position was changed from decubitus to standing The limbs that didn´t change the reflux pattern were four with type 2, five with type 4, one with type 5A and four with type 6 reflux pattern in decubitus (Table 3). The biggest change that occurred in the reflux pattern when measured in decubitus or standing, was in relation to the Type AB. This was the group with absence of significant reflux at any of the saphenous segments (Tables 2,3). When the exam was done in the decubitus position, in 16 limbs (23,88% of the total) reflux was not significant[16]. If the exam was performed with the patient standing, no limb presented with absence of significant reflux in any segment of the long saphenous vein (Tables 2,3). This reflux pattern changed to type 2 (venous reflux only at the proximal part of the LSV, including the SFJ) in 6 limbs (37,5%); to type 4 (reflux only in a segment of LSV but not at the SFJ) in 4 of the limbs (25%) and to type 5A (reflux from various sources including the SFJ) in 6 limbs (37,5%) and (Table 3). Eleven limbs were classified as having a type 2 venous reflux pattern (reflux only in the proximal portion of the long saphenous vein including the SFJ), when measured in the decubitus exam position. In these, only 4 limbs (36%) did not change the venous pattern reflux if examined in the standing position. In the other 7 limbs, the venous reflux pattern changed from type 2 to type 6 (diffuse reflux, including the SFJ), when the exam was done in the standing position (Table 3). In the 18 limbs that had a type 4 venous reflux pattern (segmental reflux in the LSV not including the SFJ), 13 (or 72%) changed pattern when examined in the standing position (Table 3). The majority of limbs (10 limbs or 56% in Table 3) changed the venous reflux pattern to type 6, with diffuse reflux that include the SFJ (Table 3). Other 2 limbs changed reflux to type 2 (venous reflux only at the proximal part of the long saphenous vein, including the SFJ). In one limb the reflux type changed to type 5A (multisegmentar reflux from various sources including the SFJ) (Table 3). On the other hand, only one of the 7 limbs (or 14,3%) that had a 5A venous reflux pattern (multi-segmental reflux including the SFJ) when examined in decubitus didn´t change its reflux pattern when examined in the standing position (Table 3). The reflux type changed in equal numbers (2 limbs) to type 2 (proximal venous reflux only at the proximal part of the long saphenous vein, including the SFJ), to type 2 and type 6 (Table 3). All two limbs with a venous reflux pattern type 5B (multi-segmental reflux without SFJ involvement) when examined in decubitus changed to type 2 reflux (proximal reflux in the long saphenous vein, including the SFJ) when the exam was done in the standing position (Table 3). The second largest change in reflux pattern occurred in the 13 limbs classified as having type 6 (diffuse reflux, including the SFJ) venous reflux pattern when measured in decubitus. In 9 of these limbs (or 69%) the reflux pattern changed if examined in the standing position (Table 3). From

Table 1: Measurements at the saphenous-Femoral Junction (SFJ) and at the Distal Tight (DT) regions.

	Decubitus	Standing	% change
Diameter SFJ (cm) DT	0,62 (± 0,16) 0,45 (± 0,15)	0,88 (± 0,23) 0,65 (± 0,17)	41 (p<0,001) 44 (p<0,001)
Reflux SFJ Duration DT (sec.)	1,10 (± 0,92) 1,89 (± 0,87)	2,17 (± 1,23) 3,32 (± 0,92)	97 (p=0,002) 75 (p<0,001)
MVR SFJ (cm/seg) DT	10,53 (± 6,24) 18,8 (± 5,25)	37,57 (± 10,37) 54,07 (± 12,73)	256 (p<0,001) 187 (p<0,001)

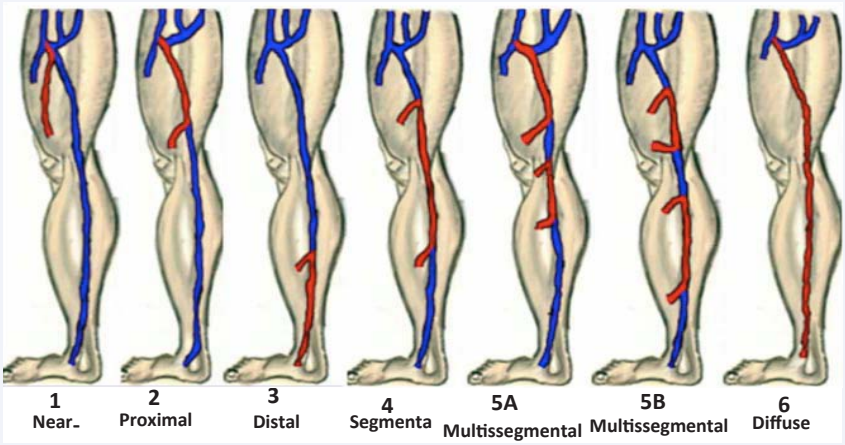

Figure 1 Types and classification of reflux (in red) in the varicose veins exam according to Engelhorn [21].v

Table 2: Reflux patterns in 67 limbs.

	Decubitus	Standing
Absent (AB)	16	0
2 – Proximal, SFJ reflux	11	18
4 – Segmental, normal SFJ	18	16
5A—Multisegmental, SFJ reflux	7	10
5B Multi Segmental, normal SFJ	2	0
6, diffuse, SFJ reflux	13	23
Total	67	67

Table 3: Change in the venous reflux pattern with the standing position.

Mesurements in decubitus position		Changes after standing		Mesurements in Standing position	
Group	**Number**	**Group**	**Number**	**Group**	**Number**
AB	16	2 4 5A	6 4 6	AB	0
2	11	2 6	4 7	2	18 (6+4+2+2+4)
4	18	2 4 5A 6	2 5 1 10	4	16 (4+5+2+2+3)
5A	7	2 4 5A 6	2 2 1 2	5A	10 (6+1+1+2)
5B	2	4	2	5B	0
6	13	2 4 5A 6	4 3 2 4	6	23 (7+10+2+4)
Total	67				67

these 4 limbs (or 31%) changed to type 2 or proximal venous reflux only at the proximal part of the long saphenous vein (LSV) including the SFJ. Other 3 limbs (or 23%) changed to type 4 (segmental reflux only in a segment of LSV but not at the SFJ) and 2 other limbs (or 15%) changed to the pattern reflux of type 5A (multisegmental reflux from various sources including the SFJ) (Table 3). The involvement of the saphenous-femoral junction in the reflux pattern changed from 46% (31 in 67) of the limbs examined when the measurements were done with the patient in decubitus to 76% (51 in 67) of the limbs when the patient was examined in the standing position (Table 4).

DISCUSSION

Standardization of any exam protocol is a must for comparison of data [1,2,24]. This is particularly true in the case of varicose veins where the clinical presentation is much influenced by body positioning [1,8,9,27,42]. However, in the available medical literature [8-30], the patient positioning for examining varicose veins with Duplex ultrasound are somewhat conflicting. The vast majority of published data indicates that the exam should be done in the standing position [8-24], however there are some publications suggesting that the exam could also be done in the decubitus position (reverse Trendelemburg) [25-30]. In order to shed light in the problem, we decided to exam the same patients in the two most common Duplex exam positioning. We choose to exam patients that had a clinical indication for varicose veins treatment. The patients were examined first in the reverse Trendelemburg and immediately after in the standing positions. Comparison of the exam data was then made and is presented in Tables (1-4). All data changes were statistically significant. In our study, venous diameter, that bears a linear relationship with venous pressure, degree of valvular incompetence and clinical findings [11,12,14,24,] was the measurement that changed the least. Even so, it increased from 0,62 (± 0,16) mm to 0,88 (± 0,23) mm at the SFJ and from 0,45 (± 0,15) mm to 0,65 (± 0,17) mm at the DT site (Table 1). The reflux time (Table 1), another measurement shown to have importance in differentiating diseased from healthy veins [15,16,19] changed from 1,10 (± 0,92) sec. (decubitus) to 2,17 (± 1,23) sec. (standing) in the SFJ site and from 1,89 (± 0,87) sec (decubitus) to 3,32 (± 0,92)sec. (standing) in the DT site. Labropoulos [22] demonstrated that significant reflux time is higher than 0,5 sec. The duration of reflux is always increased in patient with varicose vein disease [15], the same occurring with our patients. On the other hand, to the contrary of our findings (the reflux time) was shown to be bigger in the decubitus position [40,41]. This could be explained by the disease duration (mean 21 ± 7 years) in our patients. The measurement that changed the most was the maximal velocity of reflux (MVR) that changed (from decubitus to standing) 3,5 times when measured at the SFJ and 2,8 times (from decubitus to standing) when measured at the DT site (Table 1). The MVR has been shown to be more accurate in quantifying venous incompetence [19], than other measurements. One aspect that was never addressed to our knowledge was the classification of the reflux patterns when measured in the same patients in decubitus and then in the standing position (Tables 2 to 4). Traditionally reflux patterns were defined and taken only in the standing position [11,17,21]. In our case, there was a change in the reflux pattern in 79% (53 of the 77 limbs) when the exam was made in decubitus or in standing position (Ttables 2 to 4). It has to be pointed out that the reflux pattern classification [21] was only used as a reference to compare which particular vein showed reflux when examining patients in decubitus or in the standing positions. Also, it has been shown that the involvement of the saphenous femoral junction (SFJ) in the varicose vein reflux pattern is important for treatment planning [13,14]. When

Table 4: Involvement of the saphenous- femoral junction in the reflux pattern.

	Decubitus		Standing	
	Group	**Number**	**Group**	**Number**
Without SFJ involvement (Groups AB, 4, 5B)	AB 4 5B Total	16 18 2 36 (54%)	AB 4 5B Total	0 16 0 16 (24%)
With SFJ involvement (Groups 2, 5A, 6)	2 5A 6 Total (46%)	11 7 13 31	2 5A 6 Total	18 10 23 51 (76%)
Total	67		67	

examined in the decubitus position 36 (54%) of the limbs did not show a pattern of reflux that included the saphenous femoral junction (SFJ). Instead, when examined in the standing position only 16 limbs (24%) had reflux patterns without saphenous femoral junction (SFJ) involvement (Table 4). Other authors [35] have compared measurements taken in decubitus (15-degree reverse Trendelenburg or RT-15) and standing situations in the same patients. The work focused in the duration of retrograde flow and peak velocity using Valsalva maneuver and rapid cuff deflation techniques to induce venous reflux. Patients were not separated whether they had superficial (varicose veins) or deep venous reflux, since this was not the objective of the study. In another study, using healthy volunteers, the correlation between the measured to the calculated venous cross sectional area was greater in standing than in lying subjects [36]. Others [37,38] addressed valve function in normal persons and compared measurements in decubitus or standing. It was shown that the venous valvular cycle has four phases: opening, equilibrium, closing and closed. The duration of the valve cycle and of each of the four phases depended on the position of the body. In the standing position, the duration of the cycle was 2.9 to 3.2 seconds. In the horizontal position, the duration of the cycle was 1.7 to 1.8 seconds [37,38]. One study that compared external pressure necessary to narrow and occlude incompetent short saphenous veins in sitting, standing, and decubitus positions [39] showed that complete occlusion of superficial and deep leg veins occurred with 20 to 25 mm Hg in the decubitus position, between 50 and 60 mm Hg in the sitting position and at about 70 mm Hg in the standing position, demonstrating how position affects the superficial venous hemodynamic [31]. Venous reflux is the hallmark of varicose veins and one of the earlier works [32] on the subject stated: "supine position and the 10 degrees reverse Trendelemburg position is clearly inadequate for studying valve function" [32] Others also point in this direction [18,20,22]. It has been shown that flow in the veins is multifactorial and is influenced mostly by the calf muscle pump. It can also be influenced by the by cardiac impulses, respiratory cycle, venous resistance, right heart cycle, pressure in the inferior vena cava, and anatomy of veins, patient position and activity level [38]. On patients examined in the decubitus position [25], the median diameter of the LSV was 5 mm and 3 mm respectively in the SFJ and DT location. Our data showed similar values for the diameter of the LSV of 0,62 mm at the SFJ and 0,45 mm at the DT location, but the diameters increased 41 to 45% when made in the same subjects in the standing position (0,88 mm in the SFJ and 0,65 in the DT location), again showing the importance of gravity in the venous hemodynamic [31]. Authors have compared measurements made in the same patient in different positions [9,33,35,40-42] but none addressed the pattern of venous reflux change. One author [40] states that:"15% of GSVs negative for reflux in reverse Trendelenburg position were positive for reflux in the Standing Position. As a result, 3.5% of subjects in our study had a change in clinical course as the result of evaluation of the GSV in standing position". One study showed that no minimal reflux was present if the patient was examined in the reverse Trendelenburg positions [42], indicating that reflux is not well defined when using this positioning for the exam.

CONCLUSION

The exam of patients with varicose veins should be done in the standing position since there are wide variations of measurements values as well as of the pattern of reflux, if the measurements were taken in the reversed Trendelenburg position.

REFERENCES

1. Meissner MH, Eklof B, Gloviczki P, Lohr JM, Lurie F, Kistner R, et al. Mapping the future: Organizational, clinical, and research priorities in venous disease. J Vasc Surg. 2007; 46: 84-93.
2. De Maeseneer M, Pichot O, Cavezzi A, Earnshaw J, vanRij A, Lurie F, et al. Duplex Ultrasound Investigation of the Veins of the Lower Limbs after Treatment for Varicose Veins. UIP Consensus Document. Eur J Vasc Endovasc Surg. 2011; 42: 89-102.
3. American Venous Forum. Classification and grading of chronic venous disease in the lower limbs: a consensus statement. Phlebology. 1995; 10: 42-45.
4. Porter JM, Moneta GL. Reporting standards in venous disease: An update. J Vasc Surg 1995; 21: 635-645.
5. Nicolaides AN. Investigation of Chronic Venous Insufficiency. A Consensus Statement. Circulation. 2000; 102: 126–163.
6. Coleridge-Smith P, Labropoulos N, Partsch H, Myers K, Nicolaides A, Cavezzi A. Duplex ultrasound investigation of the veins in chronic venous disease of the lower limbs. UIP consensus document. Part I. Basic principles. VASA. 2006; 35; 53-61.
7. Vascular Technology: Professional performance guidelines (VTPPG) 2011. Lower Extremity Venous Insufficiency Evaluation www.svunet.org "GUIDELINE 3".
8. Dodd H. Diagnosis of Varicose Veins. Postgrad Med J. 1947; 23: 427-440.
9. Houle M, Neuhardt DL, Straight Salles-Cunha SX. Differences in saphenous vein reflux detection according to patient posicioning. J VascUltras. 2013; 37: 81-84.
10. Kohno K, Nihara H, Hamano T, Takeda M, Yamasaki M, Mizumoto K, et al. Standing posture at work and overweight exacerbate varicose veins: Shimane CoHRE Study. J Dermatol. 2014; 41: 964–968
11. Engelhorn C, Engelhorn A, Salles-Cunha S, Picheth E, Castro Jr N, Dabul Jr N, et al. Relationship Between Reflux and Greater Saphenous Vein Diameter. J Vasc Technol. 1997; 21: 167-172.
12. Zamboni P, Portaluppi F, Marcellino MG, Manfredini R, Pisano L, Liboni A. Ultrasonographic assessment of ambulatory venous pressure in superficial venous incompetence, J Vasc Surg. 1997; 2: 796-802.
13. Haan RJ, Legemate DA, VanGurp JM, Leeuwenberg A. Quantitative measurements of venous reflux by duplex scanning of the incompetent long saphenous vein before and after high ligation at the saphenofemoral junction. Eur J Surg. 1999; 165: 861-864.
14. Navarro TP, Delis KT, Ribeiro AP. Clinical and Hemodynamic Significance of the Greater Saphenous Vein Diameter in Chronic Venous Insufficiency. Arch Surg. 2002; 137: 1233-1237.
15. Yamaki T, Nozaki M, Fujiwara O, Yoshida E. Comparative evaluatuion of duplex-derived parameters in patient with chronic venous insufficiency: correlation with clinical manifestations. J Am Coll Surg. 2002; 195: 822-830.
16. Labropoulos N, Tiongson J, Pryor L, Tassiopoulos AK, Kang SS, Mansour MA, et al. Definition of venous reflux in lower-extremity veins. J Vasc Surg. 2003; 38: 793-798.

17. Wong JKF, Duncan JL, Nichols D M. Whole-leg Duplex Mapping for Varicose Veins: Observations on Patterns of Reflux in Recurrent and Primary Legs, with Clinical Correlation. Eur J Vasc Endovasc Surg. 2003; 25: 267-275.

18. Capelli M, Molino Lova R, Ermini S, Zamboni P. Hemodynamics of the sapheno-femoral junction. Patterns of reflux and their clinical implications. Int Angiol. 2004; 23: 25-28.

19. Neglén P, Egger JF 3rd, Olivier J, Raju S. Hemodynamic and clinical impact of ultrasound derived venous reflux parameters. J Vasc Surg. 2004; 40: 303-310.

20. Recek C. The Venous Reflux. Angiology. 2004; 55: 541-548.

21. Engelhorn CE, Engelhorn ALV, Cassou MF, Salles-Cunha SX. Patterns of saphenous reflux in women with primary varicose veins. J Vasc Surg. 2005; 41: 645-651.

22. Labropoulos N, Leon Jr LR. Duplex Evaluation of Venous Insufficiency Semin Vasc Surg. 2005; 18: 5-9.

23. García-Gimeno M, Rodríguez-Camarero S, Tagarro-Villalba S, Ramalle-Gomara E, González-González E, González-Arranz MA, et al. Duplex mapping of 2036 primary varicose veins. J Vasc Surg. 2009; 49: 681-689.

24. Mendoza E, Blättler W, Amsler F. Great Saphenous Vein Diameter at the Saphenofemoral Junction and Proximal Thigh as Parameters of Venous Disease Class. Eur J Vasc Endovasc Surg. 2013; 45: 76-83.

25. Haenen JH, van Langen H, Janssen MC, Wollersheim H, van't hof MA, van Asten WN. Venous duplex scanning of the leg: range, variability and reproducibility. Clin Sci(Lond). 1999; 96: 271-277.

26. Jutley RR, Cadle I, Cross KS. Preoperative investigation of the primary varicose veins. Eur J Vasc Endovasc Surg. 2001; 21: 370-373.

27. Eberhardt RT, Raffetto JD. Chronic venous insufficiency. Circulation. 2005; 111: 2398-2409.

28. Jeanneret C, Jager KA, Zaugg CE, Hoffmann U. Venous Reflux and Venous Distensibility in Varicose and Healthy Veins. Eur J Vasc Endovasc Surg. 2007; 34: 236-242.

29. Musil D, Herman J, Mazuch J. Width of the Great Saphenous Vein lumen in the groin and occurrence of significant reflux in the Sapheno Femoral junction. Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 2008; 152: 267–270.

30. Spivack DE, Kelly P, Gaughan JP, van Bemmelen PS. Mapping of superficial extremity veins: normal diameters and trends in a vascular patient population. Ultrasound in Med. & Biol. 2012; 38: 190–194.

31. Brown KR, Rossi, PJ. Superficial Venous Disease. Surg Clin North Am. 2013; 963–982.

32. van Bemmelen PS, Bedford G, Beach K, Strandness DE. Quantitative segmental evaluation of venous valvular reflux with duplex ultrasound scanning. J Vasc Surg. 1989; 10: 425-431.

33. Foldes MS, Blackburn MC, Hogan J, Klemp K, Rutherford K, Thorpe L, Auer AI. Standing versus supine positioning in venous reflux evaluation. J Vasc Technol. 1991; 15: 321-324.

34. Neglen P, Raju S. A comparison between descending phlebography and duplex doppler investigation in the evaluation of reflux in chronic venous insufficiency: a challenge to phlebography as the "gold standard." J VASE SURG. 1992; 16: 687-693.

35. Masuda EM, Kistner RL, Eklof B. Prospective study of duplex scanning for venous reflux: Comparison of Valsalva and pneumatic cuff techniques in the reverse Trendelenburg and standing positions. J Vasc Surg. 1994; 20: 711-720.

36. Jeanneret C, Labs KH, Aschwanden M, Gehrig A, Jäger KA. Measured versus calculated venous cross sectional area. Ultraschall in Med. 2000; 21: 16-19.

37. Lurie F, Kistner RL, Eklof B. The mechanism of venous valve closure in normal physiologic conditions. J Vasc Surg. 2002; 35: 713-717.

38. Lurie F, Kistner RL, Eklof B, Kessler D. Mechanism of venous valve closure and role of the valve in circulation: A new concept. J Vasc Surg. 2003; 38: 955-961.

39. Partsch B, Partsch H. Calf compression pressure required to achieve venous closure from supine to standing positions. J Vasc Surg. 2005; 42:734-738.

40. DeMuth RP, Caylor K, Walton T, Leondar LA, Rosero E, Chung, J, et al. Clinical Significance of Standing versus Reversed Trendelenburg Position for the Diagnosis of Lower- Extremity Venous Reflux in the Great Saphenous Vein. Journal of Vascular Ultrasound. 2012; 36: 19-22.

41. Lurie F, Comerota A, Eklof B, Kistner RL, Labropoulos N, Lohr J, et al. Multicenter assessment of venous reflux by duplex Ultrasound. J Vasc Surg. 2012; 55: 437-445.

42. Bonfield M, Cramp F, Robinson, T. Effect of patient positioning on the duration of venous reflux in duplex ultrasound for venous insufficiency. Ultrasound 2012; 20: 92-97.

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