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Original Article

Influence of body mass Index on saphenous venous diameter in Chronic venous insufficiency patients of rural Wardha.

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ABSTRACT

Background: - Increased Body mass index is a known risk factor in development of chronic venous insufficiency. Gold standard treatment for chronic venous insufficiency is Endovenous Laser ablation but still failures in the treatment are seen. Laser Energy used in the EVLT is calculated depending upon the diameter. But if we come to know about the variation in the diameter which is due to body mass index, then the laser energy may be calculated taking into consideration BMI along with the diameter. Aims: - In this study we want to know the variation in saphenous venous diameter due to body mass index in chronic venous insufficiency patients of rural Wardha. Method: A cross sectional type of observational study was done on 57 patients with CVI with incompetent sapheno-femoral junction. Height and weight of the patient was measured and BMI was calculated as wt/ht2. The diameter of the great saphenous vein was measured by B scanning USG and colour Doppler unit. Results: Positive correlation was found by Pearson correlation test between BMI (mean=21.31kg/mt2) and saphenous venous diameter in supine position (mean=4.7mm). 20% variation observed in diameter in supine is due to the increased BMI. By linear regression analysis, standardized coefficient was found to be BMI=0.447 DS (t=3.705, P<0.01). Positive correlation was found between BMI (mean=21.31kg/mt2) and saphenous venous diameter on Valsalva maneuver (mean=8.2mm). 9.5% variation observed in diameter on Valsalva maneuver is due to the Body mass index. Standardized coefficient was found to be "BMI=0.308 DV" (t=2.402, P<0.01).Conclusion: We showed that BMI is responsible for 20% increase in saphenous venous diameter in supine position and 9.5% increase in saphenous venous diameter on Valsalva maneuver in patients with chronic venous insufficiency.

1. Introduction

Incompetence of the deep, superficial and/or perforating veins lead to increasing venous pressure. Increased pressure in long term damages venous valve. Due to damage in venous valve vein appears as dilated, elongated, tortuous, pouched, thickened, inelastic and friable veins. Venous disorders manifest mostly as varicose veins. It can result in hyperpigmentation, edema and indurations with eventual ulceration. These changes in the skin and subcutaneous tissues of the lower leg are often referred to clinically as chronic venous insufficiency (CVI) 1.

High incidence of varicose veins and their complication increase the treatment cost.2,3 Varicose veins affects 25% to 33% of female and 10% to 20% of male adults.4-14 The prevalence of edema and skin changes due to CVI varies between 3.0% 6 and 11% 15 of the population. Brazilian Security System data reports that CVI is 14th most-frequent disease for temporary work absenteeism and 32nd frequent cause of permanent disability and public financial assistance 16 The difference in reported prevalence ranges reflect differences in the population distribution of risk factors, accuracy in application of diagnostic criteria, and the quality and availability of medical diagnostic and

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treatment resources. Risk factors include older age, female gender, pregnancy, hormones, family history of venous disease, obesity, and occupations associated with orthostasis i.e. gravitational forces from prolonged standing or sitting. 17, 18, 19.

Obesity is a well know established etiological factor. Prevalence of obesity varies in different parts of the world depending upon the ethnicity, genetic makeup and lifestyle. The increase of adipose tissue disturbs the cutaneous venous circulation. It damages the veins leading to venous stasis and varicose veins.

Venous diameter is important factor which determine the treatment modality in patients with chronic venous insufficiency. Gold standard treatment for CVI is Endovenous Laser ablation (EVLT). Laser Energy used in the EVLT is calculated depending upon the diameter. But if we come to know about the variation in the diameter which is due to increase in body mass index, then the laser energy may be calculated taking into consideration BMI along with the diameter. This may decrease the failure percentage and the financial burden of the health care system and may improve the patients' quality of life and work capacity.

Till date no study has been conducted to know the variation in saphenous venous diameter due to body mass Index in chronic venous insufficiency patients of rural Wardha. Paucity of data concerning the impact of body mass index on chronic venous insufficiency in rural Wardha provides strong rationale for conducting this study. In this study we want to find the variation in saphenous venous diameter due to body mass Index in chronic venous insufficiency patients of rural Wardha.

Methods:

· The design of the study was cross sectional type of observational study involving a single group of patients with chronic venous insufficiency with incompetent sapheno femoral junction. The study was conducted at the Department of Tifac- Core of Interventional Radiology in collaboration with Department of Physiology, Jawaharlal Nehru Medical College, Sawangi (Meghe) Wardha, Datta Meghe Institute of Medical Sciences University (Deemed University), Nagpur, Maharashtra.

Clearance from Institutional review board was obtained. Study duration was 2 years. The patient of Chronic venous insufficiency attending outdoor patient department or admitted in wards of Acharya Vinoba Bhave Rural Hospital, Sawangi (Meghe), Wardha were subjected to interview, clinical examination, and investigations using the structured schedule. The study group includes 57 patients consisting of 10 females and 47 males with mean age of 43.9 ± 12.2 yrs. Informed written consent was taken from the patient.

Inclusion criteria were varicose veins of grade C3-C6 and Chronic venous insufficiency with Incompetent sapheno-femoral junction. Exclusion criteria were Occlusive arterial diseases of leg, Obliterative arteriosclerosis, atherosclerosis of leg veins, chronic venous insufficiency with competent sapheno-femoral junction; varicose veins grade C1, C2.

Patients was interviewed and was asked about chief complains and other history of any major surgery, hospitalization, prolong immobilization, smoking, cancer, polycythemia, medication-estrogen or Oral contraceptives pills, pregnancy, prior invasive procedure of vein, hypertension and diabetes. General examination of patient was done. Height and weight of the patient was measured and BMI was calculated as wt/ht2. It was followed by clinical examination of leg under following heads -Venous dilatation, edema, Skin pigmentation and venous ulceration. A classification and grading of chronic venous disease was done according to the American Venous Forum - CEAP CLASSIFICATION. Brodie-Trendelenburg test and Perthes test for competence of venous valves was performed.

Patients who were positive by both tests were invited for further investigations at Tifac Core of Interventional Radiology, Jawaharlal Nehru Medical College, Sawangi (Meghe), Wardha. All tests were performed in morning hours between 0900Hrs to 1200Hrs.

Diagnosis of great saphenous vein incompetence was done by Doppler ultrasonographic examination in β (Brightness) - mode. Patient was asked to lie comfortably in supine position on the examination couch. The Doppler sample volume was placed at an angle of 45^0 along the great saphenous vein at the junction of upper 2/3 of thigh and lower 1/3 of thigh, and also at sapheno femoral junction.

In patient with Reverse flow longer than 0.5 seconds in saphenous segment of great saphenous vein was diagnosed to have superficial venous incompetence 20. And reverse flow longer than 0.5 seconds at sapheno femoral junction was diagnosed as incompetent sapheno-femoral junction.

Occlusive arterial diseases of leg and Obliterative arteriosclerosis were diagnosed by clinical examination of posterior tibial artery, dorsalis pedis artery, popliteal artery and femoral artery. In suspected cases diagnosis was confirmed by colour Doppler examination. Atherosclerosis of leg veins, chronic venous insufficiency with competent sapheno-femoral junction, varicose veins grade C1, C2 were diagnosed by clinical examination of veins and was confirmed by colour Doppler examination.

In 2 year duration total of 57 Patient fulfilled the criteria of varicose veins of grade C3 to C6, who were clinically positive with Trendelenburg test and Perthes test and who were positive on duplex scanning examination for chronic venous insufficiency with incompetent sapheno-femoral junction and they agreed to participate in the study by giving written consent.

The diameter of the great saphenous vein was measured by B scanning on Philips Enviser USG and colour Doppler unit. High frequency linear array transducer probe of 7.5 megahertz was used. The probe was placed on the saphenous tract between the inferior one - third of thigh and superior two - third of the thigh. The diameter of GSV was measured in transverse plane at junction

of lower one third and upper two third of thigh .The diameter was measured in

Supine position (DS)

Valsalva maneuver (DV)

3. Results: -

Out of 57 patients 10 were females and 47 were males. The sex ratio in the study was male: female 4.7:1. Mean age of the study population was 43.9 ± 12.2 yrs. All female patients had given history of pregnancy.

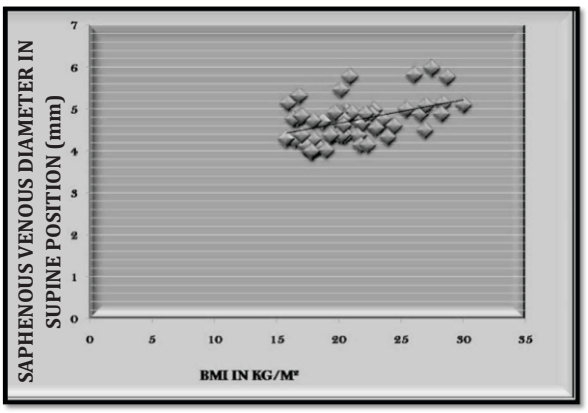
2 patients were having BMI <16 kg/m^2. 4 patients were having BMI between 16- 16.99 kg/m^2 and 8 patients were having BMI 17-18.49 kg/m^2. 33 patients were having BMI 18.5-24.99 kg/m^2, 9 patients were having BMI 25-29.99 kg/m^2 and 1 pt was having 30-34.99 kg/m^2. BMI Mean BMI was 21.31 ± 3.6 kg/m2

Graph no. 1 shows positive correlation of Body mass index (mean = 21.31 kg/mt^2) on X axis and saphenous venous diameter in supine position (mean = 4.7 mm) on y axis, indicating that increase in BMI is associated with increase in great saphenous venous diameter in supine position (r= 0.447, p<0.05). The significant correlation was further interpreted by linear regression analysis. 20% variation observed in diameter in supine is due to the increased BMI (R2=0.02). After making the variable unit less, standardized coefficient was found to be BMI = 0.447 DS (t= 3.705, P<0.01).

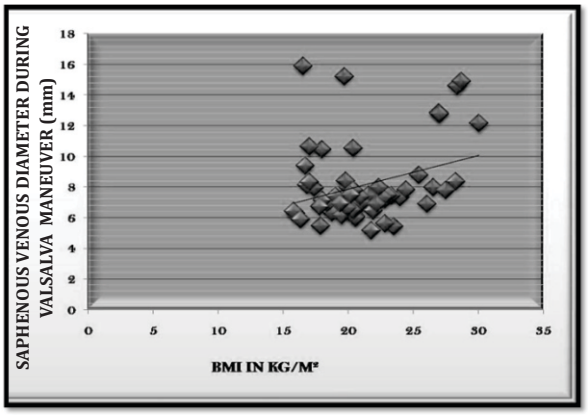
Graph no 2 shows positive correlation of Body mass index (mean = 21.31 kg/mt^2) on X axis and saphenous venous diameter on valsalva maneuver (mean = 8.2 mm) on y axis, indicating that increase in BMI is associated with increase in great saphenous venous diameter. (r= 0.308, p<0.05). The significant correlation was further interpreted by linear regression analysis. 9.5% variation observed in diameter on Valsalva maneuver is due to the Body mass index (R2=0.095). After making the variable unit less, standardized coefficient was found to be "BMI = 0.308 DV" (t= 2.402, P<0.01).

Figure

Graph No. 1. Showing positive correlation of Body mass index and saphenous venous diameter in supine position



Graph No. 2. Showing positive correlation of Body mass index and saphenous venous diameter during Valsalva maneuver



4. Discussion: -

In our study we found that CVI is more common in males than in female in rural Wardha population. It might be due to; firstly males are occupied more in occupation requiring prolonged standing. Secondly women bother less about the medical problem and do not seek medical advice till the condition becomes severe and unbearable. Thirdly being a rural area female consume less oral contraceptive pills and so are at less risk of deep venous thrombosis and Chronic venous insufficiency. These findings are in accordance with Nobl 21 1910 and Nicholson22 1927 who found male predominance. Stanhope J M 23 1975 showed modest prevalence in men and very low prevalence in women.

In this study also, we found a positive correlation between BMI and great saphenous venous diameter which may lead to chronic venous insufficiency. Our study is in accordance with Scott TE 24, Musil D 25, K Kroger26, Callam MJ 27, Lee A J 28 , Beaglehole R 9 , Ochsner A 29 , Criep 31 , Evan 31 , Kroetz 32 and Rotky 33, Arkadiusz 34, Willenberg T 35 They suggested that obesity acts as a promoter of varicose veins rather than true primary risk factors.

According to Willenberg T 35 emphasized mechanical role of abdominal adipose tissue which potentially increases the risk for both venous thromboembolism and chronic venous insufficiency.

Arcangelo Iannuzzi 36 stated that obesity could augment adipose and fibrous tissue surrounding veins which may .hamper the normal blood flow exchange between superficial and deep veins of the lower limbs. The increase of adipose tissue disturbs the cutaneous venous circulation and damages the drainage veins, provoking stasis and subsequently the appearance of varicose veins.

Van Rij A M 37 suggested that raised intra-abdominal pressure due to obesity leading to greater reflux, increased vein diameter and venous pressures.

Till date no study has been conducted to know the variation in the diameter which is due to BMI. But if the variation in the diameter which is due to obesity is established, then the laser

energy may be calculated taking into consideration BMI along with the diameter. 20% variation was observed in diameter in supine is due to the increased BMI in supine position, which suggest that 20% increase in diameter in supine position is due to increase in BMI, which may imply that increased diameter is due to external factor like augmented adipose and fibrous tissue surrounding veins or mechanical obstruction due to abdominal adipose tissue. And this excludes the possibility of inherited deficiency in the venous valve or venous wall. So more energy may ideally required in patients having inherited deficiency in the venous valve or venous as the damage having low BMI. So our study suggests that BMI should also be considered for calculating the laser energy for EVLT. This data enables us to known the impact of obesity in developing CVI.

Summary and conclusion

Prevalence is more in males than females in rural Wardha population. Body mass index and previous pregnancy has been associated with the presence of varicose veins in females. The study has indicated that damage to the venous drainage caused by BMI is severe and it cause 20% increase in venous diameter in supine position and 9.5% increase in diameter on Valsalva maneuver.

Future scope: -

New formula may be devised for calculating amount of laser energy using BMI along with venous diameter.

Limitation: -

Study should be conducted on larger population and in different regions of the world

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