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The Association Between Hemodynamic Venous Blood Flow Changes And Obesity In The Lower Limbs.

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ABSTRACT

Background and objectives: Although increase in body fat is a recognized risk factor for the development of lower limb venous disease, minimum attention has been given to identify and measuring the effect of obesity on hemodynamic vascular changes related to blood flow in the lower limbs.

Patients and methods: The diameter of lower limb veins and venous blood flow were measured in 207 patients having larger BMI than normal and chronic venous disease.

Results: there was a strong positive correlation between weight and BMI and qualified perforator diameter. Other changes such as GSV and SSV diameter show no significant relationship with obesity, weight and age.

Conclusions: These data shows that obesity has a positive correlation with both structural and hemodynamic changes in the lower limb veins.

Keywords: Body mass index (BMI), Great saphenous vein (GSV), Small saphenous vein (SSV).

INTRODUCTION

Not only chronic venous disorders frequent, but they are significantly connected with morbidity, such as chronic venous insufficiency[1].Genetic predisposition, reflux from venous value incompetence, decreased muscle pump function from immobility, prior deep vein thrombosis, and non-thrombotic venous blockage are some of the multifactorial causes of the pathophysiology. These elements cause venous hypertension to arise, which then causes venous dilatation and congestion, characteristic sclerotic skin changes, and finally skin ulceration.[2],[3] It has long been hypothesized that obesity may have a role in the path physiology of chronic venous illness, in addition to these established risk factors for the development of the condition.[4],[5]

It is currently unclear to what degree this is caused by chronic inflammation, which is characterized by adipokine release, neutrophil infiltration, endothelial dysfunction, and/or increased coagulase activity, or by a purely mechanical effect, such as reduced lower limb venous return owing to increased intra-abdominal pressure.[6],[7] Furthermore, while viscerally deposited fat may not immediately block venous return from the legs, abdominal adipose tissue may be more closely linked to the development of chronic venous disease than viscerally deposited fat, given the sex- and age-dependent distribution of adipose tissue.[8], [9]

Therefore, our goal was to unbiasedly look into changes in the lower leg veins' structure and hemodynamics. In people with fat dispersed across their abdomens (the so-calledabdomen panniculus). with the recruitment of patients who met WHO obesity criteria, and their deep and superficial venous systems were examined both during ascent and at rest of their panniculus in the abdomen. Additionally, our goal was to Examine if there are any indications of chronic vein disease. connected with the existence of obesity in and of itself or if They have anything to do with the level of obesity.

METHODS

The study included all adult patients (C2-C6 only) who presented in OPD of department of general surgery, index medical college indore .The ethics committee of the University of malwanchal approved the study. Every groups as well as every patient given written informed consent before taking part in the study. A total of 207 people recruited in this study , those exhibiting clinical signs of persistent venous illness

Patients with a body mass index (BMI) of more than 30 kg/m2 and clinical signs of chronic venous disease such as varicosities >3 mm in diameter (C2), telangiectasia or reticular veins < 3 mm in diameter (C1), phlebedema (C3), hyperpigmentation and gravitational eczema (C4a), dermatoliposclerosis and atrophie blanche scarring (C4b), corona phlebectatica (C4c), and healed (C5) or active (C6) were the patients that met the inclusion criteria.

Patients having a history of peripheral artery disease and deep vein thrombosis were excluded to reduce confounding variables. Since acquired venous disease rather than congenital venous disease was the main focus, patients under the age of 18 were also excluded.

Every patient had a thorough clinical and sonographic assessment. We documented &categorized signs of chronic venous illness using the International CEAP Classification.[10],[11]

The conventional procedure for performing duplex sonography was as follows: The great saphenous vein (GSV) was located in the sitting posture at the level of the mid-thigh. The patient's panniculus was manually elevated before the GSV's diameter was measured both at rest and after. Figure -1 &2

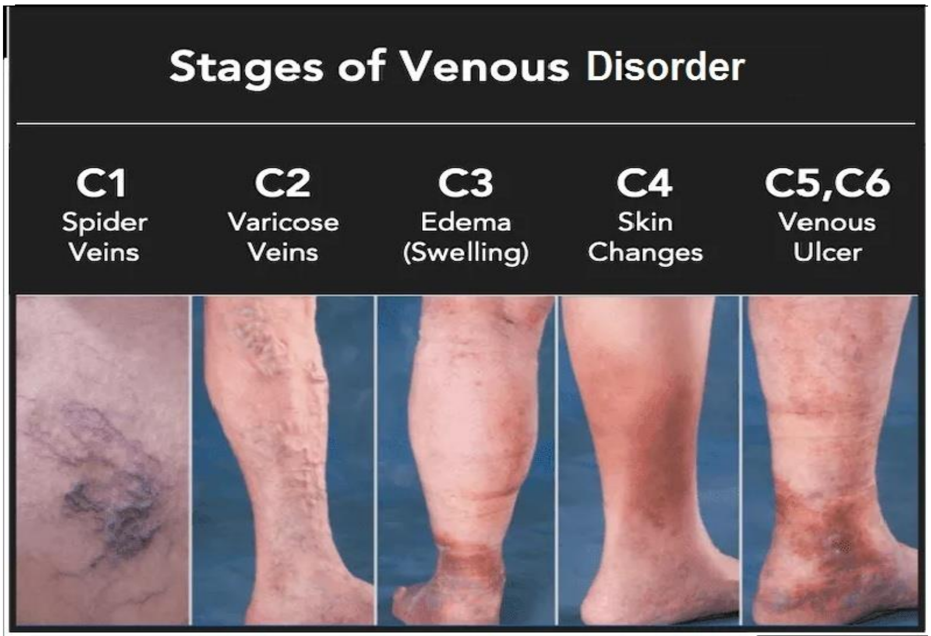

Figure 1:

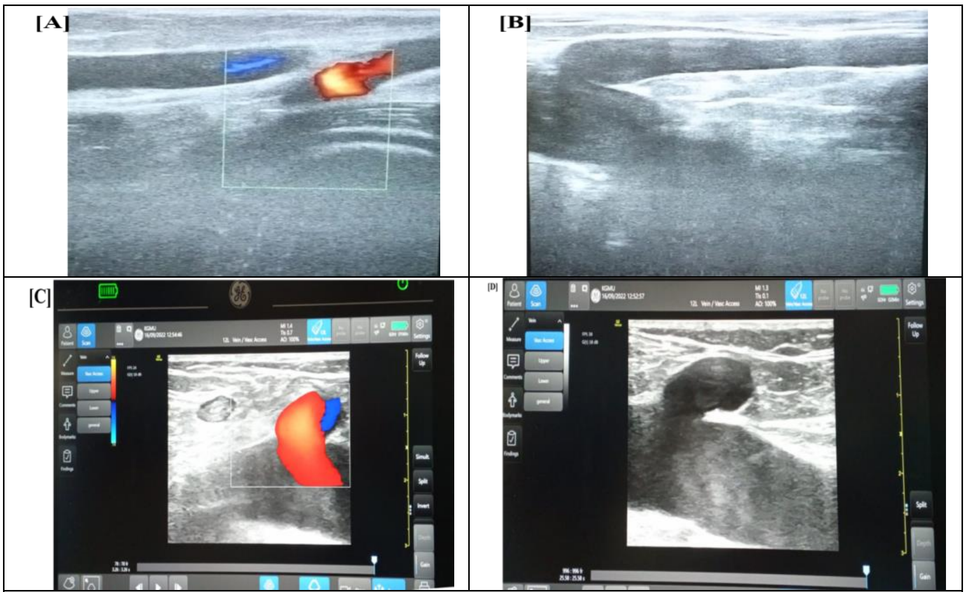

Figure2: [A] Incompetent perforator, [B]Saphenofemoral junction on B mode, [C] Incompetent SFJ on colour mode of duplex scan, [D] Duplex scan showing SFJ

Then, as conventional hemodynamic parameters, flow volume (ml/min) and flow rate (cm/s) were measured, and the mean was computed and noted. The patient was subsequently placed in a semi-supine posture (30° trunk elevation), and while at rest, the same parameters were measured in the groin's common femoral veins (CFV).

After that, the patient raised their panniculus, and the measurements were taken once more. Every measurement was done three times, and the mean was determined and noted .In order to minimize the possibility of measuring artifact caused by standing and raising the abdominal panniculus, measurements were conducted while the subject was seated or partially supine.

Duplex sonography was utilized to quantify venous reflux in the popliteal, great saphenous, common femoral, and small saphenous veins in order to complete the phlebological assessment. Lastly, height, weight, BMI, obesity grade (based on the WHO definition, grade 1-3), and the waist-to-hip ratio (WHR) were noted in order to ascertain if obesity in general or particular obesity factors were linked to morphological and hemodynamic alterations in the lower leg veins .[12]

RESULT

AGE	n	%
≤20 years	11	5.50
21-30 years	61	30.50
31-40 years	84	42.00
41-50 years	30	15.00
51-60 years	11	5.50
>60 years	3	1.50
Mean±SD	35.65±9.91	

Table 1: Distribution of patients by age groups

Table 1 Show the distribution of patients according to different age groups. The patients were 35.65 ± 9.91 years old on average. The percentages for age groups under 20, between 20 and 30, between 31 and 40, between 41 and 50, between 51 and 60, and above 60 were 5.50%, 30.50%, 42.00%, 15.00%, 5.50%, and 1.50%, respectively.

	Mean	Median	Std. Deviation	Minimum	Maximum
Weight (kg)	75.41	79.80	12.34	36.00	95.00
Height (cm)	161.24	162.43	12.85	94.74	200.66
HIP (cm)	61.02	41.75	260.48	31.50	370.00
WAIST (cm)	40.09	41.30	4.35	24.50	45.90
BMI (kg/m2)	29.37	29.30	6.97	13.81	95.81

Table 2: Details of anthropometric parameters

Table 2 Show the details of anthropometric parameters. The mean weight (kg), height (cm), Hip (cm), Waist (cm), and BMI (kg/m2) of the patients were 75.41±12.34, 161.24±12.85, 103.52±8.95, 101.83±11.06, and 29.37±6.97, respectively.

VCSS	≤10	95	47.50
	>10	105	52.50
	Mean±SD	10.40±2.54	

Table 3: Distribution of patients according to Venous Clinical Severity Score (VCSS)

Table 3 Show the distribution of patients according to Venous Clinical Severity Score (VCSS). The mean VCSS was 10.40±2.54. The percentage of ≤10 and >10 VSCC was 47.50% and 52.50% respectively.

The mean VCSS, Diameter of GSV just below SFJ (mm), at upper thigh (mm), at mid-thigh (mm), GSV Diameter above knee (mm), below knee (mm), GSV Diameter at Mid leg (mm), GSV Diameter at Med. Malleolus (mm), SSV Diameter Just below knee (mm), SSV Diameter at mid-calf (mm) and SSV Diameter at Lat. Malleolus (mm) were 10.40±2.54, 9.09±2.04, 8.10±1.96, 7.13±1.93, 6.28±1.89, 6.81±1.77,6.61±1.88,4.79±4.13,3.93±0.75,4.47±5.84,and3.85±2.86,respectively**Table 4).**

	Mild (n=95)		Moderate (n=105)		t	p-Value
	Mean	±SD	Mean	±SD		
Age (years)	35.21	9.47	36.04	10.32	-0.585	0.559
HIP (cm)	114.05	100.51	192.01	908.60	-0.831	0.407

WAIST (cm)	101.56	11.89	102.08	10.31	−0.331	0.741
BMI (kg/m²)	29.35	4.96	29.39	8.42	−0.035	0.972

Table 4: Association of anthropometric data of patients in between mild and moderate VCSS

Between mild and moderate VCSS, there was no significant difference in the mean diameter (mm) just below the SFJ, GSV diameter of the thigh, GSV diameter at mid-thigh, GSV diameter above the knee, GSV diameter below the knee, GSV diameter med. malleolus, SSV diameter lateral malleolus, or SSV diameter just below the knee. In moderate as opposed to mils VCSS, the mean GSV diameter mid leg was considerably higher.

	Age		**Weight**		**BMI**	
	Pearson Correlation	**p-Value**	**Pearson Correlation**	**p-Value**	**Pearson Correlation**	**p-Value**
VCSS	0.077	0.277	−0.016	0.825	0.059	0.409
Diameter of GSV just below SFJ	0.028	0.690	−0.001	0.994	−0.028	0.690
GSV Diameter of upper thigh	−0.001	0.990	−0.032	0.651	−0.048	0.504
GSV Diameter mid-thigh	0.025	0.729	−0.013	0.853	−0.057	0.421
GSV Diameter above knee	0.007	0.918	−0.050	0.479	−0.087	0.221
GSV Diameter below knee	0.040	0.572	−0.020	0.780	−0.024	0.738
GSV Diameter Mid leg	0.056	0.434	0.091	0.198	0.100	0.158
GSV at Diameter medial.Malleolus	0.019	0.788	0.015	0.838	−0.025	0.728
SSV Diameter Just below knee	0.000	0.999	−0.036	0.617	−0.124	0.079
SSV Diameter mid-calf	0.016	0.820	−0.041	0.570	0.045	0.531
SSV Diameter Lat. Malleolus	0.123	0.085	0.036	0.612	0.005	0.949
Ant.Accesory.SV Diameter. Just below the insertion	−0.017	0.823	−0.039	0.603	0.040	0.600
Diameter of Competent perforators	0.183	0.228	0.500	0.000	0.339	0.021
Diameter of Perforator	0.136	0.056	−0.073	0.305	0.013	0.852

Table 5: Correlation of age, weight and BMI with VCSS and diameter of GSV and SSV

Table 5 Shows the correlation of age, weight, and BMI with diameter just below the VCSS, Diameter just below SFJ (mm), GSV Diameter at upper thigh (mm), GSV Diameter at mid-thigh (mm), GSV Diameter above knee (mm), GSV Diameter below knee (mm), GSV Diameter at Mid leg (mm), GSV Diameter at Med. Malleolus (mm), SSV Diameter Just below knee (mm), SSV Diameter at mid-calf (mm),SSV Diameter at Lat. Malleolus (mm), Ant.Ace. SV diameter just below insertion, diameter of competent perforators, and diameter of perforator. Data were presented as mean (mm), median (mm), range (minimum and maximum). Age, weight, and BMI were not significantly associated with the various anatomic changes in varices.

DISCUSSION

Although there have long been methods for recording venous outcomes, recent attention has focused on clinician-developed evaluation tools for tracking clinically defined end goals and changes over time. There are numerous techniques for evaluating venous outcomes, but no agreed paradigm. This is partially attributable to the various assessment systems' differing emphasis, which ranges from relatively static elements in the clinical CEAP to subjective parameters in tools for venous disease-specific quality of life assessment, such as the CIVIQ used in this study or others like the Aberdeen Varicose Vein Questionnaire [13] and the Charing Cross Venous Ulceration Questionnaire.

The VCSS was created in order to objectively assess each patient's response to treatment and its results. Instead of being qualitative, this grading system was quantitative. Simply put, the CEAP invalidity score evolved into the VDS. It assigns patients a functional level based on whether they are receiving compression therapy, limb elevation, or both. It is straightforward and probably certainly has a tight connection to life quality [14]. According to the study by Perrin et al. examining the efficacy of treating chronic venous disease [15], the VCSS and VDS are useful and simple-to-evaluate instruments that are assessed differently depending on the severity of the disease. By testing the findings with the same and other observers, Meissner and colleagues [16] assessed the repeatability of the VCSS.

A total of 122 participants (or 61%) in this study had an anterior accessory great saphenous vein. Below the great saphenous vein, below the knee, and in the midthigh, respectively, the rates of confluence of the anterior accessory great saphenous vein with the great saphenous vein were 37.00%, 25.00%, and 38.00%. The anterior auxiliary great saphenous vein was discovered right below the confluence in 178 (89%) of the total 178 legs. The anterior accessory great saphenous vein had competence rates of 11%, 32.50%, and 56.00%, respectively. The perforators were competent, incompetent, or absent in 28.00%, 57.50%, and 14.50% of instances, respectively.

The rates of missing perforators above, below, mid-knee, mid-leg, above-ankle, mid-malleolus, and ankle were correspondingly 15.50%, 15.00%, 32.00%, 0.50%, and 35.50% in the current study. In the sample, perforators 1, 2, and 3 made up 66.00%, 25.00%, and 9.00% of the total.

In our study, the mean VCSS diameter just below the SFJ (mm), GSV diameter at the thigh (mm), GSV diameter at the mid-leg (mm), GSV diameter at the medial malleolus (mm), SSV diameter just below the knee (mm), SSV diameter at mid-calf (mm), and SSV diameter at lat. malleolus (mm) were 0.40±2.54, 9.09±2.04, 8.10±1.96, 7.13±1.93, 6.28±1.89, 6.81±1.77, 6.61±1.88, 4.79±4.13, 3.93±0.75, 4.47±5.84, and 3.85±2.86, respectively.

The male-to-female ratio was 1.4:1, and the mean age of the patients was 44.47± 12.65 (17-81) years. Age progression and clinical staging of varices according to clinical categorization showed a significant association [17]. Patients with more than five years of symptoms had a significantly larger mean diameter of the great saphenous vein at the knee. Mean BMI did not differ significantly between clinical stages of varicosis .

CONCLUSION

This study was done to study the hemodynamic venous changes as well as anatomical variation associated with obesity patients having chronic venous disease. in this study a strong positive correlation was found between BMI and diameter of the qualified perforators. This study raise the possibility that exercise and reduction in weight can be a helpful and reversing strategy to slow and stop the further development of chronic venous diseases.

CONFLICT OF INTEREST

None.

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