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Dr. Saniya Ahmed
Assistant Professor, Department of
General Surgery, Deccan College of
Medical Sciences, Hyderabad,
Telangana, India

Dr. Saif Mohammed Khan
Assistant Professor, Department of
General Surgery, Deccan College of
Medical Sciences, Hyderabad,
Telangana, India

A study on efficiency and sensitivity of evaluation and post operative management of varicose veins: A Prospective observational study

Dr. Saniya Ahmed and Dr. Saif Mohammed Khan

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Abstract

Background: The present study was conducted with the aim to evaluate the clinical features and management of varicose veins in terms of recurrence and symptoms improvement.

Methodology: It was a prospective study; fifty cases of varicose veins were attending outpatient Department and admitted in the Surgical Department of Deccan College of Medical Sciences & Hospital from October 2018 to September 2019.

Results: In the present study, out of the 55 limbs examined and investigated, 7 limbs (12.72%) found to have suffered from deep vein thrombosis. Out of these 3 (5.4%) were found on clinical examination while investigations revealed deep vein thrombosis in 4 (7.2%) limbs. Routine investigations were carried out to evaluate patients' fitness for surgery. Out of 50 patients 2 (5.5%) were unfit because of severe cardiac problem. The colour doppler study was done in all cases of which, in 12 cases (21.81%) an additional information was found. Out of these in two patient (16.66%) two perforators missed on clinical examination was detected while in 6 patients (50%) additional information about perforator competency was found. Four patients have got additional information about deep vein patency. The accuracy of colour doppler in detecting SFJ and SPJ incompetence was 100%. By colour doppler, a total of 21 sites were marked as incompetent perforators, out of which 19 were found correct on exploration (90.47% specificity). Abdominal ultrasonography was performed in all patients. No abnormality was found in 49 of them while one had small left renal calculus. Various combinations of operations were carried out, according to the site of pathology determined by clinical examination and investigations. In our study, out of 55 limbs affected, only 14 limbs were operated upon. Out of 55 limbs, 41 were (74.54%) treated conservatively. Majority of them 29 were (64.1%) relieved of the symptoms by conservative method. From total 50 patients, 23 were treated on out Patients basis while 27 patients (46%) needed admission for either operative purpose or for ulcer healing. The average stay with 13 patients (45%) having ulcer was 15days. Stay was shorter in 14 patients (55%) who were not having ulcer, was average 11days. In the present study, only early post operative complications were noted in the post operative hospital stay in all the 14 patients, of this 1 patient (7.14%) developed wound infection. Only late post operative complications were noted during the follow-up period on outpatient basis. There were no mortalities noted in the intra-operative or the immediate postoperative period.

Conclusion: A good clinical assessment with investigations, treatment of associated complications and a combination of surgical procedures have beneficial effects in minimizing cost and morbidity of varicose vein surgery.

Keywords: Varicose veins, ultra sonography, deep vein thrombosis, mortality, morbidity

Introduction

Abnormally dilated veins are called varicose veins. Varicose veins result from chronic venous insufficiency, which is a complex condition whereby the veins do not efficiently return blood from the legs to the heart^[1]. Varicose veins are commonly found in the lower limbs and may be seen either as dilated and tortuous veins or as palpable veins under the skin. Varicose veins in the lower extremities are a sign of chronic venous disorder due to valvular incompetence of the superficial venous system, and they are highly prevalent in the world^[2, 3]. Although varicose veins do not usually cause fatal conditions, concomitant complications will occur^[4, 5] and they may significantly reduce the quality of life; therefore, effective therapies are necessary^[6, 7].

This study aimed to review the current management modalities for varicose veins. There are a variety of management modalities for varicose veins. The outcomes of the treatment of varicose

Corresponding Author:
Dr. Saif Mohammed Khan
Assistant Professor, Department of
General Surgery, Deccan College of
Medical Sciences, Hyderabad,
Telangana, India

veins are different. The papers on the management of varicose veins were reviewed and the postoperative complications and efficacy were compared. A randomized controlled study in multiple centres is warranted to verify which approach is better than others for the treatment of varicose veins.

Therefore; in the present study, we investigated that various conventional and surgical procedures for treatment of varicose veins and evaluate the mortality and morbidity.

Materials and Methods

Study design

Fifty cases of varicose veins were attending outpatient department and admitted in the surgical department of Deccan College of Medical Sciences from October 2018 to September 2019. The cases were studied purely on prospective basis. No retrospective cases were added in the study.

Data collection

A clinical proforma was prepared before starting the study. Based on this Proforma a clinical data was collected by thorough clinical examination and investigations of these cases. The comprehensive clinical data accumulated the following details. In the bio-data of the patient, name, age, sex, and address were routinely noted down. Occupation was asked for with a particular note, on whether, it included prolonged hours of standing.

The history included the presenting symptoms, the possible predisposing factors and the complications of varicose veins. Previous history of surgeries for varicose veins or anything else and earlier episodes of deep venous thrombosis were elicited. Family history of varicose veins was queried. Personal history included details to elicit complaints of constipation and history of addictions. A detailed clinical examination was carried out with respect to varicose veins. The side of limbs affected, the venous system involved and the status of the communicating veins was evaluated. Complications like skin changes, as pigmentation, eczema and ulceration were noted down.

Clinical tests

To detect the site of pathology in the venous system, the following clinical tests *viz.* Brodie-Trendelenberg's test, multiple tourniquet's test. Fegan's and Shwartz's test were carried out. Modified Perthe's test, Homan's & Moses sign were elicited to diagnose deep vein thrombosis. Other tests like pratt's test, two Tourniquet test, hobbs's sliding finger test Maharn - Ochsners comparative tourniquet test are carried out. A systemic examination was performed, especially the per-abdominal examination to rule out abdominal pelvic tumours.

Routine hematological investigations were carried out as a pre-operative assessment of patient's fitness for Anaesthesia. ECG and Chest X-ray were taken whenever indicated. In specific investigations abdominal ultrasonography was done to rule out abdominal pathology causing varicose veins. Pus from the ulcer was sent for culture and antibiotic sensitivity in patients presenting with ulcers. Doppler probe study was carried out in all the patients to detect sites of incompetent perforators and in those suspected of having D.V.T. No patient was subjected to invasive test like venography.

Management

After clinical examination and investigation the patients were classified into two categories.

Category I

This included patients who are having symptoms without any complication. These patients were initially treated conservatively and if not relieved of the symptoms in 6 weeks then only subjected for surgical management. Most of these patients were treated on the outpatient basis.

Category II

This included those presenting with long term symptoms with associated complications like oedema or ulceration. They were first subjected to conservative line of management with an objective to control the associated complications. Later, they underwent definitive operative treatment. The conservative treatment included

Results

Deep vein thrombosis

Out of the 55 limbs examined and investigated, 7 limbs (12.72%) found to have suffered from deep vein thrombosis. Out of these 3 (5.4%) were found on clinical examination while investigations revealed deep vein thrombosis in 4 (7.2%) limbs. Only one patient had previous history suggestive of suffered from deep vein thrombosis.

Table 1: Showing Deep vein thrombosis

	Number	Percentage
Legs suffered from D.V.T.	7	12.72
Legs not suffered from D.V.T	48	87.27

Investigations

Routine investigations were carried out to evaluate patients' fitness for surgery. Out of 50 patients 2 (5.5%) were unfit because of severe cardiac problem.

The specific investigations done were abdominal ultrasonography and colour doppler study in all patients. The colour doppler study was done in all cases of which, in 12 cases (21.81%) an additional information was found. Out of these in two patient (16.66%) two perforators missed on clinical examination was detected while in 6 patients (50%) additional information about perforator competency was found. Four patients have got additional information about deep vein patency.

The accuracy of colour doppler in detecting SFJ and SPJ incompetence was 100%. By colour doppler, a total of 21 sites were marked as incompetent perforators, out of which 19 were found correct on exploration (90.47% specificity). So, for perforator incompetence, colour doppler missed detection of 1 perforator sites, and 2 sites were marked wrongly as false positive. So the sensitivity of colour doppler for perforator incompetence was 95% and specificity was 90.47%.

Abdominal ultrasonography was performed in all patients. No abnormality was found in 49 of them while one had small left renal calculus.

Table 2: Showing Sensitivity of Doppler Study

	Total no. of site marked on Doppler	Correct Doppler finding	Operative finding	percentage
S-F	9	9	9	100%
S-P	1	1	1	100%
Perforator	21	19	20	95%

Table 3: A. Sensitivity of Doppler Study

	Total no. of site marked on Doppler	Operative finding	percentage
S-F	9	9	100%
S-P	1	1	100%
Perforator	21	20	90.47%

Operations performed

Various combinations of operations were carried out, according to the site of pathology determined by clinical examination and investigations. Out of 55 limbs affected, only 14 limbs were operated upon.

Table 4: Showing Operations Performed

Operations Performed	No of limbs	percentage
Trendlenberg's + Stripping+ Dodd and Cocketts	3	21.12%
Trendlen berg's + Stripping	6	42.85%
Dodd and Cocks	5	35.71%
Total	14	100%

Conservative treatment

Out of 55 limbs, 41 were (74.54%) treated conservatively. Majority of them 29 were (64.1%) relieved of the symptoms by conservative method. 7 were (26.4%) having deep vein thrombosis, so not taken for operative management. 2 patients (5.8%) were candidates for operation but not willing and 1 patients were unfit.

Table 5: Showing Conservative Treatment

	No of patients	percentage
1. Patients relieved	18	43.39%
2. Patient having ulceration	13	31.7%
3. Patients with deep vein thrombosis	07	17%
4. Patients unfit for surgery	01	2.43%
5. Patients not willing	02	4.8%
Total	41	100%

Hospital stay

From total 50 patients, 23 were treated on out patients basis while 27 patients (46%) needed admission for either operative purpose or for ulcer healing. The average stay with 13 patients (45%) having ulcer was 15days. Stay was shorter in 14 patients (55%) who were not having ulcer, was average 11days.

Table 6: Showing hospital stay

Stay in hospital	No of patients	No days	percentage
Patients with operative treatment	14	10.92	55%
Patients not having operation	13	15	45%

Complications

Only early post operative complications were noted in the post operative hospital stay in all the 14 patients, of these 1 patient (7.14%) developed wound infection. Only late post operative complications were noted during the follow-up period on outpatient basis. 2 patients did not turn up for the follow up. In the remaining 12 patients one had (8.33%) parasthesia and numbness in distribution of saphenous nerve while other one (8.33%) had residual, varicosities.

Table 7: Showing surgical complications of varicose patients

Complications	No of patients	Percentage
Early		
wound infection	1	7.1%
Late		
Saphenous N. damage	1	8.33%
Residual varicosities	1	8.33%
Total	3	21.4%

Mortality

There were no mortalities noted in the intra-operative or the immediate postoperative period. No patients coming for the follow up had mortality during follow up period.

Discussion

Case evaluation and diagnosis

Deep vein thrombosis

Varicose veins are known to follow episodes of deep vein thrombosis, when they are secondary. The series of pathological events that follow deep vein thrombosis are termed together as the 'post-phlebitic' syndrome [8]. Western studies by Cockett [9] show that 48% of cases of varicose veins follow the episodes of deep vein thrombosis (D.V.T.) these episodes may be symptomatic or asymptomatic [10]. This is proved in a study which says that as many as 35% of attacks of D.V.T. are asymptomatic so, the actual figure could be high. A similar Indian study shows that the history of D.V.T. is present in about 39.62% patients of varicose veins [11].

Table 8: Comparison of association with Deep vein Thrombosis

Study	Percentage of cases with D.V.T
Cockett F.B. [9]	47.96
Vaidyanathan S. [23]	39.6%
Present Study	12.72%

As Compared to other studies the Percentage of patients with deep vein thrombosis is on the lower side.

Superficial venous system involved

The studies which have evaluated the superficial venous system involvement have shown that the long saphenous vein is more commonly involved. This is clear from the following table. In other studies, only Sapheno-Femoral and Sapheno -Popliteal valves have been studied while our study have evaluated other perforators also, this may be the reason of less incidence noted in our study.

Table 9: Comparison of involvement of superficial venous system

Study	LSV	SSV	BOTH
Jakobsen (1979) [12]	41(85.7%)	21(4.5%)	48(9.8%)
Hobbs [13]	51(83.6%)	5(8.2%)	5(8.2%)
Present study	42(76.36%)	10(18.18%)	3(5.4%)

The increased affection of the long saphenous vein is as a result of direct effect of central venous pressure on the saphenofemoral valve in the proximal valve defect the present study corroborates with the findings of the other studies compared with.

Sites of valvular defects

It has been found in various studies that the sapheno-femoral valve is incompetent more number of times than the sapheno - popliteal valve. This is due to the fact that the sapheno-femoral valve is the first to be affected by the increased venous pressure in the proximal veins.

Table 10: Valves Defective

Study	SFV	SPV
Jakobsenb (1974) ^[12]	95%	14%
Hoare <i>et al.</i> ^[14]	95.6%	34.7%
Present study	36%	12.72

Investigations

There has always been a quest for investigations which can confirm and further provide information regarding clinically evaluated cases of varicose veins. Although contrast radiographic studies remain the standard of diagnosis of venous disease, non-invasive techniques are assuming an increasing important role in the diagnosis of these conditions and are proving to be cost effective ^[15, 16]. Without these objective diagnostic Techniques, the clinical assessment of varicose veins frequently would be in error.

These techniques are as follows –

Doppler ultrasound

This is the most inexpensive and versatile method of evaluating the venous system. It can accurately pin -point the sites of incompetent perforators and make a critical comment on the patency of deep venous system.

In the present study, 55 patients were studied with the help of Doppler. All patients were treated with the help of clinical evaluation and Doppler study. The clinical and doppler study findings were confirmed intra- operatively, in 14 patients who were subjected for operative management. This showed that clinical accuracy was overcome by the doppler assessment. The doppler study was found to have 95% accuracy. Compression sonography and color and PW Doppler are systematically employed to assess the absence of deep venous thrombosis. Femoro-popliteal veins are evaluated with color and PW Doppler for valvular insufficiency with reflux by performing Valsalva maneuver and calf compression. The sapheno-femoral and sapheno-popliteal junctions are examined to identify type of junction, continence, accessory saphenous, and incompetent collaterals. Perforating veins are usually identified at the medial aspect of the thigh and at the medial, lateral, and posterior aspects of the leg. Outward flow (lasting more than 500 ms) in the perforating veins should be considered a sign of their incompetence ^[17].

Considering the clinical examination, in the present study, BrodieT rendlenberg's test was quite useful and accurate in detecting sapheno femoral incompetence while multiple tourniquet and Fegan's test were helpful to locate the exact sites of incompetent perforators in limb examined.

Hence these clinical tests have a definite role in diagnosis especially in a rural setup where, sophisticated modalities like Doppler are not available. But a combination of clinical test findings, with the studies like Doppler have a beneficial role for higher percentage of accuracy.

Venography

Ascending, descending or intra-osseous venography can be done in order to diagnose venous disorders. Usually ascending venography is done with injection of contrast in the pedal vein.

It can make a satisfactory diagnosis of deep venous obstruction and incompetent perforators. In view of invasiveness of test having less accuracy, than non invasive procedures, having higher accuracy, invasive tests were not performed in the present study.

Plethysmography

This technique records the changes in the dimensions of the limb in response to heart beat and various maneuvers like temporary venous occlusion etc. Venous outflow plethysmography has been reported to have a sensitivity of 90% to 95.1%. The disadvantages of this technique are the necessity of complicated apparatus and skilled personnel. None of the patients in this study underwent the investigation due to lack of the essential facilities required to conduct them.

Radioactive labelled fibrinogen

This method includes injection of I ¹³¹ labelled human fibrinogen. Prior to this thyroid blockage is done with iodide. Obviously this includes various tedious procedures, combined with increased exposure to radiation. Moreover it cannot be used in an extremity with healing wound, fracture, oedema, ulceration, superficial thrombophlebitis etc. This investigation was not performed in this study.

Duplex scanning

This is a technique by which an image of tissue interfaces and moving blood on a video display unit is formed by pulsed beam ultrasound scanning. Western studies show that this investigation has a high specificity of 100%. By this even the structure of the valves and their competency can be scrutinized in detail. The advantages are that it is non-invasive and can be used for prolonged viewing. It has a very high specificity. The potential for its future may totally displace venography. As this method of investigation was not available in our setup, it is not carried out in any of the patients.

Treatment

Both surgical and non-surgical methods have been used in the treatment of varicose veins. The choice of therapy depends on the nature of venous problem and on the general health status of the patient.

A. Non-Surgical treatment

This includes conservative line of treatment and sclerotherapy.

Conservative method

This is carried out on patients with associated complications like deep vein thrombosis, edema and ulceration. Also the patients with symptoms of short duration were given a initial trial with conservative method. Here a compressive crep bandage and elevation of the foot end is used along with calf muscle exercise along with Bisgaard's regimen ^[18, 19]. It also includes daily dressing of ulcer. No drugs like pentoxifylline, diosmin which improve venous tone, are used as they have not proved to play a better role in already developed varicosities. The aim of conservative treatment is to assist venous return by ^[20].

1. Collapsing the dilated superficial veins.
2. Improving the efficiency of musculo venous pump.
3. Increasing the tissue pressure and promoting the return of extra-cellular fluid into the capillary and venous system.
4. Improving tissue perfusion by improving microcirculation.

In the present study patients with complications like ulceration

and oedema were managed on this line till they were controlled in an average hospital stay of 15 days as compared with 10.92 days in patients without these complications and underwent operative management. This has added to the cost, but it has also definitely helped in restricting the disease and its morbidity. Thus conservative line of management has a definite role to play in management of varicose veins, in those cases with associated edema, ulceration etc.

Sclerotherapy

This mode of treatment is routinely carried out in several centres. It is the method of choice for –

1. Trivial cosmetic veins
2. Minimally dilated superficial veins.
3. Individual incompetent perforators.
4. Few residual or recurrent venules remaining after surgery.

This is done by multiple injections of sclerosant into the varicose vein at different sites. The sclerosant that are presently used are sodium tetra-decyl sulphate and mono-ethanolamide oleate (1-3%) After injecting the sclerosant a firm compression crep bandage is applied.

Various studies carried out worldwide show that results at 1 year are excellent and are comparative to the surgical management. But the recanalisation of vessel later on makes the failure rate progressively high from 4th year onwards. This is a significant drawback. Also the possibility of deep vein thrombosis and arterial damage due to accidental intra-arterial injection of sclerosant are the known complications. The advantages of this method of management are its simplicity, ability to be done on out-patient basis and avoidance of anesthesia, sclerotherapy was carried out in one patient for residual varicosities in operated case of stripping in present study.

Surgical Treatment

The surgical treatment includes the following procedures

1. Flush ligation of the sapheno-femoral I sapheno-popliteal junction – Trendelenberg's operation.
2. Stripping of the varicose segments.
3. Subfascial ligation of the incompetent perforators - Dodd & Cockett's operation.

These operations are done in combinations depending on the pathological defect in the venous system. The results obtained by these procedures are done in combinations are excellent in as many as 88% of cases, with no recurrence even after 5 yrs.

The choice of the procedure and the extent to which it has to be carried out is still a matter of controversy. This is especially true in the case of 'stripping', whether to strip the whole of the vein or to restrict this only to the segment that is diseased, especially of the thigh. If the distant part is left behind, it can be used for bypass surgery whenever required.

Surgical treatment in the present study includes the different operations in various combinations. The result seen at the time of discharge was that only 1 patient (9%) had a minimal wound infection during the post-operative stay. In this study, there was a major affection of long saphenous vein in 45 limbs (81.81%). The sapheno-femoral valve involvement in 20 limbs (36.36%) with various perforators associated with this. Below knee perforator was involved in 33 limbs (60%). These combinations of pathology were in the same limb in majority of limbs affected. In the present study all the three procedures were carried out at the same time in 3 patients (21.42%).

Hospital stay

The duration of hospital stay both pre-operative and post-operative reflects the cost-effectiveness in the management of varicose veins, to a significant extent in the western centers, more stress is laid on decreasing the hospital stay. Hence more stress is laid on promoting procedures which can be carried out on an out-patient basis, like sclerotherapy, ambulatory phlebectomy. In the present study an average hospital stay was of 10.92 days. The pre-operative stay was minimized by doing pre-anaesthetic workout on outpatient basis. This hospital stay is little longer than noted in the western study.

Table 11: The Study and Average Hospital stay

Study	Average Hospital Stay
Hobbs J.T [13]	7 days
Present study	10.92 days.

The early post-operative complication was found in only one patient in the form of wound infection which was tackled with daily dressings and antibiotics.

Complications

A well conducted operation for varices, correctly diagnosed with pre and post operative care is one of the most successful and trouble free operation of surgery. But, this is better said than done and a few complications are known to occur in varying extents following surgeries for varicose veins. These can be broadly divided into early and late complications.

Early Complications: These occur soon after surgery and they are –

1) Wound Infection: This is a minor complication which can increase the morbidity and post-operative stay of patient. The presence of pre-operative ulceration is known to increase the risk for wound infection and these delays wound healing. In the western studies the occurrence of post-op wound infection is about 5%. In the present study, an incidence of 7.14% was noted. This can be attributed to increased incidence of pre-operative infected condition like ulceration in the studied patients. Secondly most of our patients are from rural and semi-rural areas. Due to lack of health knowledge, they seek medical advice only when they develop ulceration and other complications.

Minor pulmonary embolism –

This is seen to occur in a small number of patients and is non-fatal, as the embolism is of minor degree [19] various studies show incidence ranging from 0.4 to 0.6%.

In the present study none of the patient had symptomatic pulmonary embolism.

3) Small Hematomas: This is a minor complication that may occur in cases

which have undergone stripping. This usually occurs as a result of improper post-op-compression bandage application. Eventually these hematomas get absorbed. Western studies report its incidence to be around 0.5%.

In the present study no patient had this. Complication.

Late complications

These tend to increase the degree of morbidity more than the early complications. They are

1. Lymphedema of the legs

This is known to occur in patients who have undergone stripping operations. Most of the lymphatic channels of the lower limb happen to course closely to the long saphenous vein. During

stripping they may get destroyed and hence can lead to lymphedema.

This complication was not noticed in any of the patients belonging to this study.

2. Nerve injury: This complication follows the stripping of the vein.

During stripping of the long saphenous vein, the saphenous nerve is prone to get damaged causing paraesthesia over the medial malleolus and medial aspect of lower third leg. The sural nerve gets injured during stripping of short saphenous vein as it coursed very close to this vein. The lateral half of foot gets anaesthetized or has parasthetic sensations.

This can be avoided with careful sub-adventitial stripping of the vein. Various western studies give the incidence of this complication as between 7 - 36.5%. This incidence has been seen to be higher when the vein is stripped from below upwards. Signs and symptoms of saphenous nerve injury are common at long-term follow-up after greater saphenous vein stripping to the ankle. However, there appears to be little, if any, significant resultant morbidity. The risk of saphenous nerve injury should therefore not be considered a reason to avoid stripping of the greater saphenous vein to the ankle.

In the present study, out of 14 operated patients 12 had come for the follow-up. This complication was seen in only 1 patient (8.33%) This co-relates with its incidence in the other compared studies.

Recurrence of varicosities

Operations that are not extensive enough to find out all varicosities are responsible for most of these residual or so-called recurrent varicosities. They usually occur due to failure to ligate the tributaries of saphenous vein at sapheno-femoral junction and incompetent perforators left behind. The theory of neo-vascularisation is also proposed for recurrent varicose veins. The incidence of recurrence widely varies from study to study between 1% to 55%. In one of Indian study conducted, it was 23.33%

In the present study amongst the patients who came for follow-up one of them (8.33%) had developed recurrences. This figure tallies with that seen in most of the similar studies to which it is compared.

Table 12: Comparison of post-operative complications

Study	Wound Infection	Nerve Injury	Recurrence
Munn <i>et al.</i> [20]	11.8%	33%	-
Burnard <i>et al.</i> [21]	-	-	55%
Cox <i>et al.</i> [22]	-	36.5%	-
Hobbs J.T. [13]	5%	7%	-
Vaidyanathan [23]	-	-	23.3%
Present study	7.14%	8.33%	8.33%

The recurrent varices seen in the post-operative follow up is correlating with those seen in other studies. This recurrence may not be solely due to an inappropriate surgery, but could be due to some other factors influencing it, like improper evaluation of the exact site of pathology by clinical examination and investigations.

In conclusion one needs a good evaluation of the case, clinically and by investigations and proper selection of the surgical procedure according to the pathology, so that a good result is obtained.

Mortality

Varicose veins as such is not a life threatening condition. It is

more a cause of morbidity. Hence a proper note should be made before taking up a patient for surgery. In the present study there was no intra-operative or post operative mortality.

Conclusion

The present study concluded that, clinical tests are important to denote the site of pathology. Commonest affection is long saphenous system with incompetency of perforator valves. Combination of inference of clinical tests in association with Doppler probe study gives higher accuracy in diagnosing the site of pathology. Conservative line of treatment before surgery is beneficial, through it increases the pre-operative stay but reduces the associated complications and thus, reducing the post-operative stay, morbidity and the cost. A good clinical assessment with investigations, treatment of associated complications and a combination of surgical procedures have beneficial effects in minimizing cost and morbidity of varicose vein surgery.

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Conflict of Interest

The author declares that, they have no conflict of interest.

Ethical approval

Ethical approval was taken from Institutional Ethics Committee.

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