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Review Article

Complications of Varicose Veins of the Lower Extremity: Systematic Review and Metanalysis

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Abstract

Background: Varicose veins of the lower extremity and other body organs like oesophagus, rectum, scrotum/vulva and umbilicus are associated with a lot of complications ranging from itching, heaviness, oedema, bleeding, ulceration and a lot more. Pathogenesis and treatment modalities are not completely resolved in the literature.

Aims/Objectives: Recent reports indicate that complications of varicose veins of the lower extremities are treated medically and or surgically. Even surgically, they are treated by vascular and or plastic surgeons as well as by interventional radiologist.

Study Design: We conducted a MEDLINE search and searched all citations in the Cochrane Central Register of all the literatures published on varicose veins of the lower extremities alongside complications.

Results: The results were centered on the anatomy and physiology of venous drainage of the lower extremities, the epidemiology, aetiology or risk factors, pathogenesis or pathophysiology of varicose veins. Others included presentations, complications and approaches to varicose veins treatment using current standard aided with the cutting edge technology.

Conclusion: Varicose vein of the lower extremity alongside the complications is common. A detailed understanding of the pathophysiology will guide preventive and treatment strategies with a view to reducing the incidence of the venous disease globally'.

Keywords: *Varicose Veins; Lower Extremity; Anatomy and Physiology*

Introduction

Anatomy and physiology

The lower limb veins are grouped into deep and superficial. The deep veins accompany the arteries and are referred to as venae commitantes. They are named after their corresponding arteries. Thus, like the arteries, they are nicknamed thus: anterior (dorsalis pedis) and posterior, popliteal and femoral veins. The superficial veins comprise of the great saphenous, the small saphenous veins and their corresponding perforators [1-3]. Particularly for the great saphenous vein (GSV), the perforators are Cocket I (5 cm), Cockett II (10 cm) and Cockett III (15 cm) from the medial malleolus respectively. The others are Dodd (knee region) and Boyd (Hunter's canal) perforators and finally the saphenofemoral junction at the cribriform fossa, 3 cm inferior lateral to the pubic tubercle [4,5].

The saphenofemoral junction perforator is accompanied consistently by four superficial veins, namely: superficial, deep pudendal, superficial and circumflex iliac veins. These tributaries must be sought and ligated during the flush ligation of the sapheno-femoral ligation for the incompetence of the associated valve so as to avoid recurrence [6].

The lower extremity veins drain towards the heart (cephalad) against gravity, i.e. they drain from distal to proximal [7,8]. This is made possible by the presence of valves. The pressure in the deep veins is higher than their superficial counter parts, yet the drainage is from superficial to deep. This is made possible by presence of valves. The other factors that aid venous drainage from the lower extremity towards the heart are negative intrathoracic pressure, the soleal pump (calf muscle) and the effect of arterial pulsation on the adjacent venae commitantes [9-11].

Aetiopathogenesis and pathophysiology

The superficial veins, especially of the lower extremity become varicose, i.e. dilated, tortuous and elongated in a period in some patients, which has been estimated to be 20% in men and 25 - 30% in women [6]. Aetiopathogenically, any cause in intravenous pressure, when sustained affects the cooptation of the valves. Such factors that lead sustained intravenous pressure are prolonged standing, intrabdominal mass (pregnancy, tumour), deep vein, obesity thrombosis and arteriovenous fistula (AVF). Others include congenital causes (Ehlers Danlos syndrome and Marfans' syndrome), which lead to thinness of the vein wall and valves [12-15].

Figure 1A

Figure 1B

Pathophysiologically, the sustained pressure causes the tortuosity, elongation and dilatation of the veins (varicose veins) [16]. The varicose veins in the lower extremity lead to the following complications: Leg oedema → this occurs as a result increased hydrostatic pressure more than oncotic pressure at the venular end of the capillaries (Frank Starling's law of fluid dynamics in the capillaries)

[17], stocking like discoloration/hyperpigmentation → increased intravenous pressure leads to diapedesis and eventual haemosiderin deposition [18]; Ulceration → results from fibrin cuff theory or white blood cell activation theory [19], bleeding → from trauma, itching from elaboration of histamine, thrombophlebitis and venous thrombosis → stasis according to Virchow's triad will cause thrombophlebitis in the superficial and venothrombosis in the deep veins respectively [20]. Other complications whose cause is not known is eczema and lipodermatosclerosis [21].

Symptomatology

Patients with varicose veins of the lower extremity present to the doctors on account of the complications such as cosmesis, swelling, hyperpigmentary skin changes, ulceration, bleeding, deep vein thrombosis including aching in the limb (s), eczema and itching [21]. Clinically, Trendelenburg test was used to elicit saphenofemoral incompetence, Perthes and Linton test for deep vein thrombosis, Oshley-Maholy, Pratt and Fegan tests for eliciting perforator incompetences. Also, Schwartz test was used to confirm and differentiate varicose veins from haemangioma [22]. These tests are now no longer relevant because, the invention and application of doppler and duplex ultrasonography have revolutionized the diagnosis of varicose veins of the lower extremity alongside other pathologies like aneurysms and peripheral artery diseases [23].

Figure 2A

Figure 2B

Investigative methodology

Duplex Doppler ultrasonography is a simple, noninvasive, painless, readily available modality that can assess the anatomy and physiology of the lower extremity venous system. It can evaluate for acute and occult deep venous thrombosis, superficial thrombophlebitis, and

incompetence of saphenofemoral and saphenopopliteal junctions. It can also assess the reflux and diameter of the greater and lesser saphenous veins and the vascular architecture of the tributary and deeper perforating veins [24]. In our review, the sonologist must address the following concerns while assessing patients with lower limb varicose veins: competence or incompetence of SFJ, SPJ, the perforators and the presence or absence of deep vein thrombosis as well as presence or absence of arteriovenous malformations (AVM) or fistula (AVF) [25]. Other less commonly used studies that may be helpful in select patients include venography, light reflex rheography, ambulatory venous pressure measurements, photoplethysmography, air plethysmography, and foot volumetry [24].

Treatment modalities

Treatment of varicose veins of the lower extremities is aimed at identifying the risk factors and the associated complications so that appropriate preventive and treatment strategies can be instituted including the varied but structured methods of managing the complications for the overall good outcome [25].

Treatment options for varicose veins include conservative management, external laser treatment, injection sclerotherapy, endovenous interventions and surgery [24]. The indications for treatment are largely based on patient choice which in turn is affected by symptoms, cost, potential for iatrogenic complications, available medical resources, insurance reimbursement and physician training, availability of equipment as well as the presence or absence of deep venous thrombosis and the characteristics of the affected veins [26]. The symptoms of varicose veins needing treatment are but not limited to aching pain, leg fatigue, ankle edema, chronic venous insufficiency, cosmetic concerns, early hyperpigmentation, external bleeding, progressive or painful ulcer, or superficial thrombophlebitis [27].

Treatment modalities are divided into conservative and non-conservative. The non-conservative modalities are further subdivided into pharmacologic and non-pharmacologic/surgery. The conservative treatment is encompassed in the acronym 'BEEM' as expounded by Bisgaard (Bisgaard regime): bandaging, elevation, exercise and massage [24,25]. Other measures not included in the Bisgaard regime are avoidance of risk factors such as prolonged standing, wearing restrictive clothing, constipation and modification of cardiovascular risk factors (oral contraceptive in the female gender) as well as medical therapy (diuretics, butcher's broom, horse chest nut extract) [24,25,28,29].

In the non-conservative management, novel modes of treatment are technologically driven and they include radiofrequency ablation, endovenous laser treatment and endovenous laser ablation especially for telangiectasias [30].

These methods of treatment are not currently available in developing countries [25] but their advantages are that it can be done on outpatient basis, it is successful on long term maintenance of vein closure and has shorter recovery period with fewer complications (paresthesia and recanalization with improved quality of life and less expense on the subject [31,32].

In injection sclerotherapy, the aim is to inject substance (s) into the superficial veins that cause the sealing and scarring of the veins. Such substances include sodium tetradecyl sulphate, 3% saline (hypertonic saline) and corrosive agents like glycerin. The diameter of the veins indicated for therapy is 1 to 5 mm. Associated complications are deep vein thrombosis and recurrence [24,33,34].

Surgery, historically, is considered the gold standard of treatment when there is combination of high ligation, division and stripping and multiple stab avulsion [35,36]. Surgical treatment depends on the outcome of doppler/duplex ultrasound report. Invariably, treatment may be single or a combination as described below: flush ligation at the saphenofemoral junction (Trendelenburg operation), subfascial (Dodd and Cockett operation), multiple ligations, saphenopopliteal ligation and venous stripping. When there is venous ulcer, the plastic surgery unit takes over the management for possible skin grafting or flap cover.

Complications of treatment

Superficial site infection (SSI), wound haematoma femoral artery injury and or femoral vein injury, including neuritis, deep vein thrombosis and or pulmonary embolism are the complications that are known to occur after treatment [37] especially by way of surgery.

Follow up strategies

Recurrence is a common phenomenon following treatment of varicose veins in spite treatment modality employed. Thus, patient should initially be followed up in vascular clinic, initially in 2 - 3 weekly to 2 - 3 monthly intervals. Thereafter, patient is referred to family physician (s) for follow up on prolonged basis.

Conclusion

In view of the fact that though, varicose veins alongside the complications are now treated noninvasively and invasively but recurrence still do occur, the understanding of the disease is still questionable and therefore open for continued research, so that a time will come when medical and or surgical therapy will cure the disease once diagnosed.

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