Feb-Apr.2012, Vol.2.No.2,885-895. e- ISSN: 2249 –1929

Journal of Chemical, Biological and Physical Sciences

An International Peer Review E-3 Journal of Sciences

Available online at www.jcbsc.org

Section B: Biological Sciences

CODEN (USA): JCBPAT

Review Article

Varicose vein: recent complications in humans

Girish P. Laddha[1], G.Vidyasagar[1], Sunil R. Bavaskar[2], Vikram Mahale[2], Mahendra Rathod[2]

[1]Shri Jagdishprasad Jhabarmal Tibrewala University, Rajasthan.

[2]Shri Sureshdada jain institute of pharmaceutical education and research, Jamner

Received: 17 March; Revised: 7 April 2012; Accepted: 24 April 2012

ABSTRACT

In daily life human being and their survival is more difficult. In normal life continuous circulation of blood to the each and every organ is possible with arteries and veins. These circulations are mean by the internal lumen diameter and their structure throughout the life. Different diet habits in the different peoples and regions and less physical exercise is the main cause of varicose vein problem. Varicose veins, commonly referred to as "varicosities", represent enlarged collaterals (branches) of so-called saphenous venous system affected by a disease called "superficial venous insufficiency of lower extremities". Varicosities, therefore, constitute not a disease, but a symptom of superficial venous insufficiency, coincidentally, by far not the most frequent symptom too. Heaviness, tiredness, swelling, pain, muscle cramps, difficulties walking and even standing are some of other symptoms of the above disease.Non-surgical treatments include sclerotherapy, elastic stockings, elevating the legs, and exercise. The traditional surgical treatment has been vein stripping to remove the affected veins. Newer, less invasive treatments which seal the main leaking vein on the thigh are available. Alternative techniques, such as ultrasound-guided foam sclerotherapy, radiofrequency ablation and endovenous laser treatment, are available as well. Because most of the blood in the legs is returned by the deep veins, the superficial veins, which return only about 10 per cent of the total blood of the legs, can usually be removed or ablated without serious harm.

Keywords: varicose vein, varicosities.

INTRODUCTION

Varicose veins or arteries are veins that have become enlarged and tortuous. The term commonly refers to the veins on the leg,[1] although varicose veins can occur elsewhere. Veins have leaflet valves to prevent blood from flowing backwards (retrograde flow). Leg muscles pump the veins to return blood to the heart, against the effects of gravity. When veins become varicose, the leaflets of the valves no longer meet

properly, and the valves do not work. This allows blood to flow backwards and they enlarge even more. Varicose veins are most common in the superficial veins of the legs, which are subject to high pressure when standing. Besides cosmetic problems, varicose veins are often painful, especially when standing or walking. They often itch, and scratching them can cause ulcers. Serious complications are rare.

Varicose veins, commonly referred to as "varicosities", represent enlarged collaterals (branches) of so-called saphenous venous system affected by a disease called "superficial venous insufficiency of lower extremities". Varicosities, therefore, constitute not a disease, but a symptom of superficial venous insufficiency, coincidentally, by far not the most frequent symptom too. Heaviness, tiredness, swelling, pain, muscle cramps, difficulties walking and even standing are some of other symptoms of the above disease. [2]

Non-surgical treatments include sclerotherapy, elastic stockings, elevating the legs, and exercise. The traditional surgical treatment has been vein stripping to remove the affected veins. Newer, less invasive treatments which seal the main leaking vein on the thigh are available. Alternative techniques, such as ultrasound-guided foam sclerotherapy, radiofrequency ablation and endovenous laser treatment, are available as well. Because most of the blood in the legs is returned by the deep veins, the superficial veins, which return only about 10 per cent of the total blood of the legs, can usually be removed or ablated without serious harm.[3][4] Varicose veins are distinguished from reticular veins (blue veins) and telangiectasias (spider veins), which also involve valvular insufficiency,[5] by the size and location of the veins. Many patients who suffer with varicose veins seek out the assistance of physicians who specialize in vein care. These physicians are called phlebologists.

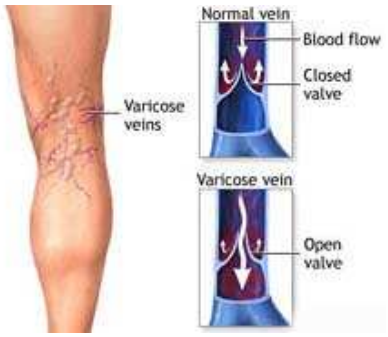
Varicose veins is a common condition observed in practice whereby patients present with dilated, tortuous and elongated veins, especially on the legs. However, any vein in the body if gets twisted, stretched out or looses elasticity, could belabeled as varicose. The veins have certain valve like mechanism which allows the blood to move upwards toward the heart. The valves have leaflets. When the leaflets loose their elasticity, the valves loose their capacity to push blood upwards; hence there is a back pressure which leads to further elongation of the veins. The veins also have reduced elasticity. As a result, the veins get 'tortuous' or twisted; as well as hardened. The veins, thus, become visible as zigzag vascular tubes, especially on legs. Varicose veins affect especially the depending parts of the body that is lower limbs, which gets even worse when one tends to stand longer. People in the business of standing for long, such as sales people, policemen, plastic surgeon (tend to stand for hours during surgery), etc. are risk of developing varicose veins.

Varicose veins, also called varicosities, are seen most often in the legs, although they can be found in other parts of the body. Most often, they appear as lumpy, inding vessels just below the surface of the skin. There are three types of veins, superficial veins that are just beneath the surface of the skin, deep veins that are large blood vessels found deep inside muscles, and perforator veins that connect the superficial veins to the

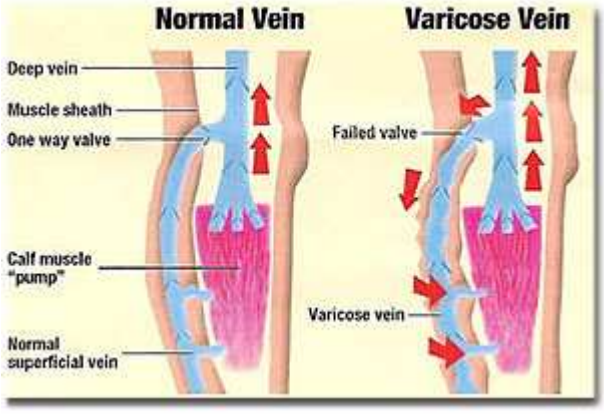
deep veins.

The superficial veins are the blood vessels most often affected by varicose veins and are the veins seen by eye when the varicose condition has developed. The inside wall of veins have valves that open and close in response to the blood flow. When the left ventricle of the heart pushes blood out into the aorta, it produces the high pressure pulse of the heartbeat and pushes blood throughout the body. Between heartbeats, there is a period of low blood pressure. During the low pressure period, blood in the veins is affected by gravity and wants to flow downward. The valves in the veins prevent this from happening. Varicose veins start when one or more valves fail to close. The blood pressure in that section of vein increases, causing additional valves to fail. This allows blood to pool and stretch the veins, further weakening the walls of the veins. The walls of the affected veins lose their elasticity in response to increased blood pressure. As the vessels weaken, more and more valves are unable to close properly. The veins become larger and wider over time and begin to appear as lumpy, winding chains underneath the skin. Varicose veins can develop in the deep veins also. Varicose veins in the superficial veins are called primary varicosities, while varicose veins in the deep veins are called secondary varicosities.[6-7]

Varicose veins are commonly caused by prolonged sitting or standing or a sedentary lifestyle which results in poor Circulation to the extremities. This causes blood to pool in the veins of the legs causing a constant low level of increased pressure that eventually weakens the veins. Chronic constipation which causes increased vascular pressure upon straining can also be a contributing factor to varicose veins. In addition to localized pain and cosmetic concerns, there are primary risks associated with varicose veins. These include an increased risk of pulmonary embolism, thrombophlebitis, heart attack, and stroke due an increased potential for forming blood clots. The primary treatment principles are to strengthen vascular resistance, thin the blood, increase circulation, and treat constipation if present.



The condition is usually the result of problems with valves within the veins of the leg. When one or more of the valves fails to close properly, the veins conduct blood back into the leg instead of up to the heart. As blood accumulates, abnormal pressures dilate the superficial vein system, causing the veins to bulge and become visible.



Varicose Veins, A Common Circulation Problem

SIGNS AND SYMPTOMS

- Aching, heavy legs (often worse at night and after exercise).
- Appearance of spider veins (telangiectasia) in the affected leg.
- Ankle swelling, especially in evening.
- A brownish-blue shiny skin discoloration near the affected veins.
- Redness, dryness, and itchiness of areas of skin, termed stasis dermatitis or venous eczema, because of waste products building up in the leg.
- Cramps may develop especially when making a sudden move as standing up.
- Minor injuries to the area may bleed more than normal and/or take a long time to heal.
- In some people the skin above the ankle may shrink (lipodermatosclerosis) because the fat underneath the skin becomes hard.
- Restless legs syndrome appears to be a common overlapping clinical syndrome in patients with varicose veins and other chronic venous insufficiency.
  Whitened, irregular scar-like patches can appear at the ankles. This is known as atrophie blanche.[8]

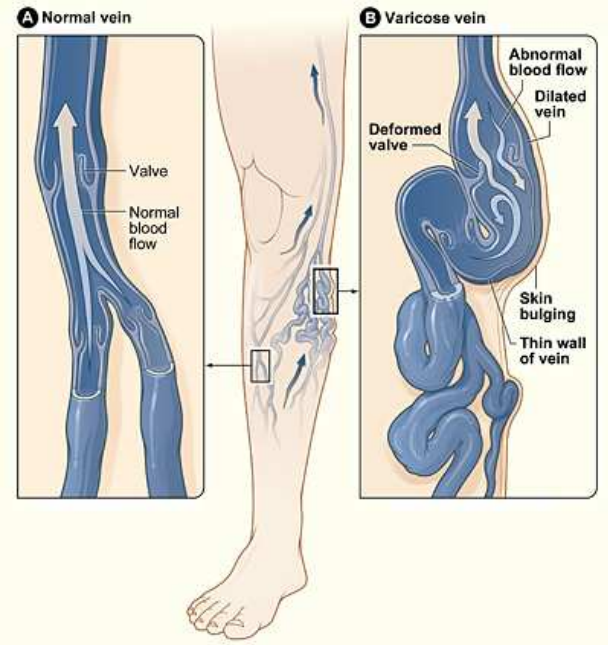
CAUSES AND SYMPTOMS

The predisposing causes of varicose veins are multiple, and lifestyle and hormonal factors play a role. Some families seem to have a higher incidence of varicose veins, indicating that there may be a genetic component to this disease. Varicose veins are progressive; as one section of the veins weakens, it causes increased pressure on adjacent sections of veins. These sections often develop varicosities. Varicose veins can appear following pregnancy, thrombophlebitis, congenital blood vessel weakness, or obesity, but is not limited to these conditions. Edema of the surrounding tissue, ankles, and calves, is not usually a complication of primary (superficial) varicose veins and, when seen, usually indicates that the deep veins may have varicosities or clots. Varicose veins are a common problem; approximately 15% of the adult population in the United States has varicose veins. Women have a much higher incidence of this disease than men. The symptoms can include aching pain, itchiness, or burning sensations, especially when standing. In some cases, with chronically bad veins, there may be a brownish discoloration of the skin or ulcers (open sores) near the ankles. A condition that is frequently associated with varicose veins is spider-burst veins. Spider-burst veins are very small veins that are enlarged. They may be caused by back-pressure from varicose veins, but can be caused by other factors. They are frequently associated with pregnancy and there maybe hormonal factors associated with their development. They are primarily of cosmetic concern and do not pre-sent any medical concerns.[6-7]

- Incompetent saphenous veins (greater or lesser).
- Incompetent perforator veins.
- Incompetent branches of the saphenous veins.

When the one-way valves fail to close properly, blood can reverse its flow. This causes increased pressure in the veins and over time can cause them to swell and become bulging, varicose veins.

The increased pressure can lead to significant symptoms such as: swelling of the ankles or legs, severe pain and aching, and complaints of tired legs. Skin changes, ulceration and phlebitis are all possible with long-standing varicose veins. Because the blood is not flowing efficiently, clots can form in the veins causing hard lumps and severe pain. This is known as “superficial phlebitis.” This is not the type of clot that doctors worry will travel to your heart, lungs, or brain. It is possible to have varicose veins without pain or swelling, and it is not necessary to have them corrected. If they worsen and become uncomfortable, it is considered medical and most insurance companies, including Medicare, will cover varicose vein treatment.[9]



The illustration shows how a varicose vein forms in a leg. Figure A shows a normal vein with a working valve and normal blood flow. Figure B shows a varicose vein with a deformed valve, abnormal blood flow, and thin, stretched walls. The middle image shows where varicose veins might appear in a leg.

INVESTIGATIONS

Varicose veins can usually be seen. In cases where varicose veins are suspected, but cannot be seen, a physician may frequently detect them by palpation (pressing with the fingers). X rays or ultrasound tests can detect varicose veins in the deep and perforator veins and rule out blood clots in the deep veins.

Traditionally, varicose veins were only investigated using imaging techniques if there was a clinical suspicion of deep venous insufficiency, if they were recurrent, or if they involved the sapheno-popliteal junction. This practice is no more accepted. All patients with varicose veins should now be investigated using Duplex scanning. The results from a randomised controlled trial (RCT) on the follow up of patients with and without routine Duplex scan has shown a significant difference in recurrence rate and reoperation rate at 2 and 7 years of follow up. [6, 7, 8]

VARICOSE VEIN RISKS AND COMPLICATIONS

While patients often try to ignore varicose veins, treatment is important to prevent dilated, twisted veins, episodes of aching pain, and leg ulcers on the surface of the skin. If left untreated, varicose veins can lead to more serious complications. Early treatment is highly recommended to help prevent the varicose veins from becoming very advanced. Bruising is common, and should resolve on it's own in one to two weeks. Compliance with the compression stockings will help speed this process. Bleeding is possible. Direct pressure should be applied and a compression dressing. Let the doctor's office know if you have trouble keeping a dressing dry. Some discomfort is normal, especially with the endovenous ablation treatment. Anti-inflammatory medication is rovided to help with this side effect. The pain should not be so intense that it affects walking or daily activities. Infections are rare, but possible with any procedure. Increasing redness and tenderness in a particular area should be reported to the doctor's office for evaluation. It is possible that some varicose veins may remain after the procedure, and this is evaluated at the follow-up appointment.[9]

Most varicose veins are relatively benign, but severe varicosities can lead to major complications, due to the poor circulation through the affected limb.

- Pain, heaviness, inability to walk or stand for long hours, thus hindering work
- Skin conditions / Dermatitis which could predispose skin loss
- Skin ulcers especially near the ankle, usually referred to as venous ulcers.
- Development of carcinoma or sarcoma in longstanding venous ulcers. There have been over 100 reported cases of malignant transformation and the rate is reported as 0.4% to 1%
- Severe bleeding from minor trauma, of particular concern in the elderly.
- Blood clotting within affected veins. Termed superficial thrombophlebitis. These are frequently isolated to the superficial veins, but can extend into deep veins becoming a more serious problem.
- Acute fat necrosis can occur, especially at the ankle of overweight patients with varicose veins. Females are more frequently affected than males.
- The afflicted person suffers tenderness in that region.

PREVENTIVE MEASURES

Measures that help the blood flow toward the heart can be helpful in slowing the progression of varicose veins, and in minimizing discomfort associated with vein problems. Graduated compression stockings are helpful in getting fluid out of the legs and back up to the heart. Knee-high stockings are not recommended, they should at least cover the thigh.Staying active and minimizing sitting or standing for long-periods of time also help. If none of these measures help alleviate the symptoms, treatment may be recommended.[9]

TREATMENT

The symptoms of varicose veins can be controlled to an extent with the following:

- Elevating the legs often provides temporary symptomatic relief.
- Advice about regular exercise sounds sensible but is not supported by any evidence.[11]
- The wearing of graduated compression stockings with variable pressure gradients (Class II or III) has been shown to correct the swelling, nutritional exchange, and improve the microcirculation in legs affected by varicose veins.[12] They also often provide relief from the discomfort associated with this disease. Caution should be exercised in their use in patients with concurrent arterial disease.
- Diosmin / Hesperidine and other flavonoids.
- Anti-inflammatory medication such as ibuprofen or aspirin can be used as part of treatment for superficial thrombophlebitis along with graduated compression hosiery – but there is a risk of intestinal bleeding. In extensive superficial thrombophlebitis, consideration should be given to anti-coagulation, thrombectomy or sclerotherapy of the involved vein.

Active: Active medical intervention in varicose veins can be divided into surgical and non-surgical treatments. Some doctors favor traditional open surgery, while others prefer the newer methods. Newer methods for treating varicose veins such as Endovenous Thermal Ablation (endovenous laser treatment or radiofrequency ablation), and foam sclerotherapy are not as well studied, especially in the longer term.[13-14]

Surgical: Several techniques have been performed for over a century, from the more invasive saphenous stripping, to less invasive procedures like ambulatory phlebectomy and chiva.

Stripping: Stripping consists of removal of all or part the saphenous vein main trunk. The complications include deep vein thrombosis (5.3%),[15] pulmonary embolism (0.06%), and wound complications including infection (2.2%). For traditional surgery, reported recurrence rates, which have been tracked for

10 years, range from 5-60%. In addition, since stripping removes the saphenous main trunks, they are no longer available for venous bypass in the future (coronary and/or leg artery vital disease)[16]

Other: Other surgical treatments are

- Ambulatory phlebectomy
- Vein ligation
- Cryosurgery- A cryoprobe is passed down the long saphenous vein following saphenofemoral ligation. Then the probe is cooled with NO_2 or CO_2 to a temperature of -85^0. The vein freezes to the probe and can be retrogradely stripped after 5 sec of freezing.It is a variant of Stripping. The only point of this technique is to avoid a distal incision to remove the stripper.[17]

NON-SURGICAL TREATMENT

Sclerotherapy: A commonly performed non-surgical treatment for varicose and "spider" leg veins is sclerotherapy in which medicine is injected into the veins to make them shrink. The medicines that are commonly used as sclerosants are polidocanol (POL), sodium tetradecyl sulphate (STS), Sclerodex (Canada), Hypertonic Saline, Glycerin and Chromated Glycerin. STS and Polidocanol(branded Asclera in the United States) liquids can be mixed with air or CO_2 or O_2 to create foams. Sclerotherapy has been used in the treatment of varicose veins for over 150 years.[18] Sclerotherapy is often used for telangiectasias (spider veins) and varicose veins that persist or recur after vein stripping. [19-20] Sclerotherapy can also be performed using foamed sclerosants under ultrasound guidance to treat larger varicose veins, including the great saphenous and small saphenous veins.[21][22] A study by Kanter and Thibault in 1996 reported a 76% success rate at 24 months in treating saphenofemoral junction and great saphenous vein incompetence with STS 3% solution.[23] A Cochrane Collaboration review[24] concluded sclerotherapy was better than surgery in the short term (1 year) for its treatment success, complication rate and cost, but surgery was better after 5 years, although the research is weak.[25] A Health Technology Assessment found that sclerotherapy provided less benefit than surgery, but is likely to provide a small benefit in varicose veins without reflux.[26] This Health Technology Assessment monograph includes reviews of the epidemiology, assessment, and treatment of varicose veins, as well as a study on clinical and cost effectiveness of surgery and sclerotherapy. Complications of sclerotherapy are rare but can include blood clots and ulceration. Anaphylactic reactions are "extraordinarily rare but can be life-threatening," and doctors should have resuscitation equipment ready.[27][28] There has been one reported case of stroke after ultrasound guided sclerotherapy when an unusually large dose of sclerosant foam was injected.

Endovenous thermal ablation: The Australian Medical Services Advisory Committee (MSAC) in 2008 has determined that endovenous laser treatment/ablation (ELA) for varicose veins "appears to be more effective in the short term, and at least as effective overall, as the comparative procedure of junction ligation and vein stripping for the treatment of varicose veins."[29] It also found in its assessment of available literature, that "occurrence rates of more severe complications such as DVT, nerve injury and paraesthesia, post-operative infections and haematomas, appears to be greater after ligation and stripping than after EVLT". Complications for ELA include minor skin burns (0.4%)[30] and temporary paraesthesia (2.1%). The longest study of endovenous laser ablation is 39 months.

Two prospective randomized trials found speedier recovery and fewer complications after radiofrequency ablation (ERA) compared to open surgery.[31][32] Myers[33] wrote that open surgery for small saphenous vein reflux is obsolete. Myers said these veins should be treated with endovenous techniques, citing high recurrence rates after surgical management, and risk of nerve damage up to 15%. In comparison, ERA has been shown to control 80% of cases of small saphenous vein reflux at 4 years, said Myers. Complications for ERA include burns, paraesthesia, clinical phlebitis, and slightly higher rates of deep vein thrombosis

(0.57%) and pulmonary embolism (0.17%).One 3-year study compared ERA, with a recurrence rate of 33%, to open surgery, which had a recurrence rate of 23%.

ELA and ERA require specialized training for doctors and expensive equipment. ELA is performed as an outpatient procedure and does not require the use of an operating theatre, nor does the patient need a general anaesthetic. Doctors must use high frequency ultrasound during the procedure to visualize the anatomical relationships between the saphenous structures. Some practitioners also perform phlebectomy or ultrasound guided sclerotherapy at the time of endovenous treatment. Follow-up treatment to smaller branch varicose veins is often needed in the weeks or months after the initial procedure. New techniques allow for a virtually painless correction of the problem. The newer techniques allow specialists to fix varicose veins in an office setting, without a trip to the hospital.Patients will be awake, without need for a general or spinal anesthetic. The entire procedure is performed under a local anesthetic, which is administered around the vein. Patient comfort is monitored throughout the entire procedure. Heat energy from a laser or radio frequency source is used to painlessly eliminate flow in the affected vein. This is called Endovenous Ablation of the Saphenous Vein. Overall circulation will be improved, as the blood will be redirected into veins that have working one-way valves. Once the source of the varicose veins (saphenous vein) has been treated the doctor will eliminate the individual varicose veins. This is called an Ambulatory MicroPhlebectomy. The phlebectomy is also performed in the office and under a local anesthetic. Small segments of the dilated veins are removed through 1-2 mm openings, similar to the size of a freckle. Results are immediate; the body will begin the healing process leaving virtually no scarring. After one or both of these procedures are performed, a ompression bandage will be applied to minimize bruising. Walking is encouraged immediately following a procedure.

TREATMENT

There is no cure for varicose veins. Treatment falls into two classes; relief of symptoms and removal of the affected veins. Symptom relief includes such measures as wearing support stockings, which compress the veins and hold them in place. This keeps the veins from stretching and limits pain. Other measures are sitting down, using a footstool when sitting, avoiding standing for long periods of time, and raising the legs whenever possible. These measures work by reducing the blood pressure in leg veins. Prolonged standing allows the blood to collect under high pressure in the varicose veins. Exercise such as walking, biking, and swimming, is beneficial. When the legs are active, the legs muscles help pump the blood in the veins. This limits the amount of blood that collects in the varicose veins and reduces some of the symptoms. These measures reduce symptoms, but do not stop the disease.

Surgery is used to remove varicose veins from the body. It is recommended for varicose veins that are causing pain or are very unsightly, and when hemorrhaging or recurrent thrombosis appear. Surgery involves making an incision through the skin at both ends of the section of vein being removed. A flexible wire is inserted through one end and extended to the other. The wire is then with- drawn, pulling the vein out with it. This is called “stripping” and is the most common method to remove superficial varicose veins. As long as the deeper veins are still functioning properly, a person can live without some of the superficial veins. Because of this, stripped varicose veins are not replaced.

Injection therapy is an alternate therapy used to seal varicose veins. This prevents blood from entering the sealed sections of the vein. The veins remain in the body, but no longer carry blood. This procedure can be performed on an out-patient basis and does not require anesthesia. It is frequently used if people develop more varicose veins after surgery to remove the larger varicose veins and to seal spider-burst veins for people concerned about cosmetic appearance. Injection therapy is also called sclerotherapy. At one time, a method of injection therapy was used that did not have a good success rate. Veins did not seal properly and blood clots formed. Modern injection therapy is improved and has a much higher success rate.

CONCLUSIONS

This is recent complications in human beings, these will affect the heart as well as different oraganelles. Varicose vein was treated with various technique but the habits of human being also causes re-ocurrance of this problems. Mostly obesity is the main problem in varicose vein chocking and blockaging.

REFERENCES

1. "Varicose Veins". 2010-07-06. http://www.webcitation.org/5r1PRrJul. Mount Sinai Hospital, New York.
2. Surgical management of varicosities, Article. June 2010. New York Vein Treatment Center - 135 East 71st St, New York, NY 10021 - (212) 575-8346. NYC Vein Clinic
3. Merck Manual Home Edition, 2nd ed.
4. Weiss RA, Weiss MA (1993). "Doppler ultrasound findings in reticular veins of the thigh subdermic lateral venous system and implications for sclerotherapy". *J Dermatol Surg Oncol* 19 (10): 947–51.
5. Alexander, R. W., R. C. Schlant, and V. Fuster, eds. *The Heart.* 9th ed. New York: McGraw-Hill 1998.
6. Berkow, Robert, ed. *Merck Manual of Medical Information.* Whitehouse Station, NJ: Merck Research Laboratories,
7. Blomgren L, Johansson G, Emanuelsson L, Dahlberg-Åkerman A, Thermaenius P, Bergqvist D. Late follow-up of a randomized trial of routine duplex imaging before varicose vein surgery. Br J Surg. 2011 Aug; 98(8):1112-6. doi: 10.1002/bjs.7579.
8. The Patient Education Institute, Inc. www.X-Plain.com Last reviewed: 1995-2008, 4/30/2008
9. Goldman M. Sclerotherapy, Treatment of Varicose and Telangiectatic Leg Veins. Hardcover Text, 2nd Ed, 1995
10. Campbell B (2006)."Varicose veins and their management". *BMJ* 333 (7562): 287–92. doi:10.1136/bmj.333.7562.287.PMC 1526945.PMID 16888305. http://www.pubmedcentral.nih.gov/articlerender.fcgi?tool=pmcentrez&artid=1526945.
11. Curri SB et al. Changes of cutaneous microcirculation from elasto-compression in chronic venous insufficiency. In Davy A and Stemmer R, editors: Phlebology '89, Montrouge, France, 1989, John Libbey Eurotext.
12. "Open Surgery Is Still The Best Technique To Ablate The Great Saphenous Vein Vascular, Vol. 14 (November 2006), Suppl. 1, p. S. 25
13. Jia, X; Mowatt, G; Burr, JM; Cassar, K; Cook, J; Fraser, C (2007). "Systematic review of foam sclerotherapy for varicose veins". *The British journal of surgery* 94 (8): 925–36. doi:10.1002/bjs.5891. PMID 17636511.
14. Van Rij AM, Chai J, Hill GB, Christie RA (December 2004). "Incidence of deep vein thrombosis

after varicose vein surgery". *Br J Surg* 91 (12): 1582–5. doi:10.1002/bjs.4701. PMID 15386324.

15. Hammarsten J, Pedersen P, Cederlund CG, Campanello M (1990). "Long saphenous vein saving surgery for varicose veins. A long-term follow-up". *Eur J Vasc Surg* 4 (4): 361–4. doi:10.1016/S0950-821X(05)80867-9. PMID 2204548.
16. Shouten R, Mollen RM, Kuijpers HC (2006). "A comparison between cryosurgery and conventional stripping in varicose vein surgery: perioperative features and complications". *Annals of vascular surgery* 20 (3): 306–11. doi:10.1007/s10016-006-9051-x. PMID 16779510.
17. Goldman M, Sclerotherapy Treatment of varicose and telangiectatic leg vein, Hardcover Text, 2nd Ed, 1995
18. "Veins & Lymphatics," L. K. Pak et al., *in* Lange's Current Surgical Diagnosis & Treatment, 11th ed., McGraw-Hill,
19. Tisi PV, Beverley C, Rees A (2006). Tisi, Paul V. ed. "Injection sclerotherapy for varicose veins". *Cochrane Database Syst Rev* (4): CD001732. doi:10.1002/14651858.CD001732.pub2. PMID 17054141.
20. Paul Thibault, Sclerotherapy and Ultrasound-Guided Sclerotherapy, The Vein Book / editor, John J. Bergan, 2007.
21. Padbury A, Benveniste G L, Foam echosclerotherapy of the small saphenous vein, Australian and New Zealand Journal of Phlebology Vol 8, Number 1 (December 2004)
22. Kanter A, Thibault P (July 1996). "Saphenofemoral incompetence treated by ultrasound-guided sclerotherapy". *Dermatol Surg* 22 (7): 648–52. doi:10.1016/1076-0512(96)00173-2. PMID 8680788.
23. Tisi, Paul V; Beverley, Catherine; Rees, Angie (2006). *Injection sclerotherapy for varicose veins*. In Tisi, Paul V. "Cochrane Database of Systematic Reviews". *Cochrane Database Syst Rev* (4): CD001732. doi:10.1002/14651858.CD001732.pub2. PMID 17054141.
24. Rigby KA, Palfreyman SJ, Beverley C, Michaels JA (2004). Rigby, Kathryn A. ed. "Surgery versus sclerotherapy for the treatment of varicose veins". *Cochrane Database Syst Rev* (4): CD004980. doi:10.1002/14651858.CD004980. PMID 15495134.
25. Michaels JA, Campbell WB, Brazier JE et al (April 2006). "Randomised clinical trial, observational study and assessment of cost-effectiveness of the treatment of varicose veins (REACTIV trial)". *Health Technol Assess* 10 (13): 1–196, iii–iv. PMID 16707070. http://www.hta.ac.uk/execsumm/summ1013.htm.
26. William R. Finkelmeier, Sclerotherapy, Ch. 12, ACS Surgery: Principles & Practice, 2004, WebMD (hardcover book)
27. Scurr JR, Fisher RK, Wallace SB (2007). "Anaphylaxis Following Foam Sclerotherapy: A Life Threatening Complication of Non Invasive Treatment For Varicose Veins". *EJVES Extra* 13 (6): 87–

89. doi:10.1016/j.ejvsextra.2007.02.005.

28. Medical Services Advisory Committee, ELA for varicose veins. MSAC application 1113, Dept of Health and Ageing, Commonwealth of Australia, 2008.

29. Elmore FA, Lackey D (2008). "Effectiveness of ELA in eliminating superficial venous reflux". *Phlebology* 23 (1): 21–31. doi:10.1258/phleb.2007.007019. PMID 18361266.

30. Cite journal |author=Rautio TT, Perälä JM, Wiik HT, Juvonen TS, Haukipuro KA |title=Endovenous obliteration with radiofrequency-resistive heating for greater saphenous vein insufficiency: a feasibility study |journal=J Vasc Interv Radiol |volume=13 |issue=6 |pages=569–75 |year=2002 |month=June |pmid=12050296 |doi= 10.1016/S1051-0443(07)61649-2}

31. Lurie F, Creton D, Eklof B et al (January 2005). "Prospective randomised study of endovenous radiofrequency obliteration (closure) versus ligation and vein stripping (EVOLVeS): two-year follow-up". *Eur J Vasc Endovasc Surg* 29 (1): 67–73. doi:10.1016/j.ejvs.2004.09.019. PMID 15570274.

32. Kenneth Myers, An opinion —surgery for small saphenous reflux is obsolete!" Australian and New Zealand Journal of Phlebology, Vol 8, Number 1 (December 2004)

***Correspondence Author: Girish Premchand Laddha;** Shri Sureshdada Jain Institute of Pharmacy and Research centre, Jamner-424206.