



The Role of Stripping of Long Saphenous Vein in Varicose Vein Surgery

KEYWORDS

Long Saphenous vein, Stripping, Varicose veins, Perforators

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ABSTRACT *Varicose Vein Surgery – Role of Stripping of Long Saphenous Vein*

INTRODUCTION

The term varicose derives from the Latin 'varix' which means twisted.

Varicose veins are not only dilated veins but also tortuous and elongated & have been recognized as chronic disorder since ancient times. Man's upright posture and gravitational force are the contributory factors.

Primary varicose veins are a common problem, affecting 13% of men and 26% of women.

Recurrent varicose veins occur in range of 7 to 93% of cases among different studies treated for primary varicose veins.

Recurrence after primary varicose vein surgery is associated with inadequate primary surgery or intervention. Neovascularisation alone is not a cause of recurrent varicose veins.

Aim of this study is to look for effectiveness of ligation of SFJ combined with stripping of Long saphenous vein and to know the complications of this procedure.

AIM OF STUDY

- To study the effectiveness of stripping of the thigh segment of long saphenous vein in the treatment of primary varicose veins of lower limb.
- To evaluate the incidence of complications after ligation and stripping of long saphenous vein.

SURGICAL ANATOMY

A thorough knowledge of the anatomy of the leg veins is essential both for adequate surgical treatment and for the understanding of basic pathophysiology.

The Venous System

For practical purposes the veins may be divided into three main systems

- The superficial system
- The perforator system
- The deep system

1 The superficial system

The superficial system of the leg consists of two major veins and their tributaries, namely the long and short saphenous veins. There is of course, another superficial system of veins namely in the knee and the thigh. These veins empty into gluteal veins and also bypass the long

saphenous vein in the groin. Their presence explains the fact that in cases when both the long saphenous vein and the femoral vein have been interrupted, there may still be adequate drainage from the leg.

2 The perforator system

In each leg there are at least 90 connections between the superficial and deep venous system. These veins connect superficial system with deep system and are valved. Such that blood flows the superficial to deep system and these are also called as communicating veins. The perforators are classified as: a) Indirect b) Direct.

3 The deep venous system

- Anterior tibia vein
- Posterior tibial vein
- Peroneal vein
- Popliteal vein
- Femoral vein

The deep fascia of the leg

The deep fascia of the leg which invests the whole of the calf muscles more so distally forming an aponeurotic layer enclosing the soleus firmly. This constitutes the essential part of the "calf muscle pump" which squeezes the blood centripetally during systole and collects the blood during the diastole of the calf muscle pump.

Venous valves

The venous valves are bicuspid valves allowing the flow of blood from distal to proximal end. The greater number of valves in the lower limb is due to their need to bear the hydrostatic pressure. There are no valves in the inferior vena-cava and common iliac vein.

The valve at the sapheno-femoral junction is constant. The popliteal vein may have 2-4 valves. The entire saphenous system is supplied with valves.

The perforating veins are provided with valves, which direct the flow of blood from the superficial to the deep system.

The venous plexus of the foot have no valves, the long saphenous vein has 12-15 valves, the majority being below the knee. The short saphenous systems has 9-10 valves.

Applied physiology

The arteries of the lower limb bring a considerable amount of the cardiac output to the lower limb and it is left to

veins of the lower limbs to return it to the heart. Thus venous system does it against heavy odds is evident from the workload it has to work against.

Venous return from the lower limb

The length of the venous column is from the sole to the right heart. In the erect posture this means that the blood has to be forced to the right heart against the force of gravity acting on this rather long vertical column of the blood.

The mechanism involved :

Following factors help in venous return

1. Negative pressure in the thorax
2. The calf muscle pump
3. Vis-a-tergo
4. Competent valves

The calf muscle pump (venous pump):

The calf muscle is to the venous system what the left ventricle is to the arterial system. The gastrocnemius and the soleus muscles are the most important parts of this pump. These muscles envelop to constitute the calf muscle pump. The calf muscle pump is put into action when the muscles contract and it exerts a force in excess of 80mmHg on the walls of the veins in the calf. This exceeds that exerted by gravity and results in a net efflux of blood out of the limb. During the phase of calf muscle relaxation or diastole the large venous channels are distended, and the pressure in the deep veins falls below that in the superficial veins. During this, flow occurs from the superficial system to the deep venous system through the perforating veins. This flow is facilitated by the unidirectional valves contained in the perforating veins.

At the completion of calf muscle counteraction the cycle is repeated. The increase in frequency and depth of respiration associated with exercise acts to facilitate overall venous return.

Response to stimulation

Venous system is under the control of the sympathetic system. Local stimuli as well as those originating in the medulla oblongata keep up the venular tone.

Hormonal stimuli during puberty, menstruation, pregnancy and menopause cause altered hemodynamic. The veins of superficial system show more response to those stimuli than the deep venous system due to their contained smooth muscles.

PATHOPHYSIOLOGY

Definition of varicose veins :

A superficial vein of the lower limb, which has permanently lost its valvular efficiency and as a product of resultant venous hypertension in the standing position becomes dilated, tortuous and thickened.

The cause of reversed flow may be primary or secondary to multiple factors.

Accordingly two theories have been put forth in the causation of primary varicose veins.

- Weak vein wall theory
- Faulty valve theory

Irrespective of the cause, the incompetent venous system causes defective venous pump mechanism, which leads to

venous hypertension. It is this venous hypertension, which is the seat caused of problems associated with varicosities.

Classification of varicose vein

Primary familial varicose vein

- Long saphenous vein
- Short saphenous vein
- Primary ankle perforator incompetence.

Second varicose vein

These could be due to blockade or compression of deep veins or due to

Post thrombotic sequelae

Post thrombotic syndrome (PTS) comprises the skin changes leading to ulceration, swelling and a bursting discomfort in the leg following exercise relieved only by resting and elevating it (venous claudication).

AETIOLOGY OF VARICOSE VEINS

Primary factors

Inefficiency of venous pump

Primary cause of varicose veins is congenital paucity of valves, weakness or wasting of muscles, or stretching of the deep fascia, all of which impair the function of the pump.

II. Secondary factors

1 Erect posture :

The anatomical make up of the venous system contributes to the developments of varicose veins. There are no valves either in the inferior vena cava of common iliac vein. Thus, the external iliac vein bears the pressure of the column of blood and this is transmitted through the femoral vein to the sapheno-femoral junction and the valve guarding it. This pressure which is at a maximum in the erect position can eventually cause incompetence of the sapheno-femoral or sapheno-popliteal valves. This is why varicose veins are common in people whose occupation require prolonged periods of standing.

2 Violent muscular effort :

varicose veins have been noticed in people involved in maximum muscular effort over a short period as in athletes, weight lifters or coolies. This violent muscular contraction causes increase of the venous pressure in the veins of the lower limb to levels, which cause intolerable strain on the valves especially those guarding the perforators and when this is for a prolonged duration these valves can become incompetent. This leads to a high pressure retrograde flow into the superficial system and resultant varicosities.

3 Obstruction :

To the normal venous return from the infra-abdominal part of the body can cause varicosity of the lower limb veins.

Central obstruction : Mitral valve disease of the heart, Emphysema.

- Pressure over the veins in the posterior abdomen as in ascites, thrombosis, tumors and gravid uterus.

4 Congenital abnormalities : A-V fistula, absence of valves in the veins.

5 Traumatic : Trauma may cause arterio venous fistula which may cause varicose veins.

6 Phlebitis : Can lead to damage of the valves and also lead to thrombosis. Both can lead to varicosities.

7 Deep vein thrombosis : In deep vein thrombosis the natural pathway of blood flow from the superficial system is blocked. This leads to hypertension in the superficial system and varicosity. When the thrombus is eventually organized, the valves of the perforators may be damaged and will result in varicosity. Postoperative deep vein thrombosis is frequently a predecessor of superficial varicosities. There primary factors for DVT are stasis hypercoagulability and endothelial damage.

CLINICAL FEATURES

The most frequent complaints for which patients seeks help are

1. Disfigurement (Prominent veins in the limb)
2. Pain in the limb
3. Swelling of the limb (limb oedema)
4. Complications of the disease

MANAGEMENT

Investigations

Identification of the distribution of varicosities and the sources of the venous hypertension is of great importance.

1 Plain X-ray :

Plain X-ray of the limbs is taken for evidence of calcification, periosteitis and bone erosion.

2 Doppler Examination :

Reflux Retrograde flow can be observed at the femoral level during valsalva maneuver or at the popliteal level with patient standing and the calf alternately compressed and released. A similar maneuver should be used when listening over perforating veins. The sensitivity of the tests exceeds 90%. But the specificity is 5 to 10% lower because of the possibility of other mechanical problems. (E.g. Baker's cyst, hematoma) interfering with venous flow.

The addition of real time B-mode imaging to Doppler measurement in a portable duplex device offers a new approach to detection and characterization of venous thrombi.

3 Plethysmography

Photoplethysmography (PPG): It uses infrared light to measure subcutaneous vascular volume and can provide a reliable index of valvular incompetence. The venous refilling time after calf muscle exercise, will be shortened considerably in the presence of valvular incompetence.

4 Duplex Scanning :

The most promising of the newer diagnoses techniques is the combination of the ultrasound duplex scanning using a B mode imager with a pulsed Doppler instrument to provide both imaging and flow patterns. Thrombi can be visualized within the veins and flow will be observed if the vein remains patent. Normal veins can be compressed by the scanner head over the vessel while thrombosed veins are incompressible.

5 Venography :

It is one of the invasive techniques used for the objective diagnosis of deep veins thrombosis (DVT). It offers direct visualization of venous system, anatomic localization of the extent of the pathologic process.

TREATMENT

METHODS :

- Conservative therapy
- Physiotherapy
- Medical therapy
- Sclerotherapy
- Surgical therapy
- Ulcer treatment

1 Conservative therapy :

There are few condition in which conservative line is indicated. These include:

- Young people in the early stage of disease with competent saphenous vein.
- Patients who are unfit for surgery or refuse surgery
- The other group of the people suitable for this line of treatment is the pregnant women.

Conservative therapy consists of

- Rest and elevation of limb
- Compression treatment
- Exercise : Exercises designed to activate the calf muscles like "Cycling in the air" is useful in improving the venous circulation.
- Reduction of weights
- Avoidance of prolonged standing

MEDICAL THERAPY

Veno-Active drugs :

Veno-active drugs are heterogeneous group of naturally occurring and synthetic compounds that are believed to improve the symptoms and haemodynamic abnormalities, specially edema, associated with venous disease. The Principal members of the group are :

- Horse chestnut extract
- Flavonoids
- Calcium dobesilate
- Tribenoside
- Dihydroergotamine

SCLEROTHERAPY

Principles Fegan coined the term compression sclerotherapy because compression bandage should immediately follow injections of sclerosants. The principle behind this therapy is that the veins should be collapsed immediately after the injection of sclerosants so that the sclerosing agent can bring about fibrosis of these veins.

SURGICAL THERAPY

Venous components of varicose vein surgery are

- Sapheno femoral ligation or Sapheno popliteal ligation
- Saphenous stripping
- Multiple phlebectomy
- Perforator ligation
- Venous reconstructive surgery

Complication of varicose vein surgeries

- Haematoma and bruising
- Seroma & Lymphedema
- Wound sepsis
- Hemorrhage
- Post operative saphenoneuritis
- Deep vein thrombosis and embolism
- Lymphoedema of the leg
- Recurrent varicose veins

- Venous ulcer

DISCUSSION

Recurrence after varicose vein surgery is common in the range of 7- 93%^(3,4,29). Such massive rates of recurrence have been attributed to various factors.

1. Anatomical variations of the superficial venous system of lower limb.
 2. Neo vascularisation
 3. Incomplete primary surgery
 4. Whether stripping of the long saphenous vein is performed or not.
- The present study is intended to assess the effectiveness of stripping of the long saphenous vein in the treatment of primary varicose veins involving the long saphenous vein and to evaluate the complications of this procedure.
 - Out of 30 patients studied maximum number of patients are in the 40 - 50 year age group.
 - All patients-were male ,no female patient was present in this study. This could be due to cultural factors and social constraints.
 - The right limb was involved in 7 cases and the left limb in 23 cases. The exact cause for this is not known,it may be because of longer course of left iliac vein compared to right iliac vein.
 - All the cases were managed by ligation combined with stripping of the long saphenous vein from groin to just below knee level to avoid saphenous nerve injury⁽³⁰⁾ .
 - Of all the cases, thigh perforators were present in 36.66% cases . After surgery residual LSV reflux below knee was present in 10% cases and no residual thigh perforators were identified.
 - The benefit of stripping the long saphenous vein from groin to upper calf probably derives from disconnection of mid-thigh communicating veins.
 - Of the post operative complications there was no recorded case of intra operative bleeding or saphenous nerve palsy
 - Two cases of limb edema was recorded after the long saphenous vein was stripped. This was not due to deep vein thrombosis as ruled out by duplex ultra sound and was managed conservatively by crepe bandage and limb elevation.
 - The hospital stay of patients was 8.5 days mean.
 - A follow-up period of 3 months was selected because it has been showed that limbs without reflux in the residual part of long saphenous vein 3 months after surgery are more likely to be free from clinical recurrence at 21 months.
 - The present study demonstrates that the results of surgery for primary varicose veins 3 months after sur-

gery in the distribution of long saphenous vein are improved by addition of long saphenous vein stripping from groin to just below knee level to the standard operations of sapheno femoral ligation and multiple avulsions.

CONCLUSIONS

1. The incidence of Residual long saphenous vein reflux is less after ligation and stripping of Long saphenous vein.
2. The incidence of residual perforator in the thigh is less after ligation and stripping of Long saphenous vein. So less chances of recurrence.
3. The incidence of Nerve palsy is not more when the Long saphenous vein is stripped from groin to just below knee.
4. The incidence of bleeding and hematoma is also not more in the ligation + stripping procedure.
5. The one considerable point is,If stripping is not done, long saphenous vein may be needed for vascular graft surgery at a future date⁽⁷⁾ (especially in DM, HTN and smoker).

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