

Classical Varicose Vein Surgery in a Diverse Ethnic Community

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SUMMARY

Chronic venous disorders range from telangiactasia or spider veins to varicose veins, venous swellings, skin changes and venous ulcerations. The aim of this study is to assess outcome of varicose vein surgery in the ethnically diverse population of Penang, Malaysia. This study is a retrospective analysis of patients seen from 1999 to 2004. All patients who presented to the outpatient clinic of our surgical department with saphenofemoral junction (SFJ) and/or saphenopopliteal junction (SPJ) reflux associated with incompetence of the great saphenous vein (GSV) or small saphenous vein (SSV) respectively underwent classical varicose varicose vein surgery. A single surgeon at a single institution performed the surgeries. Data from pre-operative, post-operative and follow-up procedures were recorded in case report forms. A total of 202 cases were treated. Of these, 200 were qualified by the inclusion criteria and follow-ups, with 23 who were treated bilaterally. Of those treated, Chinese comprised 47.5%, Indians 27.0%, Malays 12.5% and foreigners 13.0% (largely Indonesian Chinese, British and Americans). The average age was 52.1 years. Indians had the highest average BMI of 29.2, compared to the Chinese who had the lowest of 24.6. Based on occupation, housewives (43.0%), blue collar workers (19.0%), salespersons (12.0%) and factory workers (9.5%) were among those afflicted with varicose veins. While local Chinese predominated in the business groups (salespersons and food-related workers), the Indians and Malays in this study were mainly factory workers and/or blue collar workers. Symptomatology in descending order of severity included pain in 80.0% of cases, swelling in 65.5%, heaviness in 53.5%, cramps in 53.0%, lipodermatosclerosis in 39.0%, superficial thrombophlebitis in 33.5%, venous ulceration in 32.0%, eczema 22.0% and cellulitis in 12.5% of patients. Post surgery pains dropped to 9.9%, cramps 6.4%, heaviness 5.5% and swelling 5.3% ($p<0.0001$ in all groups). Indians had the highest rate of venous ulcers (35.2% of all Indians treated) possibly due to their high BMI and low socioeconomic background. In cases of venous ulcers, gram negative infections (49.8%) were more common than gram positive infections at 18.8%. Operative procedures performed included great saphenous vein high ligation in 96.5% of cases, stripping 93.5% and multiple avulsions in 98.5%, saphenous popliteal junction ligation with multiple avulsions in 13.0% and subfascial ligation in 10.5%. Operative complications included induration (40.0% of cases), bruising in 49.5%, pains in 15.0%, paraesthesia in 3.5%, wound infection in 4.0%, deep venous thrombosis in 3.0% and ulcer recurrence in 7.5%. A total of 96.2% of

patients treated expressed satisfaction with varicose vein surgery. Late presentations of chronic venous insufficiency, possibly as a result of poor understanding and inadequate education on diet, weight control, use of stockings and change in lifestyle by patients, employers and general practitioners are probably the cause of high rates of severe chronic venous disease especially venous ulcerations in the local community. However, classical varicose vein surgery is widely applicable across diverse ethnicities with a high rate of success.

KEY WORDS:

Chronic venous disorders, Varicose veins, Venous ulcers, surgery, Ethnicity, Penang

INTRODUCTION

Chronic venous disease of the lower limb is among the most prevalent of disease today, and it is actually a spectrum of medical conditions that ranges from telangiectasia or spider veins to varicose veins, venous swelling, skin changes and venous ulcerations¹. It is a common medical condition affecting all strata of society. Gender, sex, occupation, obesity and pregnancy are among the common predisposing factors². In general, it affects about 15% of adult men and 25% of adult women³.

Untreated venous insufficiency has significant morbidity and potential mortality. The sequelae include chronic pain, oedema, cramps, heaviness and itchiness. As the disease states worsen, come thrombophlebitis, ulceration and deep venous thrombosis.

The scarcity of epidemiological studies on the incidence of leg ulceration probably reflects a general lack of interest in a chronic, non-fatal condition which mainly affects the elderly⁴. Studies in Switzerland have suggested that venous ulceration affects about 1% of the population^{5,6}.

MATERIALS AND METHODS

Patients Treated

The population of study consisted of Chinese, Malays, Indians and others (foreigners) in descending order of majority. Foreigners were mainly Indonesian Chinese and Westerners from Europe and the United States of America. Patients were treated between 1999 to 2004.

This article was accepted: 12 June 2008

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All patients who presented to the outpatient phlebology clinic of our Surgical Department with saphenofemoral junction (SFJ) or saphenopopliteal junction (SPJ) reflux associated with incompetence of the great saphenous vein (GSV) or small saphenous vein (SSV) respectively underwent classic varicose vein surgery (CVVS). Patients gave written informed consent in accordance to the Helsinki Declaration. In the choice of treatment methods, patients were aware of the type of surgical treatment available, possible complications and recurrences.

Patients who had a pulseless pedal artery, general poor health and inability to ambulate were excluded. Women who were pregnant and nursing or who were planning to become pregnant and patients who had deep vein thrombosis, thrombosis tendency, haemorrhagic tendency and arteriovenous fistula were also excluded.

Of the CVVS cases, 200 patients were operated on, involving 177 patients with single leg surgery and 23 patients with bilateral lower limb surgery.

The severity of varicose veins was assessed according to the descriptive clinical etiologic, anatomical and pathophysiological (CEAP) classification^{7,8}: class 1, telangiectased reticular veins and malleolar flare; class 2, varicose veins; class 3, oedema without skin changes; class 4, skin changes such as pigmentation, venous eczema and lipodermatosclerosis; class 5, skin changes with healed ulceration; and class 6, skin changes with active ulceration. In this study, only clinical pictures from C2 to C6 were studied and compared.

Procedures

Patients were examined with duplex ultrasound to check SFJ reflux and to map out incompetent GSV pathways and its tributaries both in the leg and thigh. Likewise, this was done for the SPJ and SSV and its tributaries in the calf where there was venous incompetence. All perforator sites were also marked in the thighs and legs. Ulcers with incompetent perforators were also noted and marked.

Spinal or general anaesthesia was administered for all cases with classic varicose vein surgery.

The following procedures were usually performed: high ligation, stripping the GSV (knee level) and multiple avulsions. For the SSV, ligation of the SPJ and stripping of the SSV and/or multiple avulsions were done. Subfascial ligations were also performed for venous ulcers with significant incompetent perforators.

Techniques

GSV Surgery

- Trendelenburg position with 20"-30" head down.
- Legs abducted 10"-15".
- Saphenofemoral junction (SFJ) found 2cm below and lateral to pubic tubercle.
- SFJ identified before performing flush ligation of the GSV.
- All tributaries of the GSV, individually divided and ligated (superficial circumflex iliac vein, superficial inferior epigastric vein and superficial and deep external predein veins).

- GSV stripped retrogradely (from above-downward) up to just below knee joint level.
- Post-operative care: elevation of foot on bed for 12 hours. Patient instructed to wear Class 2 varix stockings for at least 2 weeks.

SSV Surgery

- Patient prone with 20" - 30" head down.
- Superficial vessels controlled by diathermy.
- Saphenopopliteal junction located.
- Sural nerve avoided and preserved.
- SPJ and short saphenous vein identified between the two heads of gastronemius.
- SPJ ligated and divided.
- Vein of Giacomini identified as tributary along posterior surface of thigh and ligated.
- Stripping of SSV or/and multiple avulsions.

Multiple avulsions

- 1.5mm-3mm stab incisions made with No.11 blade.
- Fine hooks are utilized to bring veins to the surface.
- Veins held with mosquito forceps, avulsed and ligated.
- Incision closed with 6mm steristrips covered by small waterproof (Opsite™, Smith and Nephew) dressings.

Calf perforating vein ligation

- Longitudinal incision, usually 2.5mm-5mm posterior to the posterior border of tibia, extending above and behind the medial malleolar (avoiding the Achilles tendon).
- Superficial fat and deep fascia divided.
- Incompetent perforating veins identified as they pass through gaps in the deep fascia, close to the posterior border of the tibia, to join the posterior tibial veins. An incompetent perforating vein was taken as being usually 3mm or more in diameter.
- Veins ligated and divided.
- Wound dressed with a soft dressing followed by a bandage.

Follow-ups

CVVS patients were followed up at ten days post-surgery, at one month, and one year. A telephone call regarding satisfaction with the treatment was also made about 1-2 years after surgery. Due to cost factors, duplex scan assessment was not done in most cases after surgery.

RESULTS

Following the epidemiology of varicose veins cases in Table I, there was a preponderance of females (126/200) over males (74/200) with a ratio of 1.7: 1. The average age was 52.1 years, with the youngest being 18 years old while the oldest was 81 years of age. The Chinese were generally older, averaging 55.9 years compared to the Indians, the youngest on average at 47.6 years. Also the Chinese (47.5%) formed the majority followed by the Indians (27.0%), foreigners (13%) and Malays (12.5%). In order of socioeconomic standing in this study, the Chinese (including Indonesian Chinese) ranked highest followed by the Malays and Indians.

The body mass index (BMI) averaged 27.2 ranging from 17-43. Those with BMI < 26 constituted 45.7% while 53.7% had BMI > 26 and 38.8% had BMI between 26 to 40. Also, 29.8% had BMI above 30. By ethnicity, the highest average BMI of

Table I: Epidemiology of patients who underwent Classical Varicose Vein Surgery

Race	Gender		Total (%)	Ave. Age	BMI
	Male	Female			
Chinese	26	69	95 (47.5)	55.9	24.6
Indians	24	30	54 (27.0)	47.6	29.2
Malays	14	11	25 (12.5)	48.7	27.2
Others	10	16	26 (13.0)	52.8	27.0
Total	74	126	200 (100)	52.1	27.2

Table II: Chronic Venous Insufficiency in Relation to Different Occupations and Ethnic Races

Occupations	Chinese	Indians	Malays	Others	Total (%)
Housewives	50	15	8	13	86 (43)
Salespersons	18	1	0	5	24 (12)
Factory workers	2	16	1	3	22 (11)
White collar workers	6	2	7	2	17 (8.5)
Blue collar workers	7	20	9	2	38 (19)
Food related workers	12	0	0	0	12 (6)
Others	0	0	0	1*	1 (0.5)
Total	95	54	25	26	200 (100)

*Mentally retarded

Table III: Presentations of Chronic Venous Insufficiency in Classical Varicose Vein Surgery Groups

Clinical Presentation	Percentage (%)
Pain	80.0 (160/200)
Swelling	65.5 (131/200)
Cramps	53.0 (106/200)
Heaviness	53.5 (107/200)
Lipodermatosclerosis	39.0 (78/200)
Superficial thrombophlebitis	33.5 (67/200)
Eczema	22.0 (47/200)
Cellulitis	12.5 (21/200)
Venous Ulceration	32.0 (64/200)
Bleeding	9.1 (18/200)

**Table IV: CEAP Classification According to Different Races
(expressed as a percentage of all patients within each ethnic group)**

Race	Clinical Picture (%)				
	2	3	4	5	6
Chinese	25.3 (24/95)	21.1 (20/95)	20.0 (19/95)	4.2 (4/95)	29.5 (28/95)
Indians	18.5 (10/54)	25.9 (14/54)	20.4 (11/54)	0.0	35.2 (19/54)
Malays	28.0 (7/25)	36.0 (9/25)	24.0 (6/25)	4.0 (1/25)	8.0 (2/25)
Others	30.8 (8/26)	19.2 (5/26)	7.7 (2/26)	3.9 (1/26)	38.0 (10/26)

Table V: Occurrence of Venous Ulcers in Different Ethnic Races and Occupations

Occupations	Race (%)			
	Chinese	Indians	Malay	Others
Housewives	8.4 (8/95)	9.3 (5/54)	4.0 (1/25)	19.2 (5/26)
Salespersons	12.6 (12/95)	3.7 (2/54)	0.0	19.2 (5/26)
Factory Worker	1.1 (1/95)	18.5 (10/54)	0.0	0.0
White Collar Worker	1.1 (1/95)	3.7 (2/54)	0.0	0.0
Blue Collar Worker	3.2 (3/95)	0.0	4.0 (1/25)	0.0
Food-related Worker	3.2 (3/95)	0.0	0.0	0.0

Table VI: Complications of Classical Varicose Vein Surgery

Complications	Percentage (%)
Pain	15.0 (30/200)
Bruising	49.5 (99/200)
Induration	40.0 (80/200)
Wound Infection	4.0 (8/200)
Cellulitis (phlebitis)	1.0 (2/200)
Paraesthesia	3.5 (7/200)
Deep Venous Thrombosis	3.0 (6/200)
New Site Recurrent Ulcer	5.0 (10/200)
Old Site Recurrent Ulcer	2.5 (5/200)

29.2 belonged to the Indians and lowest of 24.6 was amongst the Chinese.

A total of 120 left lower limbs were operated on, comprising 53.8% of all limbs treated while the right lower limbs constituted 103 cases or 46.2%.

As shown in Table II, housewives comprised 43.0% (86/200) of all cases, blue collar workers (farmers, security officers, drivers, labourers) 19.0% (38/200) and salespersons (shopkeepers, shop owners, tailors) 12.0% (24/200). Other occupations of smaller frequency in this study were white collar workers (managers, teachers, lecturers, clerks) at 8.5% (17/200), factory workers at 11.0% (22/200) and food-related workers (restauranteurs, hawkers) at 6.0% (12/200). Incidentally, housewives come out the top as the most common occupation among the Chinese (25.0%) and foreigners (53.8%). On the other hand, blue collar workers were more common amongst the Indians (37.0%) and Malays (36.0%). While the local Chinese predominated in the business groups (salespersons and food-related workers), the Indians and Malays were mainly employed as blue collar workers.

In the presentation of complaints (Table III), pain was the most important feature, appearing in 80.0% of cases, followed by swelling in 65.5%, heaviness in 53.5%, cramps in 53.0%, superficial thrombophlebitis in 33.5%, eczema in 22.0%, cellulitis in 12.5%, lipodermatosclerosis in 39.0%, venous ulceration in 32.0% and bleeding in 9.1%. The latter few complaints tended to occur in more severe CEAP classifications of 4, 5 and 6. In the post-surgery cases, pain fell to 9.9%, cramps 6.4%, heaviness 5.5% and swelling 5.3%. There were significant differences ($p<0.0001$) between the pre and post-operative symptomatology.

In Table IV, the severity of chronic venous disorders was assessed by the CEAP classification. As expected, most patients fell in CEAP 2, 3, and 4 indicating varicose veins with swelling and/or skin changes. In the CEAP 6 category, venous ulcers were debilitating and caused much avoidable suffering. The foreigners (mainly Indonesian Chinese) had the highest occurrence of venous ulcers at 38.0%, followed by the local Indians at 35.2%, Chinese at 29.5% and Malays at 8.0%. The average age of venous ulcers among the Indonesian Chinese was significantly much higher than the local Indians.

Venous ulcers were present in 35.2% (19/54) of all Indians treated in this study, or 29.7% (19/64) of all those with ulcers. Similarly, in the local and Indonesian Chinese treated, the venous ulcers appeared mainly in the business groups (salespersons, shopkeepers etc) at 12.6% (12/95) and 19.2% (5/26) respectively. Among the various ethnic groups, housewives formed the second most frequent occupation amongst patients with venous ulcers (Table V).

Of the venous ulcers with infection, the majority (49.8%) were due to gram negative organisms such as *Proteus*, *Klebsiella* and *Pseudomonas* species. Gram positive organisms were less common at an 18.8% occurrence. Also medial malleolar ulcers (gaiter area) were more common, in 90.7% (59/65) of cases, while ulcers in the lateral malleolar or dorsum of the foot were uncommon. The recurrence rate of

venous ulcers following ligation was approximately 23.8% (5/21) over the 5 years of this study (both old and new sites).

Post-operative complications (Table VI), in descending order of severity were induration in 40.0% (80/200), bruising in 49.5% (99/200) and pain in 13.5% (30/200). All of these were mainly due to post-stripping thigh haematomas. Paraesthesia occurred in 3.5% (7/200) and most improved over time. Only one was actually due to saphenous nerve injury, the others were essentially temporary neuropraxial injuries. Wound infection was at 4.0% (8/200) with gram negative organisms being more common than gram positive. Deep venous thrombosis was present in 3.0% (6/200), all involving the calf only, and these presented a few months after surgery. Treatment involved low molecular weight heparin and warfarin. Ulcer recurrence was at 7.5% (15/200, 10 at new sites and 5 at existing sites) and conservative treatment with dressing, elevation and bandaging helped with healing.

Of those who responded to telephone questionnaires following CVVS, 96.2% (125/130) expressed satisfaction with the surgery, and in fact 25.4% (33/130) were very satisfied. 2.5% (5/198) of the respondents expressed dissatisfaction with reasons of post-operative swelling (2 cases with CEAP 3), pains (1 case with CEAP 2), and a healed venous ulcer keloid (1 case with CEAP 6).

DISCUSSION

Varicose veins and its complications are indeed a common occurrence in the local diverse community consisting of the Chinese, Indians, Malays, and others. The approximate ratio of local Chinese to Malays to Indians is 4:4:1 (source: Penang statistics – Socio-economic and Environmental Research Institute, <http://www2.seri.com.my/Penang%20Statistics/2007/Q2-April-June-2007-1.pdf>). In this study, the ratio was about 4:1:2. The high number of Chinese (95 cases) could possibly illustrate their economic superiority in Penang, being able to afford private practice. Contrary to the population statistics of the region, the overwhelming number of Indians over the Malays points to the higher proportion of Indians afflicted by the varicose veins and its complications. Incidentally, the foreigners appear as quite a significant number due to the region (Penang Island) being a popular medical tourism and holiday destination besides being a second home to many of them.

In this study, there is a preponderance of females compared to males (ratio of females to males of 1.7: 1), as in some other studies such as the Framingham Study⁹. In addition, the left leg, at 53.8%, was more frequently involved than the right leg at 46.2%, which is also a finding in some other studies^{10,11}.

Despite the diversity of different races with different occupations associated with venous ulcers, it seems likely that all are related to venous hypertension. In most cases, venous hypertension is caused by reflux through incompetent valves¹², but other causes include venous outflow obstruction and failure of the calf muscle pump owing to obesity or leg immobility. Reflux may occur in the superficial or deep venous system or in both.

Indians have the highest rate of venous ulcers in this study, possibly due to their higher average BMI and lower socio-economic background. As such the quality of life in all aspects including pain, psychological, physical and social functioning were more significantly affected among the Indians compared to other races as has already been evidenced by the RELIEF Study¹³ and other similar studies^{14,15,16}. An interesting observation is that the very high age of venous ulcers among the Indonesian Chinese was possibly biased as access to specialized medical facilities is limited in Indonesia. As a result many Indonesian Chinese travel to Penang for medical care.

Symptomatic DVT, in this study, without prophylaxis was 3.0% compared to Van Rij *et al*¹⁷, Grillet *et al*¹⁸, Hagmuller¹⁹ and Critchley *et al*²⁰ who showed risks ranging from 0.15% to 5.3%. Additionally, there were no DVTs observed in bilateral procedures.

Another point of interest is the high rate of super infection of the ulcers (49.8% gram negative and 18.8% gram positive) associated with surrounding cellulitis. Similar high infection rates are noted by Chaby *et al*²¹. It is possible that the severe cellulitis with gram negative infections were due to prolonged neglect or abuse of antibiotics from different general practitioners. Among other possible reasons for such severe venous ulcer infections are patients 'shopping around' different doctors including traditional therapy, and sometimes, self-treatment. Also, ulcer recurrence following treatment was common, often due to poor compliance with stockings, medical therapies, and refusal to change lifestyle or occupation. More importantly, there may be a lack of education and understanding by both patients and employers to these issues of varicose veins and venous ulcers. For example, prolonged standing by employees in factories commonly predisposes to venous diseases.

In this study, the author practiced high ligation flush at the saphenofemoral junction of the great saphenous vein with ligation of all tributaries at the groin. This procedure was important to avoid the most common cause for recurrence of varicose veins^{22,23}.

Limited stripping of the great saphenous veins was performed in the whole thigh and upper calf where the main tributaries join. Distal to this point, most great saphenous veins were normal in diameter and their valves were competent; there was therefore no need to strip them. Avoiding interference with the normal distal great saphenous vein has two advantages; the normal segment of vein can be used for future coronary artery bypass grafting if required, and damage to the saphenous nerve is avoided. The nerve lies about 1cm away from the vein in the upper calf, but gradually becomes closer until it is intimately related to the veins at the ankle. Therefore, stripping the distal saphenous vein is very likely to produce nerve damage resulting in anaesthesia or paraesthesia on the anteromedial surface of the foot. The incidence of this complication varies from 23% to 58% in literature^{24,25,26}. By limiting the stripping operation to the proximal calf, the incidence was reduced to about 4%²⁷. In this study, the incidence of nerve damage (including neuropraxia) was 3.5%.

Also by limited stripping recurrence of varicose veins was minimized. This is evidenced by Sarin *et al*²⁸ who collated the results of several controlled clinical trials and found a mean recurrence rate of 18.7% when the vein was stripped, without stripping it was 35.1%. This recurrence would seem to be related to one or more persistent mid-thigh perforating veins.

Complications of small saphenous vein surgery have been well described. In the popliteal fossa, the sural nerve is close to the short saphenous vein and may be damaged during surgery. Sural nerve transection results in anaesthesia on the posterolateral surface of the head and lateral surface of the foot. More serious is damage to the common peroneal nerve which is laterally across the popliteal fossa before winding round the neck of the fistula. This will result in a permanent foot drop as well as anaesthesia on the anterior surface of the shin and dorsum of the foot²⁷.

The high rate of venous ulcer recurrence in this study is rather high for many reasons. The important word of compliance has been poorly understood – stockings disregarded, weight not controlled, lifestyle not changed and a host of other parameters not adhered to.

CONCLUSION

While varicose veins is a common medical condition, its significance is often unrecognized in families and working environments especially among factory workers, blue collar workers or salespersons in multiracial Malaysia. Interestingly, Indians appear to be more prone than the other ethnicities to venous ulcers. The particularly high rate of venous ulcers in the community needs to be addressed perhaps more holistically.

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