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“CIRUGÍA HEMODINÁMICA EN EL TRATAMIENTO DE LA INSUFICIENCIA VENOSA SUPERFICIAL”

Tesis presentada por José María Escribano Ferrer para acceder al grado de doctor en medicina y cirugía

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A mi madre…

INDICE

1. INTRODUCCIÓN

1.1 - Definición y epidemiología

La insuficiencia venosa es la incapacidad de una vena para conducir un flujo de sangre en sentido cardiópeto adaptado a las necesidades de drenaje de los tejidos, termorregulación y reserva hemodinámica con independencia de la posición y actividad.

En su génesis y formas de presentación pueden intervenir todos los factores que están implicados en el retorno venoso: pared venosa y sistema valvular; posturales; bomba muscular y respiratoria y el lecho vénulo-capilar. Al referirnos al síndrome de insuficiencia venosa crónica (IVC), debemos hacerlo al conjunto de síntomas y signos característicos de esta patología de los miembros inferiores. Subjetivamente los pacientes refieren: dolor, cansancio, pesadez, calor, hinchazón, etc; más intensos con la bipedestación y en circunstancias ambientales de calor y humedad [1]. Objetivamente se pueden hallar: presencia de varículas, venas reticulares, varices, edema, trastornos cutáneos, úlcera cicatrizada o activa.

Se trata de una enfermedad crónica de origen multifactorial cuya evolución es generalmente lenta, y las complicaciones (úlceras, flebitis, superficial, trombosis venosa profunda, complicaciones cutáneas…) con frecuencia se manifiestan cuando han transcurrido años o incluso décadas desde la aparición de los primeros síntomas [2].

Se estima que la prevalencia de insuficiencia venosa crónica en la población general (excluyendo los casos de telangiectasias) es del 50.5% en mujeres y del 30.1% en hombres [3]. En este país no se han realizado estudios poblacionales de la epidemiología de esta enfermedad por lo que no se dispone de datos exactos de su incidencia y prevalencia.

En el estudio prospectivo Delphi publicado en el 2004 [4] se constata que en el ámbito hospitalario los pacientes con IVC constituyen en torno al 50% de la carga asistencial de los servicios de angiología y cirugía vascular. Este mismo estudio hace una estimación de la prevalencia de la enfermedad en España para el año 2010: Por sexo: 37% mujeres / 19% varones. Por edad: 35% en > 65 años; 30% 45-65 años; 19% 25-45 años y 8% <25 años.

1.1 – Diagnóstico

Lo que ha permitido el conocimiento *in vivo* de la hemodinámica venosa, ha sido la introducción de la ecografía Doppler en el estudio de la IVC [5]. Esta exploración nos permite, además de realizar un estudio morfológico, la posibilidad de practicar un estudio hemodinámico en las condiciones reales que presenta el paciente.

Gracias a la ecografía Doppler, es posible la realización de una cartografía morfológica y hemodinámica del sistema venoso, y ofrecer una información precisa de las alteraciones de las mismas [6-10].

Si partimos de esta cartografía, podemos desarrollar una estrategia para realizar determinadas interrupciones de la columna de presión, a fin de controlar el elemento hidrostático desencadenante del síndrome varicoso [11].

En definitiva, podemos afirmar que la ecografía Doppler ha sido un elemento decisivo en la creación de la flebología moderna, habiendo desplazado otras técnicas diagnósticas no invasivas como el doppler continuo y a las técnicas pletismográficas a un segundo plano, cuando no a su desuso [12].

1.2 - Tratamiento

El tratamiento de la IVC depende del estado de desarrollo de la enfermedad en el que se encuentre el paciente [13]. Existen diversas actuaciones terapéuticas que pueden emplearse de manera combinada para tratar esta patología. Estas terapias no permiten curar la enfermedad pero son eficaces para mejorar la sintomatología y prevenir el desarrollo de complicaciones.

Entre los tratamientos para la IVC se incluyen:

- Medidas higiénicas y posturales
- Terapia de compresión
- Tratamiento tópico
- Tratamiento farmacológico
- Escleroterapia
- Tratamiento quirúrgico

Es en este último punto, en el tratamiento quirúrgico, donde se centra esta tesis. En el curso del siglo XX, el primer gran paso en el tratamiento de las varices de los miembros inferiores fue la técnica de extirpación de la vena safena por medio de un lazo metálico, ideada por Kéller en 1905. En mayo de 1906 describió la fleboextracción endoluminal. Dos años más tarde, Babcock utilizó por vez primera un fleboextractor similar al que se usa actualmente [14]. En 1966, Muller describió la flebectomía ambulatoria [15].

La fleboextración de las safenas o stripping, acompañada habitualmente de flebectomía asociada de los paquetes varicosos, sigue siendo, un siglo más tarde, la técnica quirúrgica considerada patrón de referencia [16-17]. La dinámica de la intervención es sencilla. Tras disecar la unión safeno-femoral, se procede a canalizar el cabo safeniano con el fleboextractor. Éste se hace progresar hasta el tobillo, para proceder entonces al arrancamiento de la safena tirando del fleboextractor.

Ello conlleva la rotura de todas las venas colaterales safenianas con el consiguiente sangrado de las mismas.

A continuación, suele procederse a la flebectomía de los paquetes varicosos por medio de incisiones complementarias lo que produce un sangrado añadido. En el postoperatorio inmediato, se indica la inmovilización del paciente para, en días sucesivos, iniciar cortos paseos horarios seguidos de reposo en cama, hasta la retirada de los puntos de sutura.

Algunos autores han propuesto variaciones de la técnica quirúrgica para disminuir su morbilidad, que consistirían fundamentalmente en practicar un stripping parcial de la safena, eliminando únicamente la safena a nivel del muslo [18].

Sin embargo, estudios sobre la recidiva varicosa asociada al stripping han querido ver en la conservación de algún segmento safeniano el origen de la recidivas [19]. Por ello, las modificaciones propuestas no han conseguido la aprobación de las escuelas más ortodoxas. Es más, estos autores proponen la radicalización de la eliminación del sistema venoso superficial como medio para conseguir mejores resultados [20].

¿Está justificado un tratamiento tan agresivo en casos de síndrome varicoso no complicado? Una gran proporción de los pacientes intervenidos pertenecen a los grados clínicos C2-C3 [21], es decir a pacientes sin dermatitis y sin úlceras, cuya sintomatología, de existir, puede controlarse con el uso de medias elásticas. Por otra parte, la prevalencia de esta patología aumenta con la edad y los casos más evolucionados se dan con frecuencia en el grupo de edad más avanzada. En muchos de estos pacientes añosos, el stripping sería una técnica quirúrgica demasiado agresiva. ¿Debemos operar a los pacientes jóvenes con patología banal y controlar con media elástica a los pacientes añosos con enfermedad varicosa más grave?

Por muy radical que sea el tratamiento, ¿puede asegurarse la no recidiva varicosa? Lo cierto es que las cifras de recidiva varicosa post-stripping publicadas lo desmienten por completo [22-24]. Dejando a un lado los posibles errores quirúrgicos, ni se pueden prevenir la aparición de nuevos puntos de fuga [25], ni se puede controlar la remodelación del drenaje del tejido celular subcutáneo. Este tipo de recidiva, sin punto de fuga [26], y generalmente asociado a la presencia de varicosis / telangiectasias, da lugar en ocasiones a un resultado clínico estético peor al anterior a la intervención quirúrgica, lo que es difícil de justificar en pacientes con grados clínicos C2.

En 1988, Franceschi [27] describió un procedimiento para el tratamiento de la IVC basado en la actuación sobre los elementos hemodinámicos que determinan la aparición de varices, con la conservación del capital venoso superficial.

Este procedimiento se denominó cura CHIVA (cura Conservadora Hemodinámica de la Insuficiencia Venosa Ambulatoria).

Aunque habitualmente aplicada mediante tratamiento quirúrgico, propiamente la cura CHIVA no es una técnica, sino una estrategia, que puede realizarse mediante cirugía, esclerosis, láser o procedimientos endovasculares.

La cura CHIVA defiende la idea que sea cual fuere el factor primordial o desencadenante de las varices, la concurrencia del elemento hemodinámico sería imprescindible. La supresión de dicho factor elimina las dilataciones varicosas –al elevar la extremidad del paciente varicoso, las varices desaparecen–.

Esta teoría estaría apoyada por los hallazgos de Caillard [28]. Este autor demuestra en sus estudios que una vez eliminado el factor hemodinámico (después de aplicar la cura CHIVA), se produce no sólo una involución del calibre de la vena safena interna, sino también una normalización ecográfica de la estructura de su pared.

Las varices primarias están hemodinámicamente caracterizadas por la existencia de un circuito retrógrado o shunt veno-venoso [29]. Este circuito retrógrado consiste en un punto proximal de reflujo (punto de fuga), desde el que la sangre del sistema venoso profundo es vertida al sistema venoso superficial, generalmente a las venas safenas. La columna de presión hidrostática, situada entre el punto de fuga y el punto de re-entrada al sistema venoso profundo, generalmente comprende la vena safena y una colateral insuficiente de ésta, en la que se encuentra la vena perforante de re-entrada. Este punto de re-entrada, drena el circuito venoso retrógrado de nuevo al sistema venoso profundo.

Previamente a la cura CHIVA se practica un marcaje eco-guiado sobre la piel del paciente para identificar los puntos donde el sistema venoso superficial debe ser interrumpido. La cura CHIVA consiste en una cirugía mínimamente invasiva, bajo anestesia local, basada en los hallazgos de un análisis hemodinámico cuidadoso de la red venosa superficial mediante eco-doppler.

Los principios en los que se basa la cura CHIVA son:

1º. - Fragmentación de la columna de presión.

2º. - Desconexión de los shunts veno-venosos.

3º. - Preservación de las perforantes de entrada.

4º. - Supresión de los R3 ó R4 no drenados.

El objetivo de la cura CHIVA es el de disminuir la presión de la columna hidrostática interrumpiendo los shunts veno-venosos sin eliminar la vena safena, sin eliminar el drenaje venoso de los tejidos superficiales de la extremidad.

Si al actuar sobre el componente hemodinámico podemos solucionar el problema clínico, ¿por qué deben extirparse dichas venas?

Por ello, si logramos controlar el elemento hidrostático, podemos realizar un tratamiento del cuadro sin eliminar las varices. Por otra parte, sorprende, bajo el punto de vista conceptual, propugnar la eliminación masiva de venas para tratar la IVC. Esta actitud ignora que las venas son elementos necesarios para el drenaje de los tejidos. Cuando el cirujano realiza una fleboextracción de la safena, deja que la ‘naturaleza’ organice dicho drenaje. La cura CHIVA trata de racionalizar la organización del drenaje venoso.

Animados por los principios racionales en los que se basaba este nuevo tratamiento, nuestro grupo se propuso cambiar el stripping por la cura CHIVA como tratamiento de elección para el tratamiento de las varices. El objetivo de esta tesis es el de comprobar si los resultados obtenidos con esta estrategia son comparables a los del stripping y el de analizar las distintas variaciones estratégicas condicionadas por la anatomía particular de cada caso, es decir, qué variaciones estratégicas debían aplicarse a cada tipo de shunt veno-venoso.

2.- JUSTIFICACION DE LA TESIS Y UNIDAD TEMATICA

2.- JUSTIFICACION DE LA TESIS Y UNIDAD TEMATICA

La enfermedad varicosa constituye la más conspicua manifestación clínica de la IVC y su carga asistencial en las unidades y servicios de angiología vascular es muy importante.

Si bien el tratamiento médico de las varices puede contribuir a mejorar la sintomatología, es el tratamiento quirúrgico el que consigue los mejores resultados. La fleboextracción de las safenas, técnica considerada patrón oro, consigue buenos resultados a costa de eliminar un capital venoso fundamental en el drenaje de los tejidos superficiales. Es además es una técnica agresiva que produce una baja laboral postoperatoria prolongada.

Por ese motivo nuestro servicio se propuso buscar nuevas estrategias para racionalizar el tratamiento de esta patología. Basada en conceptos hemodinámicos, la cura CHIVA consigue tratar las varices conservando las safenas (lo que además de permitir conservar el drenaje normal de los tejidos superficiales permitiría su hipotético uso en caso de precisar una futura revascularización por isquemia) y, siendo una técnica mínimamente agresiva, permite al paciente la deambulación inmediata.

Esta tesis se ha estructurado como compendio de tres estudios clínicos realizados por nuestro grupo y publicados en la literatura [30-32]

2.- JUSTIFICACION DE LA TESIS Y UNIDAD TEMATICA

El estudio se inició comparando nuestros resultados en el tratamiento de las varices a 3 años de la estrategia CHIVA frente a los obtenidos con la safenectomía [30].

Se comparó la desaparición de las varices, la mejoría sintomática general observada por los pacientes, y la presencia neuralgia del safeno asociada al tratamiento quirúrgico.

Debido a que la cura CHIVA es una estrategia diseñada hace pocos años ha ido sufriendo modificaciones a lo largo de su implementación. Por este motivo nuestro grupo se decidió a subanalizar en los estudios subsiguientes distintos grupos de pacientes en función del tipo de varices que presentaban [31-32].

Finalmente y como parte complementaria de la tesis, se realizó una revisión dividida en dos estudios: Una puesta al día de los conceptos en los que se basa la cura CHIVA que han sufrido notables modificaciones desde que fueron por primera vez publicados por C. Franceschi en 1988 [11] y una revisión de la estrategia quirúrgica de la cura CHIVA [33], así como de los resultados publicados en la literatura entre los que forman parte destacada los de nuestro servicio.

3.- OBJETIVOS

OBJETIVO FUNDAMENTAL

Los objetivos fundamentales de los 3 estudios principales han sido los siguientes:

Estudio 1

Comparison of clinical outcome of stripping and CHIVA for treatment of varicose veins in the lower extremities. Maeso J, Juan J, Escribano JM, Allegue N, Di Matteo A, González E, Matas M. Ann Vasc Surg 2001; 15 (6): 661-5.

El objetivo de este estudio prospectivo histórico fue el comparar los resultados del stripping de safena y de la cura CHIVA en el tratamiento de las varices. El resultado fue evaluado por observadores independientes. La duración del seguimiento fue de 3 años.

También se compararon los resultados, tanto del grupo CHIVA como del grupo stripping, con los publicados en la literatura.

Estudio 2

Durability of reflux-elimination by a minimal invasive CHIVA procedure on patients with varicose veins. A 3-year prospective case study. Escribano JM., Juan J, Bofill R, Maeso J, Rodríguez-Mori A, Matas M. Eur J Vasc Endovasc Surg 2003; 25 (2) 159-163.

El objetivo de esta publicación es el análisis de los resultados clínicos y hemodinámicos de la estrategia CHIVA 2 en el tratamiento de las varices asociadas al shunt veno-venoso tipo 3.

Este tipo de shunt venoso es el más prevalente y su estrategia plantea un problema: Si queremos resolver el tratamiento en un solo tiempo quirúrgico observaremos hasta un 40% de trombosis de safena interna en el postoperatorio inmediato.

Con el fin de evitar la trombosis safeniana postoperatoria y controlar la remodelación del sistema venoso superficial, se ha ensayado la estrategia en dos tiempos quirúrgicos ("CHIVA 2"). En primer lugar se interrumpe únicamente la colateral safeniana insuficiente (punto de fuga R2>R3). Se estudia la evolución del flujo en safena a partir de este momento. Interesa conocer qué porcentaje de safenas conservarán flujo anterógrado y cuántas volverán a presentar flujo retrógrado, obligando entonces a interrumpir en un segundo tiempo quirúrgico la unión safeno-femoral (punto de fuga R1>R2).

Estudio 3

Haemodynamic strategy for treatment of anterograde Giacomini varicose veins. Escribano JM, Juan J, Bofill R, Rodríguez-Mori A, Maeso J, Fuentes JM, Matas M. Eur J Vasc Endovasc Surg 2005; 30: 96-101.

En este estudio el objetivo es el de diagnosticar y analizar el resultado de la cura CHIVA sobre un tipo de varices que presentan un patrón de flujo paradójico. Son varices asociadas a flujo anterógrado en diástole en la vena de Giacomini.

En esta tercera publicación, se revisa el concepto de shunt veno-venoso, clave para entender el desarrollo de las varices, discutiéndose este caso particular de varices con flujo "paradójico" por presentar parte de su trayecto una dirección cardiópeta, como sería la dirección de flujo venoso normal. El estudio de este tipo de varices con flujo anterógrado en diástole dará pié al repaso del funcionamiento de la bomba muscular y a su distinción con el flujo anterógrado vicariante propio de la patología del sistema venoso profundo ya sea obstructiva o aplásica.

OBJETIVOS COMPLEMENTARIOS

Estudio 4

Haemodynamic surgery for varicose veins: Rationale, and anatomic and haemodynamic basis. Criado E, Juan J, Fontcuberta J, Escribano JM. Phlebology 2003; 18: 158-166

Se trata de una revisión de las bases anatómicas y funcionales en las que se basa la cura CHIVA.

Se repasa el concepto de shunt veno-venoso y se hace una descripción de los tipos de shunt veno-venosos y de los principios hemodinámicos en los que se basa la cura CHIVA.

Estudio 5

Haemodynamic surgery for varicose veins: Surgical strategy. Juan J, Escribano JM, Criado E, Fontcuberta J. Phlebology 2005; 20 (1): 2-13

El objetivo de esta publicación es el de revisar las distintas estrategias que pueden aplicarse en función del tipo de shunt veno-venoso.

En él se describen cuáles son sus indicaciones, cómo debe aplicarse la estrategia y cuáles son los resultados publicados de la cura CHIVA.

4.- PUBLICACIONES

ANNALS of VASCULAR SURGERY
International Journal of Vascular Surgery

Comparison of Clinical Outcome of Stripping and CHIVA for Treatment of Varicose Veins in the Lower Extremities

Jordi Maeso, MD, Jordi Juan, MD, José Maria Escribano, MD, Nicolas Allegue, MD, Angela Di Matteo, MD, Elena Gonzalez, MD, and Manuel Matas, MD, Barcelona, Spain

The purpose of this nonrandomized case-review study was to compare the outcome of stripping and CHIVA for treatment of varicose veins in the lower extremities in our department. Outcome was evaluated by independent physicians. A total of 85 patients underwent saphenous vein stripping in association with phlebectomy and 90 patients underwent CHIVA cure. The duration of follow-up was 3 years. Study criteria were (1) presence of varicose veins as a cause of failure (1.1% in the CHIVA group vs. 15.3% in the stripping group), (2) appearance of telangiectasia (8.9% in the CHIVA group vs. 65.9% in the stripping group), (3) patient dissatisfaction rate (3.3% in the CHIVA group vs. 16.5% in the stripping group), (4) postoperative symptoms as a cause of failure (1.1% in the CHIVA group vs. 21.2% in the stripping group), and (5) saphenous nerve injury (1 patient in the CHIVA group vs. 16 in the stripping group). Differences between all five criteria were significantly in favor of the CHIVA group as compared to saphenous vein stripping with phlebectomy. Clinical results at 3 years are better for patients treated with CHIVA than stripping with regard to presence of varicose veins, clinical symptoms, presence of telangiectasia, cosmetic satisfaction, and neurologic complications. Data in our series of CHIVA treatments are comparable to those reported in the literature and better than those described in three series of stripping procedures with 3-year follow-up. A prospective randomized study is now underway to confirm these findings.

INTRODUCTION

Since venous insufficiency is the most common peripheral vascular disease, changes in management techniques have important implications in the medical world. During the 20th century, the first major advance in the treatment of varicose veins in the lower extremities consisted of extirpation of the saphenous vein using a wire loop as described by Keller in 1905. Mayo proposed intraluminal extraction in 1906. Two years later, Babcock introduced a extractor device similar to current models.[1] After 1908, there was little change in operative treatment of varicose veins until 1966, when Muller proposed ambulatory phlebectomy.[2] The last major innovation occurred in 1983, when Francheschi described conservative hemodynamic cure of venous insufficiency known by the French acronym “CHIVA”.[3] CHIVA was designed to allow treatment of varicose veins without sacrificing the superficial vein network. Prior to CHIVA, the only treatment for venous insufficiency was stripping of the saphenous veins with or without extirpation or sclerosis of varices.

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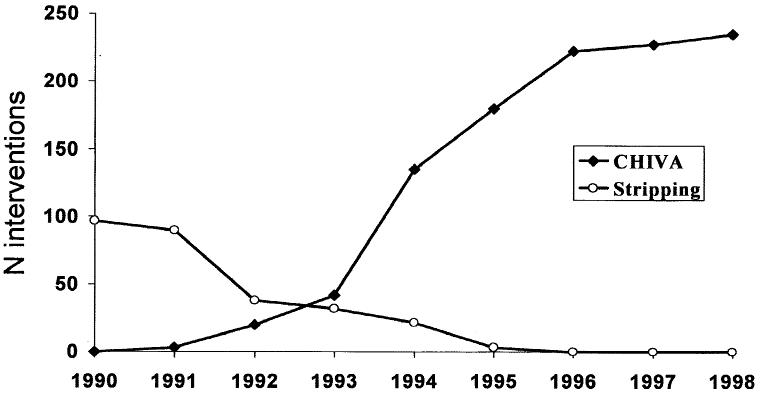

Fig. 1. Curve showing the operative techniques and patient population for treatment of varicose veins in our department from 1990 to 1998.

CHIVA is a conservative therapeutic alternative to conventional radical techniques. It was made possible thanks to progress in Doppler ultrasonography allowing anatomical and functional flow mapping of the superficial vein network (SVN). CHIVA is based on the fact that, even though varicose disease is associated with weakness of the vein wall, clinical manifestations occur only under certain orthostatic hemodynamic conditions. If these hemodynamic abnormalities are corrected by breaking the pressure column and suppressing venovenous shunting, manifestations disappear while preserving runoff from superficial tissues via the SVN.[4] By definition, stripping abolishes runoff.

Since 1988, there has been an ongoing controversy among vascular surgeons regarding the efficacy of CHIVA. A major problem in this debate has been the a lack of sufficient comparative data. The only pertinent article was published by Capelli et al.,[5] who compared the outcome of CHIVA cure with those of three previously published series of stripping procedures by other authors.[6-8] Since the methodology of that study has been strongly criticized, we decided to compare outcome in patients treated by CHIVA and stripping in our department.

PATIENTS AND METHODS

From January 1, 1990 to June 30, 1998, we treated varicose veins in 1330 lower extremities in our department. Figure 1 summarizes the treatment techniques used. In 1991, stripping was performed on 97 lower extremities and CHIVA on 4. In 1993, the number of extremities treated by stripping and CHIVA was approximately the same. Thereafter, the proportion of CHIVA procedures increased considerably until 1995, when only one patient was treated by stripping. At the present time, CHIVA is used exclusively in our department for treatment of varicose veins in the lower extremities.

In this nonrandomized, prospective case-review study, outcome of CHIVA and stripping was evaluated by independent observers. Three-year follow-up examinations were performed on a total of 85 consecutive patients treated by saphenous vein stripping in association with phlebectomy between 1991 and 1993 and 90 patients treated by CHIVA in 1994. None of the patients in either group underwent bilateral treatment. Patients treated by CHIVA cure between 1991 and 1993 were excluded to discount the effects of the learning curve. Mean patient age was 50.9 ± 12.8 years in the CHIVA group and 48.9 ± 11.1 years in the stripping group. The gender ratio was 18 (20%) men to 72 (80%) women in the CHIVA group and 29 (34%) men to 56 (66%) women in the stripping group.

Since this was a case-review study, the CEAP classification was not used. All patients presented superficial vein insufficiency with large-diameter varices and a patent, competent deep vein network. One hundred and fifty patients presented functional manifestations of venous insufficiency (pain and/or lower extremity edema), including 81 (95%) in the stripping group and 69 (76%) in the CHIVA group. All patients in the stripping group underwent preoperative work-up including physical examination and Doppler ultrasonography without flow mapping. As per the standard evaluation protocols, we studied saphenous vein reflux and status of the deep vein network. In the CHIVA group, Doppler ultrasonography was carried out to determine the anatomic and functional status of the superficial and deep vein networks and allow flow mapping for planning of surgical strategy as described by Francheschi.[3,4]

In the stripping group, preoperative outlining of

Table I. Outcome of stripping and CHIVA for treatment of varicose veins in lower extremities[a]

	Cure [*n* (%)]	Improvement [*n* (%)]	Failure [*n* (%)]	*p*
Presence of varicose veins				
CHIVA	51 (57)	38 (42)	1 (1)	<0.05
Stripping	46 (54)	26 (31)	13 (15)	
Clinical symptoms				
CHIVA	60 (67)	29 (32)	1 (1)	<0.05
Stripping	24 (28)	43 (51)	18 (21)	
Cosmetic satisfaction				
CHIVA	52 (58)	35 (39)	3 (3)	<0.05
Stripping	43 (51)	28 (33)	14 (16)	

[a]Comparison is based on assessment of the presence of varices, cosmetic satisfaction, and clinical symptoms according to the Hobbs classification.

the varicose veins was based on physical examination. Peridural anesthesia was used. Complete stripping was performed by evagination. The mean duration of hospitalization was 3 days. CHIVA procedures were carried out as an ambulatory procedure in an operating room under local anesthesia according to the technique described elsewhere.[3,9-11] No patient required hospitalization. Before the procedure, ultrasonic visualization was performed to locate division and ligation points in the SVN and potential zones for limited phlebectomy to break up the pressure column and interrupt venovenous shunting without compromising runoff from superficial tissue via perforating veins.[9-11]

All patients underwent clinical follow-up at 3 years by an independent physician not involved in treatment. Examination was focused on the presence or absence of varicose veins, appearance of telangectasia, patient satisfaction with cosmetic results, postoperative course of symptoms, and presence of neurologic abnormalities in territories enervated by the saphenous nerve.

Follow-up data also included ultrasonographic hemodynamic assessment. Clinical findings were classified using the Hobbs classification[6] as cure, improvement, or failure. Patients with no varices or symptoms were classified as cured. Patients with minor residual or recurrent varices and/or minor symptoms were classified as improved. Patients with no improvement or worsening of varices or symptoms in comparison with the preoperative findings were classified as failures.

Statistical analysis was performed by comparing data from the two groups, using the chi-squared Pearson, Mantel-Haenszel, and Yates correction tests.

RESULTS

Follow-up results for assessment of the presence or absence of varicose veins at 3 years in the CHIVA group were classified as cure in 51 (57%) cases and improvement in 38 (42%). There was only one failure (1%). In the stripping group, results were classified as cure in 46 (54%) cases, improvement in 26 (31%), and failure in 13 (15%). Statistical comparison showed a significant difference in favor of CHIVA ($p < 0.05$) (Table I).

Follow-up assessment of postoperative symptoms at 3 years revealed complete disappearance of symptoms in 60 cases (67%) in the CHIVA group and 24 cases (28%) in the stripping group. Improvement in symptoms was observed in 29 cases (32%) in the CHIVA group and 43 cases (51%) in the stripping group. Symptom-assessment findings were classified as failure in only one case (1%) in the CHIVA group and in 18 cases (21%) in the stripping group. The difference between the two groups was significant in favor of CHIVA ($p < 0.05$) (Table I).

Patient satisfaction with cosmetic outcome was studied in the two groups. In the CHIVA group, results were considered satisfactory by 52 patients (58%), improved by 35 (39%), and unsatisfactory or unchanged by 3 (3%). In the stripping group, results were considered satisfactory by 43 patients (51%), improved by 28 (33%), and unsatisfactory or unchanged by 14 (16%). The difference between the two groups was significant in favor of CHIVA ($p < 0.05$) (Table I).

Disturbances of cutaneous sensitivity in the territory enervated by the saphenous nerve were observed in 16 patients in the stripping group as com-

Table II. Incidence of late neurologic complications and telegectasia in patients treated for varicose veins in lower extremities by stripping or CHIVA

	Present [*n* (%)]	Absent [*n* (%)]	*p*
Neurologic complications			
CHIVA	1 (1)	89 (98)	
Stripping	16 (19)	69 (81)	0.005
Telengiectasia			
CHIVA	8 (9)	82 (91)	
Stripping	56 (66)	29 (34)	0.005

pared to only 1 in the CHIVA group. The difference between the two groups was significant in favor of CHIVA ($p < 0.05$) (Table II).

Major telangectasia was observed in 9% of patients in the CHIVA group and 66% in the stripping group. The difference between the two groups was significant in favor of CHIVA ($p < 0.05$) (Table II).

Since there were significantly more women in the CHIVA group (80%) than in the stripping group (66%), results were also studied as a function of gender. Outcome was excellent in 60% of male patients and 54% of female patients. Improvement was noted in 14 male patients (30%) and 50 female patients (39%). Statistical analysis showed no difference between males and females (Table III).

DISCUSSION

Our perusal of the literature showed that, unlike other vascular disorders, management of varicose veins of the lower extremities has received little attention. There are few well-documented reports describing the results of stripping, the most widely used technique at the moment. The reason for this paucity of data is probably related to difficulty in evaluating outcome for a disorder considered commonplace and often benign. Since 1995, we have been using CHIVA for treatment of all patients with varicose veins of the lower extremities. The purpose of the present study was to validate the findings of Capelli et al.[5]

The two groups in this study were homogeneous with regard to age (50.9 vs. 48.9 years), but there were more women in the CHIVA group (80%) than in the stripping group (66%). To evaluate this difference as a potential confounding factor, we compared outcome as a function of gender and found no statistical difference.

Since this was a case-review study, we were not able to ascertain initial clinical status in the two groups. As a result, initial clinical status could have been a source of bias. A randomized study will be necessary to resolve this issue.

Table III. Results of operative treatment of varicose veins in lower extremities in two groups showing no gender-related difference

	Males [*n* (%)]	Females [*n* (%)]	*p*
Cure	28 (60)	69 (54)	
Improvement	14 (30)	50 (39)	0.05
Failure	5 (10)	9 (7)	

Table IV. Outcome of CHIVA in our series (HVH) and that of Capelli et al.[5a]

Series	Cure [*n* (%)]	Improvement [*n* (%)]	Failure [*n* (%)]	Total (*n*)
Capelli et al.[5]	100 (60)	65 (39)	1 (1)	166
HVH[b]	51 (57)	38 (42)	1 (1)	90

[a]There was no significant difference.
[b]$p > 0.05$.

Table IV shows a comparison of our CHIVA results with those reported by Capelli et al.[5] in a series of 166 consecutive patients. In both series, the duration of follow-up was 3 years and results were classified according to the Hobbs classification. Capelli et al.[5] reported cure in 100 cases (60.2%), improvement in 65 (39.1%), and failure in 1 patient (0.7%). Statistical comparison showed no difference between the two studies. Our results can therefore be considered comparable to those of Capelli et al.

In their study, Capelli et al.[5] compared outcome of CHIVA at 3 years with outcome of stripping in three previously published series with the same follow-up.[6-8] Findings showed no statistically significant difference between the results of stripping in the three series. We compared the results in our 85-case stripping group with those of the same three series. No difference was found between our results and those reported by Taulaniemi,[8] Hobbs,[6] and Einarsson et al.[7] (Table V). Thus our results using stripping can be considered comparable to those reported in the literature with the same follow-up.

Finally, like Capelli et al.[5] we compared our CHIVA results at 3 years with those of stripping as reported by the aforementioned authors[6-8] (Table VI). Outcome was statistically better for the CHIVA group treated in our department.

Table V. Outcome at 3 years in our series (HVH) and in three other series with the same follow-up

Series	Cure [*n* (%)]	Improvement [*n* (%)]	Failure [*n* (%)]
Taulaniemi[8]	55 (44)	64 (50)	7 (6)
Hobbs[6]	98 (39)	127 (51)	25 (10)
Einarsson et al.[7]	34 (55)	21 (35)	6 (10)
HVH[a]	46 (54)	26 (31)	13 (15)

[a] $p < 0.05$.

Table VI. Outcome at 3 years in our series of CHIVA procedures (CHIVA HVH) and in three series of stripping procedures with the same follow-up

	Cure [*n* (%)]	Improvement [*n* (%)]	Failure [*n* (%)]
Taulaniemi[8]	55 (44)	64 (50)	7 (6)
Hobbs[6]	98 (39)	127 (51)	25 (10)
Einarsson et al.[7]	34 (55)	21 (35)	6 (10)
CHIVA HVH[a]	51 (56)	38 (42)	1 (1)

[a] $p < 0.05$.

Because of its nonrandomized, prospective case-review design, this study is subject to several limitations and data used in this study may require future re-assessment. The main problem is that the two groups are not strictly homogeneous. To resolve this problem and confirm our findings, we have undertaken a new randomized prospective study in collaboration with another department to compare conventional stripping without ultrasonographic flow mapping, stripping with preoperative ultrasonographic flow mapping, and CHIVA.

CONCLUSIONS

In our experience, 3-year results were better in patients treated with CHIVA than in patients treated with the stripping technique with regard to the following criteria: presence of varicose veins, control of clinical symptoms, appearance of telangectasia, patient satisfaction rate, and incidence of neurological complications. Clinical results in our series of stripping and CHIVA procedures were comparable to those reported in the literature. Three-year outcome was better after CHIVA than after stripping procedures previously reported in the literature. Prospective randomized studies are now underway to confirm these findings.

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Haemodynamic Strategy for Treatment of Diastolic Anterograde Giacomini Varicose Veins

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Objectives. *To assess the diagnosis and outcome of a haemodynamic strategy for the treatment of primary varicose veins associated with anterograde diastolic flow (ADF) in the Giacomini vein (GV).*
Methods. *ADF in the GV, with the escape point located at the saphenopopliteal junction, was demonstrated in 15 patients (15 limbs) by duplex ultrasound. No other escape points were seen in this group. ADF was defined as the flow present in the relaxing phase after isometric contraction of the lower limb, measured in the standing position. Duplex and clinical follow-up was performed prospectively at 1 week, at 1, 3, 6, and 12 months and once per year thereafter, between 1998 and 2001. Surgery consisted of flush division of the GV from the small saphenous vein (SSV) and division of the incompetent collateral veins from the GV.*
Results. *GV diameter showed an average reduction from 6 to 4 mm 33 months after surgery. Fourteen patients (93%) showed no symptoms or varicose veins. GV reconnection and recurrent ADF was demonstrated in two patients (13%).*
Conclusions. *ADF is a rare condition associated with primary varicose veins. ADF occurs when there is a closed venovenous shunt with recirculation in the muscular diastole. This implies that, although a part of the circuit is ascendant, the re-entry point must be located downstream to the scape point. Accurate duplex assessment is required to distinguish this atypical haemodynamic condition from an abnormal systolic circuit bypassing a deep vein obstruction. Interruption of the GV above its junction with the SSV abolished ADF with an acceptable rate of recurrences.*

Keywords: Primary varicose veins; Duplex ultrasound; Giacomini vein; Varicose vein surgery; Haemodynamic venous surgery.

Introduction

The Giacomini vein (GV) is an intersaphenous anastomosis first described in 1873.[1] Giacomini gave a detailed description of its anatomical variations, and since that time anatomical study of the GV has been supplemented by functional study[2] with the use of duplex ultrasound. The GV typically presents three sections: a distal and a proximal section lying in the saphenous compartment,[3,4] and a middle section that is usually subcutaneous. On transverse scanning of the posterior thigh, the GV is detected in a groove between the semitendinosus muscle medially, and the long head of the biceps muscle laterally.[5]

The GV is frequently involved in varicose vein disease, but usually with retrograde flow originating in the great saphenous vein (GSV) or pelvic veins. Less frequently, this gives rise to a particular 'paradoxical' varicose vein pattern with antigravitational upward diastolic flow from the saphenopopliteal junction (SPJ).[6] In normal conditions, flow in the veins of the lower limbs is activated during systole of the muscle pump. Capillary inflow occurs during the relaxation phase in the deep venous system because of the decrease in venous pressure after the muscles contract. Also in the diastolic phase, blood from the superficial venous system is aspirated to the deep venous system through perforating veins. Nevertheless, diastolic flow is too low to be detected in a duplex ultrasound examination. Therefore, in both the deep and superficial venous systems, it would be considered normal to find anterograde flow in systole and an absence of flow in diastole after valve closure.

Owing to its particular anatomical and haemodynamic characteristics, the GV may be a singular case, since a varicose syndrome characterised by anterograde diastolic flow (ADF) can arise in this vein. The

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purpose of the present article is to describe this type of flow and to propose a haemodynamic strategy for treatment.

Patients and Methods

A total of 1350 patients (1350 limbs) presenting at our outpatient surgery department with primary varicose veins from January 1998 to December 2001 were examined. Fifteen (1.1%) of these patients had SPJ incompetence and ADF in the GV (Fig. 1) as demonstrated by duplex study, and were candidates for surgery. In the preoperative duplex scan there were no cases of small saphenous vein (SSV) reflux, saphenofemoral reflux or deep venous system reflux.

Nine limbs (60%) showed a 'complete' GV, that is, an intersaphenous anastomosis was present, whereas in six limbs (40%) the GV ended in a perforating vein or in the varicose vein, with the proximal section being atrophic. Incompetent GV collaterals also involved the GSV in 10 limbs (66%) (Fig. 2). The GV was not varicosed.

Clinical disease severity was graded with the standard CEAP classification recommended by The Society for Vascular Surgery and the International Society for Cardiovascular Surgery.[7] All patients had symptoms and were CEAP Class 2 or greater. The study population consisted of 15 patients (15 limbs) (nine women and six men, mean age 44 years). The distribution of patients according to the CEAP classification was as follows: C2 (simple varicose veins), 12 patients and C3 (with oedema), three patients. The selected population was described by the algorithm C2–3, Ep, As, Pr (Fig. 3).

Whole-leg duplex US scanning was performed with a Philips P-700 scanner (Philips, Irving, CA) using a

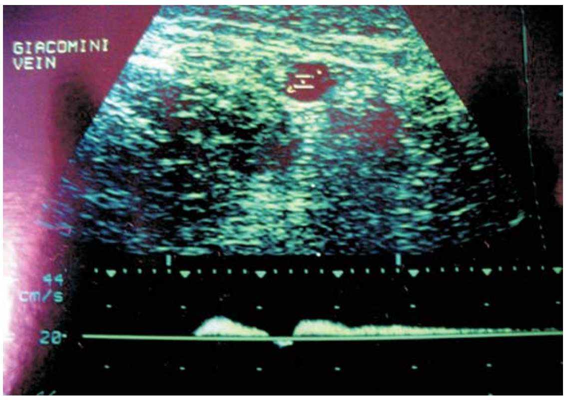

Fig. 1. Giacomini vein—upward diastolic flow in a transverse view. Venous flow direction is the same during systole and diastole of the leg muscles.

7.5-MHz probe. Duplex US examinations were done by two experienced staff members of the vascular laboratory directly involved in the study (JME, JJ).

Patients underwent duplex examination in the standing position. Reflux was tested by means of the compression-release test and the Paranà manoeuvre.[8] The latter stress test is used to measure changes in venous flow during isometric reflex contractions of the lower limbs in a stationary standing position when the examiner slightly pushes the patient's waist forward to induce disequilibrium. The Paranà manoeuvre has three advantages: it is easy to perform, has good reproducibility, and is haemodynamically similar to the real situation, reproducing the haemodynamic conditions controlling deep vein function when walking. The valvulomuscular pump in itself does not produce changes in the systolic flow of the superficial veins; instead the changes are brought about by compression of the Lejars plantar pump.

The Paranà manoeuvre was performed in all cases with the study limb in slight flexion. Bi-directional anterograde systolic flow and retrograde diastolic flow in the saphenopopliteal junction was demonstrated in all patients (Fig. 2). The GV presented unidirectional anterograde systolic and diastolic flow in all cases. As has been observed by other authors,[9,10] no relationship was found between saphenopopliteal insufficiency and functional anterograde systolic flow in the GV, possibly because the patients were examined with the limb in slight flexion.

A preoperative skin map was obtained by duplex to determine the anatomical and functional status of the superficial and deep vein networks, and to allow flow mapping for planning the surgical strategy, as described by Franceschi.[11]

The operations were performed under local anaesthesia and consisted of flush division of the GV from the SSV, and division of the incompetent collateral veins from the GV and from the GSV, when required (Figs. 4 and 5). Partial phlebectomy of the interrupted tributaries was done for cosmetic reasons. The level of the phlebectomy was based on the Perthes tourniquet test (Fig. 6). The tourniquet was placed at the origin of the varicose collateral and the patient was asked to walk. If the vein disappeared, phlebectomy was not done. If it did not disappear, the tourniquet was placed at a lower position and the manoeuvre was repeated until collapse of the varicose vein was observed. The level of the tourniquet marked the segment of the varicose collateral to be phlebectomized.

Patients were allowed to walk immediately after the procedure and were encouraged to return to normal daily activity. Elastic stockings exerting 20–30 mmHg

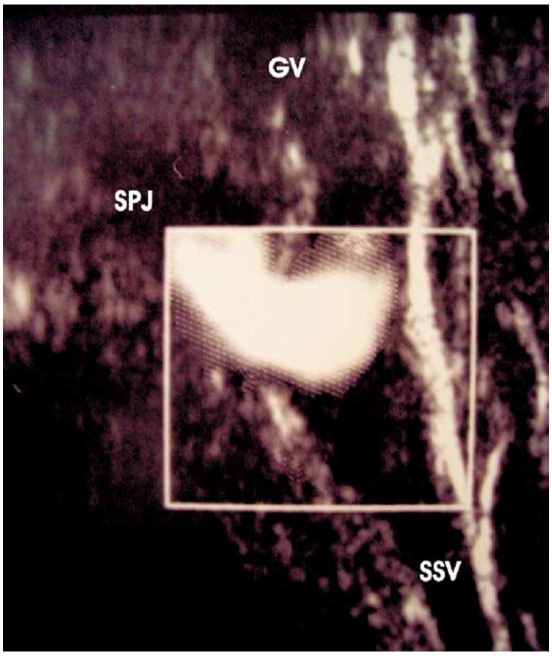

Fig. 2. Retrograde diastolic flow in the sapheno–popliteal junction (SPJ) and antegrade diastolic flow in the Giacomini vein (GV) seen in longitudinal view. SSV, small saphenous vein.

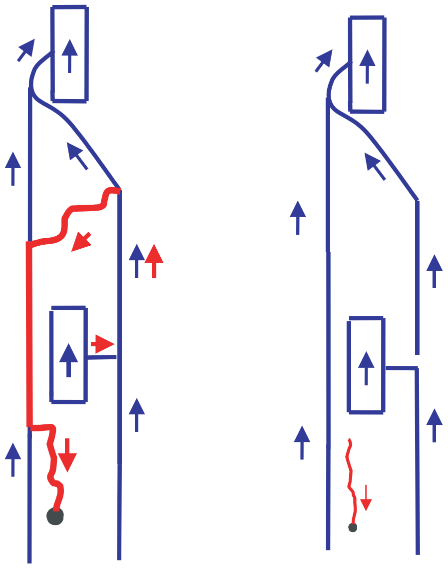

Fig. 4. Surgical procedure. Division of the Giacomini vein (GV) flush with the small saphenous vein and division of the incompetent collaterals flush with the GV and the great saphenous vein (GSV). Diastolic flow is shown in red. An incompetent collateral between GV and GSV is always completely phlebectomised to avoid thrombophlebitis. Depending on the type of drainage established in the GSV, interruption of its collaterals will result in antegrade flow or in a retrograde flow with a normal flow rate from the competent collaterals.[12]

at the ankle were maintained for 7 days. No additional sclerotherapy for superficial vessels was used.

Patients were asked to return for clinical examination and duplex scanning after 1 week and at 1, 3, 6, 12, 24, 36, 48 and 60 months after the procedure. The mean follow-up time was 31 months (24–60 months).

Duplex tests were done to demonstrate patency, diameter and flow at the GV, and correct interruption of venovenous shunting. Giacomini vein diameter was measured at 10 cm above the saphenopopliteal junction during each duplex control. Clinical examination was performed by an independent physician who not involved in the treatment. Clinical findings were graded, using the CEAP[7] classification.

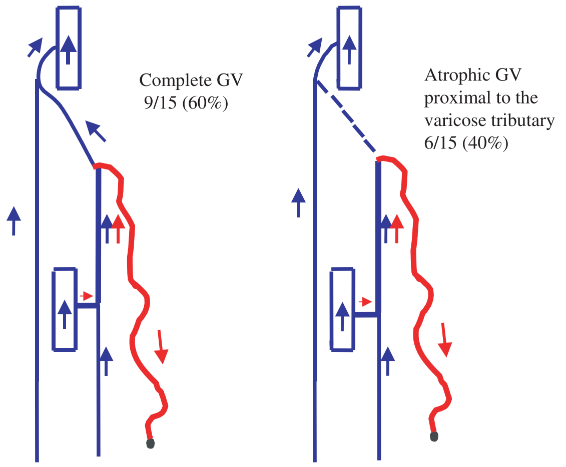

Fig. 3. Anatomical variations of the Giacomini vein (GV) seen in this study.

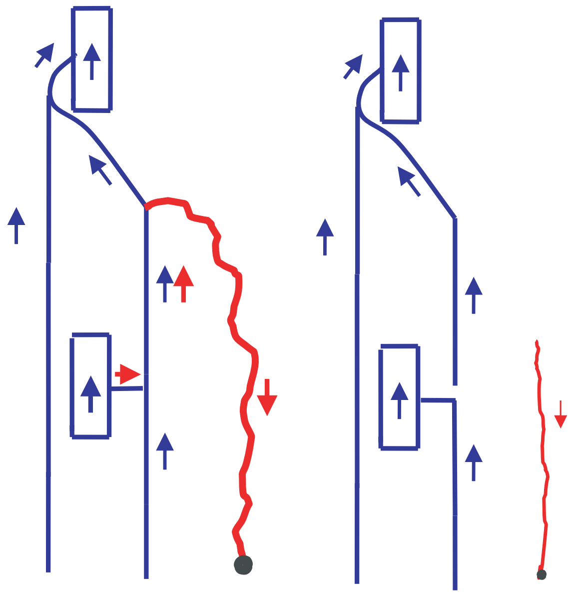

Fig. 5. Surgical procedure. Division of the Giacomini vein flush with the small saphenous vein and division of the GV tributary flush with the GV. Diastolic flow is shown in red.

Fig. 6. Perthes tourniquet test used to determine the length of the phlebectomy. The level of vein interruption that maintains the varices in an empty state with this manoeuvre will be the level of the phlebectomy.

Outcome according to complaints and cosmetic results was assessed by the patients as 'good' (excellent or fair cosmesis, or absence of complaints) or 'bad' (cosmetic assessment poor, or complaints unchanged or worse).

Results

Giacomini vein patency with anterograde systolic flow was demonstrated in all 15 limbs. The GV diameter showed an average reduction from 5.8 mm (SD: 1.01) to 3.6 mm (SD: 0.58).

Recurrent ADF was shown in two limbs (13%). Reconnection of the interrupted GV was documented after 6 to 12 months' follow-up in these cases and anterograde diastolic flow in the GV was restored. One of these patients was re-operated after recurrent visible varicose veins were observed.

The clinical findings at the time of the last control according to the CEAP classification were: C0, 12 cases (80%); C1, 2 cases (13.3%); and C2, 1 case (6.6%). None of the patients considered that their clinical results were poor.

Discussion

Primary varicose veins due to SPJ junction insufficiency with anterograde diastolic flow are fairly rare, comprising 1.1% of our series. However, identification of the condition is important since surgical treatment focussing on the GSV and SSV, often resulting in removal of healthy veins, would not be effective in such cases. With the help of tests that reproduce physiological conditions, such as the Paranà manoeuvre, we are able to carry out duplex studies of venous flow during systole and diastole of the leg muscles. During muscle relaxation (diastole), the pressure column is divided up as a result of closure of the venous valves. Thus, it seems paradoxical that anterograde flow should be pathological. Due to the limitations of the instrument, it is considered normal that the veins of the lower extremities do not present flow during diastole. Any flow, whether anterograde or retrograde, in the relaxation phase of the leg muscles may therefore be regarded as pathological. This being so, anterograde flow during diastole must be linked to an escape point distal to the point being examined: in this group of patients, the SPJ.

Primary varicose veins are haemodynamically characterised by the existence of a circuit or venovenous shunt. The shunt consists of a proximal escape point, usually located at the level of an incompetent junction, through which blood from the deep system is shunted into the superficial veins.[13] The course of this circuit, whether partially anterograde or not, is not highly relevant. What is important is the height at which the re-entry point to the deep venous system is located. If the re-entry point is a lower leg-perforating vein located distally to the escape point, a closed circuit is formed, which is activated during muscle diastole by aspiration of superficial blood to the deep venous system. If the re-entry point is a proximal thigh-perforating vein, the shunt does not recirculate and is activated only in systole. This would occur in a shunt that bypasses a deep vein obstruction, and would also occur in postural muscular-ligamentous compression on the gastrocnemius-popliteal-femoral veins, which can result in diverted flow from the deep to superficial venous system in order to bypass the constricted deep outflow. Thus, the blood may have an ascending systolic flow from the deep venous system to the saphenous axes, using the GV as intermediary conduit[9,10] (Fig. 7).

We found no connection between anatomical variations of the GV and the presence of ADF. In nine limbs (60%) a 'complete' GV, that is, an intersaphenous anastomosis, was present, while in six limbs (40%) the GV ended in a perforating vein or

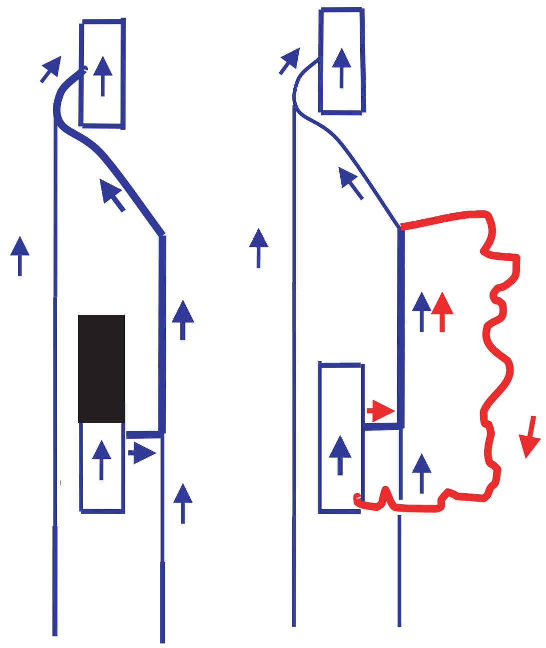

Fig. 7. Left, in systole, shows open venovenous shunt. Right, in diastole, shows closed venovenous shunt (diastolic flow is depicted in red).

Table 1. Comparison between the number of recurrences of incompetent GV collaterals according to the type of surgery performed

	Recurrence	No recurrence	
GV interruption	2	13	15
Collateral interruption	5	2	7
	7	15	22

P-value with the Fisher's exact probability test. $P=0.013$.

in the varicose vein, with the proximal section being atrophic (Fig. 4). According to Giacomini's anatomical description, it is this second group that would show backward-facing valves, directing the venous flow towards the SPJ.[2]

One point of discussion might be the most suitable place at which to interrupt the escape point. We chose an interruption point flush with the end of the SSV in order to avoid creating a cul-de-sac. In all cases, it is important to ensure accurate echo-guided marking of the exact location of the junction of the GV with the SSV at the preoperative stage. Prior to this study, in the period between 1995 and 1997, seven cases of ADF in the GV were treated with local avulsion of the varicose branch of the GV, but there were 4/7 (57%) cases of clinical varicose vein recurrence after 12 months' follow-up and 5/7 (71%) cases of sonographic reconnection ($P=0.0013$) (Table 1). This is why we emphasise the importance of interrupting the escape point located at the SPJ.

In addition, interruption of the escape point avoids deep venous thrombosis at this level[14] as well as possible recurrence due to an error in the identification of the complex venous anatomy at the SPJ.[15]

With regard to possible postoperative outcomes, it should be noted that in one case (6.6%), slight retrograde flow developed in the SSV after 12 months' follow-up, but no varices were visible. This ostial SSV insufficiency was seen in the atrophic GV group.

In conclusion, correct duplex ultrasound identification is essential in this rare, partially anterograde venovenous shunt, which produces a closed circulation system in muscular diastole. Although, more cases and longer follow-up are required to establish definite conclusions, these preliminary results suggest that GV interruption at the level of its junction with the SSV abolishes ADF with an acceptable rate of recurrences as compared to interruption of the insufficient GV collaterals alone.

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Review article

Haemodynamic surgery for varicose veins: rationale, and anatomic and haemodynamic basis

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Abstract

The treatment of varicose veins has traditionally been ablative in nature and implemented without intent to improve the haemodynamic condition of the lower extremity veins. Haemodynamic surgery attempts to treat varicose veins by changing the reflux pattern while preserving the most efficient venous drainage channels. To implement this treatment modality it is necessary to have a clear understanding of the physiologic principles and the different reflux patterns that form the basis of haemodynamic surgery. Haemodynamic surgery is an emerging treatment for varicose veins, and has received little attention in the English literature. The rationale, and functional and anatomic basis of haemodynamic surgery for varicose veins are herein described.

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Keywords: varicose veins; haemodynamic surgery

Introduction

Varicose veins are the most common manifestation of lower extremity chronic venous insufficiency and are a frequent reason for vascular consultation. Although generally regarded as a benign process, varicose veins, because of their high prevalence and the patient demand for treatment, constitute a major issue in most health care systems, with significant cost repercussions. Traditional surgical treatments for varicose veins have generally been ablative and/or obliterative in nature and have involved different procedures, using surgical or mechanical excision and vein obliteration with sclerosing agents, or radiofrequency or laser-generated energy. Despite the wide acceptance of most of these methods, current results of treatment for varicose veins are far from optimal. In contrast with arterial surgery, the traditional approach to the treatment of varicose veins has never focused on the re-establishment or improvement of haemodynamics, perhaps because the haemodynamics of venous pathophysiology have remained poorly understood, and ablative and/or obliterative treatments have been generally implemented with little attention to the preoperative study of venous haemodynamics.

In recent years, duplex scanning has allowed us to improve our understanding of venous physiology, and specifically to unravel the nature of abnormal venous flow patterns in patients with varicose veins. In 1988, Franceschi[1] described a new form of therapy for varicose veins, based on the improvement of the haemodynamic conditions that determine the occurrence of varicose veins. This treatment modality, which also avoids the excision of the saphenous veins, is known as the CHIVA treatment, from the acronym of the French for conservative haemodynamic 'cure' (i.e. treatment) of insufficient veins in ambulatory patients, cure conservatrice et hemodynamique de l'insuffisance veineuse en ambulatoire.

Haemodynamic surgery is a minimally invasive surgical procedure most often used to implement the CHIVA strategy for treatment of varicose veins.

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Theoretically, however, the CHIVA strategy could also be implemented by other technical means such as sclerotherapy, laser catheter or, perhaps, other endovascular means. Haemodynamic surgery for the treatment of varicose veins has been highly debated and often refuted because of its departure from traditional surgery. The continued difficulty in the acceptance and widespread use of this treatment is due to lack of information on its principles, difficulty in learning the strategy and lack of rigorous data supporting its results. Like any other new treatment, haemodynamic surgery is evolving and improving, and we believe it is a worthwhile and promising technique that deserves more attention and scrutiny. It is important to understand that haemodynamic surgery is in evolution and that changes are being incorporated based on the experience of a small number of surgical groups. At present, there is a notable lack of literature to support our review. Therefore, we base our statements on the learning, personal experience and opinions of the authors.

It is the purpose of the present review to explain the rationale of and the anatomic and functional basis of haemodynamic surgery for the treatment of varicose veins.

Rationale of haemodynamic surgery for varicose veins

Although the precise aetiology of varicose veins is unclear, we do know that there is an alteration in vein wall function, in association with a haemodynamic component that increases venous pressure. Regardless of the initial predisposing factor, it appears that persistence and progression of varicose vein dilatation is mainly secondary to sustained elevation in venous pressure. An intuitive explanation of this phenomenon is given by the Trendelenburg test[2], which can demonstrate the disappearance of varicose vein dilatation with leg elevation and with the application of a thigh tourniquet upon resuming the erect position. Based on this observation, it seems plausible that a reversal in the haemodynamic component of varicose veins could, in turn, produce an involution in the size of the veins and, perhaps, as suggested by Caillard *et al.*[3], be followed by normalization of the ultrasonographic structure of the venous wall. This observation suggests a direct relationship between the haemodynamic and the parietal factor in the development of varicose veins. Haemodynamic surgery is based on the premise that varicose veins regress once the haemodynamic alterations are corrected. Hence, the excision of all varicosities and dilated venous trunks may be unnecessary in the treatment of patients with varicose veins.

Traditional surgery for varicose veins has disregarded the physiologic implications of the surgical removal of the superficial venous system. This attitude ignores the importance of the superficial system in the venous drainage of the soft tissues and assumes that the spontaneous re-organization of venous drainage following ablative surgery for varicose veins is inconsequential. This is far from the truth, since blind ablation of varicose veins eliminates, in many cases, the better drainage routes for the remaining superficial veins, often leaving a poorly drained superficial system prone to the development of new varicosities and clinical recurrence. Haemodynamic surgery attempts to reduce the venous pressure in the superficial system by interrupting the gravitational venous pressure column at the origin of the reflux. Additionally, haemodynamic surgery preserves the veins that empty the superficial system into the deep system by means of hydrostatic forces and an active muscle pump.

The ultrasonographic study of the venous system in patients with varicose veins allows the morphologic identification of dilated venous segments and, more importantly, the drawing of a detailed map of the reflux pattern. Based on this information, haemodynamic surgery designs an individual surgical strategy intended to interrupt the venous pressure column and to preserve adequate routes for effective drainage of the remaining incompetent venous segments.

Anatomic and physiologic principles of haemodynamic surgery

Anatomic concepts: venous networks

An understanding of haemodynamic surgery requires a systematic but rather simple classification of the lower extremity veins. The different venous networks are classified depending on their relationship with the lower extremity fascial planes[4]. There are two main fascial planes that compartmentalize the lower extremity: the deep fascia that covers the muscle aponeurosis and the superficial fascia that divides the subcutaneous fat. These two fascial planes delineate three different spaces, as seen in Figures 1 and 2.

The primary venous network, referred to as R1, comprises all the veins located inside the deep fascia and belongs to the deep venous system. The secondary venous network, or R2, comprises the veins contained between the deep and superficial

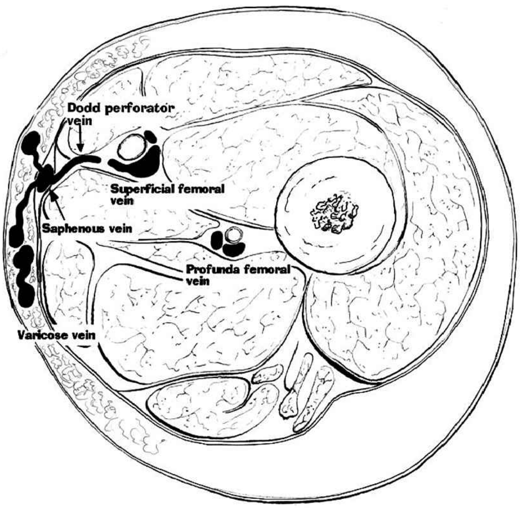

Figure 1 High thigh cross section illustrating the relationship of the fascial compartments to the deep vein, saphenous vein, superficial varicose veins and perforators

fascia, mainly the greater and lesser saphenous veins, their major branches, and the Giacomini vein. The tertiary venous network, or R3 (Figure 2), corresponds to the veins located outside the superficial fascia, mostly tributaries of the saphenous vein. Finally, the quaternary venous network, or R4 (Figure 2), comprises those veins located superficially to the superficial fascia as the tertiary network, but that connect veins from the secondary network. These R4 veins may be longitudinal if they connect a saphenous vein, or R2, to itself at different levels, or may be transverse if they communicate two different veins from the secondary network (i.e. the greater saphenous with the lesser saphenous vein).

The secondary network is connected to the primary network through the saphenous vein roots and the perforator veins. It is important to remember that not only the saphenous veins are connected to the deep system or primary network through perforating veins; superficial veins from the tertiary network also communicate with the deep system through perforating veins.

Haemodynamic concepts

Primary varicose veins are characterized by the presence of anomalous retrograde venous flow between different venous networks. Varicose veins originate in veno-venous shunts with an escape point of reflux, which in turn propagates retrograde flow from one venous network into another. The second integral part of a veno-venous shunt is the re-entry point that allows flow from network to network in an antegrade fashion. The veno-venous re-circulation re-enters the deep system through a re-entry point, typically a perforating vein.

Venous shunts can be open or closed, depending on whether they allow blood re-circulation. Closed shunts maintain venous re-circulation during diastole through a refluxing venous segment and cause venous flow and pressure overload. On the other hand, open shunts are haemodynamically benign because retrograde venous flow is unimpeded from one network to another, without re-circulation and without flow overload. In general, limbs with greater clinical severity of venous disease (CEAP clinical severity 3 to 6) are associated with closed shunts with reflux escape points from the deep system to the saphenous veins (R1

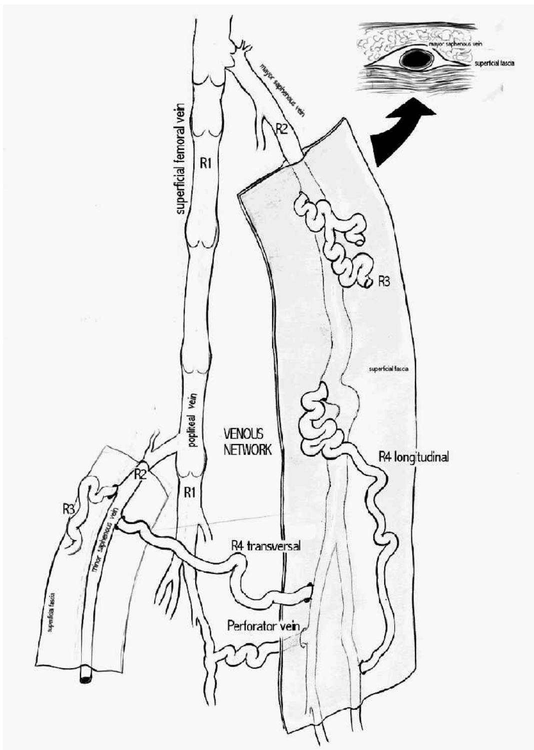

Figure 2 Diagram illustrating the four different types of venous networks and their connections. The R1 network refers to all deep veins. The R2 network refers to the greater and lesser saphenous veins and the vein of Giacomini. The R3 network refers to tributaries of the saphenous veins. The R4 network is composed of branches of the saphenous veins, which connect both saphenous veins transversely (R4 transversal) or a branch that connects one saphenous trunk to itself at two different levels (R4 longitudinal)

to R2), while open shunts are rarely associated with clinically severe venous disease. The difference in venous flow overload between open and closed shunts is manifested by the degree of saphenous vein dilatation they produce. In open shunts, the saphenous vein calibre is rarely enlarged, while in closed shunts the saphenous vein diameter is almost always dilated. The intrinsic haemodynamic difference between open and closed shunts makes the former generally easier to treat and confers to the latter, in general, a worse prognosis. However, closed shunts in which the escape point can be obliterated, leaving a well drained system, have an excellent prognosis, while certain types of open shunts carry a poor prognosis following haemodynamic surgery.

Most venous shunts allow retrograde flow only during the relaxation phase of the muscle pump mechanism. During muscular systole, reflux tends to cease because of increased pressure at the points of venous re-entry into the deep system. Shunts associated with complete deep vein obstruction, because of their higher pressure gradients, show antegrade flow through both muscle systole and diastole.

The different reflux and shunt patterns have different prognostic implications and require different treatment strategies. To customize treatment to the different patient conditions, haemodynamic surgery classifies venous shunts depending on the venous networks involved and the location of the reflux and re-entry points.

Classification of venous shunts

As our understanding of the reflux patterns evolves with increasing experience, the classification of different venous shunt configurations encountered in patients with varicose veins has been modified. The classification herein presented is the product of an unpublished consensus reached in 2002 (VII Reunion de L'Association Europeenne de CHIVA, Teupitz, Germany, May 2002). In general, a venous shunt occurs whenever there is anomalous flow (reversed) in any area of the venous system.

Type 0 shunt

A type 0 shunt consists of a saphenous vein segment with retrograde flow, typically initiated at the level of a not-incompetent R3 tributary, with direct drainage of the refluxing saphenous segment through a perforator into the deep system (Figure 3).

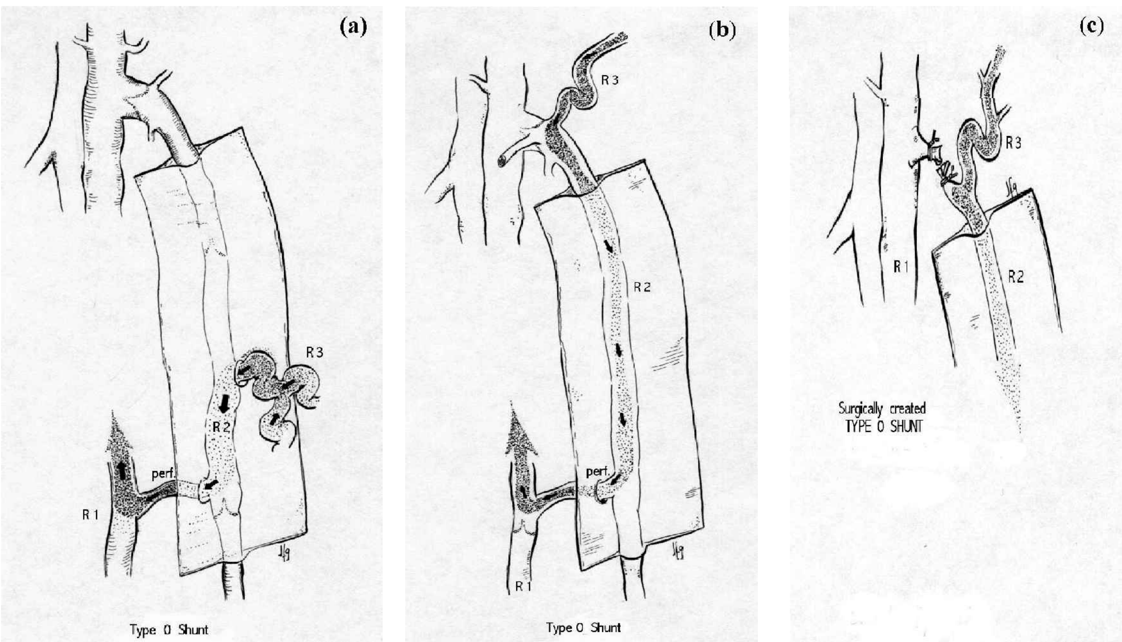

Figure 3 Type 0 shunts consist of an incompetent saphenous vein segment, originating at a saphenous tributary, which re-enters the deep system directly via a perforator (a). The incompetent saphenous segment can be rather long (b). Regardless of the saphenous vein length involvement, type 0 shunts are haemodynamically benign and are not associated with varicose vein development. A type 0 shunt may be created following high ligation of an incompetent saphenofemral junction (c)

Type 0 shunts are open shunts and do not have any pathologic significance since venous flow is not redundant and drains without impediment into the deep system. A type 0 shunt haemodynamic situation is often the result of surgical intervention, typically following high ligation of the saphenofemoral junction. (Figure 3c).

Type 1 shunt

In type 1 shunts, the reflux escape point is established between the R1 and R2 networks, with re-entry into the deep system via a perforator vein directly from the saphenous vein. This shunt is considered a closed shunt because there is venous re-circulation through the saphenous vein (Figure 4).

Type 2 shunt

In type 2 shunts, the saphenofemoral junction is always competent, and the reflux escape point starts off a branch of the saphenous vein (R3 or R4). There are three different type 2 shunts, designated as 2A, 2B, and 2C. In type 2A shunts, the saphenous vein is competent proximal to the escape point off the saphenous vein into the tertiary (R3) or quaternary (R4) networks (Figure 5). In turn, type 2A shunts can be open, if reflux occurs through a transverse R4 travelling from one saphenous vein to another, or through an R3 tributary draining directly into the deep system via a perforator. Type 2A shunts can also be closed shunts if a longitudinal R4 vein connects a saphenous vein to itself at different levels, establishing re-circulation (Figure 5). Type 2B shunts are characterized by the presence of saphenous reflux proximal to the reflux escape point into an R3, with competent flow in the saphenous vein distal to the reflux escape point (Figure 5). Type 2B shunts may have no re-circulation, and therefore are open shunts, when they drain through a perforator. However, they may produce re-circulation if they drain through a longitudinal R4. Type 2C shunts are characterized by saphenous vein reflux proximal and distal to the reflux escape point into an R3 tributary, which drains into the deep system via a perforator. In addition, type 2C shunts present a direct saphenous re-entry into the deep system via a perforator. Type 2C shunts are open shunts because there is no re-circulation.

Type 1 plus 2 shunt

Type 1 plus 2 shunts are characterized by the presence of both type 1 and type 2 shunts. The haemodynamic situation would be identical to a type 2C shunt, with the addition of a direct reflux escape point between the deep and the saphenous veins, commonly at the saphenofemoral junction. Therefore, these are closed shunts because of re-circulation through the incompetent saphenous vein (Figure 6).

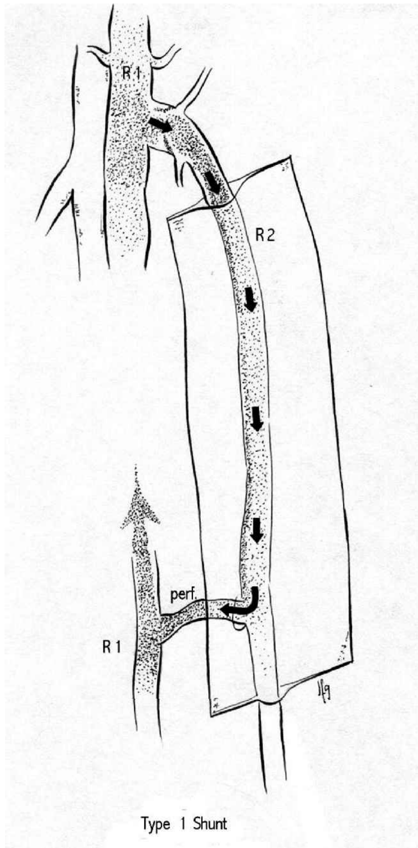

Figure 4 A type 1 shunt occurs when the saphenofemoral junction is incompetent and a segment of the saphenous vein refluxes distally until flow re-enters the deep system through a perforating vein

Type 3 shunt

This is the most common type of shunt in patients with primary varicose veins. The reflux escape point arises between the deep and the saphenous veins (R1 to R2), commonly at the saphenofemoral junction, and reflux continues into an R3 tributary, which drains in turn into the deep system via a perforator. Type 3 shunts are closed shunts because of re-circulation through the saphenous vein and R3 tributary (Figure 7).

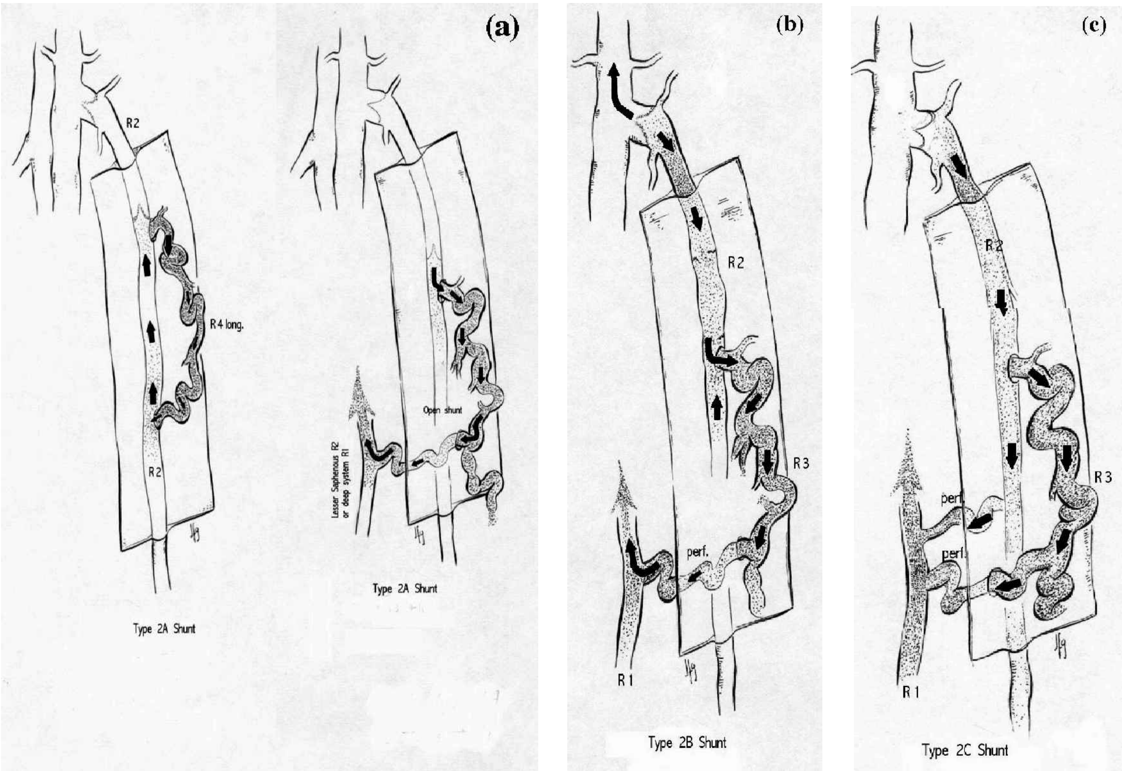

Figure 5 All type 2 shunts have a competent saphenofemoral junction. Type 2A shunt occurs when a direct tributary of the saphenous vein (R3) refluxes, re-entering the saphenous trunk at a more distal level (a). The saphenous vein is competent throughout. Type 2A shunts are closed, re-circulating shunts if the re-entry is at the same saphenous trunk, or they can be open shunts if reflux re-enters another saphenous trunk (i.e. the lesser saphenous) or the deep system via a perforator. In type 2B shunts, the saphenous vein is incompetent proximal to the tributary (R3) escape point, with a competent saphenofemoral junction, and re-entry is via a perforator into the deep system (b). In type 2C shunts, the saphenous vein refluxes distal to the reflux escape point and re-enters the deep system via a second perforator (c)

Type 4 shunt

Type 4 shunts are characterized by an origin of reflux in an incompetent perforator off the deep system, which connects to an R3 tributary that drains into the saphenous vein. The saphenous vein is rendered incompetent distal to the R3 connection, and a distal saphenous perforator re-enters the deep system. Type 4 shunts originating in a deep perforator produce re-circulation. Likewise, type 4 shunts originating in an incompetent pelvic R3 vein also produce re-circulation and would be closed shunts (Figure 8). This is evidenced by the presence of reflux in the originating R3 tributary during a Valsalva manoeuvre.

Type 4 plus 2 shunt

Type 4 plus 2 shunts are characterized by the association of a type 4 with a type 2 shunt. The reflux escape point originates in a perforating vein or in a pelvic R3 tributary that renders the saphenous vein incompetent from its entry. Re-entry occurs through a saphenous perforator and through an R3 tributary that drains into the deep system via a perforator (Figure 9). These are considered closed shunts since their global haemodynamic effect produces re-circulation.

Type 5 shunt

In type 5 shunts, the reflux escape point is similar to that in type 4 shunts. Reflux may initiate through a pelvic R3 (Figure 10a) or through an incompetent perforator (Figure 10b). The re-entry is established through an R3 into the deep system via a perforator. Type 5 shunts are all closed shunts since the pelvic veins in which they may originate are

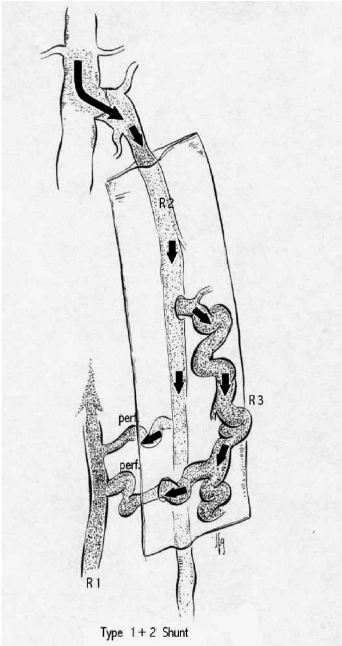

Figure 6 Type 1 plus 2 shunts are identical to type 2C shunts, with the addition of saphenofemoral junction reflux

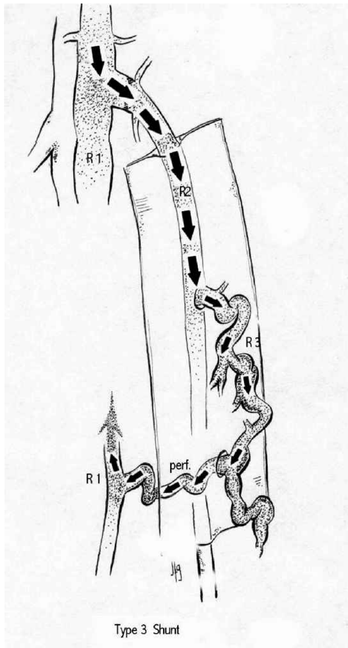

Figure 7 A type 3 shunt – the most common reflux pattern. Reflux arises at the saphenofemoral junction and flows through the saphenous trunk into a tributary that eventually drains into the deep system via a perforator

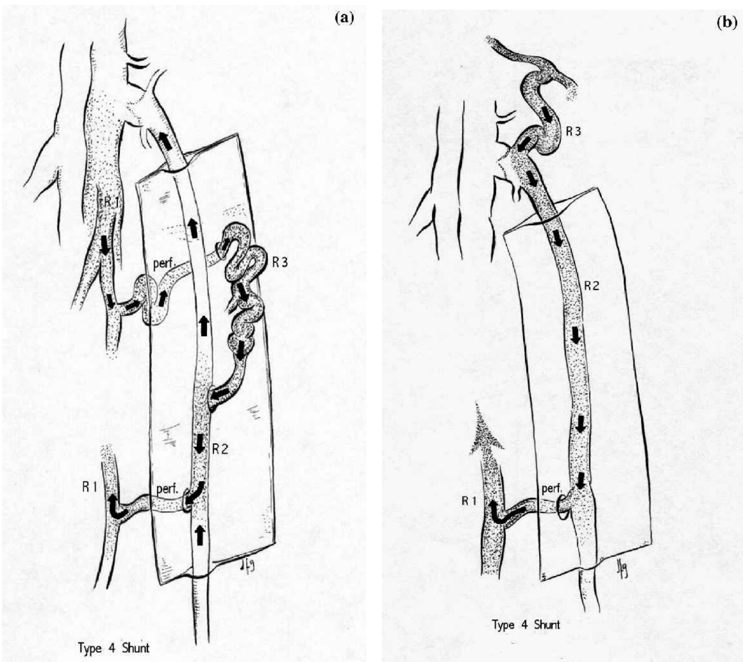

Figure 8 Type 4 shunts can originate in a perforator or a pelvic vein. Incompetent pelvic R3 veins in turn originate in the iliac vein, which is also considered an R1 segment. They connect to the saphenous trunk, which becomes incompetent, and the more distal saphenous drains into the deep system via a perforator. Both types produce re-circulation

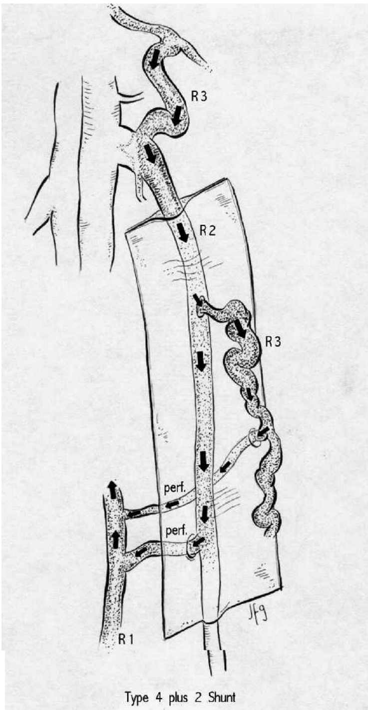

Figure 9 In type 4 plus 2 shunts a type 4 shunt has an additional incompetent tributary (R3) that refluxes and re-enters the deep system via another perforator. Incompetent pelvic R3 veins originate in the iliac vein, which is also considered an R1 segment

avalvular and can potentially generate re-circulation. Type 5 shunts are likewise closed if they originate in an incompetent perforator.

Type 6 shunt

In type 6 shunts, the saphenous vein is not involved. The reflux escape point arises from the deep system (R1) into an R3 which drains directly into the deep system via a perforator or, alternatively, into a competent saphenous vein (Figure 11). Type 6 shunts are open shunts when they drain into a competent saphenous vein and are closed when drainage is through a perforating vein.

Collateral shunts

Collateral shunts are those generated in response to a venous obstruction. In collateral shunts, venous flow is antegrade throughout muscle pump systole and diastole, and they are not necessarily associated with reflux.

This shunt classification includes most reflux patterns encountered in patients with varicose veins. It allows us to classify the different haemodynamic configurations that we may encounter in patients with superficial venous incompetence and to select accordingly the most appropriate surgical strategy. In addition, it has prognostic implications.

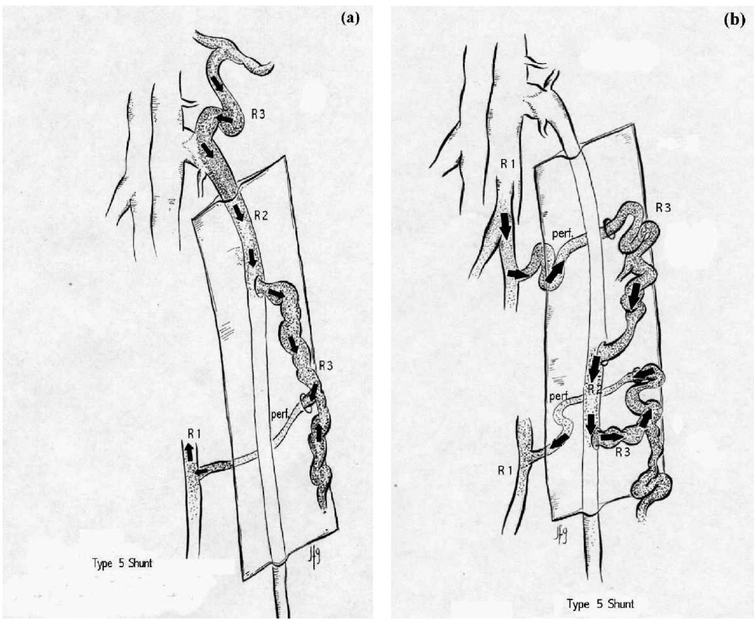

Figure 10 Type 5 shunts originate in the same way as type 4 shunts, but they drain into the deep system via perforators arising in saphenous tributaries rather than from the saphenous vein. The incompetent pelvic R3 vein that creates the shunt originates in the iliac vein (R1)

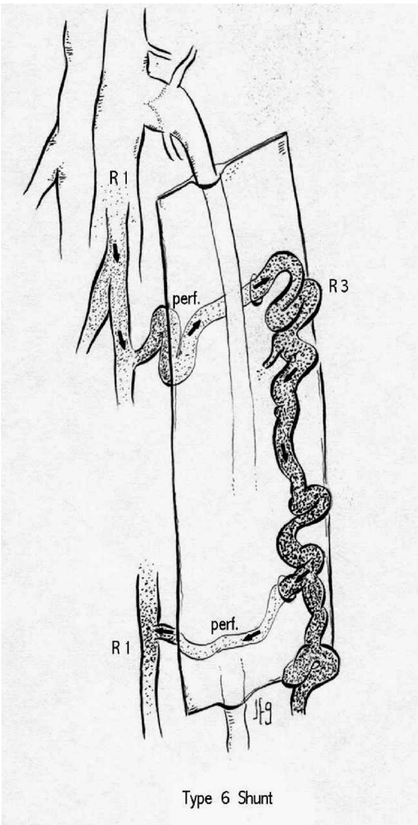

Figure 11 In type 6 shunts, the saphenous vein does not reflux. The reflux escape point arises from a perforating vein and renders an R3 tributary incompetent; this in turn drains into the deep system or, alternatively, into a competent saphenous vein

Although the results of haemodynamic surgery for varicose veins are encouraging in many respects, the late results and haemodynamic consequences are still uncertain[5].

The aforementioned concepts are necessary in order to understand the formulation and implementation of a treatment plan for varicose veins based on the CHIVA strategy. In a subsequent publication, we will discuss the CHIVA strategy and its implementation through haemodynamic surgery.

Acknowledgement

Competition of interest: nil.

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Haemodynamic surgery for varicose veins: surgical strategy

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Abstract
The haemodynamic approach for the treatment of varicose veins is a minimally invasive, non-ablative procedure that that preserves the saphenous vein. The strategic principles for the implementation of this treatment include fragmentation of the venous pressure column, the interruption of the venous segments where reflux originates, preserving the superficial venous outflow channels to allow adequate drainage of the residual superficial system, and excision of the superficial varicose veins that remain undrained. This treatment modality requires a thorough understanding of the haemodynamic and anatomic rationale on which haemodynamic surgery is construed to tailor a treatment plan individually for each patient. The principles for the implementation of this strategy for the treatment of varicose veins are described here and the results are discussed.

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Keywords: Varicose veins; haemodynamic surgery; CHIVA

Introduction

Haemodynamic surgery for the treatment of varicose veins is based on the premise that varicose veins are the consequence of a pathological venovenous shunt that creates recirculation of venous blood between the deep and the superficial system (Figure 1). In 1998, Franceschi described the procedure known as conservative haemodynamic cure of venous insufficiency on an ambulatory basis, known by the French acronym CHIVA (cure conservatrice et hemodynamique de l'insuffisance veineuse en ambulatoire). The understanding of this surgical strategy requires knowledge of the anatomic and physiological principles on which haemodynamic surgery for varicose veins is based, and the different types of venous shunts that occur more commonly.[1] The application of haemodynamic surgery for the treatment of varicose veins is based on four strategic principles, which include:

1. fragmentation of the venous pressure column (Figure 2);
2. interruption of the venovenous shunt (Figure 3);
3. preservation of re-entry perforating veins (Figure 4);
4. suppression of the tertiary and quaternary venous networks that remain undrained (Figure 5).

This surgical strategy pursues the establishment of a venous network in which the reflux venous outlets are interrupted, while antegrade or retrograde superficial venous return remains unimpeded into a competent deep venous system.

An important concept in the understanding of the surgical strategy for haemodynamic surgery is the fact that retrograde flow through a venous segment drained into the deep system through a

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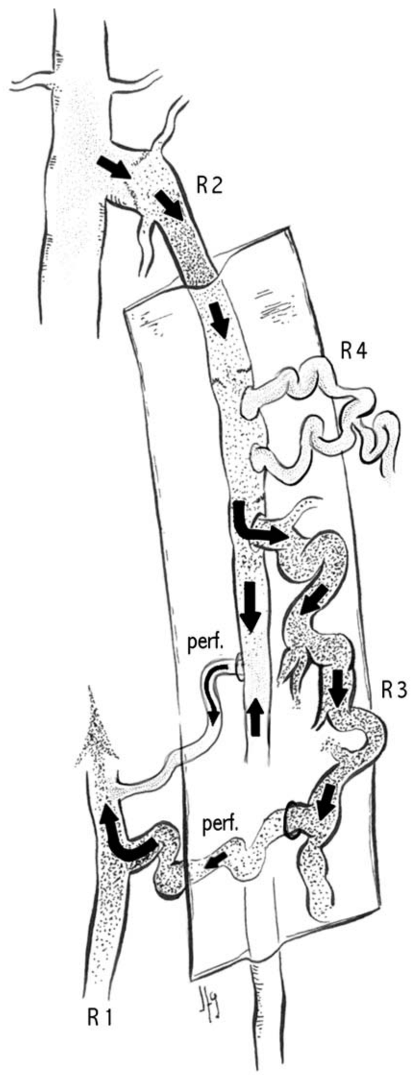

Figure 1 Haemodynamic concept of varicose veins: venous varices are the consequence of a pathological venovenous shunt that perpetuates recirculation of venous blood between the deep and superficial venous systems

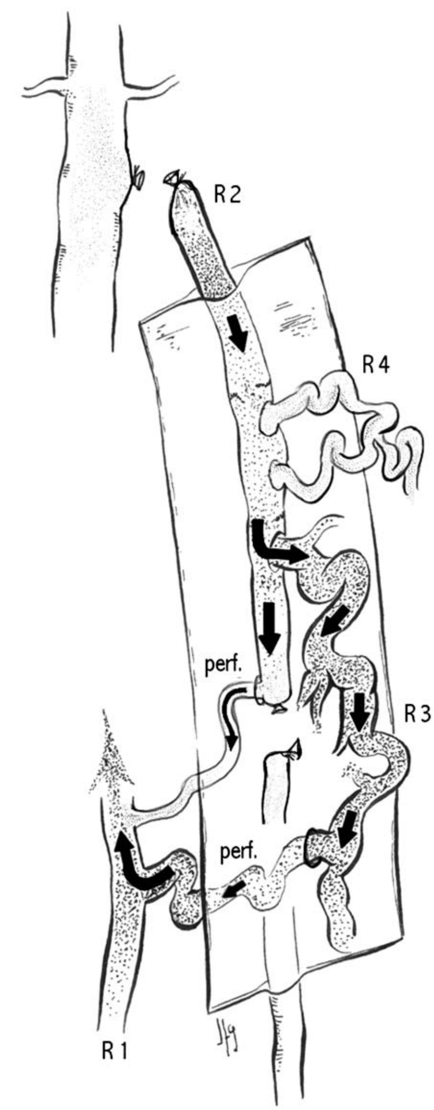

Figure 2 Fragmentation of the venous pressure column is usually accomplished by ligation of the origin of the incompetent venous segments. Occasionally, this can be done with ligation of the saphenous vein just distal to a perforator draining the saphenous vein into the deep system

perforating vein may constitute an adequately drained superficial venous system. This type of haemodynamic situation, classified as type 0 shunt,[1] is found with a certain frequency in the saphenous vein of normal individuals.

Haemodyanamic surgery strategy

CHIVA 1 strategy

The CHIVA 1 strategy is the application of all the principles of haemodynamic surgery in a single procedure without compromising the venous outflow, by creating a well-drained system. This type of surgical strategy is applicable to type 1 shunts (Figure 6), type 2 shunts (Figure 7), type 1 plus 2 shunts (Figure 8), type 4 shunts (Figure 9), type 4 plus 2 shunts (Figure 10), type 5 shunts (Figure 11), and type 6 shunts (Figure 12). In all these cases, the interruption of the reflux exit point can be done in conjunction with the interruption of R3, without creating a haemodynamic conflict. In case of type 3 shunts, the application of the CHIVA 1 strategy only allows interruption of the reflux point from R1 to the R2 system (Figure 13). This improves venous haemodynamics, but the R3 tributaries remain

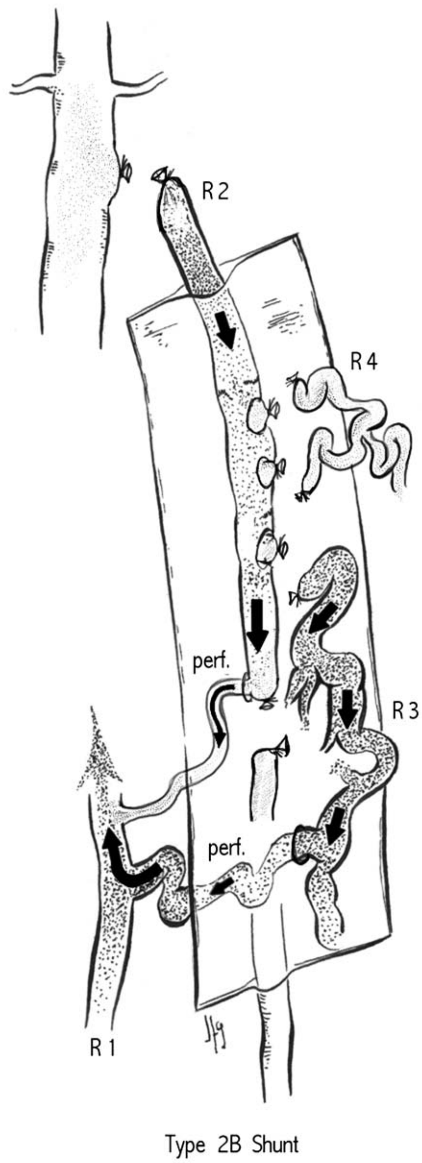

Figure 3 Interruption of reflux exit points

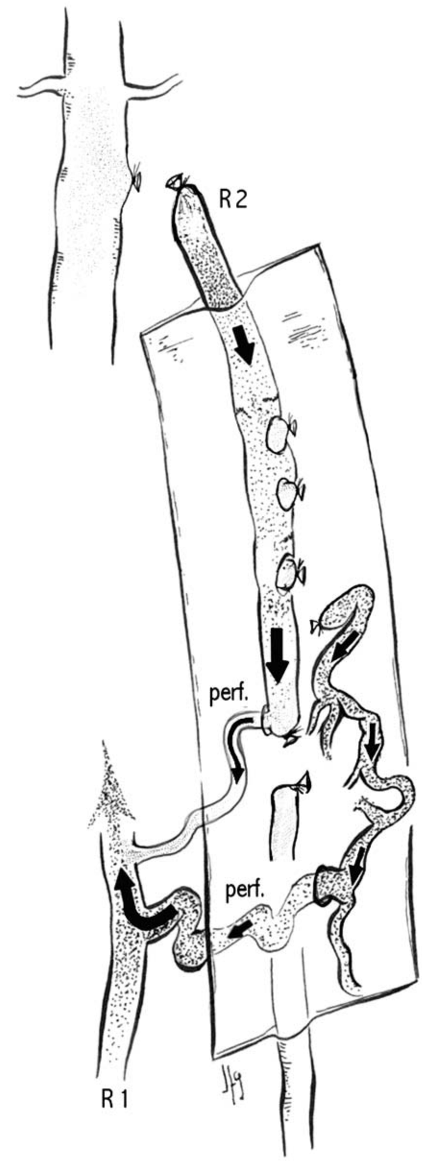

Figure 4 Preservation of re-entry perforators into a competent deep system

filled from antegrade flow from the distal saphenous vein, thereby producing unsatisfactory immediate cosmetic results because the R3 varicose tributaries remain visible.

CHIVA 2 strategy

The CHIVA 2 strategy consists of the application of the haemodynamic surgery principles in two-staged, separate procedures. This treatment modality is advisable for the treatment of type 3 shunts, to avoid the creation of venous outflow compromise. In the first stage, the secondary reflux point from the R2 to R3 venous systems is interrupted (Figure 14), leaving the main reflux point from R1 to R2 uncorrected. The initial interruption of the secondary reflux point forces antegrade flow through the greater saphenous vein. In most cases, this haemodynamic rearrangement stimulates development of a new re-entry perforator from R2 to R1 (from the saphenous vein to the deep system), transforming a type 3 shunt into a type 1 (Figure 15).

Once the new perforator acquires sufficient development, manifested by a greater retrograde flow during muscular diastole than antegrade flow during systole, the R1–R2 reflux point can be interrupted (Figure 16). In cases where the

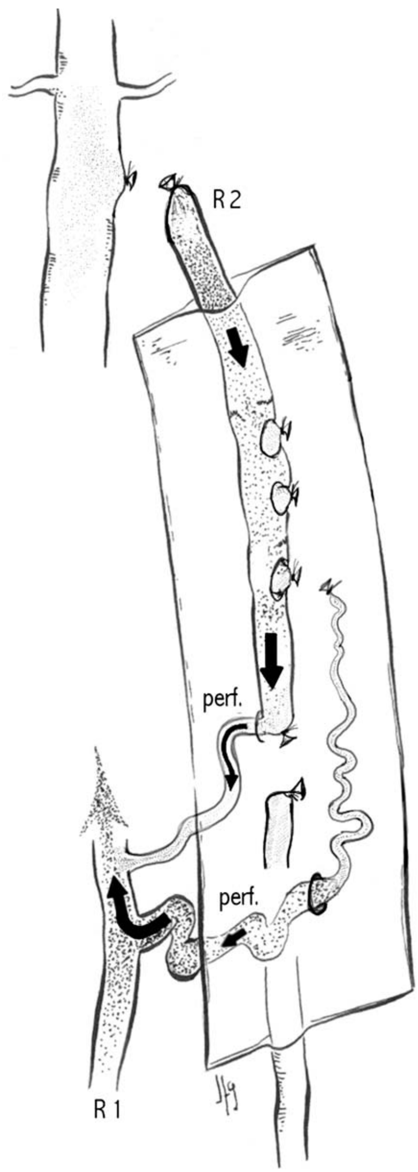

Figure 5 Excision of the non-drained tertiary and quaternary superficial system

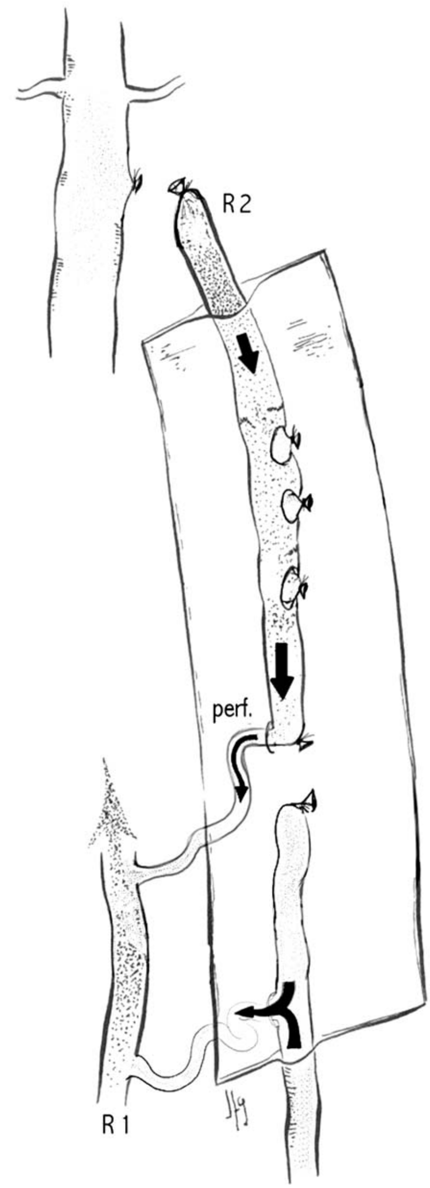

Figure 6 CHIVA 1 strategy in a type 1 shunt

saphenous vein caliber is large (i.e. >1 cm), the CHIVA 2 strategy is contraindicated because of the risk of saphenous vein thrombosis and potential thrombotic extension into the deep system, while the saphenofemoral junction remains open.

The CHIVA 2 strategy may also be indicated in type 4 plus 2 and type 5 shunts when the main reflux point presents difficult surgical access, as in shunts originating in the pelvis. In general, the low flow of such main reflux points makes unnecessary their interruption in a second-stage procedure.

It is important to understand that the implementation of this staged surgical strategy for haemodynamic surgery requires periodic evaluations with duplex scanning to estimate the flow pattern in the saphenous vein, to determine when it is appropriate to ligate the main reflux point at the saphenofemoral junction.

CHIVA 1 plus 2 strategy

The CHIVA 1 plus 2 strategy consists of the application of all the strategic principles of haemodynamic surgery in a single surgical intervention, despite generating a haemodynamic venous outflow conflict. This strategy is applicable to type 3

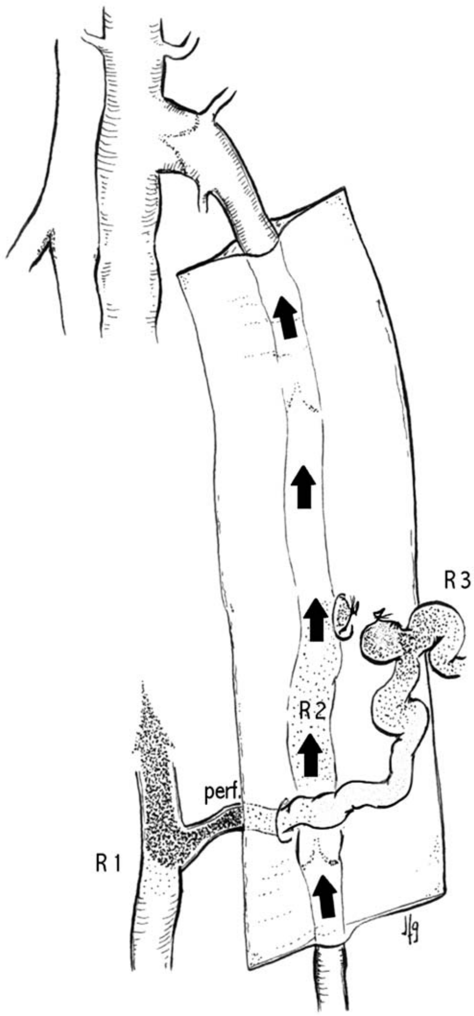

Figure 7 CHIVA 1 strategy in a type 2 shunt

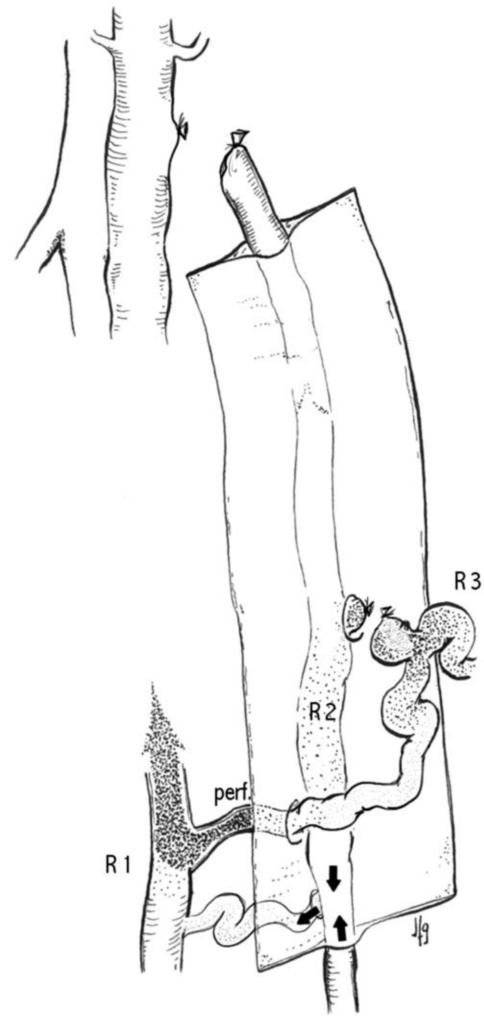

Figure 8 CHIVA 1 strategy in a type 1 plus 2 shunt

shunts, interrupting the main and secondary reflux points simultaneously (Figure 17).

This strategic option is only a partially haemodynamic modality, since it interrupts the reflux points without an appropriate rearrangement of the venous outflow of the superficial system. With this strategy, a substantial number of cases develop a new perforating vein off the saphenous trunk, which suffices for adequate drainage. In other cases, the venous drainage is re-established through a new R3 tributary that may be visible and may warrant cosmetic excision or sclerotherapy.

A major drawback of the CHIVA 1 plus 2 strategy is the associated high incidence (50%) of saphenous vein thrombosis. However, this thrombosis is followed by recanalization, in most cases, usually within 12 months of the procedure, and it does not compromise the final drainage of the venous segment. The advantage of this strategy is that it only requires clinical follow-up, and ultrasound re-evaluation is only necessary in cases of recurrence. Therefore, the CHIVA 1 plus 2 strategy is more appropriate for health-care systems where repeated follow-up ultrasonography is not possible.

Indications and patient selection for haemodyamic surgery

Any patient with primary varicose veins, who is a candidate for phlebo-extraction, is suitable for haemodynamic surgery. The size of the saphenous vein and that of the varicose veins at the time of surgery do not appear to influence the results of haemodynamic surgery at three years of follow-up.[2] Therefore, haemodynamic surgery is

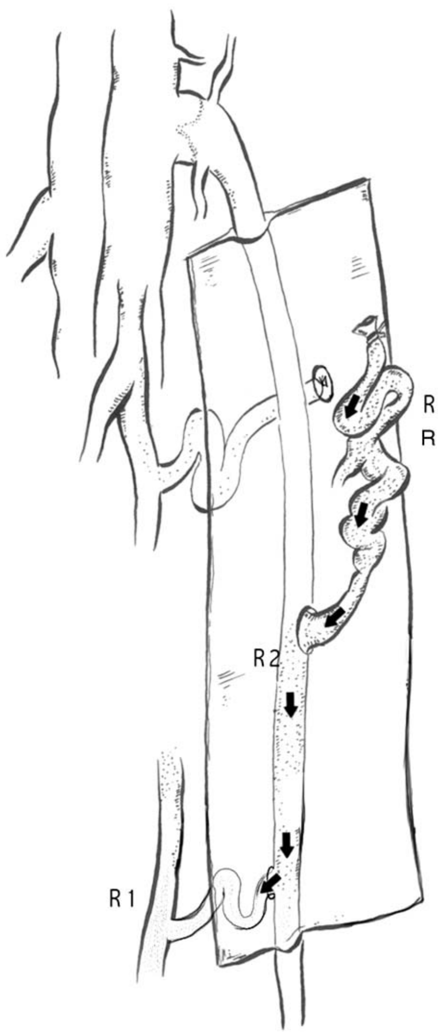

Figure 9 CHIVA 1 strategy in a type 4 shunt with a surgically accessible reflux point

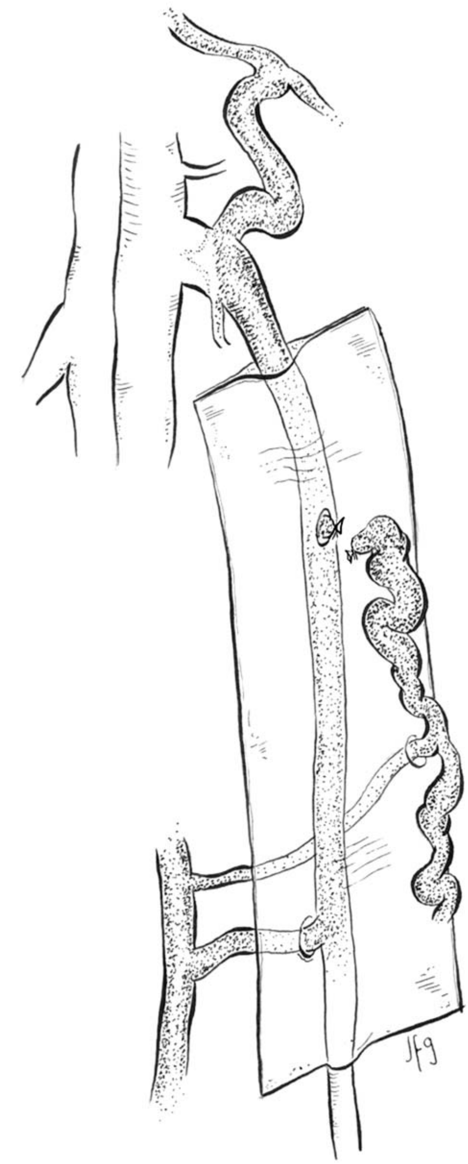

Figure 10 CHIVA 1 strategy in a type 4 plus 2 shunt with a surgically accessible reflux point

applicable regardless of the size or number of the varicose veins.

In the case of secondary varicose veins, haemodynamic surgery may be applied when the varicose veins do not represent the main collateral venous outflow, but are simply a venovenous shunt. This haemodynamic situation can be demonstrated by the identification of retrograde flow in the venous segment during muscular diastole using the Parana maneuver.[3] In such cases, haemodynamic surgery may produce clinical and haemodynamic improvement.

The differentiation between venous outflow collaterals and varicose veins is likewise important when conventional treatment of varicose veins is applied, because their excision is contraindicated.

An important factor in the selection of patients for haemodynamic surgery is their ambulatory capacity. It is essential that patients undergoing haemodynamic surgery for varicose veins are capable of ambulating immediately after surgery to activate the superficial venous return immediately after surgery. Therefore, patients with ambulatory limitations are not good candidates for haemodynamic surgery for varicose veins.

The minimal invasiveness of haemodynamic surgery makes the technique applicable to patients of advanced age or with co-morbidities in the presence of symptomatic venous reflux.

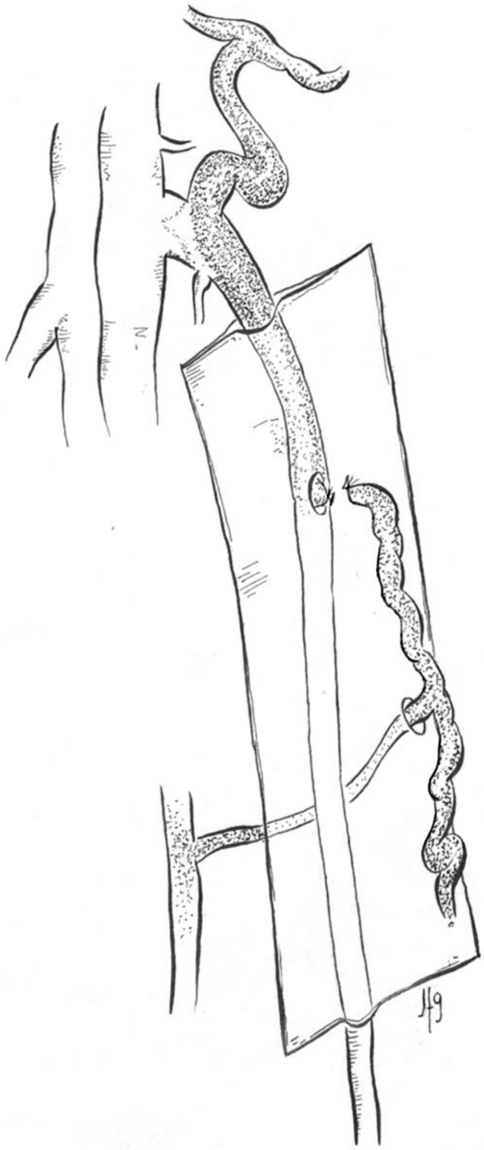

Figure 11 CHIVA 1 strategy in a type 5 shunt with a surgically accessible reflux point

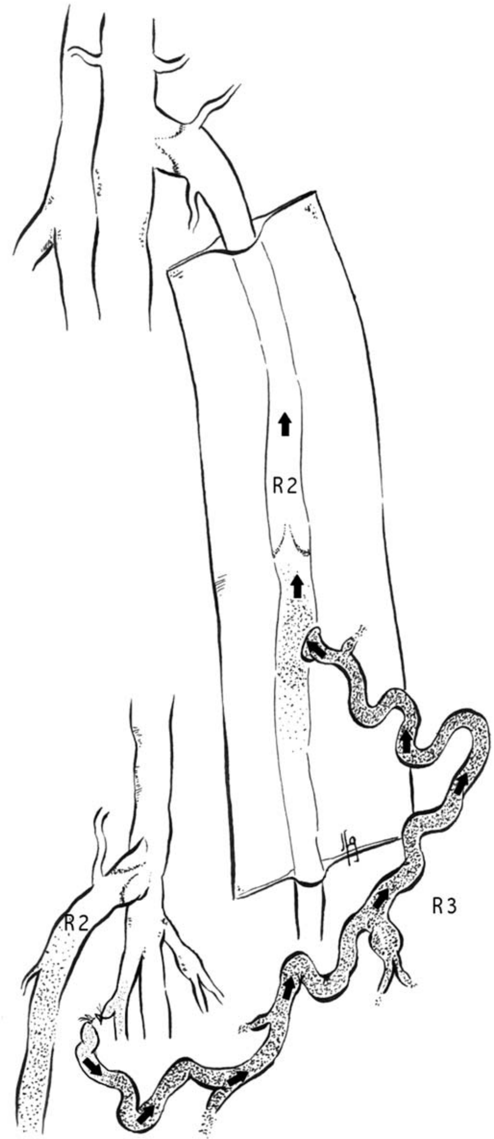

Figure 12 CHIVA 1 strategy in a type 6 shunt with a surgically accessible reflux point

Preoperative venous marking

Immediately before the surgical procedure, the patient is evaluated in the peripheral vascular laboratory with duplex ultrasound, done in the standing position. The venous reflux points are identified, as well as the venous re-entry points from the superficial to the deep system. The Valsalva and Parana maneuvers are used routinely to identify the reflux patterns in the different venous segments. The type of venous shunt is elucidated, the surgical strategy delineated with skin markings, and the venous segments that have to be excised are marked.

The Perthes manoeuvre is helpful in identifying perforating veins that allow adequate drainage of varicose vein clusters that therefore do not need to be excised. A rubber tourniquet applied above the cluster maintains the varicose veins collapsed during activation of venous return with the calf muscle pump. If the varicose veins remain filled, the manoeuvre is repeated progressively with more distal tourniquet placement until the superficial tertiary varicose network disappears. In such cases, the varicose segment proximal to the tourniquet site should be excised.

The skin markings are done with the extremity shaved in preparation for surgery, and can be done

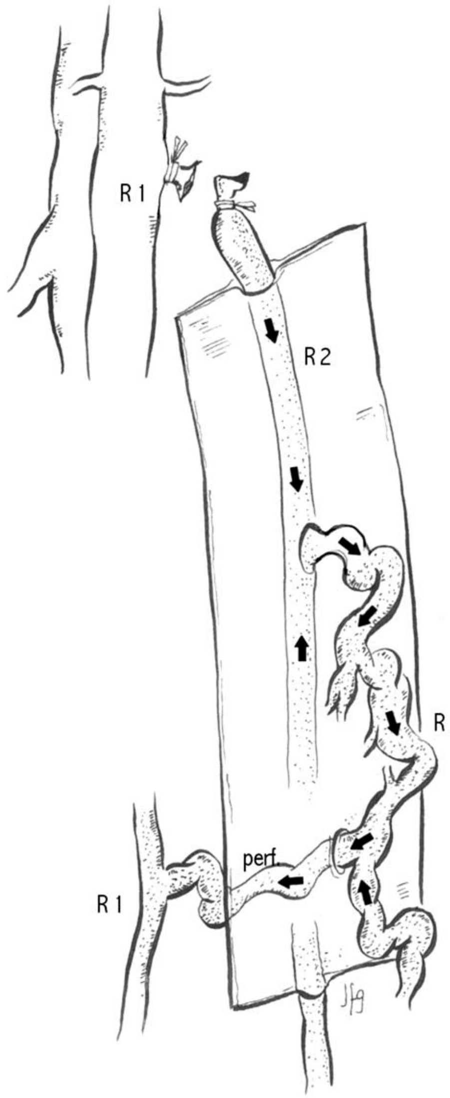

Figure 13 CHIVA 1 strategy in a type 3 shunt. The cosmetic results are poor because the tertiary network and the antegrade colaterals of the proximal, incompetent saphenous segment remain filled from antegrade flow from the saphenous vein distal to the R3 tributary

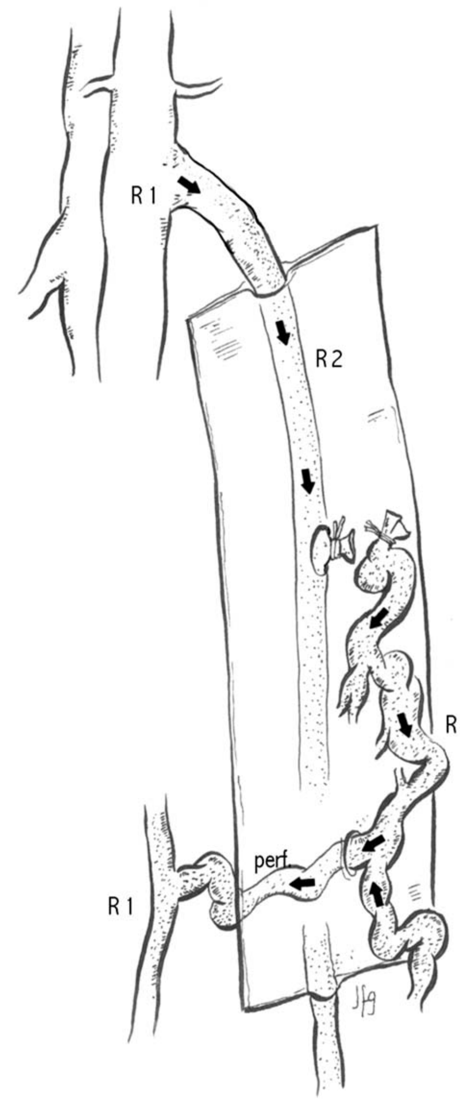

Figure 14 First stage of a CHIVA 2 strategy: interruption of a reflux exit point from R2 to R3 (saphenous vein to varicose tributary)

on the day of surgery or the day before. The patient should be instructed to avoid the use of skin lotions or creams that may prevent marking of the skin. The patient should not wash the skin prior to surgery to avoid losing the skin marks. Ideally, the skin marking is done in the presence of the operating surgeon to facilitate identification of the surgical strategy at the time of surgery. After the skin marking is completed, a diagram detailing the location of the venous interruptions and other anatomical details is done on paper to serve as a guide to the operating surgeon. This diagram also aids in the postoperative follow-up of the patient.

Surgical procedure

The operating surgeon should carefully review the diagram with the surgical plan constructed at the time of skin marking. The operation is done under local anaesthesia, although occasionally conscious sedation is necessary. In cases of reoperation at the level of the saphenofemoral junction, regional anaesthesia may be required. In case of bilateral varicose veins, the operation is preferably done on one extremity at a time to limit the amount of local anaesthetic, and to facilitate immediate postoperative ambulation.

Monofilament nonabsorbable sutures are recommended for ligation of axial venous trunks, to reduce the development of neo-vascularization.

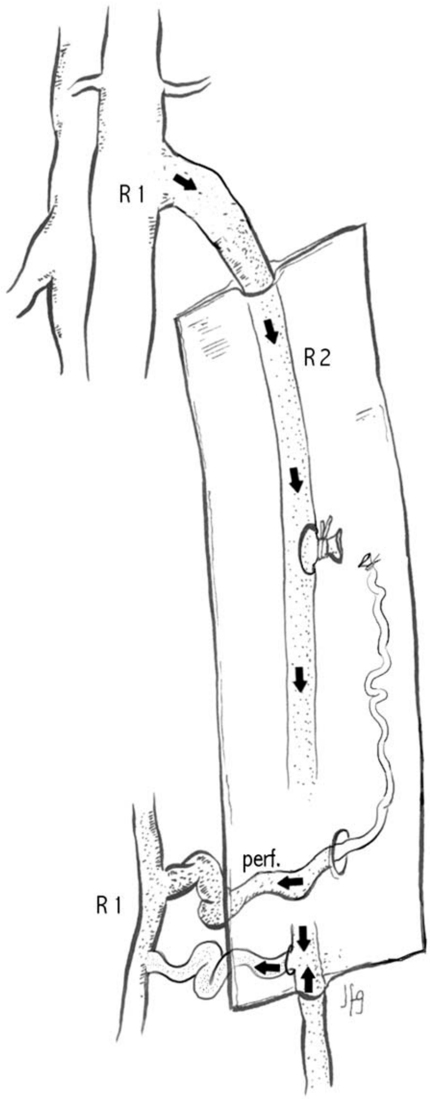

Figure 15 CHIVA 2 strategy: conversion of a type 3 shunt into a type 1 shunt following the first stage of the strategy

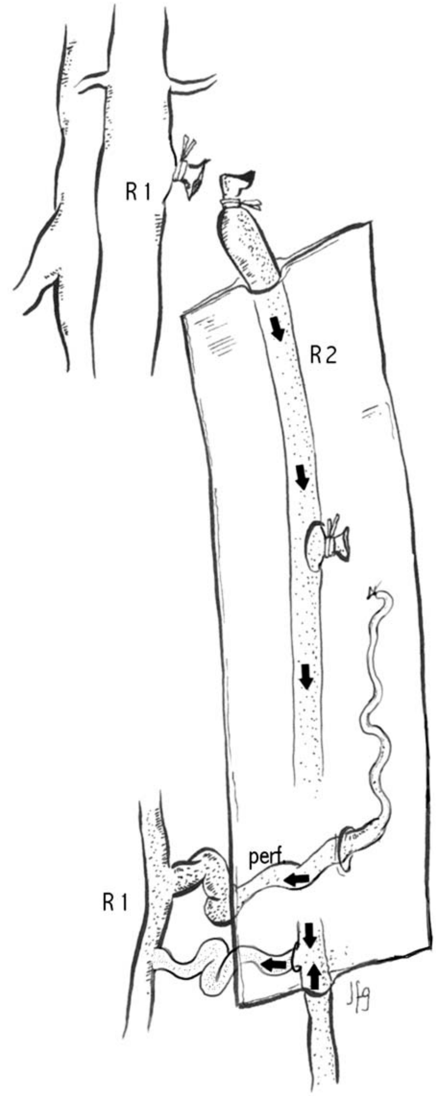

Figure 16 Second stage of a CHIVA 2 strategy: interruption of a reflux exit point from R1 to R2 (saphenofemoral junction) after development of a distal perforator from the saphenous trunk into the deep system

Because of potential recanalization of isolated venous ligatures, and the neo-angiogenic potential of pressurized venous cul-de-sacs, all venous ligations should be done flush on the proximal vein, without leaving a stump, and a segment of vein should be resected, mainly at the level of the saphenofemoral junction.

The strategic surgical incisions are marked over the reflux points that have to be ligated and transected, and need to be large enough to allow good visualization. The secondary incisions are small cosmetic incisions utilized to excise the undrained varicose veins. The stab avulsion technique is recommended for optimal cosmetic results.

A compression wrap is placed on the calf, and a small bandage in the groin incision is applied when necessary. Ambulation is resumed immediately after surgery, and typically the patient leaves the operating room walking. The patient is given instructions to walk several hours a day, in the morning and afternoon, to promote the immediate involution of the interrupted venous shunts, and to prevent thrombosis of venous segments with potentially compromised outflow.

The patient is prescribed low molecular weight heparin at prophylactic doses for seven days, and pain medication. Unilateral limb surgery is less painful and allows immediate re-ambulation better than a bilateral intervention.

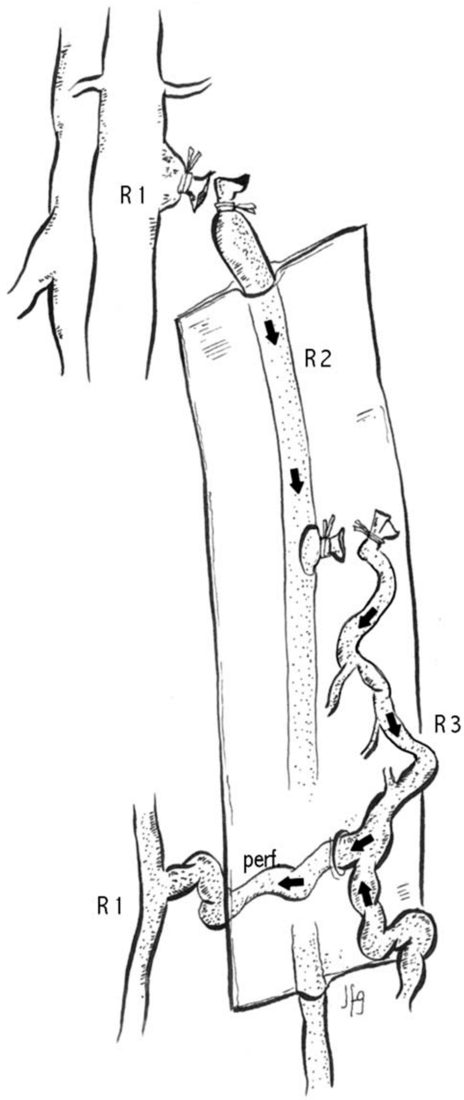

Figure 17 CHIVA 1 plus 2 strategy: interruption in a single procedure of the reflux exit points between R1 and R2 and between R2 and R3

Immediate and long-term follow-up

The patient is seen one week after surgery for a wound check and the skin stitches, if applied, are removed. A knee-high elastic stocking of 20–30 mmHg of compression gradient is then prescribed for one month.

After the first stage of a CHIVA 2 procedure, a strict follow-up with duplex ultrasound is necessary to determine the appropriate timing of the ligation of the saphenofemoral junction, the second surgical stage of this strategy. Our follow-up protocol in these patients includes duplex evaluation at three, six, 12, and 24 months after the initial procedure. Ligation of the saphenofemoral junction is indicated when reverse flow in the saphenous vein re-appears following development of a new perforator from the saphenous to the deep system. This occurs within three months in 80% of patients, and in up to 90% at 12 months.[2] Development of a new saphenous perforator transforms a type 3 shunt into a type 1 shunt, which, if not interrupted, will produce new tertiary (R3) varicose veins. Patients with smaller saphenous veins (<5 mm diameter measured at 15 cm distal to the saphenofemoral junction) are more likely to maintain antegrade sapheous vein flow, as this occurs in up to 50% of these patients.[2,5]

In patients undergoing CHIVA 1 or CHIVA 1 plus 2, the follow-up is not different from that of patients undergoing conventional surgery for varicose veins. In these patients, duplex ultrasound is indicated only when varicose vein recurrence occurs.

Results of haemodynamic surgery

Results of haemodynamic surgery for varicose veins depend mainly on three factors:

1. the obtainment of a well-drained superficial venous system, which will predictably be followed by better mid- and long-term results;
2. the type of venous shunt under treatment. Type 2B and type 5 shunts have a higher incidence of varicose vein recurrence (R3).
3. the surgical technique, as long saphenous vein stumps at the saphenofemoral junction or at any other venous interruption site, and ligation of venous segments without complete interruption are often a source of recurrence.

Clinical improvement and complications

The clinical results of haemodynamic surgery for varicose veins at three years of follow-up following Hobbs[6] criteria reveal that 83–89% of patients were cured or experienced significant improvement; 10–14% were slightly improved; and 0–1% had no improvement or got worse.

Patients undergoing a non-drained operation (CHIVA 1 plus 2) have a significantly higher clinical and ultrasonographic evidence of varicose vein recurrence.[2,7,8] A randomized comparison of the CHIVA strategy against saphenous vein stripping suggests that, at two years of follow-up, there is no significant difference in clinical results between both treatment modalities, but there is a trend towards better long-term results with the CHIVA technique.[9]

In our experience, the incidence of saphenous nerve injury or neuralgia with the CHIVA technique ranges from 1% to 5%, without any disabling consequences, and the incidence of wound infection is less than 1%.[2,7]

Ultrasonographic changes during follow-up

The evolution of the greater saphenous vein diameter shows an average reduction of 3 mm.[2,7] The incidence of saphenous vein thrombosis following the CHIVA 1 plus 2 strategy ranges from 40% to 59%,[8] while after the CHIVA 2 it is less than 10%.[2,5,7] Saphenous vein thrombosis following CHIVA is usually asymptomatic, but is more likely to present with symptoms when the saphenous vein diameter is greater than 8.5 mm. For this reason, non-drained CHIVA strategies should be avoided in patients with larger saphenous vein diameters.[10]

Saphenous vein thrombosis spontaneously evolves to recanalization in most cases within six months.[7,10] Thrombosis of the saphenous vein, however, does not preclude later development of perforators that will drain the incompetent segment into the deep system, but on the other hand may be associated with a higher recurrence rate of new varicosities.[7]

Advantages and disadvantages of haemodyamic surgery for varicose veins

Haemodynamic surgery for varicose veins has some clear advantages over conventional greater saphenous vein stripping, including immediate return to physical activity and minimal work disability,[10] lower incidence of saphenous nerve injury, and a significantly lower incidence of postoperative development of telangectasias, probably due to adequate drainage of the subcutaneous venous system.[8] In addition, the preservation of the saphenous vein as a conduit for possible future vascular reconstruction is also an appealing advantage of this technique. The preservation of pelvic shunt drainage into the saphenous system with the CHIVA technique allows a decrease in the recurrence of pelvic varicosities, which is common and difficult to treat following saphenous vein stripping.[8]

The indications and contraindications for surgery are similar for haemodynamic surgery and conventional saphenous stripping. It is important to remember that the results of haemodynamic surgery for varicose veins are not influenced by the size or extent of the varicose veins.[8]

A disadvantage of haemodynamic surgery is the need for periodic ultrasound control in those patients undergoing a CHIVA 2 strategy until the second stage of the procedure is indicated.

An important limitation of haemodynamic surgery is the requirement for a very detailed ultrasound evaluation of the incompetent venous system, because it requires extensive experience and skills in venous ultrasonography, and lengthy training and supervision are necessary to reach confidence and success with the technique.

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5.- RESULTADOS

Los resultados de los estudios que constituyen esta tesis han sido:

5.1 - Comparison of clinical outcome of stripping and CHIVA for treatment of varicose veins in the lower extremities.

El estudio publicado de comparación de la estrategia CHIVA versus Stripping, tiene un diseño no randomizado, prospectivo histórico, evaluado por observadores independientes. Se compara el resultado del tratamiento en 85 pacientes operados de forma consecutiva mediante stripping entre los años 1991-1993 y en 90 pacientes operados siguiendo la estrategia CHIVA en el año 1994.

A los 3 años del tratamiento se practicó una evaluación clínica y hemodinámica con eco-doppler. Como parámetros clínicos se valoró la presencia o no de varices visibles (usando la clasificación de Hobbs [34]: Curado, mejoría, igual o peor), aparición de telangiectasias, presencia de sintomatología de insuficiencia venosa (dolor, edema), posible desarrollo de neuralgia del safeno y grado de satisfacción estética del tratamiento.

El análisis estadístico de comparación de datos entre los grupos se efectuó mediante el test de chi-square de Pearson.

Los **resultados clínicos** en el grupo CHIVA fueron los siguientes: Curados: 51 (57%), Mejor: 38 (42%), Igual o peor: 1 (1%)

En el grupo Stripping los resultados fueron: Curados 46 (54%);

Mejor 26 (31%), Igual o peor 13 (15%). El análisis estadístico muestra significación estadística a favor del grupo CHIVA ($p < 0.05$).

En cuanto a la **sintomatología**, los resultados en el grupo CHIVA fueron los siguientes: Desaparición completa de los síntomas: 60 casos (67%); Mejoría: 29 casos (32%); Igual o peor: 1 caso (1%). En el grupo Stripping: Curados: 24 (28%); Mejor: 43 (51%); Igual o peor: 18 (21%) ($p < 0.05$).

En cuanto a la **satisfacción con los resultados estéticos**: En el grupo CHIVA: El resultado fue considerado satisfactorio por 52 pacientes (58%), encontraron mejoría 35 (39%), y consideraron los resultados igual o peor 3 pacientes (3%).

En el grupo stripping, los resultados fueron: Satisfactorio 43 pacientes (51%), mejoría 28 (33%), e igual o peor 14 (16%). Las diferencias entre ambos grupos fue estadísticamente significativa a favor del grupo CHIVA ($p < 0.05$).

También se observaron diferencias estadísticamente significativas en relación con la presencia de **neuralgia del safeno**; Así se observaron 16 casos en el grupo stripping frente a 1 sólo caso en el grupo CHIVA ($p < 0.05$).

Finalmente también se observaron diferencias estadísticamente significativas en cuanto a la presencia de **telangiectasias posquirúrgicas**: Estas se presentaron el 9% de los pacientes CHIVA frente al 66% del grupo stripping

5.2- Durability of reflux elimination by a minimal invasive CHIVA procedure on patients with varicose veins. A 3-year prospective case study

El shunt veno-venoso tipo 3, se caracteriza por tener un punto de fuga R1>R2 (habitualmente la unión safeno-femoral), un recorrido por R2 y un punto de reentrada por perforante situada en un R3 (R3>R1).

Este tipo de shunt presenta un problema estratégico y es que la interrupción en un mismo tiempo quirúrgico del punto de fuga y de las colaterales insuficientes de la safena supone dejar a la safena sin drenaje. La consecuencia de esta estrategia (CHIVA 1+2) es un 40% de trombosis safeniana y lo que es peor, la incapacidad de controlar el drenaje de la safena interna una vez se produce su recanalización.

Por este motivo se diseñó una estrategia en dos tiempos quirúrgicos. En primer lugar se interrumpen sólo las colaterales insuficientes de la safena interna. Como consecuencia, la safena se ve obligada a vaciarse por su vía fisiológica, de forma anterógrada por su cayado.

Lo que realmente desconocíamos es qué porcentaje de safenas vuelven a presentar flujo retrógrado y si es por desarrollo de perforante safeniana o por desarrollo de nuevas colaterales insuficientes.

Resultados hemodinámicos:

El diámetro medio de la safena interna medido a 15 centímetros de la unión safeno-femoral evolucionó de 6.6 mm en la evaluación preoperatorio a 3.9 mm 36 meses más tarde.

En cuanto a la evolución del flujo safeniano, a los 6 meses de seguimiento sólo 7 extremidades (12%) conservaban flujo anterógrado. En las restantes 51 extremidades volvía a observarse desarrollo de flujo retrógrado. Sin embargo, ahora la el punto de re-entrada estaba situado en una vena perforante de la safena interna (R2>R1) en lugar de una vena perforante de una colateral (R3>R1).

Siguiendo la evolución de la dirección de flujo a los 12 meses, 2 nuevos casos de desarrollo de flujo retrógrado fueron observados. Las restantes 5 extremidades del total de 58 intervenidas mantuvieron flujo anterógrado hasta el final del seguimiento.

Fijándonos en el diámetro de la safena interna preoperatorio observamos que todas las safenas con diámetro igual o superior a 7 mm desarrollaron flujo retrógrado.

En 46 de los 53 casos con desarrollo de flujo retrogrado fue indicada la interrupción de la unión safeno-femoral en un segundo tiempo quirúrgico.

Resultados clínicos

Los resultados clínicos 3 años después del tratamiento quirúrgico, basados en la clasificación de Hobbs [34] son los siguientes:

Curados: Pacientes sin venas varicosas: 52/58 (89%)

Mejor: Pacientes con venas varicosas recidivadas o residuales de inferior tamaño al preoperatorio: 6/58 (10%).

Igual o peor: Pacientes que no han experimentado mejoría tras la cirugía: 0 (0%).

5.3 - Haemodynamic strategy for treatment of anterograde Giacomini varicose veins.

Los shunts venosos asociados a este hallazgo hemodinámico pueden ser de los tipos 1, 1+2 y 3. Para que pueda desarrollarse este tipo de shunt venoso cerrado activado en diástole, la perforante de re-entrada debe situarse a un nivel inferior al de punto de fuga. En caso contrario, nos encontraríamos frente a un shunt vicariante (shunt abierto que se activa en sístole) por trombosis venosa la mayor parte de las veces.

En un 50% de los casos, las varices involucrarían a la vena safena interna.

5.- RESULTADOS

Tras la interrupción de la vena de Giacomini por encima de su unión con la safena externa, se comprobó su permeabilidad en todos los casos con desaparición del flujo diastólico.

Como en publicaciones previas [28, 32, 35-36], la interrupción del shunt veno-venoso se siguió de una reducción del diámetro medio de las venas interesadas. De esta manera, se observó una reducción media de 5.8 mm a 3.6 mm a los 3 años de seguimiento.

La recanalización del punto de interrupción de la vena de Giacomini se comprobó en 2 casos (13%) entre los 6 y los 12 meses de seguimiento.

En estos casos se reprodujo el flujo anterógrado en diástole. Uno de estos casos fue reintervenido al presentar recurrencia de varices visibles.

Los resultados clínicos en el control a 3 años fueron los siguientes:

Curados: 12 casos (80%); Mejoría clínica: 3 casos (20%)

6.- DISCUSIÓN

La insuficiencia venosa crónica, en general y su expresión en forma de varices en particular, constituyen una parte fundamental de la patología vascular por su alta prevalencia [3-4].

Debido a la sobrecarga asistencial de los servicios de angiología y cirugía vascular, ha sido generalmente relegada a un segundo plano por detrás de la patología arterial. El stripping safeniano, técnica quirúrgica de referencia durante décadas, dista sin embargo de ser la solución perfecta. No es una cirugía reparadora sino destructiva, que elimina segmentos venosos sanos. Presenta el stripping cifras de recidiva varicosa importantes, que según distintas publicaciones varían enormemente, tanto como entre el 7 y el 70% [22-23] de los casos y que en Inglaterra suponen el 20% de los procedimientos quirúrgicos practicados para el tratamiento de las varices [24].

Por recordar algunas de sus virtudes, no olvidamos que provoca no pocos casos de neuralgia del safeno [30, 35-36], que la baja laboral del postoperatorio es importante [37], que la masiva destrucción del sistema venoso superficial produce como efecto rebote la aparición de varicosis / telangiectasias [26, 30]…

Todo ello ha dado lugar al interés por desarrollar otras formas de tratamiento.

La esclerosis con endoláser [38], la esclerosis con radiofrecuencia [39], y la ligadura endoscópica subfascial de venas perforantes [40] son ejemplos significativos.

Sin embargo todas ellas persiguen el mismo objetivo que el stripping: La destrucción del sistema venoso superficial. Su máximo desideratum sería el alcanzar unos resultados superponibles a los de un buen stripping, aunque en general, por medio de estrategias menos agresivas, lo que permitiría que los pacientes sufrieran un postoperatorio más benigno.

A los problemas propios de la safenectomía anteriormente mencionados, se han añadido algunos problemas nuevos: El coste adicional que supone el equipamiento necesario para su puesta en práctica y lo que es más preocupante, los problemas surgidos a la hora de abordar la interrupción de la unión safeno-femoral. Se han publicado series de trombosis venosa de safena interna con trombo móvil flotante asociado en femoral, tanto tras la práctica de endoláser como, sobre todo, de esclerosis con radiofrecuencia [41-42].

Frente a todas estas estrategias destructivas surge la cura CHIVA [27] como un tratamiento más racional, que intenta comprender mediante el estudio hemodinámico con eco-doppler la patología varicosa. Impulsor de un tratamiento conservador del capital venoso superficial basado en una estrategia hemodinámica.

Luego de las primeras publicaciones francesas en las que se describe la técnica y los resultados de casos particulares, son las publicaciones de Cappelli [36] y la de nuestro grupo [30] las primeras en comparar series de casos con el patrón de referencia del tratamiento quirúrgico, el stripping. En la primera de ellas, Cappelli compara sus resultados con la cura CHIVA frente a los publicados sobre el stripping. En nuestra serie, se comparan ambos tratamientos en pacientes intervenidos en nuestro servicio. Tanto en la recidiva varicosa, como en la presencia de complicaciones derivadas de la cirugía como son la telangiectasia y la neuralgia del safeno, el grupo intervenido mediante la cura CHIVA obtuvo mejores resultados. Posteriormente se hizo un análisis de ambos grupos comparándolos con los resultados publicados: Los resultados del grupo CHIVA eran comparables a los publicados por los de Cappelli y los del grupo stripping eran comparables a las series publicadas en la literatura.

Pese a no tratarse de un ensayo clínico aleatorizado, con lo que el nivel de evidencia obtenida no puede considerarse como definitivo, se obtenía constancia de que los pacientes tratados en ambos brazos del estudio habían obtenido los resultados estandarizables en cada caso, es decir que los pacientes habían sido correctamente intervenidos en los dos grupos, lo que daba mayor valor si cabe, a la superioridad del grupo CHIVA sobre el grupo stripping.

Estas publicaciones supusieron un impulso muy importante para la implantación de la cura CHIVA.

Publicaciones posteriores han perseguido hacer un análisis particular de los distintos tipos de estrategias indicadas en los distintos tipos shunt veno-venosos. En todas ellas se ha profundizado en el análisis y compresión de los fundamentos hemodinámicos que rigen esta estrategia. En estas últimas, tanto en las propias [31-32] como también en las de grupos italianos [35,43-44] también se ha puesto de manifiesto que es una estrategia indicada en cualquier tipo de varices, independientemente del grado de patología de la enfermedad varicosa.

Los resultados de la cura CHIVA de los que tenemos información a los tres años [30-32, 35-36] se agrupan de acuerdo con la clasificación propuesta por Hobbs [34]. En ellos observamos un porcentaje de pacientes Curados / con mejoría suficiente en un 83-89%, pacientes con mejoría clínica en un 10-14,5% y pacientes sin mejoría clínica o que empeoran en un 0-1%.

No obstante, observamos que Cappelli et al [35] encuentran un mayor número de casos con recidiva varicosa clínicamente visible y también ecográfica entre el grupo de pacientes en los que se ha practicado un CHIVA no drenado (1 + 2). En este momento se plantea el segundo trabajo del compendio de artículos de esta tesis. ¿Debemos variar la estrategia en función del tipo de shunt veno-venoso?

En particular en el caso del shunt tipo 3, ¿debemos plantear una estrategia en dos tiempos?, es más según Cappelli [35] y Zamboni [44] un porcentaje importante de estos casos no va a precisar del segundo tiempo quirúrgico, es decir de la interrupción de la unión safeno-femoral. ¿Qué porcentaje de casos van a mantener flujo anterógrado en safena tras el primer tiempo quirúrgico?, ¿en qué momento debe practicarse el segundo tiempo quirúrgico? y finalmente, ¿qué sobrecarga asistencial va a significar el seguimiento clínico, hemodinámico y la doble intervención quirúrgica?

Ciertamente también, nuestro grupo ha obtenido resultados sensiblemente superiores en el grupo de pacientes con shunt tipo 3 tratados según la estrategia drenada (CHIVA 2) [32] que en el trabajo de comparación de CHIVA y stripping, en el que el *shunt* tipo 3 se trató de acuerdo con una estrategia no drenada (CHIVA 1 + 2) [30]. Sin embargo, y al contrario que la experiencia publicada por los grupos italianos, la gran mayoría de los pacientes presentaban nuevamente flujo retrógrado a los 6 meses de la primera intervención, obligando a la interrupción de la unión safeno-femoral en un segundo tiempo quirúrgico. La explicación a esta diferencia con respecto a la experiencia italiana habría que buscarla en dos aspectos: Nuestra serie presenta mayor número de pacientes y con mayor tiempo de seguimiento que la de Zamboni [45] y con respecto a Cappelli, nuestros pacientes presentan una patología varicosa más avanzada. Como se demuestra en nuestro estudio, un 50% de los casos con safenas inferiores a los 5 mm mantendrán flujo anterógrado, mientas que ningún caso mantiene flujo anterógrado cuando se parte de calibres de safenas internas iguales o superiores a los 7 mm.

Finalmente, para una asistencia sanitaria pública saturada, con listas de espera importantes para el tratamiento de la patología varicosa, la sobrecarga asistencial producida por la estrategia CHIVA 2 es difícilmente asumible. Por este motivo, la estrategia CHIVA 2 ha quedado relegada a un segundo plano, siendo reservada para unos pocos pacientes, normalmente mujeres jóvenes con alta demanda estética y que presentan safenas internas inferiores a los 5 mm en la evaluación preoperatoria

Siguiendo con la comparación CHIVA-stripping es fundamental el estudio que está llevando a cabo el Dr. Parés et al [46]. Los resultados preliminares de este ensayo clínico controlado aleatorizado a los dos años de seguimiento, presentados en el Congreso Mundial de Flebología (Roma, 2001), no muestran diferencias clínicas, estadísticamente significativas, entre ambos grupos de pacientes. No obstante, la tendencia, según aumenta el seguimiento, es hacia un mejor resultado en el grupo CHIVA.

En cuanto a la neuritis del safeno, una complicación que afecta hasta una tercera parte de los pacientes intervenidos de stripping [47], en el CHIVA es una complicación que presenta una prevalencia del 1-5%, y en ningún caso ha causado discapacidad ni en nuestras series ni en las publicadas por otros autores [30, 32, 35-36].

Con respecto al seguimiento hemodinámico de los pacientes intervenidos de CHIVA, nos fijamos en dos detalles que vienen reflejados la mayor parte de las publicaciones y con resultados comparables: La evolución del diámetro safeniano muestra una reducción media de 3 mm [28, 31-32, 35-36, 44].

La evolución del diámetro safeniano tiene un doble significado: Fundamentalmente está en relación con la energía de shunt venoso, aunque también en cierta medida, se relaciona con la capacidad de la bomba muscular de absorber la columna de presión a través de las venas perforante de re-entrada. Para nosotros tiene el valor de demostrar que la cura CHIVA resuelve el factor hemodinámico que da lugar al síndrome varicoso. Además, en el CHIVA 2, resulta un parámetro indirecto de desarrollo de la perforante de drenaje cuando vuelve a presentarse flujo retrógrado.

Algunos casos, los menos, vuelven a presentar flujo retrógrado en diástole, pero siguen drenando fundamentalmente en sentido anterógrado durante la sístole de la bomba muscular, Estos casos mantienen estable la reducción del diámetro de safena resultante del primer tiempo quirúrgico y pueden, deben esperar a practicar la interrupción safeno-femoral pues de lo contrario la trombosis safeniana tiene un alto porcentaje de posibilidades de producirse.

Otro dato hemodinámico que venimos siguiendo es la prevalencia de trombosis safeniana. En el CHIVA 1 + 2 se sitúa en un 40-59% de los casos [30], frente a tan sólo un 0-10% si practicamos CHIVA 2 [32, 35, 44].

Esta trombosis puede ser sintomática, sobre todo en safenas con un diámetro superior a los 8,5 mm, con un riesgo relativo = 3,1(IC 95% (1,2-7,8)) [48]. Por este motivo, evitaremos indicar una estrategia no drenada en los casos con safenas de mayor diámetro.

La evolución de la trombosis safeniana es a la recanalización en el 95-100% de los casos a los 6 meses [32, 35, 37, 48]. Esta trombosis safeniana no condiciona el desarrollo posterior del drenaje a través de perforantes. Sin embargo, si que se ha descrito en el seguimiento de estos casos, un mayor porcentaje de nuevas colaterales safenianas insuficientes (neo R3) [35].

La comprensión de lo que es un shunt veno-venoso en el desarrollo de las varices primarias fue fundamental para el estudio de la vena de Giacomini. El cayado de la safena externa es una región particularmente compleja, pues ya puede originarse en la vena poplítea las más de las veces, como en una vena gemelar. Ya puede originarse a nivel de la línea interarticular, como por encima o por debajo de ella. Ello hace que el marcaje del cayado de la safena externa deba ser particularmente meticuloso.

Si a esto añadimos que el flujo retrógrado del cayado puede derivarse en sentido anterógrado hacia la vena de Giacomini, su estudio se complica más. En este punto, debemos ser capaces de diferenciar si se trata de una vía de colateralidad por obstrucción del sistema venoso profundo o bien se trata de un shunt veno-venoso en relación con el síndrome varicoso.

El shunt vicariante se activa durante la sístole muscular, mientras que el shunt venoso asociado al síndrome varicoso se activa en diástole. Además, el shunt vicariante se vacía nuevamente al sistema venoso profundo en un punto proximal a su origen permitiendo saltar un obstáculo venoso, mientras que el shunt venoso asociado al síndrome varicoso se vacía al sistema venoso profundo en un punto distal a su origen, aunque parte de su trayecto haya podido ser anterógrado. De esta manera se produce un circuito venoso cerrado que se activa en diástole tras el vaciamiento del sistema venoso profundo como consecuencia de la disminución de la presión venosa originada tras la sístole muscular.

En cuanto a las indicaciones de la cura CHIVA, Zamboni demostró la eficacia de esta estrategia en el tratamiento de los estados clínicos más avanzados [43]. Nuestro grupo no ha analizado el resultado particular de la cura CHIVA en el grupo de pacientes con úlceras venosas, pero sí ha comparado el resultado de la cura CHIVA en función del diámetro de la safena interna preoperatorio como signo indirecto de gravedad de la patología y no ha observado diferencias significativas en función de este parámetro [49]

Finalmente, dos publicaciones han demostrado que la cura CHIVA produce una baja laboral significativamente inferior a la observada tras practicar un stripping [36-37]. Este dato tampoco ha sido analizado por nuestro grupo aunque parece lógico si se tiene en cuenta que a los

pacientes del grupo stripping se les suele indicar reposo en cama durante los primeros días del postoperatorio mientras que a los del grupo CHIVA, que salen andando del quirófano, se les indica la deambulación en el postoperatorio inmediato como parte del tratamiento.

En resumen, la cura CHIVA presenta varias ventajas frente al stripping:

- Recuperación inmediata de la actividad física. Se practica con anestesia local indicándose la deambulación en el postoperatorio inmediato.
- Menor prevalencia de neuralgias por lesión del safeno.
- Menor presencia de telangiectasias postoperatorias gracias al mantenimiento del drenaje del tejido celular subcutáneo.
- Conservación de un conducto potencialmente importante para su posible uso en la revascularización de la isquemia miocárdica o de las EEII.

Como posibles desventajas cabría citar la necesidad de realizar controles hemodinámicos con eco-doppler en los pacientes en los que se ha practicado un primer tiempo de CHIVA 2.

Además, plantear un tratamiento ajustado a cada paciente, según las diferencias anatómicas y hemodinámicas de cada caso, precisa de un estudio hemodinámico detallado con eco-doppler, lo cual conlleva un entrenamiento específico para lograr el adecuado dominio de la estrategia.

7.- CONCLUSIONES

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1.- En nuestra experiencia, los resultados a 3 años fueron mejores en los pacientes tratados con la cura CHIVA que aquellos que fueron tratados con stripping en los siguientes aspectos: Presencia de venas varicosas, mejoría de la sintomatología, aparición de telangiectasias post-quirúrgicas, satisfacción subjetiva del paciente acerca del resultado del tratamiento e incidencia de complicaciones neurológicas.

2.- La evolución del flujo retrogrado en la safena interna tras la interrupción de sus colaterales insuficientes (primer tiempo del CHIVA 2) es sólo temporal. La mayor parte de las veces es necesario interrumpir la unión safeno-femoral en un segundo tiempo quirúrgico.

3.- El hallazgo del shunt venoso asociado a flujo anterógrado en diástole en la vena de Giacomini es poco frecuente. Para su identificación es necesario practicar un cuidadoso estudio con eco-doppler en el que identificaremos un punto de re-entrada situado en posición distal al punto de fuga, configurándose un shunt veno-venoso cerrado. La interrupción de la vena de Giacomini a nivel de su unión con la safena externa, permite controlar correctamente el punto de fuga, con desaparición del flujo paradójico característico de este tipo de shunt.

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