

CHIVA Treatment of Refractory Venous Leg Ulcer in a 92-Year-Old Female: A Case Report

Abstract

Background: Venous leg ulcers (VLU) in extreme elderly patients pose significant therapeutic challenges. Conventional surgical approaches carry elevated perioperative risks, and skin grafting without correcting underlying venous hypertension frequently fails. The CHIVA (Cure Conservative et Hémodynamique de l'Insuffisance Veineuse en Ambulatoire) strategy offers a hemodynamically targeted, minimally invasive alternative. We present a case of a 92-year-old female with refractory VLU successfully treated with the CHIVA strategy combined with wound debridement and compression therapy.

Case Presentation: A 92-year-old Chinese female with a 30-year history of varicose veins presented with a 2-year history of recurrent right malleolar ulcers (CEAP classification: C6). Prior treatments included multiple failed skin grafts at a local hospital and subsequent home-based wound care. Hemodynamic assessment revealed a great saphenous vein (GSV) diameter of 8 mm, reflux time >4 seconds at the saphenofemoral junction (SFJ), and a mixed Franceschi shunt type I+II pattern. The patient underwent the CHIVA1 strategy under local anesthesia, consisting of high ligation at the SFJ (blocking the N1→N2 escape point) and ligation of the N2→N3 escape point at the lower leg, with preservation of the GSV. Concurrent wound debridement and elastic compression bandage therapy were applied. Two weeks postoperatively, the ulcer had essentially healed, edema resolved, and the Venous Clinical Severity Score (VCSS) decreased from 16 to 6. At 6-month follow-up, the ulcer showed no recurrence.

Conclusion: This case demonstrates that the CHIVA strategy—a hemodynamically guided, minimally invasive approach performed under local anesthesia—can be safely and effectively applied in nonagenarians with refractory VLU. Addressing the underlying

venous hemodynamic pathology, rather than treating the ulcer in isolation, is critical for sustained healing. The CHIVA approach may represent an optimal treatment paradigm for extreme elderly patients with C6 chronic venous disease who are poor candidates for conventional surgery or thermal ablation under general or spinal anesthesia.

Keywords: CHIVA, venous leg ulcer, nonagenarian, varicose veins, CEAP C6, saphenofemoral junction reflux, case report

Background

Chronic venous disease (CVD) is among the most prevalent medical conditions worldwide, with varicose veins affecting an estimated 25–30% of adults and advanced chronic venous insufficiency (C4–C6) affecting 3–5% of the population over 60 years of age [1,2]. Venous leg ulcers (VLU), representing the most severe manifestation (CEAP C6), are associated with chronic pain, reduced quality of life, and substantial healthcare costs. In elderly populations, the prevalence of CVD rises steeply, yet the willingness to intervene surgically often diminishes with advancing age, creating a therapeutic gap in which patients are managed conservatively—often indefinitely—without addressing the underlying venous pathology [1,2].

The CHIVA strategy (Cure Conservative et Hémodynamique de l'Insuffisance Veineuse en Ambulatoire), developed by Franceschi in 1988, represents a paradigm shift in venous surgery. Rather than ablating or stripping the refluxing saphenous vein, CHIVA aims to correct the hemodynamic abnormalities responsible for venous hypertension by targeting specific escape points (EPs) identified through duplex ultrasound mapping, while preserving the saphenous vein and its drainage function [3–6]. Randomized controlled trials have demonstrated that CHIVA yields lower recurrence rates and fewer complications compared to conventional stripping, with long-term efficacy sustained at 10-year follow-up [3,4,5].

Despite growing evidence supporting CHIVA's efficacy and safety, its application in extreme elderly patients (≥ 90 years) with advanced venous disease (C6) remains

underreported. We present a case of a 92-year-old female with a refractory venous leg ulcer, previously unresponsive to multiple skin grafting attempts, who achieved rapid ulcer healing following CHIVA treatment under local anesthesia. This report follows the CARE (CAse REport) guidelines [13].

Case Presentation

Patient Information

A 92-year-old Chinese female was referred to our CHIVA center for evaluation of a chronic right leg ulcer that had been unresponsive to treatment for approximately 2 years. The patient had a 30-year history of varicose veins in the right lower extremity, which had never been surgically treated. Her relevant medical history included lumbar disc herniation, for which she was taking oral analgesics. She had no history of diabetes mellitus, hypertension, coronary artery disease, or atrial fibrillation. She had no known drug allergies and was a non-smoker.

Clinical Findings

On physical examination, the right lower extremity exhibited extensive varicose tributaries along the medial thigh and calf, consistent with great saphenous vein (GSV) distribution. Marked hyperpigmentation and lipodermatosclerosis were present in the distal calf and ankle region (gaiter area). Multiple irregular, scattered ulcers were observed at both the medial and lateral malleolar regions, with the largest measuring approximately 4×1 cm. The ulcer beds showed a mixture of granulation tissue and slough, with moderate exudate. Surrounding skin demonstrated eczematous changes and induration. No signs of clinical infection (cellulitis, purulent discharge) were present at the time of evaluation. Peripheral pulses (dorsalis pedis and posterior tibial) were palpable and symmetric bilaterally. Ankle-brachial index (ABI) was not recorded, but palpable pulses and absence of resting pain suggestive of arterial disease provided clinical assurance of adequate arterial perfusion.

Timeline

Table 1. Summary of clinical timeline.

Time Point	Event
~30 years prior (age ~62)	Onset of varicose veins, right lower extremity; no treatment sought
~2 years prior (age ~90)	Development of right malleolar ulcers (medial and lateral); multiple skin graft procedures at local hospital — all failed to achieve sustained healing
~1.5–0.5 years prior	Self-managed home wound care; no venous intervention
~6 months prior (age ~92)	Referred to our team; comprehensive hemodynamic assessment performed
Day 0	CHIVA strategy under local anesthesia + wound debridement + compression bandage
Week 2 post-op	Ulcer essentially healed; edema resolved; VCSS improved from 16 to 6
6 months post-op	Continued follow-up; no ulcer recurrence; patient ambulatory with improved quality of life

Diagnostic Assessment

Duplex ultrasound examination was performed with the patient in standing and supine positions using a high-frequency linear transducer. The right GSV was measured at 8 mm in diameter at the proximal thigh, with reflux duration >4 seconds at the saphenofemoral junction (SFJ), indicating significant valvular incompetence. Reflux was confirmed to originate at the SFJ with downward propagation through the GSV. The Franceschi shunt classification was determined as a mixed type I+II pattern: a type I component (N1→N2 via SFJ, re-entry via a perforator from the GSV) combined with a type II component (N1→N2→N3, re-entry via a perforator from the epifascial collaterals). This mixed pattern explained the extensive collateral network and bilateral malleolar ulcer involvement, as the N3 collaterals extended to both medial and lateral ankle regions. The

small saphenous vein (SSV) and deep venous system were assessed and found to be competent, without evidence of deep vein thrombosis or obstruction. Perforator incompetence was identified in the distal calf, corresponding to the re-entry points of the shunt circuit.

The Venous Clinical Severity Score (VCSS) at presentation was 16, reflecting severe disease with active ulcers, significant edema, pigmentation, and inflammation. The CEAP classification was C6 (active ulcer), with anatomical distribution confined to the superficial venous system (As, d, p).



Figure 1. Preoperative clinical appearance of the right lower extremity, showing extensive malleolar venous ulcers with hyperpigmentation, lipodermatosclerosis, and fibrinous exudate.

Preoperative Hemodynamic Assessment and CHIVA1 Strategy

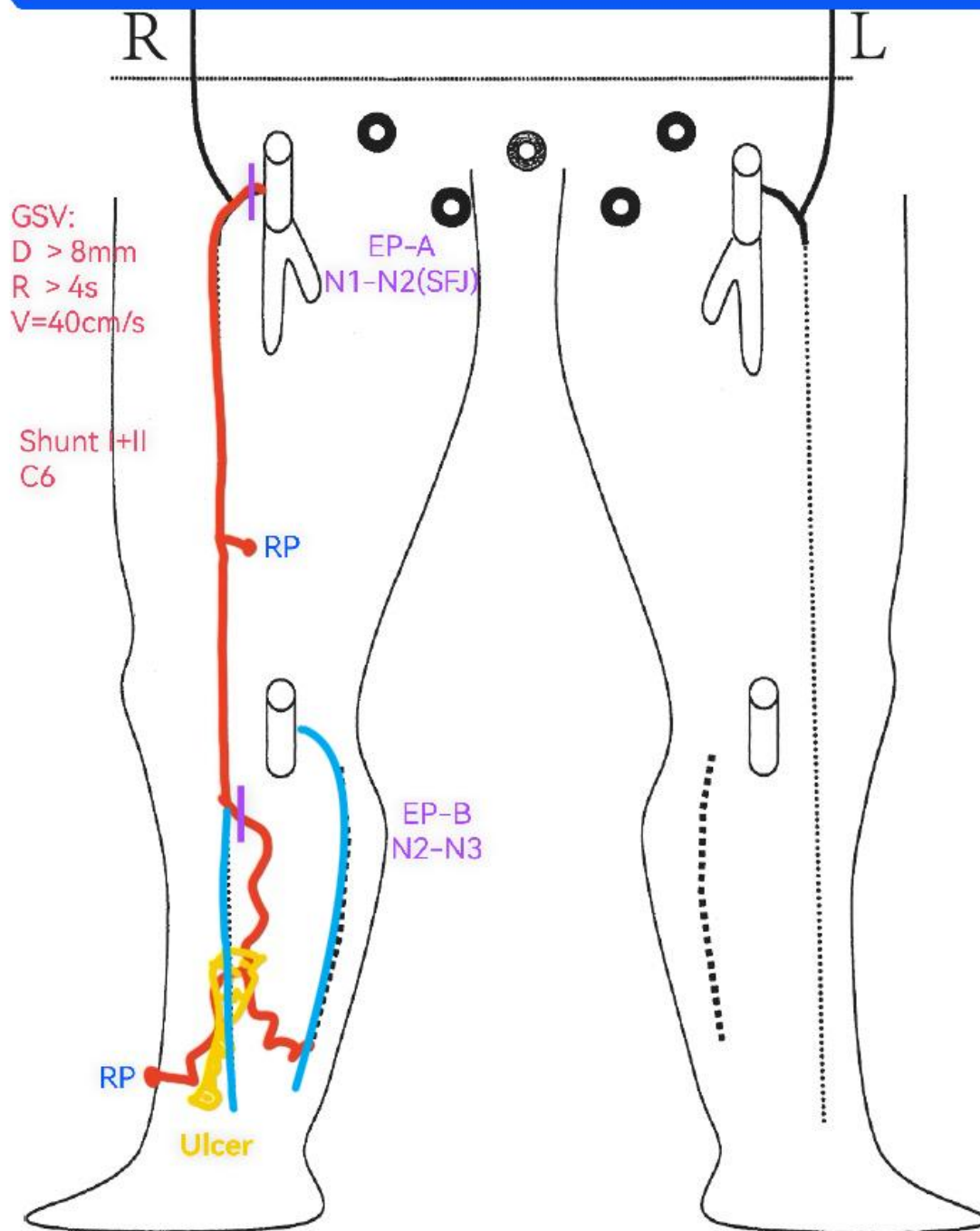


Figure 2. Preoperative hemodynamic assessment and CHIVA1 strategy based on duplex ultrasound mapping. The right leg demonstrates a mixed Franceschi shunt type I+II, with pathological reflux (red) originating from the deep venous system (N1) through the saphenofemoral junction escape point (EP-A, green) into the great saphenous vein (N2), then propagating into epifascial collaterals (N3) via the

N2→N3 escape point (EP-B, green), and ultimately re-entering the deep system through a perforator (RP, blue) near the malleolar ulcer. The left leg is shown for comparison with a competent GSV and normal antegrade drainage. GSV, great saphenous vein; EP, escape point; RP, re-entry point; R, reflux duration.

Therapeutic Intervention

Based on the hemodynamic assessment, a CHIVA1 strategy was planned. The surgical procedure was performed under local anesthesia (1% lidocaine infiltration), reflecting both the minimally invasive nature of CHIVA and the patient's age-related anesthetic risk profile. The specific procedure consisted of two targeted ligations:

1. **N1→N2 escape point (EP) closure:** High ligation of the GSV at the SFJ was performed via a small inguinal incision, disconnecting the reflux source from the deep venous system (N1) to the saphenous system (N2). All principal SFJ tributaries were individually ligated and divided to prevent cross-circuit reflux.
2. **N2→N3 escape point (EP) closure:** Ligation of the connection between the GSV (N2) and the epifascial collaterals (N3) at the distal calf was performed via a small incision at the identified escape point, eliminating the pathway through which reflux propagated into the ankle collaterals responsible for the ulceration.

The GSV trunk was deliberately preserved throughout the procedure, maintaining its physiological drainage function through remaining competent perforators and preserving the vein for potential future use as an arterial bypass conduit.

Concurrent with the CHIVA procedure, surgical debridement of the ulcer beds was performed to remove necrotic tissue and slough, promoting a clean granulation base. Postoperatively, a multi-layer elastic compression bandage system was applied to the affected limb, delivering graduated compression to support venous return and reduce ambulatory venous hypertension.

No systemic anticoagulation was administered beyond routine prophylaxis. The patient was ambulated on the same day of the procedure.



Figure 3. Intraoperative photograph after wound debridement, demonstrating the ulcer bed with granulation tissue and residual fibrinous exudate prior to CHIVA1 intervention.



Figure 4. Clinical appearance at 14-day follow-up, showing near-complete epithelialization of the previously ulcerated malleolar areas.

Follow-up and Outcomes

At the 2-week postoperative visit, clinical examination revealed that the previously active ulcers had essentially healed, with re-epithelialization covering the former ulcer beds. Preoperative edema had resolved completely. The patient reported significant reduction in pain. The VCSS had improved from 16 (preoperative) to 6 (postoperative), representing a 10-point reduction—far exceeding the minimal clinically important difference (MCID) of 3.38 points for the VCSS. The compression bandage was transitioned to maintenance graduated compression stockings (30–40 mmHg).

At the time of this report, the patient has been followed for approximately 6 months. The ulcer has not recurred. The patient remains ambulatory with improved functional status and reports sustained pain relief. Postoperative duplex ultrasound surveillance has not yet been performed but is planned for the 12-month follow-up.

Discussion

1. Varicose Vein Treatment in Extreme Elderly: An Unmet Need

The treatment of varicose veins in elderly patients has historically been approached with caution. Concerns regarding anesthetic risk, comorbidity burden, wound healing capacity, and perceived limited life expectancy have led many practitioners to favor conservative management indefinitely, even in the presence of active ulceration. However, emerging data challenge this paradigm.

The Vascular Quality Initiative (VQI) analysis by Sutzko et al. [1] examined outcomes after varicose vein procedures in octogenarians and demonstrated that patients aged ≥ 80 years experienced significant improvements in Venous Clinical Severity Score (VCSS), with complication rates comparable to younger cohorts. The authors recommended that age alone should not be a barrier to intervention and that limiting treatment to trunk ablation (rather than extensive tributary phlebectomy) was appropriate in this population. Similarly, Sarfraz et al. [2] analyzed national trends in hospital-based varicose vein surgery among the elderly and found that older patients were increasingly managed with simpler procedures under local or regional anesthesia, with no significant increase in age-related adverse events.

These studies, however, focused on octogenarians (≥ 80 years). Data on nonagenarians (≥ 90 years) are virtually absent from the literature. To our knowledge, this is the first reported case of CHIVA treatment in a 92-year-old patient with active C6 venous disease. The successful outcome in this case—performed entirely under local anesthesia, with same-day ambulation and rapid ulcer healing—suggests that the therapeutic ceiling for venous intervention in extreme elderly patients may be higher than commonly assumed.

The key determinant is not chronological age per se, but the ability to perform a hemodynamically targeted, minimally invasive procedure that corrects the underlying venous pathology without the physiological burden of general anesthesia or extensive tissue dissection.

2. CHIVA: Hemodynamic Rationale and Evidence

The CHIVA strategy is fundamentally distinct from ablation-based approaches (stripping, endovenous thermal ablation, cyanoacrylate adhesive, mechanochemical ablation).

Rather than destroying the refluxing saphenous vein, CHIVA restores venous hemodynamics by disconnecting the pathological shunt circuits identified through duplex ultrasound mapping, while preserving the saphenous vein as a drainage conduit [3–6].

In Franceschi's nomenclature, the venous network is divided into three compartments: N1 (deep veins), N2 (saphenous veins), and N3 (epifascial collaterals). Venous insufficiency is conceptualized as "shunts"—abnormal circuits where blood flows from the deep system (N1) into the superficial system (N2/N3) through incompetent escape points (EPs) and returns to the deep system through re-entry perforators. The CHIVA strategy treats the specific EPs responsible for the pathological shunt, thereby eliminating venous hypertension while preserving normal venous drainage.

In this case, the patient presented with a mixed shunt type I+II pattern. The type I component involved reflux from N1 through the SFJ into the GSV (N2), with re-entry via a perforator from the GSV. The type II component involved reflux propagating from the GSV (N2) into epifascial collaterals (N3) in the distal calf, with re-entry via perforators near the ankle. The N3 collaterals extended to both medial and lateral malleolar regions, explaining the bilateral ankle ulcer distribution despite GSV-only reflux at the SFJ. The CHIVA1 strategy targeted both EPs: (a) the N1→N2 EP at the SFJ (high ligation, eliminating the reflux source) and (b) the N2→N3 EP at the distal calf (eliminating the pathway through which reflux fed the ankle collaterals). By preserving the GSV trunk, the strategy maintained drainage through competent perforators while eliminating the pathological shunt circuit.

The evidence base supporting CHIVA is robust and growing. The landmark randomized controlled trial by Carandina et al. [3] compared CHIVA with conventional stripping in 150 patients with a 10-year follow-up, demonstrating significantly lower recurrence rates (18% vs. 35%, $P < 0.04$) in the CHIVA group. The larger randomized trial by Parés et al. [4] enrolled 501 patients and confirmed that CHIVA achieved superior cure rates compared to stripping, with fewer complications. A network meta-analysis by Guo et al. [5], synthesizing 39 randomized controlled trials, found that CHIVA had the highest treatment success rate and lowest recurrence rate among all treatment modalities for varicose veins. The Cochrane systematic review by Bellmunt-Montoya et al. [6], analyzing 6 randomized trials with 1,160 participants, concluded that CHIVA may reduce the risk of nerve injury (RR 0.14) and hematoma (RR 0.59) compared to stripping, with comparable or superior efficacy.

For this 92-year-old patient, the CHIVA approach offered several specific advantages over alternative strategies: (1) the procedure was performed entirely under local anesthesia, eliminating the cardiopulmonary risks of general or spinal anesthesia; (2) the hemodynamically targeted ligations involved minimal tissue dissection, reducing operative time and wound-related complications; (3) preservation of the GSV maintained the venous drainage network and avoided the inflammatory cascade associated with saphenous ablation; and (4) the individualized shunt-based treatment plan addressed the specific hemodynamic pathology (mixed type I+II shunt), rather than applying a one-size-fits-all ablation strategy.

3. Venous Leg Ulcer: Treating the Cause, Not the Wound

The patient's clinical history illustrates a common and instructive failure pattern: multiple skin grafting procedures were performed to close the ulcer, but all failed to achieve sustained healing. This outcome was predictable, as skin grafting addresses the wound surface without correcting the underlying venous hypertension that caused the ulcer in the first place. Without eliminating ambulatory venous hypertension, the transplanted skin is

subjected to the same pathological environment that caused the original tissue breakdown, and graft failure is the expected result.

The importance of addressing the underlying venous pathology in VLU management is firmly established in the evidence base. The ESCHAR trial [9], a landmark randomized controlled trial by Barwell et al. published in *The Lancet* (2004), randomized 500 patients with venous ulcers (C5–C6) to compression therapy alone versus compression plus superficial venous surgery. While ulcer healing rates were similar between groups (65% vs. 65%), the recurrence rate was significantly lower in the surgery-plus-compression group (12% vs. 28%, $P < 0.001$). This established that surgical correction of superficial venous reflux, when combined with compression, is essential for preventing ulcer recurrence—even though compression alone may achieve initial healing.

The EVRA trial [10], published in the *New England Journal of Medicine* (2018), further refined this paradigm. Gohel et al. randomized 450 patients with venous ulcers to early endovenous ablation (within 2 weeks of randomization) versus deferred ablation (after ulcer healing or 6 months). The early ablation group demonstrated significantly faster ulcer healing (median 56 days vs. 82 days, $P = 0.001$) and a higher 24-week healing rate (93% vs. 86%). This finding—that early correction of venous reflux accelerates ulcer healing—has been interpreted as evidence that venous hypertension is not merely a risk factor for recurrence, but an active impediment to the healing process itself.

The current case powerfully illustrates this principle. Despite 2 years of wound-focused treatment (skin grafting, home wound care), the ulcer remained unhealed because the GSV reflux and the resulting ambulatory venous hypertension were never addressed. Once the CHIVA1 strategy eliminated the reflux circuit and compression therapy was initiated, the ulcer healed within 2 weeks—a dramatic acceleration that underscores the causal role of venous hypertension in maintaining the ulcer. The compression component alone, as established by the Cochrane review of 48 randomized trials by O'Meara et al. [11], can promote ulcer healing, but the addition of venous reflux correction is what transforms the healing trajectory from "possible" to "rapid and sustained."

The SVS/AVF clinical practice guidelines by Gloviczki et al. [12] provide a Grade 1A recommendation for superficial venous ablation in combination with compression therapy for patients with C5–C6 disease—a recommendation based on the highest level of evidence. This case demonstrates that the CHIVA strategy can fulfill this guideline recommendation while offering the additional benefits of local anesthesia, saphenous preservation, and hemodynamic precision—advantages that are particularly salient in the nonagenarian population.

4. Rapid Healing: Mechanistic Interpretation

The 2-week healing timeframe observed in this case is notably rapid, particularly given the 2-year history of refractory ulceration in a 92-year-old patient. Several factors likely contributed to this accelerated healing:

First, CHIVA1 immediately eliminated the reflux circuit, restoring normal pressure dynamics in the superficial venous system. The elimination of reflux at the SFJ and the N2→N3 connection point meant that venous hypertension in the ankle region was corrected at its source, rather than merely managed. The compression bandage augmented this effect by supporting venous return during ambulation, but the fundamental correction was hemodynamic—the pathological shunt was eliminated, not merely compressed.

Second, the debridement performed concurrently with the CHIVA procedure removed the chronic necrotic tissue and biofilm that had accumulated over 2 years of non-healing, creating a clean wound bed that could respond to the newly corrected hemodynamic environment.

Third, the patient's preserved arterial perfusion (palpable distal pulses, no history of arterial disease) ensured adequate oxygenated blood supply to support the healing process once venous hypertension was removed as the primary obstacle.

A recent case report by Li et al. [7] described a 78-year-old C6 patient treated with CHIVA combined with negative pressure wound therapy (NPWT), achieving ulcer

healing in 75 days with no recurrence at 11 months. While the clinical contexts differ, the comparison is instructive: in the Li et al. case, NPWT was employed as an adjunct to accelerate wound healing, and the healing time was 75 days; in our case, debridement plus compression (without NPWT) achieved healing in approximately 14 days in a 92-year-old patient. While direct comparison between single cases is limited, the rapid healing in our case may be attributed to the combination of immediate hemodynamic correction, effective debridement, early compression, and the patient's adequate arterial perfusion—suggesting that the duration of ulcer healing is more dependent on the completeness of hemodynamic correction than on adjunctive wound technologies.

5. Clinical Implications

This case carries several important clinical implications:

1. Age is not a contraindication to venous intervention. The 92-year-old patient in this case tolerated the procedure under local anesthesia with same-day ambulation and rapid healing, challenging the common clinical assumption that extreme age precludes surgical venous treatment.

2. Hemodynamic assessment is essential before any ulcer treatment. The patient's multiple failed skin grafts underscore the importance of duplex ultrasound evaluation to identify and map venous reflux patterns before initiating wound-focused treatment.

Treating an ulcer without addressing its cause is an exercise in futility.

3. CHIVA is particularly suited for the elderly population. The combination of local anesthesia, minimal tissue dissection, saphenous vein preservation, and individualized hemodynamic targeting makes CHIVA an ideal strategy for patients in whom conventional surgery or thermal ablation under general/spinal anesthesia carries unacceptable risk.

4. The "treat the vein, heal the ulcer" paradigm should be applied universally. The ESCHAR and EVRA trials [9,10] have established this principle for the general VLU

population; this case extends it to the nonagenarian population, demonstrating that the same principle applies regardless of age.

Limitations

This report has several limitations. First, it is a single case report, and the findings cannot be generalized without larger studies. Second, postoperative duplex ultrasound surveillance has not yet been performed, so the hemodynamic outcomes of the CHIVA procedure have not been objectively confirmed at the time of this report; ultrasound follow-up is planned at 12 months. Third, the 6-month follow-up period is relatively short for definitive assessment of ulcer recurrence, as late recurrence beyond one year has been documented in venous ulcer studies [9]. Fourth, the ABI was not formally documented; while palpable distal pulses provided clinical reassurance, a formal ABI measurement would have strengthened the assessment. Finally, the patient's lumbar disc herniation and analgesic use may have confounded the pain assessment component of the VCSS, potentially underestimating the true venous-related pain burden preoperatively.

Conclusion

This case report describes the successful treatment of a refractory venous leg ulcer in a 92-year-old female using the CHIVA1 strategy under local anesthesia, combined with wound debridement and compression therapy. The patient, who had endured 2 years of refractory ulceration and multiple failed skin grafts, achieved near-complete ulcer healing within 2 weeks and sustained remission at 6-month follow-up, with a VCSS reduction from 16 to 6. The case demonstrates that: (1) extreme age alone is not a contraindication to venous intervention when the appropriate minimally invasive strategy is selected; (2) the CHIVA strategy, with its hemodynamic precision, local anesthesia feasibility, and saphenous vein preservation, is particularly well-suited for nonagenarian patients with advanced venous disease; and (3) correcting the underlying venous hemodynamic pathology—rather than treating the ulcer in isolation—is the key to achieving rapid and

sustained ulcer healing. Further studies with larger cohorts are needed to establish the safety and efficacy profile of CHIVA in the nonagenarian population.

Declarations

Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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Conflicts of Interest

The authors declare that they have no competing interests.

Authors' Contributions

JIANPING DENG — patient management, surgical procedure, manuscript drafting;
QIANG ZHANG — manuscript revision and critical review. All authors read and approved the final manuscript.

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CARE Checklist Compliance Statement

This case report has been prepared in accordance with the CARE (CAse REport) guidelines [13]. The following CARE checklist items have been addressed:

CARE Item	Section
Title contains "case report"	Title
Keywords (3–10)	Keywords
Abstract (structured)	Abstract
Introduction	Background
Patient Information	Case Presentation → Patient Information
Clinical Findings	Case Presentation → Clinical Findings
Timeline	Case Presentation → Timeline
Diagnostic Assessment	Case Presentation → Diagnostic Assessment
Therapeutic Intervention	Case Presentation → Therapeutic Intervention
Follow-up and Outcomes	Case Presentation → Follow-up and Outcomes
Discussion	Discussion
Patient Perspective	Case Presentation → Patient Perspective (to be supplemented)



Figure 1. Preoperative clinical appearance of the right lower extremity, showing extensive malleolar venous ulcers with hyperpigmentation, lipodermatosclerosis, and fibrinous exudate

Preoperative Hemodynamic Assessment and CHIVA1 Strategy

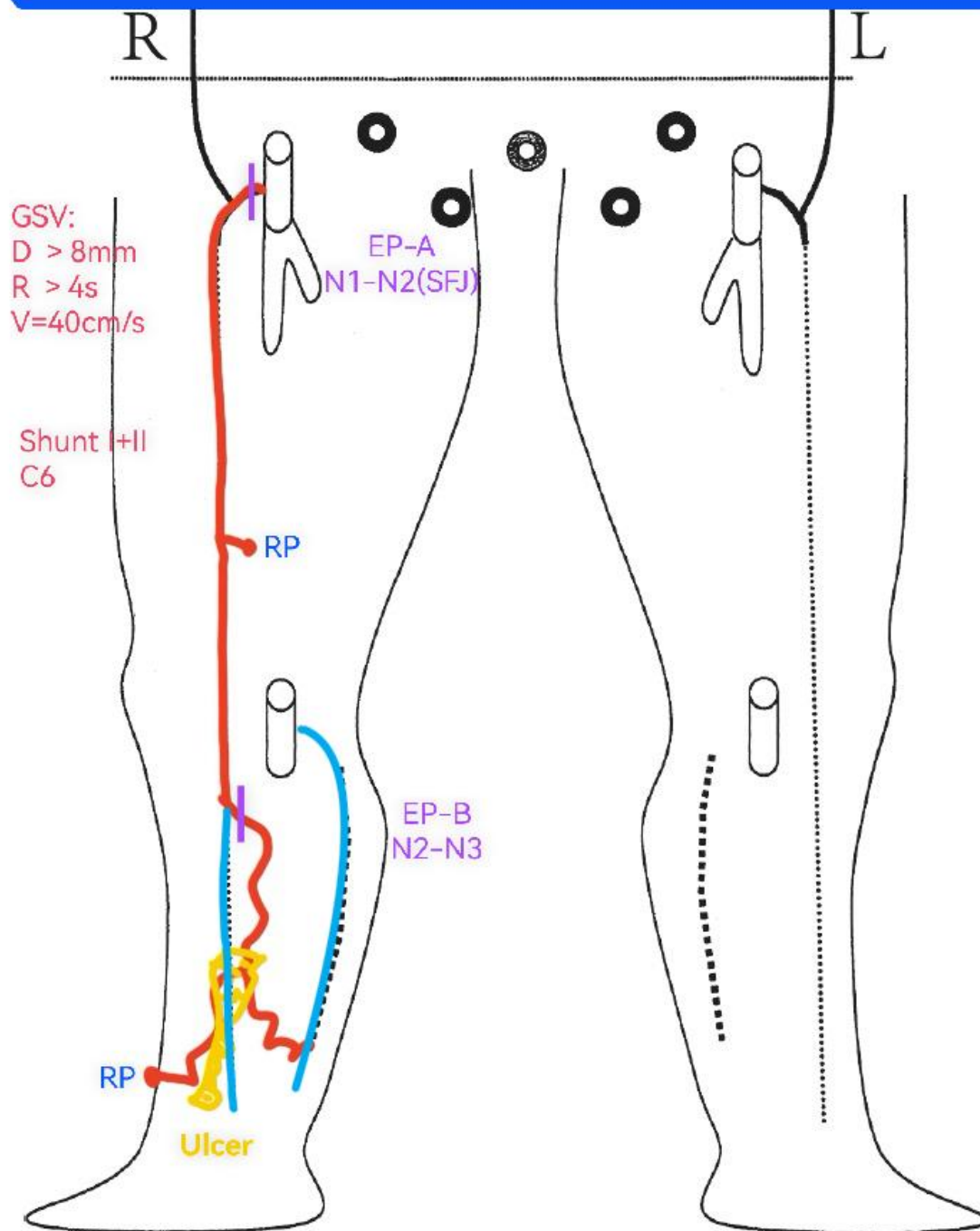


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N2→N3 escape point (EP-B, green), and ultimately re-entering the deep system through a perforator (RP, blue) near the malleolar ulcer. The left leg is shown for comparison with a competent GSV and normal antegrade drainage. GSV, great saphenous vein; EP, escape point; RP, re-entry point; R, reflux duration.



Figure 3. Intraoperative photograph after wound debridement, demonstrating the ulcer bed with granulation tissue and residual fibrinous exudate prior to CHIVA1 intervention.



Figure 4. Clinical appearance at 14-day follow-up, showing near-complete epithelialization of the previously ulcerated malleolar areas.