European Society for Vascular Surgery (ESVS) 2022 Clinical Practice Guidelines on the Management of Chronic Venous Disease of the Lower Limbs

Tables of Evidence for the Recommendations

Please click below to move to the recommendation of interest

Click here to go back to list of Recommendations

Recommendation 3	**Class**	**Level of evidence**			
For diagnosis and treatment planning in patients with suspected or clinically evident chronic venous disease, full lower limb venous duplex ultrasound is recommended as the primary imaging modality.	**I**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Blomgren, 2011	RCT	293 patients initially underwent surgery for primary VV 227 were interviewed and 194 were examined with duplex after 7 years	Preoperative duplex ultrasound *n* = 95	Clinical examination only preoperatively *n* = 99	Routine preoperative duplex imaging improved the results of surgery for primary VV Reoperations in the duplex group 12.1% Reoperations in the control group 28.4%, *p*=.001 Incompetence at the SFJ and/or SPJ in duplex group 14% Incompetence at the SFJ and/or SPJ in control group 46%, *p*<.001) at 7 years follow-up

RCT = randomised controlled trial; OR = odds ratio; CI = confidence interval; VV = varicose veins; SFJ = sapheno femoral junction; SPJ = sapheno popliteal junction

Reference:

- Blomgren L, Johansson G, Emanuelsson L, Dahlberg-Akerman A, Thermaenius P, Bergqvist D. Late follow-up of a randomized trial of routine duplex imaging before varicose vein surgery. Br J Surg. 2011;98:1112-6.

Click here to go back to list of Recommendations

Recommendation 4	**Class**	**Level of evidence**			
For patients with suspected supra-inguinal venous obstruction, in addition to full leg duplex assessment, ultrasound of the abdominal and pelvic veins should be considered, as part of the initial assessment.	**IIa**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Metzger, 2016	Prospective study	102 limbs in 51 patients with advanced CVI C3-C6	DUS and IVUS	-	DUS presented high agreement with IVUS for detection of obstructions >50%. The velocity ratio in obstructions >2.5 is the best criterion for detection of significant venous outflow obstructions in iliac veins

CVI = chronic venous insufficiency; DUS = duplex ultrasound; IVUS = intravenous ultrasound; OR = odds ratio; CI = confidence interval

Reference:

- Metzger PB, Rossi FH, Kambara AM, Izukawa NM, Salej MH, Pinto IMF et al. Criteria for detecting significant chronic iliac venous obstructions with duplex ultrasound. J Vasc Surg: Venous Lymphat Disord 2016;4:18-27.

Click here to go back to list of Recommendations

Recommendation 5	**Class**	**Level of evidence**			
When an intervention is contemplated in patients with suspected supra-inguinal venous obstruction, cross-sectional imaging by magnetic resonance venography or computed tomography is recommended in addition to duplex ultrasound assessment.	**I**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Coelho, 2019	Retrospective study	30 patients with a symptomatic previous iliofemoral DVT	Patients underwent both direct CTV and venography Two groups defined on venography; (a) femoral vein or (b) deep femoral vein as dominant inflow	None	Direct CTV accurately determined the dominant inflow vein before iliofemoral stenting

DVT = deep venous thrombosis; CTV = computed tomography venography; OR = odds ratio; CI = confidence interval

Reference:

- Coelho A, O'Sullivan GJ. Usefulness of direct computed tomography venography in predicting inflow for venous reconstruction in chronic post-thrombotic syndrome. Cardiovasc Intervent Radiology 2019;42:677-84.

Click here to go back to list of Recommendations

Recommendation 6	**Class**	**Level of evidence**			
For selected patients with suspected supra-inguinal venous obstruction, where cross-sectional diagnostic imaging is inadequate or not available, venography and/or intravascular ultrasound may be considered.	**IIb**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Gagne, 2017	Observational	100 patients (18-85 years) with iliac compression disease and C4-C6	Iliac vein stenting	-	IVUS identified more (81/100) significant venous lesions (50% diameter reduction) than venography (51/100). IVUS changed the treatment plan in 57/100 patients.
Lau, 2019	Retrospective	107 patients with chronic venous insufficiency	Venography and IVUS guided venous stenting	-	IVUS changed the treatment plan up to 48% compared to venography

OR = odds ratio; CI = confidence interval; IVUS = intravenous ultrasound

References:

- Gagne PJ, Tahara RW, Fastabend CP, Dzieciuchowicz L, Marston W, Vedantham S, et al. Venography versus intravascular ultrasound for diagnosing and treating iliofemoral vein obstruction. J Vasc Surg Venous Lymphat Disord, 2017;5:678-87.
- Lau I, Png CYM, Eswarappa M, Miller M, Kumar S, Tadros R et al. Defining the utility of anteroposterior venography in the diagnosis of venous iliofemoral obstruction. J Vasc Surg Venous Lymphat Disord 2019;7:514-21.

Click here to go back to list of Recommendations

Recommendation 7	**Class**	**Level of evidence**			
For patients with chronic venous disease, air-plethysmography may be considered for quantification of reflux and/or obstruction, in particular when duplex ultrasound results do not reconcile with the clinical findings.	**IIb**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Kalodiki, 2019	RCT	100 patients with saphenous reflux	EVLA *n* = 50	UGFS *n* = 50	Outcomes were assessed using three domains: AVVQ, VCSS and VFI of air plethysmography and reported at 5 years using a Venn diagram to profile the outcomes: a DOA Using a DOA, only 76% after EVLA *vs* 60% after UGFS had success in all three domains. Using improvement thresholds, this reduced to 54% and 39%, respectively
Lattimer, 2019	Observational study	21 limbs in 16 hospital employees with varicose veins	Quantitative measurements in legs with reflux *n* = 14	Quantitative measurements in legs without reflux *n* = 7	Quantitative measurements of superficial venous insufficiency of the saphenous trunk were done using VAFI, RCI, VFI and PDC: All 4 tests demonstrated significant differences between the two groups; VAFI (p=.028), RCI (p<.0005), VFI (p=.001), and PDC (p=.014)
Raju, 2019	Retrospective study	4599 limbs of CVD patients	Measurement of VFI and AVP	None	The VFI is a useful index of reflux. AVP may be omitted if the VFI is normal as the yield will be very low (7%)
Lattimer, 2017	Observational study	21 healthy volunteers	Increasing thigh obstruction with a pneumatic cuff	Self-controls	Significant VDI reduction and DRV increase with step wise increases in venous obstruction pressure (p<.0005)
Lattimer, 2016	Observational study	33 legs (a) without clinical or duplex evidence of venous disease (b) with an obstruction after iliofemoral DVT	Measurement of VFI, VDI and wVV on a rapid tilt-table in patients with obstruction *n* = 11 legs, or reflux, *n* = 11 legs	Measurement of VFI, VDI and wVV on a rapid tilt-table in patients without venous disease *n* = 11 legs	VFI discriminating reflux was ≥2.9 mL/second VDI discriminating obstruction was ≤10.8 mL/second

Click here to go back to list of Recommendations

		(c) with reflux with primary varicose veins			

RCT = randomised controlled trial; EVLA = endovenous laser ablation; UGFS = ultrasound guided foam sclerotherapy; AVVQ = Aberdeen varicose vein questionnaire; VCSS = venous clinical severity score; VFI = venous filling index; DOA = discord outcome analysis; OR = odds ratio; CI = confidence interval; VAFI = venous arterial flow index; RCI = recirculation index; VFI = venous filling index; PCD = postural diameter change; CVD = chronic venous disease; AVP= ambulatory venous pressure; VDI = venous drainage; DRV = drainage reserve volume; DVT = deep venous thrombosis; wVV = working venous volume

References:

- Kalodiki E, Azzam M, Schnatterbeck P, Geroulakos G, Lattimer CR. The Discord Outcome Analysis (DOA) as a Reporting Standard at Three Months and Five Years in Randomised Varicose Vein Treatment Trials. Eur J Vasc Endovasc Surg 2019; 57:267-74.
- Lattimer CR, Rudolphi PB, Recke A, Geroulakos G, Kahle B. Comparison of Four Haemodynamic Tests that Quantify Superficial Venous Insufficiency. Eur J Vasc Endovasc Surg 2019; 57:570-7.
- Raju S, Knepper J, May C, Knight A, Pace N, Jayaraj A. Ambulatory venous pressure, air plethysmography, and the role of calf venous pump in chronic venous disease. J Vasc Surg Venous Lymphat Disord 2019;7:428-40.
- Lattimer CR, Doucet S, Geroulakos G, Kalodiki E. Validation of the novel venous drainage index with stepwise increases in thigh compression pressure in the quantification of venous obstruction. J Vasc Surg Venous Lymphat Disord 2017;5:88-95.
- Lattimer CR, Mendoza E. Reappraisal of the Utility of the Tilt-table in the Investigation of Venous Disease. Eur J Vasc Endovasc Surg 2016; 52:854-61.

Click here to go back to list of Recommendations

Recommendation 8	**Class**	**Level of evidence**			
For patients with symptomatic chronic venous disease, exercise should be considered to reduce venous symptoms.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Karakelle, 2021	RCT	24 patients 18-75 ages, with primary superficial and/or deep venous incompetence	12 patients had supervised exercise program for 6 weeks in addition to compression	12 patients had compression therapy only	Chronic Venous Disease Quality of Life Questionnaire-20, SF-36, DUS, VCSS, hand-held dynamometer, VAS, circumference measurements, 6 minute-walking test, and 10-meter-walking test before and after treatment. Except of hemodynamic status and oedema ($p>.05$), all parameters were significantly in favour of exercise ($p<.05$)
Kahn, 2011	RCT	39 patients aged 18–75 years with unilateral, symptomatic DVT at least 6 months previously and PTS	Six-month trainer-supervised Exercise program *n* = 17	One-hour educational presentation on PTS and follow-up by phone *n* = 22	Exercise training was associated with improvement in VEINES-QOL scores and in scores on the Villalta scale
Araujo, 2016	Systematic review	54 patients with non-ulcerated chronic venous insufficiency	Exercise (unspecified)	No exercise	There is currently insufficient evidence available to assess the efficacy of physical exercise in people with CVI

RCT = randomised controlled trial; DVT = deep venous thrombosis; PTS = post thrombotic syndrome; OR = odds ratio; CI = confidence interval; QOL = quality of life; CVI = chronic venous insufficiency; VCSS = venous clinical severity score; DUS = duplex ultra sound; VAS = visual analogue scale

References:

- Araujo DN, Ribeiro CTD, Maciel ACC, Bruno SS, Fregonezi GAF, Dias FAL. Physical exercise for the treatment of non-ulcerated chronic venous insufficiency. Cochrane Database of Systematic Reviews 2016, 12:CD010637.
- Kahn SR, Shrier I, Shapiro S, Houweling AH, Hirsch AM, Reid RD et al. Six-month exercise training program to treat post-thrombotic syndrome: a randomized controlled two-centre trial. CMAJ, 2011;183:37-44.
- Karakelle S G, Ipek Y, Tulin O, Alpagut I U. The efficiency of exercise training in patients with venous insufficiency: A double blinded, randomized controlled trial Phlebology 2021 DOI: 10.1177/0268355520985759
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Click here to go back to list of Recommendations

Recommendation 9	**Class**	**Level of evidence**			
For patients with symptomatic chronic venous disease, elastic compression stockings, exerting a pressure of at least 15 mm Hg at the ankle, are recommended to reduce venous symptoms.	**I**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Benigni, 2003	RCT	125 female patients with CVD C1s-C3s	ECS 15-20 mmHg *n* = 60	Placebo stockings <10 mmHg *n* = 65	ECS 15-20 mmHg significantly improved painful discomfort and each symptom of CVD with the exception of paraesthesia, as well as 2 quality-of-life factors (mood and daily work activity)
Kakkos, 2018	RCT	30 patients with CVD C2-C6	ECS 18-21 mmHg *n* = 15	Placebo stockings 0 mmHg *n* = 15	ECS seem effective in ameliorating symptoms, particularly pain and aching, compared with placebo stockings after 1 week of use

RCT = randomised controlled trial; CVD = chronic venous disease; ECS = compression stockings; OR = odds ratio; CI = confidence interval

References:

- Benigni JP, Sadoun S, Allaert FA, Vin F. Efficacy of Class 1 elastic compression stockings in the early stages of chronic venous disease. A comparative study. Int Angiol 2003;22:383-92.
- Kakkos Timpilis M, Patrinos P, Nikolakopoulos KM, Papageorgopoulou CP, Kouri AK et al. Acute Effects of Graduated Elastic Compression Stockings in Patients with Symptomatic Varicose Veins: A Randomised Double-Blind Placebo Controlled Trial. Eur J Vasc Endovasc Surg 2018;55:118-25.

Click here to go back to list of Recommendations

Recommendation 10	**Class**	**Level of evidence**			
For patients with chronic venous disease and oedema (CEAP clinical class C3), compression treatment, using below knee elastic compression stockings, inelastic bandages or adjustable compression garments, exerting a pressure of 20 – 40 mm Hg at the ankle, is recommended to reduce oedema.	**I**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Mosti, 2012	RCT	42 legs of 30 patients with C3, both sexes	ECS 23-32 mm Hg *n* = 21 legs	IB 60 mm Hg *n* = 21 legs	ECS slightly less effective than IB. Difference not statistically significant
Mosti, 2013	RCT	40 legs of 28 patients with C3, both sexes	Light stocking ("liner", 20mmHg) for 1 week, followed by super-imposing a 2nd stocking 1 size smaller achieving an ankle pressure of about 40 mmHg for 3 weeks *n* = 20 legs	Short- stretch bandages for 2 weeks, followed by an elastic knee- high compression stocking (23-32 mmHg) for 2 weeks *n* = 20 legs	Volume reductions (measured by water displacement volumetry) were equal between groups after 1, 2 and 4 weeks. The initial improvement in leg volume (1 week) was independent of the pressure applied and the volume reduction was maintained by superimposing a second stocking.
Mosti, 2015	RCT	40 legs of 36 patients with C3, both sexes	ACG 40 mm Hg *n* = 20 legs	IB 60 mm Hg *n* = 20 legs	ACG more effective than IB

RCT = randomised controlled trial; ECS = compression stockings; IB = inelastic bandage; ACG = adjustable compression garment; OR = odds ratio; CI = confidence interval

References

- Mosti G, Picerni P, Partsch H. Compression stockings with moderate pressure are able to reduce chronic leg oedema. Phlebology 2012;27:289–96.
- Mosti G, Partsch H. Bandages or double stockings for the initial therapy of venous edema? A randomized, controlled pilot study. Eur J Vasc Endovasc Surg 2013 Jul;46:142-8.
- Mosti G, Cavezzi A, Partsch H, Urso S, Campana F. Adjustable Velcro® Compression Devices are More Effective than Inelastic Bandages in Reducing Venous Edema in the Initial Treatment Phase: A Randomized Controlled Trial. Eur J Vasc Endovasc Surg 2015;50:368-74.

Click here to go back to list of Recommendations

Recommendation 11	**Class**	**Level of evidence**			
For patients with chronic venous disease and lipodermatosclerosis and/or atrophie blanche (CEAP clinical class C4b), using below knee elastic compression stockings, exerting a pressure of 20 – 40 mm Hg at the ankle, is recommended to reduce skin induration.	**I**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Vandongen, 2000	RCT	153 patients with C4-C5	ECS 34-46 mm Hg *n* = 72 patients	No compression *n* = 81 patients	Elastic stockings alone can improve the skin changes of lipodermatosclerosis

CEAP= Clinical Etiological Anatomical Pathophysiological (Classification); RCT = randomised controlled trial; ECS = elastic compression stocking; OR = odds ratio; CI = confidence interval

Reference

- Vandongen YK, Stacey MC. Graduated compression elastic stockings reduce lipodermatosclerosis and ulcer recurrence. Phlebology 2000;15:33-37.

Click here to go back to list of Recommendations

Recommendation 12	**Class**	**Level of evidence**			
For patients with post-thrombotic syndrome, below knee elastic compression stockings, exerting a pressure of 20- 40 mm Hg at the ankle, should be considered to reduce severity.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Azirar, 2019	Cochrane Systematic Review	Patients with PTS *n* = 69	Graduated ECS	no ECS or placebo	low-certainty evidence that the use of graduated ECS can be beneficial

ECS = elastic compression stocking; PTS = post-thrombotic syndrome; OR = odds ratio; CI = confidence interval

Reference

- Azirar S, Appelen D, Prins MH, Neumann MH, de Feiter AN, Kolbach DN. Compression therapy for treating post-thrombotic syndrome. Cochrane Database Syst Rev. 2019 (9):CD004177.

Click here to go back to list of Recommendations

Recommendation 13	**Class**	**Level of evidence**			
For patients with post-thrombotic syndrome, adjuvant intermittent pneumatic compression may be considered to reduce severity.	**IIb**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Azirar, 2019	Cochrane Systematic Review	Patients with PTS *n* = 47	IPC	control device	low-certainty evidence that the use of IPC can be beneficial

IPC = intermittent pneumatic compression; PTS = post-thrombotic syndrome; OR = odds ratio; CI = confidence interval

Reference

- Azirar S, Appelen D, Prins MH, Neumann MH, de Feiter AN, Kolbach DN. Compression therapy for treating post-thrombotic syndrome. Cochrane Database Syst Rev 2019 (9):CD004177.

Click here to go back to list of Recommendations

Recommendation 14	**Class**	**Level of evidence**			
For patients with symptomatic chronic venous disease, who are not undergoing interventional treatment, are awaiting intervention or have persisting symptoms and/or oedema after intervention, medical treatment with venoactive drugs should be considered to reduce venous symptoms and oedema, based on the available evidence for each individual drug.	**IIa**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Kakkos, 2018	Meta-analysis	1692 patients with CVD	MPFF	Placebo	MPFF reduced leg pain (RR 0.53, *p*=.0001), heaviness (RR 0.35, *p*<.00001), feeling of swelling (RR 0.39, *p*<.00001), cramps (RR 0.51, *p*= .02), paresthesia (RR 0.45, *p*=.03), and functional discomfort (RR 0.41, *p*=.0004) MPFF reduced pain (SMD -0.25, 95% CI -0.38 to -0.11), heaviness (SMD -0.80, 95% CI -1.05 to -0.54), feeling of swelling (SMD -0.99, 95% CI -1.25 to -0.73), burning sensation (SMD -0.46, 95% CI -0.78 to -0.14), cramps (SMD -0.46, 95% CI -0.78 to -0.14), and functional discomfort (SMD -0.87, 95% CI -1.13 to -0.61) MPFF reduced ankle circumference (SMD -0.59, 95% CI -1.15 to -0.02), leg redness (SMD -0.32, 95% CI -0.56 to -0.07, RR 0.50, *p*=.03), improved skin changes (RR 0.18, *p*=.0003), quality of life (SMD -0.21, 95% CI -0.37 to -0.04) clinical improvement (RR 0.28, *p*<.00001)
Kakkos, 2017	Meta-analysis	719 patients with CVD	Ruscus extracts	Placebo	Ruscus reduced leg pain (RR=0.35, *p*=.01), heaviness (RR=0.26, *p*<.00001), feeling of swelling (RR=0.53, *p*<.0001), paraesthesia (RR=0.27, *p*<.0001), global symptoms (RR=0.54, *p*<.00001) and the total number of venous symptoms (RR 0.41, *p*=.002) Ruscus reduced pain (SMD=-0.80, 95% CI: -1.21 to -0.39), heaviness (SMD=-1.23, 95% CI: -1.60 to -0.86), fatigue (SMD -1.16, 95% CI: -1.71 to -0.61), feeling of swelling (SMD=-2.27, 95% CI: -3.83 to -0.70), and paraesthesia (SMD=-0.86, 95% CI: -1.51 to -0.21) Ruscus reduced ankle circumference (SMD=-0.74, 95% CI: -1.01 to -0.47) and leg or foot volume (SMD=-0.61, 95% CI: -0.91 to -0.31)

Click here to go back to list of Recommendations

Ciapponi, 2004	Meta-analysis (only 3 trials of good methodological quality, 608 patients)	778 patients with CVD	Calcium dobesilate	Placebo	Calcium dobesilate significantly improved night cramps and discomfort nearly twice as well, with the number needed to treat being 8 (95% CI 4-50) and 4 (95% CI 3-7), respectively Pain, lower limb heaviness, lower limb edema and symptom improvement were improved Greater improvements in pain, heaviness, and malleolar swelling in the severe group than in the mild group Calcium dobesilate improved paraesthesia in the severe but not in the mild group, and the effect on leg volume was significantly better in the severe group (-7.2% *vs* -1.6%)
Flota-Cervera, 2008	RCT	49 patients with CVD	Calcium dobesilate *n* = 25	Placebo *n* = 24	Calcium dobesilate significantly reduced the perimeter of leg, calf, and ankle. Twenty-two out of 25 (88%) calcium dobesilate–treated patients presented clinical improvement *versus* 5 out of 24 (20.8%) in the placebo group
Martinez-Zapata, 2008	RCT	509 patients with CVD	Calcium dobesilate *n* = 246	Placebo *n* = 263	QOL after 3 months, oedema and symptoms of CVD were not different between the groups QOL at 12 months was better in the calcium dobesilate group than in placebo group (*p*=.02)
Rabe, 2011 (Phlebology)	RCT	256 patients with CVD	Calcium dobesilate *n* = 132	Placebo *n* = 124	The volume of the lower calf diminished in the dobesilate group at the end of the active treatment period by 264.72+111.93 cm^3 (mean +SD), independent of the concomitant use of compression stockings *versus* placebo +0.8+152.98 cm^3 (*p*=.0002) The symptoms of pain, discomfort, heavy legs, tired legs, tingling, itching and cramps, as well as the global assessments by investigators and patients, also improved significantly (*p*<.05) in the dobesilate group at the end of the treatment
Rabe, 2016	RCT	351 patients with CVD	Calcium dobesilate *n* = 174	Placebo *n* = 177	At the end of treatment, the relative volume change in the most pathological leg was -0.6±4.8% with calcium dobesilate *vs* -0.3±3.3% with placebo (*p*=.09) At the end of follow-up, this was -1.01±5.4% for calcium dobesilate *vs* -0.08±3.5% for placebo (*p*=.002)

Click here to go back to list of Recommendations

Pittler, 2012	Meta-analysis of 17 trial of which 10 RTCs	17 trials on patients with CVD	Horse chestnut seed extract (HCSE)	Placebo	Leg pain was assessed in 7 placebo-controlled trials. Six studies (*n* = 543) reported a significant reduction of leg pain in the HCSE group, while another reported a statistically significant improvement compared with baseline. One study suggested a WMD of 42.4 mm (95% CI 34.9 to 49.9) measured on a 100 mm visual analogue scale Leg volume was assessed in 7 placebo-controlled trials. Six trials (*n* = 502) suggested a WMD of 32.1 mL (95% CI 13.49-50.72) in favour of HCSE
Aziz, 2015	Meta-analysis, 15 RCTs	1643 patients with CVD	Hydroxyethyl-rutosides *n* = 1052	Placebo *n* = 591	Hydroxyethylrutosides significantly reduced symptoms of pain (SMD -1.07, 95% CI -1.44 to -0.70), symptoms of heavy legs (OR 0.50; 95% CI 0.28–0.91) and cramps (SMD -1.07, 95% CI -1.45 to -0.69)
Rabe, 2011 (EJVES)	RCT	248 patients	Red vine leaf extract *n* = 126	Placebo *n* = 122	After 12 weeks, red vine leaf extract significantly reduced lower limb volume by a mean of 19.9 SE 8.9 mL over placebo (95% CI: -37.5, -2.3; *p*=.0268) On day 84, the symptom 'pain in the legs' decreased in the red vine leaf extract group compared with the placebo group WMD -6.6 SD 3.3 mm (95% CI: -13.1 to -0.1, *p*=.047)
Kalus, 2004	RCT	36 patients	Red vine leaf extract *n* = 36	Placebo *n* = 35	After 6 weeks of treatment the leg circumference was decreased (ankle level: by –0.39±0.09cm *vs* +0.29±0.09cm; p<0.0001; calf level: by –0.54±0.05cm *vs* +0.14±0.05cm; p<0.0001). The efficacy rating of the patients treated with red vine leaf extract was good or satisfactory in 81.4% of the cases, but only 48.6% when treated with placebo (p <0.0001)

CVD = chronic venous disease; HCSE = horse chestnut seed extract; MPFF = micronized purified flavonoid fraction; RCT = randomised controlled trial; QOL = quality of life; RR = relative risk; SD = standard deviation; SE = standard error; SMD = standardized mean difference; WMD = weighted mean difference; OR = odds ratio; CI = confidence interval

References

- Aziz Z, Tang WL, Chong NJ, Tho LY. A systematic review of the efficacy and tolerability of hydroxyethylrutosides for improvement of the signs and symptoms of chronic venous insufficiency. J Clin Pharm Ther 2015;40:177-85.
- Ciapponi A, Laffaire E, Roque M. Calcium dobesilate for chronic venous insufficiency: a systematic review. Angiology 2004;55:147-54.
- Flota-Cervera F, Flota-Ruiz C, Trevino C, Berber A. Randomized, double blind, placebo-controlled clinical trial to evaluate the lymphagogue effect and clinical efficacy of calcium dobesilate in chronic venous disease. Angiology. 2008;59:352-6.

Click here to go back to list of Recommendations

- Kakkos SK, Allaert FA. Efficacy of Ruscus extract, HMC and vitamin C, constituents of Cyclo 3 fort®, on improving individual venous symptoms and edema: a systematic review and meta-analysis of randomized double-blind placebo-controlled trials. Int Angiol 2017;36:93-106.
- Kakkos SK, Nicolaides AN. Efficacy of micronized purified flavonoid fraction (Daflon®) on improving individual symptoms, signs and quality of life in patients with chronic venous disease: a systematic review and meta-analysis of randomized double-blind placebo-controlled trials. Int Angiol 2018;37:143-54.
- Kalus U, Koscielny J, Grigorov A, Schaefer E, Peil H, Kiesewetter H. Improvement of Cutaneous Microcirculation and Oxygen Supply in Patients with Chronic Venous Insufficiency by Orally Administered Extract of Red Vine Leaves AS 195. A Randomised, Double-Blind, Placebo-Controlled, Crossover Study. Drugs R D 2004;5:63-71.
- Martinez-Zapata MJ, Moreno RM, Gich I, Urrutia G, Bonfill X, Chronic Venous Insufficiency Study G. A randomized, double-blind multicentre clinical trial comparing the efficacy of calcium dobesilate with placebo in the treatment of chronic venous disease. Eur J Vasc Endovasc Surg 2008;35:358-65.
- Pittler MH, Ernst E. Horse chestnut seed extract for chronic venous insufficiency. Cochrane Database Syst Rev 2012;11:CD003230.
- Rabe E, Jaeger KA, Bulitta M, Pannier F. Calcium dobesilate in patients suffering from chronic venous insufficiency: a double-blind, placebo-controlled, clinical trial. Phlebology 2011;26:162-8.
- Rabe E, Ballarini S, Lehr L, on behalf of the Doxium EDX09/01 Study Group. A randomized, double-blind, placebo-controlled, clinical study on the efficacy and safety of calcium dobesilate in the treatment of chronic venous insufficiency. Phlebology 2016;31:264-74.
- Rabe E, Stucker M, Esperester A, Schafer E, Ottillinger B. Efficacy and tolerability of a red-vine-leaf extract in patients suffering from chronic venous insufficiency--results of a double-blind placebo-controlled study. Eur J Vasc Endovasc Surg 2011;41:540-7.

Click here to go back to list of Recommendations

Recommendation 15	**Class**	**Level of evidence**			
For patients with superficial venous incompetence presenting with symptomatic varicose veins (CEAP clinical class $C2_S$), interventional treatment is recommended.	**I**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Michaels, 2006	RCT	246 patients with symptomatic uncomplicated VVs (C2-C3)	HLS *n* = 124	Conservative (life- style advice and ECS) *n* = 122	In the first 2 years after treatment there was a significant quality of life benefit for surgery of 0.083 (95% CI: 0.005 to 0.16) QALYs based on the SF-6D score and 0.13 (95% CI: 0.016 to 0.25) based on the EQ-5D score.

CEAP= Clinical Etiological Anatomical Pathophysiological (Classification); CI = confidence interval; OR = odds ratio; ECS = elastic compression stockings; EQ-5D = Euro Qol 5 Dimensions Questionnaire; QALYs = quality-adjusted life years; HLS = high ligation and stripping; RCT = randomised controlled trial; SF-6D = Short Form 6 Dimensions Questionnaire; VVs = varicose veins

Reference:

- Michaels JA, Brazier JE, Campbell WB, MacIntyre JB, Palfreyman SJ, Ratcliffe J. Randomized clinical trial comparing surgery with conservative treatment for uncomplicated varicose veins. Br J Surg 2006;93:175-81.

Click here to go back to list of Recommendations

Recommendation 20	**Class**	**Level of evidence**			
For patients with superficial venous incompetence treated under tumescent anaesthesia, buffered solutions should be considered to reduce peri-procedural pain.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Nandhra, 2018	RCT	97 patients undergoing EVTA with AP	Buffered tumescence *n* = 47	Non-buffered tumescence *n* = 50	Peri-procedural pain scores were significantly lower in the buffered tumescence group with a mean ± SD score of 2.86 ± 3.57 *vs.* 4.44 ± 2.94 (*p*=.001).

RCT = randomised controlled trial; OR = odds ratio; CI = confidence interval; EVTA = endovenous thermal ablation; AP= ambulatory phlebectomy; SD = standard deviation

Reference:

- Nandhra S, Wallace T, El-Sheikha J, Leung C, Carradice D, Chetter I. A Randomised Clinical Trial of Buffered Tumescent Local Anaesthesia During Endothermal Ablation for Superficial Venous Incompetence. Eur J Vasc Endovasc Surg 2018;56:699-708.

Click here to go back to list of Recommendations

Recommendation 22	**Class**	**Level of evidence**			
For patients with superficial venous incompetence undergoing ultrasound guided foam sclerotherapy or endovenous thermal ablation of a saphenous trunk, post-procedural compression treatment should be considered.	**IIa**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Bootun, 2019	RCT	206 patients undergoing EVTA with or without phlebectomy	ECS class 2, applied for 7 days *n* =101	no compression *n* = 105	The median pain score was significantly lower in the ECS group, on days 2-5. No significant difference was found between intervention and control groups when comparing the improvement in the median VCSS, generic- or disease-specific QoL, the time to return to activities, the degree of ecchymosis and occlusion rates.
Cavezzi, 2019	RCT	97 limbs in 94 patients undergoing CDFS with phlebectomy	ECS 35 mmHg, applied 24 hours for 7 days; subsequently ECS 21-23 mmHg in daytime; *n* = 49	ECS 23 mmHg, applied 24 hours for 7 days; subsequently ECS 21-23 mmHg in daytime; *n* = 48	Ambulation, ECS stability/tolerability and skin healing were significantly better in ECS 35 mmHg group, with *p*=.046, 0.021/0.060, and 0.010, respectively, at day 7. Pain and heaviness were significantly milder in ECS 35 mmHg group, at day 7 and 40.
Chou, 2019	Meta-analysis (5 RCTs)	775 patients undergoing EVTA of GSV	ECS for 1–2 weeks	ECS for 24–48 h	ECS for 1-2 weeks significantly reduced postoperative pain at 1 week (MD 1.19; 95% CI: 0.58–1.80) and recovery time off work (MD 1.01 days, 95% CI: 0.06–1.96) when compared with ECS for 24-48 h. The mean pain scores at 2 (0.1; 95% CI: 0–0.2) and 6 weeks postoperatively (−0.3; 95% CI: −1.09-0.49) did not differ significantly between the two groups. The incidence rates of complication, paresthesia, and phlebitis did not differ significantly between the groups.
Hamel-Desnos, 2010	RCT	60 patients undergoing UGFS	ECS 15-20 mmHg, applied for 3 weeks in daytime; *n* = 31	No compression; *n* = 29	No significant difference was found between intervention and control groups when comparing efficacy, side effects, satisfaction scores, symptoms and QoL.

Click here to go back to list of Recommendations

Onwudike, 2020	RCT	100 patients undergoing RFA	ECS 23-32 mm Hg day and night for 1 week then by day for another week *n* = 51	No compression *n* = 49	At 12-weeks: - target vein occlusion was 98% in each group (*p*=1.0) - no difference in mean AVVQ score (6 *vs.* 5, *p*= .57) - comparable pain scores (2.0 *vs.* 2.0, *p*= .92) and patient satisfaction scores (*p*= .72) - comparable rates of DVT (2/51 *vs.* 2/49)
Pihlaja, 2020	RCT	177 patients undergoing RFA with UGFS	ECS 23-32 mm Hg, applied 24 hours for 2 days and subsequently in daytime for 5 days; *n* = 90	No compression; *n* = 87	Within 14 days of treatment, full physical activity was achieved by 87% of the ESC group and 81% of the control group (*p*=.29). Pain scores were comparable between groups. Post-operative pain medication was used for 2.3 days and for 2.8 days in the intervention and control groups, respectively (*p*=.28). Complications throughout the six months follow up were comparable between groups, although skin rash/blisters occurred more often in the compression group (*p*=.01).

OR = odds ratio; CI = confidence interval; CDFS = catheter directed foam sclerotherapy; ECS = elastic compression stockings; EVTA = endovenous thermal ablation; GSV = great saphenous vein; MD = mean difference; QoL = quality of life; RCT = randomised controlled trial; RFA = radiofrequency ablation; UGFS = ultrasound guided foam sclerotherapy; VCSS = Venous Clinical Severity Score; AVVQ = Aberdeen varicose vein questionnaire; DVT = deep venous thrombosis

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- Chou JH, Chen SY, Chen YT, Hsieh CH, Huang TW, Tam KW. Optimal duration of compression stocking therapy following endovenous thermal ablation for great saphenous vein insufficiency: A meta-analysis. Int J Surg 2019;65:113-9.
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- Onwudike M, Abbas K, Thompson P, Mc Elvenny DM. The role of compression post radio-frequency ablation of varicose veins – A randomised controlled trial. Eur J Vasc Endovasc Surg 2020;60:108-17.
- Pihlaja T, Romsi P, Ohtonen P, Jounila J, Pokela M. Post-procedural Compression *vs* No Compression After Radiofrequency Ablation and Concomitant Foam Sclerotherapy of Varicose Veins: A Randomised Controlled Non-inferiority Trial. Eur J Vasc Endovasc Surg 2020;59:73-80

Click here to go back to list of Recommendations

Recommendation 23	**Class**	**Level of evidence**			
For patients with superficial venous incompetence undergoing stripping and/or extensive phlebectomies, immediate post-procedural compression treatment is recommended.	**I**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Bootun, 2021	RCT	206 patients undergoing EVTA with or without phlebectomy	ECS class 2, applied for 7 days *n* = 101	no compression *n* = 105	Those patients having concurrent phlebectomy and ECS had significantly better pain scores on days 1-3, day 5, and day 7.
Huang, 2013	Systematic review and meta-analysis (4 RCTs)	686 patients undergoing GSV stripping with phlebectomy	ECS for 3- 10 days	ECS for 3- 6 weeks	Non-significant differences were found in postoperative pain scores between the groups (MD -0.03; 95% CI: -0.53- 0.47) at 4 weeks, (MD -0.01; 95% CI: -0.31- 0.33) at 6 weeks, postoperatively. Non-significant differences were found in the incidence of postoperative complications (RR: 0.84, 95% CI: 0.60-1.18), and changes in leg volume between the groups, at 4 weeks postoperatively (*p*=.18).

OR = odds ratio; CI = confidence interval; ECS = elastic compression stockings; EVTA = endovenous thermal ablation; GSV = great saphenous vein; MD = mean difference; RCT = randomised controlled trial; RR = risk ratio

References

- Bootun R, Belramman A, Bolton-Saghdaoui L, Lane TRA, Riga C, Davies AH. Randomized Controlled Trial of Compression After Endovenous Thermal Ablation of Varicose Veins (COMETA Trial). Ann Surg 2021;273:232-9.
- Huang TW , Chen SL, Bai CH, Wu CH, Tam KW. The optimal duration of compression therapy following varicose vein surgery: a meta-analysis of randomized controlled trials. Eur J Vasc Endovasc Surg 2013;45:397-402.

Click here to go back to list of Recommendations

Recommendation 24	**Class**	**Level of evidence**			
For patients with superficial venous incompetence undergoing intervention, the duration of post-intervention compression, used to minimize post-operative local complications, should be decided on an individual basis.	**I**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Chou, 2019	Meta-analysis (5 RCTs)	775 patients undergoing EVTA of GSV	ESC for 1–2 weeks	ECS for 24–48 h	ECS for 1-2 weeks significantly reduced postoperative pain at 1 week (MD 1.19; 95% CI: 0.58–1.80) and recovery time off work (MD: 1.01 days, 95% CI: 0.06–1.96) when compared with ECS for 24-48 h. The mean pain scores at 2 (0.1; 95% CI: 0–0.2) and 6 weeks postoperatively (−0.3; 95% CI: −1.09-0.49) did not differ significantly between the two groups. The incidence rates of complication, paresthesia, and phlebitis did not differ significantly between the groups.
Huang, 2013	Systematic review and meta-analysis (4 RCTs)	686 patients undergoing GSV stripping with phlebectomy	ECS for 3-10 days	ECS for 3-6 weeks	Non-significant differences were found in postoperative pain scores between the groups (MD -0.03; 95% CI: -0.53- 0.47) at 4 weeks, (MD -0.01; 95% CI: -0.31- 0.33) at 6 weeks, postoperatively. Non-significant differences were found in the incidence of postoperative complications (RR: 0.84, 95% CI: 0.60-1.18), and changes in leg volume between the groups, at 4 weeks postoperatively (*p*=.18).

OR = odds ration; CI = confidence interval; ECS = elastic compression stockings; EVTA = endovenous thermal ablation; GSV = great saphenous vein; MD = mean difference; RCT = randomised controlled trial; RR = risk ratio

References

- Chou JH, Chen SY, Chen YT, Hsieh CH, Huang TW, Tam KW. Optimal duration of compression stocking therapy following endovenous thermal ablation for great saphenous vein insufficiency: A meta-analysis. Int J Surg 2019;65:113-9.
- Huang TW , Chen SL, Bai CH, Wu CH, Tam KW. The optimal duration of compression therapy following varicose vein surgery: a meta-analysis of randomized controlled trials. Eur J Vasc Endovasc Surg 2013;45:397-402

Click here to go back to list of Recommendations

Recommendation 26	**Class**	**Level of evidence**			
For patients with superficial venous incompetence undergoing intervention, individualised thromboprophylaxis strategies should be considered.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
San Norberto, 2013	RCT	262 patients undergoing high ligation and stripping of GSV or SSV with moderate risk for VTE	LMWH bemiparin 2500 IU 1x/d for 10 days *n* = 132	no VTE prophylaxis *n* = 130	There were no reported thrombotic events in either group. No significant differences were seen between groups in the rates of bleeding episodes. All patients undergoing VVs surgery should be assessed for VTE risk, but not all patients need pharmacologic thromboprophylaxis.
Wang, 2015	RCT	2196 patients undergoing high ligation and stripping of the GSV	Group B: LDUH 125 U/kg per day in three divided doses *n* = 531 Group C: LMWH 6000 IU once a day *n*= 573 Group D: LMWH 4000 IU twice daily *n* = 550	Group A: no VTE prophylaxis *n* = 542	Postoperative DVT and PE were significantly higher in group A (DVT 5.17%, PE 1.48%) compared to groups B (0.56%, 0%), C (0.35%, 0%) and D (0.36%, 0%) (p<.01). Haemorrhagic complications were low for each group but higher in group B (0.75%) compared to the other groups (group A 0.18%; group C 0.17%; group D 0.18%, p<.01).

OR = odds ration; CI = confidence interval; DVT = deep vein thrombosis; GSV = great saphenous vein; LMWH = low molecular weight heparin; IU = international units; LDUH = low-dose unfractionated heparin; PE = pulmonary embolism; RCT = randomised controlled trial; SSV = small saphenous vein; VTE = venous thromboembolism

References:

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Click here to go back to list of Recommendations

Recommendation 28	**Class**	**Level of evidence**			
For patients with great saphenous vein incompetence requiring treatment, endovenous thermal ablation is recommended as first choice treatment, in preference to high ligation/stripping and ultrasound guided foam sclerotherapy.	**I**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Brittenden, 2019	Multicenter RCT	798 patients with GSV incompetence 5-year follow up rate was 75%	EVLA *n* = 212	Surgery n = 294 UGFS *n* = 292	At 5 years, the complete success of GSV ablation was found in 64.0%, 33.3% and 75.9% after EVLA, UGFS, HLS, respectively. AVVQ scores were lower after EVLA or HLS than UGFS (EVLA vs UGFS: −2.86; 95% CI: −4.49 to −1.22; *p*<.001 and for HLS vs UGFS, −2.60; 95% CI, −3.99 to −1.22; *p*<.001). There were no differences between groups in SF-36 subscales or EQ-5D VAS scores. Cost-effectiveness favoured EVLA at a willingness-to-pay ratio of £20,000 ($28,433) per QALY.
Cao, 2019	Meta-analysis (11 RCTs)	1145 patients with GSV incompetence	EVLA *n* = 574	HLS *n* = 571	EVLA resulted in lower recurrence rate (3.1% vs 10%; OR: 0,.28 (95% CI: 0.16-0.49) *p*<.00001), lower intraoperative blood loss (RR= −6.31; 95%CI: −9.03 to−3.60; *p*<.00001), less operation time (OR= -39.76 (95% CI: -42.27 to -37.24) *p*<.00001) and less complication rate (12% vs 26%; OR= 0.37; 95% CI: 0.22-0.61; *p*<.00001) than HLS.
Hamann, 2017	Systematic review and meta-analysis (3 RCTs, 10 follow-up studies of RCTs)	1395 limbs with GSV incompetence	EVLA *n* = 611	HLS *n* = 549 UGFS *n* = 121 HL with EVLA *n* = 114	At 5 years, UGFS had significantly lower pooled anatomical success rates than HLS, EVLA, and EVLA with HL: 34% (95% CI: 26-44) vs 83% (95% CI: 72-90), 88% (95% CI 82-92), and 88% (95% CI: 17-100) respectively; *p*=.001. At 5 years, the pooled recurrent reflux rate at the SFJ was significantly lower for HLS than for UGFS (12%, 95% CI 7-20, vs 29%, 95% CI 21-38; *p*=.001) and EVLA (12%, 95% CI 7-20, vs 22%, 95% CI 14-32; *p*=.038). VCSS scores for EVLA and HLS, showed similar improvements
Kheirelseid, 2018	Systematic review and	2185 limbs with GSV incompetence	EVLA *n* = 785	HLS *n* = 787	At 5 years, when comparing EVLA with HLS, there was no significant difference in recurrence rate (36.6% *vs* 33.3%, respectively; pooled RR= 1.35 [95% CI: 0.76-2.37]; *p*=.3) and re-operations (pooled RR= 1.42 [95% CI, 0.80-2.51]; *p*=.23).

Click here to go back to list of Recommendations

	meta-analysis	5-year follow up rate was 61.9%		RFA *n* = 147 UGFS *n* = 225 EVLA with HL *n* = 214	Significantly higher recanalization rate of SFJ reflux was found after EVLA (26.9% *vs* 14.7%; pooled RR= 2.28 [95% CI, 1.20-4.30]; *p*=.01) and neovascularization after HLS (15.7% *vs* 4.9%; RR= 0.24 [95% CI, 0.07-0.82]; *p*=.02) At 5 years, recurrence rate was lower after RFA than UGFS (RR= 6.35 [95% CI, 2.60-15.54]; *p*<.0001), but with no difference when compared with HLS (RR= 0.60 [95% CI, 0.24-1.49]; *p*=.27) and EVLA (RR= 2.08 [95% CI, 0.84-5.16]; *p*=.11) No significant difference detected in neovascularization between RFA and HLS (RR= 38 [95% CI, 0.12-1.19]; *p*=.10), EVLA (RR= 2.24 [95% CI, 0.69-7.30]; *p*=.18), RFA and UGFS (RR= 0.29 [95% CI, 0.03-2.60]; *p*=.27) Reintervention rate was lower with RFA compared with UGFS (RR= 110.89 [95% CI, 14.25-863.28]; *p*<.0001) but with no significant difference with HLS (RR= 0.51 [95% CI, 0.24-1.07]; *p*=.08) and EVLA (risk ratio, 1.44 [95% CI, 0.67-3.12]; *p*=.35). UGFS was associated with higher recurrence rate compared with EVLA (68.6% *vs* 24.4%; RR= 6.08 [95% CI, 1.62-22.82]; *p*=.007) and HLS (18.1% *vs* 68.6%; RR= 8.88 [95% CI, 1.67-47.14]; *p*<.01)
Rasmussen, 2013	RCT	578 limbs with GSV incompetence 1-, 2, 3-year follow-up was 84%, 63%, 47%, respectively	UGFS *n* = 144	RFA *n* = 148 EVLA *n* = 144 HLS *n* = 142	At 3 years, procedure failure (open vein and reflux of 10 cm of vein) was found in 6.5%, 7%, 6.8% and 26.4% after HLS, RFA, EVLA and UGFS (*p*<.0001), respectively. At 3-years, the recurrence rate was 20.2%, 14.9%, 20%, 19.1% after HLS, RFA, EVLA, and UGFS (*p*<.66), respectively. The reoperation rate was 15.5%, 11.1%, 12.5% and 31.6% after HLS, RFA, EVLA, and UGFS (*p*<.001), respectively. VCSS improved significantly in all groups (*p*<.0001), with no difference between groups and lasted throughout the 3 years. AVVQ improved significantly in all groups (*p*<.0001), with no difference between groups, but deteriorated over 3 years. SF-36 improved significantly in all groups in the domains: physical functioning and mental component
Siribumrungwong, 2012	Systematic review and meta-analysis (28 RCTs)	3442 patients with GSV incompetence	EVLA: 810 nm and 980 nm *n* = 1008	RFA: VNUS Closure & VNUS Closure FAST *n* = 685	There were no significant difference between EVTA (EVLA and RFA) *vs* HLS in primary failure (RR= 1.5 (95% CI:0.7,- 3.0) *vs.* 1.3 (95% CI:0.7,- 2.4), respectively) and in clinical recurrences (RR=0.6 (95% CI:0.3, -1.1) *vs* 0.9 (95% CI:0.6, -1.4), respectively). UGFS had 2-fold higher risk of failure than HLS.

Click here to go back to list of Recommendations

				HLS *n* = 1343 UGFS *n* = 406	EVTA resulted in lowering wound infections (RR=0.3 (95% CI: 0.1,- 0.8) for EVLA), haematoma (RR=0.5 (95% CI: 0.3,- 0.8) for EVLA and 0.4 (95% CI: 0.1, -0.8) for RFA), faster return to normal activities or work (MD of 4.9 days (95% CI: 7.1,-2.7) for RFA) and lower post-operative pain (MD of 0.6 (95% CI:1.1,-0.2) for EVTA and 1.6 (95% CI:2.1,-1.1) for HLS) than HLS.

AVVQ = Aberdeen Varicose Vein Questionnaire; OR = odds ratio; CI = confidence interval; EQ-5D = Euro Qol 5 dimensions questionnaire; EVLA = endovenous laser ablation; EVTA = endovenous thermal ablation; GSV = great saphenous vein; HL = high ligation; HLS = high ligation and stripping; MD = mean difference; QALY = quality-adjusted-life-year; RCT= randomised controlled trial; RFA = radiofrequency ablation; RR = risk ratio; SF-36 = short form 36; SFJ = saphenofemoral junction; UGFS = ultrasound guided foam sclerotherapy; VCSS = venous clinical severity score

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Click here to go back to list of Recommendations

Recommendation 29	**Class**	**Level of evidence**			
For patients with saphenous trunk incompetence undergoing thermal ablation, the selection of the device should be left at the discretion of the treating physician.	**I**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Malskat, 2019	Systematic review and meta-analysis	28 RCTs with > 3 months FU and DUS evaluation	EVLA of the GSV *n* = 2829 - Pooled proportions of anatomical success were compared. - Subgroup and meta- regression analysis	Other GSV treatment (HLS, UGFS etc.)	The overall success rate of EVLA was 92% (95% CI 90-94%, I^2 ¼ 68%). Subgroups included wavelengths (short [810, 940, and 980 nm], long [1470, 1500, and 1920 nm]), amount of energy (50 J/cm, >50 J/cm), follow up (≤1 year, >1 year), outcome definition (occlusion, no reflux), and quality of the studies (low risk of bias, unclear/high risk of bias). These commonly used parameters of EVLA have no influence on the treatment success rate.

OR = odds ration; CI = confidence interval; RCT= randomised controlled trial; FU = follow-up; DUS = duplex ultrasound; EVLA = endovenous laser ablation; GSV = great saphenous vein; HLS = high ligation and stripping; UGFS = ultrasound guided foam sclerotherapy

Reference

- Malskat WSJ, Engels LK, Hollestein LM, Nijsten T, van den Bos RR. Commonly used endovenous laser ablation (EVLA) parameters do not influence efficacy: Results of a systematic review and meta-Analysis. Eur J Vasc Endovasc Surg 2019;58:230-42.

Click here to go back to list of Recommendations

Recommendation 30	**Class**	**Level of evidence**			
For patients with great saphenous vein incompetence requiring treatment, cyanoacrylate adhesive closure should be considered when a non-thermal non-tumescent technique is preferred.	**IIa**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Çalık, 2019	RCT	412 limbs in 400 patients with GSV incompetence	CAC *n* = 208	EVLA 1470 nm *n* = 204	3-, 6- and 12-month occlusion rates were 98.6%, 97.1% and 96.6% for CAC group and 97.4%, 95.6%, and 94.1% for EVLA, respectively, with no significant difference between groups; Operative time was 13+-3.4 min during CAC and 31.7+-8.8 min during EVLA (p<0.001); Procedural pain score, induration, ecchymosis and paresthesia were significantly less often after CAC *vs* EVLA (p<.001); CAC group had significantly faster recovery and early return to daily activities (p<0.001). There were no significant differences between CAC and EVLA in VCSS, CIVIQ improvement and the need for additional adjunctive therapies for each follow-up.
Eroglu, 2018	RCT	525 patients with GSV or SSV incompetence	CAC *n* = 175	EVLA 1470 nm *n* = 175 RFA *n* = 175	6- month, 1-, 2-year occlusion rates were 98.1%, 94.7%, and 92.6%, respectively, in the CAC group, 94.1%, 92.5%, and 90.9% in the RFA group, and 95.1%, 94.2%, and 91.5% in the EVLA group, with no significant difference between groups. Peri-procedural pain was significantly lower after CAC than after EVLA and RFA (p<.001), but there was no difference in post-operative pain. Time to return to work was shortest after CAC *vs* RFA and EVLA (1.04 days, 1.56 days and 1.31 days; p<.001). Complication rates (DVT, bleeding, and phlebitis) were similar in all groups. VCSS decreased significantly in all groups (p<.001) but were significantly lower after CAC *vs* RFA and EVLA at 6 months and 2 years (p<.001).

Click here to go back to list of Recommendations

García-Carpintero, 2020	Systematic review and meta- analysis 12 studies; 2 RCT 1 non- RCT 9 case series (3 included in meta-analysis)	1057 patients with GSV or SSV incompetence	CAC	RFA EVLA	12-month occlusion rates were 97.2% and 94.7% for CAC *vs* 97% and 92.5% for RFA *vs* 92.2% and 94.2% for EVLA, with no significant difference between groups. there were no significant differences between groups in occlusion rates at 24-month follow-up. CAC groups had a lower probability of ecchymosis events than RFA group (RR= 0.46; I^2= 71%). There was no significant difference in phlebitis events. There was no significant difference in ecchymosis and phlebitis events between CAC and EVLA. CAC group had significantly lower pain during the intervention and significantly shorter treatment time and recovery time than RFA and EVLA groups.
Gibson, 2020	Retrospective/ prospective study	379 limbs in 286 patients with GSV, SSV, AASV, PASV, PV incompetence 3-month follow-up rate was 94%	CAC *n* = 379	No control group	Hypersensitivity reactions occurred in 18 patients (5.8% treatments, 6.3% patients); 13 were mild (4.2%), 4 were moderate (1.3%), and 1 was severe (0.3%). Duration of symptoms ranged from 3 to 28 days (mean 10.8 CI 4.9 days).
Morrison, 2020	Multicenter RCT	222 patients with GSV incompetence 1-, 2-, 3-, 5-year follow-up rates were: 86.5%, 77%, 67%, 40% respectively	CAC *n* = 108	RFA *n* = 114	1-,3-, 6-, 12-, 24-, 36-, 60- month occlusion rates were 100%, 99%, 99%, 96.8%, 95.3%, 94.4%, 91.4% after CAC and 86%, 95.4%, 96.2%, 95.9%, 94.0%, 91.9%, 85.2% after RFA, respectively, with no significant difference between groups. Time to complete occlusion was lower after CAC *vs* RFA. Freedom from recanalization with CAC was noninferior (p<.0001) and trends toward superiority (p=.08) compared with RFA. 41.1% of returning CAC patients and 39.4% of returning RFA patients were at least two CEAP clinical classes lower than at baseline Pain during the procedure was mild and similar between treatment groups (2.2 *vs* 2.4 for CAC *vs* RFA, on a 10-point scale; p=.11). Ecchymosis at day 3 was absent in significantly more subjects after CAC *vs* RFA (68% *vs* 48%; p< .01). Adverse events occurred at a similar rate between groups and were generally mild and well tolerated.

Click here to go back to list of Recommendations

					There were no significant differences between CAC and RFA in VCSS, AVVQ, EQ-5D and CEAP improvement and patient satisfaction. 84.7% of CAC group and 78.4% of RFA group were “very satisfied” with the treatment.
Vos, 2017	Systematic review and meta- analysis 8 studies: 7 prospective cohorts, 1 RCT	1016 limbs in 954 patients with GSV incompetence	CAC	No control group or RFA	6- month occlusion rate ranged from 89.5% to 99.1%, the pooled anatomic success was 94.8% (95% CI: 92.0%-97.6%). 12- months occlusion rate ranged from 78.9% to 95.5% in five studies. The pooled anatomic success of four studies was 89.0% (95% CI: 84.2-93.9%). VCSS and AVVQ significantly improved after treatment compared with baseline values. Reported complications: thrombophlebitis (0.5%-18%), hyperpigmentation (1.6%-3%), deep venous thrombosis (0%-3.5%), access site infection or cellulitis (1.4%-3%) and ecchymosis or hematoma (1.4%-1.6%), nerve injury or paraesthesia (0%-2%).

OR = odds ration; CI = confidence interval; AASV = anterior accessory saphenous vein; CAC = cyanoacrylate adhesive closure; RFA = radiofrequency ablation; CIVIQ = chronic lower limb venous insufficiency questionnaire; DVT = deep vein thrombosis; EQ-5D = Euro Qol 5 dimensions questionnaire; AVVQ = Aberdeen Varicose Vein Questionnaire; CEAP = Clinical Etiological Anatomical Pathophysiological (Classification); EVLA = endovenous laser ablation; GSV = great saphenous vein; PV = perforating vein; RCT = randomised controlled trial; SSV = small saphenous vein; VCSS = Venous Clinical Severity Score; PASV = posterior accessory saphenous vein

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Click here to go back to list of Recommendations

Recommendation 31	**Class**	**Level of evidence**			
For patients with saphenous trunk incompetence requiring treatment, ultrasound guided foam sclerotherapy may be considered for treating saphenous trunks with a diameter less than 6 mm.	**IIb**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Myers, 2007	Prospective cohort study	807 venous saphenous veins and related tributaries or non-saphenous tributaries *n* = 489 patients.	UGFS of trunks and tributaries (1189 treatment sessions)	-	Primary and secondary success rates at 36 months for all veins were 52.4% (95%CI 46-58%) and 76.8% (95%CI 71-82%). Cox regression for all saphenous veins showed independently worse results for patients less than 40 years age (HR 2.16 - 95%CI 1.27-3.66), small compared to great saphenous veins (HR 1.58 - 95%CI 1.11-2.24), veins greater than 6 mm diameter compared to smaller veins (HR 2.22 - 95%CI 1.40-3.50),
Shadid, 2015	Prospective study (post-hoc analysis of RCT)	225 patients with GSV incompetence	UGFS *n* = 225	No	The risk of recurrent reflux was significantly associated with the mid-thigh GSV diameter (HR.1.012; 95% CI: 1.002–1.022, *p*=.022) and the presence of distal GSV reflux (HR.1.882 with 95% CI: 1.029–3.443, *p*=.040). 2-year cumulative probability of recurrent reflux in case of mid-thigh GSV diameter of > 6mm *vs* < 6mm was 62.6% (51.2%–74.2%) *vs* 42% (34.6%–50.4%), respectively. In the presence of two risk factors (reflux in distal GSV and GSV diameter > 6 mm), 2-year cumulative probability of GSV reflux recurrence after one session was 63.9% (95% CI: 51.9%–75.8%). In only one risk factor, the probability was 46.5% (95% CI:38.2%–55.8%). When both risk factors were absent, the observed probability was 27.0% (95% CI:15.4%–45.5%).
Venermo, 2016	RCT	214 patients with GSV incompetence	UGFS *n* = 76	EVLA *n* = 73 HLS *n* = 65	At 1-year, complete occlusion rate was 97%, 97%, 51% after EVLA, HLS and UGFS, respectively (*p*<.001); Reintervention rate was 1%, 7%, 15% after EVLA, HLS, UGFS, respectively (*p*<.009) UGFS occlusion rate was associated with vein diameter and was 75% for GSV< 6mm and <40% for GSV> 9mm

Click here to go back to list of Recommendations

		1-year follow-up rate was 96.3%			Perioperative pain was significantly reduced and sick leave shorter after UGFS (mean 1 day) than after EVLA (8 days) and surgery (12 days). Median AVVQ significantly improved in all groups, without significant differences between groups.

AVVQ = Aberdeen Varicose Vein Questionnaire; CI = confidence interval; EVLA = endovenous laser ablation; GSV = great saphenous vein; HLS = high ligation and stripping; HR = hazard ratio; OR = odds ratio; RCT = randomised controlled trial; UGFS = ultrasound guided foam sclerotherapy;

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Click here to go back to list of Recommendations

Recommendation 33	**Class**	**Level of evidence**			
For patients with great saphenous vein incompetence requiring treatment, catheter directed foam sclerotherapy with or without the use of peri-venous tumescent solution may be considered.	**IIb**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Lim, 2020	Systematic review and meta-analysis	3689 patients with GSV incompetence	CDFS *n* = 789	UGFS *n* = 2900	At 6 months, the complete occlusion rate after CDFS *vs* UGFS was 94.6% *vs* 82.6% (*p*<.001). At 12 months, the complete occlusion rate after CDFS *vs* UGFS was 82.5% *vs* 80.4% (*p*>.05). At 36 months, the complete occlusion rate after CDFS *vs* UGFS was 82.4% *vs* 62.9% (*p*<.001). Complications were significantly higher after UGFS than CDFS: major complications (0.97% *vs* 0.23%; *p*< .05), hyperpigmentation (15.2% *vs* 9.92%; *p*< .001), thrombophlebitis (13.7% *vs* 5.93%, *p*<.001). The post-operative pain significantly higher after UGFS than CDFS: 19.9% *vs* 15.5% (*p*<.05).
Dos Santos, 2020	RCT	50 patients with GSV incompetence (diameter >6mm, <10mm)	CDFS *n* = 25	UGFS *n* = 25	At 1 month, the complete occlusion rate after CDFS *vs* UGFS was 80% *vs* 36% (*p*=.012). The retreatment rate after CDFS *vs* UGFS was 12% *vs* 56% (*p*=.002). At 12 months, complete occlusion rate after CDFS *vs* UGFS was 79.2% *vs* 75% (*p*=.383); patients of both groups needed retreatment session at 6-month follow-up. Complication rates were similar between the groups. QoL improved in both groups with statistical difference between preop and after 1 year (*p*<.001).

OR = odds ration; CI = confidence interval; CDFS = catheter directed foam sclerotherapy; GSV = great saphenous vein; RCT = randomised controlled trial; UGFS = ultrasound guided foam sclerotherapy

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Click here to go back to list of Recommendations

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Click here to go back to list of Recommendations

Recommendation 34	**Class**	**Level of evidence**			
For patients with great saphenous vein incompetence requiring treatment, mechanochemical ablation may be considered when a non-thermal non-tumescent technique is preferred.	**IIb**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Holewijn, 2019	Multicenter RCT	209 patients with GSV incompetence (diameter >3mm, <12 mm) 30-day, 1-, 2-year follow up rates for MOCA were: 97.2%, 86.8%, 72.4%, for RFA were 100%, 88.7%, 78.6%, respectively	MOCA *n* = 105	RFA *n* = 104	Anatomic success rate after MOCA *vs* RFA were 80.0% *vs* 83.5% (*p*=.025), at 1-year and 88.3% *vs* 94.2% (*p*=.066), at 2-year. Clinical success rates after MOCA *vs* RFA were 88.7% *vs* 93.2% (*p*=.315), at 1 year and 90.4% *vs* 93.0% (*p*=.699), at 2 years. Complete failures after MOCA *vs* RFA were 3.8% *vs* 0% (*p*=.045) Median pain scores during the first 14 days were lower after MOCA (0.2 *vs* 0.5; *p*=.010). There was no significant difference in complication rate at 30 days, beside hyperpigmentation which were reported significantly more often after MOCA (7 *vs.* 2, *p*=.038). Median 30-day VCSS was significantly lower after MOCA (1.0 *vs.* 2.0; *p*<.001). No differences were observed between groups in total AVVQ scores at 1- and 2-year follow-up.
Mohamed, 2021	RCT	150 patients with GSV or SSV incompetence 1-year follow-up rate was 92%	MOCA *n* = 75	EVLA *n* = 75	1-year complete occlusion rate was significantly higher after EVLA than after MOCA (91% *vs.* 77%; *p*=.020) There was no significant difference between EVLA and MOCA in median pain during the procedure (22 [9 – 44] *vs.* 15 [9 – 29]; *p*=.210), AVVQ, EQ-5D and VCSS improvement, median time to work in days (*p*=.725), median time to normal activity (*p*= .127), median satisfaction with the overall outcome (100 [90 – 100] *vs.* 97 [91 – 100]; *p*=.385), median cosmetic satisfaction (98 [90– 100] *vs.* 91 [87–100]; *p*=.084) There was no significant difference between EVLA and MOCA in minor complications: phlebitis (7% *vs.* 13%, *p*=.262), hyperpigmentation (6% *vs.* 13%, *p*=.139). There was 1 DVT in MOCA group.

Click here to go back to list of Recommendations

Vähäaho, 2021	RCT	125 patients with GSV incompetence 1- and 3- year follow-up rates were 93.6% and 84.8%	MOCA *n* = 59	EVLA *n* = 34 RFA *n* = 32	1- year occlusion rates were 82%, 100%, 100% after MOCA, EVLA, RFA, respectively (*p*=.009). 3- year occlusion rates were 80%, 100%, 100% after MOCA, EVLA, RFA, respectively (*p*=.002). There was a strong association between recanalization at 3- years and the preoperative diameter of the thigh GSV (OR 2.15, 95% CI 1.15-4.00, *p*= .016). The occlusion rates for preoperative GSV diameter of 6 mm, 7mm and 8 mm were 100%, 87.5% and 75%, respectively. There was no significant difference between MOCA and EVTA in sick leave duration (*p*=.841) and AVVQ scores improvement (*p*=.901) and VCSS improvement at 1- and 3- year follow-up
Vos, 2017	Systematic review and meta-analysis (7 studies: 6 prospective cohorts, 1 RCT)	735 limbs in 691 patients with GSV incompetence	MOCA	No control group or RFA	6-month complete occlusion rate ranged from 87.1 % to 98.1%, the pooled anatomic success 94.7% (95% CI, 93.3%-98%) 12- month complete occlusion rates ranged from 87.7% to 95.2%. The overall anatomic success was 94.1% (95% CI, 91.5-96.8%). 2-year anatomic success ranged from 89.5% to 95.0%, and at 3-year follow-up, 86.5% (one study). VCSSs and AVVQ significantly improved after treatment compared with baseline values. Reported complications: induration (12%-18%), thrombophlebitis (2%-13%), and ecchymosis (8%-10%) or hematoma (1%- 11%), DVT (0%-1%), hyperpigmentation (5%). No nerve injuries, skin injuries, or infections were reported.

OR = odds ration; CI = confidence interval; AVVQ = Aberdeen Varicose Vein Questionnaire; DVT = deep vein thrombosis; EQ-5D = Euro Qol 5 Dimensions Questionnaire; EVLA = endovenous laser ablation; GSV = great saphenous vein; MOCA = mechanochemical ablation; RFA = radiofrequency ablation; RCT = randomised controlled trial; SSV = small saphenous vein; VCSS = Venous Clinical Severity Score

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Click here to go back to list of Recommendations

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Click here to go back to list of Recommendations

Recommendation 35	**Class**	**Level of evidence**			
For patients with great saphenous vein incompetence requiring treatment, high ligation/stripping should be considered, if endovenous thermal ablation options are not available.	**IIa**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Hamann, 2017	Systematic review and meta-analysis (3 RCTs, 10 follow-up studies of RCTs)	1395 limbs with GSV incompetence	HLS *n* = 549	EVLA *n* = 611 UGFS *n* = 121 HL with EVLA *n* = 114	At 5 years, UGFS had significantly lower pooled anatomical success rates than HLS, EVLA, and EVLA with HL: 34% (95% CI: 26-44) *vs* 83% (95% CI: 72-90), 88% (95% CI 82-92), and 88% (95% CI: 17-100) respectively; *p*=.001. At 5 years, the pooled recurrent reflux rate at the SFJ was significantly lower for HLS than for UGFS (12%, 95% CI 7-20, *vs* 29%, 95% CI 21-38; *p*= .001) and EVLA (12%, 95% CI 7-20, *vs.* 22%, 95% CI 14-32; *p*=.038). VCSS scores for EVLA and HLS, showed similar improvement.
Kheirelseid, 2018	Systematic review and meta-analysis	2185 limbs with GSV incompetence 5-year follow up rate was: 61.9%	HLS *n* = 787	EVLA *n* = 785 RFA *n* = 147 UGFS *n* = 225 EVLA with HL *n* = 214	At 5 years, when comparing EVLA with HLS, there was no significant difference in recurrence rate (36.6% *vs.* 33.3%, respectively; pooled RR= 1.35 [95% CI: 0.76-2.37]; *p*=.3) and re-operations (pooled RR= 1.42 [95% CI, 0.80-2.51]; *p*=.23). Significantly higher recanalization rate of SFJ reflux was found after EVLA (26.9% *vs.* 14.7%; pooled RR= 2.28 [95% CI, 1.20-4.30]; *p*=.01) and neovascularization after HLS (15.7% *vs.* 4.9%; RR= 0.24 [95% CI, 0.07-0.82]; *p*=.02) At 5 years, recurrence rate was lower after RFA than UGFS (RR= 6.35 [95% CI, 2.60-15.54]; *p*<.0001), but with no difference when compared with HLS (RR= 0.60 [95% CI, 0.24-1.49]; *p*=.27) and EVLA (RR= 2.08 [95% CI, 0.84-5.16]; *p*=.11) No significant difference detected in neovascularization comparing RFA with HLS (RR= 38 [95% CI, 0.12-1.19]; *p*=.10), EVLA (RR= 2.24 [95% CI, 0.69-7.30]; *p*=.18), and UGFS (RR= 0.29 [95% CI, 0.03-2.60]; *p*=.27). Reintervention rate was lower with RFA compared with UGFS (RR= 110.89 [95% CI, 14.25-863.28]; *p*<.0001) but with no significant difference with HLS (RR= 0.51 [95% CI, 0.24-1.07]; *p*=.08) and EVLA (risk ratio, 1.44 [95% CI, 0.67-3.12]; *p*=.35).

Click here to go back to list of Recommendations

O'Donnell, 2016	Meta-analysis 8 RCTs	1266 patients with GSV incompetence	HLS *n* = 580	EVLA *n* = 558 RFA *n* = 128	No difference in the incidence of recurrent VVs for EVTA *vs* HLS (22% *vs.* 22%, *p*=ns), but the causes of recurrence are different with HLS. Recanalization for HLS was significantly less common (1.5%) than for the other procedures (RFA, 8.9%; EVLA, 6.5%; *p*=.037). Neovascularization was least common for EVLA (0.2%), followed by HLS (2.3%) and RFA (5.0%; *p*= .056 across the three techniques). Incompetent calf perforating veins were an infrequent cause of recurrent VVs (7%; 8 of 125).

OR = odds ration; CI = confidence interval; EVLA = endovenous laser ablation; EVTA = endovenous thermal ablation; GSV = great saphenous vein; HL = high ligation; HLS = high ligation and stripping; RCT = randomised controlled trial; RFA = radiofrequency ablation; RR = risk ratio; SFJ = saphenofemoral junction; UGFS = ultrasound guided foam sclerotherapy; VCSS = Venous Clinical Severity Score; VVs = varicose veins

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Click here to go back to list of Recommendations

Recommendation 36	**Class**	**Level of evidence**			
For patients with chronic venous disease requiring treatment of varicose tributaries, ambulatory phlebectomy, ultrasound guided foam sclerotherapy or a combination of both are recommended.	**I**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
De Roos, 2003	RCT	98 limbs with AASV incompetence	liquid sclerotherapy *n* = 49	AP *n* = 49	1- year recurrence rate after AP *vs* liquid sclerotherapy was 2.1% *vs* 25% ($p < .001$). 2- year recurrence rate after AP *vs* liquid sclerotherapy was 2.1% *vs* 37.5% ($p < .001$). There were significantly more blisters, telangiectatic matting, scar formation, and bruising after AP than liquid sclerotherapy.
Michaels, 2006	RCT	357 patients divided into three groups: Group I- 34 patients with minor VVs with no reflux Group II- 77 patients with moderate VVs with reflux Group III- 246 patients with severe VVs with reflux	Group I: sclerotherapy *n* = 16 Group II: sclerotherapy *n* = 41 Group III: Conservative *n* = 122	Group I: Conservative *n* = 18 Group II: Surgery *n* = 36 Group III: surgery *n* = 124	In group I, 84.6% after sclerotherapy had no cosmetic concerns or considered cosmetic improvement, compared with 14.3% after conservative treatment ($p<.05$). Sclerotherapy resulted in significantly better results for aching ($p < .05$). In group II, 76% after surgery had no visible varicosities at 1-year, compared with 39% following sclerotherapy ($p<.05$). There were no significant differences between groups in symptoms improvement and patient satisfaction at the 1-year. In group III, the surgical treatment showed significantly better results for symptoms ($p<.05$), anatomical extent, QoL ($p<.05$) and patient satisfaction ($p<.05$) at 1-year follow-up than conservative treatment.

Click here to go back to list of Recommendations

Vasquez, 2017	Multicenter RCT 3 phase study	117 patients with GSV incompetence and visible VVs	EVTA with sclerotherapy *n* = 79	EVTA with placebo *n* = 38	Physician-rated vein appearance at week 8 was significantly better after EVTA with sclerotherapy *vs* placebo (*p*<.001); patient-assessed appearance trended similarly. Significantly more patients achieved improvement after EVTA with sclerotherapy than with placebo on the 'Independent Photography Review – Visible VVs' instrument (Week 8: 83.5% *vs.* 57.9%, *p*<.004; Month 6: 70.9% *vs.* 42.1%, *p*<.001) and the 'patient self-assessment of visible VVs' score (Week 8: 72.2% *vs.* 55.3%, *p*<.06; Month 6: 67% *vs* 50%, *p*<.034). The number of patients who received additional treatment for residual varicosities between week 8 and month 6 was significantly lower after EVTA with sclerotherapy than with placebo (13.9% *vs.* 23.7%, *p*=.037) Elimination of reflux through the SFJ was achieved 78.9% of patient after EVTA with placebo and 87.3% of patient after EVTA with sclerotherapy.
Zhang, 2012	RCT	96 patients with medium-sized and/ or large non-saphenous VV*s* of > 5 mm	Liquid sclerotherapy *n* = 72	Placebo *n* = 24	Patient satisfaction was significantly higher with liquid sclerotherapy than with placebo (*p*<.001). 82.8% of investigators and 85.9 % of patients were satisfied or very satisfied with the treatment at 12-week follow- up.

OR = odds ration; CI = confidence interval; AASV = anterior accessory saphenous vein; AP= ambulatory phlebectomy; EVTA = endovenous thermal ablation; GSV = great saphenous vein; QoL = quality of life; RCT = randomised controlled trial; SSV = small saphenous vein; PV = perforating vein; UGFS = ultrasound guided foam sclerotherapy; VVs = varicose veins

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Click here to go back to list of Recommendations

Recommendation 37	**Class**	**Level of evidence**			
For patients with chronic venous disease requiring treatment of incompetent perforating veins, endovenous ablation, division or ligation should be considered.	**IIa**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Abdul-Haqq, 2013	Retrospective study	108 limbs in 95 patients with VLU	EVLA of GSV and perforators *n* = 17	EVLA of GSV only *n* = 91	Ulcer healing was accomplished to a significantly greater degree using EVLA of the GSV and PV compared to GSV ablation alone (71% *vs.* 33%, *p*=.011)
Gibson, 2020	multicenter, prospective study	83 Patients with PV incompetence and advanced skin changes or VLU	EVLA of PV only *n* = 83	None	Successful primary occlusion rates of PVs were 76.96%, 75.7%, 70.3%, 62.1%, 68.8% and 71.3% at 10 days, 1-, 3-, 6-, 9- and 12-months, respectively. Significant improvements (*p*<.05) were seen in patients' QoL at 1-, 3-, 6-, 9- and 12-months.
Kiguchi, 2014	Retrospective study	62 patients with VLU and PV incompetence	UGFS *n* = 62	None	Complete occlusion of all incompetent PVs in an ulcerated limb was the only predictor of ulcer healing. Complete occlusion of all incompetent PV was found in 92% of healed VLU *vs* 68% of non-healed VLU (*p*=.02).
Van Gent, 2015	Subgroup analysis of RCT	94 patients with VLU and PV incompetence	SEPS with HL or HLS of GSV/SSV *n* = 94	None	Complete SEPS procedure with superficial venous surgery significantly lowered the VLU recurrence rate (*p*=.007)

OR = odds ration; CI = confidence interval; EVLA = endovenous laser ablation; GSV = great saphenous vein; HL = high ligation; HLS = high ligation and stripping; PV = perforating vein; QoL = quality of life; RCT = randomised controlled trial; SEPS = subfascial endoscopic perforator surgery; SSV = small saphenous vein; VLU = venous leg ulcer or ulceration

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Click here to go back to list of Recommendations

Recommendation 38	**Class**	**Level of evidence**			
For patients presenting with reticular veins and/or telangiectasias, duplex ultrasound of lower extremity veins should be performed before treatment, to look for associated incompetent veins.	**I**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Ruckley, 2012	Cross-sectional population study	Population screening (an age stratified random sample of 1566 people (699 men and 867 women) aged 16-64)	Clinical examination, photography and DUS of the superficial veins and the deep veins	None	A total of 1411 (90.1%) subjects were classified as having telangiectasia. Advancing grade (2 and 3) of telangiectasia were associated with a statistically significant trend for increasing incompetence in the superficial veins (p=.006) and either the superficial or deep veins (p<.001).

OR = odds ration; CI = confidence interval; DUS = duplex ultrasound

Reference:

- Ruckley CV, Allan PL, Evans CJ, Lee AJ, Fowkes FGR. Telangiectasia and venous reflux in the Edinburgh Vein Study Phlebology 2012;27:297-302

Click here to go back to list of Recommendations

Recommendation 40	**Class**	**Level of evidence**			
For patients with reticular veins, where treatment is planned, sclerotherapy is recommended, as the first choice treatment.	**I**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Bertanha, 2017	Triple- blind RCT	106 patients with reticular veins	LS with 0.2% POL and 70% HG *n* = 51	LS with 75% HG *n* = 55	LS with 0.2% POL and 70% HG was significantly more effective than 75% HG alone in eliminating reticular veins from the treatment area (95.17% *vs.* 85.40%; *p*<.001).
Hamel-Desnos, 2009	Systematic review (1 RCT 1 prospective Study)	116 patients with reticular veins and telangiectasias	FS *n* = 61	LS *n* = 55	There is no conclusive evidence to support the superiority of efficacy of one form over the other. In one trial, the satisfaction score was in favour of FS *vs* LS (80% *vs.* 60%) for both patients and experts. In the other, there was no significant difference between FS *vs.* LS in median patient satisfaction scores (60.2% *vs.* 59.3%) and in the expert reading score (5.71–6.24 *vs.* 5.26–5.67). Local side-effects (pigmentation, microthrombi, matting) seem to be more common with FS than with LS.
Ianosi, 2019	RCT	488 limbs in 244 patients with reticular veins and telangiectasias	Sclerotherapy with POL *n* = 169 Sclerotherapy with HS *n* = 154	Nd:Yag 1064 nm *n* = 165	good and very good results were found in 88.47%, 68.63% and 63.63% after Nd:Yag, POL and HS, respectively. For < 1 mm veins, good and very good results occurred significantly more often after Nd:Yag *vs* HS (95.05% *vs.* 59.08%, RR=9.72, *p*<.001) and after Nd:Yag *vs* POL (95.05% *vs.* 52.8%, *p*< .001). Nd:Yag treatment is clearly superior to POL and HS. For > 1 mm veins, good and very good results occurred significantly more often after Nd:Yag and POL *vs* HS (82.14% , 86.25% *vs.* 67.03%, respectively, RR=2.70, *p*=.003). The superiority of POL *vs* Nd:Yag in terms of achieving good treatment results could not be demonstrated. Both types of treatments were well superior to HS treatment
Munia, 2012	RCT	30 patients with reticular veins and telangiectasias of 0.5-1.5 mm	Sclerotherapy with HG *n* = 30	Nd:Yag 1064 nm *n* = 30	There were no significant difference in clearing of the veins and patient's satisfaction between sclerotherapy and Nd:Yag (*p*=.31). Significantly better assessment of clearing scores by blinded reviewers after Nd:Yag than sclerotherapy (*p*=.002)

Click here to go back to list of Recommendations

					Nd:Yag was significantly more painful (p<.001)
Parlar, 2015	RCT	102 limbs in 51 patients with reticular veins and telangiectasias of 0.2-2.9 mm	FS with POL *n* = 51	Nd:Yag 1064 nm *n* = 51	At 6 months, a very good improvement of > 70% was observed for both therapies in the evaluation of the blinded experts (p=.84). At 6 months, the degree of patient's satisfaction was the same for both therapies (p=.58). Nd:Yag was significantly more painful than FS (p=.003) Hyperpigmentation was significantly more often after FS (p<.001)
Rabe, 2010	Double-blind RCT	316 patients with reticular veins or telangiectasias	Sclerotherapy with POL *n* = 158 Sclerotherapy with STS *n* =105	Placebo *n* = 53	12- and 26- week treatment success rates for POL were 96% and 95%, respectively, and were both significantly higher than placebo (p<.0001). 12- and 26- week treatment success rates for STS were 92% and 91%, respectively), and were significantly higher compared with placebo (p<.0001). At 12- and 26- week, 88% and 84% of patients treated with POL were satisfied with the treatment. The number of patients satisfied with the treatment was significantly lower after STS (64% and 63%, respectively; p<.0001) and after placebo (13% and 11%, respectively; p<.0001) than after POL. The majority of AEs were mild (80%) or moderate (16%): discolouration (72%), neovascularization (14%) and injection site scar (9%). Irritation, discolouration, necrosis, ulcer, haematoma, neovascularization and scar at the injection site were significantly more frequent in patients treated with STS than with POL.
Zhang, 2012	RCT	142 patients with telangiectasias of <1 mm, reticular veins and/or small-sized veins of 1–5 mm	LS with POL *n* = 142	Placebo: *n* = 47 patients	Patient satisfaction and investigators assessment was significantly higher with POL than with placebo (p<.001) For telangiectasias <1 mm, 88.1% of investigators and 86.5% of patients were satisfied or very satisfied with the treatment at 12-week follow- up. For reticular veins and/or small-sized veins of 1–5 mm, 85.7% of investigators and 90.5 % of patients were satisfied or very satisfied with the treatment at 12-week follow- up

OR = odds ration; CI = confidence interval; AE = adverse events; FS = foam sclerotherapy; HG = hypertonic glucose; HS = hypertonic saline; LS = liquid sclerotherapy; Nd:Yag = neodymium:ytrium aluminium garnet; POL = polidocanol; RCT = randomised controlled trial; STS = Sodium Tetradecyl Sulphate

Click here to go back to list of Recommendations

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- Zhang J, Jing Z, Schliephake DE, Otto J, Malouf GM and Gu YQ. Efficacy and safety of Aethoxysklerol (polidocanol) 0.5%, 1% and 3% in comparison with placebo solution for the treatment of varicose veins of the lower extremities in Chinese patients (ESA-China Study). Phlebology 2012;27:184–90.

Click here to go back to list of Recommendations

Recommendation 41	**Class**	**Level of evidence**			
For patients with telangiectasias, where treatment is planned, sclerotherapy should be considered.	**IIa**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Bertanha, 2021	Triple- blind RCT	115 patients with telangiectasias on the lateral aspect of one thigh Follow-up rate was 85.5% (98 patients)	LS with 0.2% POL and 70% HG	LS with 75% HG	Sclerotherapy with 0.2% POL + 70% HG was significantly more effective than with 75% HG alone to treat telangiectasias in the target area (82.2% *vs.* 63.9%; *p*<.001) Pigmentation was the most common minor adverse event and was significantly shorter in length in the group treated with 0.2% POL+ 70% HG (median 0 cm *vs.* 0.5 cm, respectively; *p*=.033).
Hamel-Desnos, 2009	Systematic review (1 RCT 1 prospective Study)	116 patients with reticular veins and telangiectasias	FS *n* = 61	LS *n* = 55	There is no conclusive evidence to support the superiority of efficacy of one form over the other. In one trial, the satisfaction score was in favour of FS *vs* LS (80% *vs.* 60%) for both patients and experts. In the other, there was no significant difference between FS *vs.* LS in median patient satisfaction scores (60.2% *vs.* 59.3%) and in the expert reading score (5.71–6.24 *vs.* 5.26–5.67). Local side-effects (pigmentation, microthrombi, matting) seem to be more common with FS than with LS.
Ianosi, 2019	RCT	488 limbs in 244 patients with reticular veins and telangiectasias	sclerotherapy with POL *n* = 169 sclerotherapy with HS *n* = 154	Nd:Yag 1064 nm *n* = 165	good and very good results were found in 88.47%, 68.63% and 63.63% after Nd:Yag, POL and HS, respectively. For < 1 mm veins, good and very good results occurred significantly more often after Nd:Yag *vs* HS (95.05% *vs.* 59.08%, RR=9.72, *p*<.001) and after Nd:Yag *vs.* POL (95.05% *vs.* 52.8%, *p*<.001). Nd:Yag treatment is clearly superior to POL and HS. For > 1 mm veins, good and very good results occurred significantly more often after Nd:Yag and POL *vs.* HS (82.14% , 86.25% *vs.* 67.03%, respectively, RR=2.70, *p*=.003). The superiority of POL *vs.* Nd:Yag in terms of achieving good treatment results could not be demonstrated. Both types of treatments were well superior to HS treatment

Click here to go back to list of Recommendations

Munia, 2012	RCT	30 patients with reticular veins and telangiectasias of 0.5-1.5 mm	sclerotherapy with HG *n* = 30	Nd:Yag 1064 nm *n* = 30	There were no significant difference in clearing of the veins and patient's satisfaction between sclerotherapy and Nd:Yag (*p*=.31). Significantly better assessment of clearing scores by blinded reviewers after Nd:Yag than sclerotherapy (*p*=.002) Nd:Yag was significantly more painful (*p*<.001)
Parlar, 2015	RCT	102 limbs in 51 patients with reticular veins and telangiectasias of 0.2-2.9 mm	FS with POL *n* = 51	Nd:Yag 1064 nm *n* = 51	At 6 months, a very good improvement of > 70% was observed for both therapies in the evaluation of the blinded experts (*p*=.84). At 6 months, the degree of patient's satisfaction was the same for both therapies (*p*=.58). Nd:Yag was significantly more painful than FS (*p*=.003) Hyper pigmentation was significantly more often after FS (*p*<.001)
Rabe, 2010	Double-blind RCT	316 patients with reticular veins or telangiectasias	Sclerotherapy with POL *n* = 158 Sclerotherapy with STS *n* = 105	Placebo *n* = 53	12- and 26- week treatment success rates for POL were 96% and 95%, respectively, and were both significantly higher than placebo (*p*<.0001). 12- and 26- week treatment success rates for STS were 92% and 91%, respectively), and were significantly higher compared with placebo (*p*<.0001). At 12- and 26- week, 88% and 84% of patients treated with POL were satisfied with the treatment. The number of patients satisfied with the treatment was significantly lower after STS (64% and 63%, respectively; *p*< .0001) and after placebo (13% and 11%, respectively; *p*<.0001) than after POL. The majority of AEs were mild (80%) or moderate (16%): discolouration (72%), neovascularization (14%) and injection site scar (9%). Irritation, discolouration, necrosis, ulcer, haematoma, neovascularization and scar at the injection site were significantly more frequent in patients treated with STS than with POL.
Zhang, 2012	RCT	142 patients with telangiectasias of <1 mm, reticular veins and/or small-sized veins of 1–5 mm	LS with POL *n* = 142	Placebo: *n* = 47 patients	Patient satisfaction and investigators assessment was significantly higher with POL than with placebo (*p*<.001) For telangiectasias <1 mm, 88.1% of investigators and 86.5% of patients were satisfied or very satisfied with the treatment at 12-week follow- up. For reticular veins and/or small-sized veins of 1–5 mm, 85.7% of investigators and 90.5 % of patients were satisfied or very satisfied with the treatment at 12-week follow- up

Click here to go back to list of Recommendations

OR = odds ration; CI = confidence interval; AE = adverse events; FS = foam sclerotherapy; HG = hypertonic glucose; HS = hypertonic saline; LS = liquid sclerotherapy; Nd:Yag = neodymium:ytrium aluminium garnet; POL = polidocanol; RCT = randomised controlled trial; STS = Sodium Tetradecyl Sulphate

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Click here to go back to list of Recommendations

Recommendation 42	**Class**	**Level of evidence**			
For patients with telangiectasias, where treatment is planned, transcutaneous laser should be considered.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Ianosi, 2019	RCT	488 limbs in 244 patients with reticular veins and telangiectasias	sclerotherapy with POL *n* = 169 sclerotherapy with HS *n* = 154	Nd:Yag 1064 nm *n* = 165	good and very good results were found in 88.47%, 68.63% and 63.63% after Nd:Yag, POL and HS, respectively. For < 1mm veins, good and very good results occurred significantly more often after Nd:Yag *vs* HS (95.05% *vs.* 59.08%, RR=9.72, *p*<.001) and after Nd:Yag *vs.* POL (95.05% *vs.* 52.8%, *p*<.001). Nd:Yag treatment is clearly superior to POL and HS. For > 1 mm veins, good and very good results occurred significantly more often after Nd:Yag and POL *vs.* HS (82.14% , 86.25% *vs.* 67.03%, respectively, RR=2.70, *p*=.003). The superiority of POL *vs* Nd:Yag in terms of achieving good treatment results could not be demonstrated. Both types of treatments were well superior to HS treatment
Munia, 2012	RCT	30 patients with reticular veins and telangiectasias of 0.5-1.5 mm	sclerotherapy with HG *n* = 30	Nd:Yag 1064 nm *n* = 30	There were no significant difference in clearing of the veins and patient's satisfaction between sclerotherapy and Nd:Yag (*p*=.31). Significantly better assessment of clearing scores by blinded reviewers after Nd:Yag than sclerotherapy (*p*=.002) Nd:Yag was significantly more painful (*p*<.001)
Parlar, 2015	RCT	102 limbs in 51 patients with reticular veins and telangiectasias of 0.2-2.9 mm	FS with POL *n* = 51	Nd:Yag 1064 nm *n* = 51	At 6 months, a very good improvement of > 70% was observed for both therapies in the evaluation of the blinded experts (*p*=.84). At 6 months, the degree of patient's satisfaction was the same for both therapies (*p*=.58). Nd:Yag was significantly more painful than FS (*p*=.003) Hyperpigmentation was significantly more often after FS (*p*<.001)

OR = odds ration; CI = confidence interval; FS = foam sclerotherapy; HG = hypertonic glucose; HS = hypertonic saline; Nd:Yag = neodymium:ytrium aluminium garnet; POL = polidocanol; RCT = randomised controlled trial

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Click here to go back to list of Recommendations

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Click here to go back to list of Recommendations

Recommendation 43	**Class**	**Level of evidence**			
For patients with small saphenous vein incompetence requiring treatment, endovenous thermal ablation is recommended in preference to surgery or foam sclerotherapy.	**I**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Boersma, 2016	Systematic review and meta-analysis (49 studies: 5 RCT, 44 cohort studies)	4678 limbs with SSV incompetence	EVLA *n* = 2950 RFA *n* = 386	Surgery *n* = 798 UGFS *n* = 494 MOCA *n* = 50	Pooled anatomical success rate was: 58.0% (95% CI: 40.9% to 75.0%) for surgery after a mean follow-up of 17.3 months, 98.5% (95% CI: 97.7% to 99.2%) for EVLA after a mean follow-up of 12.5 months, 97.1% (95% CI: 94.3% to 99.9%) for RFA after a mean follow-up of 14.3 months, 63.6% (95% CI: 47.1% to 80.1%) for UGFS after a mean follow-up of 10.4 months. One study reported a 12-month results of MOCA, with an anatomical success rate of 94%. Neurologic complications were most frequently reported after surgery (mean 19.6%) and EVTA (EVLA: mean 4.8%; RFA: mean 9.7%). DVT was a rare complication (0% to 1.2%).
Doganci, 2011	RCT	60 limbs with SSV incompetence	EVLA, mid-calf access *n* = 30	EVLA, lateral malleolar access *n* = 30	Temporary paraesthesia was more frequent after lateral malleolar access *vs* mid- calf access (20% *vs* 3%, $p<.05$). Mid- calf access was also associated with less pain duration ($p<.05$) and analgesic requirement ($p<.05$). Severe complications such as DVT, PE, skin burns, and motor nerve lesions did not occur in any limb.
Paravastu, 2016	Meta-analysis of 3 RCT's	311 patients with SSV incompetence	EVLA *n* = 185	Open surgery *n* = 147 UGFS *n* = 21	For the EVLA *vs* surgery comparison, 6-week recanalization or persistence of reflux occurred less frequently after EVLA than after surgery (OR 0.07, 95% CI: 0.02 to 0.22; I^2 = 51%) 1- year reflux recurrence rate was less frequent after EVLA than after surgery (OR 0.24, 95% CI: 0.07 to 0.77; I^2 = 0%) There was no difference between groups in AVVQ either at 6 weeks (MD: 0.15, 95% CI: -1.65 to 1.95; I^2= 0%) or at 1 year (MD: -1.08, 95% CI -3.39 to 1.23)

Click here to go back to list of Recommendations

					Main complications reported at six weeks were sural nerve injury, wound infection and DVT (EVLA: 1/161, 0.6%; surgery 1/104, 1%). For the UGFS *vs* surgery comparison, there were insufficient data to detect clear differences between the groups for recanalization or persistence of reflux at 6-weeks (OR 0.34, 95% CI: 0.06 to 2.10), and recurrence of reflux at 1 year (OR 1.19, 95% CI: 0.29 to 4.92).

DVT = deep vein thrombosis; EVLA = endovenous laser ablation; EVTA = endovenous thermal ablation; MOCA = mechanochemical ablation; OR = odds ratio; CI = confidence interval; PE = pulmonary embolism; RCT = randomised controlled trial; RFA = radiofrequency ablation; SSV = small saphenous vein; UGFS = ultrasound guided foam sclerotherapy

References:

- Boersma D, Kornmann VN, Van Eekeren RR, Tromp E, Ünlü Ç, Reijnen MM, de Vries JP. Treatment modalities for small saphenous vein insufficiency: systematic review and meta-analysis. J Endovasc Ther. 2016;23:199-211.
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Click here to go back to list of Recommendations

Recommendation 44	**Class**	**Level of evidence**			
For patients with small saphenous vein incompetence requiring treatment, endovenous non-thermal non-tumescent ablation methods may be considered.	**IIb**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
García-Carpintero, 2020	Systematic review and meta- analysis 12 studies: 2 RCT 1 non- RCT 9 case series (3 included in meta-analysis)	1057 patients with GSV or SSV incompetence	CAC	RFA EVLA	12-month occlusion rates were 97.2% and 94.7% for CAC *vs.* 97% and 92.5% for RFA *vs.* 92.2% and 94.2% for EVLA, with no significant difference between groups. CAC groups had a lower probability of ecchymosis events than RFA group (RR= 0.46; I^2 = 71%). There was no significant difference in phlebitis events. There was no significant difference in ecchymosis and phlebitis events between CAC and EVLA. CAC group had significantly lower pain during the intervention and significantly shorter treatment time and recovery time than RFA and EVLA groups.
Boersma, 2016	Systematic review and meta-analysis (49 studies: 5 RCT, 44 cohort studies)	4678 limbs with SSV incompetence	UGFS *n* = 494 MOCA *n* = 50	Surgery *n* = 798 EVLA *n* = 2950 RFA *n* = 386	Pooled anatomical success rate was: 63.6% (95% CI 47.1% to 80.1%) for UGFS after a mean follow-up of 10.4 months. 58.0% (95% CI 40.9% to 75.0%) for surgery after a mean follow-up of 17.3 months, 98.5% (95% CI 97.7% to 99.2%) for EVLA after a mean follow-up of12.5 months, 97.1% (95% CI 94.3% to 99.9%) for RFA after a mean follow-up of 14.3 months, One study reported a 12-month results of MOCA, with an anatomical success rate of 94%. Neurologic complications were most frequently reported after surgery (mean 19.6%) and EVTA (EVLA: mean 4.8%; RFA: mean 9.7%). DVT was a rare complication (0% to 1.2%).
Lane, 2017	Multicenter RCT	170 patients with GSV or SSV incompetence	MOCA *n* = 87	RFA *n* = 83	1-month complete or proximal occlusion rate after MOCA *vs* RFA were 93% *vs* 92%, respectively (*p*=.403).

Click here to go back to list of Recommendations

		1- and 6-month follow-up rates were 76% and 71%, respectively			6-month complete or proximal occlusion rate after MOCA *vs* RFA were 87% *vs* 93%, respectively (*p*=.483) MOCA group experienced significantly less maximum pain during the procedure than RFA group on VAS (15mm [IQR 7-36 mm] *vs.* 34 mm [IQR 16-53 mm], *p*=.003) and number scale (3 [IQR 1-5] *vs.* 4 [IQR 3-6.5], *p*=.002). There was no significant difference between MOCA and RFA in AVVQ and VCSS improvement, time of return to work and complication rate.
Mohamed, 2021	RCT	150 patients with GSV or SSV incompetence 1-year follow-up rate was 92%	MOCA *n* = 75	EVLA *n* = 75	1-year complete occlusion rate was significantly higher after EVLA than after MOCA (91% *vs.* 77%; *p*=.020) There was no significant difference between EVLA and MOCA in median pain during the procedure (22 [9 – 44] *vs.* 15 [9 – 29]; *p*=.210), AVVQ, EQ-5D and VCSS improvement, median time to work in days (*p*=.725), median time to normal activity (*p*=.127), median satisfaction with the overall outcome (100 [90 – 100] *vs.* 97 [91 – 100}; *p*=.385), median cosmetic satisfaction (98 [90–100] *vs.* 91 [87–100], *p*= .084) There was no significant difference between EVLA and MOCA in minor complications: phlebitis (7% *vs.* 13%, *p*=.262), hyperpigmentation (6% *vs.* 13%, *p*=.139). There was 1 DVT in MOCA group.

OR = odds ration; CI = confidence interval; AVVQ = Aberdeen Varicose Vein Questionnaire; EQ-5D = Euro Qol 5 Dimensions Questionnaire; CAC = cyanoacrylate adhesive closure; DVT = deep vein thrombosis; RFA = Radiofrequency ablation; MOCA = mechanochemical ablation; EVLA = endovenous laser ablation; GSV = great saphenous vein; RCT = randomised controlled trial; SSV = small saphenous vein; VCSS = Venous Clinical Severity Score

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Click here to go back to list of Recommendations

Recommendation 45	**Class**	**Level of evidence**			
For patients with small saphenous vein incompetence treated by endovenous thermal ablation, care should be taken to avoid injury to the sural nerve if cannulation is carried out below midcalf level.	**I**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Doganci, 2011	RCT	60 limbs with SSV incompetence	EVLA, midcalf access *n* = 30	EVLA, lateral malleolar access *n* = 30	Mean treated SSV length (cm) for lateral malleolar access was 25.8 cm (SD 3.2) and 17.9 cm (SD 1.9) for midcalf access ($p<.001$). Temporary paraesthesia was more frequent after lateral malleolar access *vs* midcalf access (20% *vs.* 3%, $p<.05$). Midcalf access was also associated with less pain duration ($p<.05$) and less analgesic requirement ($p<.05$). Severe complications such as DVT, PE, skin burns, and motor nerve lesions did not occur in any limb.
Rodriguez-Acevedo, 2017	Case series	118 with full length SSV incompetence	Extended RFA of almost entire length of SSV using hydrodisplace-ment of the sural nerve	No control group	Successful hydrodisplacement in the nerve in 100 % of cases Mean distance of 0.8 cm (Range, 0.48 mm – 1.1 cm) of displacement 2 reported neurological events 1 foot drop< 6 hours secondary to peroneal nerve infiltration 1 persistent sural nerve sensory deficit

OR = odds ration; CI = confidence interval; DVT = deep vein thrombosis; EVLA = endovenous laser ablation; RCT = randomised controlled trial; SD = standard deviation; SSV = small saphenous vein; PE = pulmonary embolism; RFA = radiofrequency ablation

Reference:

- Doganci, S., Yildirim, V., and Demirkilic, U. Does puncture site affect the rate of nerve injuries following endovenous laser ablation of the small saphenous veins?. Eur J Vasc Endovasc Surg. 2011;41:400–5.
- Rodriguez-Acevedo O, Elstner KE, Martinic K, Zea A, Diaz J, Martins RT, Arduini F, Hodgkinson A, Ibrahim N. Hydrodisplacement of sural nerve for safety and efficacy of endovenous thermal ablation for small saphenous vein incompetence. Phlebology 2017;32:482-87.

Click here to go back to list of Recommendations

Recommendation 46	**Class**	**Level of evidence**			
For patients with incompetence of the anterior accessory saphenous vein requiring treatment, endovenous thermal ablation should be considered	**IIa**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
King, 2009	Prospective study	56 patients with AASV incompetence	EVLA with concomitant UGFS *n* = 56	None	1-month occlusion rate was 100 %. The result remained unchanged for more than a year (*p*<.001). QoL revealed significant improvement at 1-2 year (*p*<.001).
Theivacumar, 2009	Cohort study	66 patients with SFJ incompetence (33 patients with isolated SFJ/ AASV incompetence 33 patients with isolated SFJ/GSV reflux)	EVLA of AASV *n* = 33	EVLA of GSV *n* = 33	At the 1-year follow-up, EVLA had successfully abolished 100% AASV and had restored SFJ competence in all patients. 61% after EVLA of AASV and 42% after EVLA of GSV required post-ablation sclerotherapy at 6 weeks post-procedure for residual varicosities (*p*=.218). Median patient-satisfaction scores were similar in both groups (*p*=.23) and the AVVQ improved significantly at 1 year, with no significant difference between the groups (*p*=.18).

OR = odds ration; CI = confidence interval; AASV= anterior accessory saphenous vein; AVVQ = Aberdeen Varicose Vein Questionnaire; EVLA = endovenous laser ablation; UGFS = ultrasound guided foam sclerotherapy; GSV = great saphenous vein; QoL = quality of life; SFJ = saphenofemoral junction

References:

- King T, Coulomb G and Goldman A. Experience with concomitant ultrasound-guided foam sclerotherapy and endovenous laser treatment (ELT) in chronic venous disorder and its influence of Health Related Quality of Life: interim analysis of more than 1000 consecutive procedures. Int Angiol 2009;28:289–97.
- Theivacumar N, Darwood R and Gough M. Endovenous laser ablation (EVLA) of the anterior accessory great saphenous vein (AAGSV): abolition of sapheno-femoral reflux with preservation of the great saphenous vein. Eur J Vasc Endovasc Surg 2009;37:477–81.

Click here to go back to list of Recommendations

Recommendation 47	**Class**	**Level of evidence**			
For patients with incompetence of the anterior accessory saphenous vein requiring treatment, ultrasound guided foam sclerotherapy may be considered.	**IIb**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Bradbury, 2010	Prospective study	139 patients with AASV incompetence (primary AASV incompetence *n* = 93 recurrent AASV incompetence *n* = 46)	UGFS *n* = 139	None	At 28-months, the recurrence rate was 3.6%.

OR = odds ration; CI = confidence interval; AASV= anterior accessory saphenous vein; UGFS = ultrasound guided foam sclerotherapy

References:

- Bradbury A, Bate G, Pang K, Darvall KA, Adam DJ. Ultrasound guided foam sclerotherapy is a safe and clinically effective treatment for superficial venous reflux. J Vasc Surg 2010;52:939–45.

Click here to go back to list of Recommendations

Recommendation 48	**Class**	**Level of evidence**			
For patients with an incompetent saphenous trunk treated with endovenous thermal or non-thermal ablation, concomitant tributary treatment should be considered as part of a shared decision process.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Aherne, 2020	Systematic review and Meta-analysis (15 studies: 3 RCTs, 3 prospective studies, 3 retrospective studies)	6915 limbs with superficial venous incompetence	Truncal ablation (EVLA, RFA or MOCA) with concomitant tributary treatment (AP or UGFS) *n* = 4645	Truncal ablation (EVLA, RFA or MOCA) with delayed tributary treatment (AP or UGFS) *n* = 2316	Re-intervention rates up to one year were significantly lower after concomitant *vs* delayed intervention (6.3% *vs* 36.1%; RR 0.21 [95% CI 0.07- 0.62], *p*=.004, I^2=90%, *p*<.001). VCSS was lower in the concomitant group up to 3 months (MD-1.16 [95% CI:- 1.97 to - 0.35; *p*=.005), however this benefit was not maintained between 3 and 12 months (MD -0.70 [95% CI, -2.14 to 0.75]; *p*=.35, I^2=89%, *p*<.002) QoL, assessed by AVVQ, favoured concomitant treatment when measured up to 3 months (MD: -3.6 [95% CI, -7.17 to -0.03] *p*=.050) and between 3 and 12 months (MD -1.61 [95% CI, -2.99 to -0.23] *p*=.020). Reported complications after concomitant *vs* delayed (21% *vs.* 15.4%; RR 1.14 [95% CI 0.67 to 1.93], *p*=.64) and rates of DVT (1.2% *vs.* 2.8%; RR 1.41 [95% CI 0.72 to 2.77] *p*=.31) did not differ significantly between each group.
Gibson, 2019	Single-centre, multi-investigator, single-arm prospective study	50 patients with GSV, SSV, and/or AASV incompetence and VVs	CAC with no concomitant treatment of tributaries *n* = 50	None	At 3 months, 66% of patients underwent treatment of tributaries. The percentage of patients who required adjunctive treatments was lower than had been predicted by the treating physicians (65% *vs.* 96%, *p*=.0002). At 3 months, there was a significant improvement in VCSS (6.4 ± 2.2 to 1.8 ± 1.5; *p*<.001) and AVVQ (17.3 ± 7.9 to 6.5 ± 7.2; *p*<.0001).
Vasquez, 2017	Multicenter RCT 3 phase study	117 patients with GSV incompetence and VVs	EVTA with UGFS *n* = 79	EVTA with placebo *n* = 38	Physician-rated vein appearance at week 8 was significantly better after EVTA with UGFS *vs* placebo (*p*<.001); Patient-assessed appearance trended similarly.

Click here to go back to list of Recommendations

					A significantly more patients achieved improvement after EVTA with UGFS than with placebo on Independent Photography Review – Visible Varicose Veins (week 8: 83.5% *vs.* 57.9%, *p*<.004; Month 6: 70.9% *vs.* 42.1%, *p*<.001) and the Patient Self- Assessment of Visible Varicose Veins (Week 8: 72.2% *vs.* 55.3%, *p*<.06; Month 6: 67% *vs.* 50%, *p*<.034). The number of patients who received additional treatment for residual varicosities between week 8 and month 6 was significantly lower after EVTA with UGFS than with placebo (13.9% *vs.* 23.7%, *p*=.037) Elimination of reflux through the SFJ was achieved 78.9% of patient after EVTA with placebo and 87.3% of patient after EVTA with UGFS.
Watanabe, 2020	prospective study	113 limbs with GSV incompetence with VVs	EVLA with concomitant UGFS *n* = 64	EVLA *n* = 50	Additional second stage UGFS was needed significantly more often after EVLA alone than with concomitant treatment (66% *vs.* 3%; *p*<.0001). VCSS significantly improved after EVLA with concomitant treatment than EVLA alone (*p*<.0001). Thrombophlebitis was observed in 3.1 % of patients in concomitant treatment group, but with no significant difference between the groups (*p*=.13).

OR = odds ration; CI = confidence interval; AASV = anterior accessory saphenous vein; AP= ambulatory phlebectomy; AVVQ = Aberdeen Varicose Vein Questionnaire; CAC cyanoacrylate adhesive closure; DVT = deep vein thrombosis; EVLA = endovenous laser ablation; EVTA = endovenous thermal ablation; SFJ = saphenofemoral junction; GSV = great saphenous vein; MD = mean difference; MOCA = mechanochemical ablation; QoL = quality of life; RFA radiofrequency ablation; RCT = randomised controlled trial; RR = relative risk; SSV = small saphenous vein; UGFS = ultrasound guided foam sclerotherapy; VCSS = Venous Clinical Severity Score; VV = varicose vein

References:

- Aherne TM, Ryan ÉJ, Boland MR, McKevitt K, Hassanin A, Tubassam M, Tang TY, Walsh S. Concomitant *vs* staged treatment of varicose tributaries as an adjunct to endovenous ablation: a systematic review and meta-analysis.. Eur J Vasc Endovasc Surg. 2020;60:430-42.
- Gibson K, Minjarez R, Gunderson K, Ferris B. Need for adjunctive procedures following cyanoacrylate closure of incompetent great, small and accessory saphenous veins without the use of postprocedure compression: three month data from postmarket evaluation of the VenaSeal System (the WAVES Study). Phlebology 2019;34:231-7.
- Vasquez M, Gasparis AP. A multicenter, randomized, placebo-controlled trial of endovenous thermal ablation with or without polidocanol endovenous microfoam treatment in patients with great saphenous vein incompetence and visible varicosities. Phlebology 2017;32:272-81.
- Watanabe S, Nishio S, Tsuji T, Fujita S, Kyo E. Effect of Transluminal Injection of Foam Sclerotherapy Combined with Endovenous Thermal Ablation of Varicose Veins. EJVES Vascular Forum 2020;47:83-6.

Click here to go back to list of Recommendations

Recommendation 50	**Class**	**Level of evidence**			
For patients with advanced skin changes (CEAP clinical class C4b, C5 or C6), with isolated or residual incompetent perforating veins, thought to be significant, treatment may be considered.	**IIb**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Abdul-Haqq, 2013	Retrospective study	108 limbs in 95 patients with VLU	EVLA of GSV and PVs *n* = 17	EVLA of GSV only *n* = 91	Ulcer healing was accomplished to a significantly greater degree using EVLA of the GSV and PVs compared to GSV ablation alone (71% *vs.* 33%, *p*=.011)
Gibson, 2020	Multicenter, prospective study	83 Patients with PV incompetence and advanced skin changes or VLU	EVLA of PV only *n* = 83	None	Successful primary occlusion rates of 76.9%, 75.7%, 70.3%, 62.1%, 68.8%, and 71.3% of PVs were achieved at 10-days, 1 month, 3 months, 6 months, 9 months, and 12 months, respectively. Significant improvements (*p*<.05) were seen in patients' QoL at 1-, 3-, 6-, 9- and 12-months.
Kiguchi, 2014	Retrospective study	62 patients with VLU and PV incompetence	UGFS *n* = 62	None	Complete occlusion of all incompetent PVs in an ulcerated limb was the only predictor of ulcer healing. Complete occlusion of all incompetent PV was found in 92% of healed VLU *vs* 68% of non-healed VLU (*p*=.02).
Van Gent, 2015	Subgroup analysis of RCT	94 patients with VLU and PV incompetence	SEPS with HL or HLS of GSV/SSV *n* = 94	None	Complete SEPS procedure with superficial venous surgery significantly lowered the VLU recurrence rate (*p*=.007)

OR = odds ration; CI = confidence interval; EVLA = endovenous laser ablation; GSV = great saphenous vein; HL = high ligation; HLS = high ligation and stripping; PV = perforating vein; QoL = quality of life; RCT = randomised controlled trial; SEPS = subfascial endoscopic perforator surgery; SSV = small saphenous vein; UGFS = ultrasound guided foam sclerotherapy; VLU = venous leg ulcer or ulceration

References

- Abdul-Haqq, Almaroof B, Chen BL, Panneton JM, Parent FN. Endovenous Laser Ablation of Great Saphenous Vein and Perforator Veins Improves Venous Stasis Ulcer Healing. Ann Vasc Surg 2013;27:932–9
- Gibson K, Elias S, Adelman M, Hager ES, Dexter DJ, Vayuvegula S et al. A prospective safety and effectiveness study using endovenous laserablation with a 400-µm optical fiber for the treatment of pathologic perforator veins in patients with advanced venous disease (SeCure trial). J Vasc Surg Venous Lymphat Disord 2020;8:805-13.
- Kiguchi MM, Hager ES, Winger DG, Hirsch SA, Chaer RA, Dillavou ED. Factors that influence perforator thrombosis and predict healing with perforator sclerotherapy for venous ulceration without axial reflux. J Vasc Surg 2014;59:1368-76
- van Gent, Wittens C. Influence of perforating vein surgery in patients with venous ulceration. Phlebology 2015;30:127–32.

Click here to go back to list of Recommendations

Recommendation 51	**Class**	**Level of evidence**			
For patients with superficial venous incompetence requiring treatment, ambulatory conservative haemodynamic treatment of venous incompetence (CHIVA) may be considered, if performed by physicians experienced in this treatment strategy.	**IIb**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Bellmunt-Montoya, 2021	Syst review (6 RCT)	1160 patients with C2- C6 class of CEAP	CHIVA *n* = 433	HLS *n* = 564 RFA *n* = 74 EVLA *n* = 50 Compression (inelastic bandage) *n* = 24 (VLU)	At 1.5 to 10 years, pooled clinical recurrence showed no difference to the recurrence of varicose veins after CHIVA compared to HLS (RR 0.74, 95% CI 0.46 to 1.20; 5 studies, 966 participants; low-certainty evidence), or no difference to VLU recurrence after CHIVA compared to compression (RR 0.23; 95% CI: 0.06 to 0.96; NNTB 3; 95% CI: 2 - 17). CHIVA may reduce slightly nerve injury (RR 0.14, 95% CI 0.02 to 0.98; NNTH 9, 95% CI 5 to 100; 4 studies, 846 participants; low-certainty evidence) and haematoma compared to HLS (RR 0.59, 95% CI 0.37 to 0.97; NNTH 11, 95% CI 5 to 100; 2 studies, 245 participants; low-certainty evidence). For bruising, one study found no differences between groups while another study found reduced rates of bruising in the CHIVA group compared to the HLS group. There were no statistically significant differences between CHIVA and HLS regarding the incidence of limb infection and superficial vein thrombosis. Compared to RFA, CHIVA may make little or no difference to rates of limb infection, superficial vein thrombosis, nerve injury or hematoma, but may cause more bruising (RR 1.15, 95% CI 1.04 to 1.28; NNTH 8, CI 95% 5 - 25; 1 study, 144 participants; low-certainty evidence). Compared to endovenous laser, CHIVA may make little or no difference to rates of limb infection, superficial vein thrombosis, nerve injury or hematoma. The study comparing CHIVA *vs* compression did not report side effects.

OR = odds ration; CI = confidence interval; CHIVA = Ambulatory Conservative Haemodynamic Treatment of Venous Incompetence; HLS: high ligation and stripping; NNTB = the number of people needed to treat for an additional beneficial outcome, NNTH = the number of people needed to treat for an additional harmful outcome; RCT = randomised controlled trial; RR = risk ratio, VLU = venous leg ulcer; CEAP = Clinical Etiological Anatomical Pathophysiological (Classification)

Reference:

Bellmunt-Montoya S, Escribano JM, Pantoja Bustillos PE, Tello-Díaz C, Martinez-Zapata MJ. CHIVA method for the treatment of chronic venous insufficiency. Cochrane Database Syst Rev. 2021;9:CD009648.

Click here to go back to list of Recommendations

Recommendation 52	**Class**	**Level of evidence**			
For patients with uncomplicated varicose veins (CEAP clinical class C2) requiring treatment, phlebectomies with preservation of the saphenous trunk (ASVAL) may be considered.	**IIb**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Biemans, 2014	Prospective	94 patients with GSV and tributary incompetence, with C2-C4 class o CEAP	AP with preservation of GSV *n* = 94	None	At 1 year, abolishment of GSV reflux was seen in 50% of patients (p<.01) and GSV diameter decreased significantly (p<.01). 32% (15/47) of patients with persisting GSV incompetence did not receive additional treatment because they were asymptomatic. At 1 year, AVVQ scores improved significantly (p<.01) and symptoms disappeared in 66% patients. Independent predictors for success were: low C class of CEAP, low number of refluxing GSV segments, small diameter of GSV above the tributary and positive reflux examination test (p<.0001).
Pittaluga, 2009	Retrospective	303 limbs in 221 patients with GSV or SSV and tributary incompetence, with C2 class of CEAP	AP with preservation of GSV or SSV *n* = 303	None	SV reflux was abolished in 69.6%, 69.2%,68.7%, 68.0%, and 66.3% of limbs, respectively, after 6 months, 1, 2, 3, and 4 years of follow-up. Symptoms improved or disappeared in 84.2%, 84.2%, 83.4%, 81.4%, and 78.0% of limbs at each annual check-up until year 4. Freedom of varices recurrence was 95.5%, 94.6%, 91.5%, and 88.5%, respectively at 1, 2, 3, and 4 years. When the number of zones to be treated was >7, recurrence rate was more frequent (OR 6.82; p<.0001). When an SFJ/ SPJ reflux extended to the malleolus preoperatively, the elimination of the SV reflux was less frequent (47.6% *vs.* 70.3%; p<.05).
Richards, 2021	Systematic review	2 RCTs comparing phlebectomies	ASVAL in 2106 limbs in 1734 patients; GSV		VV recurrence at 1 year ranged from 0.5% to 13.5% in patients.

Click here to go back to list of Recommendations

		with sclerotherapy; 1 case control; 3 cohort studies; 5 case series	incompetence in 1622 limbs		Of 1622 limbs with diagnosed GSV incompetence before intervention, 1114 were competent at 1 year (mean, 68.2% ±12.6%). All studies measuring GSV diameter reported statistically significant reductions in vein size.

OR = odds ration; CI = confidence interval; AVVQ = Aberdeen Varicose Vein Questionnaire; CEAP= Clinical Etiological Anatomical Pathophysiological (Classification); GSV = great saphenous vein; RCT = randomised controlled trial; SFJ = saphenofemoral junction; SPJ = saphenopopliteal junction; SSV = small saphenous vein; SV = saphenous vein

References:

- Biemans AA, van den Bos RR, Hollestein LM, Maessen-Visch MB, Vergouwe Y, Neumann HA. The effect of single phlebectomies of a large varicose tributary on great saphenous vein reflux. J Vasc Surg Venous Lymphat Disord 2014;2:179-87.
- Pittaluga P, Chastanet S, Rea B, Barbe R. Midterm results of the surgical treatment of varices by phlebectomy with conservation of a refluxing saphenous vein. J Vasc Surg 2009;50:107-18.
- Richards T, Anwar M, Mostafa, M, Davies AH, Onida S. Systematic review of ambulatory selective variceal ablation under local anesthetic technique for the treatment of symptomatic varicose veins. J Vasc Surg Venous Lymphat Disord 2021;9:525-35.

Click here to go back to list of Recommendations

Recommendation 53	**Class**	**Level of evidence**			
For patients with an incompetent great saphenous vein with a very large truncal diameter (more than 12 mm), endovenous thermal ablation should be considered.	**IIa**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Dabbs, 2018	Retrospective study	334 limbs with GSV incompetence and GSV diameter of 15-42 mm	EVLA *n* = 334	None	At 8 weeks, the GSV occlusion rate was 100%.
Woo, 2019	Retrospective comparative study	722 limbs with GSV incompetence	RFA for GSV diameter > 12 mm (mean 13.17 ± 1.28 mm) *n* = 59	RFA for GSV diameter<12 mm (mean 6.00 ± 1.74 mm) *n* = 663	At 12 months, GSV occlusion rates in GSV> 12 mm *vs* GSV< 12 mm were 98.9% *vs.* 100% (*p* = .428). There was no significant difference in the incidence of complications, including phlebitis and EHIT between the 2 group. Both groups showed marked improvements in the VCSS and the AVVQ at 1, 3, 6, and 12 months postoperatively, with no significant differences (all *p*<.05).

OR = odds ration; CI = confidence interval; EHIT = endovenous heat induced thrombosis; EVLA = endovenous laser ablation; GSV = great saphenous vein; RFA = radiofrequency ablation; VCSS = Venous Clinical Severity Score; AVVQ = Aberdeen Varicose Vein Questionnaire

References:

- Dabbs EB, Mainsiouw LE, Holdstock JM, Price BA, Whiteley MS. A description of the 'smile sign' and multi-pass technique for endovenous laser ablation of large diameter great saphenous veins. Phlebology 2018;33:534-9
- Woo HY, Kim SM, Kim D, Chung JK, Jung IM. Outcome of ClosureFAST radiofrequency ablation for large-diameter incompetent great saphenous vein. Ann Surg Treat Res 2019;96:313-8.

Click here to go back to list of Recommendations

Recommendation 54	**Class**	**Level of evidence**				
For patients presenting with foot and ankle varicose veins, phlebectomy, sclerotherapy, and foot perforating vein ligation may be considered during or after ablation of proximal reflux.	**IIb**	**C**				
Reference	**Study type**	**Patient population**	***n***	**Intervention**	**Control group**	**Relevant findings concerning the record**
Albernaz, 2018	Prospective	Patients with symptomatic foot varicose veins	119 patients 188 feet	Phlebectomy of foot varicose veins with sclerotherapy (104 patients- 87,3%) or without sclerotherapy, with concomitant EVLA of GSV above the knee and sclerotherapy of GSV below the knee (if required)	No	Median VCSS was 4 (interquartile range: 2 to 5) before the procedure and 1 (interquartile range: 0–2) at 90 days after the procedure (p<.001). Complications: oedema 13 (6.9%) feet, transient paraesthesia 11 (5,9%) feet; all resolved at 90 days after the procedure, except one case of oedema.
De Roos, 1998	Prospective	Patients with primary foot varicose veins	14 patients 19 feet	Foot veins phlebectomy after surgical treatment of incompetent SFJ and sclerotherapy with/without lower limb varicose veins phlebectomy	No	No serious side effects were observed. Three cases of haematoma and one case of temporary nerve damage were observed.

OR = odds ration; CI = confidence interval; EVLA = endovenous laser ablation; GSV = great saphenous vein; VCSS = Venous Clinical Severity Score

References:

- Albernaz LF, Schlindwein Albernaz DT, Machado Zignani FR, Chi YW. Treatment of foot varicose veins: A study of 119 consecutive patients. Phlebology 2018;33:267-72.
- De Roos KP, Neumann HAM. Muller's Ambulatory Phlebectomy for Varicose Veins of the foot. Dermatol Surg 1998; 24:465-70.

Click here to go back to list of Recommendations

Recommendation 55	**Class**	**Level of evidence**			
For patients with symptomatic recurrent varicose veins due to saphenous trunk incompetence, endovenous thermal ablation or ultrasound guided foam sclerotherapy with or without phlebectomy should be considered.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Darvall, 2011	Prospective study	91 limbs with recurrent VVs of GSV	UGFS with 3% STS *n* = 91	None	GSVa and GSVb reflux was completely eradicated by a single session of UGFS in 86 (98%) and 74 (93%) limbs, respectively and by two sessions of UGFS in 88 (100%) and 77 (97%) limbs, respectively. At 12 months, recanalisation occurred in 7/78 (9%) GSVa and in 8/68 (12%) GSVb. Retreatment with a single UGFS session effectively eradicated all GSV reflux in all cases of recanalisation.
Hinchliffe, 2006	RCT	32 patients with bilateral recurrent VVs of GSV	RFA *n*= 16	Surgery *n* = 16	The occlusion rate after RFA was 100% The procedure time was significantly lower for RFA than for surgery (25.5 [20.5-31.3] min *vs.* 40 [34.5-45.5] min; *p*=.02.) Pain score was significantly lower for RFA than for surgery (1.7 [0.2-4] *vs.* 3.8 [0.6-6.3]; *p*=.02). Bruise score was significantly lower for RFA than for surgery (1.7 [0.4-4.4] *vs.* 5.2 [2.6-7]; *p*=.03). Minor complications occurred in 3 (18.7%) legs after surgery and in 2 (12.5%) after RFA.
Nwaejike, 2010	Retrospective study	77 limbs with recurrent VVs of GSV or SSV (GSV *n*= 64; SSV *n*= 13)	EVLA *n* = 77	None	There was no clinical recurrence and no recanalization of the treated GSV or SSV on duplex ultrasound at the median follow-up 18 months (range 1-38).
Theivacumar, 2011	Retrospective comparative study	104 limbs with recurrent VVs (SFJ/ GSV *n* = 51; SPJ/ SSV *n* = 24; AASV *n* = 11; PV *n* = 6;	EVLA for recurrent VVS *n* = 104 (EVLA of GSV *n* = 69	EVLA for primary VVs *n* = 75 (EVLA of GSV	Following EVLA of GSV, complete occlusion was found in 96% of limbs with recurrent VVs and in 98% with primary VVs; *p*=.2 There was a significant improvement in AVVQ (*p*<.001), similar in both groups (*p*=.23) Patient satisfaction was similar in both groups (86% *vs.* 82%; *p*=.32). 12- month occlusion rate was 98%.

Click here to go back to list of Recommendations

		PVI *n* = 4, mixed source *n* = 8) 75 limbs with PVVs (GSV *n* = 51; SSV *n* = 24)	EVLA of SSV *n* = 24 EVLA of AASV *n* = 11)	*n* = 51 EVLA of SSV *n* = 24)	Following EVLA of SSV, complete occlusion was found in 100% of limbs with recurrent and primary VVs This was associated with a similar (*p*=.33) improvement in AVVQ (*p*<.001) in both groups. Following EVLA of AASV, complete occlusion was found in 100% of patient with a significant improvement in the AVVQ, *p*<.001. All patients with incompetent mid-thigh PV had successful GSV EVLA following which all PV regained competency. At 1 year follow-up, complete occlusion was found in 85.8% (79/92) limbs with recurrent VVs and 86.6% (65/75) with primary VVs. The improvements in both AVVQ and VCSS persisted and patient satisfaction was high: 91% of group with recurrent VVs were pleased with their outcome compared to 88% with primary VVs
van Groenendael, 2009	Retrospective Comparative study	216 patients with recurrent VVs of GSV	EVLA *n* = 67	Surgery *n* = 149	At 25 weeks of follow-up, re-recurrences occurred in 29% after surgery and in 19% after EVLA (*p*=.511). Wound infections (8% *vs.* 0%; *p*<.05) and paresthesia (27% *vs.* 13%; *p*<.05) were more frequent after surgery, whereas after EVLA patients reported more delayed tightness (17% *vs.* 31%; *p*<.05). Surgically treated patients suffered less postoperative pain (*p*<.05) but reported a higher use of analgesics (*p*<.05). Hospital stay in the surgery group was longer (*p*<.05) and they reported a longer delay before resuming work (7 *vs.* 2 days; *p*<.0001). Patient satisfaction was equally high in both groups.
van Groenendael, 2010	Retrospective study	42 patients with recurrent VVs of SSV	EVLA *n* = 26	Surgery *n* = 16	Technical success for surgery *vs* EVLA was 94% *vs.* 100% Complications in both groups were mostly minor and self-limiting. Sural nerve neuralgia appeared to be more frequent after surgery *vs* EVLA (20% *vs.* 9%).

OR = odds ration; CI = confidence interval; AASV = Anterior accessory saphenous vein; AVVQ = Aberdeen Varicose Vein Questionnaire; EVLA = endovenous laser ablation; GSV = great saphenous vein; GSVa = great saphenous vein above knee; GSVb = great saphenous vein below knee; PV = perforating vein; PVI = pelvic vein incompetence; RCT = randomised controlled trial; RFA = radiofrequency ablation; SSV = small saphenous vein; UGFS = ultrasound guided foam sclerotherapy; VCSS = Venous Clinical Severity Score; VV = varicose Vein; SPJ = saphenopopliteal junction

References:

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Click here to go back to list of Recommendations

- Hinchliffe RJ, Ubhi J, Beech A, Ellison J, Braithwaite BD. A prospective randomised controlled trial of VNUS closure versus surgery for the treatment of recurrent long saphenous varicose veins. Eur J Vasc Endovasc Surg. 2006;31:212–8.
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- van Groenendael L, Flinkenflogel L, van der Vliet JA, Roovers EA, van Sterkenburg SMM, Reijnen MMPJ. Conventional surgery and endovenous laser ablation of recurrent varicose veins of the small saphenous vein: a retrospective clinical comparison and assessment of patient satisfaction. Phlebology 2010; 25: 151–7.
- van Groenendael L, van der Vliet JA, Flinkenflogel L, Roovers EA, van Sterkenburg SMM, Reijnen MMPJ. Treatment of recurrent varicose veins of the great saphenous vein by conventional surgery and endovenous laser ablation. J Vasc Surg 2009; 50: 1106–13.

Click here to go back to list of Recommendations

Recommendation 56	**Class**	**Level of Evidence**			
For patients with symptomatic recurrent varicose veins requiring treatment, where endovenous ablation is possible, re-exploration of the groin or popliteal fossa is not recommended.	**III**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Hinchliffe, 2006	RCT	32 patients with bilateral recurrent VVs of GSV	RFA *n* = 16	Surgery *n* = 16	The occlusion rate after RFA was 100%. The procedure time was significantly lower for RFA than for surgery (25.5 [20.5-31.3] min *vs.* 40 [34.5-45.5] min; *p*=.02.) Pain score was significantly lower for RFA than for surgery (1.7 [0.2-4] *vs.* 3.8 [0.6-6.3]; *p*=.02). Bruise score was significantly lower for RFA than for surgery (1.7 [0.4-4.4] *vs.* 5.2 [2.6-7]; *p*= .03). Minor complications occurred in 3 (18.7%) legs after surgery and in 2 (12.5%) after RFA
van Groenendael, 2009	Retrospective comparative study	216 patients with recurrent VVs of GSV	EVLA *n* = 67	Surgery *n*= 149	At 25 weeks of follow-up, re-recurrences occurred in 29% after surgery and in 19% after EVLA (*p*=.511). Wound infections (8% *vs.* 0%; *p*<.05) and paraesthesia (27% *vs.* 13%; *p*<.05) were more frequent after surgery, whereas after EVLA patients reported more delayed tightness (17% *vs.* 31%; *p*<.05). Surgically treated patients suffered less postoperative pain (*p*<.05) but reported a higher use of analgesics (*p*<.05). Hospital stay in the surgery group was longer (*p*<.05) and they reported a longer delay before resuming work (7 *vs.* 2 days; *p*<.0001). Patient satisfaction was equally high in both groups.
van Groenendael, 2010	Retrospective study	42 patients with recurrent VVs of SSV	EVLA *n* = 26	Surgery *n*= 16	Technical success for surgery *vs* EVLA was 94% *vs.* 100% Complications in both groups were mostly minor and self-limiting. Sural nerve neuralgia appeared to be more frequent after surgery *vs* EVLA (20% *vs.* 9%).

Click here to go back to list of Recommendations

OR = odds ration; CI = confidence interval; EVLA = endovenous laser ablation; GSV = great saphenous vein; RCT = randomised controlled trial; RFA = radiofrequency ablation; SSV = small saphenous vein; VV = varicose Vein

References:

- Hinchliffe RJ, Ubhi J, Beech A, Ellison J, Braithwaite BD. A prospective randomised controlled trial of VNUS closure versus surgery for the treatment of recurrent long saphenous varicose veins. Eur J Vasc Endovasc Surg 2006;31:212-8.
- van Groenendael L, Flinkenflogel L, van der Vliet JA, Roovers EA, van Sterkenburg SMM, Reijnen MMPJ. Conventional surgery and endovenous laser ablation of recurrent varicose veins of the small saphenous vein: a retrospective clinical comparison and assessment of patient satisfaction. Phlebology 2010; 25: 151–7.
- van Groenendael L, van der Vliet JA, Flinkenflogel L, Roovers EA, van Sterkenburg SMM, Reijnen MMPJ. Treatment of recurrent varicose veins of the great saphenous vein by conventional surgery and endovenous laser ablation. J Vasc Surg 2009; 50:1106-13.
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Click here to go back to list of Recommendations

Recommendation 58	**Class**	**Level of evidence**			
For patients with iliac vein outflow obstruction and severe symptoms/signs, endovascular treatment should be considered, as the first choice treatment.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Neglen, 2007	Retrospective case series	982 patients with iliocaval outflow obstruction	Endovascular reconstruction with stents	None	72- month patency (primary, primary assisted and secondary): NIVL: 79%, 100%, 100% Thrombotic disease: 57%, 80%, 86% Relief of pain 62%, swelling 32% and ulcer 58%
Seager, 2016	Systematic Review	Patients' treatment for iliac outflow obstruction NIVL: 2373 PTS: 2586	Endovascular reconstruction	None	Data too heterogenous for a meta-analysis Patency rates 32-98.7% (primary) and 66-96% (secondary) with complications 0-8.7% and symptom healing in majority Evidence quality 'very low' to 'low'
Williams, 2020	Systematic Review	3812 patients treated for iliac outflow obstruction	Endovascular reconstruction	None	740 dedicated venous stents, 3072 standard stents used Complication <1% Patency rates (primary, primary assisted and secondary) standard stents: 71, 89, 91% Dedicated stents (12 months primary patency rates) NIVL: 95.8%; PTS: 73.4% Level of evidence: low
Rossi, 2018	RCT	51 patients with C3-C6 with >50% iliac vein obstruction on IVUS	Endovascular stent *n* = 26	Best medical therapy *n* = 25	VAS at 6 months: Stent: declined from 8 to 2.5; BMT: declined from 8 to 7 (p<.001) VCSS at 6 months: Stent: declined from 18.5 to 11; BMT: declined from 15 to 14 (p<.001) QoI at 6 months (SF36): Stent: improved from 53.9 to 85.0; BMT: improved from 48.3 to 59.8 (p<.001) High patency rate

NIVL = non thrombotic iliac vein lesion; RCT = randomized controlled trial; PTS = post thrombotic syndrome; IVUS = intravascular ultrasound; OR = odds ratio; CI = confidence interval; BMT = best medical therapy; VAS = visual analogue scale; VCSS = venous clinical severity score; QoL = quality of life

Click here to go back to list of Recommendations

References:

- Neglen P, Hollis KC, Olivier J, Raju S. Stenting of the venous outflow in chronic venous disease: long-term stent-related outcome, clinical, and hemodynamic result. J Vasc Surg 2007;46:979-90.
- Rossi F, Kambara A, Izukawa N, Rodrigues T, Rossi C, Sousa A, et al. Randomized double-blinded study comparing medical treatment versus iliac vein stenting in chronic venous disease. J Vasc Surg Venous Lymphat Disord 2018;6:183-91.
- Seager M, Busuttil A, Dharmarajah B, Davies A. Editor's Choice-- A Systematic Review of Endovenous Stenting in Chronic Venous Disease Secondary to Iliac Vein Obstruction. Eur J Vasc Endovasc Surg 2016;51:100-20.
- Williams Z, Dillavou E. A systematic review of venous stents for iliac and venacaval occlusive disease. J Vasc Surg Venous Lymphat Disord 2020;8:145-53.

Click here to go back to list of Recommendations

Recommendation 60	**Class**	**Level of evidence**			
For patients with iliac vein outflow obstruction suffering from a recalcitrant venous ulcer, severe post-thrombotic syndrome or disabling venous claudication, surgical or hybrid deep venous reconstruction may be considered when endovascular options alone are not appropriate.	**IIb**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Dumantepe, 2019	Retrospective case series	157 patients with severe PTS	Endophlebectomy	None	Three months after treatment: VCSS improved: from 15.3 to 6.1 ± 1.8, *p*<.001; Villalta score improved: from 12.7 to 6.3, *p*<.001; QoL improved by 17.2 points, *p*<.001; Symptom severity scores improved after 20.5 points, *p*<.001 Primary patency: 81% (124/153); Secondary patency: 89.5% (137/153) at 12 months Wound complications related to: groin incision 22.8% (35/153) lymphatic fistulas 28.7% (44/153)

PTS = post thrombotic syndrome; OR = odds ratio; CI = confidence interval; VCSS = venous clinical severity score; QoL = quality of life

Reference:

- Dumantepe M, Aydin S, Ökten M, Karabulut H. Endophlebectomy of the common femoral vein and endovascular iliac vein recanalization for chronic iliofemoral venous occlusion. J Vasc Surg: Venous Lymphat Disord;2020;8:572-82.

Click here to go back to list of Recommendations

Recommendation 64	**Class**	**Level of evidence**			
For patients with extensive axial deep venous incompetence and severe persistent symptoms and signs, where previous management has failed, surgical repair of valvular incompetence may be considered in specialised centres.	**IIb**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Goel 2015	Cochrane review of 4 RCTs	273 patients with primary femoral valve incompetence	Valvuloplasty with treatment of superficial venous incompetence	Treatment of superficial venous incompetence only	Four studies identified of poor quality with no comparable outcomes to allow pooled analysis No studies assessing anything other than valvuloplasty in primary disease No evidence for benefit or harm and trials are of poor quality

OR = odds ratio; CI = confidence interval; RCT = randomised controlled trial

Reference:

- Goel RR, Abidia A, Hardy SC. Surgery for deep venous incompetence. Cochrane Database Syst Rev, 2015 (2), CD001097.

Click here to go back to list of Recommendations

Recommendation 65	**Class**	**Level of evidence**			
For patients with chronic venous disease, caused by combined superficial and deep venous incompetence, treatment of incompetent superficial veins should be considered.	**IIa**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Knipp, 2008	Prospective series	311 patients with symptomatic GSV reflux and DVI in PV or CFV	EVLA GSV	Patients with symptomatic GSV reflux without DVI *n* = 132	VCSS scores improved significantly over time, *p*<.001 Using a fixed-effects model, DVI had no effect on the rate of change of the VCSS (*p*=.572)
Marston, 2008	Retrospective series	75 limbs in patients with symptomatic CVI with both deep and superficial reflux, C3-C6	EVLA GSV or SSV	None	Entire group VFI falling to 2.67±2.3 cc/sec, *p*<.01 Improvement in VCSS 1.9 ± 2.2, *p*<.001 Deep reflux FV and/or PV (40 limbs) VFI improved from 6.2 to 3.3 cc/sec, *p*<.001 VCSS improved from 7.7 to 2.6, *p*<.001 If the MRV in this most distal refluxing deep vein was >10 cm/sec, the improvement in VFI and VCSS were significantly less than in limbs where this was < 10 cm/sec Deep reflux CFV only (35 limbs) VFI improved from 6.5 to 2.2 cc/sec, *p*<.001 VCSS improved from 7.0 to 1.3, *p*<.001 This was independent of MRV in the CFV

OR = odds ratio; CI = confidence interval; GSV = great saphenous vein; DVI = deep vein insufficiency; PV = popliteal vein; CFV = common femoral vein; EVLA = endovenous laser ablation; VCSS = venous clinical severity scores; SSV = small saphenous vein; FVI = venous filling index; FV = femoral vein; PV = popliteal vein; MRV = maximal reflux velocity

References:

- Knipp BS, Blackburn SA, Bloom JR, Fellows E, Laforge W, Pfeifer JR, et al. Endovenous laser ablation: Venous outcomes and thrombotic complications are independent of the presence of deep venous insufficiency. J Vasc Surg 2008;48:1538-45.
- Marston WA, Brabham VW, Mendes R, Berndt D, Weiner M, Keagy B. The importance of deep venous reflux velocity as a determinant of outcome in patients with combined superficial and deep venous reflux treated with endovenous saphenous ablation. J Vasc Surg 2008;48:400-6.

Click here to go back to list of Recommendations

Recommendation 66	**Class**	**Level of evidence**			
For patients with a popliteal vein aneurysm with thromboembolic complications or those that are saccular, fusiform exceeding 20 mm, or containing thrombus, surgical repair should be considered.	**IIa**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Bergqvist, 2006	Systematic review	105 patients with popliteal venous aneurysm	Excision and lateral suture	None	Four fatal cases were reported Follow-up time and results are poorly documented Popliteal venous aneurysm is rare but should be considered as a local source of pulmonary embolism when no other explanation is found
Noppeney, 2019	Retrospective case series	39 patients with popliteal vein aneurysm	Surgery (*n* = 29) or lifelong anticoagulation (*n* = 2) Total *n* = 31	Surveillance *n*= 8	Risk factors for DVT development: Age, *p*=.014 Aneurysm diameter, *p*=.008 Aneurysm size >20 mm, *p*=.029 Turbulent flow on duplex ultrasound, *p*=.001
Sessa, 2000	Retrospective case series	25 patients with popliteal vein aneurysm *n* = 18 (72%) saccular *n* = 10 (40%) containing thrombus	Excision and lateral venorrhaphy *n* = 19 Other techniques *n* = 6	None	Follow up: 63 months (range 11 – 168) No deaths, no recurrent PE. Local thrombosis of the surgical repair in 3 cases. Minor complications in 20%: transient common peroneal nerve palsy (*n* = 2), postoperative hematoma (*n* = 2), and wound infection (*n* = 1) Conclusion: Because of the unpredictable risk of thromboembolic complications, surgical treatment that is accompanied by a low morbidity rate is indicated.

OR = odds ratio; CI = confidence interval; DVT = deep venous thrombosis

References:

- Bergqvist D, Bjorck M, Ljungman C. Popliteal venous aneurysm – a systematic review. World J Surg 2006; 30: 273-9.
- Noppeney T, Kopp R, Pfister K, Schierling W, Noppeney J, Cucuruz B Treatment of popliteal vein aneurysms. J Vasc Surg Venous Lymphat Disord 2019; 7: 535-42.
- Sessa C, Nicolini P, Perrin M, Farah I, Magne J, Guidicelli H. Management of symptomatic and asymptomatic popliteal venous aneurysms: a retrospective analysis of 25 patients and review of the literature. J Vasc Surg 2000;32:902-12.

Click here to go back to list of Recommendations

Recommendation 67	**Class**	**Level of evidence**			
For patients with active venous leg ulceration without infection, the use of local or systemic antibiotics to improve ulcer healing is not recommended.	**III**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
O'Meara, 2014	Cochrane review of 5 RCTs, no meta-analysis performed	233 patients with venous leg ulcers	Systemic antibiotics	Different control groups per study; standard treatment, placebo, or topical agents *n* = not available	More ulcers healed with levamisole (normally used to treat roundworm infection) compared with placebo: RR 1.31 (95% CI 1.06 - 1.62) No differences were detected in terms of complete healing for other comparisons: antibiotics according to antibiogram *vs* standard care, ciprofloxacin *vs* standard care/placebo, trimethoprim *versus* placebo, ciprofloxacin *vs* trimethoprim, amoxicillin *vs* topical povidone-iodine Bacterial resistance developed more frequently with ciprofloxacin compared with standard care or placebo All the RCTs were small and had an overall unclear risk of bias. One RCT restricted patient selection to those with non-infected ulcers at baseline, and the others did not clearly report the baseline ulcer infection status.

OR = odds ratio; CI = confidence interval; RCT = randomised controlled trial

Reference:

- O'Meara S, Al-Kurdi D, Ologun Y, Ovington LG, Martyn-St James M, Richardson R. Antibiotics and antiseptics for venous leg ulcers. Cochrane Database Syst Rev. 2014(1):CD003557.

Click here to go back to list of Recommendations

Recommendation 69	**Class**	**Level of evidence**			
For patients with active venous leg ulceration, compression therapy is recommended to improve ulcer healing.	**I**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
O'Meara, 2012	Cochrane review of 48 RCTs with meta-analysis for some comparisons	4321 patients with venous leg ulcers	Any type of compression bandage system or compression stockings	No compression, or an alternative type of compression *n* = not available	Un-pooled data from 8 RCTs showed ulcer healing outcomes are better with compression compared with no compression Single-component compression bandage systems are less effective than multi-component compression for complete healing at 6 months (one large RCT) Two-component system containing an elastic bandage healed more ulcers at 1 year than one without an elastic component (one small RCT) Three-component systems containing an elastic component healed more ulcers than those without elastic at 3-4M (two RCTs pooled): RR 1.83 (95% CI: 1.26 - 2.67) Meta-analysis of 5 RCTs suggested significantly faster healing with the four-layer bandage than the short stretch bandage: HR 1.31 (95% CI: 1.09 - 1.58) High-compression stockings better healing outcomes than short stretch bandages at 2-4M (four RCTs pooled): RR 1.62 (95% CI: 1.26 - 2.10)

OR = odds ratio; CI = confidence interval; RCT = randomised controlled trial; M = months; RR = relative risk

Reference:

- O'Meara S, Cullum NA, Nelson EA, Dumville JC. Compression for venous leg ulcers (Review). Cochrane Database Syst Rev. 2012 (1):CD000265.

Click here to go back to list of Recommendations

Recommendation 70	**Class**	**Level of evidence**			
For patients with active venous leg ulceration, multilayer or inelastic bandages or adjustable compression garments, exerting a target pressure at least 40 mmHg at the ankle, are recommended to improve ulcer healing.	**I**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
O'Meara, 2012	Cochrane review of 48 RCTs with meta-analysis for some comparisons	4321 patients with venous leg ulcers	Any type of compression bandage system or compression stockings	No compression, or, an alternative type of compression *n* = not available	Un-pooled data from 8 RCTs showed ulcer healing outcomes are better with compression compared with no compression Single-component compression bandage systems are less effective than multi-component compression for complete healing at 6 months (one large RCT) Two-component system containing an elastic bandage healed more ulcers at 1 year than one without an elastic component (one small RCT) Three-component systems containing an elastic component healed more ulcers than those without elastic at 3-4M (two RCTs pooled): RR 1.83 (95% CI 1.26 - 2.67) Meta-analysis of 5 RCTs suggested significantly faster healing with the 4LB than the short stretch bandage: HR 1.31 (95% CI 1.09 - 1.58) High-compression stockings better healing outcomes than SSB at 2-4 months (4 RCTs pooled): RR 1.62 (95% CI 1.26 - 2.10)
Dolibog, 2014	RCT	147 patients both sexes with C6 disease	5 types of compression 1: IPC 60 mmHg, *n* = 28 2: ulcer stocking 30–40 mmHg, *n* = 30 3: MLSSB 45-55 mmHg, *n* = 29 4: 2-layer SSB 20-30 mmHg, *n* = 30		Comparison between groups in terms of healing rate: Groups 1 and 4: 57.14% *vs* 16.66%, *p*=.03 Groups 2 and 4: 56.66% *vs* 16.66%, *p*=.03 Groups 3 and 4: 58.62% *vs* 16.66%, *p*=.03 Groups 1 and 5: 57.14% *vs* 20.00%, *p*=.03 Groups 2 and 5: 56.66% *vs* 20.00%, *p*=.03 Groups 3 and 5: 58.62% *vs* 20.00%, *p*=.03

Click here to go back to list of Recommendations

			5: Unna's boot, *n* = 30		
Mosti, 2020	RCT	66 patients, both sexes, with C6	ACG *n* = 33	IB *n* = 33	Comparison between groups in terms of costs and healing rate. Material cost for every healed patient: 228.46 € for ACG and 380.87 € for IB, *p*<.0001 Healing rate: 78.7% in ACG patients; 69.6% in IB patients, *p* = ns

OR = odds ratio; CI = confidence interval; RCT = randomised controlled trial, IPC = intermittent pneumatic compression; MLSSB = multilayer short stretch bandages; SSB = short stretch bandages; 4LB: four layer bandage; ACG: adjustable compression garments; IB: inelastic bandages; ns: non-significant; RR = relative risk; HR = hazard ratio; M = months

References:

- O'Meara S, Cullum NA, Nelson EA, Dumville JC. Compression for venous leg ulcers (Review). Cochrane Database Syst Rev. 2012 (1):CD000265.
- Dolibog P, Franek A, Taradaj J, Dolibog P, Blaszczak E, Polak A et al. A comparative clinical study on five types of compression therapy in patients with venous leg ulcers. Int J Med Sci 2014; 11:34-43.
- Mosti G, Mancini S, Bruni S, Serantoni S, Gazzabin L, Bucalossi M et al. Adjustable compression wrap devices are cheaper and more effective than inelastic bandages for venous leg ulcer healing. A Multicentric Italian Randomized Clinical Experience. Phlebology 2020;35:124-33.

Click here to go back to list of Recommendations

Recommendation 71	**Class**	**Level of evidence**			
For patients with active venous leg ulceration, superimposed elastic compression stockings exerting a target pressure up to 40 mmHg at the ankle should be considered for small and recent onset ulcers.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Ashby, 2014	RCT	454 patients both sexes with at least 1 VLU of any size > 6 weeks or with previous history of VLU	2-layer hosiery 35-40 mmHg *n* = 230	4-layer bandage, at least 40 mmHg *n* = 224	Median time to ulcer healing was 99 days in the hosiery group and 98 days in the bandage group The proportion of ulcers healing was 70.9% in the hosiery group and 70.4% in the bandage group After adjustment for ulcer area, duration, and mobility with shared centre frailty effects, the HR was 0·99 (95% CI: 0.79–1.25, *p*=.96) The authors conclude that wo-layer compression hosiery is a viable alternative to the four-layer bandage
Jünger, 2004	RCT	134 patients with VLU – treated for 12 weeks	Ulcer stocking *n* = 66 ITT *n* = 61	Compression bandages *n* = 68 ITT *n* = 60	Therapy with the Ulcer Stocking produced a significantly higher rate of complete healing of 47.5% (29/61) *vs* 31.7% (19/60) with bandages, 1-sided *p*=.0129 (95% CI: 4.3% to 28.5%). Mean time to healing was 46 days in both groups.

OR = odds ratio; CI = confidence interval; RCT = randomised controlled trial, VLU = venous leg ulcer; ITT = intention to treat

Reference:

- Ashby RL, Gabe R, Ali S, Adderley U, Bland JM, Cullum NA et al. Clinical and cost-effectiveness of compression hosiery versus compression bandages in treatment of venous leg ulcers (Venous leg Ulcer Study IV, VenUS IV): a randomised controlled trial. Lancet 2014;383:871-9.
- Jünger M, Wollina U, Kohnen R, Rabe E. Efficacy and tolerability of an ulcer compression stocking for therapy of chronic venous ulcer compared with a below-knee compression bandage: results from a prospective, randomized, multicentre trial. Curr Med Res Opin 2004 20:1613-23.

Click here to go back to list of Recommendations

Recommendation 73	**Class**	**Level of evidence**			
For patients with active venous leg ulceration, intermittent pneumatic compression should be considered when other compression options are not available, cannot be used, or have failed to promote ulcer healing.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Alvarez, 2020	RCT	52 patients with hard-to heal VLU >1 year and >20 cm^2	4-layer compression bandage + IPC at 40-50mmHg *n* = 25	4-layer compression bandage *n* = 27	The median time to healing (by 9 months) was 141 days for the IPC-treated group and 211 days for the control group, *p*=.031 The rate of healing was 2.3 mm/day for the group treated with IPC and 1.1 mm/day for the control group, *p*<.05 Compared with subjects treated with compression alone, the group treated with IPC reported less pain at each evaluation point for the first 6 weeks The IPC-treated group had greater reduction in leg oedema (19% *vs* 11%), but this difference was not statistically significant
Dolibog, 2014	RCT	147 patients both sexes with C6 disease	5 types of compression 1: IPC 60 mmHg, *n* = 28 2: ulcer stocking 30–40 mmHg, *n* = 30 3: MLSSB 45-55 mmHg, *n* = 29 4: 2-layer SSB 20-30 mmHg, *n* = 30 5: Unna's boot, *n*= 30		Comparison between groups in terms of healing rate: IPC equally effective as groups 2 and 3 and better compared with groups 4 and 5 (1 *vs* 4: 57.14% *vs.* 16.66%, *p*=.03 and 1 *vs.* 5: 57.14% *vs* 20.00%, *p*=.03)

OR = odds ratio; CI = confidence interval; RCT = randomised controlled trial, VLU = venous leg ulcer; IPC = intermittent pneumatic compression; MLSSB = multilayer short stretch bandages; SSB = short stretch bandages

References:

- Alvarez O, Markowitz L, Parker R, Wendelkem M. Faster healing and a lower rate of recurrence of venous ulcers treated with intermittent pneumatic compression: results of a randomized controlled trial. Eplasty 2020;20:e6.

Click here to go back to list of Recommendations

- Dolibog P, Franek A, Taradaj J, Dolibog P, Blaszczak E, Polak A et al. A comparative clinical study on five types of compression therapy in patients with venous leg ulcers. Int J Med Sci 2014; 11:34-43.

Click here to go back to list of Recommendations

Recommendation 74	**Class**	**Level of evidence**			
For patients with a mixed ulcer due to coexisting arterial and venous disease, modified compression therapy under close clinical supervision, with a compression pressure less than 40 mmHg may be considered, provided the ankle pressure is higher than 60 mmHg.	**IIb**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Mosti, 2016	Retrospective study	180 recalcitrant leg ulcers (RLU) > 6 months with no signs of healing	Pure venous RLU treated with compression > 60 mmHg *n* = 109	Mixed arterial (ABPI 0.5-08) and venous RLU treated with compression <40 mmHg *n* = 71	The maximum healing time was 48 weeks in the pvRLU group and 52 weeks in the mavRLU group, *p*=.009 Median healing time was 25 weeks in the pvRLU group and 28 weeks in the mavRLU group, *p*=.009 Patients with mavRLU tolerated the modified compression very well and did not complain of any compression related discomfort
Stansal, 2018	Retrospective study	25 hospitalized patients with moderate PAOD (ABPI > 0.5, ankle pressure > 70 mmHg, toe pressure > 50 mmHg)	Short stretch bandages 20-30 mmHg		No increase in pain and no ischemic skin changes occurred under compression therapy

OR = odds ratio; CI = confidence interval; RLU = recalcitrant leg ulcer; ABPI = ankle brachial pressure index; pvRLU = pure venous recalcitrant leg ulcers; mavRLU = mixed arterial and venous recalcitrant leg ulcers; PAOD = peripheral arterial occlusive disease

References:

- Mosti G, Cavezzi A, Massimetti G, Partsch H. Recalcitrant Venous Leg Ulcers May Heal by Outpatient Treatment of Venous Disease Even in the Presence of Concomitant Arterial Occlusive Disease. Eur J Vasc Endovasc Surg 2016;52:385-91.
- Stansal A, Tella E, Yannoutsos A, Keita I, Attal R, Gautier V, Sfeir D, Lazareth I, Priollet P. Supervised short-stretch compression therapy in mixed leg ulcers. J Med Vasc 2018;43:225-30.

Click here to go back to list of Recommendations

Recommendation 75	**Class**	**Level of evidence**			
For patients with healed venous leg ulceration, long term compression therapy should be considered to reduce the risk of ulcer recurrence.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Milic, 2018	RCT, 5 years follow-up	308 patients with recently healed VLU	ECS class III *n* = 186	ECS class II *n* = 175	Ulcer recurrence after 5 years: ECS class III: 28.98%, ECS class III 60% (p<.001) Patients in the ECS class III experienced longer absolute (46 *vs.* 40 months, p<.001) and proportional (77% *vs.* 67%; p<.001) ulcer-free time after 5 years than those in the ECS class II
Clarke-Moloney, 2014	RCT, 1 year follow-up	100 patients with healed VLU	ECS class II *n* = 50	ECS class I *n* = 50	Less recurrence rate in control group (p= ns) Non-compliant patients had a higher risk of recurrence (p<.0001)

OR = odds ratio; CI = confidence interval; RCT = randomized controlled trial; VLU = venous leg ulcer; ECS = medical compression stocking

References:

- Milic DJ, Zivic SSA, Bogdanovic DC, Dragan C, Golubovic MD, Lazarevic MV et al. Randomized trial of class 2 and class 3 elastic compression in the prevention of recurrence of venous ulceration. J Vasc Surg Venous Lymphat Disord. 2018;6:717-23.
- Clarke-Moloney M, Keane N, O'Connor V, Ryan MA, Meagher H, Grace PA, et al. Randomised controlled trial comparing European standard class 1 to class 2 compression stockings for ulcer recurrence and patient compliance. Int Wound J 2014;11:404-8.

Click here to go back to list of Recommendations

Recommendation 76	**Class**	**Level of evidence**			
For patients with active venous leg ulceration and superficial venous incompetence, early endovenous ablation is recommended to accelerate ulcer healing.	**I**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Gohel, 2018	RCT	450 patients with active VLU, 6 weeks to 6 months duration with significant superficial reflux	Compression + early endovenous ablation (within 2 weeks of randomisation) *n* = 224	Compression + deferred endovenous ablation (once ulcer healed, or if unhealed at 6 months) *n* = 226	Shorter time to ulcer healing in early intervention group (56 days) compared with deferred group (82 days) HR for ulcer healing 1.38 (95% CI 1.13-1.68, *p*=.001)

OR = odds ratio; CI = confidence interval; RCT = randomized controlled trial; VLU = venous leg ulcer; HR = hazard ratio

Reference:

- Gohel MS, Heatley F, Liu X, Bradbury A, Bulbulia R, Cullum N et al. A Randomized Trial of Early Endovenous Ablation in Venous Ulceration. N Engl J Med. 2018;378:2105-14.

Click here to go back to list of Recommendations

Recommendation 77	**Class**	**Level of evidence**			
For patients with superficial venous incompetence and healed venous leg ulceration, treatment of the incompetent veins is recommended to reduce the risk of ulcer recurrence.	**I**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Gohel, 2020	RCT	450 patients with active VLU, 6 weeks to 6 months duration with significant superficial reflux	Compression + early endovenous ablation (within 2 weeks of randomization) *n* = 224	Compression + deferred endovenous ablation (once ulcer healed, or if unhealed at 6 months) *n* = 226	Ulcers recurred at a lower rate of 0.107 per person year in the early-intervention group compared with 0.162 per person year in the deferred-intervention group (incidence rate ratio 0.658; 95% CI: 0.480-0.898, *p*=.003)
Gohel, 2007	RCT	500 patients with open or recently healed VLU	Compression + superficial venous surgery (stripping or ligation alone if unfit for GA) *n* = 242	Compression only (4- layer bandaging, then class 2 stocking once healed) *n* = 258	Reduced ulcer recurrence at 4 years in compression + surgery group HR 2.93 (95% CI: 1.72-4.13)

OR = odds ratio; CI = confidence interval; RCT = randomized controlled trial; VLU = venous leg ulcer; GA = general anaesthesia; HR = hazard ratio

References:

- Gohel MS, Barwell JR, Taylor M, Chant T, Heather BP, Earnshaw JJ, Mitchell DC, Whyman MR, Poskitt KR. Superficial venous surgery reduces venous ulcer recurrence: long-term results from the ESCHAR trial Br Med J 2007;335:83-8.
- Gohel MS, Mora MSc J, Szigeti M, Epstein DM, Heatley F, Bradbury A et al.. Long-term Clinical and Cost-effectiveness of Early Endovenous Ablation in Venous Ulceration: A Randomized Clinical Trial. JAMA Surg 2020;155:1113-21.

Click here to go back to list of Recommendations

Recommendation 78	**Class**	**Level of evidence**			
For patients with active venous leg ulceration, ablation of the sub-ulcer venous plexus using ultrasound guided foam sclerotherapy should be considered as part of the treatment strategy.	**IIa**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Bush, 2010	Retrospective	VLU of 6-24 months. *n* = 14 patients	TIRS with 1% Sotradecol foam injection into periulcer veins	None	All VLUs healed 6-8 weeks. At 5 years: 7 are ulcer free 4 were ulcer free for > 2 years 1 was ulcer free at 1 year 1 has remaining ulcers
Bush, 2013	Retrospective	C6 *n* = 35 patients	TIRS with foam into periulcer veins	None	90% healed within 4-8 weeks 100% healed at 4 months
Kamhawy, 2020	Prospective	20 VLU	UGFS with Aethoxysklerol 1% foam into periulcer veins.		95% ulcers healed in 8 (3-17) weeks At 1 year: 90% ulcer free (1 recurrence at 19 weeks)

OR = odds ratio; CI = confidence interval; VLU = venous leg ulcer; TIRS = terminal interruption of the reflux source; UGFS = ultrasound guided foam sclerotherapy

Reference:

- Bush RG. New technique to heal venous ulcers: terminal interruption of the reflux source. Perspect Vasc Surg Endovasc Ther 2010;22:194-9.
- Bush R, Bush P. Percutaneous foam sclerotherapy for venous leg ulcers. J Wound Care 2013;22(10 Suppl):S20-22.
- Kamhawy AH, Elbarbary AH, Elhenidy MA, Elwagih AMM. Periulcer foam sclerotherapy injection in chronic venous leg ulcers using near-infrared laser for vein visualisation. Int J Low Extrem Wounds 2020;19:63-9.

Click here to go back to list of Recommendations

Recommendation 79	**Class**	**Level of evidence**			
For patients with superficial venous incompetence and active or healed venous leg ulceration, treatment of incompetent superficial veins is recommended, even in the presence of deep venous incompetence.	**I**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Gohel, 2007	RCT	500 patients with open or recently healed VLU	Compression + superficial venous surgery (stripping or ligation alone if unfit for GA) *n* = 242	Compression only (4- layer bandaging, then class 2 stocking once healed) *n* = 258	Reduced ulcer recurrence at 4 years in compression + surgery group HR 2.93 (95% CI: 1.72-4.13) Benefit also seen in patients with superficial and segmental deep reflux
Gohel, 2018	RCT	450 patients with active VLU, 6 weeks to 6 months duration with significant superficial reflux	Compression + early endovenous ablation (within 2 weeks of randomization) *n* = 224	Compression + deferred endovenous ablation (once ulcer healed, or if unhealed at 6 months) *n* = 226	Shorter time to ulcer healing in early intervention group (56 days) compared with deferred group (82 days HR for ulcer healing 1.38 (95% CI: 1.13-1.68, *p*=.001) Benefit despite presence of deep reflux

OR = odds ratio; CI = confidence interval; VLU = venous leg ulcer; GA = general anaesthesia; HR = hazard ratio

References:

- Gohel MS, Barwell JR, Taylor M, Chant T, Heather BP, Earnshaw JJ, Mitchell DC, Whyman MR, Poskitt KR. Superficial venous surgery reduces venous ulcer recurrence: long-term results from the ESCHAR trial Br Med J 2007;335:83-8.
- Gohel MS, Heatley F, Liu X, Bradbury A, Bulbulia R, Cullum N et al. A Randomized Trial of Early Endovenous Ablation in Venous Ulceration. N Engl J Med. 2018;378:2105-14.

Click here to go back to list of Recommendations

Recommendation 80	**Class**	**Level of evidence**			
For patients with active venous leg ulceration due to superficial venous incompetence and perforating vein incompetence close to the ulcer, concomitant treatment of both truncal reflux and incompetent perforators may be considered.	**IIb**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Van Gent, 2015	Subgroup analysis of RCT	97 legs of 85 patients with VLU > 12 months	SEPS + superficial venous surgery (high ligation +/- stripping)	none	Complete SEPS procedure + superficial surgery lowered the venous ulcer recurrence rate significantly, *p*=.007
Abdul-Haqq, 2013	Retrospective study	108 legs of 95 patients with VLU	EVLA of GSV + perforators *n* = 17 legs	EVLA of GSV only *n* = 91 legs	Ulcer healing was higher (71%) after EVLA of the GSV + perforators, compared with EVLA of the GSV only (33%, *p*=.01)
Gibson, 2020	Single-arm, prospective study	83 patients with advanced skin changes or venous ulcers, C4b, C5, C6 and pathologic PVs (reflux >0.5s, ≥3.5 mm, located near the area of skin disease)	Treatment of pathologic PVs with a 1470-nm laser *n* = 125 PVs	None	Primary closure rates of PVs were 75.7% at 1 month and 71.3% 12 months The percentage of patients with ulcers was 22.9% at screening and 11.1% at 12 months

OR = odds ratio; CI = confidence interval; RCT = randomised controlled trial; VLU = venous leg ulcer; SEPS = subfascial endoscopic perforating vein surgery; EVLA = endovenous laser ablation; GSV = great saphenous vein; PV = perforating vein

References:

- Abdul-Haqq R, Almaroof B, Chen BL, Panneton JM, Parent FN. Endovenous Laser Ablation of Great Saphenous Vein and Perforator Veins Improves Venous Stasis Ulcer Healing. Ann Vasc Surg 2013; 27:932-9.
- van Gent W, Wittens C. Influence of perforating vein surgery in patients with venous ulceration. Phlebology 2015;30:127–32.

Click here to go back to list of Recommendations

- Gibson K, Elias S, Adelman M, Heger ES, Dexter DJ, Vayuvegula S, et al. A prospective safety and effectiveness study using endovenous laser ablation with a 400-µm optical fiber for the treatment of pathologic perforator veins in patients with advanced venous disease (SeCure trial). J Vasc Surg Venous Lymphat Disord. 2020;8:805-13.

Click here to go back to list of Recommendations

Recommendation 81	**Class**	**Level of evidence**			
For patients with active or healed venous leg ulceration and iliac vein outflow obstruction, venous stenting should be considered.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Raju, 2013	Prospective cohort	192 patients with an active VLU	All treated with the same algorithm 1 EVA only 2 Iliac stents + EVA 3 Iliac stents only, depending on diameter saphenous vein and features of proximal obstruction	None	Long-term ulcer healing at 5 year overall was 75%, with no differences between the 3 groups
Yin, 2015	Retrospective cohort, subgroup	30 patients with a VLU and MTS plus superficial venous reflux	Iliac stent + EVLA *n* = 19	EVLA only *n* = 11 (refused stent)	Stent + EVLA Ulcer present in 15.7% before and 2.0% after treatment, *p*=.001 EVLA only Ulcer present in 12.8% before and 5.9% after treatment, *p*=.15
Williams, 2020	Systematic review of 23 studies, no RCTs, 2 prospective and 21 retrospective studies	3812 legs of patients who underwent venous stenting for iliofemoral / iliocaval occlusive and compressive disease	Iliocaval or iliofemoral stenting	None	Ulcer healing rate was 71% in the stented limbs

OR = odds ratio; CI = confidence interval; VLU = venous leg ulcer, EVA = endovenous ablation; MTS = May Thurner Syndrome; EVLA = endovenous laser ablation

References:

- Raju S, Kirk OK, Jones TL. Endovenous management of venous leg ulcers. J Vasc Surg Venous Lymphat Disord 2013;1:165-72.
- Yin M, Shi H, Ye K, Lu X, Li W, Huang X, et al. Clinical Assessment of Endovascular Stenting Compared with Compression Therapy Alone in Post-thrombotic Patients with Iliofemoral Obstruction. Eur J Vasc Endovasc Surg. 2015;50:101-7.
- Williams Z, Dillavou E. A systematic review of venous stents for iliac and venacaval occlusive disease. J Vasc Surg Venous Lymphat Disord 2020;8:145-53.

Click here to go back to list of Recommendations

Recommendation 82	**Class**	**Level of evidence**			
For patients with active venous leg ulceration, micronized purified flavonoid fraction, hydroxyethylrutosides, pentoxifylline, or sulodexide should be considered, as an adjunct to compression and local wound care to improve ulcer healing.	**IIa**	**A**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Coleridge-Smith, 2005	Meta-analysis of 5 RTCs	723 patients with VLU	MPFF and local care (compression and wound care)	Local care (compression and wound care) w/without placebo	At 6 months, the chance of ulcer healing was higher in patients treated with adjunctive MPFF compared with local care only, RRR 32% (95% CI: 3–70%) This difference was present from month 2 RRR 44%, 95% CI:7–94%, and was associated with a shorter time to healing, 16 *versus* 21 weeks, *p*=.003
Scallon, 2013	Cochrane review with meta-analysis of 5 RCTs, 4 with poor reporting, 1 with low risk of bias	723 patients with VLU	MPFF and local care (compression and wound care)	Local care (compression and wound care) w/without placebo	More venous leg ulcers were healed in the MPFF group than in the control group RR 1.36 (95% CI: 1.07-1.74) However, the most rigorously conducted trial, with low risk of bias, did not show any additional benefit of MPFF RR 0.94 (95% CI: 0.73-1.22) Since this trial was unpublished, the possibility of publication bias in trials involving flavonoids must be acknowledged
Scallon, 2013	Cochrane review with meta-analysis of 3 RCTs, all of poor quality	279 patients with VLU	Hydroxyethyl-rutosides and local care (compression and wound care)	Local care (compression and wound care) and placebo	Numbers of ulcers healed higher in the hydroxyethylrutosides group compared with controls RR 1.70 (95% CI: 1.24-2.34)
Jull, 2012	Meta-analysis	864 patients with venous ulcers	Pentoxifylline *n* = 442	Placebo or no treatment	Participants receiving pentoxifylline were more likely to heal their ulcer than those receiving the control treatment (RR 1.70, 95% CI 1.30 to 2.24)
Wu, 2016	Cochrane review with meta-	438 patients with VLU	Sulodexide and local care (compression and wound care)	Local care (compression and wound care) w/without placebo	Proportion of ulcers completely healed was higher (49.4%) in the sulodexide group compared with controls (29.8%) RR 1.66 (95% CI: 1.30-2.12)

Click here to go back to list of Recommendations

	analysis of 3 RCTs		*n* = 233	*n* = 205	

OR = odds ratio; CI = confidence interval; VLU = venous leg ulcer, MPFF = micronized purified flavonoid fraction; RRR = relative risk reduction; RR = relative risk; RCT = randomised controlled rial

References:

- Coleridge-Smith P, Lok C, Ramelet AA. Venous leg ulcer: a meta-analysis of adjunctive therapy with micronized purified flavonoid fraction. Eur J Vasc Endovasc Surg 2005;30:198-208.
- Jull AB, Arroll B, Parag V, Waters J. Pentoxifylline for treating venous leg ulcers. Cochrane Database Syst Rev. 2012(12):CD001733.
- Scallon C, Bell-Syer SE, Aziz Z. Flavonoids for treating venous leg ulcers. Cochrane Database Syst Rev. 2013(5):CD006477.
- Wu B, Lu J, Yang M, Xu T. Sulodexide for treating venous leg ulcers. Cochrane Database Syst Rev. 2016(6):CD010694.

Click here to go back to list of Recommendations

Recommendation 83	**Class**	**Level of evidence**			
For female patients with pelvic pain and a clinical suspicion of pelvic venous disorders, exclusion of other causes of pain is recommended.	**I**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Park, 2004	Prospective case-control study	139 patients clinically suspected of having PCS, all with chronic pelvic pain for more than 6 months 32 patients with PCS based on venography	TVUS, TA DUS, selective venography	Healthy volunteers *n* = 35	With TVUS and TA DUS, in 74 of 139 patients suspected of PCS, pelvic varicoceles were found and other pelvic pathology was excluded, 32 of these 74 patients underwent selective ovarian venography. Pelvic varicoceles were present in all these patients.

PCS = pelvic congestion syndrome; TVUS = transvaginal duplex ultrasound; TA DUS = transabdominal duplex ultrasound; OR = odds ratio; CI = confidence interval

Reference:

- Park SJ, Lim JW, Ko YT, Lee DH, Yoon Y, Oh JH, *et al.* Diagnosis of pelvic congestion syndrome using transabdominal and transvaginal sonography. Am J Roentgenol 2004; 182:683–8.

Click here to go back to list of Recommendations

Recommendation 84	**Class**	**Level of evidence**			
For patients presenting with symptomatic varicose veins where there may be a pelvic origin, specific duplex ultrasound assessment of pelvic escape points is recommended.	**I**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Labropoulos, 2001	prospective	835 limbs with signs and symptoms of CVD	DUS examination of lower-extremity and pelvic escape points	none	Non-saphenous reflux was found in 10% of patients, of which 34% had a reflux arising from pelvic veins.

OR = odds ratio; CI = confidence interval; CVD = chronic venous disease; DUS = duplex ultrasound

Reference:

- Labropoulos N, Tiongson J, Pryor L, Tassiopoulos AK, Kang SS, Mansour MA et al. Nonsaphenous superficial vein reflux. J Vasc Surg 2001;34:872-7

Click here to go back to list of Recommendations

Recommendation 85	**Class**	**Level of evidence**			
For female patients with suspected pelvic venous disorders, abdominal and/or transvaginal ultrasound should be considered to confirm the presence of venous pathology.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Park, 2004	Prospective case- control study	139 patients clinically suspected of having PCS, all had chronic pelvic pain for more than 6 months 32 patients with PCS based on venography	TVUS, TA DUS venography	Healthy volunteers *n* = 35	With TVUS and TA DUS, in 74 of 139 patients suspected of PCS, pelvic varicoceles were found and other pelvic pathology was excluded, 32 of 74 patients underwent selective ovarian venography. Pelvic varicoceles were present in all these patients.
Steenbeek, 2018	Systematic review	Patients with (suspected) PCS *n* = 136	TVUS	Healthy controls *n* = 54	In diagnosing pelvic venous disorders using TVUS: The occurrence of a vein greater than five mm crossing the uterine body had a specificity of 91% (95% CI: 77–98%) The occurrence of pelvic varicoceles had a sensitivity of 100% (95% CI; 89–100%) and a specificity of 83–100% (95% CI; 66–93%)

PCS = pelvic congestion syndrome; TVUS = transvaginal duplex ultrasound; TA DUS = transabdominal duplex ultrasound; OR = odds ratio; CI = confidence interval

References:

- Park SJ, Lim JW, Ko YT, Lee DH, Yoon Y, Oh JH, *et al.* Diagnosis of pelvic congestion syndrome using transabdominal and transvaginal sonography. Am J Roentgenol 2004;182:683–8.
- Steenbeek MP, van der Vleuten CJM, Schultze Kool LJ, Nieboer TE. Noninvasive diagnostic tools for pelvic congestion syndrome: a systematic review. Acta Obstet Gynecol Scand. 2018;97:776-786

Click here to go back to list of Recommendations

Recommendation 86	**Class**	**Level of evidence**			
For patients with varicose veins of pelvic origin without pelvic symptoms requiring treatment, local procedures for varicose veins and related pelvic escape points should be considered, as initial therapeutic approach.	**IIa**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Delfrate, 2019	prospective	273 patients with incompetent pelvic escape points	surgical ligation of pelvic escape points *n* = 273	None	Pelvic escape points recurrence was detected in 2.2% of patients.
Gavrilov, 2017	prospective	44 patients with vulvar VVs	liquid sclerotherapy *n* = 12 AP *n* = 32	None	At 1-year follow-up, a consistent therapeutic and cosmetic effect was noted in 83.3% of patients after sclerotherapy. Vulvar VVs relapsed in 2 patients (16.7%) at 2 and 3 months after sclerotherapy, due to the next pregnancy. No complications after sclerotherapy were observed. At 3-8 years follow-up, no recurrence of vulvar VVs was observed after AP. There were no complications after AP and no occurrence or worsening of the signs of pelvic symptoms.
Castenmiller, 2013	prospective	43 patients with PVI and lower limb and vulvar VVs	Ovarian vein(s) embolization *n* = 43	None	Lower limb VVs disappeared in only 12% of patients after coil embolization of ovarian vein(s) without further treatment. Vulvar VVs disappeared in 88% of patients. Improvement in CEAP classification was found in only 31% of patients.
Creton, 2007	prospective	24 patients with pelvic symptoms of PVI and lower limb VVS of pelvic origin	ovarian or internal iliac vein embolization with VVs AP *n* = 24	None	At 3-year follow-up, 54.4% of patients had lower limb VVs recurrence. The results concerning VVs recurrence are difficult to evaluate and it is difficult to claim that embolization can prevent VVs recurrence.

Click here to go back to list of Recommendations

		3-year follow-up rate was 91.7%			
Hartung, 2015	prospective	119 patients with PVI: 102 patients with lower limb VVS of pelvic origin, 86 patients with CPP	Ovarian or internal iliac vein embolization *n* = 78	None	Mild or moderate improvement of VVS was found in 51%. None had a significant improvement. An additional treatment of VVS was needed in 82% of patients.

OR = odds ratio; CI = confidence interval; AP= ambulatory phlebectomy; CPP= chronic pelvic pain; PVI = pelvic vein incompetence; VVs = varicose veins

References:

- Castenmiller PH, de Leur K, de Jong TE, van der Laan L. Clinical results after coil embolization of the ovarian vein in patients with primary and recurrent lower-limb varices with respect to vulval varices. Phlebology 2013;28:234–238.
- Creton D, Hennequin L, Kohler F, Allaert FA. Embolisation of symptomatic pelvic veins in women presenting with non-saphenous varicose veins of pelvic origin - three-year follow-up. Eur J Vasc Endovasc Surg 2007;34:112-7.
- Delfrate R, Bricchi M, Franceschi C. Minimally-invasive procedure for pelvic leak points in women. Veins and Lymphatics, 2019, Vol 8 No 1:7789
- Gavrilov SG. Vulvar varicosities: diagnosis, treatment, and prevention. Int J Women Health 2017;9:463–75
- Hartung O. Embolization is essential in the treatment of leg varicosities due to pelvic venous insufficiency. Phlebology 2015;30(1S) 81–5.

Click here to go back to list of Recommendations

Recommendation 87	**Class**	**Level of evidence**			
For patients with varicose veins of pelvic origin without pelvic symptoms, pelvic vein embolisation as initial treatment should not be performed.	**III**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Castenmiller, 2013	prospective	43 patients with PVI and lower limb and vulvar VVs	Ovarian vein(s) embolization *n* = 43	None	Lower limb VVs disappeared in only 12% of patients after coil embolization of ovarian vein(s) without further treatment. Vulvar VVs disappeared in 88% of patients. Improvement in CEAP classification was found in only 31% of patients.
Creton, 2007	prospective	24 patients with pelvic symptoms of PVI and lower limb VVS of pelvic origin 3-year follow-up rate was 91.7%	ovarian or internal iliac vein embolization with VVs AP *n* = 24	none	At 3-year follow-up, 54.4% of patients had lower limb VVs recurrence. The results concerning VVs recurrence are difficult to evaluate and it is difficult to claim that embolization can prevent VVs recurrence.
Hartung, 2015	prospective	119 patients with PVI: 102 patients with lower limb VVS of pelvic origin, 86 patients with CPP	Ovarian or internal iliac vein embolization *n* = 78	None	Mild or moderate improvement of VVs was found in only 51%. None had a significant improvement. An additional treatment of VVs was needed in 82%.

OR = odds ratio; CI = confidence interval; CEAP= Clinical Etiological Anatomical Pathophysiological (Classification); CPP= chronic pelvic pain; PVI = pelvic vein incompetence; VVs = varicose veins

References:

- Castenmiller PH, de Leur K, de Jong TE, van der Laan L. Clinical results after coil embolization of the ovarian vein in patients with primary and recurrent lower-limb varices with respect to vulval varices. Phlebology 2013;28:234–8.
- Creton D, Hennequin L, Kohler F, Allaert FA. Embolisation of symptomatic pelvic veins in women presenting with non-saphenous varicose veins of pelvic origin - three-year follow-up. Eur J Vasc Endovasc Surg 2007;34:112-7.
- Hartung O. Embolization is essential in the treatment of leg varicosities due to pelvic venous insufficiency. Phlebology 2015;30(1S) 81–5.

Click here to go back to list of Recommendations

Recommendation 88	**Class**	**Level of evidence**			
For patients with varicose veins of pelvic origin with pelvic symptoms requiring treatment, pelvic vein embolisation should be considered to reduce symptoms.	**IIa**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Brown, 2018	Systematic review; (14 prospective studies)	828 patients with CCP due to PVI	Coil embolisation; *n* = 473 Embolisation with glue; *n* = 60 Isolated ovarian vein sclerosis; *n* = 33 Coil embolisation with sclerotherapy; *n* = 196	None	697 patients (range: 68.3–100%; M: 95.1, IQR Q3–Q1: 17.4) reported some degree of symptomatic improvement. 57 (range: 0–31.7%; M: 4.6, IQR Q3–Q1: 14.2) reported no symptom change. 6 (range: 0–4.1%; M: 0, IQR Q3–Q1: 0) reported worsening of symptoms. Of patients initially reporting symptom improvement, 18 (range: 0–18.2%, M: 2.1, IQR: 5.4) report symptom recurrence occurring over a range from 4 to 12 months. Reported complications range from 0.85 to 10% and were minor without sequelae: 6 cases of vessel perforation, 20 cases of nontarget embolisation, 6 groin hematomas, 1 arrhythmia, 1 internal iliac vein thrombus, and 2 contrast reactions.
Champaneria, 2016	Systematic review; (21 prospective case series, 1 RCT)	1308 patients with CPP due to PVI	embolisation of pelvic vein(s) *n*= 1308	None	Early substantial relief from pain was observed in approximately 75% of women undergoing embolisation. Significant pain reductions following treatment were observed in all studies Transient pain was common following foam embolisation, and there was a < 2% risk of coil migration.
Hartung, 2015	Prospective	119 patients with PVI: 102 patients with lower limb VVs of pelvic origin, 86 patients with CPP	Ovarian or internal iliac vein embolisation *n* = 78	None	CPP was improved in 91% of patient, 60% of patients had no more sings of PVI. Mild or moderate improvement of VVs was found in 51%. None had a significant improvement. An additional treatment of VVs was needed in 82%.

OR = odds ratio; CI = confidence interval; CPP= chronic pelvic pain; PVI = pelvic vein incompetence; VV = varicose vein; RCT = randomised controlled trial; M = median; IQR = interquartile range;

Click here to go back to list of Recommendations

References:

- Brown CL, Rizr M, Alexander R, Sharpe EE, Rochon PJ. Pelvic congestion syndrome: systematic review of treatment success. Semin Intervent Radiol 2018;35:35-40
- Champaneril R, Shah L, Moss J, Gupta JK, Birch J, Middleton L, et al. The relationship between pelvic vein incompetence and chronic pelvic pain in women: systematic reviews of diagnosis and treatment effectiveness. Health Technol Assess 2016;20:1-108.
- Hartung O. Embolization is essential in the treatment of leg varicosities due to pelvic venous insufficiency. Phlebology 2015;30 (1S):81–5.

Click here to go back to list of Recommendations

Recommendation 90	Class	Level of evidence			
For patients with chronic venous disease who have suffered from an episode of acute bleeding of superficial veins or telangiectasias, local foam sclerotherapy should be considered to prevent recurrent bleeding.	IIa	C			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Hamahata, 2011	Retrospective series	5 patients with haemorrhage from varicose veins, F:M=2:3	UGFS with polidocanol 1% followed by UGFS of the refluxing GSV or SSV	None	100% success: no recurrent bleeding after 5 – 41 months
Serra, 2018	Systematic review	17 articles included			Epidemiology and predisposing factors, pathophysiology and forensic aspects and first aid are discussed. Deaths for bleeding due to peripheral venous problems account up to 0.01% of autopsy cases.

OR = odds ratio; CI = confidence interval; F = female; M = male; UGFS = ultrasound guided foam sclerotherapy; GSV = great saphenous vein; SSV = small saphenous vein

References:

- Hamahata A, Yamaki T, Osada A, Fujisawa D, Sakurai H. Foam sclerotherapy for spouting haemorrhage in patients with varicose veins. Eur J Vasc Endovasc Surg 2011;41:856-8.
- Serra R, Ielapi N, Bevacqua E, Rizzuto A, De Caridi G, Massara M, Casella F, Di Mizio G, de Franciscis S. Haemorrhage from varicose veins and varicose ulceration: A systematic review. Int Wound J 2018;15:829-33.

Click here to go back to list of Recommendations

Recommendation 91	**Class**	**Level of evidence**			
For patients with chronic venous disease, who are obese, weight loss should be considered for improving venous outcomes.	**IIa**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Parkyn, 2014	Audit utilising questionnaires	117 patients undergoing bariatric surgery	Bariatric surgery *n*= 117	None	Bariatric surgery significantly lowered the prevalence of symptoms and skin problems in the lower legs
Shaalan, 2021	Retrospective study	123 patients with morbid obesity	Bariatric surgery Group A: *n* = 72	No bariatric surgery Group B: *n* = 51	After one year, outcome regarding CVI had improved in patients of Group A Increased rate of ulcer healing: Charing Cross Venous Ulceration Questionnaire score for group A had decreased 77.5 to 36.8 (*p* = .0001) *vs.* 77.34 to 75.36 (*p* = .13) for Group B. Decreased VCSS from 8.6 to 2.1 in Group A *vs* non-significant changes in Group B. Decreased incidence of venous claudication: in Group A from 8 to 2 (*P* = .036) compared with no changes in group B. Improved quality of life: the mean 36-item short-form heath survey score had increased from 48 ± 6.8 to 81 ± 4.4 (*p* = .001) compared with an increase from 52 ± 8.8 to 59 ± 1.2 (*p* = .52) in group B.

OR = odds ratio; CI = confidence interval; CVI = chronic venous insufficiency; VCSS: venous clinical severity score

Reference:

- Parkyn WR, Chan CY, Van Rij AM. Skin Problems in the Lower Legs of Morbidly Obese Patients and the Possible Role of Bariatric Surgery. J Obes Weight Loss Ther 2014;4:4.
- Shaalan W, El Eman A, Lofty H, Naga A. Clinical and haemodynamic outcome of morbidly obese patients with severe chronic venous insufficiency with and without bariatric surgery: a comparative study. J Vasc Surg Venous Lymphat Disord 2021. doi: 10.1016/j.jvsv.2021.01.005. (online)

Click here to go back to list of Recommendations

Recommendation 92	**Class**	**Level of evidence**			
For obese patients with saphenous trunk incompetence requiring treatment, endovenous ablation should be considered.	**IIa**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Deol, 2020	Retrospective review	49.310 patients C2-C6, with BMI >25 kg/m2	TA +/- phlebectomies +/- UGFS	Patients C2-C6 with BMI ≤ 25 kg/m^2 *n*= 16.019	The % degree of improvement after TA alone was progressively less with increasing BMI with a least degree of improvement for BMI>46 (*p*<.001) Multivariate logistic regression analysis showed that BMI category was a significant independent variable associated with a poor outcome (percentage of change in r-VCSS)

OR = odds ratio; CI = confidence interval; TA = thermal ablation; UGFS = ultrasound guided foam sclerotherapy; BMI = body mass index; r-VCSS = revised venous clinical severity score

Reference:

- Deol ZK, Lakhanpal S, Franzon G, Pappas PJ. Effect of obesity on chronic venous insufficiency treatment outcomes. J Vasc Surg Ven Lymphat Disord 2020;8:617-28.

Click here to go back to list of Recommendations

Recommendation 93	**Class**	**Level of evidence**			
For pregnant women presenting with symptoms and/or signs of chronic venous disease, the use of elastic compression hosiery is recommended.	**I**	**B**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Adamczyk, 2013	RCT	21 pregnant women, CEAP 0,1,2,3	Compression pantyhose *n* = 13	No compression pantyhose *n* = 8	Water plethysmography showed a significantly smaller increase in lower leg volume in pregnant women with compression hosiery, *p*<.05
Saliba,2020	RCT	60 pregnant women (10-15 gestational weeks), CEAP 0,1,2,3	Compression stockings (20-30 mm Hg), knee length, 8 hours daily *n* = 30	No compression stockings *n* = 30	GSV/SSV diameter: a significant decrease in the intervention group (from 0.37 to 0.32 cm, *p*<.0001); a significant increase in the control group (from 0.28 to 0.38, *p*<.0001) reflux >0,5 s in GSV/SSV: no pregnant women in the intervention group; the majority of patients in the control group (53%) The CEAP clinical classification: a discrete worsening of the condition in the intervention group (*p*=.125); a marked worsening in the control group (*p*<.0001) Pain: decreased significantly in the intervention group (73% to 23%; *p*<.0001); increased significantly in the control group (33% to 87%; *p*<.0001) Oedema: decreased in the intervention group (50% to 33%; *p*<.1904); increased significantly in the control group (17% to 70%; *p*<.0001) Heaviness: decreased significantly in the intervention group (67% to 13%; *p*<.0001); increased significantly in the control group (33% to 93%; *p*<.0001)
Thaler, 2001	RCT	42 pregnant women	Group 1: 18-21 mmHg compression stockings on the left leg; 25-32 mmHg stocking on the right	No compression Stockings *n* = 15	GSV reflux at the SFJ was observed in the third trimester in only 1/27 treated women *vs* 4/15 controls (*p*=.047) Compression stocking significantly improved leg symptoms (7/27 *vs* 0/15 controls, *p*=.045) Emergent varicose changes did not differ significantly (7/14 controls *vs* 5/12 in group 1, and 8/14 in group 2; 3x3 table, Fisher's exact = 0.94)

Click here to go back to list of Recommendations

			Group 2: compression classes were reversed *n* = 27		

OR = odds ratio; CI = confidence interval; RCT = randomised controlled trial; GSV = great saphenous vein; SSV = small saphenous vein; SFJ = saphenofemoral junction; CEAP= Clinical Etiological Anatomical Pathophysiological (Classification)

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- Adamczyk A, Krug M, Schnabl S, Häfner HM. Compression therapy during pregnancy: boon or bane? Phlebologie 2013;42:301-7.
- Saliba Junior OA, Rollo HA, Saliba O, Sobreira ML. Graduated compression stockings effects on chronic venous disease signs and symptoms during pregnancy. Phlebology 2020;35:46-55.
- Thaler E, Huch R, Huch A, Zimmermann R. Compression stockings prophylaxis of emergent varicose veins in pregnancy: a prospective randomized controlled study. Swiss Med Wkly 2001;131:659-62.

Click here to go back to list of Recommendations

Recommendation 94	**Class**	**Level of evidence**			
For patients with chronic venous disease, who are on anticoagulants and scheduled to undergo endovenous thermal ablation, interruption of anticoagulation is not recommended.	**III**	**C**			
Reference	**Study type**	**Population**	**Intervention**	**Control group**	**Relevant findings concerning the record**
Westin, 2020	Retrospective cohort	patients on warfarin continued during endovenous treatment *vs* patients not on warfarin	Radiofrequency or laser endovenous ablation of the GSV or SSV *n* = 65 (100 procedures)	Patients not on oral anticoagulation *n* = 89 (127 procedures)	At 18 months, successful ablation was 92% in patients on anticoagulation and 95% in controls, *p*=.96

OR = odds ratio; CI = confidence interval; GSV = great saphenous vein; SSV = small saphenous vein

Reference:

- Westin GG, Cayne NS, Lee V, Ekstroem J, Yau PO, Sadek M et al. Radiofrequency and laser vein ablation for patients receiving warfarin anticoagulation is safe, effective, and durable. J Vasc Surg Venous Lymphat Disord 2020;8:610-6.

Click here to go back to list of Recommendations