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Original article

Cost-effectiveness of traditional and endovenous treatments for varicose veins

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Background: **The aim of this study was to evaluate the cost-effectiveness of traditional and endovenous treatments for patients with primary great saphenous varicose veins.**

Methods: **A Markov model was constructed to compare costs and quality-adjusted life years (QALYs) for great saphenous vein (GSV) reflux. Eight popular treatment strategies were compared up to 5 years. Estimates for the effectiveness of treatments were obtained from published randomized studies and cost values were obtained from published National Health Service (NHS) healthcare resource group tariffs and device manufacturers. Parameter uncertainty was tested using sensitivity analysis and Monte Carlo simulation.**

Results: **Ultrasound-guided foam sclerotherapy (UGFS) had the lowest initial cost, but a higher requirement for further interventions. Day-case surgery (with concomitant treatment of varicosities), endovenous laser ablation (EVLA) and radiofrequency ablation (RFA) performed in an outpatient or office setting (with staged treatment of varicosities) were likely to be cost-effective treatment strategies. The incremental cost-effectiveness ratio (ICER) for UGFS (*versus* conservative care), EVLA (*versus* UGFS) and RFA (*versus* EVLA) were £1366, £5799 and £17 350 per QALY respectively. The ICER for traditional surgery (performed on a day-case basis) was £19 012 compared with RFA. Other strategies were not cost-effective using the NHS threshold of £20 000 per QALY.**

Conclusion: **Day-case surgery or endovenous ablation using EVLA or RFA performed as an outpatient are likely to be cost-effective treatment strategies for patients with primary unilateral GSV reflux requiring treatment.**

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Introduction

Varicose veins affect approximately 25 per cent of the adult population, and complications arising from them are a significant cause of patient morbidity and health service expense[1,2]. The treatment of patients with superficial venous reflux has changed in recent years following the widespread acceptance of minimally invasive, endovenous modalities including ultrasound-guided foam sclerotherapy (UGFS)[3], radiofrequency ablation (RFA)[4] and endovenous laser ablation (EVLA)[5]. Although long-term outcomes for endovenous therapies are awaited, clear technical, clinical and quality-of-life benefits have been reported consistently for these new techniques[6]. Although few randomized trials have shown superiority over traditional surgery, patient acceptance of endovenous therapies is likely to be greater than for ligation and stripping operations[7]. With a wide range of available treatments and few comparative studies, treatment choices are currently made on the basis of local availability and clinician preference, rather than clinical evidence. Moreover, the impression that endovenous, particularly endothermal, therapies may be more expensive than traditional treatments (because of costs of consumable items) has limited their implementation in some National Health Service (NHS) settings.

The identification and use of cost-effective therapies is desirable in all areas of healthcare, but of particular relevance in the treatment of varicose veins. The debate over which patients should be offered treatment for varicose veins is ongoing and patients without skin changes or ulceration may not qualify for treatment within the NHS. These issues are pertinent in the current economic climate where health budgets are likely to be under considerable scrutiny for many years to come. Large numbers of studies have evaluated technical and clinical outcomes following endovenous interventions, but few have assessed health economic outcomes, or the cost-effectiveness of these treatments. A greater understanding of the costs of varicose vein treatment strategies may help to guide service provision and improve consistency in clinical practice when considered in conjunction with clinical and patient-reported outcomes. The aim of this study was to evaluate and compare the cost-effectiveness of traditional and endovenous treatments for patients with primary great saphenous varicose veins.

Methods

Model design and assumptions

The analysis was performed from the perspective of the NHS, and the management of symptomatic patients with primary unilateral great saphenous vein (GSV) reflux was considered. A Markov model was constructed to compare costs and quality-adjusted life years (QALYs) for eight popular treatment strategies (*Table 1*). Details of the model design are shown in *Fig. 1*; the time horizon of the model was 5 years.

Table 1 Popular treatment strategies for great saphenous varicose veins evaluated in the decision model

Strategy	Treatment modality	Location	Type of anaesthesia
A	Traditional GSV surgery	Inpatient	General
B	Traditional GSV surgery	Day case	General
C	UGFS	Office-based	Local
D	EVLA	Office-based	Local/tumescent
E	EVLA	Day case	General
F	RFA	Office-based	Local/tumescent
G	RFA	Day case	General
H	No surgery (conservative care)	Primary care	None

GSV, great saphenous vein; UGFS, ultrasound-guided foam sclerotherapy; EVLA, endovenous laser ablation; RFA, radiofrequency ablation.

The structure of the model is illustrated in *Fig. 1* for the first two intervals (each of 3 months). By 3 months after surgery, one of three outcomes is possible: (1) the initial intervention is considered successful if the GSV is fully occluded and the patient has no residual varicosities; (2) the GSV vein may be completely occluded but there remain residual varicosities; and (3) there is residual reflux or incomplete occlusion of the GSV vein (with or without varicosities). Patients with residual varicosities after initial treatment (with a successfully occluded GSV) were assumed to require at least one treatment of adjuvant foam sclerotherapy in an office or outpatient setting (with 1 in 3 patients requiring a second treatment). All patients with residual or recurrent GSV reflux after initial treatment were treated with one repeat GSV intervention (specific to that treatment strategy). This was assumed to have the same success rate in treating GSV reflux as the primary intervention. All patients treated under general anaesthetic (GA) were treated with concomitant phlebectomy, with the aim of removing varicosities. Patients who were successfully treated at 3 months might develop recurrent GSV reflux (and require a repeat GSV intervention) during any subsequent interval. Recurrence of varicosities after the first 3 months was not included in the model.

Estimates of the effectiveness of treatments

Two recent systematic literature reviews have assessed the effectiveness of varicose vein therapies. In 2009, van den Bos and colleagues[6] estimated the proportion of patients with anatomically successful outcome at 3 months, 1, 3 and 5 years after surgical ligation with stripping (*Table 2*). They considered ultrasound-based outcomes resulting in the obliteration or complete removal of the insufficient vein such as complete occlusion, free of reflux and absence of recurrent varicose vein to be equally successful. From these data, it was estimated that the probability of incomplete occlusion after ligation with stripping was 0·219 (SE 0·020) in the first 3 months and the rate of recurrence of reflux was 0·004 (SE 0·003) per 3 months thereafter. In 2008, Luebke and Brunkwall[8] conducted a systematic review and meta-analysis of randomized clinical trials (RCTs) to estimate the odds ratios for incomplete occlusion of endovenous laser therapy *versus* stripping, RFA *versus* stripping and UGFS *versus* stripping (*Table 3*). The present authors reviewed the studies included by Luebke and Brunkwall[8] and excluded those that were not properly randomized comparisons or did not compare these modalities from the present analysis (*Table 3*). It was assumed that the same odds ratios for occlusion applied to each treatment modality regardless of the location (inpatient, day case

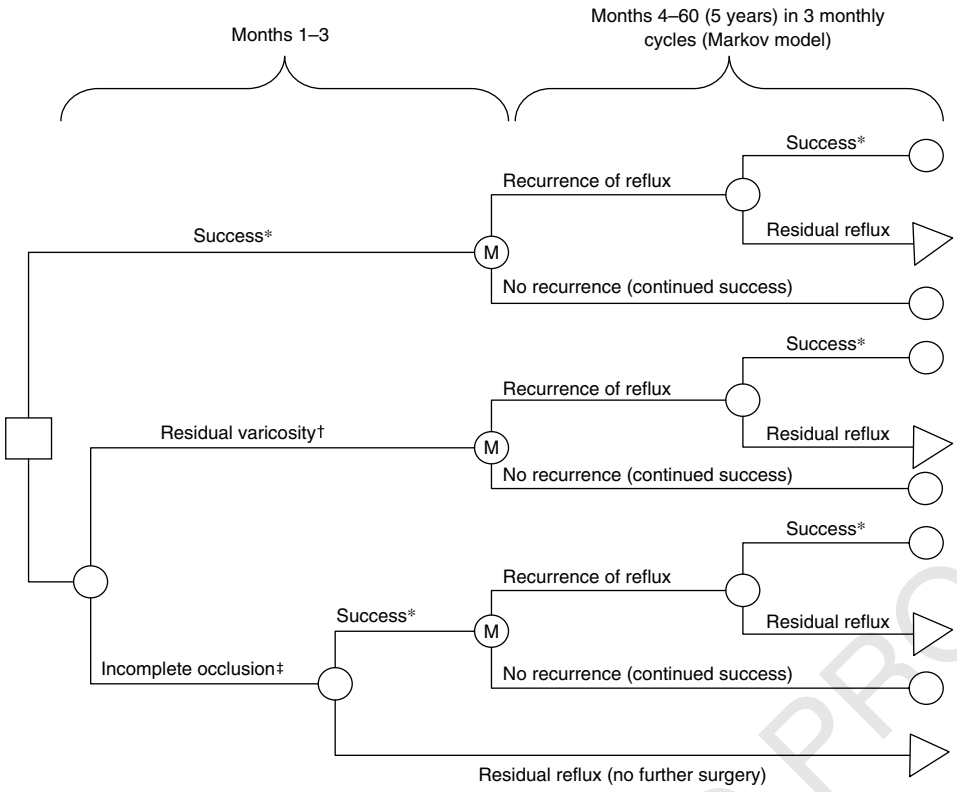

Fig. 1 Structure of the decision model for the management of patients with primary great saphenous vein (GSV) reflux. *Defined as successful GSV occlusion without varicosities. † All patients with residual varicosities offered treatment at 3 months with office-based sessions of ultrasound-guided foam sclerotherapy, assumed to be successful. ‡ All patients with recurrent or residual GSV reflux offered one further treatment, with same probability of success as initial treatment. Squares indicate points where management decisions were made. Circles indicate chance events (M, Markov node). Triangles indicate absorbing states (patients remained in this state until the model ended)

Table 2 Probability of great saphenous vein occlusion after surgical ligation with stripping

Reference	Time after surgery	Probability of GSV occlusion*
van den Bos *et al.*[6] (meta-analysis)	3 months	0·80 (0·72, 0·87)
	1 year	0·80 (0·72, 0·86)
	3 years	0·78 (0·70, 0·84)
	5 years	0·76 (0·68, 0·82)

*After one treatment with occlusion as defined by individual authors in published studies. GSV, great saphenous vein.

or office-based; *Table 1*). A further literature review was undertaken to identify RCTs that compared sequential with concomitant phlebectomy (*Table 4*). Meta-analyses were carried out using STATA® 10 (StataCorp, College Station, Texas, USA). The risks of incomplete occlusion and of residual varicosities are unlikely to be independent. The correlation between these outcomes was estimated by the authors to be 0·40 (range 0·20–0·80). Probabilities of complete treatment success and each of the other outcomes were calculated using the method described by Rodgers and co-workers[23]. The correlation coefficient was varied in the sensitivity analysis.

Costs

Costs were estimated from NHS healthcare resource group (HRG) reference costs 2008–2009[24], supplemented by additional information from device manufacturers and published list prices for the latest available laser and radiofrequency devices (excluding potential discounts) (*Table 5*). The mean NHS cost of a day-case primary varicose vein procedure was £980 and that of an inpatient primary varicose vein procedure was £1583, which was assumed to correspond to the cost of ligation with stripping under GA. Although HRG tariffs represent a mean cost

Table 3 Odds ratio of incomplete occlusion for stripping *versus* ablation or sclerotherapy

	Incomplete occlusion		
Reference	Stripping*	Ablation or sclerotherapy*	Pooled odds ratio
Stripping *versus* EVLA†			0·97 (0·21, 4·43)
de Medieros and Luccas[9]‡	1 of 20	0 of 20	
Rasmussen *et al.*[10]§	2 of 49	3 of 51	
Stripping *versus* RFA			0·84 (0·37, 1·93)
Hinchliffe *et al.*[11]‡	2 of 16	3 of 16	
Lurie *et al.*[12]§	8 of 36	6 of 44	
Perälä *et al.*[13]¶	3 of 13	5 of 15	
Rautio *et al.*[14]¶	1 of 13	0 of 15	
Stotter *et al.*[15]¶	0 of 20	0 of 20	
Stripping *versus* UGFS#			3·01 (1·55, 5·85)
Wright *et al.*[16]¶	13 of 94	58 of 178 (UGFS)	

Values in parentheses are 95 per cent confidence intervals. *Number with event of the total number randomized and available at follow-up. †Belcaro *et al.*[17,18] were excluded from the evidence synthesis because they used ligation without stripping as the comparator surgery; Lurie *et al.*[19] was excluded as the same patients were used in Lurie *et al.*[12]; Kianifard *et al.*[20] was excluded because it was a non-randomized study (patients in the intervention group were compared pairwise with an age- and sex-matched control group). ‡Included only patients with bilateral great saphenous vein (GSV) reflux; each patient was operated on using both the intervention and control, one on each leg, using a lottery to make the choice. §Included unilateral and bilateral GSV interventions; over 85 per cent of patients had unilateral GSV reflux; the unit of analysis was the leg. ¶Included only unilateral GSV interventions. #Bountouroglou *et al.*[21] was excluded because the study compared ultrasound-guided foam sclerotherapy (UGFS) with saphenofemoral ligation *versus* surgery with ligation and stripping. EVLA, endovenous laser ablation; RFA, radiofrequency ablation.

Table 4 Odds ratio of residual varicosity requiring reintervention for sequential *versus* concomitant phlebectomy

	Reintervention for residual varicosity		
Reference	Sequential*	Concomitant*	Pooled odds ratio
Carradice *et al.*[22]†	16 of 24	1 of 25	48·00 (5·50, 422·00)

Values in parentheses are 95 per cent confidence intervals. *Number with event of the total number randomized and available at follow-up. †Included only unilateral great saphenous vein interventions.

over several kinds of varicose vein procedure, these values corresponded fairly closely to day-case and inpatient costs of surgery estimated by other published UK-based studies[21,25], taking account of inflation. The additional costs of RFA and EVLA under GA included the use of the generator, a catheter, plus the staff and equipment costs of using ultrasonography. It was assumed that the costs of RFA and EVLA under local anaesthetic comprised an outpatient attendance (£154) plus the use of the generator, catheter and ultrasound machine, as above. The cost of UGFS was the cost of a vascular surgery outpatient attendance, plus the use of sclerosant and ultrasonography. It was assumed that the cost of conservative care to the NHS was negligible, without the option of future surgery[25].

Health-related quality of life

Health-related quality of life (HRQOL) was measured using the EQ-5D index, where a value of 1 represented full health and 0 a health state that the general population consider to be equivalent to death[26]. In a previous randomized study, the estimated HRQOL using the EQ-5D™ (EuroQol Group, Rotterdam, The Netherlands) was 0·77 (SE 0·02) before traditional varicose vein surgery and 0·87 (SE 0·02) 1 year after surgery, with little change in a comparator group that had conservative care[27]. It was assumed that patients with residual varicosities and incomplete occlusion had the HRQOL of patients before surgery during the time in which the condition was unresolved. Traditional surgery tends to have a longer and more painful recovery than other treatments[10,14]. Based on the results from these studies for •Short Form 36 bodily pain, a diminution of HRQOL of 0·1 was assumed for 2 weeks after traditional surgery.

Cost-effectiveness analysis

The decision model was constructed in Microsoft® Excel (Microsoft Corporation, Mountain View, California, USA). The uncertainty in the mean value of each parameter was represented using a probability distribution and the model was analysed by running 1000 Monte Carlo simulations[28]. The results were presented in two ways. First, mean costs and QALYs over 5 years for the eight strategies were reported and their cost-effectiveness was compared, estimating incremental cost-effectiveness ratios (ICERs) using standard decision rules[29]. Briefly, the alternative strategies were ranked by mean cost. Strategies that were more costly than another but offered no greater

Table 5 Cost items used in model

Cost item	Details	Cost per patient (£)*	Source	Comments
Traditional surgery	Unilateral (inpatient)†	1583 (1172–1922)	NHS costs[10]	
	Unilateral (day case)	980 (706–1196)	NHS costs[10]	
Catheter	EVLA	395	List prices‡	Biolitec AG, Jena, Germany
	RFA	495	List prices‡	VNUS ClosureFAST™ (VNUS™ Medical Technologies, San Jose, California, USA)
Generator	EVLA‡	111	List prices‡	Biolitec 980-nm laser; acquisition cost £9995
	RFA‡	89	List prices‡	VNUS™ Medical Technologies; acquisition cost £7995
Ultrasonography		38	NHS costs[10]	Mobile intraoperative ultrasonography
Outpatient attendance	First attendance	154 (115–168)	NHS costs[10]	Consultant-led multiprofessional clinic
Sclerosant	Fibro-Vein™ 3%	10	List prices§	10 5-ml vials, £102·65

*Values are mean (interquartile range); mean cost per patient was calculated using an annuity formula for the economic cost of depreciation of capital, assuming an asset life of 5 years, 20 patients per year and a discount rate of 3·5 per cent per year. †One overnight stay assumed. ‡Manufacturer's list prices for 2008–2009; §STD Pharmaceutical Products, Hereford, UK, May 2010. NHS, National Health Service; EVLA, endovenous laser ablation; RFA, radiofrequency ablation.

expected benefit were known as 'dominated' and excluded. Strategies that were dominated by a linear combination of other strategies were considered subject to 'extended domination' and were also excluded. ICERs were then calculated for each of the remaining strategies, compared with the next best alternative. The strategy with the lowest ICER may not be the most cost effective. Conventionally in the UK, a strategy is likely to be considered cost effective if the ICER is less than £20 000 per QALY, and unlikely to be considered cost effective •if the ICER is more than £30 000 per QALY[30]. Costs and QALYs were discounted by 3·5 per cent per year[30]. Second, the decision uncertainty was shown as the probability that each intervention was the most cost effective for a given cost-effectiveness threshold[28].

Results

Clinical effectiveness

The results of the pooled meta-analyses of the odds ratios for occlusion from nine RCTs identified by Luebke and Brunkwall[8] are shown in *Tables 3* and *4*. Compared with surgical ligation with stripping, incomplete occlusion tends to be more likely with UGFS, and tends to be less likely with RFA and EVLA, although only the results for UGFS were significant at the 5 per cent level. The RCTs reported results at different intervals of follow-up, from 1 week to 2 years, but the data suggested that the odds ratios for incomplete occlusion did not differ during follow-up. One RCT was identified that reported relative risks of reintervention for residual varicosities after concomitant *versus* sequential phlebectomy (*Table 4*). Sequential phlebectomy was associated with higher rates of secondary intervention[22]. The estimated mean probabilities for each of the outcomes 3 months after treatment are shown in *Table 6*. These estimates changed only slightly in response to different assumptions about the correlation between occlusion and residual varicosity after treatment.

Cost-effectiveness

The initial cost of surgery, cost of reinterventions, total costs, QALYs and ICERs for each strategy are shown in *Table 7*. UGFS has the lowest initial cost, but this was partly offset by the costs of reintervention for recurrent reflux and residual or recurrent varicosities over 5 years. Relative to

Table 6 Estimated probabilities for outcomes at 3 months after treatment

Treatment	Complete occlusion with residual varicosity	Incomplete occlusion (with or without varicosity)	Success (complete occlusion without varicosity)
Surgery (GA)	0·04	0·19	0·77
EVLA (LA)	0·22	0·18	0·60
EVLA (GA)	0·04	0·18	0·77
RFA (LA)	0·22	0·16	0·62
RFA (GA)	0·04	0·16	0·79
UGFS (LA)	0·38	0·47	0·16

GA, general anaesthetic; EVLA, endovenous laser ablation; LA, local anaesthetic; RFA, radiofrequency ablation; UGFS, ultrasound-guided foam sclerotherapy.

Table 7 Results of cost-effectiveness analysis

Treatment	Cost of initial surgery (£)	Reinterventions for residual varicosity at 3 months (£)	Reinterventions for GSV reflux over 5 years (£)	Total cost over 5 years (£)	QALYs over 5 years	Incremental cost (£)	Incremental QALY	ICER per QALY	Probability that treatment is cost-effective at threshold of £20 000 per QALY
Conservative	0	0	0	0	3·522	—	—	—	< 0·01
UGFS (LA)	202	101	125	429	3·836	429	0·314	1366	0·10
EVLA (LA)	698	161	173	1031	3·940	602	0·104	5799	0·35
RFA (LA)	776	166	168	1110	3·944	78	0·005	17 350	0·24
Surgery (DC)	980	12	251	1242	3·951	133	0·007	19 012	0·29
EVLA (GA)	1524	12	380	1915	3·954	—	—	ED	0·01
RFA (GA)	1602	12	351	1964	3·958	722	0·007	100 451	< 0·01
Surgery (IP)	1583	12	405	2000	3·951	—	—	D	0·00

GSV, great saphenous vein; QALY, quality-adjusted life year; ICER, incremental cost-effectiveness ratio; UGFS, ultrasound-guided foam sclerotherapy; LA, local anaesthetic; EVLA, endovenous laser ablation; RFA, radiofrequency ablation; DC, day case; GA, general anaesthetic; ED, extendedly dominated; IP, inpatient; D, dominated.

conservative care (if no alternative treatment was available), all treatments were cost effective. However, in order to identify the most cost-effective strategy (using the National Institute for Health and Clinical Excellence cost-per-QALY threshold), the aim of this study was to perform an incremental cost-effectiveness analysis, assuming that all treatments were feasible strategies.

UGFS had an ICER of about £1400 per QALY relative to conservative care. EVLA (local anaesthetic, LA) had an ICER of about £5800 per QALY relative to UGFS. RFA (LA) had an ICER of £17 350 per QALY relative to EVLA (LA), and the ICER for day-case surgery *versus* RFA (LA) was about £19 000 per QALY. The ICER for RFA (GA) *versus* day-case surgery was more than £100 000 per QALY. Other treatments were dominated or extendedly dominated, and not cost effective on average at any cost-per-QALY threshold.

Fig. 2 shows that there is considerable uncertainty surrounding these results. At a threshold of £20 000 per QALY, the probability that EVLA (LA) was cost effective was 0·35, the probability for RFA (LA) was 0·24, and that for day-case surgery 0·29; the probabilities that the other treatments were cost effective were very low. Univariable sensitivity analyses were performed on plausible values of the uncertain parameters, including the costs of the alternatives and their relative effectiveness in terms of GSV reflux and residual varicosities. Results were substantially changed compared with the base case in four of these scenarios.

First, if the probability of occlusion of the GSV 3 months after UGFS was the same as that for surgery (odds ratios of 1·00), then UGFS was cost effective, with an ICER of about £1000 per QALY *versus* conservative care, and other treatments were not cost effective.

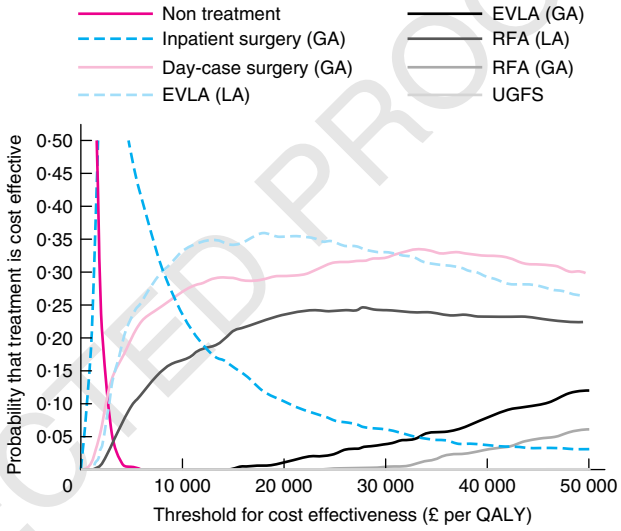

Fig. 2 Probability● that each treatment is cost effective for different threshold costs per quality-adjusted life year (QALY). GA, general anaesthetic; EVLA, endovenous laser ablation; LA, local anaesthetic; RFA, radiofrequency ablation; UGFS, ultrasound-guided foam sclerotherapy

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Second, if the odds ratio of a reintervention for residual varicose vein after sequential *versus* concomitant phlebotomy was 5·50 (the lower value of the 95 per cent confidence interval of the odds ratio), then UGFS, RFA (LA) and EVLA (LA) were approximately equally likely to be cost effective and day-case surgery was dominated (fewer QALYs and greater cost).

Third, if the cost of day-case surgery was £700, then day-case surgery was the most cost-effective strategy, with an ICER of about £4000 per QALY *versus* UGFS.

Fourth, if the cost of day-case surgery was £1200, the ICER for surgery increased to £58 000 per QALY, and UGFS, RFA (LA) and EVLA (LA) were about equally likely to be cost effective.

Discussion

This study suggested that either RFA or EVLA, performed under local/tumescent anaesthesia in an outpatient or office-based setting, or day-case traditional GSV surgery were likely to be cost-effective strategies for the treatment of primary GSV reflux at a conventional threshold for a cost per QALY in the UK. Interestingly, despite the perceived high costs of EVLA and RFA, both of these treatments were likely to be as cost effective as traditional GSV surgery when performed in an office-based setting, with staged foam sclerotherapy for residual varicosities. Both EVLA and RFA are promoted as being ideal for office-based ambulatory procedures and a recent survey[31] showed that the majority of venous specialists offer endovenous ablation procedures using only local or tumescent anaesthesia. In published randomized studies, RFA and EVLA had similar rates of occlusion compared with traditional surgery, and the initial cost savings were only partly offset by higher costs of reinterventions for residual varicosities. In this model, the presence of residual or recurrent varicosities had only a modest impact on HRQOL, as it was assumed that reinterventions for varicosities after the initial surgery were undertaken promptly and successfully in outpatient clinics. Concomitant phlebectomy may be performed under local/tumescent anaesthesia[22] and, although this specific treatment strategy was not evaluated in the present study, it would seem logical to assume that even greater economic advantages may be present with this approach.

UGFS was the least expensive initial cost, but this advantage was partly offset by high expected rates of reintervention at 3 months for residual reflux or varicosities, with a corresponding loss in HRQOL for the patient, and cost to the health service. Although the ICER was lowest, at less than £1400 per QALY, other treatments may offer greater expected benefits for the additional cost and may be considered better value for money. Consequently, in the base-case analysis UGFS had a low probability of being cost effective. This conclusion was based on the results of a single RCT[16] which showed that foam sclerotherapy was less effective in occluding the GSV than surgery; UGFS would be cost effective if the strategies were equally effective for this outcome. Potential cerebral and other complications of UGFS have received considerable recent publicity[32,33], although the cost or quality-of-life impact of these were not considered in the present model.

Unilateral endothermal ablation may also be performed under GA, allowing additional phlebectomies for prominent varicosities. However, the additional costs of laser or radiofrequency consumables mean that this approach is probably more expensive than traditional venous surgery. Although the model found that endothermal ablation under GA was not cost effective on average, some patients may be best treated with unilateral GSV intervention under GA, particularly when multiple venous segments require ablation, there are large numbers of superficial varicosities or the patient is averse to treatment under LA. Although individual practice varies between venous specialists, bilateral endothermal ablation under LA alone is not commonly performed. As both legs may be treated at the same time (including phlebectomy for varicosities) and the costs of multiple treatment visits may be avoided, the cost-effectiveness of superficial venous interventions under GA may be greatest in patients who need bilateral surgery or ablation of multiple venous segments. In view of the lack of published studies, the cost-effectiveness of bilateral treatment was not modelled in the present study.

It should be recognized that economic modelling has limitations arising from the assumptions required and uncertainty in the data. Although eight commonly offered treatment strategies for GSV reflux were assessed in this model, others may be used. Moreover, as the published studies used numerous different laser and radiofrequency devices, with different definitions of treatment success, there was considerable heterogeneity in the data combined to generate the probability estimates. This model did not consider the recurrence of varicosities beyond 3 months, but did take account of recurrent GSV reflux. Recurrent varicosities alone (without GSV reflux, excluding *de novo* small saphenous vein reflux) are uncommon, and would be unlikely to affect the conclusions of this analysis. The unit cost data may not be representative, particularly as many institutions may have negotiated reduced consumable prices with device manufacturers. However, reductions in the costs of EVLA and RFA consumables will further increase the cost-effectiveness of these interventions. This model made inferences only about the relative effectiveness of treatments based on RCT evidence[30], addressing the major methodological weakness of other comparative reviews[6,8]. However, there is a lack of large RCTs comparing traditional and endovenous interventions. The available RCTs have compared EVLA or UGFS or RFA with traditional surgery, requiring indirect comparisons between the treatments[34]. A large Health Technology Assessment-funded multicentre randomized

study comparing traditional surgery, EVLA and foam sclerotherapy (Comparison of LAser, Surgery and foam Sclerotherapy, CLASS study)[35] is currently recruiting, and may help to address some of these deficiencies.

The cost-effectiveness of varicose vein surgery varies widely, depending on the choice of treatment and location. Despite initial concerns about the expense of EVLA and RFA treatments, these interventions are likely to be cost effective at the conventional threshold of the cost per QALY in the UK when offered as an outpatient procedure. Day-case surgery is also likely to be cost effective. There is greater uncertainty about UGFS and further comparative trials are needed. Inpatient surgery and endothermal ablation performed under GA are unlikely to be cost effective for treating unilateral primary GSV reflux except in specific circumstances.

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Commentary

Cost-effectiveness of traditional and endovenous treatments for varicose veins (*Br J Surg* 2010; ??: ????–????)

This investigation of the costs of varicose vein treatments is a very useful analysis of the factors that contribute to the hospital costs of treatment. It is clear that saphenous stripping and phlebectomies is one of the more expensive options, with no clear advantages as far as the long-term outcome is concerned. This study did not include the potential societal costs of treatment for varicose veins – only the costs of treatment and benefit to health were analysed. The different treatments may lead to greatly differing times away from work, especially when comparing the most and least invasive treatments. Absence from work in the range of 1–4 weeks following surgical treatment has been reported in several studies, whereas minimally invasive treatments usually lead to absence from work of a few days. Failure to consider such costs does not fully reflect the advantage of less invasive treatments.

AQ1 The authors acknowledge that many of the crucial parameters in their model have wide ranges reported in published literature. They have analysed the effect of using a range of values. This results in substantially different conclusions being reached depending upon the initial assumptions. Thus, •it all hinges on the reliability of the information in *Table 6*, where each treatment strategy is compared concerning its 3-month outcome. In fact, all the data are very similar except for that for ultrasound-guided foam sclerotherapy (UGFS). So why is the outcome here so poor? The authors have referred to AQ2 the paper by Wright and colleagues[1], which is one of few randomized controlled trials comparing UGFS with surgery. In fact, the data used by the authors (•UGFS 68 per cent, surgery 87 per cent success rate at 3 months) represent only half

of the study – that performed by surgeons. When sclerotherapists performed the foam sclerotherapy (in the same study) they obtained 94 per cent occlusion with foam and 88 per cent with liquid at 3 months. Data from clinical series published recently by Coleridge Smith[2] and Darvall and co-workers[3] showed 12-month occlusion of saphenous trunks and freedom from varices in 90–95 per cent of cases. The authors have therefore been inadvertently disingenuous about the outcome of foam sclerotherapy. Surgeons naive to the methods of UGFS may have poor results, but skilled practitioners can equal or exceed the reported outcomes of surgery, laser and radiofrequency ablation.

I would recommend assuming that all treatments achieve the same clinical success rate, thus substantially modifying the existing conclusions in this paper.

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Queries from the Copyeditor:

AQ1 By "Thus, it all hinges.", do you mean: "Thus, the validity of the conclusions depends upon the reliability of the information. . ."?

AQ2 These data (UGFS 68 per cent, surgery 87 per cent success rate at 3 months) do not appear to be given in the paper by Gohel *et al*. Please check with data in the proof (?Table 6).

AQ3 Proofreader: As the author was unable to tell from the original papers which version of SF-36 had been used, I have just used the full version without the name of the "manufacturer" (Alex).

AQ4 Should this be ". . . if the ICER is more than £20 000 per QALY[30]"?

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