Adoption of endovenous laser treatment as the primary treatment modality for varicose veins: the Auckland City Hospital experience

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Abstract

Aim To assess the effectiveness of adopting endovenous laser treatment (EVLT) as the primary treatment modality for varicose veins at Auckland City Hospital (Auckland, New Zealand).

Methods The outcomes of 354 consecutive EVLT procedures performed between 2007 and 2013 were reviewed. Data was collected from a prospectively maintained procedural database and by retrospective chart review.

Results Of the 319 patients who had an ultrasound, at 1 month post-procedure there was a saphenous vein occlusion rate of 96%. Side effects were minimal with no cases of DVT or skin burns and one case of self-limiting neuralgia. The procedure was well tolerated with a median pain score of 3. Since the adoption of EVLT there has been a large increase in the number of patients treated for varicose veins (28 in 2007 compared to 176 in 2013).

Conclusions EVLT is a safe and effective treatment for varicose veins and its adoption has allowed a large increase in the number of varicose vein patients treated at Auckland City Hospital.

Varicose veins are a very common complaint. Various studies have estimated the incidence to be between 20 and 40% in Western populations.1,2 Numerous studies have shown significant improvement in the quality of life in patients who have had their varicose veins treated.3,4

Traditionally public hospitals have struggled to treat adequate numbers of patients with varicose veins. There are numerous potential reasons for this, but perhaps the most significant is the difficulty varicose vein patients have in “competing” for precious operating-room time with other patients who have “life or limb” threatening conditions.

For many years, varicose veins have been treated by surgical stripping in an operating room environment. Numerous randomised trials have now been published establishing that endovenous ablation of varicose veins (using either radiofrequency or laser energy) produces similar short and medium term results to surgery.5-8 Generally endovenous procedures are associated with less postoperative pain and a faster recovery time. These procedures can also be performed in the office or a “procedure room” type environment under local anaesthesia without sedation.

The aim of this paper is to describe the results of the Auckland Regional Vascular Service following adoption of endovenous laser treatment (EVLT) as the primary treatment modality for varicose veins.
Methods

All patients who underwent EVLT at Auckland City Hospital since the adoption of the procedure in July 2007 until 31 December 2013 were included. Patient information and procedural details were retrieved from a prospectively maintained procedural database. Additional information was obtained retrospectively by reviewing patients’ electronic medical records.

Results were tabulated using Microsoft Excel software. Institutional ethical protocols were adhered to. In general only patients with secondary complications of their varicose veins, e.g. ulceration, skin changes, bleeding thrombophlebitis, or eczema are offered treatment at Auckland City Hospital. No formal prioritisation tools are used. Since the adoption of EVLT, surgery is reserved for patients who are anatomically unsuitable for EVLT (e.g. tortuous or very large veins) or who are unwilling or unable to have local anaesthetic procedure.

In brief the procedure consists of a local anaesthetic puncture of the saphenous vein (usually below the knee at the mid-calf level) under ultrasound guidance. A 4Fr sheath is placed inside the vein and the laser fibre is introduced and positioned just distal to the saphenofemoral junction under ultrasound guidance. Local tumescent anaesthesia (500 ml of cold normal saline mixed with 10 ml of 8.4% bicarbonate and 20 ml of 2% lignocaine with adrenaline 1:200,000) is injected around the treated length of the saphenous vein.

The laser fibre is activated and slowly pulled back. No sedation is given for the procedure. In general calf varicosities were not directly treated at the time of EVLT with the intention being to perform top-up foam sclerotherapy at subsequent follow-up appointments if the patient has persistent symptoms.

EVLT is exclusively performed in a procedure room on the vascular ward and the only staff present for the procedure are the operator and the nurse assistant. Patients are discharged approximately 30 minutes after the procedure in a below knee TED stocking with instructions to walk regularly. No DVT prophylaxis is used.

Results

During the study period there was 354 EVLT procedures scheduled. Eleven patients did not complete the EVLT procedure as planned. The reasons for this included inability to cannulate the saphenous vein due to vessel spasm (5 patients), inability to pass the laser fibre up the saphenous vein due to webs from previous thrombophlebitis (2 patients), inability to tolerate a local anaesthetic procedure (2 patients), and EVLT deemed an inappropriate treatment modality (2 patients).

Of the 11 patients who did not have EVLT as planned 4 returned at another date for successful EVLT, 4 had surgery, 1 had sclerotherapy, 2 were managed conservatively and 1 patient moved out of area while awaiting surgery.

Figure 1 compares the number of endovenous and surgical procedures for varicose veins over time at Auckland City Hospital. During the study period 7 patients were also treated by endovenous mechanic-chemical ablation using the ClariVein® device.
The median age of patients scheduled for EVLT was 50 (range 17–86). The male to female ratio was 1:1.1 (171:183).

Figure 2 shows the distribution of ethnicities. The indications for intervention are listed in Table 1.
Table 1. Indications for endovenous laser treatment (EVLT)

<table>
<thead>
<tr>
<th>Indication for intervention</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain, bleeding, thrombophlebitis</td>
<td>120 (34)</td>
</tr>
<tr>
<td>Leg Swelling</td>
<td>38 (11)</td>
</tr>
<tr>
<td>Skin changes</td>
<td>100 (28)</td>
</tr>
<tr>
<td>Venous ulcer (healed)</td>
<td>67 (19)</td>
</tr>
<tr>
<td>Venous ulcer (active)</td>
<td>29 (8)</td>
</tr>
</tbody>
</table>

The great saphenous vein (GSV) was the most commonly treated vein. 332 patients had their GSV alone treated. 19 patients had their short saphenous vein alone treated and 3 patients had an accessory saphenous vein alone treated. Three patients had a short saphenous vein treated at the same time as their GSV and one patient had an accessory saphenous vein treated at the same time as their GSV. Only 1 patient had bilateral GSVs treated simultaneously.

The median length of vein treated was 44 cm (range 2–78 cm). The average joules of laser energy delivered per cm of vein was 56 J. Pain score data was available for 310 patients. The median pain score was 3 (range 0–10). The median volume of tumescent anaesthesia used was 200 ml (range 50–500 ml). Four patients had ambulatory phlebectomies done at the same time as the primary EVLT procedure. 36 patients (10%) had post-procedure sclerotherapy for residual varicosities. All EVLT procedures were performed by three operators (141, 110 and 99 procedures each).

327 patients had a follow up ultrasound post EVLT. Of these 313 (96%) had ultrasound confirmed occlusion of their saphenous vein. Of the 14 completed but unsuccessful procedures 6 were in fact partially successful, i.e. there was partial occlusion of the saphenous vein but not within 5 cm of the saphenofemoral junction so they were classified as non-occlusion. These 6 patients all had resolution of their symptoms so are all being managed expectantly.

Of the remaining 7 unsuccessful procedures 2 patients are being managed conservatively, 1 patient has been successfully re-treated with EVLT, 2 patients who each had two unsuccessful EVLT procedures on the same leg have undergone successful surgery and 1 patient who also had two unsuccessful EVLT procedures is being managed conservatively. One patient fully recanalized his GSV associated with recurrent symptoms 5 years after the original procedure. He has subsequently been successfully treated with surgical stripping.

No patient is known to have had a post-procedural deep vein thrombosis or pulmonary embolus. Two patients were treated with brief periods of low molecular weight heparin for thrombus in the GSV protruding slightly into the common femoral vein. No patients were readmitted to the vascular service with wound infections or skin burns.

The authors are not aware of any cases of saphenous neuralgia complicating the EVLT procedure in this series. One patient did develop a sural nerve neuralgia with paraesthesia and numbness along the lateral border of her foot after EVLT of the short saphenous vein. This resolved spontaneously after 3 months.
Discussion

Treatment of symptomatic varicose veins results in a significant improvement in patients’ quality of life and in certain patients can avoid morbid complications such as skin ulceration.\textsuperscript{1,2} However traditionally in New Zealand varicose vein treatment have been afforded a low priority in the public health care system with only a fraction of patients who may benefit from treatment of their varicose veins receiving treatment. This is well demonstrated by the low number of varicose vein surgeries performed at Auckland City Hospital between 2006 and 2008 as shown in Figure 1.

There was one spike in the number of surgical treatments performed in 2009 when a locum general surgeon was contracted to perform day case varicose vein surgery in an attempt to rectify this situation. Subsequent to this EVLT was adopted as primary treatment modality for varicose veins. Initially, due to staffing and equipment availability issues the number of EVLT cases performed was low, but since these were rectified in around 2011 there has been a large and sustained increase in the number of EVLT cases at Auckland City Hospital.

The primary advantage of EVLT from a service delivery perspective is that an operating room environment is not required. EVLT is performed in a procedure room purely under local anaesthetic with no sedation with one operator and a nurse assistant as a day case procedure. It overcomes the primary limiting factor for public hospital patients accessing varicose vein treatments—access to the operating theatre and its attached resources; anaesthesia, anaesthetic tech support, theatre nurses, surgical assistants, recovery nurses, preoperative nurses and postoperative ward beds. A shortage of any one of which can result in cancellation of surgical cases.

Although a cost-effectiveness study has not demonstrated superiority EVLT over surgery—primarily due to the initial capital costs of buying a laser machine, ultrasound machine and the ongoing costs disposables with each laser case (laser fibre, wires and sheaths etc) there is no doubt that in the Auckland City Hospital environment it provides improved access to treatment.\textsuperscript{9}

This improved access to treatment does not come at the cost of decreased quality of treatment. Numerous randomised controlled trials (RCTs) have demonstrated similar treatment effectiveness between surgery and EVLT with most demonstrating EVLT (and RFA) have less postoperative pain and a faster return to normal activities.\textsuperscript{5–8}

Our results, although limited by a short duration of follow up, indicate the procedure is effective and safe. Our occlusion rates of 96% are comparable to other studies such as the 99% by Myers\textsuperscript{10} and 92% by Darwood.\textsuperscript{6}

As this study is a retrospective audit rather than a prospective study we have limited information on long-term effectiveness. So far only one patient has developed clinical recurrence requiring re-treatment (with surgical stripping). Undoubtedly more patients will have varicose vein recurrence if long-term ultrasound surveillance is performed but this would be very expensive and probably futile as patients would only receive re-treatment if they have clinical symptoms justifying this.

Our complication rates are very low with no cases of DVT, skin burns, or saphenous neuralgia. However because these complications were collected through a retrospective chart review it is possible we may be under-estimating their incidence.
Our complication rates compare well to Molls’ RCT which also had no cases of DVT or skin burns but a 5% (3/60) incidence of saphenous neuralgia. Carradices’ series of 232 patients undergoing EVLT also had a 0% DVT rate and 2.1% incidence of sensory disturbance.

Although not specifically recorded some patients did develop a marked thrombophlebitis causing some prolonged postoperative discomfort and requiring an extended period of anti-inflammatory treatment. This complication was often mistakenly diagnosed as infection by the primary care doctor due to the redness along the course of the saphenous vein.

Despite being performed under local anaesthetic with no sedation EVLT is well tolerated. The median pain score was 3 with only 9 patients (2.5%) rating their pain as 8 or greater. In two patients the procedure was unable to be completed due to discomfort, one of whom was a 17-year-old boy. Both subsequently had surgical stripping under general anaesthesia.

The treatment of calf varicosities during endovenous saphenous vein ablations remains an area of controversy. Surgical saphenous vein stripping is usually accompanied by multiple stab avulsions to remove with branch varicosities. With EVLT the options to deal with these include immediate or delayed foam sclerotherapy or immediate or delayed ambulatory phlebectomies. Only 10% of our patients had post-procedural foam sclerotherapy. This is a much lower rate of secondary intervention than for example in Cheeters RCT comparing immediate to delayed ambulatory phlebectomy where 67% of patients needed secondary intervention for the calf varicosities.

Our experience is that treatment of saphenous vein reflux abolishes most of the venous hypertension in the leg with effective treatment of patients’ symptoms, including ulceration and skin changes. We believe that, in most patients, residual branch varicosities are of cosmetic significance only and therefore their treatment cannot usually be justified in the public healthcare system.

The importance of improved access to varicose vein treatment in the public hospital setting provided by EVLT cannot be overstated. Most of our patients were treated for “medically complicated varicose veins (i.e. not just pain symptoms). In fact 27% of our patients had either a current or healed venous ulcer as their indication for EVLT (Table 1). The effects of leg ulceration on patient’s quality of life and the cost to the community are well known. In the United States the estimated annual cost for treating venous ulcers is between $1.9 and $2.5 billion. It is also important to note that over 30% of our patients treated by EVLT are of Māori or Pacific Island origin. These patient groups make up only 19% of the Auckland District Health Board catchment area. It could be assumed that the rates of private health insurance in these groups are lower than the general population. This emphasises the importance of the public health system in providing access to varicose vein treatments for Māori and Pacific Islanders.

In conclusion, EVLT is a safe and effective way to treat varicose veins at Auckland City Hospital. It has also allowed improved access to treatment for patients with venous disease by moving the treatment location from the operating room. For these reasons we believe all public hospitals in New Zealand should consider adopting
endovenous ablation techniques as their primary treatment modality for varicose veins.

**Competing interests:** Nil.

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**Acknowledgements:** The authors thank Russell Bourchier (Vascular Surgeon Auckland City Hospital), Brendan Buckley (Interventional Radiologist, Auckland City Hospital), and Kara Hamilton (Vascular Ward Charge Nurse, Auckland City Hospital) for their assistance.

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**References:**

