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Case Report

Modified High Ligation of the Sapheno-Popliteal-Junction (SPJ)

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Abstract

Background: Endovenous ablation techniques were reported to be superior to surgery in the treatment of symptomatic varicose small saphenous vein. The purpose of this retrospective analysis is to demonstrate success, complication, and recurrence rates after modified high ligation of the Sapheno-Popliteal Junction (SPJ) and segmental excision of symptomatic incompetent and dilated Small Saphenous Vein (SSV).

Methods: We performed preoperative duplex ultrasound scanning und marking of the SPJ and incompetent and dilated small saphenous vein in 94 patients, 37 females, and 57 males. All patients underwent modified (without flush ligation) high ligation of the SPJ and segmental excision of the SSV.

Results: In 121 limbs with a preoperative duplex ultrasound scan (DUS) confirmed mean diameter (0,73 cm left SPJ; 0,75 cm right SPJ) of the SSV modified high ligation and segmental excision were performed. There were no intraoperative complications. There was evidence of phlebosclerosis in all histological evaluations (95% of all operations). There were no major postoperative complications, no DVT, wound infection, sural nerve damage. Minor temporary paresthesia occurred in 6,6%, ecchymosis in 15,7%. Clinical recurrence rate and DUS verified reflux occurred in 4 cases (3,3%). The mean follow-up was 32,8 months (range 1-145 months).

Conclusions: Modified high ligation of the SPJ and segmental excision of varicose small saphenous vein represents an effective alternative to more invasive techniques in open surgery and endovenous techniques.

Keywords: Complication; High ligation; Neural injury; Sapheno-popliteal junction; Small saphenous vein

Introduction

Chronic Venous Insufficiency (CVI), one of the most frequent disorders, affects women more than men [1]. The significance of the Small Saphenous Vein (SSV) for the development of CVI is not fully recognized [2]. Endovenous Laser Ablation (EVLA), Radiofrequency Ablation (RFA), and Ultrasound-Guided-Foam Sclerotherapy (UGFS) are considered to be superior in technical success, complication, and recurrence rates [3,4]. Nerve injury is the leading cause medicolegal claims [5]. Since operations on the Sapheno-Popliteal-Junction (SPJ) show a higher risk for vascular and neural injury, flush ligation of the SPJ should not be enforced; endothelial closure by non-absorbable suture and electro cauterization may avoid neovascularization and recurrence [6,7]. The aim of this retrospective investigation was to analyze the success, complication, and recurrence rates after modified High-Ligation (HL) and segmental excision in symptomatic SPJ and SSV incompetence.

Materials and Methods

Each patient with symptomatic incompetent and dilated SSV (C2-4) was clinically assessed by the same surgeon between 2007-2018. Patients underwent venous Duplex Ultrasound Scanning (DUS) in an outpatient setting. Reflux was defined as a reversed flow for greater than 0,5 seconds after manual compression release maneuver with the patient in a prone position on a 30-60 degree

unfolded examination table. Patients with isolated symptomatic incompetent and dilated SSV and DUS proved reflux not more than 15 cm below the SPJ (middle calf) were scheduled for modified ligation of the SPJ (without flush ligation) and segmental excision of the SSV. Immediately before the operation the SPJ and the SSV were marked by DUS. Anesthesia consisted of intravenous anesthesia and local infiltration of the dorsal thigh, popliteal area, and calf with short and long-acting anesthetics (mepivacaine, bupivacaine) to allow a neural response during surgery; pain prophylaxis consisted of oral admitted ibuprofen (1200 mg) for 3 days. A 2 cm transverse incision just above the marked SPJ was followed by identification of the SSV underneath the fascia and complete removal of all adhesions of the SSV. The SPJ was exposed and the terminal portion of the SSV ligated, disconnected, and over sewn by atraumatic non-absorbable suture combined with electro cauterization of the endothelial layer of the stump. Then the SSV was dissected distally for up to 10 cm, excised, and sent for histological evaluation. Low Molecular Weight Heparins (LMWH) were not administered for prophylaxis. Patients were seen for close follow-up with clinical and color-coded duplex examination during the first two weeks, after 3, 6, and 12 months and then each year primarily during the summer.

Results

94 patients, 37 females (39,4%), and 57 males (60,6%), mean age 54,6 years (29-83), were admitted for treatment of symptomatic SSV with dilated, incompetent SPJ. No incompetent perforating veins were found, nor incompetent non-saphenous vein (Giacomini's vein) during 2007-2018.

On preoperative DUS of the dilated SSV the diameter of the left SSV was 0,73 cm (mean; 0,3-1,64) and of the right SSV 0,75 cm (mean; 0,41-1,51) measured 1-2 cm below the SPJ.

Modified HL and excision of the dilated vein (5-10 cm length) was performed in n=121 limbs (n=40 left SSV, n=37 right SSV, n=22 bilateral).

Histological evaluation of the excised SSV demonstrated phlebosclerosis in most cases (95/99 cases; 96%).

There were no major postoperative complications. Minor adverse events included: minor temporary inflammation of the skin near the incision (n=8; 6,6%), suture dehiscence (n=2; 1,7%), minor temporary paresthesia (n=8; 6,6%), delayed wound healing (n=2; 1,7%), allergic reaction to wound dressing (n=3; 2,5%), ecchymosis (n=19; 15,7%), scar overgrowth (n=1; 0,8%), induration of the suture line (n=2; 1,7%), hematoma (n=1; 0,8%).

Recurrence at the ligation site of the SPJ, mostly neovascularization, occurred in 4 cases (3,3%).

The mean follow-up of surgically treated patients was 32,8 months (mean; 1-145 month).

Discussion

Varicosis is caused by incompetence of the SSV in 15% of people, more commonly in women than men. However, in this study 60% were male and 40% female. The significance of the SSV reflux is underestimated [8]. Surgical removal of the SSV and HL of the SPJ was the preferred form of preferred treatment until in recent years endovenous thermal ablation techniques (EVLA, RFA) and ultrasound-guided foam sclerotherapy (UGFS) were considered to deliver superior results [3]. The type of vein treated or technical variations may be responsible for differing results [9,10]. Restrictions in different national health reimbursement systems may be responsible that many patients are denied surgical treatment for symptomatic uncomplicated varicose veins regardless of their symptoms [11].

The purpose of the study was to analyze technical success, recurrence, and complication rates of modified HL of SPJ combined with segmental SSV excision in symptomatic SSV with preoperative DUS verified solitaire dilated enlargement of the vein excluding significant variation of veins in the popliteal fossa. Variation of the SPJ/SSV morphology may influence the success of treatment: common or separate drainage of SSV and Gastrocnemius Vein (GNV); ampullary ectasy, tortuosity, duplicate drainage or normal anatomy of SPJ; thigh extension of SSV (Giacomini's vein) dilatation [12-15]. We performed a modified HL with atraumatic non-resorbable suture and electro cauterization to avoid neovascularization combined with segmental excision of the dilated proximal SSV with preoperative DUS as performed and/or recommended by others [16-20] and rejected by others [21]. In Britain and Ireland 89-93% of the surgeons request DUS, but only 50-64% perform additional DUS preoperatively to mark the SPJ [22,18]. Preoperative DUS is recommended for identifying the sural nerve which may be at risk for injury [23].

An increased diameter of the SPJ may be associated with higher rates of recanalization, thrombosis, and Endovenous-Heat-Induced Thrombosis (EHIT) [24,25]. Phlebosclerotic lesions as demonstrated in 96% of cases in this series may be associated with advanced chronic venous disease [26]. The mean diameter of SPJ/SSV in our patients was 0,73-0,75 cm (range 0,3-1,64 cm), in EVLA treated SSV in other studies 0,6-0,68 cm [27]. Major complications could be avoided in this series by preoperative DUS and by modified HL of the SPJ similar to others [6,28,29]. Complete exposure of the SPJ and flush ligation are performed by 10.4 to 67% of surgeons in the UK, 75,7% dissect the SSV to expose the SPJ, complete stripping is performed by 19,5-34% of surgeons, 55,1% favor segmental excision of the SSV, as we did [22,30]. Deep vein thrombosis did not occur in our patients without LMWH prophylaxis, but occurred in 1,8% of cases with SSV disconnection reported by others [31]. EVLA may cause phlebitis (2%) [32]. EHIT may complicate endovenous thermal

ablation at a higher frequency than previously reported (7,8-17.5%) [24]. DVT is reported rarely (0,1-1,2%) [33]. However, it may range from 1,8% to 3,5% after surgery and 2,5-5,7% after EVLA [3]. Neurological complications may occur in surgical stripping or disconnection and thermal ablation of the SSV due to the close relationship of the nerve to the SSVSSV [23,34]. Due to the varying descriptions and definitions, there is an insufficient comparison of neurological complications. We observed minor temporary paresthesia in 6,8% of cases. Postoperative paresthesia is reported to range from 2,8-31% [31,33,35-40]. Postoperative paresthesia after EVLA were seen in 2,4-40% [32,33,36-39,41,42,] and after RFA in 9,7% [33].

Pain, associated with nerve injury, was reported in different intensity after surgery and endovenous ablation [37, 38]. 23% of EVLA treated patient's required additional analgesia [42] which did not occur in this study. Induration has been demonstrated in 39% EVLA treated patients [32]; there were two cases with induration (1,7%) in the proximal part of the calf in this series. 51% of patients had bruising after EVLA [32]. We identified one patient (0,8%) with hematoma as a side effect of LMWH prophylaxis. Ecchymosis may occur in up to 60% of cases after EVLA [41]; ecchymosis formation was seen in 19 cases (15,7%) in this series. Wound infection is considered to be related to surgery (1-10% [31,37]. We observed minor inflammation in 8 cases (6.6%), suture dehiscence in 2 cases (1,7%), delayed wound healing in 2 cases (1,7%) but no Surgical Site Infection (SSI). There was no creation of an arteriovenous fistula in this study [43].

Clinical recurrence and complication rates did not differ after SSV HL only (24%) or SPJ flush ligation and stripping (18%). However, SPJ incompetence as confirmed by DUS one year after operation was 13% after stripping and 32% after SPJ ligation alone [35]. Clinical recurrence may be low (4,3%) after HL and short segment excision of the SSV (<5cm) compared to HL and extended stripping (3,7%) [44]. The technical success rate after EVLA may range from 97%-100% and 94% after surgery [32,36,42]. The abolition of reflux in DUS was high after EVLA 81,2-99,1% versus 65,9-79% in surgery [37-39]. Recurrence rates for EVLA (18%) and RFA (19%) may be similar [45]. In this series, clinical and DUS recurrence was seen only in 4 cases (3,3%) (follow-up of the 32,8 8-month mean; range 1-145 month). Others reported success rates which were in surgery 24-100% (follow-up 1,5-60 month) compared to EVLA 91-100 (follow-up 1,5-36 month) and UGFS 82-100% (follow-up 1,5-11 months) [3]. The pooled anatomical success rate was 58% in surgery in 798 SSVs, 98,5% for EVLA in 2950 SSVs, 97,1% for RFA in 385 SSVs and 63,3% for UGFS in 494 SSVs [33]. However, data may not be sufficient to compare UGFS to surgery [4]. The results of this study may be subject to bias - retrospective and not a randomized study, a small number of patients. However, the mode of treatment is uniform and the mean follow-up is almost three years.

Conclusions

Modified HL of the SPJ and segmental excision of the varicose small saphenous vein is an effective alternative to more invasive surgical and endovenous techniques.

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Conflicts of Interest: Prof. René Holzheimer - no conflict of interest; Prof. Thomas Noppeney is on the list of the speakers Bureau, Medtronic

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Authors' Contributions: Prof. Holzheimer - clinical data and manuscript; Prof. Noppeney - evaluation of clinical data and manuscript

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