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SOCIÉTÉ FRANÇAISE DE PHLEBOLOGIE

# Feasibility and Results of Incompetent Thigh Perforator Ablation by Coil Embolization in Recurrence of Varices After Surgery (REVAS).

## *Évaluation du traitement par embolisation des veines perforantes crurales responsables de récidive de varices après chirurgie.*

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### *Summary*

**Introduction:** Treatment of thigh perforators connected to varicose veins remains difficult in REVAS. Surgery is often incomplete and traumatic, sclerotherapy often incomplete and endovenous thermal ablation inappropriate.

**Material and method:** Patients with REVAS were prospectively included in two surgical centers. The number of previous surgery, CEAP class, perforator's anatomy and its connexion with varicose veins were reported. Additional therapy was carried out simultaneously or afterwards. The main criteria were perforator obliteration and varicose vein recurrence.

**Results:** Forty patients (mean age 62) were presented with a REVAS after 2.1 operations over a mean period of 22 years. CEAP class distribution was essentially C2 (58,4%, 24/40 patients). In 16 cases, additional therapy was simultaneously performed. At 30 days, there were no major complications. At 11 months, one recanalization was reported. For 36 patients, the perforators were closed except for two, which were incomplete. At 51,5 months of mean follow-up, there were 13/40 cases without information because the patients did not their follow-up, 3/40 cases of recanalization, one case of partial recanalization, 11 cases of obliteration, no information for the other (12/40). No recurrences was observed when there was an obliteration.

### *Résumé*

***Introduction :*** *Le traitement des veines perforantes (VP) responsables de varices est délicat chez les patients présentant une récidive variqueuse après chirurgie (REVAS). Une nouvelle chirurgie est souvent incomplete et traumatique, la sclérothérapie incomplete et le traitement thermique endoveineux inapproprié.*

***Matériel et méthode :*** *Des patients REVAS due à une VP incontinente ont été inclus de manière prospective dans deux centres médicaux. Le nombre de chirurgies précédentes, le score CEAP, l'anatomie des varices ont été renseignés. Un traitement complémentaire a été réalisé simultanément ou après. Les critères majeurs étaient l'oblitération de la VP et la présence d'une récidive.*

***Résultats:*** *40 patients (moyenne d'âge de 62 ans), ont été inclus, après 2,1 chirurgies, après une période moyenne de 22 ans. Le score CEAP était essentiellement C2 (58,4 %, 24/40 patients). Un traitement complémentaire a été réalisé simultanément pour 16 patients. À 30 jours, aucune complications n'a été observé. Après une durée moyenne de 11 mois, 36 patients présentaient une obliteration totale, 2 patients une reperméabilisation partielle, 1 patient une reperméabilisation totale; pas de suivi pour un patient. Après une durée moyenne de 51,5 mois, 13 patients n'ont pas réalisé leur suivi. Il y avait 3 recanalisations, 1 recanalisation partielle, 11 cas d'oblitération et pas d'information pour les autres. Aucune récidive n'a été observé lorsque la perforante était oblitérée.*

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**Conclusion:** Coil embolization of thigh perforators in REVAS appears to be a safe and effective procedure.

***Keywords:*** *Recurrence of varices, perforator vein insufficiency, embolization.*

***Conclusion :*** *L'embolisation des VP chez les patients REVAS semble être un traitement intéressant.*

**Mots-clés :** Récidive de varices, insuffisance de veine perforante, embolisation.

## Introduction

The incidence of chronic venous disease is estimated at 0.5-3% of the adult population in Europe and America [1].

Perforator vein insuffiency is the most common cause of recurrent varicose veins after treatment, often unrecognized [2, 3].

One of the complications of perforator vein insufficiency is ulcer, which has an important public health impact. The other complications of perforator vein insufficiency are the consequences of chronic venous insufficiency: lower extremity swelling, eczema, pigmentation, hemorrhage [4].

The different treatment options are surgical treatment and minimally invasive treatment, which are ultrasound guided sclerotherapy (USGS) and endovascular thermal ablation (EVTA) with either laser or radiofrequency energy sources [1].

Compression is the mainstay of treatment, but long-term compliance with this therapy is often inconsistent [8].

Pathologic perforator veins are described as having reversed flow from deep system to superficial vein greater than 500 ms, and with diameter greater than 3.5 mm.

Risk factors for incompetent perforator veins are the same as all chronic superficial venous disease, including history of deep venous thrombosis, multiple pregnancies, advanced age and genetic factors [5].

Current guidelines recommend perforator treatment in cases of clinical severity, etiology, anatomy, pathophysiology score (CEAP) 5 and 6, with treatment of the perforator at the level of previous or active venous ulceration.

Several authors also suggest treating incompetent perforator veins in cases of focal pain, focal swelling, associated varicose veins, focal skin irritation and/or discoloration in the area of the incompetent perforator vein [6, 7].

Subfascial endoscopic perforator surgery (SEPS) is the method recommended for the reduction of incompetent superficial venous system pressure and tibial ulcer treatment due to perforator vein insufficiency of the leg [1, 8].

There is no recommandation about the treatment of tigh perforator vein insufficiency.

Treatment of thigh perforators connected to varicose veins remains difficult in REVAS.

Open redo-surgery is often incomplete and traumatic, sclerotherapy is often incomplete and endovenous thermal ablation is difficult.

Therefore, coil embolization could be an interesting solution.

Van Dijk L.C. and al [9] has also studied percutaneous ultrasound-guided coil embolization but only to the lower leg.

*The aim of our study is to assess feasability and to present early results of abalation by coil embolization of incompetent thigh perforator vein in recurrence of varices after surgery (REVAS).*

## Material and method

We organised a prospective multicentre study.

Patients with REVAS feeded by a thigh perforator were prospectively included in two surgical centers between 2004 and 2013.

The first center was in Nancy, France, with a vascular surgeon who included the patients and an interventional radiologist who did the procedure.

The second center was in Lyon, France.

A vascular surgeon included and did the procedure.

The number of previous surgery and also the number of years since surgery, CEAP class, perforator's anatomy and its connexion with varicose veins were reported.

We also reported the age, the side, the number of coil, radiation and time of fluororscopy, the associated procedure with the delay, the complications, and the time of follow-up with successful obliteration.

Embolization was performed in a center by an interventional radiologist and in another center by a vascular surgeon.

The procedure was performed under local tumescent anaesthesia.

The access was the common femoral vein, homo or contralateral, or a residual saphenous trunk.

The presence of a reversed flow in the deep venous system during passage through the femoral valves was described.

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The approach, the number of coils, radiation exposure and technical difficulties were reported.

Additional therapy (phlebectomies and/or foam sclerotherapy) was carried out simultaneously or afterwards.

Patients had a one month and one-year follow-up by an ultrasound duplex scan.

A third one has been done calling each vascular doctor in order to have the most recent ultrasound scan.

The main criteria were perforator obliteration and varicose vein recurrence.

Thirty-day complications and competence of the superficial femoral vein were also reported.

# Results

## Inclusion

All the patients with a varicose recurrence after a saphenectomy, because of a perforator vein, were included.

Patients were included between 2004 and 2016, seventeen in Lyon, France and twenty-three in Nancy, France.

## Characteristic of the population

40 patients were included and 40 thigh perforator vein were treated.

The mean age was around 62 years.

They presented with REVAS after 2,1 operations over a mean period of 22 years. CEAP class distribution was essentially C2 (58,4%, 24/40 patients).

## Characteristic of the varicose recurrence

In most of the cases (n=38/40), the perforator vein was a single trunk and was mainly medial (n=38/40) from the femoral superficial vein.

In two cases, the perforator vein was lateral and in one case it was posterior.

In 22/40 patients, varicose recurrence was right and to 19/40 patients, the varicose recurrence was left.

## Embolization procedure

***Embolization protocol:***

The procedure begins with a deep femoral ventral approach against lateral or ipsilateral with introduction of a 4F catheter.

During angiography, continence and the integrity of the deep network are visualized.

Opacification visualizes the femoral vein and localizes the perforating vein responsible for varicose recurrence.

It is then introduced a guide and a catheter into the trunk of the perforator.

The embolization of the perforating vein is carried out using metal turns of 2 to 10 mm until complete occlusion judged by angiography.

Upon removal, good femoral vein continence and good venous compressibility are verified.

The result can be appreciated remotely by phleboscan with injection on the back of the foot and withers in the calf and thigh.

In 18 cases, the approach was contralateral femoral, in 19 cases homolateral, in 2 cases through the saphenous trunk and in 1 case through the saphenous trunk and homolateral femoral **(Table 1)**.

| Femoral vein access | Number of patient | Number of patient % |
|---|---|---|
| Contralateral | 18 | 45 % |
| Homolateral | 19 | 47 % |
| Saphenous trunk | 2 | 5 % |
| Saphenous trunk and homolateral femoral | 1 | 3 % |
| Total | 40 | 100 % |

*TABLE 1: The different femoral vein access.*

In 16/40 cases, this perforator was connected to a residual saphenous trunk and in 25/41 cases, directly to tributaries.

To have a complete occlusion, the mean number of coil was 6,6, of different size.

The mean irradiation was 1993 cGycm2 and the mean time of fluoroscopy was 12,3 min.

No peri-procedural incident was reported.

## Results

In 25 cases, additional therapy was simultaneously performed and in 15 cases, it was delayed.

Additional therapy consisted in 9 cases phlebectomies, 26 cases to sclerotherapies and phlebectomies, 3 cases to phlebectomies and sclerotherapies and radiofrequency, 1 case to phlebectomies and radiofrequency, 1 case to laser and phlebectomies and sclerotherapies and 1 case no data **(Table 2).**

## Outcome and short term follow-up

At 30 days, there were no major complications.

Two superficial venous thromboses occurred, which did not allow performing complete delayed phlebectomies.

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| Additional therapies | Number of patient | Number of patient % |
|---|---|---|
| Phlebectomies | 9 | 22 % |
| Phlebectomies and scleroterapies | 25 | 62 % |
| Phlebectomies, scleroterapies and radiofrequency | 3 | 7 % |
| Phlebectomies and radiofrequency | 1 | 3 % |
| Laser, phlebectomies and scleroterapy | 1 | 3 % |
| No data | 1 | 3 % |
| Total | 40 | 100 % |

*TABLE 2: Different additional therapies.*

Some minor complications were described: two coils were introduced too far into the varicose veins, resulting in pain under the skin.

At mean follow-up, 11 months, all patients had their follow-up.

One recanalization was reported. For 36 patients, the perforators were closed except for two, which were incomplete.

There was no follow-up for one patient. No deep venous incompetence was reported.

### Long term follow-up

After a mean follow-up (51,5 months), one patient has presented a varicose recurrence due to a recanalization of the perforator vein.

A new coil embolization was performed and the last follow-up showed a good result with no recurrence and an obliteration of the perforator vein, after 12 months of follow-up.

There were 13/40 cases without information because the patients did not their follow-up, there were 3/40 cases of recanalization, one case of partial recanalization, 11 cases of obliteration.

Unfortunately, there were 3 patients, where there was no vascular doctor informed, no data, because of no specific ultrasound scan for one patient, and 8 vascular doctors did not respond.

No recurrence was observed, when there was an obliteration of the perforator vein.

The recanalization was associated with recurrences.

## Discussion

There are a few data to compare the different treatment of perforator vein insuffiency, specially about recurrence after surgery.

Surgery is an invasive approach.

That is why some mininvasive treatment are developped for perforator vein insufficiency: ultrasound guided sclerotherapy (USGS), endovascular thermal ablation (EVTA) [1, 2] and and subfascial endoscopic perforator vein surgery in the leg.

Ultrasound guided sclerotherapy is easily used with variable success [10], but it is not evaluated in recurrence after surgery, specially long term results [11] for incompetent thigh perforator vein.

About EVTA, ***J.L. Bacon and al.*** [12] described a percutaneous method of treating incompetent perforator veins, using ultrasound-guided radiofrequency ablation: TRansluminal Occlusion of Perforator (TRLOP).

The closure rates were comparable with the data for subfascial endoscopic perforator surgery.

But this treatment was not evaluated specially in recurrence of varices after surgery and not specially for thigh. Only some minor complications were observed.

***P. Marsh and al.*** [11] studied radiofrequency ablation.

Truncal reflux was treated before and incompetent perforator vein of lower leg in a second time by radiofrequency ablation with a dedicated stylet.

The closure rate was good (82%) but some complications were observed (significant rateof neuropraxia, one phlebitis, one cellulitis, one chemical ulcer).

But this treatment was not evaluated specially in tigh perforator vein.

Coil embolization is a surgical technique that widespread in treatment of pelvic venous incompetence [13, 14].

It seems to be also a valid treatment to occlude tigh perforator veins.

**Our study is interesting because:** it is a prospective multicenter study, which assesses an original process.

In our study, there were no major complication.

Only some minor complications were described.

No reversed flow of deep venous system was described during our procedure, during passage through the femoral valves.

The feasibility is good and the process is simple. It is also efficient with almost all patients with closed perforators vein.

We, however, need a better long term follow-up to confirm these data.

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## Conclusion

Coil embolization of thigh perforators in REVAS appears to be a safe and effective procedure.

The feasibility is good. There is no major complications.

At short term follow-up, the rate of obliteration is good. In order to assess long term results, it would be necessary to carry out long-term follow-ups.

This process could be a treatment option in REVAS due to incompetent thigh perforator, like ultrasound guided sclerotherapy and endovascular thermal ablation.

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