Post ablation superficial thrombus extension (PASTE) into the common femoral vein as a consequence of endovenous ablation of the great saphenous vein

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This report summarizes the Internet discussion on Post Ablation Superficial Thrombus Extension (PASTE) from the great saphenous vein (GSV) into the common femoral vein as a consequence of endovenous treatment of the GSV with laser or radiofrequency, and represents the collective work of the Laser-Floating Group. The Vasculab group moderated the Internet discussion. The PASTE entity was discovered thanks to the follow-up examination with duplex ultrasound in the immediate post-treatment period. The thrombi are apparent on ultrasound within 3-7 days of treatment, are non-occlusive and asymptomatic and are rarely identifiable after 14 days. They caused neither venous obstruction, nor symptomatic pulmonary embolism. Anticoagulant treatment was used at the beginning, but the experience showed that the course was usually benign, harmless and asymptomatic; therefore, it seems that no therapy, only observation is needed in these cases.

KEY WORDS: Laser endovenous ablation - Radiofrequency - Great saphenous vein - Post-treatment thrombosis - Floating thrombus.

Introduction

Endovenous ablation of the great saphenous vein (GSV) by means of laser, radiofrequency (RF) and foam sclerotherapy has become popular in the last years. This technique was originally meant as a substitution for stripping, but many phlebologists refrained from crossectomy as well when treating primary varicose veins with GSV incompetence. Some authors followed up the patients in the immediate post-treatment period by duplex ultrasonography and discovered that in several cases thrombosis continued from the GSV at the saphenofemoral junction (SFJ) into the common femoral vein (CFV) as a floating thrombus that was present for about 14 days and then disappeared, without causing any obstructive problems in the CFV, nor producing symptoms suggestive of pulmonary embolism.

An Internet discussion moderated by the Vasculab team was running on this issue from Sep to Dec 2008; the main thoughts of this interesting exchange of views were summarized in a collective work of the Laser-Floating Group and are presented in this article.

Definition

Wright defined the floating thrombus as follows: It is a thrombus extending from the termination of the GSV, appears to be a consistent finding with all forms of endovenous ablation of the GSV, including laser, RF and chemical ablation.

It is apparent on ultrasound within 3-7 days of treatment, is non-occlusive and asymptomatic and is rarely identifiable at 14 days. It does not result
in valvular damage. Without post treatment ultrasound examination within the first few days it is likely that the thrombus would never be identified. The clinical significance appears to be completely different from spontaneous proximal thrombus either forming in the femoral or common femoral vein or extending from classical superficial thrombophlebitis.

It is not a deep vein thrombosis (DVT) as commonly understood; as yet we do not know it’s propensity to embolise, which is of course the most important complication, and therefore a definitive recommendation for an optimal clinical course of action cannot be made. The observation of a thrombus emanating from an ablated vein should, for now, be named in a descriptive manner, such as:

– ‘Post Ablation Superficial Thrombus Extension’ or PASTE.

The definition of PASTE should include the following important features:

1. Asymptomatic;
2. Ultrasound detected;
3. Non-occlusive;
4. Continuity with thrombus in the treated superficial vein;
5. Detected within the first week after treatment.

Alternatively, Passariello defined the ultrasonographic features of the „spontaneous“ floating thrombus as a Compression Ultra-Sonography (CUS) positive partial thrombosis:

– the free lumen has the image of a half moon
– the thrombus moves during several dynamic manoeuvres as spontaneous or forced breathing, Valsalva, distal/proximal compression
– the base is adherent to the vein wall and the tail is completely free in the vessel lumen
– it may be present in several sites of the deep or superficial venous system, in the lower and also the upper limb.
– the thrombus has a variable echogenicity. Though no evidence is available, it can be hypothesised that fresh, hypoechogenic parts should be more at risk of embolization than organised and hyperechogenic ones.
POSTABLATION SUPERFICIAL THROMBUS EXTENSION (PASTE) INTO THE COMMON FEMORAL VEIN

Incarcence

PASTE appears to occur in approximately 1% - 5% of cases of superficial endovenous ablation (Wright, Morrison). The Mayo series had a 7% incidence with laser and about 5% and one pulmonary embolism (PE) with RF³⁴. Both of these reports were on a small series of patients (Goldman). No one apparently has systematically followed a large number of patients. Without duplex scan no one would be aware of PASTE, although we might experience a patient with a rare unexplained PE (Goldman). Bush saw 7 clot extensions into the CFV in 3,600 cases; without PE occurrences.

Clinical importance

Morrison described his own experience as follows: “Although admittedly we have not published our data, we have a long single center experience with such “floating” thromboses (Figure 1A, B and Figure 2) beginning with our first identification in 2000 following RF ablation. Our initial reaction was that of considerable apprehension, resulting in patients who were fully anticoagulated for 3 months minimum and carefully monitored by duplex every 2-3 days to assure stability or retraction of the thrombus. This retraction (or embolization) occurred in every case, with no patient complaining of symptoms suggestive of PE, in spite of repeated direct questioning. Thus we made the determination to anticoagulate with low molecular weight heparin (LMWH) only for 10 days or until the thrombus resolved by duplex examination, and again saw no patient with symptoms suggestive of PE. We never ordered spiral CT scans on patients, as there was no clinical indication of PE. As we saw more of these patients with PASTE, we stopped using LMWH and followed them closely with duplex ultrasound only. When we continued to see no patients with symptoms suggestive of PE, we finally stopped following these patients, and eventually stopped even looking for these thromboses because it never changed our patient management regimen. Our first follow up is now at one week, and it is extremely uncommon for us to see PASTE following either endovenous laser or RF thermal ablation. I suspect we are missing a number of such thromboses by not examining patients with duplex ultrasound earlier than one week, but because of our long experience demonstrating the benign course of these thromboses and because we did not change our patient management when we did discover them, we have simply stopped looking for them before the one week interval.”

Bergan also believes that PASTE is fundamentally benign and though it has the potential for embolization, it is too small to cause a real trouble. Goldman agrees that while there are thousands of people being treated with RF closure world-wide, there are few reports of a serious PE.
However, on the U.S. Food and Drug Administration Manufacturer and User Device Experience (MAUDE) website there are reports of concerning DVT, PE and fatal PE, which appear to have increased following introduction of the newer generation RF catheter, which led to advising that thermal ablation should start at least 2 cm distal to the SFJ (Goldman).

**Clinical course**

As mentioned above, PASTE in the CFV occurs within 3-7 days of treatment and is rarely identifiable at 14 days (Wright). The question arises: what happens to these thromboses? Do the floating thrombi dissolve or do they break off and cause PE? It is improbable that complete thrombolysis of a PASTE in the CFV occurs spontaneously within one week; more likely the thrombi tore off and embolised, the size of them being apparently not large enough to cause symptomatic PE. Endothelial cells in the pulmonary artery display an increased fibrinolytic activity so that complete spontaneous lysis of pulmonary emboli takes place and patency of the pulmonary circulation is restored within a few weeks. (Recek) (Figure 3A, B, C). A small thrombus of saphenous origin that doesn’t cause occlusion of the common femoral vein is free to embolise maybe without any risk of fatal PE because of its dimensions. Pulmonary filter can easily digest it without any risk of occlusion of the pulmonary arteries’ bifurcation (Pieri).

**Therapeutic Intervention**

**What to do: Nothing? Anticoagulant? IVC filter?**

There is now sufficient experience to tell us that this is not classical DVT and needs not be treated (Bergan). Morrison and Goldman agreed that no treatment is necessary. Wright commented that full anticoagulation initially with heparin and conversion to coumadin and maintained for 3-6 months is disproportionate. Use of LMWH until the thrombus retreats is pragmatic but may still be an over reaction whereas simple observation may not be sufficient.

As to the use of inferior vena cava (IVC) filter, Lee stated that also the spontaneous free floating tail is no longer indication for the IVC filter to prevent PE. Indeed, IVC filter is for the prevention of ‘fatal’ PE and not for small size PE. No superficial venous thrombosis (SVT) should be able to throw fatal PE by itself and that is the reason why distal SVT does not need prophylactic anticoagulation. Only analgesics are necessary in case any pain occurs. Spontaneous proximal SVT also could be handled only with close observation. If it should extend, then all it needs is proper anticoagulation to prevent further extension and no IVC filter. In addition, the use of graduated compression stockings with ambulation and non-steroidal antiinflammatory therapy with drainage of coagulum is the standard treatment for SVT (Goldman).

**Prevention**

Disconnection of the SFJ would have prevented thrombus extension into the femoral vein (Recek, Pieri, Corcos, Zini). Tight ligation of the SFJ does not leave behind a blind arm where floating thrombi could develop, and no such thrombi in the CFV have so far been documented after crossectomy or high ligation; nevertheless, it must be acknowledged that these procedures have not been scrutinized in a similar manner with duplex ultrasonography as cases of endovascular ablation (Wright). Some co-authors do not believe that crossectomy would be contributory in these cases, because the floating thrombus did not cause any clinical problem and no therapy seems to be needed (Goldman, Morrison, Passariello, Wright).

In addition, there is no evidence that a reduced laser delivered energy is needed for destruction of the saphenous endothelium when crossectomy is simultaneously performed (Goldman). Therefore, the Laser-Floating Group did not find support for performing crossectomy simultaneously with endovenous ablation of the GSV.

**Healing process, recanalization and possible recurrence**

The healing process is based on vein thrombosis, fibrosis, and venous atrophy. Various organized thrombi containing necrotic inclusions and patent
areas were observed in the vein lumen. Progressive venous diameter decrease and thrombus fibrotic transformation up to the hypotrophic venous disappearance at 12 months were followed up. Not occluded (18.8%), recanalized short segments (22.7%), two entirely recanalized saphenous veins with varicose recurrence (4.5%) were found following laser ablation (Corcos).5, 6

No significant relation was found between the energy applied (which depends not only on power but mainly on the venous diameter) and recanalization. Thus it can be supposed that recanalization mainly depends on the natural tendency of the thrombus (Corcos). Long term histological findings in thermally treated veins showed areas of neovascularity commonly found up to 6 weeks post treatment in the resultant thrombus. However due to the overwhelming injury response this subsides if no persistent flow is present (Bush). Even if the thrombus at the SFJ remains confined to the GSV, the reopening of the terminal segment of the GSV with several branches issuing into this segment occurs in most cases and such a situation with incompetent SFJ would probably preprogram recurrence. The experience showed convincingly enough that a lower ligation of the GSV that leaves untouched the incompetent SFJ and the “venous star” is the main cause of varicose vein recurrence. The other problem is the re-canalization of the thrombosed saphenous trunk that can result in recurrent reflux, which could be regarded as a failure of the method. The length of follow-up after laser and RF ablation is not yet long enough (about 5 years up to now) for an overall assessment of the risk of recurrence. Therefore, it remains controversial whether crossectomy can be given up when using these new ablative methods or whether these ablative methods would definitely displace stripping (Recek).

**Thrombosis of the treated GSV occurs irrespective of the mode of treatment**

All thermal ablations must terminate with a less severe injury that repairs with thrombus, independently of the used technique (Wright). Thrombosis occurs in both laser and RF. Same outcome, different modes of injury. Collagen is deposited in the thrombus by fibroblasts, which is the normal injury response. (Bush R., J.Laser Med Surg., in press) Thrombosis is a fact in all these procedures (Gonzales Zeh).

**Conclusion**

Floating thrombus extending from the GSV into the CVF appears roughly in 1%-7% of cases as a consequence of GSV ablation by laser and radiofrequency or foam sclerotherapy. It is symptomless and detectable only by duplex ultrasonography, uses to disappear within 2 weeks after ablation therapy and causes neither venous obstruction nor symptomatic pulmonary embolism. For this reason anticoagulant or other form of therapy is considered to be unnecessary.

**References**

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