CASE REPORT

DEEP VEIN ULTRASOUND-GUIDED THROMBOLYSIS

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Abstract

Catheter directed thrombolysis is a minimally invasive procedure that results in a significant reduction in venous obstruction after deep vein thrombosis. The technique implies the performance of phlebographies to monitor the thrombolysis progression. The objective of this paper is to describe the use of vascular ultrasound to follow the thrombus lysis and to adjust the catheter position according to the progression of the thrombolysis. This is the first case reported describing the application of ultrasound to monitor the thrombolysis. A 36-year woman was admitted ilio-femoral vein. The ipsilateral great saphenous vein was the percutaneous access to perform the anterograde thrombolysis. The procedure, including the control of thrombus lysis, as well as catheter progression was performed under ultrasound guidance. The thrombolysis took 52 hours. The patient has two years of follow-up without any complaint. The use of vascular ultrasound to monitor the thrombolysis has several theoretical advantages in patients with adequate biotopes. It minimizes the number of venograms and can be performed at the bedside. It is effective and inexpensive.

Keywords: *vascular ultrasound; deep vein thrombosis; catheter-directed thrombolysis.*

INTRODUCTION

Catheter-directed thrombolysis (CDT) consists in the percutaneous placement of a catheter into a thrombosed vein followed by infusion of a thrombolytic agent directly into the clot.[1,2] The continuous infusion of the thrombolytic usually continues for at least 24 hours.[1] When compared to systemic thrombolysis, CDT minimizes the systemic drug exposure, reducing the risk of bleeding and the dose of thrombolytic.[1,2,3]

The subgroup analysis of the ATTRACT trial showed that the CDT may have a benefit in patients with iliac vein thrombosis.[4] Camerota concluded that CDT reduced the severity of post-thrombotic syndrome and reduced the proportion of patients who developed moderate-or-severe post-thrombotic syndrome.[5] The CDT also reduces risk of recurrent deep vein thrombosis.[1,2,3]

Long life expectancy patients with acute venous ilio-femoral thrombosis have the greatest benefit from CDT.[1,2]

Ideally the thrombolysis should be performed in the first 2-3 weeks following the onset of deep vein thrombosis symptoms.[1] In order to maintain the catheter in direct contact with the thrombus and to monitor the efficacy of thrombolysis, venograms are usually recommended every 8 to 24 hours.[1] Using ultrasound for monitoring in the place of venograms has several advantages.

CASE REPORT

A 36 years old woman was admitted due to deep vein thrombosis in the right limb with 24 hours of evolution. The thrombus was localized at the common femoral vein, external and common iliac veins. The great saphenous, femoral and the deep femoral veins were spared.

A hip oedema was evident (hip diameter was 52 cm 17 cm above to the patella). A CDT was performed. The procedure, including the control of thrombus lysis, as well as catheter progression was performed under ultrasound guidance.

After 52 hours of treatment oedema disappeared (hip diameter was 50 cm). The control phlebography demonstrated repermeabilization of the right ilio-femoral deep vein. The patient completed 6 months of direct oral anticoagulation. A thrombophilic condition was excluded by appropriate testing. She stopped smoking and taking oral contraceptives. She has 2 years of follow-up without complains and a computed tomographic scan showed that the deep venous system remains permeable.

Technical description

The patient was positioned supine with the foot externally rotated. The skin was prepared with betadine and local anesthesia was applied (1% lidocaine). Ipsilateral great

Figure 1 *Great saphenous vein with a 4 Fr multiperforated straight catheter to perform thrombolysis.*

saphenous vein was punctioned with ultrasound guidance. A 5 Fr sheet was positioned and 4 Fr multiperforated straight catheter was inserted on a guidewire Terumo angled type (Figure 1). The anterograde progression of the guidewire and the catheter was monitored with ultrasound until the catheter tip was in direct contact with the distal end of the thrombus, at the common femoral vein. Heparin (500-1000U/h- aPTT target: 50-90 seconds) was infused into the sheet while the thrombolytic- alteplase (0,01mg/kg/h) was simultaneously infused into the catheter. The patient was evaluated clinical, analytically (hemoglobin, platelets, APTT, fibrinogen) and with ultrasound twice a day. She used compression stockings.

8 hours after the procedure, ultrasound controlled showed that the common femoral vein was patent (Figure 2). With ultrasound control the catheter was proximally moved until the tip reached the distal end of the thrombus at the external iliac vein, 10 cm above the inguinal ligament. Twice a day the thrombolysis was monitored using doppler ultrasound, instead of phlebography.

52 hours after the procedure the ultrasound control showed permeability of deep vein system (Figure 3). To confirm the result a phlebography was performed. The phlebography showed small filling defects at the external iliac vein without compromising the venous return. We decided to not deploy a stent. The CT scan performed at follow-up showed the permeability of deep vein system (Figure 4 and 5).

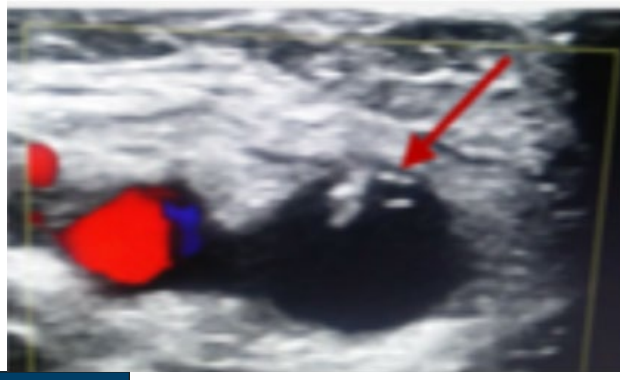

Figure 2 *Transverse vascular ultrasound image showing the catheter tip (arrow) in the right common femoral vein.*

Figure 3 *Longitudinal vascular ultrasound image showing the thrombus (arrow) and the catheter tip (triangle) in the right external iliac vein.*

Figure 4 *CT scan (performed two years after the thrombolysis) showing the permeability of common femoral right vein (arrow).*

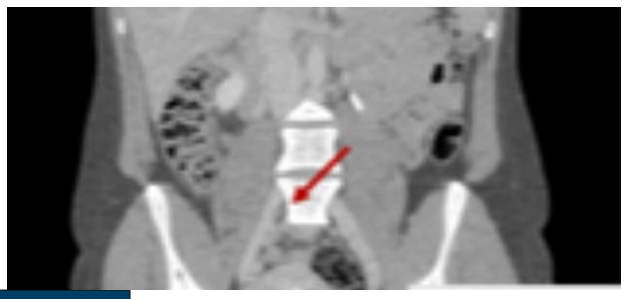

Figure 5 *CT scan (performed two years after the thrombolysis) showing the permeability of right common iliac vein (arrow).*

DISCUSSION

To our knowledge this is the first case reported in the literature about the use of vascular ultrasound to monitor the efficacy of thrombolysis and to adjust the catheter position according to the lysis of the clot.

The ATTRACT trial concluded that there was no difference in the incidence of post-thrombotic syndrome in patient treat with CDT when compared to patients on anticoagulation.[4] However, this study included patients with acute deep vein thrombosis in the femoropopliteal segment alone as well

as those with proximal iliac thrombosis. The iliofemoral cases are known to be higher risk for late post-thrombotic syndrome.[4] The subgroup analysis of the ATTRACT trial showed that the CDT may have a benefit in patients with iliac vein thrombosis.[4]

Lin considered that catheter direct thrombolysis should be performed in younger, healthier patients, with more to gain from prevention of post-thrombotic syndrome later in life.[6] In this report the patient was 36 years old, healthy, with a low risk of bleeding, so we judged that she could benefit from CDT. We decided to use the vascular ultrasound during the procedure minimizing the number of phlebographies.

Ultrasound was used to obtain venous access, as recommended.[1,3,7] It is necessary due to the variable vessel course, to avoid puncturing the thrombosed vein and the nearby structures (arteries and nerves), to minimize the bleeding risk and to preserve the integrity of the access.[1,3,7]

In this case the great saphenous vein and anterograde approach were used as an access to thrombolysis. Fiengo demonstrated that the use of great saphenous vein is a valid, safe and easy alternative to the deep vein system, with less risk of haematoma and venous lesion. 8 This access can be performed in supine position, while the popliteal vein (the alternative access in this case) would be approached in prone position.[9] In a randomized control study comparing the popliteal, great and small saphenous vein as an access to CDT thrombolysis, the authors concluded the great saphenous vein was the most efficacious.[9] The anterograde approaches chosen during catheterization reduce the risk of damage to the valve leaflets.[9]

In this case report, the vascular ultrasound was performed every 6 hours to monitor the thrombolysis and when indicated to advance the catheter into the clot. To our knowledge this technique has not been described in the literature. It has several advantages in a patient with a favorable biotype. It can be performed at the bedside, minimizing the patient movement and the risk of catheter displacement.[10] The number of phlebographies can be minimized, avoiding the radiation and contrast exposition which is a particular advantage in younger patients.[10] In a study publish by Madsen during thrombolysis a daily venography was performed requiring a median of three invasive procedures.[11] The injection of contrast material, during phlebographies can disrupt the thrombus.[12] The thrombolysis and the contrast exposition can cause nephropathy. 7 With the use of ultrasound, the thrombolysis follow-up can be frequently performed with a constant reposition of the catheter improving the thrombolysis efficacy. In this case the thrombolysis was performed in 52 hours, the thrombolytic protocols range from 12-72 hours.[7]

CONCLUSION

The use of vascular ultrasound to monitoring the venous thrombolysis has theoretical advantages. Avoids radiation and contrast exposition, can be performed at the bedside is inexpensive, do not cause discomfort. It will be necessary to increase the number of study patients to validate this approach.

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