Ultrasound-guided perforator vein sealing with cyanoacrylate glue

Siyanoakrilat yapıştırıcı ile ultrason kılavuzluğunda perforatör ven mühürleme

Hamit Serdar Başbuğ, Kanat Özüşik

Department of Cardiovascular Surgery, Medical Faculty of Kafkas University, Kars, Turkey

ABSTRACT
The introduction of the cyanoacrylate into the blood vessel triggers a polymerization reaction that further causes an occlusion in the affected vessel. This effect has been used for the treatment of various vascular disorders including the cerebral arteriovenous malformations and aneurysms. The endovenous administration of the cyanoacrylate has recently started to be used for the treatment of incompetent lower extremity venous system as well. In this article, we report an endovenous administration of cyanoacrylate with the ultrasound guidance into the posterior tibial (Cockett-2) perforator vein and eventual treatment of the incompetent vein. This case demonstrates that this athermal treatment modality for the perforator veins may become an alternative to the successfully used current thermal methods.

Keywords: Cyanoacrylate; insufficiency; perforator vein.

ÖZ

Anahtar sözcükler: Siyanoakrilat; yetmezlik; perforatör ven.

Chronic venous insufficiency is seen in 10 to 35% of the adult population. Over the 65 years of age, the incidence of venous ulcer rises to 4%.[1] Lower extremity venous system can be studied in four parts, the deep venous system, superficial venous system, communicating (perforating) venous system, and the microcirculatory venous plexus. The increased venous pressure in either of these systems may result in lower extremity venous insufficiency symptoms.[2] Valvular insufficiency, venous obstruction or poor muscle pump action play a role in pathogenesis. Increased venous pressure is the initial pathology that further causes an increased capillary permeability. Extravasation of the macromolecules and the erythrocytes lead to edema. Hemosiderin collection gives the characteristic brown skin color and results in hyperpigmentation and lipodermatosclerosis. Eventual progression to ulcer becomes inevitable when left untreated.[1,2]

Endovenous delivery of the cyanoacrylate (CA) glue has been used as a new procedure for the treatment of venous insufficiency.[3] It is a non-ablative technique, and was accepted as an implantable medical device in the United States for the treatment of cerebral arteriovenous malformations (AVMs) and intracranial aneurysms.[4] In this article, we present a different usage of the CA glue in the incompetent perforator veins (PVs) of the lower extremity.

CASE REPORT
A 38-year-old female patient admitted to our outpatient clinic with complaints of edema and itching on her left leg. Physical examination revealed a Clinical-Etiology-Anatomy-Pathophysiology class-3 signs on her left leg. Color Doppler ultrasound (DUS) showed an insufficiency in the posterotibial perforator (Cockett-2) vein of the affected limb (Figure 1).
The great saphenous vein and the small saphenous veins were totally normal. The Cockett-2 PV was punctured percutaneously under the DUS guidance, and the CA glue (VariClose® Biolas, FG Group, Ankara, Turkey) was injected into the vein. After five minutes of external compression over the vein, the DUS images demonstrated the collapsed PV with no remaining incompetent blood circulation (Figure 2).

During the injection, some points should be watched out. Puncture of the incompetent PV should be performed carefully under the guidance of a DUS. Needle syringe gauge size is important as the vein has a tortuous shape. A thin needle might be unable to conduct the glue efficiently, while a too thick needle might damage the target vein. We preferred to use 22 gauge needle with a green hub (1x1/2” in size, 0.80 mm diameter) in this case. Lidocaine hydrochloride was used as the local anesthesia during the procedure. After puncturing the PV, blood is withdrawn to ensure that the needle is inside the vein. Then, the needle is stabilized with one hand and irrigated antegradely with a saline solution to wash out the blood inside the needle before the administration of the glue. Otherwise, the CA glue encounters and reacts with the blood inside the needle lumen prematurely causing an obstruction. This obstruction makes the injection impossible. The glue should be conducted to the target without any interaction with blood inside the needle. As dosage, 0.5 mL of CA glue is sufficient for an incompetent PV. After the injection of the glue, the PV should be externally compressed and left at least five minutes under pressure. This enables the adherence of the endothelium and sealing also preventing a possible glue embolization through the deep venous system.

**DISCUSSION**

Perforator veins of the lower extremities may entirely be responsible for chronic venous insufficiency symptoms and leg ulcers in the absence of an axial vein insufficiency. Subfascial endoscopic ligation (SEPS), percutaneous thermal ablation, and the DUS-assisted ligation with mini incisions are the preferred methods for the current perforating vein treatment. After a long period of open surgery history, the SEPS procedure had been proved to be a worthy alternative until less invasive techniques were introduced in the late nineties. Percutaneous endovenous thermal ablation techniques have still been successfully used with high closure rates in axial veins as well as the PVs. However, thermal ablation techniques require...
tumescent anesthesia to prevent the potential damage to the surrounding tissues such as nerves in axial vein ablation.\[^{[6]}\] Application of the tumescent anesthesia needs multiple needle punctures to direct large amounts of perivenous anesthetic solution to shrink the vein diameter and to create a thermal barrier to prevent the adjacent structures from heat damage.\[^{[8]}\] Cyanoacrylate glue treatment is also called athermal or chemical ablation since it needs no tumescent anesthesia and does not produce a heat energy.\[^{[3]}\] It is thus safer compared to the thermal ablation techniques for axial vein ablation in terms of a probable neurological damage.\[^{[8]}\]

However, advantage of lacking tumescent anesthesia could be a part of the axial vein closure procedures but not for just a small PV sealing procedure. The mentioned thermal methods as well as the CA glue could also be used without tumescent anesthesia using only a local anesthesia as in this case.

Cyanoacrylate, commonly called as a superglue, has been started to be used recently for the treatment of some vascular pathologies such as AVMs, pelvic congestion syndromes, and varices.\[^{[8,9]}\] Although it has been used with permission for the endovascular procedures in Europe, its approved usage could not be achieved until 2000 when Trufill\[^{[6]}\] (Cordis, Miami Lakes, Florida, USA) received Unites States Food and Drug Administration clearance for cerebral AVM embolizations.\[^{[4]}\]

Biochemically, CA glue triggers a robust inflammatory reaction in the vessel wall. Anionic substances like the blood or plasma stimulate the polymerization upon contact leading to occlusion.\[^{[8]}\] The resultant polymers destroy the intima and cause an acute immunological response.\[^{[10]}\] After the polymerization is completed, the gradual resorption of the occlusive polymers take place.\[^{[11]}\] In approximately one month, the cellular response progresses to the granulomatous giant cell formation ending with a permanent fibrosis.\[^{[12]}\]

Previous alternative minimal invasive athermal method for the treatment of venous insufficiency was the foam sclerotherapy. The DUS-guided sclerotherapy has gained worldwide popularity; however, it has a significant tendency for systemic embolization with every injection.\[^{[8]}\] Venous embolization of the foam sclerosants have been well tolerated, but the arterial ones have caused devastating effects.\[^{[13]}\] Although CA is considered to be safer than the other sclerosants, it has a theoretical risk of deep vein thrombosis. Therefore, the peripheral emboli still can rarely be encountered despite the faster polymerization time.\[^{[14]}\]

In conclusion, color Doppler ultrasound-guided perforator vein sealing with a cyanoacrylate glue can be effectively used in perforator vein insufficiency. It is a non-thermal and non-tumescent method alternative to the thermo-ablation devices as well as the previously used foam sclerotherapy.\[^{[8]}\] Depending on the success and the safety of the cyanoacrylate in the occlusion of the vascular malformations, this glue may be a viable treatment alternative for the lower extremity perforator vein insufficiencies.\[^{[11]}\]

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REFERENCES


