



## Cyanoacrylate Glue is a Novel Approach for the Treatment of Small Saphenous Vein Incompetence- A Case Report

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**ABSTRACT**

Varicose veins are a medical condition in lower extremities, characterized by leg swelling, tortuosity and enlarged superficial veins involving both great saphenous vein and small saphenous vein due to incompetent saphenous vein. Varicose veins are very common, affecting both in male and female. But women (28%) are more common than male. Duplex ultrasound study of the affected lower limb is the gold standard of investigation for detection of presence of reflux or incompetence of saphenous vein. Treatment of incompetent saphenous vein has undergone wide changes during the past decade. Previously, the main therapeutic option was surgical stripping. However, endothermal ablation using laser or radiofrequency energy has mostly supplanted it. N-butyl-2 cyanoacrylate glue (NBCA), a medical tissue adhesive using VenaSeal closure system, a novel technique for the treatment of incompetent saphenous vein. Here we report a case of small saphenous venous incompetence or varicose vein treated with N-butyl-2 cyanoacrylate glue using VenaSeal Closure System.

### INTRODUCTION

Varicose veins are a medical condition in which superficial veins become swollen, enlarged, and twisted that usually occur on the legs and feet due to incompetent saphenous vein. Venous reflux is a significant cause. Other related factors include prolonged standing or sitting, obesity, overweight, pregnancy, menopause, ageing, abdominal straining. Reflux in superficial veins of lower limbs is reported in 15% of men and 28% of women [1]. Both great saphenous vein & small saphenous superficial veins are affected. Superficial venous incompetence is associated with aching pain, fatigue, heaviness, night cramps, pruritus, discomfort, and leg swelling.

Duplex ultrasound study of the affected lower limb is the gold standard of investigation for detection of presence of reflux or incompetence of saphenous vein. Surgical stripping was the preferred method of treating incompetent saphenous vein or varicose veins. However, endothermal ablation using laser or radiofrequency energy has mostly supplanted it [2]. Over the past two decades, there have been significant advancements in the treatment of incompetent saphenous veins, including the development of minimally invasive endovenous thermal (radiofrequency ablation and Laser ablation) procedures to block the pathologically refluxing superficial saphenous vein.

Recently, a new concept of treatment, N-butyl Cyanoacrylate glue (NBCA) using VenaSeal closure system, has been approved for the treatment of incompetent saphenous vein. The VenaSeal Closure System (Medtronic, Minneapolis, MN, USA), a new technique using CAC, received the Conformité Européene (CE) mark in September 2011 and was approved by the U.S. Food and Drug Administration for closure of lower extremity superficial truncal veins in February 2015[3]. CAG triggers an acute inflammatory reaction in the vessel wall via a polymerization reaction leading to encapsulation and vein fibrosis. The high viscosity and polymerization properties of the adhesive allow precise placement within the vein. The VenaSeal™ Closure System (VSCS)

(Medtronic Plc, Dublin, Ireland) is a NTNT ablative device that induces endovenous closure by delivery of cyanoacrylate glue (CAG) commonly referred to as “super glue.”

In Korea, CAC for treatment of incompetent saphenous veins was approved in November 2016 as a new technology and announced by the Ministry of Health and Welfare in December 2016.

### CASE REPORT

A 38 -year- old male patient was referred to our outpatient department with the complaints of night cramps, heaviness, and tortuous swelling on the posterior aspect of his right leg. There was no evidence of skin changes in his affected leg. He had no history of diabetes mellitus and dyslipidemia. He was a long-standing worker and was also a chain smoker. All peripheral artery pulsation of his right lower limb were present. His CEAP (Clinical Etiology Anatomy Pathophysiology) clinical stage was C4a. Doppler Ultrasonography revealed there are dilated subcutaneous venous channels in the medial and posterior aspect of the right calf, consistent with superficial venous varicosities. The short/small saphenous vein (SSV) shows prolonged reflux after distal augmentation at the sapheno-popliteal junction (SPJ) and distally in rest of the vein. The duration of the reflux measures about 4.1 sec. The diameter of the SSV measures about 8.0-8.5 mm.

The great saphenous vein (GSV) and deep veins of the right lower limb appear patent, show normal respiratory phasicity and distal augmentation.

No evidence of any thrombus is seen in any vein of right lower limb.



Figure 1: Duplex Ultrasound of Right Lower Limb Venous System – Showed Rt. Small Saphenous Vein Augmentation.



Figure 2: Small Saphenous Venous varicosities (Before procedure)

After that discussed with the patient about his diagnosis and treatment plan which was include VenaSeal closure treatment of varicose vein of the affected leg. The patient was agreed for this procedure and was admitted to our hospital under cardiovascular surgery department for his further treatment.

On the day after admission, a written informed patient consent was obtained prior to his procedures.

Equipment used for VenaSeal closure procedure: A 7 French (F) access kit was used to access the vein. The Vena Seal closure system includes a 5 F delivery catheter, 3 ml syringe, a dispenser tip, custom designed dispenser gun and a proprietary formulation of cyanoacrylate glue.

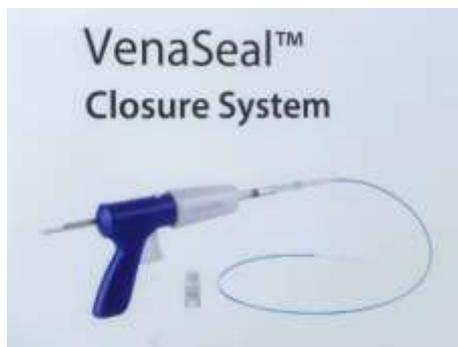


Figure 3. VenaSeal glue dispenser gun with the cyanoacrylate glue primed catheter.

The patient underwent endovascular ablation of small saphenous vein (SSV) with the VenaSeal closure system under local anesthesia. After the preoperative vein marking, the patient was placed in a prone position with the foot hanging off the edge of the operating table to allow dorsiflexion of the foot and easier percutaneous venous access of the SSV at the ankle. Antibiotics was routinely given prior to start the procedure.

After disinfecting the area to be treated with povidone- iodine solution, a sterile drape was placed over it. At first the puncture site of small saphenous vein was identified with ultrasound guidance in the distal calf, infiltrated with local anesthetic (1% lignocaine) solution and then small saphenous vein was cannulated using standard Seldinger technique.

Briefly, with ultrasound guidance, a 5Fr delivery catheter in 7 Fr introducer catheter was advanced to the sapheno-popliteal junction (SPJ).

On a separate sterile dry preparatory trolley, the cyanoacrylate glue (CAG) was drawn up into the proprietary 5 ml syringe without air and was attached to the dispenser gun. The 5 Fr delivery catheter was connected to the syringe and was primed with adhesive up to the black mark 3 cm from the tip end. Then the delivery catheter tip was positioned 5 cm distal to the sapheno-popliteal junction (SPJ) and the delivery gun attached. The proximal end of the small saphenous vein at the sapheno-popliteal was compressed transverse thoroughly by the ultrasound probe with the left hand. The first dose of N-butyl-2 Cyanoacrylate glue, approximately 0.10-ml was applied by pressing and holding the trigger of the dispenser gun for 3 seconds. The device was immediately pulled back 1 cm and another 0.10-ml of glue shot was discharged for the same duration followed by a 3 minutes period of compression with the right hand. Following this, repeated 3 cm-spaced injections with 30-second manual compression sequences were applied until the entire length of the target vein was treated.

To seal the subcutaneous tract and reduce bleeding, the final dosage of glue was applied 3 cm from the access site, and the sheath / catheter was quickly removed while glue was continually applied. After that, a steri-strip dressing was used to close the puncture site. The total length of the treated vein was about 15 cm.

Due to superficial venous varicosities in the medial and posterior aspect of the right calf, concomitant foam sclerotherapy was used with sodium tetradecyl sulfate (STS) after the VenaSeal closure procedure was finished. The patient was discharged from the hospital after the procedure with no complications.

The patient was recommended to wear a knee high compressive elastic stockings for two weeks due to concomitant foam sclerotherapy.

#### FOLLOW UP

The patient was free of symptoms like pain and swelling of his leg, at the time of follow- up visit at two weeks, one month, three months and six months postoperatively. There were no postoperative complications or adverse effects such as allergic reaction, phlebitis, infection, glue- induced thrombosis, pulmonary thromboembolism (PTE), paresthesia occurred after the procedure up to the follow-up period. Duplex ultrasound was done at follow-up period showed small saphenous vein was obliterated completely with no evidence of deep vein thrombosis.



**Figure 4: Disappearance of varicose vein at follow up period.**

## **DISCUSSION**

The lower extremity venous system consists of deep and superficial veins and perforating veins connecting them. The deep veins are the main drainage system of the lower extremities. These veins accompany the lower extremity arteries and are typically referred to by the same names as the arteries (common iliac vein, deep femoral vein, etc.) The superficial veins consist of the great saphenous vein (GSV), small saphenous vein (SSV) and the communicating veins that connect these veins. Unlike deep veins, superficial veins are not "indispensable" for the venous drainage of the leg [4-5]. However, venous insufficiency/ incompetence usually occurs over the superficial veins and appears as varicose veins.

There are two methods for treating endovenous ablation of saphenous vein incompetence: thermal and non-thermal techniques. The basis of thermal techniques like radiofrequency ablation and laser ablation is that heat energy can be used to denature the venous wall. Although peri-venous tumescent can be used to provide anesthesia and to protect surrounding tissues from thermal injuries but there is a risk of skin burns, nerve injury and endothermal heat- induced thrombosis, hematoma, ecchymosis may occur. On the other hand, N-2-butyl cyanoacrylate glue is a non-thermal, non-tumescent endovenous ablation technique in which cyanoacrylate glue immediately polymerizes when in contact with blood cells and endothelial wall of the vein. The body encapsulates the polymer as a foreign body, cyanoacrylate glue trigger's inflammatory reaction in the vessel wall resulting in fibrosis and occlusion. As a result, there is low risk of damage of surrounding structures and skin, no risk of thermal injury. Other side effects like bruising, pruritus, phlebitis, paresthesia are less. DVT and pulmonary embolism are also rare. Advantages are minimally invasive technique, no need of general or regional anesthesia, better cosmetic effect, shorter intervention, and rapid recovery period.

N-2-butyl cyanoacrylate glue application to varicose veins is a novel minimally invasive method for the treatment of small saphenous vein incompetence or large saphenous vein incompetence. This material was first documented for the treatment of insufficient varicose trunks in lower limbs in humans by Almeida et al. in 2010[6].

This is my first reported case of ablation of small saphenous vein incompetence by VenaSeal Closure System using N-2-butyl cyanoacrylate glue. There were no adverse effects such as allergic reaction, phlebitis, infection, glue- induced thrombosis, pulmonary thromboembolism (PTE), paresthesia occurred at immediate post-operative period and at follow up-period. Although this single case report illustrates a novel technique but needs further study with case series and awaits the publication of randomized trials.

## **CONCLUSIONS**

Use of cyanoacrylate glue in VenaSeal closure system is a safe and efficacious modality of treatment to ablate small saphenous vein incompetence but more study with case series and experiences should be carried out for effective result.

## **CONFLICTS OF INTEREST**

There are no conflicts of interest.

## **FUNDING**

None

## **REFERENCES**

1. J. M. F. A. e. a. Criqui MH, Chronic venous disease in an ethnically diverse population: The San Diego Population Study. *Am J Epidemiol.*, vol. 158, 2003, pp. 448-56.

2. US markets for varicose vein treatment devices. Medtech 360.Toronto(Canada): Millennium Research Group, Inc:2013, 2013.
3. U.S. Food and Drug Administration. Approval order:Venaseal Closure System-P140018. Silver Spring(MD): U.S Food and Drug Administration :2015 Feb 20.
4. R. L. B. S. A. P. R. C. F. F. e. a. Lee AJ, Progression of varicose vein and chronic venous insufficiency in the general population in the Edinburgh vein study.J Vasc Surg:Venous and Lym Dis., vol. 3, 2015, pp. 18-26.
5. D. A. Lim CS, Pathogenesis of primary varicose veins. Br J Surg., vol. 96(11), 2009;, pp. 1231-42..
6. J. J. M. E. B. C. C. D. P. T. Almeida JI, Two-year follow-up of first human use of cyanoacrylate adhesive for treatment of saphenous vein incompetence. Phlebology, vol. 30, 2015, pp. 397-404.