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Protecting the Nerves

Incidence of nerve injury after endovenous laser ablation of incompetent great saphenous veins

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The content of this study was presented at 21st Annual Meeting of the European Venous Forum on 26th June 2021 (Web).

Summary:
Endovenous laser ablation (EVLA) was performed on 1,489 patients with great saphenous vein (GSV) insufficiency. Nerve injury occurred in 3.1% of the patients. Incidence of nerve injury was 4 times higher in cases of ablation length more than 40cm when compared to those below 40cm (5.2% vs 1.3%). One year after EVLA, more than 90% of the patients were relieved from their neurological symptoms.

Objectives:
Nerve injury is one of the most common complications after EVLA. The incidence rate is generally reported, having a wide range of 3-10% in literatures. The most common cause of the injury is a damage of the saphenous nerve system. Many of the injuries are transient, but some cases are known to be persistent.

In the present study, the incidence of nerve injury was observed in patients who underwent EVLA of incompetent GSV. One year after EVLA, changes of the neurological symptoms were investigated by phone interview.

Methods:
From January 2017 to December 2019, 1,489 patients (1,513 legs) underwent EVLA of incompetent GSV in the Kumamoto Vascular Clinic. The average age was 64.1 years. Male to female ratio was 1:2.5.

biolitec endovenous laser system (wave-length 1470nm) was used with Radial 2ring fibers (diameter 1.85mm). Anesthesia was a combination of tumescent local anesthesia and intravenous anesthesia. Ablation power was 9W. Targeting LEED was set at 50-70J/cm, depending on the diameter of GSV.

A nerve injury was defined as any neurological abnormal feelings in the treated leg persisting after 1 month after EVLA. Knee joint pain, sciatic neuralgia, and muscle pains were carefully excluded.

At 1 year after EVLA, 25 patients who had postoperative nerve injury were investigated by phone interview. They were asked if there were any changes in their symptoms. Patients informed the interviewer of their current pain level by selecting numbers on a range from "0-5". Number "5" means "symptom has not changed". Number "0" means "symptom completely disappeared". Results were divided into 3 groups. Number "1 or 2" is a group of "relieved". There were also patients who answered "3-5". These were put into the "no change" group. They were also asked about their quality of life.

Results:
1 month after EVLA, treated GSV were evaluated by ultrasonography. All GSV were completely obstructed. Nerve injury occurred in 47 legs (3.1%). The symptom was sensory nerve disturbance only. Motor nerves were not damaged. The most common symptom was a sensory disorder of saphenous nerve area, like a numbness seen after sitting with knee bending position for a long time. The relationship between ablation length and incidence of nerve injury is shown in > fig. 1. The longer the ablation length, the higher the incidence rate observed.

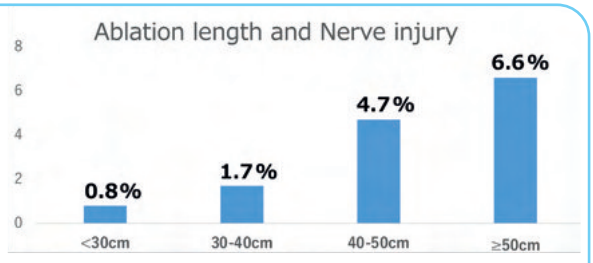

fig. 1 > Ablation length of GSV and incidence rate of nerve injury

One year after EVLA, a phone interview was performed asking about any changes of their neurological symptoms. As a result, symptoms disappeared in 44%, relieved in 48% and were not changed in 8% of the patients > fig. 2. No patients reported any restrictions in their quality of life.

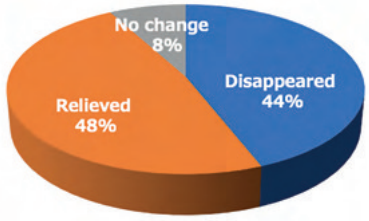

fig. 2 > Change of neurological symptoms at 1 year after EVLA

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Discussion:

Nerve injury was observed in 3.1% of patients. The incidence of nerve injury was 4 times higher in cases of ablation length of more than 40cm when compared to those under 40cm (5.2% vs 1.3%). A similar tendency was observed in patients who underwent radiofrequency ablation of incompetent GSV during the same observation period in the Kumamoto Vascular Clinic > fig. 3.

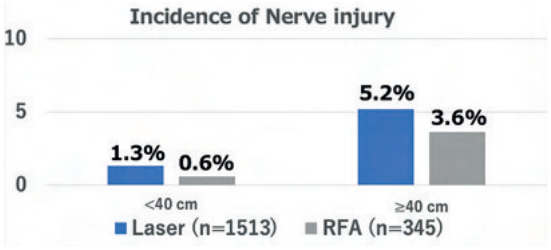

fig. 3 > Incidence of nerve injury after EVLA and RFA

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Of course, it depends on the body size of patients, at 40cm from the saphenofemoral junction, the posterior arch vein flows in GSV (> fig. 4).

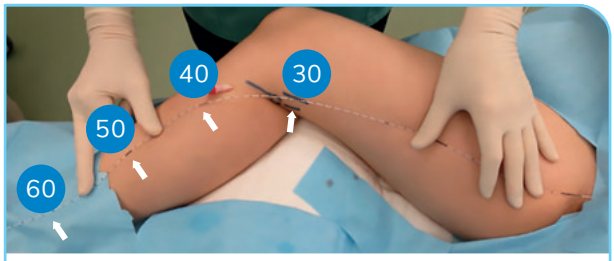

fig. 4 > At the point of 40cm from the saphenofemoral junction, saphenous nerve comes close to GSV. Below this point, the nerve runs side by side with GSV and the risk of saphenous nerve injury apparently arise.

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Below this point, it is known that saphenous nerve comes close to GSV and runs side by side in a narrow segment of saphenous compartment. Therefore, GSV ablation for more than 40cm may cause some damage to the surrounding structures.

Indication of below-knee GSV ablation is still controversial. In Japan, there is a dilemma. Half of vascular surgeons agree with it because of the benefit of a high curability of EVLA. But the other half disagrees with it because of a high risk of nerve injury. If saphenous nerve injury becomes preventable, more patients would have the opportunity to receive more curable EVLA in the future.

The ablation power used in this study was 9W. Reviewing the clinical results, we considered that exposure of below knee GSV to 9W was too large. Therefore, some new improvements would be necessary to prevent nerve injury in below-knee GSV ablation.

A new protocol for below knee GSV ablation:

We have recently changed our protocol for GSV ablation.

	Above Knee GSV	Below Knee GSV
power	7 W	5 W
targeting LEED	50-70 J/cm	20-25 J/cm
ablation length	36.9 ± 5.4 cm	13.5 ± 5.6 cm
actual LEED	53.4 ± 9.6 J/cm	21.7 ± 3.8 J/cm

Starting January 2021, using Radial 2ring slim fiber (diameter 1.25mm), below-knee GSV is ablated with the power of 5W with a targeting LEED of 20-25J/cm (> fig. 5). We call this technique "2-step-ablation". With this technique, we have not experienced any nerve injury in 140 consecutive legs which underwent GSV ablation of more than 40cm in length. We would like to recommend this new protocol for the purpose of avoiding saphenous nerve injury in below-knee GSV ablation. Long term clinical observations are now studied.

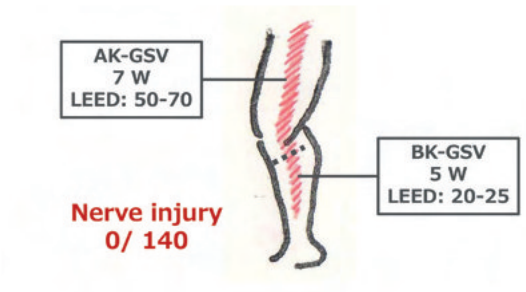

fig. 5 > "2-step-ablation" of GSV

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In addition to that, he is Councilor of The Japanese Society of Phlebology, Councilor of The Japanese Society for Vascular Surgery, Board Certified Surgeon of The Japanese Society of Surgery, and Board Certified Fellow of The Japanese College of Angiology.


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