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Effective Surgical Approach for Breast Cancer–Related Lymphedema Using High-Quality Vein Viewer

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Dear editor,

Breast cancer-related lymphedema occurs in 9 to 41% of patients, undergoing breast cancer treatment.[1] Lymphedema significantly impacts an individual's appearance, capacity to perform activities of daily living, and quality of life. First reported in 1977, lymphaticovenous anastomosis (LVA) is a minimally invasive surgical treatment for lymphedema.[2]

Lymphatic vessels are identified by injecting indocyanine green through the dorsum of the hand with the aid of a Photo Dynamic Eye (Hamamatsu Photonics, Japan). The accurate evaluation of lymph vessels results in a successful surgery without complications. Venous evaluation is equally important. Small veins are appreciable on ultrasound, but evaluating the blood vessels is time consuming. Therefore, this study investigated the utility of VueTek's Veinsite, a non-contact vein visualization system, in mapping the small veins of upper extremity with lymphedema at a faster rate compared with ultrasound (►**Fig. 1**).

The non-contact vein visualization system was developed primarily to facilitate blood collection in infants. However, veins measuring less than 0.5 mm were difficult to identify.[3] Veinsite is a high-performance, non-contact, and non-invasive vein visualization device that uses near-infrared light. It is a portable device, that is worn on the head, allowing the surgeon to use both hands. This allows for the real-time marking of identified vessels.

There have only been two case reports on the application of Veinsite in LVA. Both cases involved lower extremity lymphedema.[4,5] In the present study, LVA was performed using Veinsite on seven patients with upper extremity lymphedema. A total of 15 anastomoses were performed on the forearm, while seven were performed on the upper arm. All patients developed lymphedema secondary to breast cancer surgery. The number of small veins identified using Veinsite in a 3×3-cm^2 area centered at the orthogonal point of the incision line, and the linear patterns were examined. Veins visible to the naked eye were excluded.

In upper extremity lymphedema, Veinsite easily identified small veins throughout the forearm and upper arm, with an average of 2.42 veins in the forearm and 2.50 veins in a 3×3-cm^2 area of the upper arm (►**Fig. 2**). The concordance rate was 100%.

The conventional ultrasonography-guided marking takes approximately 30 minutes. Meanwhile, Veinsite is easy to

Fig. 1 Veinsite is a high performing, non-contact, vein viewer. Adjust it with the upper and posterior notches until the appropriate position is met. When you wear the device on your head, you will be able to see the screen inside the main unit. The screen shows a visualized image of blood vessels.

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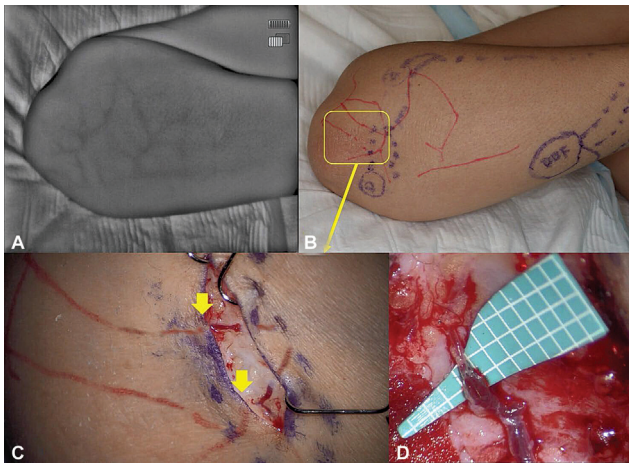

Fig. 2 Lymphaticovenous anastomosis using Veinsite for right upper extremity lymphedema with breast cancer of the refractory to compression therapy after total mastectomy and axially dissection. Preoperatively, there was marked edema at the elbow, which improved postoperatively. (**A**) Several small veins not visible to the naked eye identified using Veinsite on the upper arm. (**B**) Lymphatic vessels identified using indocyanine green fluorescent contrast marked in purple, and veins identified using Veinsite marked in red. (**C**) After skin incision, two small veins of 0.3 mm were identified just below the dermis. Both of them exactly matched the markings using Veinsite. (**D**) Lymphatic venous anastomosis is performed using the identified veins.

use, and it marks a large area within approximately 5 minutes. This significantly reduces the burden for patients who need to undergo other preoperative tests, such as the indocyanine green function tests.

However, this study has some limitations. The detectable vein thickness was not determined. Veins as small as 0.3 mm were identified in the area proximal to the dermis. However, veins of the same thickness were not appreciated in deeper areas. The detection rate varied with the depth of the vessels.

Veinsite is an accurate and simple tool for small vein identification. In upper extremity LVA, it was also useful in determining the incision site and significantly reducing the time spent on vein identification. Further improvements on this device will improve the field of supermicrosurgery.

Conflict of Interest

None declared.

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