Effectiveness of lymphatic cannulation in case of non-applicable intranodal lymphangiography

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ABSTRACT

A 78-year-old man presented with lymphatic fluid collections in bilateral inguinal area after bilateral inguinal lymph node dissections. Because no inguinal or popliteal lymph nodes were observed under ultrasound examination, intranodal lymphangiography was not applicable. Although traditional pedal lymphangiography was required, it was difficult to perform this procedure owing to the decreasing frequency over the past 20 years and being unavailable in not only our institution, but also other in institutions. Therefore, we performed catheterization using the 29-guage Argyle PI catheter into the lymphatic duct in lower legs under a microscope and achieved successful percutaneous embolization using N-butyl cyanoacrylate for inguinal lymphatic leakage. (J Vasc Surg Cases and Innovative Techniques 2021;7:97-9.)

Keywords: Pedal lymphangiography; Inguinal lymph node dissection; Lymphatic cannulation

Lymphangiography includes two methods, pedal lymphangiography (PL) and intranodal lymphangiography (IL). PL has been recently replaced by IL because it is (a) less time consuming, (b) less invasive (not requiring an incision to expose a pedal lymphatic duct), and (c) technically less difficult. However, PL was effective for diagnosing lymphatic leakage after dissecting inguinal or femoral lymph nodes and for both diagnosing and treating the leakage site in the lower legs. When the tiny lymphatic duct at the dorsum of the foot is punctured using a small needle, the rupture of the lymphatic duct or the instability of the needle may cause unsuccessful lymphangiography. Therefore, we performed catheterization of the lymphatic duct in lower legs under a microscope and achieved successful embolization using N-butyl cyanoacrylate (NBCA) for inguinal lymphatic leakage.

CASE REPORT

A 78-year-old man underwent low rectal resection for rectal cancer and ileum stoma construction at another hospital approximately 2 years ago. In addition, approximately 1.5 and 1.0 years earlier, carbon ion radiotherapy for treating the recurrence of sigmoid mesenteric and left lateral lymph nodes, and bilateral obturator lymph nodes were performed, respectively. Bilateral inguinal lymph node dissection was conducted for treating recurrence at our institution. After the surgical drains were removed, fluid collections were identified as palpable masses in the bilateral inguinal area, as confirmed by computed tomography scans (Fig 1) approximately 3 weeks after the operation. Because lymphatic leakage was strongly suggested, drainage tubes were placed percutaneously in each cavity. Elastic compression of lower legs was also performed in a hospital stay. The maximum drained volume was 975 mL/day with a right-sided predominance. Therefore, lymphatic embolization was planned.

No inguinal and popliteal lymph nodes were detected under ultrasound guidance. Therefore, polidocanol foam sclerotherapy was performed four times. The right-sided lymphocele had multiple compartments. Shortly before the first sclerotherapy, the left-sided drainage tube was removed because of insufficient drainage. Ultrasound-guided punctures were needed for some main compartments. However, the leakage continued after the sclerotherapy. A plastic surgeon exposed and catheterized the lymphatic duct in lower legs under a microscope and an interventional radiologist performed percutaneous embolization using NBCA for inguinal lymphatic leakage under local anesthesia with additional intravenous sedation in the following manner. First, indocyanine green (ICG; Daiichi sankyo, Tokyo, Japan) was intracutaneously injected between the first and second toes of bilateral feet similar to traditional trans-PL, the Kinmonth method.[1,2] Because lymphatic duct distribution can be observed under an infrared camera (Photo dynamic Eye; Hamamatsu Photonics K.K., Hamamatsu, Japan), the distribution was traced on the skin before surgery.

Second, the right-sided incision was made at the medial ankle, whereas the left-sided incision was created at the upper medial ankle. Each incision was approximately 1 cm long. The lymphatic ducts were exposed. Third, the 31-gauge needle was

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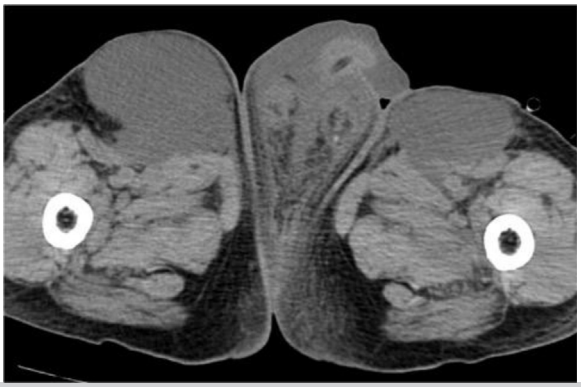

Fig 1. Noncontrast-enhanced computed tomography image of lymphoceles in bilateral inguinal area.

inserted to expose the right-sided lymphatic vessel (Fig 2, *A*). Iodized oil (Lipiodol; Guerbet, Tokyo, Japan) was injected gently at 0.2-0.4 mL/minute with 0.3 mL/kg or a 15-mL limit for adults, and the leakage point in the right inguinal area was detected (Fig 2, *B*). Subsequently, we punctured the upstream lymphatic vessel using a 25-gauge needle under fluoroscopy, as confirmed in two directions. To confirm that the needle reached the lymphatic vessels, we injected 5% glucose from the needle and detected that iodized oil in the lymphatic vessels was swept. Finally, we created an embolus by using 0.7 mL of NBCA (Histoacryl; B. Braun, Melsungen, Germany) and iodized oil (NBCA:iodized oil; 1:4) mixture, under digital subtraction angiography. However, we could not visualize the left-sided lymphatic vessels because of needle instability, despite attempting to insert a 31-gauge needle to the lymphatic vessel as well. Therefore, we attempted lymphatic cannulation using a catheter (29-gauge Argyle PI catheter; COVIDIEN, Tokyo, Japan; outer diameter [OD], 0.37 mm) (Fig 3, *A* and *B*). The catheter was advanced easily into the lymphatic duct over a guidewire. The lymphatic ducts in the left leg were visualized clearly, and the leakage point in the left inguinal area was identified (Fig 3, *C*). The left-sided 25-gauge needle was also inserted for the direct upstream lymphatic duct embolization by using 0.7 mL of a mixture of NBCA and iodized oil (NBCA:iodized oil; 1:4) similar to the right-sided embolization. After the embolization, the leakages disappeared. The drained volume also decreased and the drainage tube was removed 1 day after the embolization. No recurrence was observed after this treatment. All procedures performed in studies involving human participants were performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Informed consent was obtained from the patient for the treatments included in the study.

DISCUSSION

Conventional PL was reported in 1952 by Kinmonth.[1] However, IL is recently accepted as an alternative technique owing to some advantages such as reduced technical difficulties and procedure time and less invasiveness compared with PL. The original procedure of IL that was first described in 1967[2] was performed by a direct puncture of enlarged lymph nodes under palpation without ultrasound guidance. Rajebi et al[3] reported the effectiveness of IL under ultrasound guidance in 2011. Subsequently, IL was used an alternative to PL and accepted as the first-line evaluation and intervention for lymphatic disorders. However, the use of IL has been limited and less preferred than PL in case of lymphatic leakage after inguinal lymph node dissection and leakage site in lower legs. The technical difficulties associated with PL include rupture of the lymphatic duct using a small needle and instability of the needle. To overcome these difficulties, lymphatic cannulation may be a good alternative to PL.

Lymphatic cannulation has some advantages. First, a plastic surgeon performed the cannulation under a microscope, which made lymphangiography easier and more stable than under direct vision by small-needle puncture. Second, we detected a thicker lymph duct by ICG and a Photo dynamic Eye camera in the lower leg. Thus, the lymphatic duct was certainly accessible compared with the traditional PL. Peripheral lymphatic cannulation has been extensively described since the 1970s.[4,5] Based on these reports, Castillo and Lillioja[6] developed and simplified the technique for peripheral lymphatic cannulation. They inserted a catheter (0.35-0.45 mm) at 15 cm proximal to the medial malleolus between the medial border of the tibia and the saphenous vein. This technique was used for lymphatic fluid analysis, and not for the treatment of lymphatic leakage.

In clinical cases, Kimura et al[7] first reported about lymphatic cannulation using a catheter (OD, 0.42 mm). They performed therapeutic lymphangiography in a patient with chylous ascites using this technique. As lymph vessels used in lymphaticovenular anastomosis are approximately 0.3-0.5 mm in diameter,[8] catheters used for the neonatal central vein (OD, 0.37-0.42 mm) are suitable for lymphatic cannulation. Moreover, the outer catheter was soft; thus, it did not damage the lymph duct. Another effective option is direct lymphocele excision and leak ablation; this approach is simple and highly curative. However, direct resection is more invasive because it requires scar tissue dissection to identify the lymphatic vessel under general anesthesia. In contrast, identifying and exposing the lymphatic ducts in the lower legs are easily and reliably possible for a plastic surgeon with experience regarding lymphaticovenular anastomosis for lymphedema under local anesthesia and ICG lymphangiography; this approach is also less invasive.

In conclusion, lymphangiography with lymphatic cannulation may be effective in case of nonapplicable IL and PL.

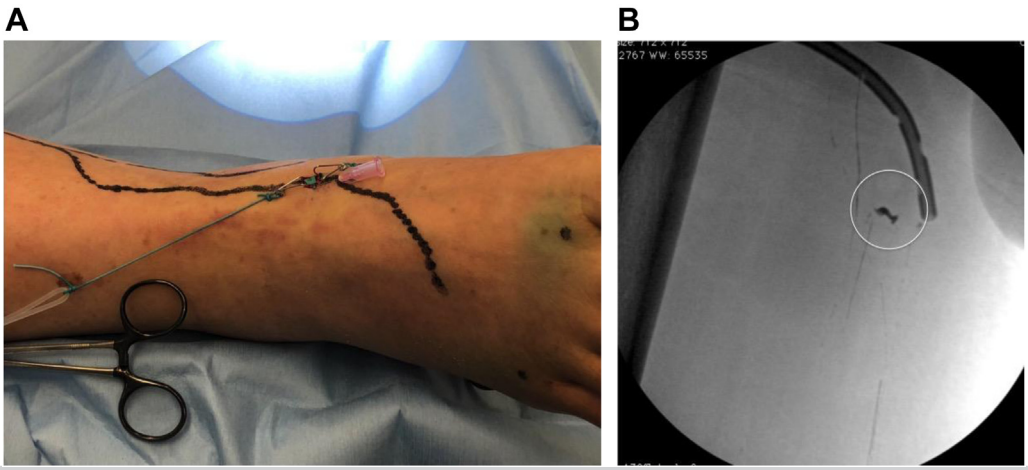

Fig 2. A, A 31-gauge needle was inserted to expose the right-sided lymphatic vessel. **B,** Leakage point in the right inguinal area was detected (*circle*).

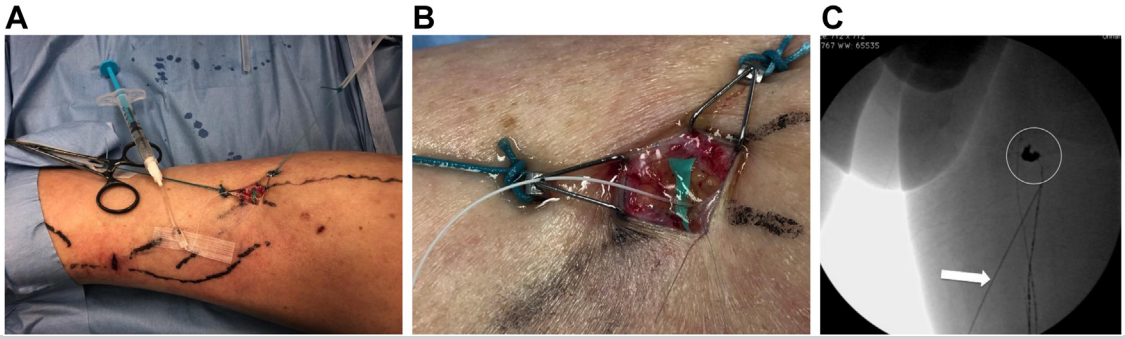

Fig 3. A, Exposed left-sided lymphatic vessel and lymphatic cannulation using a catheter for the neonatal central vein. **B,** Enlarged view. **C,** Lymphangiography revealed lymphatic leakage at the left inguinal area (*circle*). A 25-guage needle (*arrow*) was inserted directly at the inflow lymphatic vessel.

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