Journal of
Vascular Surgery
Venous and Lymphatic Disorders™

Use of computed tomography-lymphangiography with direct injection of water-soluble contrast medium to identify the origin of chylous ascites

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Contrast lymphangiography is a useful technique to determine the site of lymphatic leakage in the patient with chylous ascites. Conventional lymphangiography with lipid-soluble contrast material carries the disadvantage of complications, such as oil emboli and lymphedema. The authors report a successful case of computed tomography (CT)-lymphangiography with direct injection of water-soluble contrast medium into a lower limb lymphatic vessel to determine the site of lymphatic leakage in a pediatric patient with refractory primary chylous ascites. The patient subsequently underwent laparoscopic ligation of the leaking site and recovered well. This novel technique offers superior potential for preoperative assessment and the planning of laparoscopic repair.

Primary chylous ascites is uncommon. Its true incidence has never been well established,[1] although it can be estimated at approximately 1 in 20,000 admissions to large university-based hospitals.[2] Diagnostic investigation for primary chylous ascites includes abdominal sonography scans, lymphoscintigraphy, lymphangiography combined with CT using lipid-soluble intralymphatic contrast material, magnetic resonance imaging, and laparoscopy.[3-5] Lymphangiography is the "gold standard" for the evaluation of primary chylous ascites. This technique can confirm lymphangiectasia and identify the site of the lymphatic leak; this information is helpful for planning of surgical treatment. Oral administration or bipedal injections of lipid-soluble contrast material are the standard methods.[6] Although it is rare, conventional lymphangiography with the injection of 10 to 15 mL of Ethiodol may lead to life-threatening complications, such as pulmonary embolization, pulmonary edema, and adult respiratory distress syndrome.[7] In addition, the procedure may be uncomfortable for the patient.

The authors report a pediatric case of primary chylous ascites in which CT-lymphangiography with the direct injection of water-soluble contrast medium into a lymph vessel was performed to determine the site of the lymphatic leak and to enable laparoscopic surgical correction.

CASE REPORT

A 13-year-old girl without a history of surgery or trauma was referred to our hospital for chylothorax and chylous ascites of unknown etiology with the chief complaint of abdominal fullness. On admission, laboratory findings included C-reactive protein level of 0.02 mg/dL (range, 0-0.30 mg/dL), serum albumin level of 4.5 g/dL (range, 3.8-5.0 g/dL), total protein level of 8.0 g/dL (range, 6.5-8.0 g/dL), and lactate dehydrogenase level of 167 U/L (range, 124-215 U/L). The analysis of the ascites revealed its chylous nature (lactate dehydrogenase 100 U/L and triglyceride 1359 mg/mL of ascites). A CT scan and positron emission tomography-CT did not identify any abnormal findings that would suggest infection or neoplasia except for the presence of free fluid throughout the right thorax, abdomen, and pelvis (Fig 1, *A-C*). Lymphoscintigraphy revealed a leakage of chyle in the peritoneal cavity 90 minutes after bipedal injection of technetium Tc 99m-labeled human serum albumin (Fig 1, *D*). Magnetic resonance-thoracic ductography revealed the left-sided thoracic ducts to flow into the left venous angle and did not show any evidence of obstruction. The results of these examinations revealed that there were no findings of the obstruction and dilation of lymphatic vessels. The diagnosis of primary chylous ascites was made, and nonoperative management (a fat-restricted diet and somatostatin analogue) was started. After the treatment, the chylothorax improved. However, chylous ascites did not completely resolve, and it worsened immediately after nonoperative management was stopped.

Lymphoscintigraphy combined with CT was performed with indocyanine green (ICG) dye for imaging of the lymphatic vessels and ascertaining when the tracer reached the abdominal cavity (Fig 2, *A*). The leakage point was suspected to be the left lumbar lymphatic trunk at the level of the umbilicus (Fig 2, *B*). CT-lymphangiography was needed to determine the site of the lymphatic leak. The procedure was performed under general anesthesia. A small lymphatic duct was isolated on the dorsum of the left foot by use of ICG dye to visualize the lymphatic vessels, and it was cannulated with a 30-gauge needle. However, the

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Author conflict of interest: none.

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The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

2213-333X/$36.00

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http://dx.doi.org/10.1016/j.jvsv.2014.04.005

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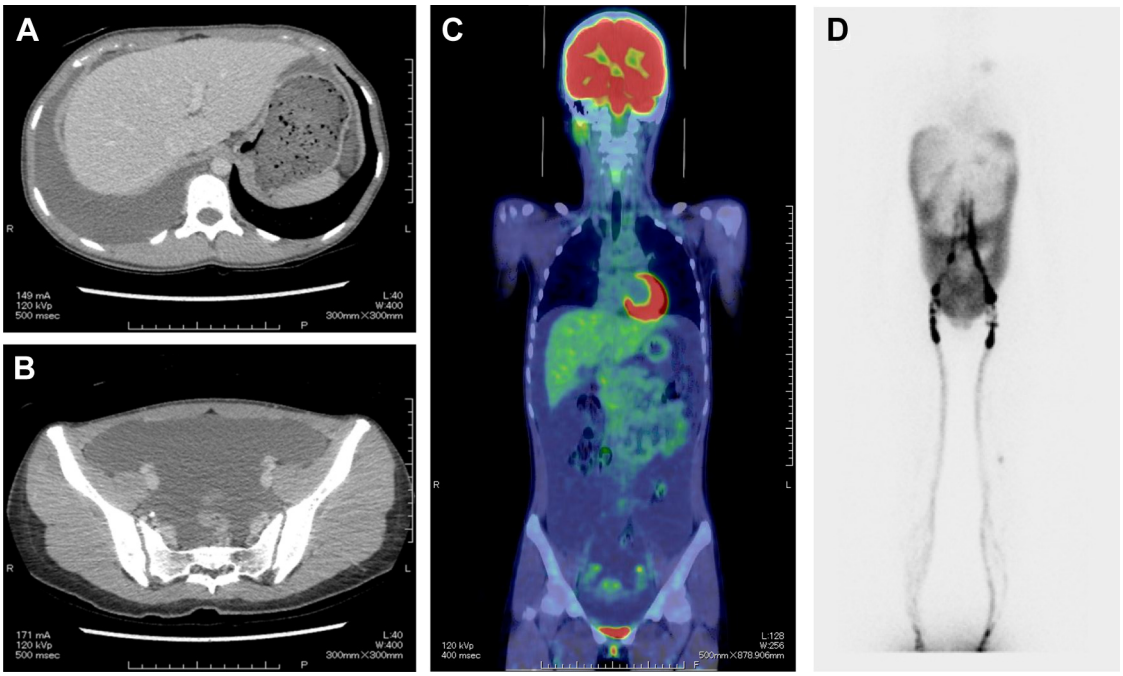

Fig 1. A, Transverse computed tomography (CT) view demonstrating ascites in the abdominal cavity. **B,** Transverse CT view demonstrating ascites in the pelvic cavity. **C,** Positron emission tomography-CT. **D,** Lymphoscintigraphy demonstrating the leakage of chyle in the peritoneal cavity 90 minutes after bipedal injection of technetium Tc 99m-labeled human serum albumin.

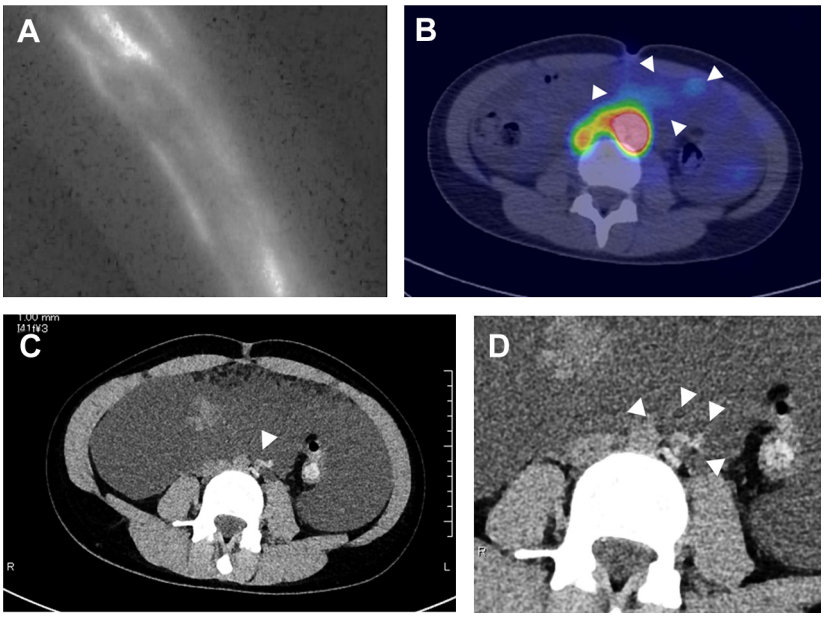

Fig 2. A, Indocyanine green (ICG) lymphography with a photodynamic eye camera. The left lower limb of the patient shows smooth lymphatic flow and no obvious dermal backflow. **B,** Lymphoscintigraphy combined with computed tomography (CT) demonstrates chyle leakage (*arrowheads*). **C** and **D,** CT-lymphangiography by the direct injection of water-soluble contrast medium into a lymphatic vessel of the lower limb; *arrowheads* show the extravasation of contrast medium from the left lumbar lymphatic trunk at the level of the umbilicus.

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