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Percutaneous Treatment of Chylous Ascites

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Chylous ascites occurs as a result of lymphatic leakage, which contains high concentration of triglycerides. The leakage is caused by various benign or malignant etiologies ranging from congenital lymphatic abnormality to trauma. Lymphangiography has been shown to be effective in the diagnosis of lymphatic leakage and has also been reported to have therapeutic outcome. The development of intranodal technique for lymphangiography has recently made the procedure more widespread. As an adjunctive procedure, percutaneous embolization may be performed which involves use of embolic agents such as N-butyl cyanoacrylate and coil to occlude the leak. Embolization in the lymphatic system was first made popular by the introduction of thoracic duct embolization by Cope et al and has recently led to the development of various techniques for percutaneous embolization. This article reviews the options and techniques for percutaneous treatment of lymphatic leaks in patients presenting with chylous ascites.
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KEYWORDS Lymphatic system, Lymphangiography, Chyle, Embolization, Cn-butyl-2-cyanoacrylate

Introduction

Chylous ascites is a condition characterized by accumulation of triglyceride-rich fluid in the peritoneum and results from various etiologies that cause disruption of the lymphatic system.[1,2] Reported causes include congenital lymphatic abnormalities, inflammatory conditions, liver cirrhosis, malignancies, trauma, and iatrogenic injury during surgery.[3-7] The definition for chylous ascites varies among the literature. Although some authors define chylous fluid as that with "milky" appearance and triglyceride content above 110 mg/dL, others use a higher threshold value of 200 mg/mL.[1,5,8] Not only does chylous ascites cause mechanical symptoms related to abdominal distension it also may lead to malnutrition and complications in the immune system that is linked with morbidity and mortality.[9] Initially, conservative treatment is attempted with high-protein, low-fat diet with medium-chain triglycerides and, when needed, absolute fasting with total parenteral nutrition and intravenous administration of octreotide.[9,10] Surgery such as lymphatic duct ligation or peritoneovenous shunting is reserved for patients that fail conservative management and is associated with perioperative morbidity especially owing to the poor condition of such patients.[2,9] In contrast, lymphangiography and percutaneous embolization is less invasive.[11-13] Lymphangiography alone has been reported to have therapeutic effect in 56%-86% of patients with lymphatic leaks.[13-17] Lymphatic embolization was first described by Cope et al where the thoracic duct was catheterized and subsequently embolized to treat chylothorax.[18,19] Thereafter, there have been accumulating reports on the subject of lymphatic embolization describing the techniques and outcome of the procedure.[20-25]

Clinical evaluation

At our institution, most cases of chylous ascites that are referred for lymphatic intervention largely comprise patients who have undergone extensive lymph node dissection during surgery for malignancies in the esophagus, stomach or pelvis. The reported incidence of lymphatic leak attributed to retroperitoneal lymph node dissection reaches up to 4%.[10,26] A large proportion of the patients have had surgical drains placed in the surgical field at the time of surgery, whereas the remaining few are referred beforehand for percutaneous placement of drainage catheters to alleviate symptoms related to abdominal

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distension. Although, the indication for lymphatic intervention varies according to the discretion of the referring surgeon, our patients generally suit one of the following criteria: drainage of 1000 mL/d for >5 days or persistent drainage lasting more than 1-2 weeks despite conservative treatment. The long duration of hospitalization resulting from conservative treatment that may last from weeks up to months after surgery, together with improved outcomes after lymphatic intervention during the recent years have resulted in a generally low threshold for converting from conservative treatment to percutaneous lymphatic intervention.

Currently, there is no guideline which states absolute indications or contraindications to lymphangiography and adjunctive embolization. Ahead of the procedure, the patients are informed of how the procedure is carried out and what to expect with respect to outcome. While obtaining informed consent, they are also informed of complications reported in the literature including allergic reaction to Lipiodol, pulmonary oil embolism and, in rare patients with right-to-left cardiac shunts, embolism to the brain.[14] At our institution, we do not routinely screen the patients for underlying cardiac disease. Furthermore, questioning each patient if they have history of allergy to ethiodized oil is not practical because they are very unlikely to have been exposed to such agent in the past. Lastly, the patients are informed of chronic complications that may result from embolization of the thoracic duct or cisterna chyli such as swelling of the abdomen, lower extremities, and chronic diarrhea.[27] The patients are given time to consider the benefits of the procedure over the consequences of prolonged, refractory chylous ascites that may lead to malnourishment and problems in the immune system.[1] To prevent loss of compliance during the period of treatment, the patients should be informed that repeated intervention may be required on some occasions to cure lymphatic leaks.

Equipment and Technique

Intranodal injection of Lipiodol (Guerbet, Aulnay-sous-Bois, France) is the sole technique used at our institution to obtain a lymphangiogram. All procedures are performed under guidance of ultrasound and fluoroscopy. With the patient in supine position on the fluoroscopy unit, cutaneous disinfection is performed from the level of the xiphoid process to that of the upper thigh. The groin and thigh regions are scanned with a linear transducer on both sides to determine the most accessible lymph node. Although larger lymph nodes are readily identified and tend to be easier to target under ultrasound guidance, smaller ones that are not hyperplastic are also accessible with a fine needle. The needle used is a 25-gauge metallic spinal needle that is not damaged by Lipiodol during injection as seen with some needles that have plastic components. The main advantage of using such a fine needle is that it penetrates the lymph node easily rather than pushing it away and that it prevents forceful injection of Lipiodol when injected manually. An additional advantage is that the patients mostly do not experience pain when the needle is introduced. After removal of the stylet of the needle, it is pre-assembled with a short connecting tube that is also stable in Lipiodol before puncturing the lymph node. Once the needle and connecting tube is assembled, the lymph node of interest is targeted with the needle under ultrasound guidance. A shallow angle of needle entry ensures secure positioning of the needle that is less prone to getting dislodged as compared to when the angle of entry is steep. The tip of the needle can be placed anywhere within the lymph node to inject Lipiodol. Some authors have suggested that the junction of the hilum and cortex should be targeted to achieve success.[28,29] Although this is also true in our experience, lymphangiography was nevertheless successful in any location regardless of whether the cortex or hilum was punctured. However, because of abundant fat within the hilum, a higher rate of extravasation was demonstrated when the needle tip was positioned at the center of the lymph node. Lipiodol injection was performed manually using a 3-mL syringe and controlled injection was performed allowing 3 mL of Lipiodol to be injected over a time of 6 minutes (0.5 mL/min). This rate is a little faster than that described in an earlier study by Kariya et al[28] where the injection rate was either 1 mL/3 min. The rate ranges between 0.2 and 0.4 mL/min in other reports.[14,29] A successful injection is demonstrated by a "blush" or "reticular" appearance of the cortex with opacification of the efferent ducts on fluoroscopy. Meanwhile, a globular collection of Lipiodol suggests extravasation into the fatty hilum or perinodal soft tissue. In the presence of extravasation, if some of the Lipiodol is seen to opacify the efferent ducts, Lipiodol injection is continued under close monitoring. However, if no efferent ducts are seen, Lipiodol injection is discontinued and another lymph node is sought. If a lymphaticovenous shunt is seen, caution must be taken not to allow excessive shunting of Lipiodol into the systemic venous circulation that may consequently result in pulmonary oil embolism.[28] The maximum dose of Lipiodol should not exceed 20 mL owing to risk of pulmonary embolism.[11] Fluoroscopy is used intermittently to avoid excessive radiation to the patient and operator. Lipiodol injection is continued until the Lipiodol reaches the ascending lumbar trunk. Usually, at this stage, Lipiodol injection can be withheld while waiting for the Lipiodol in the ascending lumbar trunk to slowly flow upwards to opacify the cistern chyli and thoracic duct. Lymphangiography has been reported to successfully demonstrate leaks in up to 86% of patients with lymphatic disruption.[13-15,17] Recently, we have started to make use of cone-beam CT that is available on our fluoroscopy equipment in cases where the leak is not clearly demonstrated on fluoroscopy. When the leak is identified, either one of the following choices can be made: (1) expect for therapeutic effect of lymphangiography alone (Figs. 1 and 2); (2) perform adjunctive percutaneous embolization. The latter is performed when therapeutic lymphangiography fails or in the face of high-out leaks exceeding 1000 mL/d. When the