Postoperative Lymphoceles: Detection with High-resolution MR Lymphangiography

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Lymphoceles that do not resolve spontaneously or with treatment may be a major problem associated with a high degree of morbidity. Several imaging studies, including ultrasonography, computed tomography, magnetic resonance (MR) imaging, lymphography, lymphoscintigraphy, and intraoperative lymphatic mapping have been proposed to delineate lymphoceles before treatment. The present report describes the successful detection of three lymphoceles of the inguinal region with leaking lymphatic vessels by means of high-resolution MR lymphangiography.

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Abbreviation: MIP = maximum-intensity projection

LYMPHOCELE formation is a well-known complication of operations in and around the inguinal and femoral vessels, with an incidence as high as 49% after radical lymphadenectomy (1–4). Any operation in and around the femoral and groin region may lead to inadvertent transection of lymphatic channels (1–4). If the surgeon does not recognize the lymphatic damage, anatomic compartments without an epithelial lining surrounding the site of dissection fill with protein-rich lymphatic fluid that is devoid of platelets and has low concentrations of clotting factors. Transected lymphatic channels therefore cannot clot and are prone to leak, resulting in a lymphocele. Most lymphoceles are small, sterile, and asymptomatic, and resolve spontaneously by reabsorption. However, large or infected lymphoceles may become symptomatic, causing distension, pain, secondary infection, and local compression. A variety of treatment options, including external compression, edema control, introduction of sclerosing agents, open and endoscopic exploration, lymphatic ligation, and placement of drainage catheters, have been attempted to provide relief of symptomatic lymphoceles, with varying degrees of success and a recurrence rate as high as 50% (5–11). Although the aim of successful treatment of lymphoceles is cessation of lymph leakage, the identification of damaged lymphatic vessels is difficult. Intraoperative lymphatic mapping with use of various dyes has shown promising results in the localization of lymphatic leakage (1–4,11). However, it is currently used more frequently for sentinel node evaluation in patients with malignancies (12).

The purpose of this study was to present the successful detection of three lymphoceles of the inguinal region with leaking lymphatic vessels by means of high-resolution magnetic resonance (MR) lymphangiography.

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MATERIALS AND METHODS

Study Design

Between February and July 2005, three patients with lymphoceles of the inguinal and femoral region (one woman and two men; mean age, 55 years; range, 45–62 y) were referred by the Foeldi Clinic for Lymphology and the Department of General and Visceral Surgery for high-resolution MR lymphangiography. Patients with contraindications to MR imaging, renal insufficiency, or known gadolinium contrast agent allergy were excluded. This study was approved by the local ethics committee, and all participants gave their informed consent before being included in the study.

Contrast Agent

Gadodiamide (GE Healthcare, Munich, Germany) is a commercially available extracellular water-soluble paramagnetic contrast agent with a gadolinium concentration of 0.5 mmol. At 37°C, the osmolality is 789 mOsm/kg. This contrast agent is normally administered intravenously at a recommended dosage of 0.1 mmol/kg body weight, which is equivalent to a dosage of 0.2 mL/kg. However, for MR angiography, gadodiamide has

been approved at doses as high as three times the standard dose. It is not subject to metabolization and is excreted unchanged by passive glomerular filtration. Gadolinium chelates have low molecular masses and are rapidly cleared from the intravascular space through the capillaries into the interstitial space. Experimental animal models have demonstrated only minor tissue damage after nonintravenous injection or extravasation (13). Therefore, the agent offers an acceptable safety profile for intracutaneous administration.

Contrast Material Administration

For injection of gadodiamide, a thin needle (24-gauge; Braun, Melsungen, Germany) was used. A contrast material dose of 18 mL and 2 mL of mepivacaine hydrochloride 1% was subdivided into 10 portions. Four portions were injected intracutaneously into the dorsal aspect of each foot in the region of the four interdigital webs, and one portion was injected medial to each first proximal phalanx.

Directly after administration of the contrast material, the injection sites of each foot were massaged for approximately 60 seconds. The massage was repeated during data acquisition. All patients were asked to describe the intensity of pain at the time of gadodiamide application. A four-point scale was used: 0, no pain; 1, mild pain; 2, moderate pain; and 3, severe pain. The patients were monitored clinically for at least 3 days after contrast agent injection to observe possible complications such as swelling or infection.

MR Imaging Examinations

MR imaging was performed with a 1.5-T system (Magnetom Symphony; Siemens Medical Systems, Erlangen, Germany) equipped with high-performance gradients. Three stations were examined: first, the lower leg and foot region; second, the upper leg and knee region; and third, the pelvic region and proximal upper leg. A phased-array body coil was used to perform imaging of the pelvic region, and a dedicated peripheral surface coil was used to examine the upper and lower leg. Before high-resolution MR lymphangiography, the location and size of the lymphoceles and lymphedema were evaluated with a heavily T2-weighted three-dimensional turbo spin-echo sequence (repetition time/echo time, 2,000/694 msec; flip angle, 180°; matrix, 256 × 256; bandwidth, 247 Hz/pixel; 6/8 rectangular field of view, 480 mm; slices, 96; voxel size, 2.0 × 1.9 × 1.7 mm; acquisition time, 4 minutes 4 seconds). To highlight the edema, three-dimensional maximum-intensity-projection (MIP) reconstructions were performed.

For high-resolution MR lymphangiography, a three-dimensional spoiled gradient-echo sequence (ie, volumetric interpolated breath-hold examination) with the following parameters was used: repetition time/echo time, 3.4/1.47 msec; flip angle, 25°; matrix, 448 × 448; bandwidth, 490 Hz/pixel; 6/8 rectangular field of view with a maximum dimension of 500 mm; slices, 128; voxel size, 2.2 × 1.1 × 1.5 mm; acquisition time, 44 seconds. The three stations were first imaged without contrast material, and imaging was repeated 5, 15, 25, 35, 45, and 55 minutes after intracutaneous application of the contrast material. To emphasize the gadolinium-containing structures, baseline images were subtracted before three-dimensional MIP reconstructions were calculated.

Image Analysis

Three authors qualitatively assessed the enhancement of gadodiamide in the lymphatic pathways, inguinal/iliac lymph nodes, and lymphoceles with use of the source images and MIP reconstructions. Images were evaluated regarding the visibility of lymphatic vessels, lymphatic leakage, and lymphoceles. An area of progressive dispersion of contrast medium into the soft tissues was regarded as dermal backflow. Diagnosis was made by consensus. The time courses of enhancement of the lymphatic pathways, inguinal/iliac lymph nodes, and veins were analyzed quantitatively by one author. The sizes of the regions of interest were adapted to encompass as much as possible of these structures. Imaging after administration of contrast medium facilitated the identification of these structures on the images obtained before administration of contrast medium.

RESULTS

Patient 1

A 45-year-old man with a history of non-Hodgkin lymphoma underwent extirpation of tumor bulk in the left groin and combined chemotherapy/immunotherapy. A large fluid collection developed after therapy, and aspiration of the fluid collection with biochemical analysis confirmed the diagnosis of lymphocele. Treatment in an outside hospital with percutaneous drainage and open surgery was unsuccessful, with recurrence of the lymphocele. Subsequently, the patient was referred to our clinic for further consultation.

High-resolution MR lymphangiography detected a left inguinal lymphocele 6.6 cm × 6.3 cm with one leaking lymphatic vessel (**Fig 1**). The patient underwent surgery at our institution and the leaking lymphatic vessel was confirmed by intraoperative patent blue dye injection (**Fig 1d**). Consequently, the leaking lymphatic vessel was anastomosed with another epifascial lymphatic vessel. Clinical and sonographic follow-up 1 month after surgery showed no accumulation of lymphatic fluid or swelling in the left groin.

Patient 2

A 62-year-old man with a history of metastatic anal carcinoma underwent local radiation therapy, chemotherapy, and bilateral inguinal lymph node extirpation at our institution. One month later, he presented with a large fluid collection that had developed in the left groin, and a lymphocele was suspected. Aspiration of the fluid collection with biochemical analysis confirmed the diagnosis of lymphocele. High-resolution MR lymphangiography demonstrated a lymphocele 6.0 cm × 4.5 cm and one leaking lymphatic vessel (**Fig 2**). The patient underwent open exploration and ligation of the lymphatic vessel. Clinical follow-up for several months until the death of the patient did not demonstrate recurrence of lymphatic fluid or swelling in the left groin.

Patient 3

A 57-year-old woman with a history of bilateral lipedema and