Cardiovasc Intervent Radiol (2019) 42:481–483
https://doi.org/10.1007/s00270-018-2125-7

LETTER TO THE EDITOR

The Use of Non-ionic Contrast Agent for Lymphangiography and Embolization of the Thoracic Duct

Mohammed H. Alomari[1] · Anna Lillis[1] · Cindy Kerr[1] · Jane W. Newburger[2] · Luis Quinonez[3] · Ahmad I. Alomari[1]

Received: 22 July 2018 / Accepted: 16 November 2018 / Published online: 28 November 2018

The authors report the successful use of non-ionic contrast agent for intranodal lymphangiography and subsequent embolization of refractory postoperative chylothorax in an infant with congenital heart disease and contraindication to the use of ethiodized oil contrast (Lipiodol) due to right-to-left shunting.

A 7-month-old female with complex congenital heart disease (including situs ambiguous, double-outlet single right ventricle and atrioventricular canal defect) developed right chylous pleural effusion following takedown of a modified Blalock–Taussig shunt. She was treated with chest tube placement, withholding oral intake and parenteral nutrition. Following 5 weeks of persistent effusion, intranodal MR lymphangiography was performed demonstrating contrast leak into the right pleural space. Due to the risk of stroke related to intracardiac right-to-left shunt, lymphangiography using Lipiodol (Lipiodol Ultra-Fluide, Guerbet, France) was not considered. After 9 weeks of refractory effusion (up to 235 mL/day; weight 9.0 kg), intranodal lymphangiography was performed as described by Rajebi et al. [1] using 22-gauge needles placed into femoral lymph nodes bilaterally under sonographic guidance. Non-ionic contrast (15 mL of Optiray 320, 678 mg/mL ioversol, Mallinckrodt, Hazelwood, MO) was injected under intermittent fluoroscopy over about 10 min delineating the iliofemoral and lumbar lymphatics. Faint visualization of the cisterna chyli and the thoracic duct was noted in about 8 min (Fig. 1). The cisterna chyli was accessed percutaneously at the level of the L2 vertebra through the anterior abdominal wall using a 22-gauge Chiba needle under fluoroscopic guidance. The needle was exchanged for a Prowler 14 microcatheter (Codman Neurovascular, Raynham, MA), which was advanced into the thoracic duct over a 0.014-inch Transend wire (Boston Scientific, Natick, MA). Transcatheter injection of Optiray 320 further confirmed the leak (Fig. 2). The thoracic duct was embolized with 20% *n*-butyl-2 cyanoacrylate glue (0.1 mL of Histoacryl, B. Braun, Melsungen, Germany, prepared with Lipiodol) (Fig. 3) and the microcatheter was then immediately withdrawn. The patient tolerated the procedure without complications.

The effusion gradually resolved with no output on POD 6 despite resuming feeding via the gastrojejunal tube on POD 4. The chest tube was removed 9 days following the procedure, and the infant was discharged 2 days later with no effusion. On the follow-up 15 weeks after discharge, she remained free of pleural effusion.

Dori et al. reported 18 patients with surgically corrected congenital heart disease, plastic bronchitis and right-to-left shunt on whom MR lymphangiography and intranodal lymphangiography using Lipiodol were performed. Embolization of veno-venous collaterals and temporary balloon occlusion of the Fontan fenestration were done prior to the use of Lipiodol to reduce the risk of oil embolization [2]. Nevertheless, one patient developed neurologic impairment due to diffuse deposition of Lipiodol in the brain.

✉ Ahmad I. Alomari
ahmad.alomari@childrens.harvard.edu

[1] Division of Vascular and Interventional Radiology, Children's Hospital Boston and Harvard Medical School, 300 Longwood Ave, Boston, MA 02115, USA

[2] Department of Cardiology, Children's Hospital Boston and Harvard Medical School, Boston, MA, USA

[3] Department of Cardiac Surgery, Children's Hospital Boston and Harvard Medical School, Boston, MA, USA

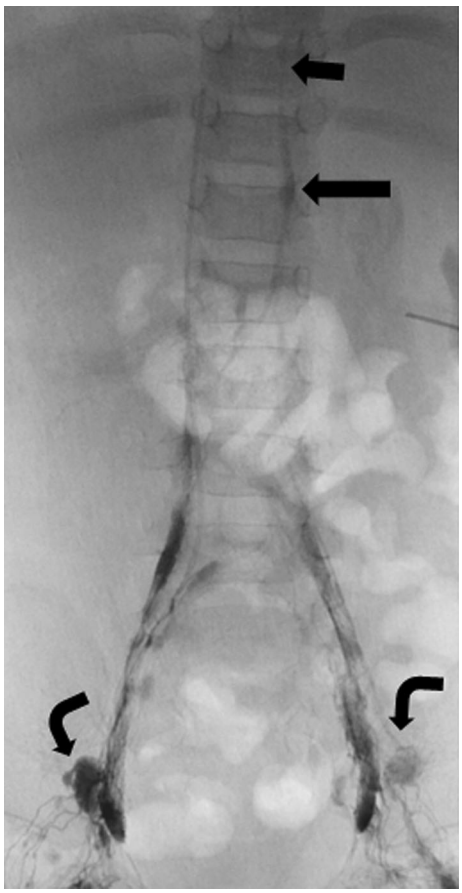

Fig. 1 Frontal radiograph of intranodal lymphangiography using non-ionic contrast demonstrating faint opacification of the iliofemoral lymphatic vessels and nodes (bent arrows), cisterna chyli (long arrow) and thoracic duct (short arrows)

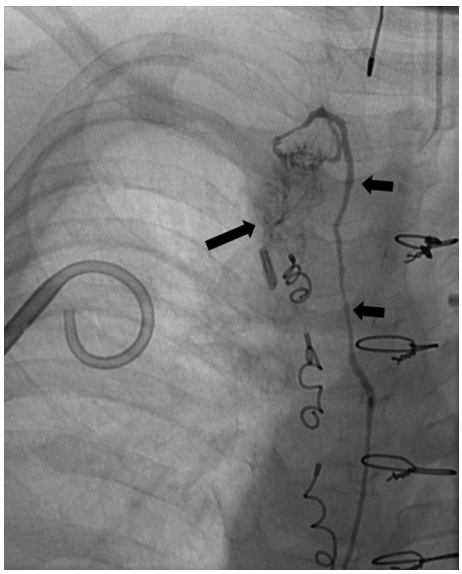

Fig. 2 Transcatheter lymphangiography demonstrating the upper segment of the thoracic duct (short arrows) with occlusion of the two cervical terminal branches and contrast leak into the upper pleural cavity (long arrow)

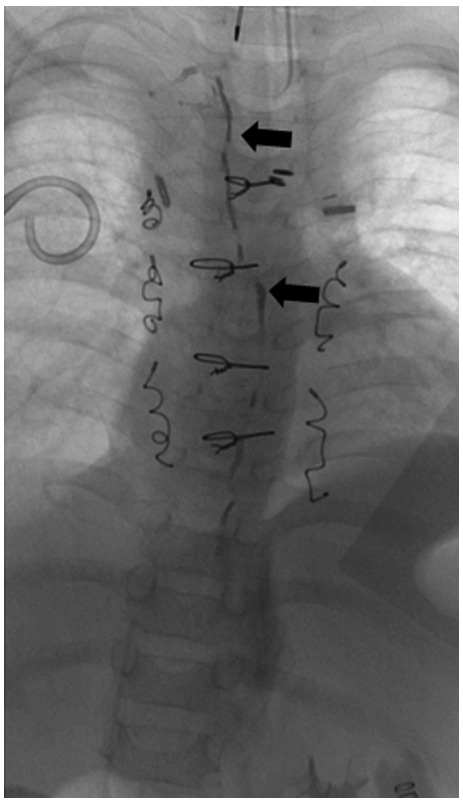

Fig. 3 A small glue cast within the thoracic duct (arrows)

Non-ionic water-soluble contrast agents are readily available and inexpensive; flow faster; and allow for using larger dose. This is particularly important in children in whom the recommended dose for Lipiodol is limited to 0.25 mL/kg [1]. We used 1.7 mL/kg of Optiray 320 in our patient.

The major disadvantage of using water-soluble iodinated contrast is the reduced density and rapid diffusion through the lymphatic trunk and lymph nodes, resulting in fuzzy "barbed wire" or "angora wool" appearances within minutes [3, 4]. Such faint visualization may even be more significant in larger patients. The use of a high-quality fluoroscopy protocol, contrast agent with high iodine content (e.g., Optiray 320) and rapid administration of the contrast intranodally may partially compensate for these limitations.

In conclusion, the use of non-ionic contrast for intranodal lymphangiography can be considered for patients in whom the use of ethiodized oil is contraindicated. This simple modification may eliminate the risk of stroke and expand the utilization of minimally invasive therapy for the challenging lymphatic disorders.

Compliance with Ethical Standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

1. Rajebi MR, Chaudry G, Padua HM, Dillon B, Yilmaz S, Arnold RW, Landrigan-Ossar MF, Alomari AI. Intranodal lymphangiography: feasibility and preliminary experience in children. J Vasc Interv Radiol. 2011;22:1300–5.
2. Dori Y, Keller MS, Rome JJ, Gillespie MJ, Glatz AC, Dodds K, Goldberg DJ, Goldfarb S, Rychik J, Itkin M. Percutaneous lymphatic embolization of abnormal pulmonary lymphatic flow as treatment of plastic bronchitis in patients with congenital heart disease. Circulation. 2016;133:1160–70.
3. Cusick BD. Technique of lymphography. In: Kuisk H, editor. Technique of lymphography and principles of interpretation. St. Louis, MO: Warren H. Green Inc.; 1971. p. 15–39.
4. Fischer HW. Lymphagiography and lymphadenography with various contrast agents. Ann N Y Acad Sci. 1959;78:799–808.