Abdominal lymphatic malformations in children: case series

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Abstract

Lymphatic Malformations (LMs) are benign congenital malformations of the lymphatic system that commonly involve the abdomen in children (mesentery of the small intestine and omentum). The management of these malformations is not unique. 7 children with different ages (range: newborn to 14 years), diagnosis was incidental in some cases, while in others for abdominal pain. All patients underwent abdominal ultrasound and Magnetic Resonance Imaging (MRI). Laparoscopy for diagnosis was useful in 4 cases. Treatment was: conservative in 1 child, laparoscopic excision in 3 patients, laparotomic excision in 3 cases. At follow up we observed recurrence in a case that required integrated treatment and bowel occlusion after excision in 1 case. This benign malformations may not cause any symptoms to patient. The goal of treatment is to maintain organ function, preserve aesthetic integrity and complications control. Management of these patients could be varied: the best approach should be evaluated on the basis of the patient.

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Introduction

Lymphatic Malformations (LMs) are benign congenital malformations that occur in the vascular lymphatic system, consist of variously dilated lymphatic channels or cysts, lined with endothelial cells with lymphatic phenotype.[1] These malformations are classified into 3 groups: macrocystic, microcystic and mixed one, defined by the size of its channels and complex lymphatic anomalies. LMs are usually isolated, but sometimes they may be associated with other venous or capillary abnormalities; rarely they could be part of more complex syndromic pictures.[2] LMs can be located anywhere except in the central nervous system, because it does not have lymphatics.

The neck and armpit are the most affected sites (about 90% of cases), less affected other sites (groin, retroperitoneum, mediastinum, trunk and extremities).[3]

The most common site for an abdominal LM is the mesentery of the small intestine, followed by the omentum.[4] Most of these malformations are present at birth; but in 90% of cases the diagnosis occurs in the first two years of life, a small part cannot be detected due to their deep localization or the absence of symptoms.[5]

The clinical presentation can be very variable and there is no single therapy for all cases, but the treatment must be adapted to the individual patient.

The aim of this case series is to show the difficulty in adopting a unique treatment for all types of abdominal LMs in children.

Case series

Case 1

A 7-year-old girl was referred to our hospital due to abdominal pain, vomiting and fever for approximately 72 hours. On examination, the abdomen was largely painful, in the absence of a palpable mass. At admission, the laboratory evaluation was negative, while

the abdominal ultrasound showed a voluminous expansion process extending from Morrison's space to the pelvis. Magnetic Resonance Imaging (MRI) confirmed the presence of an expansive tumour, located retroperitoneally in the mesenteric tissue, just below the head of the pancreas, with a smaller portion to the right; the formation appeared to be composed of fluid material with thin internal septa. Because of clinical presentation (acute abdominal pain) the patient underwent laparotomy that showed a massive retroperitoneal cystic mass that extended from the anterior space to the sacrum, to the right renal loggia with the lower part of the lesion resting on the right iliac and gonadal vessels. All the mass has been removed and histopathological reported a diagnosis of lymphatic malformation. In the postoperative period the girl presented a bowel occlusion due to adhesions which required a laparotomy on the fourth day after surgery. Clinical and ultrasound follow-up (3 – 6 - 12 months) was regular without signs of recurrence (Table 1).

Case 2

A 14-year-old girl comes to our observation for a mesenteric cyst diagnosed in the another hospital. He complained from 3 months an abdominal pain in his left hypochondrium, without other symptoms. Clinical examination revealed a palpable mass in the left hypochondrium, intensely painful on palpation. The blood tests were negative. Abdominal ultrasound showed in the left hypochondrium the presence of an elongated fluid mass, without vascularization, about 6.5 cm long.

MRI confirmed a mass with liquid content just below the aorta-bisiliac bifurcation, with some rounded, others elongated cysts located near the common iliac vessels on the left, with thin walls and no endoluminal projections, with a total extension of about 6.8 x 3.6 cm. Due to clinical presentation and diagnosis the patient underwent laparoscopy, which found, at the level of the ileal mesentery, a cystic formation that was completely removed with histopathological examination compatible for lymphatic malformation. Clinical and ultrasound follow-up (3 – 6 - 12 months) was regular without signs of recurrence (Table 1).

Case 3

A 4-year-old girl arrived to our observation with a diagnosis of abdominal mass during the hospitalization for pneumonia. The clinical examination showed the presence of a mass in the lower abdominal quadrants.

Blood tests showed an increase in leukocytes and C-reactive Protein (CRP); chest radiograph showed right postero-basal pneumonia; abdominal ultrasound showed a multiloculated cyst. MRI confirmed the presence of a fluid mass with septa in the lower abdomen, size 15 x 6.5 x 7.5 cm.

After resolution of the pneumonia, for a more accurate diagnosis she underwent diagnostic laparoscopy with evidence of large multicystic omental formation and adhesions with the abdominal wall and left ovary. A laparoscopic adhesiolisys was performed and once released, the formation was excised through the umbilical access, moderately enlarged to have better access to mass. A lymphatic malformation was diagnosed. Clinical and ultrasound follow-up at 3, 6 and 12 months showed no recurrence (Table 1).

Case 4

A 5-year-old boy arrived to the emergency room for abdominal pain and fever for about 48 hours. During the examination the abdomen was relaxed, but intensely painful. The laboratory tests showed an increase in inflammation indices, negative tumour markers, normal renal and pancreatic function.

Abdominal ultrasound described a fluid formation without vascularization in the left hypochondrium. The MRI confirmed the presence of this expansive process with multiple thin septa, with irregular margins of about 10 x 8 x 9 cm, the formation had relations with the stomach, the omentum and reached the pancreas, kidneys and spleen (Figure 1).

A diagnostic laparoscopy was performed, showing an abdominal mass in the retroperitoneum extended to the surface of the pancreas. The formation was isolated and excised through an umbilical mini-laparotomy. The sample was sent for histopathological examination compatible with lymphatic malformation. On the fifth postoperative day, ultrasound was performed and the boy was discharged. Three days later, he came to emergency room for abdominal pain.

Laboratory tests revealed inflammation and an increase in pancreatic function indices.

Abdominal ultrasound showed a recurrence of the mass (size 4 x 4 x 1.8 cm) just above the pancreas. Feeding was immediately suspended, parenteral nutrition started with administration of somatostatin and methylated gabesate.

After an initial improvement with oral feeding the child worsened again. A CT scan was performed and it showed a fluid formation with polylobate margins (size 5.8 x 4.6 cm) surrounding the pancreas anteriorly and posteriorly.

Table 1. All cases reported with clinical presentation, diagnostic tests performed, treatment and follow up. US: Ultrasound. MRI: Magnetic Resonance Imaging

Case sex	Age	Clinical presentation	Diagnosis	Treatment	Follow up
1 Female	7 years	Abdominal pain, vomiting and fever	US, MRI Lab: negative	Laparotomic excision	Intestinal occlusion (adhesions)
2 Female	14 years	Abdominal pain	US, MRI Lab: negative	Laparoscopic excision	No recurrence
3 Female	4 years	Abdominal mass during pneumoniae	US, MRI Lab: inflammation	Laparoscopy and laparotomic excision	No recurrence
4 Male	5 years	Abdominal pain and fever	US, MRI, CT Lab: inflammation	Laparoscopy and laparotomic excision Rapamycin	Recurrence
5 Male	Newborn	Fetal abdominal mass	US, MRI, Xray Lab: negative	Conservative	Reduction mass
6 Female	7 years	Recurrent abdominal pain	US, MRI Lab: negative	Trans-parietal puncture, Laparoscopic excision	Recurrence
7 Female	Newborn	Incidental abdominal mass	US, MRI Lab: negative	Laparoscopic excision	No recurrence

Due to the difficulty in removing the mass from the pancreatic tissue, it was decided, in agreement with hematologists, to undertake therapy with sirolimus (rapamycin). The program included weekly checks of the rapamycin level, inflammation indices, pancreatic function, glycaemia and electrolytes for the first month and then every month thereafter; an MRI every 6 months.

The patient, during therapy, has always been asymptomatic, pancreatic function indices are normal and MRI showed a reduction in mass (Figure 2).

After a year, given the condition of stability, it was decided to suspend the therapy, initially subjecting the patient to ultrasound and haematological monitoring every month and after the first three months every six months.

At 24 months of follow-up the patient is asymptomatic with normal haematological parameters, without mass size increase at ultrasound and MRI (Table 1).

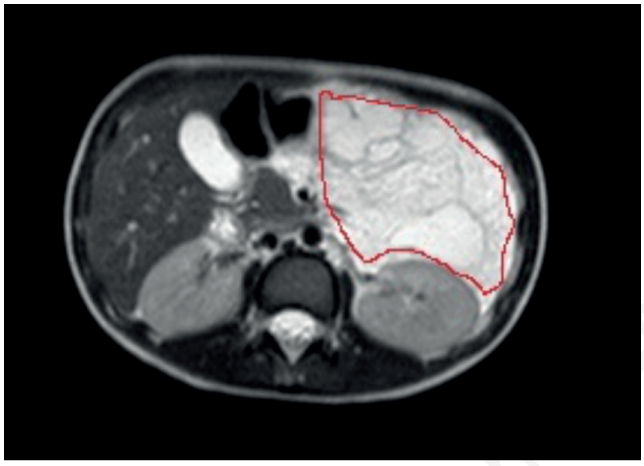

Figure 1. MRI image of expansive process with multiple thin septa, with irregular margins of about 10 x 8 x 9 cm (red line). The intrabdominal extension of the mass, without interesting the retroperitoneum, leads to a laparotomic removal.

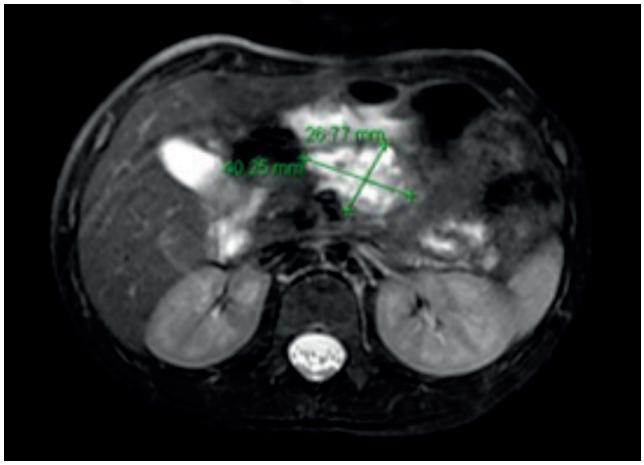

Figure 2. MRI image (12 months after integrated treatment) of the patient in figure 1. Green arrows show reduction in mass.

Case 5

Newborn with abdominal mass. At birth, the abdomen was treatable and apparently painless. The abdominal ultrasound showed free fluid in the abdomen and a cystic mass with internal septa localized in the lower quadrants. The Xray of the abdomen was normal with meteoric distension of the bowel. The meconium emission occurred on the first day of life; the patient was fasted. On the second day of life, he underwent MRI, which revealed the presence of a voluminous formation almost completely occupying the abdomen, further to the left. The formation compressed the left kidney posteriorly. The study of any associated malformations was negative and the general conditions were good (regular feeding, normal bowel movements and diuresis). Due to the good general condition and the characteristics of the large lesion, it was decided to follow the patient clinically and with abdominal ultrasound. These checks were performed every week in the first month and then every month for a year; the MRI was performed after 6 months. At 8 years follow up the patient was asymptomatic and ultrasound showed the mass reduced by half compared to the initial volume (Table 1).

Case 6

A 7-years-old girl came to our attention for recurrent abdominal pain since 1 year with abdominal ultrasound evidence of multiseptated anechoic mass in the left hypochondrium. The MRI confirmed the presence of a cystic mass with fluid content of approximately 5 x 3.7 x 7 cm in size. The suspicion was of a mesenteric lymphatic malformation or other cystic intrabdominal mass.

In order to have an accurate diagnosis of cystic formation, a trans-parietal puncture and aspiration of cyst's content under laparoscopic view was then performed. Cytological examination showed a lymphatic malformation. After this procedure the symptoms disappeared. After two years from the procedure, an abdominal ultrasound showed an increased size of the intra-abdominal lymphangioma (18.4 x 6.4 x 13.7cm). Because of this recurrence the girl was then submitted to a complete laparoscopic excision of the lesion. Histopathological examination confirmed the diagnosis of lymphatic malformation. At clinical and ultrasound follow-up (3, 6 and 12 months then yearly) no signs of recurrence was highlighted and the girls was asymptomatic. Currently the follow-up is 3 years (Table 1).

Case 7

Newborn female with an incidental ultrasound finding of suspected abdominal lymphangioma of 4.6 cm of the left hypochondrium. She was treated conservatively up to 4 years of age when the girl started to complain of abdominal pain. A MRI was performed demonstrating an important increase in size (20 x 20 cm) of the cystic mass. Because of the important size of the mass, the girl was then submitted to laparoscopic-assisted removal of the lesion. The mass was adherent to the omentum and the splenic flexure and after a laparoscopic excision, the lesion was exteriorized through the umbilical port access enlarged of 2 cm. Histological examination confirmed the diagnosis of intra-abdominal lymphatic malformation. At clinical and ultrasound follow-up (3, 6 and 12 months) the girls was asymptomatic without signs of recurrence. Currently in follow-up for 3 years (Table 1).

Discussion

The lymphatic system develops in the fifth gestational week from an endothelial sprouting outgrowth of the venous system. Alterations at this developmental stage cause the formation of dysfunctioning lymphatic collectors. Depending on the size of the cysts,

the International Society for the Study of Vascular Anomalies distinguishes macrocystis and microcystic subtypes mixed, and complex types.[2] From the histological point of view the LMs present squamous epithelium, a small lymphatic space, abundant lymphoid tissue, smooth muscle in the walls of the cyst, and cells containing lipid material.[6] Intra-abdominal localization of LM is rare; the incidence has been reported from 1 in 6000 to 1 in 16,000.[7,8] In abdomen, the lesions are preferentially localized in mesentery and the epiploon, and also found in the liver, spleen, pancreas, kidney, adrenal gland, large intestine and duodenum.[8]

As for incidence, there appears to be a slight male predominance (male/female ratio: 3.2 /1) and these lesions were observed in patients aged 3 months to 13 years.[9] Clinical presentation is very varied: some cases remain asymptomatic for many years, while others may have an acute symptomatology (abdominal pain, abdominal distension, fever, vomiting) or subacute with nausea and constipation. The complications of such a malformation can include abscess formation, intestinal obstruction, volvulus, bleeding into the cyst resulting in a hematoma formation, and/or rupture. As reported, clinical presentation in the child is faster than in the adult because the size of the abdomen is smaller and an increase in volume of an abdominal mass occurs faster, with the symptoms of acute abdomen.[10,11] The physical examination can therefore be completely silent, or highlight the presence of an abdominal mass, with or without signs of obstruction. The diagnosis is usually by imaging: the ultrasound is the first choice and can documents the type of malformation and any hemorrhagic complication (Figure 3). In our experience all children analysed were submitted to abdominal US and MRI. The latter was preferred for the better soft tissue characterization and because it does not involve ionizing radiation, as reported in the literature.[7] Only one case underwent CT scan because we needed a better study of the lymphatic mass in relation to pancreatic tissue. The abdominal ultrasound found the lesion in 100% of cases reported. It typically shows a cystic mass, with thin walls, containing fluid or corpuscular content if there is a hemorrhagic complication.[12] With signs of intestinal occlusion, an abdominal X-ray may be performed which may reveal a lateral displacement of intestinal loops or may show signs of obstruction. MRI is a second level examination, important in case of deep localization (confirms the diagnosis, defines the type of malformation, determines the size and identify the anatomical connection). In the presented cases, the MRI confirmed the diagnosis of an abdominal LM suspected of ultrasound. In cases of prenatal suspicion, fetal MRI has acquired a fundamental role in order to differentiate abdominal LMs from other lesions such as choledochal cysts, renal pelvis dilatations and intestinal duplications; obviously at birth must be performed in-depth examinations. The goal of treatment is to maintain organ function, preserve aesthetic integrity and complications control. The therapeutic possibilities for these patients are multiple: medical treatment, surgery, integrated treatments. It is important to remember that, when possible, the non-invasive treatment is to be preferred: in asymptomatic patients can be proposed a vigilant wait monitoring the possible clinical and ultrasound progress, in fact the spontaneous regression can be had in 45% of cases. In recent years, the improved comprehension of the pathogenesis of these lymphatic malformations has opened the era of targeted medical treatment. First of all with the advent of the mTOR inhibitor rapamycin (also known as sirolimus), the use of this drug in the treatment of vascular malformations is recent, compared to its historical use in transplant patients. The starting dose was 0.8 mg/m^2 twice daily for children, adjusted to reach serum target concentration between 8 and 15 ng/mL; also in our experience the use of sirolimus has been well tolerated and has allowed a reduction in

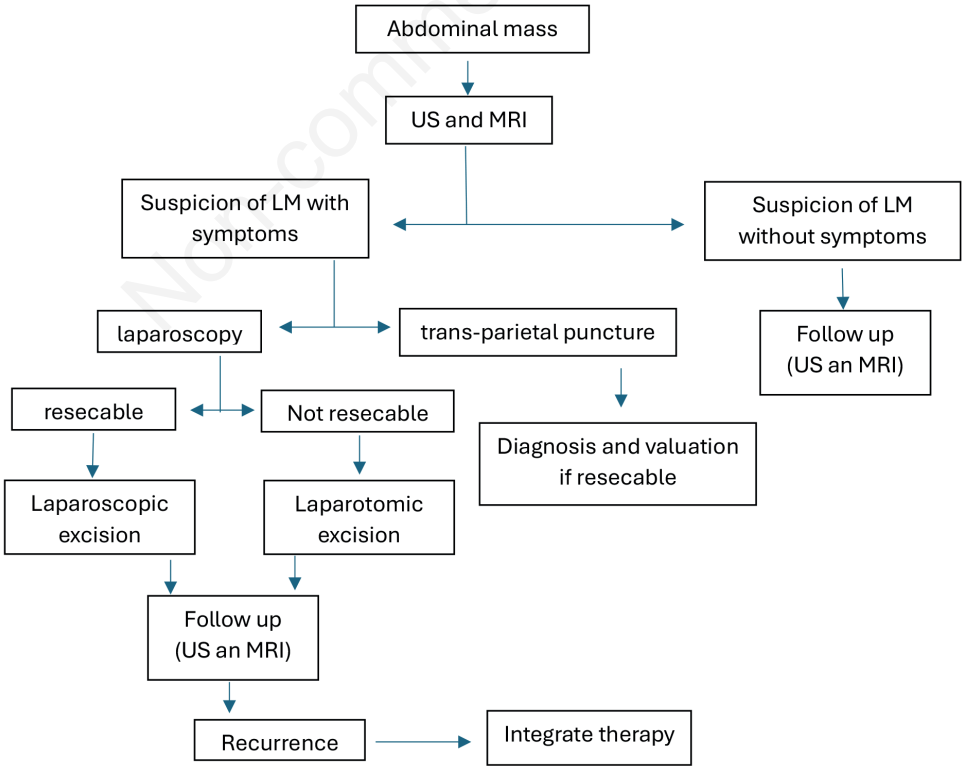

Figure 3. Flow chart: Diagnostic and therapeutic approach adopted for our patients. US: ultrasound. MRI: Magnetic Resonance Imaging. LM: Lymphatic Malformation.

the size of the lesion and a regression of the symptomatology. The treatment of recurrence is even more complex than the first treatment, in our experience we performed a surgical removal in one patient and we used sirolimus in another child, the approach was decided together with the hematologist and pediatrics. In our opinion, treatment of recurrence should be discussed even more by multidisciplinary team. In cases where surgery is required, this must be radical but not mutilating; in fact despite the fact that LMs are benign lesions, the typical feature is to infiltrate the surrounding tissues making complete excision extremely difficult; so that there is a high possibility of recurrence in cases of incomplete excision. The two possible surgical options are either the removal of the cyst alone or the removal of the cyst with the infiltrated structures.[13] An important role is played by the laparoscopic approach, for different orders of reasons: in doubtful cases it allows to confirm the diagnosis, faster recovery even in the case of large resections, better aesthetic result.[14,15] Probably, as demonstrated in some preliminary cases, a further improvement can be obtained by performing these procedures with the help of robotics.[16] For unresectable abdominal macrocystic type, sclerotherapy has become an important therapeutic option; sclerotherapy performed under radiological or laparoscopic guidance, consisting of the local injection of different agents such as picibanil (OK-432), or doxycycline, that causes scarring of cyst walls to one another.[17,18] This therapeutic approach is indicated especially for the forms that are difficult to resect surgically (retroperitoneal LM), only one present in our series.[19,20] A mutation of the PIK3CA gene has recently been evaluated on tissue removed from patients with LM, this was not performed in our series, but seems important for prognosis and to address follow up.[21]

Conclusions

Lymphatic malformations are a type of vascular malformation, characterized by low flow, which have a tendency to infiltrate organs and can create great difficulties in management, especially in children.[22] Also the study of this case series of two pediatric surgery centers confirms that the treatment can't be unique. The aim of this series is to emphasize the necessity of a multidisciplinary approach, underlining the importance of collaboration between pediatric surgeons, radiologists, and other specialists (hematologists, pediatrician) for optimal management of these complex cases.[7]

References

1. Wohlgemuth WA, Brill R, Dendl LM et Al. Abdominal lymphatic malformations. Radiologe 2018;58:29-33.
2. Wassef M, Blei F, Adams D, et al. Vascular anomalies classification: recommendations from the International Society for the Study of Vascular Anomalies. Pediatrics 2015;136:e203-14.
3. Mulliken JB, Burrows PE, Fishman SJ (eds.). Mulliken and Young's. Vascular Anomalies Hemangiomas and malformations. 2nd edition. pg 575.
4. Mendez-Gallert R, Solar-Boga A, Gomez-Tellado M, et al. Giant mesenteric cystic lymphatic malformation in an infant presenting with acute bowel obstruction. Can J Surg 2009;52: e42–3.
5. Cahill AM, Nijs EL. Pediatric vascular malformations: pathophisiology, diagnosis, and the role of international radiology. Cardiovascular Intervent Radiol 2011;34:691-704.
6. Lee S, Park J. Abdominal lymphatic malformation in children. Adv Pediatr Surg 2018;24:60-7.
7. Hyvönen H, Aronniemi J, Salminen P, et al. Operative management of intra-abdominal lymphatic malformations in children: a single tertiary center experience. J Pediatr Surg 2024;59:1875-8.
8. Thiam O, Faye PM, Niasse A, et al. Cystic mesenteric lymphangioma: A case report. Intern J Surg Case reports 2019;61;318-21.
9. Steyaert H, Guitard J, Moscovici J, et al. Abdominal cystic lymphangioma in children: benign lesions that can have a proliferative course. J Pediatr Surg 1996;31:677–80.
10. Saviano MS, Fundaro S, Gelmini R, et al. Mesenteric cystic neoformations: report of two cases. Surg Today 1999;29:174–7.
11. Goh BKP, Tan YM, Ong HS, et al. Intra-abdominal and retroperitoneal lymphangiomas in pediatric and adult patients. World J Surg 2005;29:837–40.
12. Makni A, Chebbi F, Fetirich F, et al. Surgical management of intra-abdominal cystic lymphangioma. Report of 20 cases. World J Surg 2012;36:1037-43.
13. Kim SH, Kim HY, Lee C, et al. Clinical features of mesenteric lymphatic malformation in children. J Pediatr Surg 2016;51: 582–7.
14. Liu Q, Fu J, Yu Q, et al. Laparoscopic surgery of intra-abdominal lymphatic malformation in children. Exp Ther Med 2022;24:581.
15. Bertozzi M, Ruffoli M, Vatta F, et al. The effectiveness of abdominal lymphangioma laparoscopic removal in children: a single center experience. J Laparoendosc Adv Surg Tech A 2021; 31:1367-71.
16. Qingjiang C, Shuhao Z, Wenjuan L, et al. Robotic-assisted laparoscopic management of mesenteric cysts in children. Front Pediatr 2023;10:1089168.
17. Wohlgemuth WA, Dendl LM, Brill R, et al. Abdominal lymphatic malformations. German version. Radiologe 2018;58:19–24.
18. Russell KW, Rollins MD, Feola GP, et al. Sclerotherapy for intra-abdominal lymphatic malformations in children. Eur J Pediatr Surg 2014;24:317–21.
19. Zamora AK, Barry WE, Nowicki D, et al. A multidisciplinary approach to management of abdominal lymphatic malformations. J Pediatr Surg 2021;56:1425e9.
20. Madsen HJ, Annam A, Harned R, et al. Symptom resolution and volumetric reduction of abdominal lymphatic malformations with sclerotherapy. J Surg Res 2019;233:256e61
21. Venot Q, Blanc T, Rabia SH, et al. Targeted therapy in patients with PIK3CA related overgrowth syndrome. Nature 2018;558: 540e6.
22. Kulungowski AM, Patel M. Lymphatic malformations. Semin Pediatr Surg 2020;29:150971.