

Fetal and Perinatal Lymphangiomas - A Spectrum of MR and CT Findings

George Hadjidekov^{1,*}, Boyan Balev², Savina Hadjidekova³, Ivan Plachkov¹, Kristian Tzvetankov¹ and Violeta Groudeva⁴

¹Department of Radiology, University Hospital "Lozenets, Sofia 1407, Bulgaria

²Department of Radiology, University Hospital "Sveta Marina"9000, Varna, Bulgaria

³Department of Medical Genetics, Medical University, Sofia, 1431 Bulgaria

⁴Department of Radiology, University Hospital "Sveta Ekaterina", Sofia 1431, Bulgaria

Abstract: Lymphangiomas are uncommon benign congenital multiloculated cystic malformations of lymphatics with the potential to infiltrate surrounding structures. They are discovered mainly by US, as first method of choice in fetal examination. However, fetal MR imaging is suitable to confirm or reject ultrasonographic findings, provides detailed anatomical orientation and is appropriate to evaluate the extent and character of lymphangiomas. This complementary technique contributes to the accurate diagnosis of lymphatic anomalies and benefits of excellent tissue resolution, large field-of-view and relative operator independency. This article presents three cases of lymphangioma of different localizations, describes prenatal and perinatal magnetic resonance (MR) and computed tomography (CT) imaging findings, and discusses the advantages of those supplementary to ultrasound (US) methods in regard to patient counseling, management and delivery decisions /continuation or termination of pregnancy/.

Keywords: Cystic lymphangioma, Fetal and perinatal CT and MR Imaging.

INTRODUCTION

Lymphangiomas are lymphatic malformations due to developmental failure. These uncommon, benign, cystic soft-tissue tumors found in neonates and children can affect different body regions. They consist of solid and cystic components with variable extent and may grow very large even in utero. Spontaneous regression of lymphangiomas is controversial. Sudden increase in size could be observed in intralesional hemorrhage. The local growth and extension occurs along the layers of connective tissue between organs and muscles. Fetal and perinatal imaging is performed by ultrasound (US), magnetic resonance imaging (MRI) and rarely computed tomography (CT) [1]. This article describes the common MR and CT findings and the different localizations of lymphangiomas in fetuses and newborns. All three cases showed normal karyotype.

A short review of the literature shows that the ability to diagnose fetal tumors has improved over recent years. Avni *et al.* find ultrasound findings and the location of the tumors suitable for establishing the differential diagnosis, however in selected cases MR imaging can provide additional information [2]. According Rodriguez *et al.* MR imaging offers various technical advantages over US, including a larger field

of view, limitations due to maternal habitus etc. and can be used to distinguish different types of cystic malformations [3]. Tamizkan *et al.* suggest to avoid CT in fetal age because of issues relating to radiation exposure to mother and foetus. The method could be used postpartum in limited occasions. According to those authors, MR imaging may play a role in prenatal imaging to provide early comprehensive information about both the anatomy and the extension of cystic hygromas [4]. Some authors like Ljubic *et al.* describe an extensive comparison between MR and US in the diagnosis of fetal and maternal complications [5].

CASE 1

The majority of lymphangiomas occur in the neck, mainly in the posterior triangle. The first case represents a 6 week old male referred to our department with prenatal suspected vascular lesion of the neck. On physical examination swelling of the left side of the neck of the newborn was observed without any signs of respiratory difficulties or skin defects or coloration. Ultrasound performed prior to MRI depicts a thick-walled polycystic formation and has been described as cystic aciniform tumor. The MR examination [single-shot fast spin echo SS-FSE and Fiesta sequences in Coronal, Axial and Sagittal plane FOV 24x18, slice thickness 5mm matrix 51x256] demonstrated a prominent heterogeneous mass on the left side of the neck (Figure 1). The lesion is lobulated,

*Address correspondence to this author at the Department of Radiology, University Hospital "Lozenets, Sofia 1407, Bulgaria; E-mail: jordiman76@yahoo.com

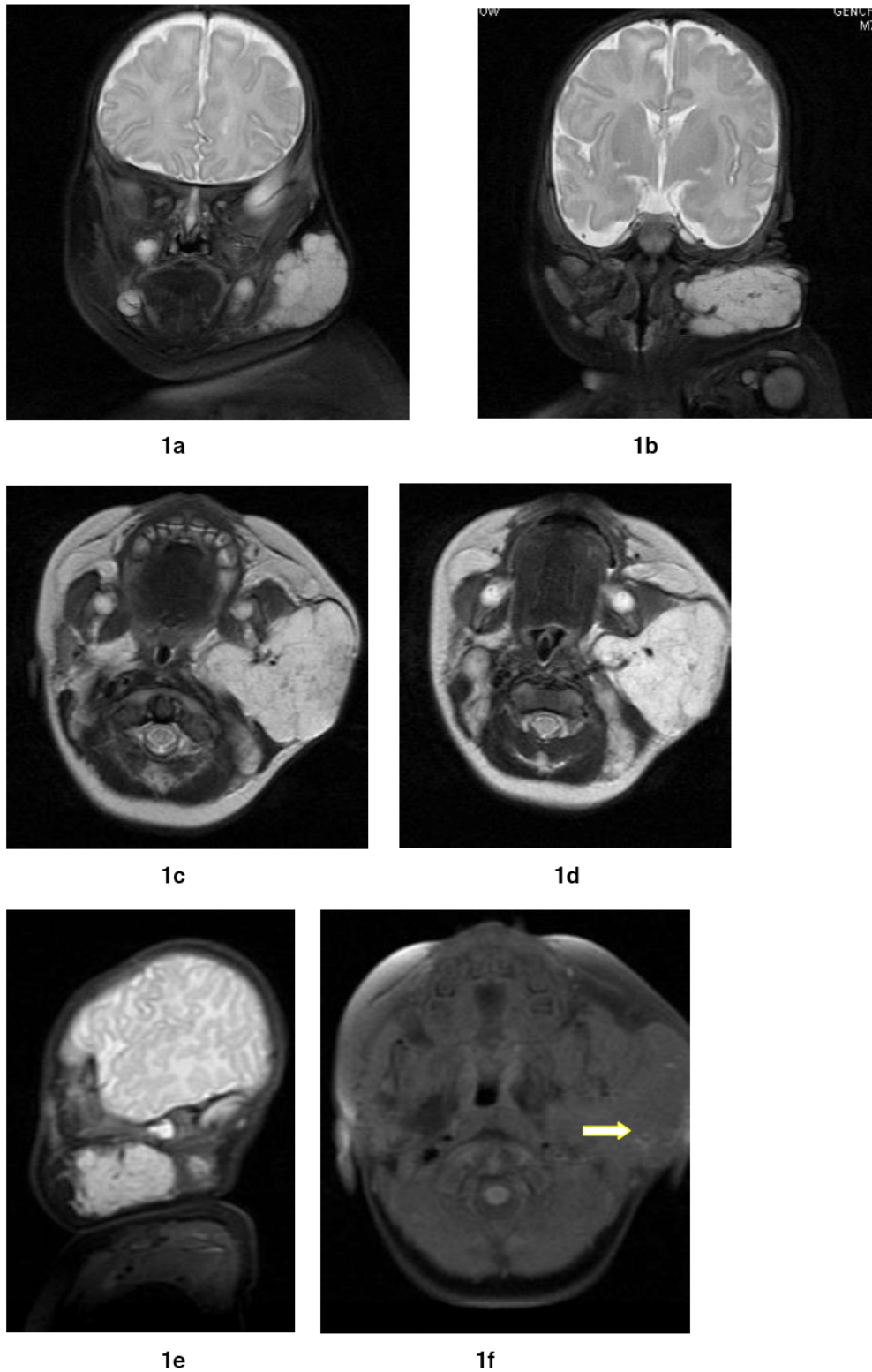


Figure 1: MR appearance of lymphangioma colli at the age of 6 weeks. **1a, 1b** - coronal SS-FSE **1c, 1d** -axial **1e** - sagittal image demonstrates multiples internal locules, compressing adjacent structures on this left side cystic mass of the neck. Axial T1 fat-saturated image - **1f** - shows some hyperintensities within the cystic component, indicating intralesional hemorrhage (arrow).

multicystic, hyperintense on T2 and hypointense on T1 sequences, well defined with mild compression of

surrounding structures.

CASE 2

Although lymphangiomas are most common in the neck region, they may also be present in the axillae and mediastinum. Primary mediastinal lymphangioma is extremely rare, as it usually affects the upper anterior mediastinum, almost always extending from a cervical hygroma. Acute enlargement is often associated with spontaneous intralesional hemorrhage. In this case, a 1 month old male was referred to low-dose CT with lack of normal breath sound on auscultation of the left hemithorax and consolidation of the left lung with displacement of the mediastinum to the right on plain film. Infiltration of the mediastinal soft tissues with compression of the left cardiac chambers and displacement of the trachea, esophagus and aorta due to the presence of the large cystic mass, almost entirely occupying the left hemithorax has been observed (Figure 2). There was no evidence of calcifications secondary to infection or bleeding. CT was conclusive in establishing the diagnosis of

intrapulmonary cystic lymphangioma and allowed clinicians to clearly define the extent of the lesion. However, in fetal and neonatal age and in pediatrics CT should be avoided when possible due to radiation exposure and can be done only when clinically justified. The immediate benefits of CT outweigh the long-term risks in many settings and because of CT's diagnostic accuracy and speed of scanning, notably removing the need for anaesthesia and sedation in young patients, it will remain in use in clinical practice for the foreseeable future [6].

CASE 3

Abdominal lymphangioma is a very uncommon congenital anomaly. Therefore, this is an unusual case, which on prenatal sonography at 30 weeks of gestation of 26 years old woman, first pregnancy a suspicion of neuroblastoma or hepatoblastoma was suggested (Figure 3). Subsequent fetal MRI at 31weeks gestation was performed. Findings demonstrated a large

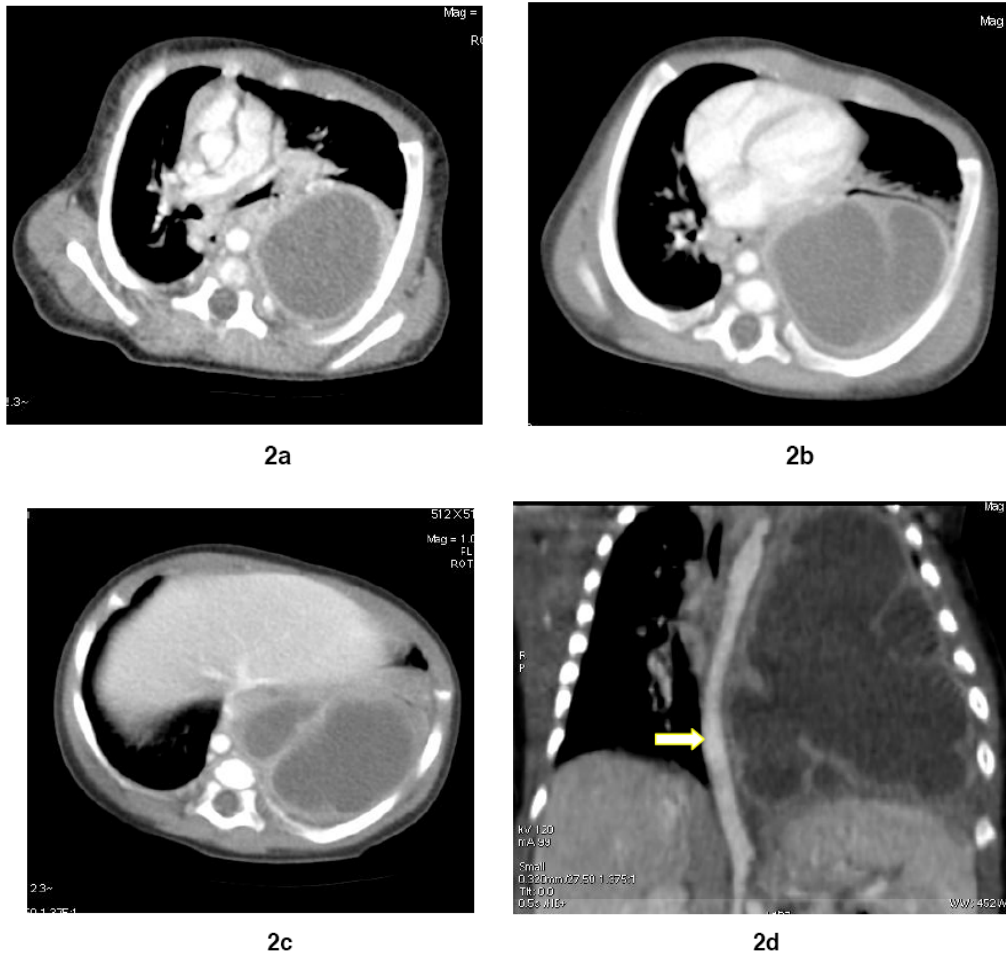


Figure 2: Contrast-enhanced low-dose CT scan on different levels - **2a, 2b, 2c** - demonstrates peripheral enhancement of a loculated, septated cystic mass in the left hemithorax with marked compression and displacement of major mediastinal structures. **2d** - reformat image in coronal plane presenting the displaced thoracic aorta by the cystic lesion (arrow).

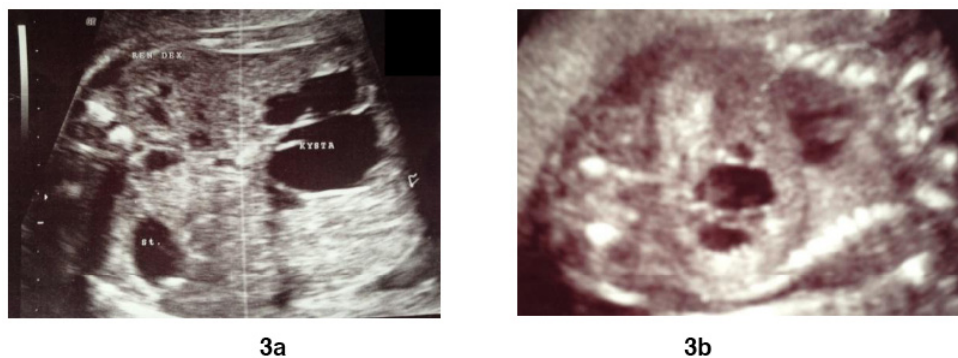


Figure 3: 3a, 3b. Prenatal ultrasonographic findings of fetal cystic abdominal lymphangioma.

hyperintense multicystic mass adjacent to the inner liver contour with mesenteric origin. The liver was displaced towards the abdominal wall. On MRI, no solid mass was evident in addition to the cystic component of the lesion, measuring 37/24mm in the axial plane and 33/30mm in coronal view (Figure 4). No liquid levels were observed within the cysts.

DISCUSSION

Lymphangiomas presents congenital lymphatic malformations due to failure of normal lymphatic development and are usually discovered at birth. Four main histological types of lymphangiomas are known and are classified as a) capillary lymphangioma (a small, irregular mass of thin-walled dilated lymphatics in a rich cellular connective tissue stroma); b) cavernous lymphangioma (a larger spongy compressible mass of dilated lymphatics with fibrous adventitial coat); c) cystic hygroma (a large macroscopic lymphatic space result from sequestration of the central lymphatics); and d) vascolymphatic malformations [7]. The spectrum of manifestations in all types is identical and is part of the same pathologic process. [8]

In prenatal and perinatal diagnosis, US still remains a primary screening method. However, recently there is an expansion of the use of MRI due to the limited sonographic anatomical orientation in some pathology. Although US is first method of choice in fetal and perinatal age, MRI MR is more sensitive for detecting fluid levels, could be beneficial in cases of complex extension due to the large field of view englobing different anatomic regions – ex.from neck to mediastinum and is less operator dependant [3, 5]. MRI could be used preoperatively to evaluate engagement of vital structures (aorta, trachea, nerve bundles, etc.). Therefore, the role of MRI for exclusion of even partial compression of the airways by a cystic neck mass is essential, as the method could reveal more anatomical

detail; this could be helpful in planning airway access procedures [4, 9]. Despite the fact that most lymphangiomas occur in the cervical region, they may also be found in the mediastinum, in the abdomen, the retroperitoneum and the extremities [8]. Failure to diagnose a mediastinal cystic lymphangioma could be fatal due to their increasing size and the potential to produce acute respiratory embarrassment. According the literature intrapulmonary cystic lymphangiomas are extremely rare [10].

Cystic lymphangiomas located inside the abdominal cavity are very rare, occurring most frequently in the mesenteric region and less frequently in the mesocolic, greater omental and retroperitoneal regions, small intestinal and gastric walls, and peritoneum [11]. Fetal MRI is a valuable supplemental tool to enhance prenatal ultrasound examination in the evaluation of abdominal cystic masses, providing better contrast and tissue resolution for clear anatomical details. Ultrafast imaging sequences are helpful to confirm, refine or exclude a sonographic diagnosis, thus providing useful information in prenatal counseling and management. Some authors suggest that cystic lymphangioma, seen as mesenteric masses in neonates and pediatric patients could be misdiagnosed with other mesenteric masses such as cystic teratomas [12].

Other authors describe a very rare condition as cystic lymphangioma of the spleen, detailing correlated US-CT-MRI features of both noninvasive imaging techniques for preoperative diagnosis [13]. CT and multiplanar MRIs are able to present the extent of the disease in case of renal peripelvic lymphangiomas associated with generalized lymphangiomatosis, including retroperitoneal lesions [14]. In the nuchal region, the etiology of lymphangiomas is related to inadequate drainage of the lymphatic vessel into the venous system and those cases are often associated with chromosome abnormalities. However, cystic

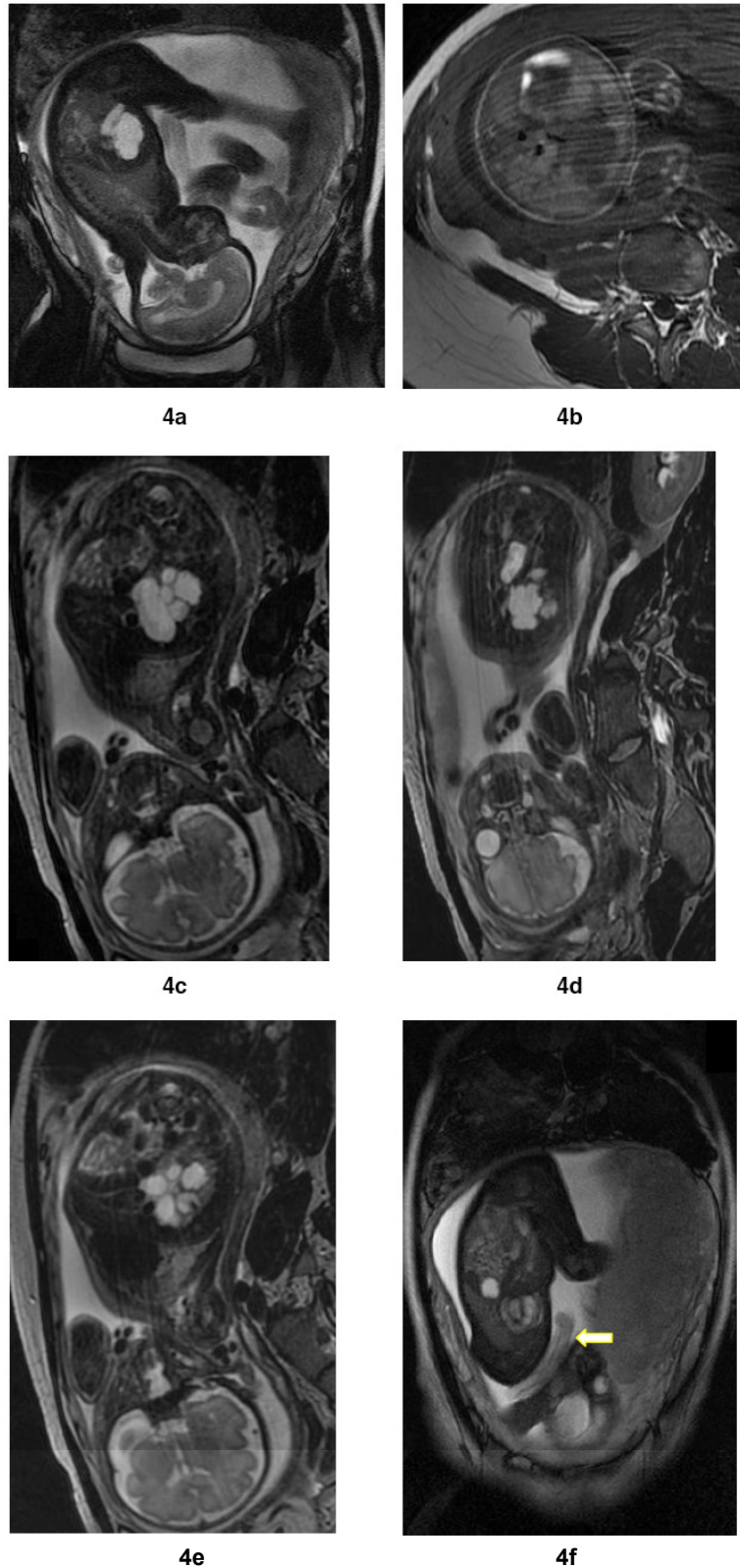


Figure 4: Fetal MRI of abdominal lymphangioma. **4a** Sagittal FIESTA image, **4b** Gradient Echo image, **4c, 4d, 4e** subsequent sagittal SS-FSE images. **4f** sagittal FIESTA image demonstrating the umbilical cord wrapped around the fetal neck (arrow).

lymphangiomas in other locations are thought to have a distinct etiology, most likely resulting from insufficient anastomoses with larger lymphatic channels.

The association with chromosomal aberrations in these cases is less distinct [15]. According to some authors describing associated findings, perinatal

outcome and prognostic factors in live –born infants with cystic hygroma and lymphangioma the incidence of chromosomal abnormalities was found to be 40,3%. Their observations found as most common abnormality in nonseptated cystic hygroma trisomy 21(25%) and in septated cystic hygroma - Turner syndrome (21,1%) [16].

CONCLUSION

Fetal MRI represents a safe and useful imaging method which may confirm, complete and clarify or change the diagnosis in cases of antenatal sonographically detected cystic masses. Prenatal MRI characterization of lymphangiomas gives a precise anatomical delineation of the lesion, detects associated and concomitant pathologies as well as differential diagnosis with other cystic pathologies. MRI examination could alter patient management regarding the type and time of treatment and the decision of continuation or termination of pregnancy. CT, even low-dose, should be avoided in fetal and perinatal age and in the postnatal period only in cases where other imaging methods, such as MRI, are impossible to be performed. Both methods are valuable adjuncts to sonography, particularly in controversial cases, for the diagnosis of cystic lymphangioma.

There is no conflict of interest in this

REFERENCES

- [1] Riccabona M. *Pediatric Imaging Essentials*. 1st ed. Stuttgart, NewYork: Thieme; 2014
- [2] Avni F, Masseur A, Cassart M. Tumors of the fetal body: a review. *Pediatr Radiol* 2009; 39: 1147-1157
<http://dx.doi.org/10.1007/s00247-009-1160-6>
- [3] Rodriguez MR, de Vega VM, Alonso RC, Arranz JC, Ten, PM, Pedregosa JP. MR imaging of thoracic abnormalities in the fetus. *Radiographics* 2012; 32 (7): 305-321
<http://dx.doi.org/10.1148/rq.327125053>
- [4] Temizkan O, Abike F, Ayvaci H, Demikrag E, Gorucu Y, Isik E. Fetal axillary cystic hygroma: a case report and review. *Rare Tumours* 2011; 3 (4); e39
<http://dx.doi.org/10.4081/rt.2011.e39>
- [5] Ljubic A, Cetkovic A, Mikic, AN, Stamenkovic JD, Jovanovic I, Opincal TS, Damjanovic D. Ultrasound vs MRI in diagnosis of fetal and maternal complications. *DSJUOG* 2011; 5(3): 231-242
<http://dx.doi.org/10.5005/ip-journals-10009-1200>
- [6] Pearce MS, Salotti JA, Little JA, McHugh K, Lee C, Kim KP, Howe N, Ronckers CM, Rajaraman P, Craft AW, Parker L, de Gonzales AB. Radiation exposure from CT scans in childhood and subsequent risk of leukemia and brain tumors: a retrospective cohort study. *The Lancet* 2012; 380(9840): 499-505
[http://dx.doi.org/10.1016/S0140-6736\(12\)60815-0](http://dx.doi.org/10.1016/S0140-6736(12)60815-0)
- [7] Zadvinskis DP, Benson MT, Kerr HH *et al.* Congenital malformations of the cervicothoracic lymphatic system: embryology and pathogenesis. *Radiographics* 1992; 12: 1175-1189
<http://dx.doi.org/10.1148/radiographics.12.6.1439020>
- [8] Lee SH, Cho JY, Song MJ, Min JY, Han BH, Lee YH, Cho BJ, Kim SH. Prenatal Ultrasound Findings of Fetal Neoplasms. *Korean J radiol* 2002; 3: 64-73
<http://dx.doi.org/10.3348/kjr.2002.3.1.64>
- [9] Teksam M, Ozyer U, McKinney A, Kirbas I. MR imaging and ultrasound of fetal cervical cystic lymphangioma: utility in antepartum treatment planning. *Diagn Interv Radiol* 2005; 11: 87-89
- [10] Takahara T, Morisaki Y, Torigoe T, Sano S, Nakamura E, Fujino K, Yoshida H, Ishii Y, Hidaka H. Intrapulmonary cystic lymphangioma: report of a case. *Surg Today* 1998; 28: 1310-1312
<http://dx.doi.org/10.1007/BF02482823>
- [11] Losanoff JE, Richman BW, El-Sherif A, Rider KD, Jones JW. Mesenteric cystic lymphangioma. *J Am Coll Surg* 2003; 196:598-603.
[http://dx.doi.org/10.1016/S1072-7515\(02\)01755-6](http://dx.doi.org/10.1016/S1072-7515(02)01755-6)
- [12] Hatten MT, Hamrick-Turner JE, Smith DB. Mesenteric cystic lymphangioma: radiologic appearance mimicking cystic teratoma. *Pediatr Radiol* 1996; 26:458-460
<http://dx.doi.org/10.1007/BF01377201>
- [13] Bezzi M, Spineli A, Pierleoni M, Andreoli GM. Cystic lymphangioma of the spleen: US-CT-MRI correlation. *Eur Radiol* 2001; 11:1187-1190
<http://dx.doi.org/10.1007/s003300000738>
- [14] Younathan CM, Kaude JV. Renal peripelvic lymphatic cysts (lymphangiomas) associated with generalized lymphangiomatosis. *Urol radiol* 1992; 14: 161-164
<http://dx.doi.org/10.1007/BF02926920>
- [15] Jackson DN, Brown L. Cystic lymphangioma of the axilla and chest wall. *Genetics in Medicine* 2000; 2: 110-110
<http://dx.doi.org/10.1097/00125817-200001000-00215>
- [16] Gedikbasi A, Gul A, Sargin A, Ceylan Y. Cystic hygroma and lymphangioma: associated findings, perinatal outcome and prognostic factors in live-born infants. *Archives of Gynecology and Obstetrics* 2007; Vol 276, Issue 5: 491-498
<http://dx.doi.org/10.1007/s00404-007-0364-y>

Received on 23-02-2015

Accepted on 16-03-2015

Published on March-2015

<http://dx.doi.org/10.15379/2408-9761.2015.02.01.9>

© 2015 Hadjidekov *et al.*; Licensee Cosmos Scholars Publishing House.

This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License

(<http://creativecommons.org/licenses/by-nc/3.0/>), which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.