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Case Report

Isolated hepatic hemangiomatosis in 2 septuagenarians

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ABSTRACT

We report 2 cases of isolated hepatic hemangiomatosis: a 76-year-old woman who is, to our knowledge, the oldest person with this diagnosis, and a 74-year-old woman. Magnetic resonance imaging of the abdomen showed T2 hyper intense lesions throughout the liver, peripheral nodular arterial enhancement, and filling of contrast on the portal venous and delayed phases. Computed tomography showed liver lesions with peripheral nodular enhancement in the early phase and a centripetal pattern or "filling in" during the late phase; the lesions opacified after a delay of 3 or more minutes and remained isodense or hyperdense on delayed scans. Both images were consistent with hepatic hemangiomatosis. These cases help increase awareness about benign and unusual liver lesions with radiologic characteristics similar to those of malignant liver tumors. The authors also present a review of 15 other cases of isolated hepatic hemangiomatosis reported in English literature from 1970 to present.

Introduction

Hepatic hemangioma is the most prevalent type of benign liver tumor with an incidence reaching 20% in the overall population [1]. Conversely, hepatic hemangiomatosis, a term used to describe the presence of innumerable hemangiomas, is a rare presentation of liver hemangiomas and is more frequently seen in neonates [2,3]. Isolated hepatic hemangiomatosis, without extrahepatic involvement, is uncommon, particularly in the adult population [4]. We report 2 cases: 76-year-old and 74-year-old women, both diagnosed with isolated hepatic hemangiomatosis, with a review of 15 other cases reported in English literature from 1970 to 2018.

Case reports

Patient 1

A 76-year-old woman with a past medical history of hypertension, hyperlipidemia, postherpetic neuralgia, and

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gastroesophageal reflux disease was seen for abdominal pain. She had a history of cigarette smoking more than 35 years ago and denied any alcohol or illicit drug use. Her medications included Atenolol, Lisinopril, Gabapentin, Omeprazole, ASA, and Ativan. The patient saw her primary care provider for right upper quadrant abdominal pain, described as nonradiating, moderate in severity, that she was unable to characterize. Her physical exam was normal and her laboratory tests, including complete blood count, alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), bilirubin, albumin, and prothrombin time were normal. Alpha-fetoprotein was 1.0 ng/mL. Magnetic resonance imaging (MRI) of the abdomen with and without contrast showed multiple T2 hyperintense lesions throughout the liver, and a liver biopsy was performed to exclude a neoplastic process. With a diagnosis of hepatic hemangiomatosis, she was referred to our center in 2018 for specialized care. Upon her visit to our institute, she reported that she was previously diagnosed with liver lesions and had a biopsy performed at a hospital in Iowa in 2009; at that time, she was told she had benign liver tumors.

Her most recent MRI showed multiple hyperintense T2 liver lesions. On the postcontrast images, the hepatic lesions demonstrated peripheral nodular arterial enhancement and slowly fill with contrast on the portal venous and delayed phases. This pattern is consistent with hemangiomatosis (Fig. 1). The liver biopsy showed multiple dilated vascular spaces scattered within the otherwise benign liver tissue. The portal areas had a mild chronic inflammatory infiltrate consisting of lymphocytes and plasma cells. The dilated thin-walled vascular channels were lined by bland endothelium. The biopsy confirmed the diagnosis of hepatic hemangiomatosis (Fig. 2).

Patient 2

A 74-year-old woman with a past medical history of primary biliary cholangitis, hyperlipidemia, and hypothyroidism presented to our facility for primary biliary cholangitis follow-up. Her medications include Ursodiol, Obeticholic acid, Pravastatin, ASA, Levothyroxine, magnesium, vitamin D, fish oil, and multivitamin. Her physical exam was normal, including no hepatomegaly, and her laboratory tests including ALT, AST, ALP, bilirubin, albumin, and prothrombin time were normal. Alpha-fetoprotein was 5.2 ng/mL. A computed tomography (CT) of the abdomen with and without contrast in June 2018 showed multiple liver lesions, the 2 largest ones measuring 2.7 cm and 4.1 cm, both of which were unchanged from prior CT in 2017. The lesions showed a peripheral nodular enhancement in the early phase, and a centripetal pattern or “filling in” during the late phase. The lesions opacified after a delay of 3 or more minutes and remained isodense or hyperdense on delayed scans. These characteristics were consistent with the diagnosis of liver hemangiomatosis and biopsy was not performed.

Discussion

Hepatic hemangiomas are also known as cavernous hemangiomas given the cavernous vascular space seen on liver biopsy [5]. Liver hemangiomas are typically isolated lesions, but can be seen in both liver lobes in 40% of cases. The diameter of the hemangioma can vary from only a few millimeters to greater than 20 cm, and the larger lesions are referred to as giant hemangiomas [6]. Hemangiomatosis, or the occurrence of innumerable hemangiomas, is a less common presentation of hepatic hemangiomas and is more commonly seen in neonates diagnosed with hereditary hemorrhagic telangiectasia or systemic hemangiomatosis [2,7,8]. Hepatic hemangiomatosis has also been described in association with giant cavernous hemangiomas. In 2011, Jhaveri et al. described hepatic hemangiomatosis in 18 out of 41 patients who were diagnosed with giant cavernous hemangiomas [7]. Additional reports of hemangiomatosis-associated giant hemangioma have been described [4,15,18,21,24,30]. Isolated liver hemangiomatosis, without any extrahepatic involvement or association with giant hemangioma, is uncommon in children and even more so in the adult population.

Both of our patients were reassured about the benign nature of the liver lesions and plans were made for consistent follow-up appointments. They were advised against the use of hormonal replacement therapy, and it was recommended that they carry medical alert bracelets with the diagnosis. This would avoid unnecessary liver biopsies and a potential delay in the diagnosis of ruptured hemangiomas.

Demographics and clinical presentations

Table 1 depicts the clinical characteristics of our patients and the other 15 cases of isolated hepatic hemangiomatosis reported in English literature from 1970 to present. The age of patients at the time of publication varied from 21 to 76 with a mean age of 46.4. Of the 17 total cases reported, 13 were women, which is consistent with the previously described predominance of hepatic hemangiomatosis in women [9–11]. Our patients were 74 and 76 years old and are the oldest patients in this review.

While the etiology of hepatic hemangiomatosis remains unknown, one study suggests a role of the vascular endothelial growth factor in its development [12]. In addition, there is a case report that found an association of hemangiomatosis with the use of metoclopramide, as well as regression of the hepatic lesions with discontinuation of the drug [13]. In patients with hepatic hemangiomas, enlargement of the lesions during pregnancy and with estrogen or progesterone therapy, with subsequent regression after the medication is discontinued, suggests hormonal influence over tumor growth. This has not been described in patients with hepatic hemangiomatosis. However, 4 of the 13 women with hepatic hemangiomatosis reported to date had previously taken some form of estrogen [13,14,16]. Our patients were not on hormonal replacement; however, our first patient had 3 full-term pregnancies and our second patient had 2 full-term pregnancies.

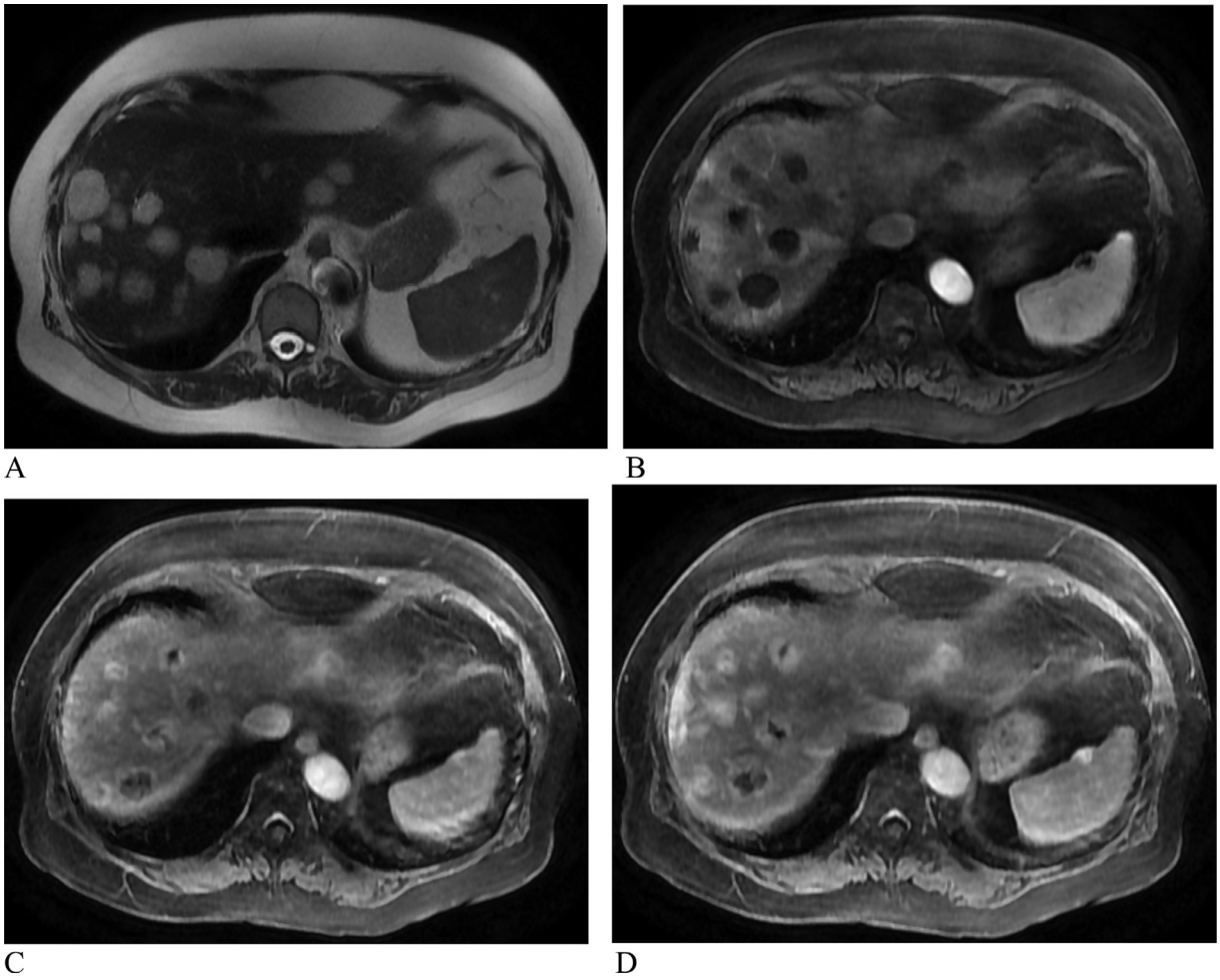

Fig. 1 – MRI of the abdomen with a pattern consistent with hemangiomatosis. A: The multiple hepatic lesions demonstrate hyperintense T2 signal. B: On the postcontrast images, the lesions demonstrate peripheral nodular arterial enhancement. C: The lesions slowly fill in with contrast on the portal venous phase. D: The lesions slowly fill in with contrast on the delayed phase.

Out of the 17 cases reported, 13 patients had symptoms of upper abdominal pain and/or sensation of fullness and/or abdominal mass, in either the right upper quadrant and/or epigastrium. Other common symptoms included dyspnea and systemic symptoms of fevers and night sweats. Fatigue was also a reported symptom [17]. The most common finding on physical exam was hepatomegaly [19–21] reported in 8 of the 17 patients.

Laboratory values and imaging studies

Few of the reported cases included laboratory tests; of those who did, the liver chemistry tests, that is, ALT, AST, ALP, GGT, and bilirubin were normal in the majority of patients. Alpha fetoprotein was reported in 6 cases and was normal in all.

Abdominal ultrasound was performed in 8 out of the 17 cases. On ultrasound exam, the characteristic finding was hyper- or hypoechoic nodules diffusely distributed throughout the liver. Other imaging modalities included CT, MRI, and CT angiography. On CT, performed in 9 out of 17 cases, the lesions of hepatic hemangiomatosis were described as heterogeneous nodular enhancement and hypodense hepatic lesions. MRI, performed in 7 out of 17 cases, showed low signal intensity on T1-weighted images, high signal intensity on T2-weighted sequences, and delayed enhancement in the contrast images.

Differential diagnosis

While the characteristics of the cross-sectional images described above are consistent with the diagnosis of liver hemangiomatosis, there are no definitive radiologic features that will diagnose liver hemangiomatosis with certainty. Therefore, a detailed clinical history and physical exam are paramount. Other liver lesions that may present with similar characteristics are liver angiosarcomas, hepatic epithelioid hemangioendothelioma, and multicentric hepatocellular carcinoma. Table 2 describes the different clinical characteristics of the tumors that should be considered in the differential diagnosis of hepatic hemangiomatosis.

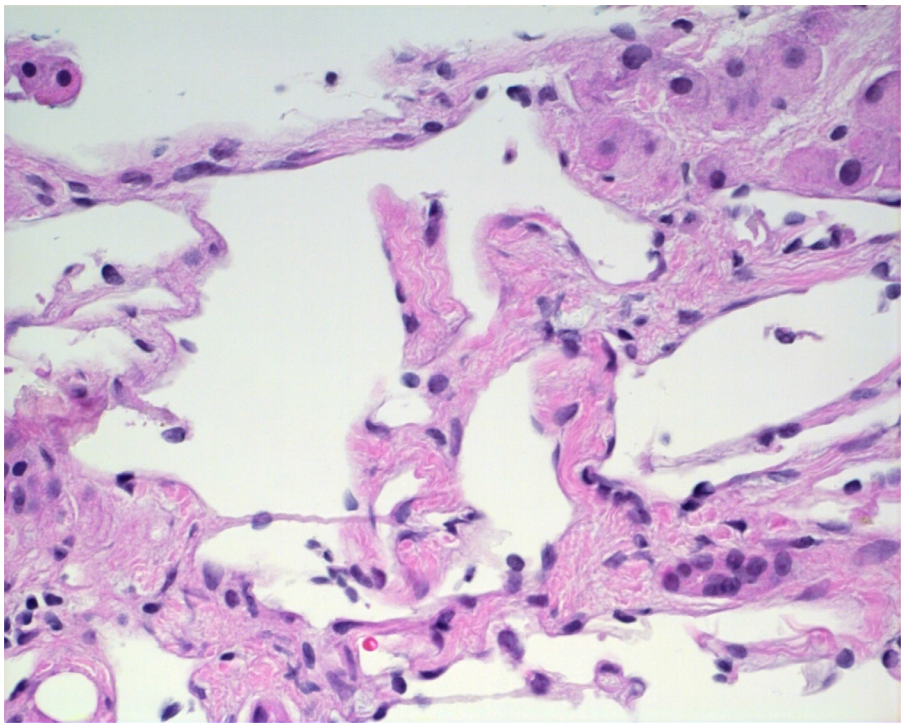

Fig. 2 – Liver biopsy showed multiple-dilated vascular spaces scattered within the otherwise benign liver tissue. The portal areas contained mild chronic inflammatory infiltrate consisting of lymphocytes and plasma cells. The dilated thin-walled vascular channels were lined by bland endothelium.

Table 1 – Clinical characteristics of our patients and 15 cases of isolated hepatic hemangiomatosis reported in English literature from 1970 to present.

Author	Age	Sex	Hormone use	Symptoms	Hepatomegaly
This manuscript	76	F	N	Abdominal pain	N
This manuscript	74	F	N	None	N
Gruttadauria et al. 2015	37	F	N	Abdominal pain, fatigue, anemia	Unk
Batista et al. 2014	68	M	N	None	Y
Ramos and Coelho, 2014	66	M	N	None	N
Supakul et al. 2013	53	M	N	Fatigue, dyspnea on exertion	Y
Kim et al. 2008	33	F	N	Abdominal distention, edema	Y
Kim et al. 2008	33	F	N	Abdominal distention, shortness of breath	Y
Bakhshi et al. 2008	65	M	N	Mass in right hypochondrium and epigastrium	Y
Ozakyol and Kebapci, 2006	47	F	Y	Abdominal pain	N
Ozakyol and Kebapci, 2006	42	F	Y	Abdominal pain	N
Tanaka et al. 2002	32	F	N	Abdominal pain, lower back pain, dyspnea on exertion	N
Jayanthi et al. 2000	21	F	N	Abdominal pain, dyspnea	Y
Moon et al. 2000	50	F	N	Postprandial abdominal pain and indigestion	N
Lehmann et al. 1999	35	F	N	Abdominal pain, weight loss, night sweats, fever	Y
Feurle, 1990	22	F	Y	Abdominal pain radiating to right shoulder	N
Kositchek and Cullen, 1970	36	F	Y	Abdominal fullness and pain, distention, postprandial fullness, constipation	Y

Unk: unknown.

Histology

In 12 out of the 17 reported cases, a liver biopsy was performed to confirm the diagnosis of hepatic hemangiomatosis. As seen in our 76-year-old patient (Fig. 2), the histologic findings of those patients for whom a liver biopsy was performed showed multiple-dilated vascular spaces scattered within the otherwise benign liver tissue. The portal areas contained mild chronic inflammatory infiltrate consisting of lymphocytes and plasma cells. The dilated thin-walled vascular channels were lined by bland endothelium. However, for patients presenting with the characteristic findings on image tests, particularly

Table 2 – Clinical characteristics of tumors that should be considered in the differential diagnosis of hepatic hemangiomatosis.

Diagnosis	Age	Sex	History of chronic liver disease	Symptoms	References
Hepatic hemangiomatosis	30-50	F	N	Abdominal pain and fullness	[11,31,32]
Angiosarcoma	>60	M	Unk	Abdominal pain, jaundice, ascites, weight loss	[33–36]
Epithelioid hemangioendothelioma	50's	F	N	Abdominal pain, mass, weight loss	[37–40]
Hepatocellular carcinoma	50-60	M	Y	Upper abdominal pain, weight loss, early satiety, mass in upper abdomen, signs of decompensation (ascites, jaundice, variceal bleeding, encephalopathy)	[41,42]

Unk: unknown.

cross-sectional image, liver biopsy should be avoided, given the vascular nature of these lesions with an increased risk of bleeding.

Follow-up and outcomes

Given the few number of cases reported to date, it is not possible to make statements on the natural history or outcome of hepatic hemangiomatosis. Our patients have done very well and have remained asymptomatic since the diagnoses, 9 years prior to this publication. Other reports described similarly favorable outcomes, although most patients were followed for less than 5 years [13,14,16,22,23,25,26]. Nonetheless, not all reported cases had the same uneventful course. There has been a report of a patient who developed liver failure and eventually expired 10 days after hospitalization [27]. Three other fatalities were reported, but no clear relationship between the hemangiomatosis and the cause of death. One patient was diagnosed with deep venous thrombosis during admission and expired after 1 week [28]. Additionally, there was a patient who was admitted with lactic acidosis and expired after cardiopulmonary arrest [29]. Another patient expired after hemorrhagic shock due to a duodenal ulcer that was present for a few years prior to hospital admission [19].

The scarce number of cases reported and the diversity of the outcome of this unique presentation of isolated liver hemangiomatosis explain the lack of recommendations for treatment, or if any treatment should be considered. Based on the reports of some hemangiomas increasing in size when the patients were exposed to estrogen, recommendations against the use of oral contraceptives and hormonal replacement therapy should be considered. Given the report of an association between metoclopramide and hepatic hemangiomatosis [13], discontinuing this medication may be considered. Otherwise, the treatment approach should be individualized for each patient, based on the symptoms and radiologic findings at presentation. There are reports of patients treated with arterial embolization and hepatectomy [19,30], and a case of a patient who developed progressively growing hemangiomatosis on the remaining liver parenchyma after left hepatectomy [26]. The above anecdotal reports illustrate the need to individualize the care based on each patient's presentation.

Conclusion

We present 2 cases of isolated hepatic hemangiomatosis: a 76-year-old woman, who is, to our knowledge, the oldest person reported to date with this diagnosis, as well as a 74-year-old woman. These case reports help increase awareness about a benign liver lesion that has radiologic characteristics similar to those of malignant liver tumors. The literature review confirms the rarity of this entity, which is seen more frequently in women and are often asymptomatic. The finding of hepatomegaly on physical exam is likely to prompt imaging of the liver. The importance of a detailed clinical history for the evaluation of these patients cannot be over emphasized. The absence of chronic liver disease, normal laboratory tests, and careful evaluation of the cross-sectional imaging of the liver may obviate the need to perform a liver biopsy. Given the vascular nature of these lesions, liver biopsy is likely to carry an increased risk of bleeding, similar to that seen in biopsies of liver hemangiomas.

Author contributions

Both authors reviewed the information of the patients in the report, reviewed the published literature, and wrote the manuscript.

Informed consent statement

The patients involved in this study gave written informed consent authorizing the use and disclosure of their protected health information.

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REFERENCES

[1] Chiche L, Adam J. Diagnosis and management of benign liver tumors. Semin Liver Dis 2013;33:236–47. https://doi.org/10.1055/s-0033-1351779 PMid:23943104.

[2] Isaacs H Jr. Fetal and neonatal hepatic tumors. J Pediatr Surg 2007;42:1797–803. https://doi.org/10.1016/j.jpedsurg.2007.07.047 PMid:18022426.

[3] Lopriore E, Markhorst DG. Diffuse neonatal haemangiomatosis: new views on diagnostic criteria and prognosis. Acta Paediatr 1999;88:93–7. https://doi.org/10.1111/j.1651-2227.1999.tb01276.x PMid:10090556.

[4] Guerra A, Infante A, Rinninella E, Spinelli I, Mazziotti MA, De Gaetano AM, et al. A peculiar case of diffuse hemangiomatosis of the left hepatic lobe in an asymptomatic adult patient: case report and literature review. Eur Rev Med Pharmacol Sci 2017;21:1593–7 PMid:28429345.

[5] Evans J, Sabih DE. Hemangioma, Cavernous Liver. [Updated 2017 Dec 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2018 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470283/.

[6] Ribeiro MA, Papaiordanou F, Goncalves JM, Chaib E. Spontaneous rupture of hepatic hemangiomas: a review of the literature. World J Hepatol 2010;2:428–33. https://doi.org/10.4254/wjh.v2.i12.428 PMid:21191518 PMCid:PMC3010512.

[7] Jhaveri KS, Vlachou PA, Guindi M, Fischer S, Khalili K, Cleary SP, et al. Association of hepatic hemangiomatosis with giant cavernous hemangioma in the adult population: prevalence, imaging appearance, and relevance. Am J Roentgenol 2011;196:809–15. https://doi.org/10.2214/AJR.09.4143 PMid:21427329.

[8] Buscarini E, Buscarini L, Civardi G, Arruzzoli S, Bossalini G, Piantanida M. Hepatic vascular malformations in hereditary hemorrhagic telangiectasia: imaging findings. Am J Roentgenol 1994;163:1105–10. https://doi.org/10.2214/ajr.163.5.7976883 PMid:7976883.

[9] Bajenaru N, Balaban V, Savulescu F, Campeanu I, Patrascu T. Hepatic hemangioma: review. J Med Life 2015;8:4–11 PMid:26361504 PMCid:PMC4564031.

[10] Reddy KR, Kligerman S, Levi J, Livingstone A, Molina E, Franceschi D, et al. Benign and solid tumors of the liver: relationship to sex, age, size of tumors, and outcome. Am Surg 2001;67:173–8 PMid:11243545.

[11] Gandolfi L, Leo P, Solmi L, Vitelli E, Verros G, Colecchia A. Natural history of hepatic haemangiomas: clinical and ultrasound study. Gut 1991;32:677–80. https://doi.org/10.1136/gut.32.6.677 PMid:2060877 PMCid:PMC1378888.

[12] Kitajima S, Liu E, Morimoto M, Koike T, Yu Y, Watanabe T, et al. Transgenic rabbits with increased VEGF expression develop hemangiomas in the liver: a new model for Kasabach-Merritt syndrome. Lab Invest 2005;85:1517–27. https://doi.org/10.1038/labinvest.3700346 PMid:16200077.

[13] Feurle GE. Arteriovenous shunting and cholestasis in hepatic hemangiomatosis associated with metoclopramide. Gastroenterology 1990;99:258–62. https://doi.org/10.1016/0016-5085(90)91256-6.

[14] Ozakyol A, Kebapci M. Enhanced growth of hepatic hemangiomatosis in two adults after postmenopausal estrogen replacement therapy. Tohoku J Exp Med 2006;210:257–61. https://doi.org/10.1620/tjem.210.257 PMid:17077603.

[15] Freedman AN. Liver lesions and oral contraceptives. CMA J 1982;126:1149–50 PMid: 7074431.

[16] Kositchek RJ, Cullen RA. Hemangiomatosis of the liver with thrombosis following use of an oral contraceptive. West J Med 1970;113:70–4 PMid: 5457518.

[17] Gruttadauria S, Pagano D, Burgio G, Arcadipane A, Panarello G, Petridis I, et al. Liver transplantation for hemoperitoneum secondary to huge multiple hemangiomatosis: a case report of a tele-intensive care unit in deceased-donor management. Telemed e-Health 2015;21:499–502. https://doi.org/10.1089/tmj.2014.0145 PMid:25714805.

[18] Adam YG, Huvos AG, Fortner JG. Giant hemangiomas of the liver. Ann Surg 1970;172:239–45. https://doi.org/10.1097/00000658-197008000-00010 PMid:5433290 PMCid:PMC1397054.

[19] Bakhshi GD, Shaikh A, Borisa AD, Alagappan C, Patnaik A, Subnis BM. Diffused liver haemangiomatosis in an adult. Bombay Hosp J 2008;50:669–71.

[20] Kim JD, Chang UI, Yang JM. Clinical challenges and images in GI. Diffuse hepatic hemangiomatosis involving the entire liver. Gastroenterology 2008;134:1830 2197.

[21] Ohkura Y, Hashimoto M, Lee S, Sasaki K, Matsuda M, Watanabe G. Right hepatectomy for giant cavernous hemangioma with diffuse hemangiomatosis around Glisson's capsule. World J Gastroenterol 2014;20:8312–16. https://doi.org/10.3748/wjg.v20.i25.8312 PMid:25009410 PMCid:PMC4081710.

[22] Batista A, Matos AP, Oliveira e Neta J, Ramalho M. Diffuse hepatic hemangiomatosis in the adult without extra-hepatic involvement: an extremely rare occurrence. J Clin Imaging Sci 2014;4:1–4.

[23] Ramos LR, Coelho ML. Hepatic haemangiomatosis: multinodular liver in an asymptomatic elderly man. BMJ Case Rep 2014. https://doi.org/10.1136/bcr-2013-202505. doi:10.1136/bcr-2013-202505.

[24] Tanaka A, Morimoto T, Yamamori T, Moriyasu F, Yamaoka Y. Atypical liver hemangioma with shunt: long-term follow-up. J Hepatobiliary Pancreat Surg 2002;9:750–4. https://doi.org/10.1007/s005340200104 PMid:12658411.

[25] Moon WS, Yu HC, Lee JM, Kang MJ. Diffuse hepatic hemangiomatosis in an adult. J Korea Med Sci 2000;15:471–4. https://doi.org/10.3346/jkms.2000.15.4.471 PMid:10983701 PMCid:PMC3054652.

[26] Lehmann FS, Beglinger C, Schnabel K, Terracciano L. Progressive development of diffuse liver hemangiomatosis. J Hepatol 1999;30:951–4. https://doi.org/10.1016/S0168-8278(99)80152-4.

[27] Kim EH, Park SY, Ihn YK, Hwang SS. Diffuse hepatic hemangiomatosis without extrahepatic involvement in an adult patient. Korean J Radiol 2008;9:559–62. https://doi.org/10.3348/kjr.2008.9.6.559 PMid:19039274 PMCid:PMC2627242.

[28] Jayanthi V, Ravi Shankar T, Ravindran C, Sudalaimuthu S, Chandrasekar TS. Diffuse hepatic hemangiomatosis: case report. Trop Gastroenterol 2000;21:188–9 PMid:11194583.

[29] Supakul R, Vakili ST, Liangpunsakul S. Adult diffuse hepatic hemangiomatosis: a rare cause of dilated cardiomyopathy and sudden cardiac arrest. J Gen Intern Med 2013;29:244–5.

https://doi.org/10.1007/s11606-013-2531-0 PMid:23868097 PMCid:PMC3889961.
[30] Lee JH, Yoon CJ, Kim YH, Han H, Cho JY, Kim H, et al. Living-donor liver transplantation for giant hepatic hemangioma with diffuse hemangiomatosis in an adult: a case report. Clin Mol Hepatol 2017. https://doi.org/10.3350/cmh.2017.0002. doi:10.3350/cmh.2017.0002.
[31] Farges O, Daradkeh S, Bismuth H. Cavernous hemangiomas of the liver: are there any indications for resection?. PMid:7740805 https://doi.org/10.1007/BF00316974 .
[32] Grieco MB, Miscall BG. Giant hemangiomas of the liver. Surg Gynecol Obstet 1978;147:783 PMid:362577.
[33] Huerta-Orozco LD, Leonher-Ruezga KL, Ramirez-Gonzalez LR, Hermosillo-Sandoval JM, Sandoval-Alvarado J, Moran-Galaviz RE. Hepatic angiosarcoma and liver transplantation: case report and literature review. Cirugia y Cirujanos (English Edition) 2015;83:510–15. https://doi.org/10.1016/j.circen.2015.11.016. doi:10.1016/j.circir.2015.05.027.
[34] Sherman M. Vinyl chloride and the liver. J Hepatol 2009;51:1074. https://doi.org/10.1016/j.jhep.2009.09.012 PMid:19836850.
[35] Bioulac-Sage P, Laumonier H, Laurent C, Blanc JF, Balabaud C. Benign and malignant vascular tumors of the liver in adults. Semin Liver Dis 2008;28:302. https://doi.org/10.1055/s-0028-1085098 PMid:18814083.
[36] Locker GY, Doroshow JH, Zwelling LA, Chabner BA. The clinical features of hepatic angiosarcoma: a report of four cases and a review of the English literature. Medicine 1979;58:48–64. https://doi.org/10.1097/00005792-197901000-00003.
[37] Baron PW, Amakonah T, Cubas RF, Kore AH, Elihu A, de Vera ME, et al. Diffuse hepatic epithelioid hemangioendothelioma developed in a patient with hepatitis C cirrhosis. Case Rep Transplant 2014;2014:1–4. https://doi.org/10.1155/2014/694903 PMid:25276467 PMCid:PMC4172934.
[38] Makhlouf HR, Ishak KG, Goodman ZD. Epithelioid hemangioendothelioma of the liver: a clinicopathologic study of 137 cases. Cancer 1999;85:562. https://doi.org/10.1002/(SICI)1097-0142(19990201)85:3⟨562::AID-CNCR7⟩3.0.CO;2-T.
[39] Walsh MM, Hytiroglou P, Thung SN, Fiel MI, Siegel D, Emre S, et al. Epithelioid hemangioendothelioma of the liver mimicking Budd-Chiari syndrome. Arch Pathol Lab Med 1998;122:846 PMid:9740148.
[40] Weiss SW, Ishak KG, Dail DH, Sweet DE, Enzinger FM. Epithelioid hemangioendothelioma and related lesions. Semin Diagn Pathol 1986;3:259 PMid:3303234.
[41] Sugano S, Miyoshi K, Suzuki T, Kawafune T, Kubota M. Intrahepatic arteriovenous shunting due to hepatocellular carcinoma and cirrhosis, and its change by transcatheter arterial embolization. Am J Gastroenterol 1994;89:184 PMid:8304300.
[42] Kew MC, Dos Santos HA, Sherock S. Diagnosis of primary cancer of the liver. Br Med J 1971;4:408. https://doi.org/10.1136/bmj.4.5784.408 PMid:5124443 PMCid:PMC1799483.