INTRODUCTION
Liver hemangiomas are the most common benign liver tumors. Diffuse hepatic hemangiomatosis (DHH) is a rare disorder, usually occurring in the neonate, characterized by extensive replacement of liver parenchyma with hemangiomatous lesions.[1] It is frequently associated with a palpable abdominal mass and high-output heart failure, with high mortality rate in neonates. DHH in the adult, especially without extra-hepatic involvement, is extremely rare.[2] Hemangiomatosis differs from multiple or giant hemangiomas in that the boundary of the lesion is ill-defined, while in the latter, the liver parenchyma surrounding the lesion is compressed by a fibrous capsule forming the wall of the hemangioma.[3] The etiology and clinical course are not completely understood because of its rareness. The diagnosis may be based on the magnetic resonance imaging (MRI) findings. The final diagnosis is based on histological confirmation.[4]

CASE REPORT
An asymptomatic 68-year-old man was referred to our hospital due to the presence of numerous nodular hepatic
lesions accidentally detected on ultrasound. There was a history of heavy drinking (alcohol intake around 70-90 g/d) and no prior history of medication or steroid intake. The other personal and family history was unremarkable. Physical examination upon admission revealed diffuse hepatomegaly, with no associated cardiac murmur or leg edema. Laboratory investigations showed a slight elevation of $\gamma$-glutamyl transpeptidase (76 UI/L; normal value: 0-51 UI/L).

Abdominal ultrasound (US) showed multiple ill-defined sub-centimeter hyperechoic hepatic nodules, predominantly in the right lobe, with no posterior acoustic shadowing or significant through transmission and absence of high vascularity on color Doppler [Figure 1].

Abdominal MRI was performed for further evaluation. Countless predominantly sub-centimeter nodular lesions with low T1-weighted signal intensity (SI) and moderately high T2-weighted SI were depicted. Liver lesions showed moderately restricted diffusivity, and post-contrast fat-suppressed T1-weighted images showed predominantly hypovascular features with retention of contrast in later phases. A discontinuous centripetal filling appearance was noted on larger lesions [Figure 2]. There was no evidence of extra-hepatic masses or lymphadenopathy. A US-guided biopsy using an automated gun with an 18-gauge needle was performed collecting three representative fragments.

Pathology revealed endothelial-lined sinusoidal proliferation with erythrocyte content, consistent with hepatic hemangiomatosis [Figure 3]. No sarcomatous changes were seen. No evidence for extra-hepatic hemangiomatosis was revealed on further imaging studies. Definitive diagnosis of DHH was established based on a combination of imaging and pathological findings and clinical/imaging follow-up. Imaging follow-up included annual abdominal MRI investigation. Two years following the diagnosis, the patient’s hepatic function and imaging findings remain stable, with no relevant associated symptoms.

**DISCUSSION**

Imaging plays a vital role in the detection and characterization of multifocal liver lesions in adults. There are numerous causes including benign and malignant neoplasms, infectious lesions, and inflammatory conditions. The US evaluation showed multiple sub-centimeter, ill-defined, hyperechoic nodules dispersed throughout the liver parenchyma, predominantly in the right hemi-liver, with...
BH have been described as innumerable tiny hypoechoic or hyperechoic foci measuring less than 10 mm and distributed uniformly throughout the liver, with some displaying a comet tail artifact. Differences in echogenicity may be due to the size of the dilated bile duct component, which, at a certain size, would behave like other microcystic structures. On MRI, bile duct hamartomas usually appear as multiple tiny cystic lesions, strongly hyperintense on T2-weighted images. After gadolinium administration, some authors described a thin rim of enhancement, which correlates with the compressed liver parenchyma surrounding the lesions. Internal progression or retention of contrast is not seen in BH.

Angiosarcoma is the most frequent malignant mesenchymal hepatic tumor and is commonly multiple. It is very aggressive and sometimes may mimic hemangioma on dynamic studies, showing high SI on T2-weighted images, since both tumors contain abundant blood-filled vascular spaces; also, heterogeneous centripetal and progressive enhancement has been described. Its definite diagnosis is based on histological findings. As no definite radiological findings can precisely distinguish DHH from angiosarcoma, the final diagnosis was histologically established.

DHH is a rare, although benign, condition that is characterized by diffuse replacement of liver parenchyma by hemangiomatous lesions. The natural history and prognosis of hepatic hemangiomatosis are poorly understood due to its rarity. Hemangiomatosis is different from multiple or giant hemangiomas in that the boundary of the lesion is ill-defined, while in the latter, the liver parenchyma surrounding the lesion is compressed by a fibrous capsule that forms the wall of the hemangioma.

DHH can occur in all age groups, but is most frequent in the neonate where it can result in high-output cardiac failure and significant mortality. It is usually asymptomatic in adulthood, being extremely rare when not associated with giant cavernous hemangiomas and even rarer when no other organ is affected besides the liver.

The imaging findings of DHH are comparable to those of other common hepatic hemangiomas. There is an association with giant cavernous hemangiomas. Two patterns of DHH are described, the diffuse (non-nodular) and the nodular pattern, the former being the predominant pattern, representing approximately two-thirds of the cases.

Sonographically, the liver affected by DHH appears as homogeneous hyperechoic areas with poorly defined margins (diffuse pattern) or a heterogeneous echo pattern with multiple discrete or coalescent small hyperechoic

BH, also called von Meyenburg complexes, originate from embryonic bile ducts that fail to involute. On ultrasound,
nodules (multinodular pattern). These nodular lesions are variable in size (usually <5-10 mm), appearing as countless oval or round hyperechoic nodular lesions. Very little or no flow is seen on color Doppler.[9,10]

On MRI, the areas affected by hemangiomatosis may also display a diffuse non-nodular pattern composed of tiny cystic spaces separated by numerous thin hypointense septa, creating a lattice-like appearance or a diffuse nodular pattern consisting of multiple small discrete and coalescent nodules on T2-weighted imaging.[10] The extremely low velocity of blood flow within hemangioma relates to the absence of flow void seen in MRI imaging. Dynamic contrast-enhanced MRI shows heterogeneous enhancement in these areas during the arterial phase that becomes more homogeneous during portal and delayed phase imaging. The multinodular type, as was our case, exhibits small discrete and coalescent nodules with early homogeneous enhancement or the typical peripheral discontinuous enhancement during the arterial phase, showing uniform late retention of contrast.[4,8,10]

CONCLUSION

In conclusion, DHH with no associated cavernous hemangiomas and without extra-hepatic involvement is an extremely rare condition. Despite its rarity, it can be suggested in adults presenting with multiple, predominantly sub-centimeter hepatic lesions demonstrating MRI features of hemangiomas. MR imaging may be superior to US and computed tomography (CT) for the diagnosis and is the preferable cross-sectional imaging technique for long-term follow-up.

REFERENCES

1. Ohnishi S, Miyagishima T, Nakagawa M, Kamata T, Kishimoto A, Choi GH, et al. Diffuse neonatal hemangiomatosis without cutaneous lesions in an adult: A case report. Angiology 2002;53:235-7.
2. Lopriore E, Markhorst DG. Diffuse neonatal haemangiomatosis: New views on diagnostic criteria and prognosis. Acta Paediatr 1999;88:93-7.
3. Adam YG, Huvos AG, Fortner JG. Giant hemangiomas of the liver. Ann Surg 1979;172:239-45.
4. 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.
5. Semelka RC, Brown ED, Ascher SM, Patt RH, Bagley AS, Li W, et al. Hepatic hemangiomas: A multi-institutional study of appearance on T2-weighted and serial gadolinium-enhanced gradient-echo MR images. Radiology 1994;192:401-6.
6. Markhardt BK, Rubens DJ, Huang J, Dogra VS. Sonographic features of biliary hamartomas with histopathologic correlation. J Ultrasound Med 2006;25:1631-3.
7. Mortelé KJ, Ros PR. Cystic focal liver lesions in the adult: Differential CT and MR imaging features. Radiographics 2001;21:895-910.
8. Itai Y, Teraoka T. Angiosarcoma of the liver mimicking cavernous hemangioma on dynamic CT. J Comput Assist Tomogr 1989;13:910-2.
9. Moon WS, Yu HC, Lee, JM, Kang MJ. Diffuse hepatic hemangiomatosis in an adult. J Korean Med Sci 2000;15:471-4.
10. 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. AJR Am J Roentgenol 2011;196:809-15.