

Hepatic Hemangioma

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Abstract

Hepatic hemangiomas are the most common benign liver tumors in infancy. Patients with these tumors are usually asymptomatic, requiring only observation. However, both infantile hepatic hemangiomas and congenital hepatic hemangiomas have the potential to cause significant morbidity, particularly when large or diffuse. Imaging, especially US and MRI, is characteristic and essential for diagnosis and monitoring. Post-contrast imaging highlights the peripheral, nodular arterial phase enhancement with centripetal fill-in on delayed phases. Treatment is individualized, ranging from medical therapy with propranolol and corticosteroids to more invasive interventions such as embolization or surgery in severe cases.

Keywords: Abdominal, Hepatic, Vascular Malformation

Case Summary

A neonate underwent echocardiography after a murmur was detected on physical examination. Imaging revealed a small ventricular septal defect and an incidental complex cystic mass in the liver. The neonate had no cutaneous lesions and no clinical signs of heart failure.

Imaging Findings

Initial abdominal US (Figure 1) demonstrated a complex, predominantly hyperechoic mass in the right hepatic lobe with a solid periphery and central cystic component. The lesion exhibited mild internal vascularity on color Doppler imaging, and adjacent hepatic vessels were enlarged. Liver MRI (Figure 2) confirmed a T2 hyperintense mass with a central cystic or necrotic component. The lesion showed peripheral nodular arterial

phase hyperenhancement with progressive partial fill-in on delayed phases. Mild contrast retention was observed in the peripheral portion of the lesion on hepatobiliary phase imaging. Follow-up USs (Figures 3, 4) performed over time showed a gradual involution of the mass.

Diagnosis

Hepatic hemangioma.

Differential diagnosis includes infantile hemangioendothelioma, hepatic cysts, regenerative nodules, vascular malformations, focal steatosis, hepatocellular carcinoma, and hepatic metastasis.

Discussion

Hepatic hemangiomas are the most common benign liver tumors in infants and young children, characterized by abnormal proliferation of blood vessels within the liver.¹ These tumors are broadly

classified into two types: infantile hepatic hemangioma and congenital hepatic hemangioma.^{1,2} Although clinically, histologically, and genetically distinct, both types occur exclusively in infancy and share similar imaging characteristics.¹ These tumors can present in different patterns within the liver and are broadly categorized as focal, multifocal, or diffuse.

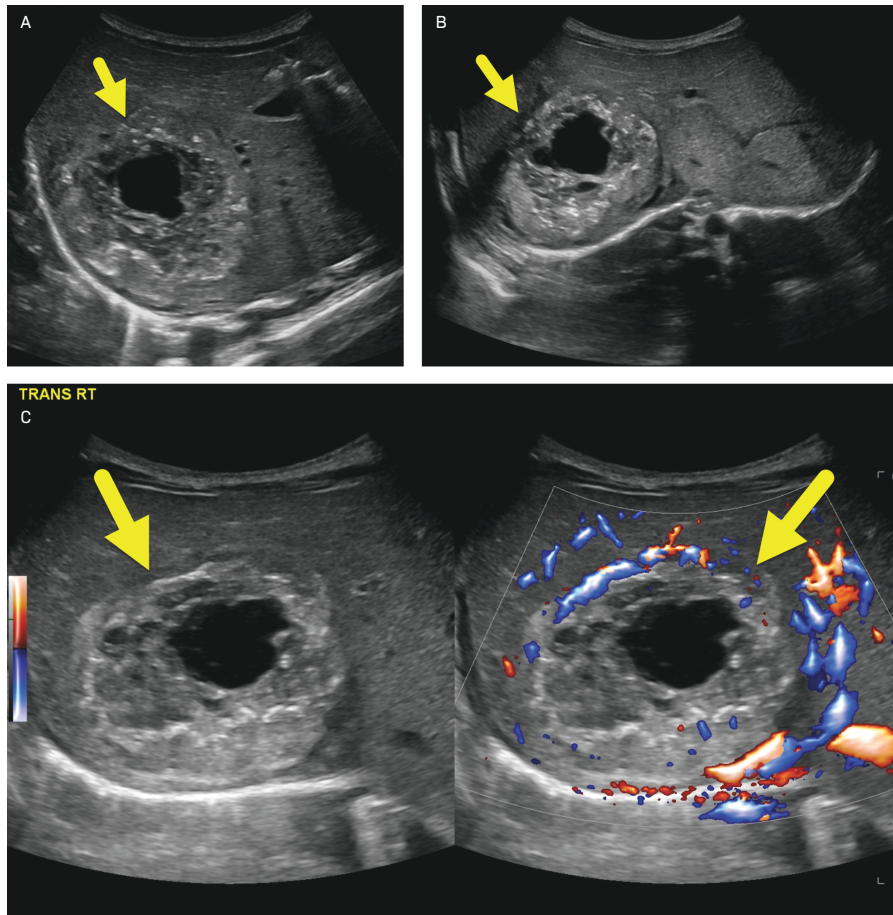
Congenital hepatic hemangiomas develop during fetal life and proliferate in utero.^{3,4} Unlike infantile hepatic hemangiomas, they are not associated with cutaneous hemangiomas and stain negative for glucose transporter-1 (GLUT-1).⁴ The behavior of congenital hepatic hemangiomas is defined by their pattern of involution. Rapidly involuting congenital hemangiomas regress quickly during infancy and are usually fully involuted by 14 months of age.⁴ Partially involuting congenital hemangiomas demonstrate minimal or partial regression, while non-involuting congenital hemangiomas do not regress and instead grow proportionally with the child's development.⁴ Congenital hepatic hemangiomas typically present with a focal pattern, appearing as a solitary hepatic lesion.

Infantile hepatic hemangiomas are the most common hepatic vascular tumors

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Figure 1. (A) Longitudinal, (B) transverse, and (C) transverse color Doppler US images of the liver demonstrate a large, predominantly hyperechoic mass (arrow) occupying the right hepatic lobe. The lesion has a heterogeneous solid peripheral component and a central cystic region. Mild internal vascularity is seen on color Doppler. Surrounding hepatic vessels are enlarged.



of infancy and are frequently associated with cutaneous infantile hemangiomas involving the skin and other visceral organs.^{1,2} Infantile hemangiomas occur in up to 10% of the pediatric population, with higher incidences in preterm infants, females, and those of Caucasian descent.² Unlike congenital lesions, infantile hepatic hemangiomas are not present at birth. After birth, they undergo a rapid proliferative growth phase, followed by a gradual involution that can extend up to 14 years.³ The skin is the site most affected by infantile hemangiomas. When visceral sites are affected, the liver is the most frequently involved organ.^{2,3}

Infantile hepatic hemangiomas are typically classified as either multifocal or diffuse.³ Multifocal lesions are

defined by the presence of multiple hepatic nodules (typically 5-10 lesions) with normal intervening liver parenchyma. In contrast, diffuse infantile hepatic hemangiomas extensively involve the liver, leaving little normal hepatic tissue visible.¹ Both multifocal and diffuse forms may be associated with multiple (>5) cutaneous infantile hemangiomas.³ Histologically, infantile hemangiomas (including infantile hepatic hemangiomas) consistently stain positive for GLUT-1, a hallmark feature of the diagnosis.^{3,4}

Congenital hepatic hemangiomas and infantile hepatic hemangiomas are often asymptomatic and frequently discovered incidentally on routine imaging.⁴ When symptoms are present, they are

typically nonspecific and may include abdominal distention, hepatomegaly, or failure to thrive.^{4,5} In congenital hepatic hemangiomas, unique complications include transient thrombocytopenia and disseminated intravascular coagulation.¹ Although generally benign, infantile hepatic hemangiomas, especially those with multifocal or diffuse involvement, carry a higher risk of morbidity and mortality.⁵ Multifocal lesions may result in coagulopathy and macrovascular shunting, potentially progressing to high-output cardiac failure.⁵ Diffuse infantile hepatic hemangiomas are associated with severe hepatomegaly, abdominal compartment syndrome, respiratory distress, and consumptive hypothyroidism (thyroid-stimulating hormone > 50) due to overproduction of type III iodothyronine deiodinase during the proliferative phase.^{5,6}

While there is no definitive gold standard for diagnosis, US is the preferred initial imaging modality due to its widespread availability and high sensitivity.⁶ On US, hepatic hemangiomas typically appear as well-defined, homogeneous, hyperechoic masses with posterior acoustic enhancement.⁶ In otherwise healthy patients with lesions smaller than 3 cm, US is often sufficient for diagnosis.⁶ On color Doppler interrogation, minimal to absent flow can help distinguish hepatic hemangiomas from malignant lesions.⁶ Serial abdominal US examinations are valuable for monitoring the growth patterns of hepatic hemangiomas, screening patients with more than five cutaneous hemangiomas, and supporting the clinical distinction between infantile hepatic hemangiomas and congenital hepatic hemangiomas.⁷

CT or MRI serves as a valuable complementary tool, particularly when US findings are inconclusive, or in the evaluation of larger or atypical lesions. MRI is preferred over CT due to the absence of radiation and its superior soft tissue resolution. On MRI, hepatic hemangiomas appear as well-defined lesions that are hypointense to the liver

Figure 2. (A) Axial T2-weighted MRI performed during free breathing shows a large hepatic mass (arrow) occupying the right hepatic lobe. The peripheral portion of the mass is slightly less hyperintense than the central portion. (B) Axial gradient recalled echo arterial phase, (C) portal venous phase, and (D) hepatobiliary phase post-contrast images demonstrate peripheral nodular enhancement of the mass (arrow) with progressive centripetal fill-in. On the hepatobiliary phase, mild contrast retention is seen in the periphery of the lesion.

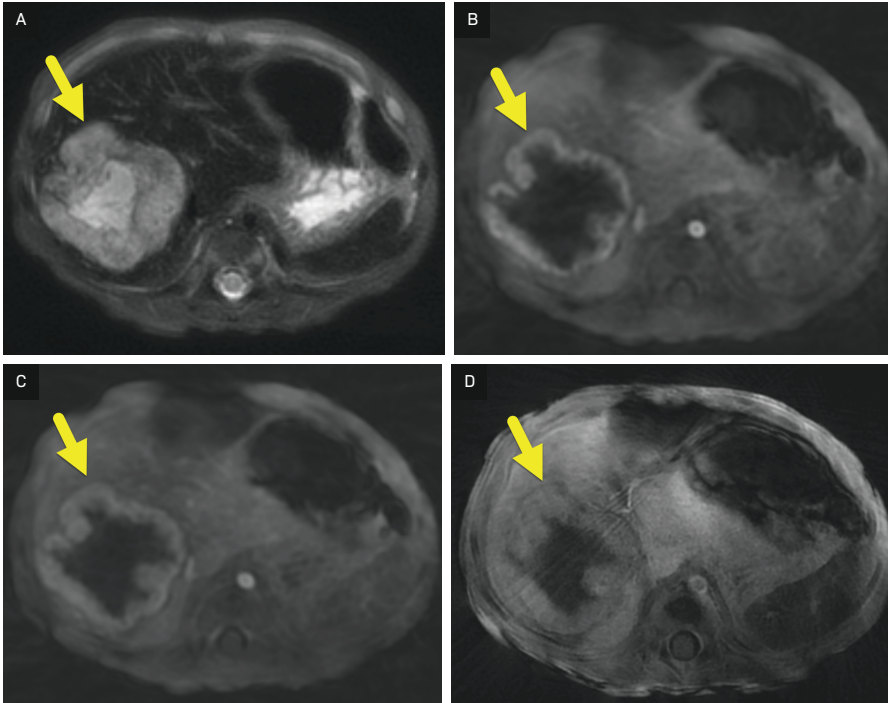
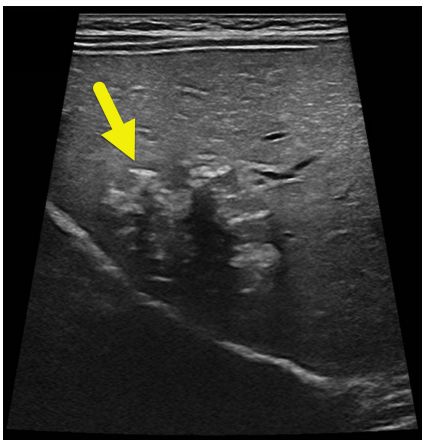
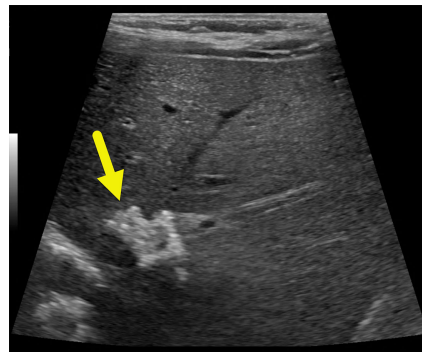


Figure 3. The US performed 3 months after the initial study shows moderate interval involution of the hepatic mass (arrow).



parenchyma on T1-weighted imaging and hyperintense on T2-weighted sequences.⁶ Following contrast administration, they often demonstrate peripheral, nodular enhancement in the arterial phase, with progressive centripetal fill-in on delayed

Figure 4. Transverse US performed 20 months after the initial study demonstrates continued involution with only a small residual hyperechoic mass (arrow).



imaging.⁶ This characteristic enhancement pattern is also seen on contrast-enhanced US and CT. While the imaging appearance is similar, hepatic lesions in adults are not true hemangiomas but rather represent venous malformations. Unlike pediatric hepatic hemangiomas, these adult lesions are non-proliferative and do not demonstrate GLUT-1 positivity.

Asymptomatic hepatic hemangiomas are typically managed conservatively with observation and serial imaging surveillance.⁷ Symptomatic patients are usually treated with medical therapies such as propranolol, corticosteroids, or thyroid hormone replacement, depending on the specific complications encountered.^{3,7} In severe cases, mortality rates can reach up to 16%. In these severe cases, more invasive procedures such as transarterial embolization, surgical resection, or liver transplantation may be required.^{8,9}

Conclusion

Hepatic hemangiomas are the most common benign liver tumors in infancy. Patients with these tumors are usually asymptomatic, requiring only observation. However, both infantile hepatic hemangiomas and congenital hepatic hemangiomas have the potential to cause significant morbidity, particularly when large or diffuse. Imaging, especially US and MRI, is characteristic and essential for diagnosis and monitoring. Post-contrast imaging highlights the peripheral, nodular arterial phase enhancement with centripetal fill-in on delayed phases. Treatment is individualized, ranging from medical therapy with propranolol and corticosteroids to more invasive interventions such as embolization or surgery in severe cases.

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