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Case Report Open Access

Huge Focal Nodular Hyperplasia Presenting in a 6-Year-Old Child: A Case Presentation

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Abstract

Focal nodular hyperplasia (FNH), a benign lesion of the liver, is characterized by hepatocyte hyperplasia and a central stellate scar. FNH is relatively prevalent in healthy adults, but it is uncommon for FNH to be diagnosed in children. Herein, we report the case of a 6-year-old child (male) with a huge FNH. The child presented to the clinic with a two-year history of a hepatic space-occupying lesion. The physical examination and liver function testing were near-normal. The abdominal ultrasound scan showed a 6.1*5.2 cm lesion with an inhomogeneous and well-demarcated low echo in the right lobe of the liver. On computed tomography (CT) imaging, a plain scan displayed a 7.1*6.4 cm circular shadow with a slightly low density and a central star-like scar in the right hepatic lobe. The tumor showed clear enhancement in the arterial phase and slightly decreased enhancement in the venous phase. As a result of uncertainty in the imaging and needle biopsy results, this child underwent surgical resection of the tumor. After surgery, we found that the tumor was shown to be enlarged in the right posterior liver, well-defined, yellow-to-tan in color, and 11*8*7 cm in size, which is larger than previously reported. The histopathologic evaluation of the surgical specimen was consistent with focal nodular hyperplasia (FNH).

Keywords: Focal nodular hyperplasia; Child; Benign liver tumors; Computed tomography

Introduction

Primary tumors of the liver, including malignant and benign tumors, constitute 1%-2% of all pediatric tumors [1]. Focal nodular hyperplasia (FNH) is a benign lesion of the liver which is usually found in healthy adults [2]; however, FNH is rare in children, and comprises only 2% of all pediatric liver tumors [3]. FNH is a well-circumscribed and lobulated tumor, which is often asymptomatic and incidentally discovered [4]. On gross examination, the typical architecture of FNH includes bile ducts and a central stellate scar, which also contains blood vessels that supply the hyperplastic process. Microscopically, the proliferating cells are almost identical to the surrounding hepatocytes [5]. For asymptomatic patients, complete surgical resection of explicit FNH is not necessary. Chen et al. [6] showed that children with an indefinite diagnosis should undergo surgical treatment [6]. Herein, we managed a 6-year-old boy with a huge FNH. The diagnosis could not be established based on imaging studies and needle biopsy, thus the boy underwent a surgical procedure.

Case Report

A healthy 6-year-old boy was referred to the First Affiliated Hospital of Nanjing Medical University for evaluation of a hepatic space-occupying lesion, which was first detected approximately 2 years ago. Two weeks ago, the child had fevers and abdominal pain, and sought evaluation at a local hospital. He had no symptoms of nausea or vomiting. The physical examination showed mild hepatomegaly. The results of liver function tests performed at the local hospital showed the alanine aminotransferase (ALT) and aspartate aminotransferase (AST) to be 73.4 U/L (normal, 15-40 U/L) and 144.8 U/L (normal, 9-50 U/L), respectively. Imaging studies, including abdominal ultrasound and computed tomography (CT), were performed 2 years ago. An abdominal ultrasound scan revealed a 6.1*5.2 cm lesion with inhomogeneous and a well-demarcated low echo in the right lobe of the liver. On CT image of the upper abdomen, a plain scan showed a 7.1*6.4 cm circular shadow with a slightly low density in the right hepatic lobe, which displayed a central star-like scar in the low-density area. On the contrast CT scan, the shadow was more prominent in the arterial phase and decreased slightly in the venous phase. In the delayed phase, the density was close to the liver parenchyma and the lower-density area disappeared in the right hepatic lobe. The tentative diagnoses were FNH or hepatoblastoma based on imaging. The patient was referred to our hospital for further therapy. Laboratory testing revealed the following: liver function tests were within the normal ranges (ALT and AST, 23.2 and 37.0 U/L, respectively); viral serologic tests for hepatitis B and C were negative; and the alpha-fetoprotein (AFP) level was 0.7 ng/ml.

During hospitalization, the re-examination showed that the lesion had enlarged slightly. The patient had another CT in our hospital, which showed the size of the shadow to be 8.5*7.9 cm in the right

hepatic lobe and the spleen was slightly larger. A dynamic CT scan of the liver disclosed a lobulated tumor with several expanded feeding vessels in the right hepatic lobe. On arterial and portal venous phase imaging, the tumor continued to exhibit a brightly enhanced early phase and early washout (Figure 1). Next, we invited a pediatrician to perform the needle biopsy in our hospital; however, the diagnosis was still indeterminate after the histologic examination. Thus, we decided to intervene surgically to obtain a definite pathologic diagnosis. During surgery, a well-defined mass was palpated in the right posterior lobe of the liver. The texture of the mass was hard, and the diameter was approximately 7 cm. Combined with the pre-operative imaging examination, the intra-operative diagnosis was FNH. Thus, we decided to perform a partial hepatectomy.

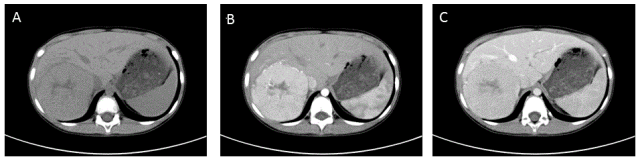

Figure 1: (A) Plain scan showed the lesion was low density with a lower density scar showed in the center. (B) In the arterial phase, the lesion was significantly enhanced without central scar tissues and showed a clear capsule. (C) The lesion was decreased in the venous phase.

On the gross pathologic examination of the surgical specimen, the tumor was shown to be enlarged in the right posterior liver, well-defined, yellow-to-tan in color, and 11*8*7 cm in size, with numerous small nodes on the surface of the liver tumor (Figure 2). Microscopically, we observed a huge non-encapsulated tumor (10.5*8*6.5 cm), which consisted of a proliferation of bile ducts and a central stellate scar containing tortuous blood vessels. The pathologic findings were consistent with FNH (Figure 3). Post-operatively, the child was recovering well at the 4-month follow-up visit.

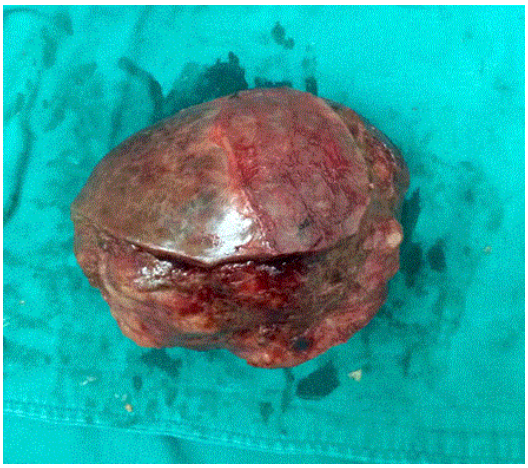

Figure 2: Gross pathology of the resected tumor shows an 11-cm tumor with a round-like appearance, compatible with the imaging features.

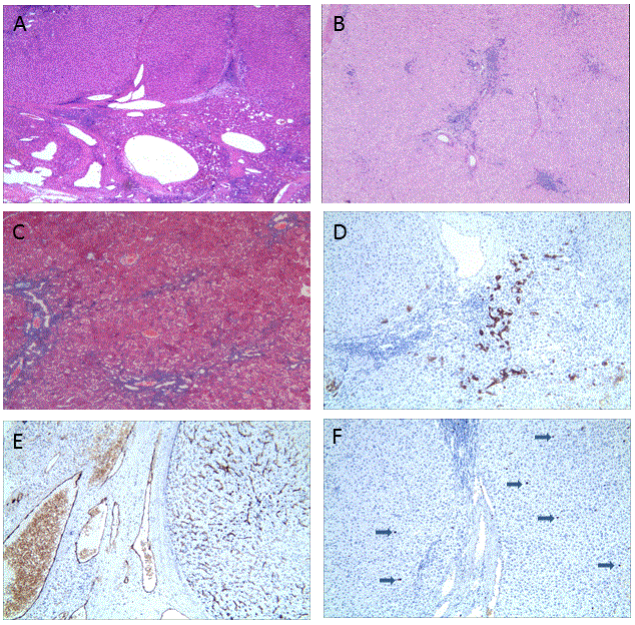

Figure 3: (A-B) Well-defined, non-encapsulated tumor, composed of nodular hepatocytes with "cirrhosis-like" architecture, separated by fibrous septa. Numerous duct-like structure proliferations with scattered lymphocytes (hematoxylin & eosin, 40X), (C) Architectural disturbance caused by fibrous septa linking portal tracts (Masson staining, 100X), (D) Immunostaining for CK7 shows ductular reaction and phenotypic switching of the hepatocytic cytokeratins, reflecting long-standing intrahepatic cholestasis (CK7 immunostaining, 100X), (E) Immunostaining for CD34 shows a large sum of vascular endothelial cells which proliferated widely (CD34 immunostaining, 100X), (F) Immunostaining for Ki-67 shows the lower expression of proliferation (<1%, Ki-67 immunostaining, 100X).

Discussion

Among pediatric primary liver neoplasms, 57% are malignant and 43% are benign [5]. In children with liver diseases, vascular tumors, hamartomas, adenomas, hepatic cysts, and FNH are all considered benign. Whether newborns or the elderly, FNH can be investigated in any age group. In children, FNH is usually diagnosed between 2 and 5 years of age [7]. Nevertheless, case reports involving children > 5 years of age are still rare worldwide.

FNH is an uncommon diagnosis in children, and is often found incidentally [8-12]. The etiology of these lesions is unclear, with possibilities including vascular or environmental factors (specifically, medications) [10,13,14]. The pathogenesis is hypothesized to be from localized interruption of blood flow resulting in a hyperplastic response of the remaining liver parenchyma [9,13,14]. Like other benign liver tumors, small lesions can be asymptomatic incidental findings. Larger lesions eventually present with numerous symptoms, the most frequent of which is abdominal pain. On examination, the child usually presents with a right upper abdominal mass [15]. Although normal levels of AFP suggest a benign lesion, laboratory tests

are usually unremarkable [16]. In this case report, the 6-year-old boy had fevers and abdominal pain before being referred to our hospital because of the larger lesion, the size of which was 7.1 cm in diameter.

FNH of the liver, which is a nodular, non-encapsulated, occasionally multifocal (15%-20%) liver mass, most frequently occurs in the left liver lobe [17]. Abdominal ultrasound is often used as the initial diagnostic imaging modality. Ultrasound is non-specific and FNH typically appears as a homogeneous, well-circumscribed lesion that can be isoechoic, hypoechoic, or hyperechoic [11]. The typical central scar is slightly hyperechoic, but is often difficult to visualize on ultrasound (20% of cases) [18]. Ungermann et al. [19] showed that contrast-enhanced ultrasonography can be the final diagnostic method for FNH >3 cm in size with a typical spoke-wheel vessel structure. If this phenomenon is not present and the central scar is not visible, a specific diagnosis of FNH cannot be based solely on contrast-enhanced ultrasound findings.

The tumor has characteristics which are more specific and can aid in the diagnosis on CT scan after intravenous contrast enhancement. On pre-contrast CT scans, FNH is often seen as s focal hypo- or iso-dense mass. Some statistics have shown that a central hypodense scar is observed in only one-third of cases [18]. FNH typically demonstrates uniform enhancement with IV contrast administration and enhances more than normal liver tissue. In most cases (89%-100%), the lesion enhances rapidly during the arterial phase of contrast-enhanced CT because of the prominent arterial supply to FNH [20]. In our case, the typical central scar was not noted on ultrasound imaging; however, the central scar was seen on CT. Nevertheless, the diagnosis of CT was uncertain, which was compatible with the pathologic results.

Thus far, no histologic reports have shown that FNH undergoes malignant progression; however, cases of FNH lesions associated with hepatocellular carcinoma (HCC) do exist [21-23]. Petsas et al. reported a case of HCC arising within a large FNH. The patient underwent pre-operative CT-guided core needle biopsy that revealed FNH; however, the final pathologic diagnosis disclosed FNH and HCC. Based on this case, we understand that although radiographic imaging could have a particular finding, liver biopsy or resection might be necessary to establish the diagnosis effectively. Makhlouf et al. [24] reported that when there is any doubt about the diagnosis by imaging, a needle biopsy can be performed; however, only 24% of the cases were correctly diagnosed with certainty in the present series. In this case, we invited a pediatrician to perform the needle biopsy to establish the diagnosis; however, this attempt failed because of the lack of typical histologic characteristics of FNH. In our experience, we found that a needle biopsy for diagnosis is unnecessary if the patients have hypervascular tumors or undetermined, but resectable tumor. A needle biopsy might increase the risk of internal bleeding or tumor dissemination. Yang et al. [9] suggested that for pediatric FNH patients, active surgical treatment by hepatectomy should be performed if the patient has the following: (1) clinical symptoms; (2) indefinite diagnosis or hepatitis B virus carriage; (3) tumor size>5 cm. The child presented herein underwent standard surgery.

In conclusion, it is occasional for children to have FNH without typical appearance. The location and size of the tumor apparently determines the clinical symptoms. We usually use imaging examinations, such as ultrasound and CT, to ensure the diagnosis of FNH. Sometimes, however, it is difficult for us to differentiate from other benign and malignant tumors in children. A needle biopsy for diagnosis is unnecessary in children without clinical symptoms; however, in children undergoing standard FNH surgery, surgical excision is acceptable.

(Written informed consent was obtained from the patient's legal guardian(s) for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.)

Competing Interests

The authors declare that they have no competing interests.

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