Focal Nodular Hyperplasia of the Liver in a 5-year-old Girl

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Focal nodular hyperplasia of the liver is a benign tumor that usually affects young women. Traditionally, its treatment in children has been conservative. As a result of its rarity in childhood, its differential diagnosis with other liver tumors is challenging. We present the case of a 5-year-old girl with a 1-week history of fever and abdominal pain. No definite diagnosis could be obtained after serial imaging and liver biopsy. As a result of uncertainty in the imaging and needle biopsy results, the patient underwent complete tumor resection. Pathology showed focal nodular hyperplasia that affected the right lobe of the liver. After surgery, the child was doing well at 24 months of follow-up. [*J Chin Med Assoc* 2010; 73(11):611–614]

Key Words: child, focal nodular hyperplasia, liver tumor

Introduction

Primary tumors of the liver, both malignant and benign, constitute 1–2% of all pediatric tumors.[1] Focal nodular hyperplasia (FNH) represents only 2% of these.[2] FNH is a well-circumscribed, lobulated tumor. Its typical architecture on gross examination consists of bile ducts and a central stellate scar that contains blood vessels that supply the hyperplastic process. Microscopically, the proliferating cells are almost identical to the surrounding hepatocytes.[2] Complete surgical resection of biopsy-proven FNH is not mandatory in asymptomatic patients.

We report a case of FNH in a 5-year-old girl who presented with fever and abdominal pain, and underwent surgical treatment because of uncertain diagnosis after imaging studies and needle biopsy.

Case Report

A 5-year-old previously healthy girl was referred to Taichung Veterans General Hospital because of elevated liver function profile and a liver tumor that was detected at another hospital. She had suffered from fever and abdominal pain for 1 week and had visited a local hospital first. She had no symptoms of nausea or vomiting. Physical examination showed mild hepatomegaly. The liver function tests at the local hospital were elevated, including an aspartate aminotransferase level of 68 IU/L (normal, < 37 IU/L) and an alanine aminotransferase level of 127 IU/L (normal, < 41 IU/L). Imaging studies, including abdominal ultrasound and computed tomography (CT), had also been performed there. She was then referred to our hospital for further management. We found the patient's liver function tests to be within the normal ranges (aspartate aminotransferase/alanine aminotransferase, 28/35 IU/L). Viral serological tests for hepatitis B and C were negative. Alpha-fetoprotein level was 1.78 ng/mL.

Abdominal ultrasonography showed a hypoechoic, 6.9 × 4.5 cm, well-defined mass in the right lobe of the liver. A dynamic CT scan of the liver disclosed a lobulated right hepatic tumor with a dilated feeding vessel from the right hepatic artery (Figure 1). On arterial- and portal-venous-phase imaging, the tumor continued to show hyperenhancement relative to normal liver parenchyma.

Needle biopsy was performed by a pediatrician, but no definite diagnosis could be obtained after histological examination. Thus, the patient underwent exploratory surgery by means of a Kocher incision to obtain a pathological diagnosis. A large mass, without adherence to adjacent structures, was immediately

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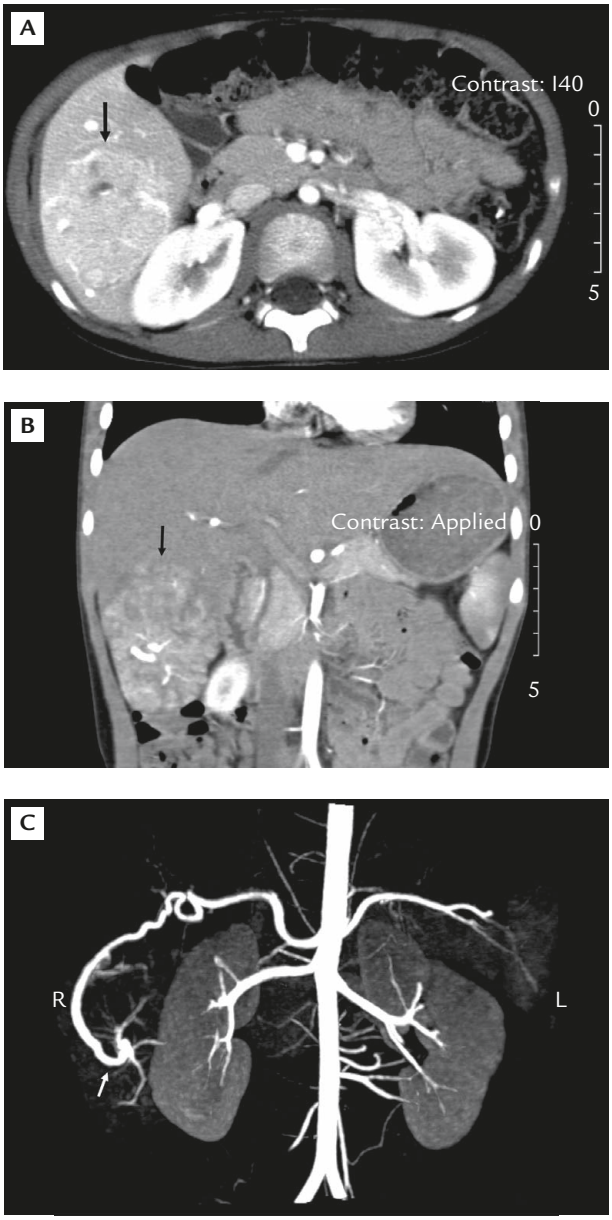

Figure 1. (A and B) Dynamic computed tomography of the liver shows a lobulated right hepatic tumor (arrow) with a dilated feeding vessel from the right hepatic artery during the arterial phase. (C) Computed tomographic angiography demonstrates a spoke-wheel pattern (arrow) that corresponded to radiated arteries.

evident at the entrance to the abdomen (Figure 2). Some blood clots, due to a previous needle biopsy, were found around the tumor. To decrease blood loss, Pringle's maneuver was performed once during liver resection. A segmentectomy of S6–7 with complete resection of the tumor was performed. The time taken for liver resection was 18 minutes, and liver ischemic time was 23 minutes. Blood loss was minimal.

Gross pathological examination showed that the tumor was well-defined, yellow to tan in color, and $6.8 \times 5.3 \times 4.5$ cm in size, with a nodular appearance.

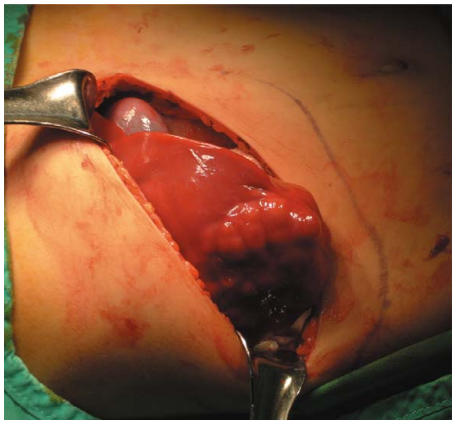

Figure 2. A large mass with nodular appearance, without adherence to adjacent structures, was immediately evident at the entrance to the abdomen.

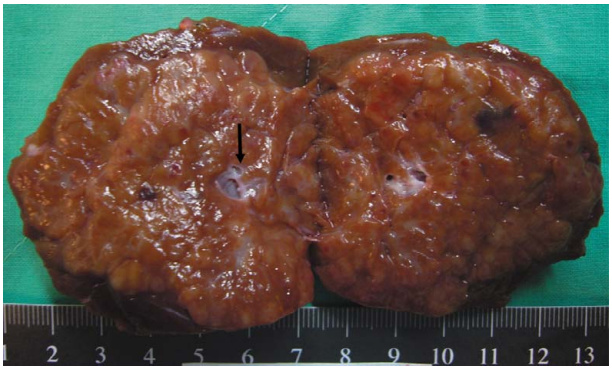

Figure 3. Gross pathology of the resected tumor shows a 6-cm tumor with nodular appearance and a centrally located vessel (arrow), compatible with the imaging features.

It weighed 85 g. A cross section of the tumor was multinodular, without a typical central stellate scar (Figure 3).

Microscopically, we observed a non-encapsulated tumor, composed of nodular hepatocytes with "cirrhosis-like" architecture separated by fibrous septa, and containing bile ductule proliferation and tortuous blood vessels (Figure 4). The hepatocytes were cytologically normal. A final diagnosis of FNH was made. After surgery, the child was doing well at 24 months of follow-up.

Discussion

Among pediatric primary liver neoplasms, 57% are malignant and 43% are benign.[2] Benign liver tumors in children include vascular tumors, hamartomas, adenomas, and FNH. FNH can be diagnosed in any age group, from newborns to the elderly. In children, it is usually diagnosed between 2 and 5 years of age.[3]

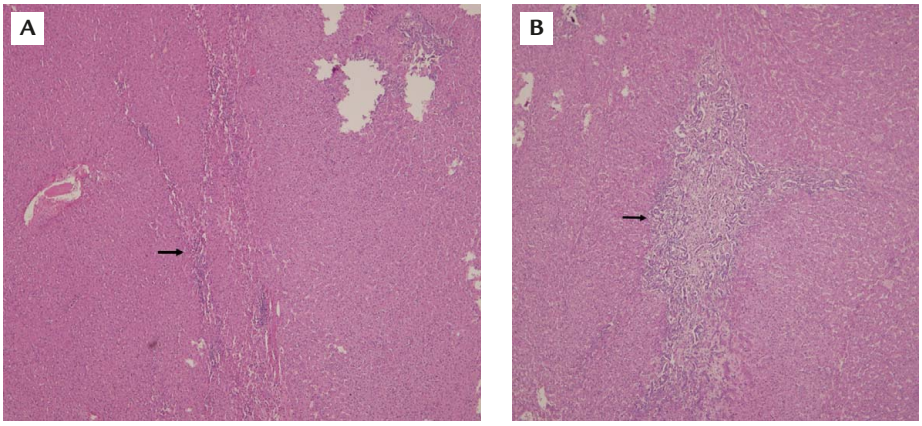

Figure 4. (A) Well-defined, non-encapsulated tumor, composed of nodular hepatocytes with "cirrhosis-like" architecture, separated by fibrous septa. The left part is normal liver parenchyma. The septum is infiltrated by lymphocytes (arrow) (hematoxylin & eosin, 40×). (B) Numerous duct-like structure proliferations (arrow) with scattered lymphocytes (hematoxylin & eosin, 100×).

Like other benign liver tumors, small lesions can be asymptomatic incidental findings. Larger lesions eventually present with mass symptoms, usually abdominal pain. On examination, the child usually presents with a right upper abdominal mass.[4] Laboratory tests are unremarkable, although normal levels of α-fetoprotein are indicative of a benign lesion.[5] The 5-year-old girl in this case report had symptoms of fever and abdominal pain, due to a larger lesion of 6.8 cm in diameter.

FNH of the liver is a nodular, non-encapsulated, occasionally multifocal (15–20%) liver mass, which most frequently occupies the left liver lobe.[6] It is usually slightly hypoechoic or isoechoic, with lobulated contours or a hypoechoic halo on ultrasound. The typical central scar is slightly hyperechoic, but is often difficult to visualize on ultrasound (20% of cases).[7] Ungermann et al[8] reported that contrast-enhanced ultrasonography can be the final diagnostic method for FNH > 3 cm 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 can be much more evident on CT after intravenous contrast enhancement. On precontrast CT scans, FNH is seen as a focal hypodense or isodense mass. A central hypodense scar is observed in only one-third of cases.[7] In most cases (89–100%), the lesion enhances rapidly during the arterial phase of contrast-enhanced CT because of the prominent arterial supply to the FNH.[9] Furthermore, based on evidence provided by magnetic resonance imaging (MRI) about the characteristics of soft tissue and vascularity of the tumor, Hussain et al[10] concluded that MRI has a higher sensitivity and specificity for FNH than either ultrasonography or CT. In our case, the typical central scar was not seen by CT or ultrasound, which was compatible with the pathological findings.

The possible malignant potential of FNH lesions remains the main issue. To date, there have been no reports of histologically proven FNH presenting with a malignant evolution; however, cases of FNH lesions associated with hepatocellular carcinoma (HCC) do exist.[11–13] A series of patients operated on for preoperative diagnosis of benign liver tumor showed 3 with HCC diagnosed at the time of surgery.[12] Petsas et al[13] reported a case of HCC arising within large FNH. This case underwent preoperative CT-guided core needle biopsy that revealed FNH. However, the final pathological diagnosis disclosed FNH and HCC. These data suggest that, despite distinctive findings on radiographic imaging, liver biopsy or resection might be necessary to establish the diagnosis definitively.

Makhlouf et al[14] reported that when there is doubt about the diagnosis by imaging, needle biopsy can be performed. In their experience, if an adequate specimen is obtained, the diagnosis of FNH can usually be established on hematoxylin and eosin sections, but only 24% of the cases in the presented series were correctly diagnosed with certainty. In our case, needle biopsy was arranged by a pediatrician for pathological diagnosis because of atypical findings on CT or ultrasound, but this form of diagnosis failed because of the lack of typical histological characteristics of FNH. In our experience, for patients with hypervascular tumor or undetermined but resectable tumor, needle biopsy for diagnosis is not favored because of risks of internal bleeding or tumor dissemination.

From the retrospective analysis of Reymond et al,[15] the outcome appears to be good for those with observation alone and those with resection. Hence, asymptomatic FNH can be treated conservatively with

regular follow-up. For pediatric FNH patients, Yang et al[16] suggested that active surgical treatment by hepatectomy should be performed if the patient has: (1) clinical symptoms; (2) indefinite diagnosis or hepatitis B virus carriage; and (3) tumor size > 5 cm. Our patient and another case reported by Feng et al[17] shared some similarities clinically, and both fulfilled the criteria for surgery.

In conclusion, FNH can present as an incidental finding without typical appearance in children. Clinical symptoms are dependent on tumor size and location. The diagnosis of FNH mainly depends on imaging, such as ultrasound, CT and MRI. However, it is difficult to differentiate from other frequent liver tumors in children. Complete surgical resection of biopsy-proven FNH is not mandatory in asymptomatic patients. For symptomatic patients or those with indefinite diagnosis, surgical excision is suggested.

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