Incremental Diagnostic Value of F-18 FDG PET/CT Over MRI in a Pediatric Patient With Suspected Hepatoblastoma and Histologic Diagnosis of Focal Nodular Hyperplasia

Francesco Bertagna, MD,* Emanuela Orlando, MD,† Giovanni Bosio, MD,* Luisa Bercich, MD,‡ Simona Fisogni, MD,‡ Luigi Grazioli, MD,† and Raffaele Giubbini, MD§

Abstract: Hepatoblastoma (HB) is the most common pediatric liver cancer representing 1% of all pediatric malignances and occurring mostly within 5 years of age. Liver recurrences and secondary lesions (abdomen, lung, and brain) can occur. Surgery and chemotherapy are widely accepted. Focal nodular hyperplasia (FNH) is a benign, usually asymptomatic, and incidental hepatic tumor with an unclear etiology, good prognosis, and its clinic management should be conservative. FNH could be evaluated by ultrasonography, computed tomography, and magnetic resonance imaging. Nuclear medicine procedures do not have an effective role in evaluating HB/FNH but F-18 FDG PET/CT represents a new option. We report a case of a child with a lesion suspect for HB at magnetic resonance imaging and negative F-18 FDG PET/CT with histologic diagnosis of FNH after resection.

Key Words: hepatoblastoma, focal nodular hyperplasia, MRI, F-18 FDG PET/CT

REFERENCES

FIGURE 1. An 11-month-old female underwent abdominal echography after a domestic fall that revealed an incidental finding of a mildly hypogenic oval-shaped lesions at VII hepatic segment. Chest radiography, human chorionic gonadotropin, carcinoembriogenic antigen, C-reactive protein, and A, B, C hepatitis markers were negative but slightly elevated alpha-fetoprotein. A magnetic resonance imaging revealed a solid, oval-shaped, and dishomogeneous lesion measuring 3.3 per 2.8 cm at VII hepatic segment. The lesion was slightly hypointense at precontrast T1-weighted sequence (1-A1) and hyperintense at T2-weighted sequence with (1-A2) and without (1-A3) fat suppression (T2 Fat Sat). After administration of hepatocellular specific contrast agent (CA) gadolinium-ethoxybenzyl-diethylenetriaminepentaacetic acid (Gd-EOB-DTPA, Primovist), the lesion was slightly and homogeneously hyperintense in arterial phase (1-A5), isointense in portal venous phase (1-A6), slightly hypointense in equilibrium phase (1-A7), and very hypointense in hepatobiliary phases at 5’, 10’, 15’ e 20’ from the administration of contrast medium (1-A4;1-A8). The lesion was judged suspect for HB. An F18 FDG PET/CT was performed after the intravenous administration of 156 MBq of F18-FDG; serum glucose levels was lower than 150 mg/dL and images were acquired under sedation, 60 minutes after injection from the skull apex to the midthigh region on Discovery ST tomograph (GE—Milwaukee, WI; 4-slice-CT, 80 mA, 120 Kv; 4 minutes per PET-bed); F-18 FDG PET/CT was negative not revealing any pathologic uptake, particularly at the liver and showed only physiologic moderate uptake at thymus and bowel. Are reported axial views of CT images (1-B2), PET images (1-B3), and fused images (1-B1) of the lesion identified at MR.
The patient underwent VI and VII segments surgical resection and, at histologic examination, the liver nodule measured 2.5 cm, was yellowish and showed central whitish scar with septa imparting pseudonodular aspect at macroscopic evaluation (2-D1). The scar and the septa contained proliferating marginal biliary ductules, positive for cytokeratin AE1 at immunohistochemical analysis (2-D2, 2-D3).

The definitive diagnosis was focal nodular hyperplasia (FNH) and after 2-year follow-up, the patients were well-being and growing-up. The usefulness of F-18 FDG PET/CT in a variety of malignant diseases is well established in literature showing high accuracy and very high negative predictive value; however, the glucose metabolism of HB and FNH has not been reported in a large number of studies, especially in pediatric field because of a relative low incidence of this pathology and difficult clinical management of patients (necessity of sedation and dosimetric concerns). FNHs are considered typical at magnetic resonance when appear homogeneously isointense or slightly hypointense respect to the normal surrounding tissue at T2-weighted fast spin-echo images and isointense or slightly hypointense at T1-weighted gradient echo images before administration CA.1,2 Typical behavior during the dynamic phase of intravascular extracellular contrast enhancement is a marked and homogeneous signal intensity enhancement during the arterial phase, rapid and homogeneous signal intensity washout during the portal venous phase, signal isointensity or slightly hyperintensity during the equilibrium phase; using an hepatocellular specific CA the typical finding is hyperintensity during the hepatobiliary phase, and this behavior is determined by the presence of misshapen biliary ductules which cause a biliary contrast enhancement delay.1,2 A typical scar is revealed as a hyperintense central stellar area on T2-weighted gradient echo images. During the dynamic phase of contrast enhancement, a typical scar appear hypointense during the arterial and portal venous phase and slightly hyperintense during the equilibrium phase.1,2 The presence of scar is the main element for the definition of a typical FNH in lesion greater than 3 cm in size. Our case is an atypical finding for FNH because of the absence of central scar in a 3.3-cm lesion and mostly of hypointensity in hepatobiliary phases. These features and the increased alpha-fetoprotein value have suggested the hypothesis of...
hepatic malignant lesion as HB. Even if very few articles are published about this issue, F-18 FDG PET findings in HB are usually characterized by high uptake both in primary lesion and recurrences. In particular, Mody et al have studied 7 pediatric patients, 5 of which affected by HB, showing increased FDG uptake in all lesions. In adult patients, FNH usually shows low F-18 FDG uptake at F-18 FDG PET, not distinguishable from the surrounding tissue due to low metabolic activity that characterize benign tumors. In particular Kurtaran et al have studied 8 patients with FNH showing no increased glucose metabolism at F-18 FDG PET with SUV value between 1.5 and 2.6, not significantly different from normal liver uptake. In a recent article, Magini et al have demonstrated that F-18 FDG PET/CT is very useful in differentiating FNH, characterized by normal uptake, from hepatic adenoma, primary and secondary hepatic malignancy, characterized by high uptake, and that C11-acetate-PET offers no additional diagnostic advantage in this field as it accumulates both in hepatocellular carcinoma, hepatic adenoma, and FNH but not in secondary hepatic lesions. On this topic, Huo et al have suggested that dual time point imaging has potential to improve diagnostic accuracy of C11-Acetate-PET in the diagnosis of hepatocellular carcinoma. Moreover, to our knowledge, no articles are currently available in literature about F-18 FDG PET/CT findings in pediatric patients affected by FNH. In conclusion, in a field in which literature is very poor, this case contributes to demonstrate that F-18 FDG PET/CT could be useful and reliable in evaluation of suspect hepatic lesions showing high negative predicting value in ruling out HB hypothesis as well as other hepatic malignancies. Larger studies with more patients enrolled are desirable to confirm these findings and these new insights of F-18 FDG PET/CT application.