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EDITORIAL

Pediatric hepatoblastoma and hepatocellular carcinoma: lessons learned in the last decade

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In this issue of *Pediatric Radiology*, we have an excellent series of articles on imaging and image-guided interventions in pediatric hepatic malignancies [1–4]. These articles are the result of several years of collaboration among pediatric radiologists, interventional radiologists, surgeons and oncologists at their individual institutions and in international cooperative groups.

The authors have shown that the time invested by radiologists by serving in clinical trials groups can provide opportunities for collaboration across continents. This is especially important when dealing with diseases that have an incidence of ~1–1.5 in a million [5]. Standardized, high-quality imaging and interpretation is essential in therapeutic studies to ensure accuracy of outcomes data. This also allows for incorporation of clinically relevant imaging questions in therapy studies.

There has been considerable evolution in the management of pediatric hepatoblastoma and hepatocellular carcinoma over the last 3 decades through the joint efforts of the Children's Oncology Group (COG), Société Internationale d'Oncologie Pédiatrique – Epithelial Liver Tumor Study Group (SIOPEL), and the Japanese Study Group for Pediatric Liver Tumors (JPLT). The incorporation of orthotopic liver transplantation, especially with the improved availability of livers for children through split liver transplants, has improved the 10-year overall survival of children with hepatoblastoma to 85% [6]. It is imperative that all radiologists who image children be aware of imaging guidelines for pediatric liver malignancies. This will aid in timely identification of children with potentially unresectable tumors and facilitate early referral to centers with expertise in liver resection and transplantation.

The first article in this series [1] focuses on imaging of pediatric liver malignancies and provides an update to the 2005 revision of the PRETEXT classification system [7]. Just as the Liver Imaging Reporting and Data System (LIRADS) provides consistent guidelines for evaluating adults at risk of developing hepatocellular carcinoma, this update on the PRETEXT imaging system provides concise definitions for imaging pediatric hepatic malignancies [8]. A clear understanding of the PRETEXT imaging system is needed to determine whether a child with a liver malignancy will be eligible for tumor resection after chemotherapy vs. needing a liver transplant. I anticipate this article being frequently referenced in the reading room when a child with a hepatoblastoma is imaged.

Through the auspices of their respective pediatric cancer study groups, the authors have developed a systematic imaging schema that will be used in an international clinical trial of pediatric hepatoblastoma and hepatocellular carcinoma (the Paediatric Hepatic International Tumour Trial, or PHITT) [9]. Concise definitions have been created for annotation factors that are known to be poor prognostic factors such as vascular involvement and tumor rupture [10]. Consistency of imaging and staging across continents and cooperative groups is essential to be able to compare the impact of innovative therapies as future trials are developed to improve the outcome of children with liver malignancies.

Histological evaluation of pediatric tumors has traditionally relied on surgical sampling by excisional or open biopsy. An increasing body of literature in pediatric solid tumors has shown that adequate sampling of tumor for histological evaluation and special stains can be performed using percutaneous biopsies performed by interventional radiologists [11]. In North America, percutaneous biopsy of a pediatric renal malignancy is considered to be equivalent to tumor rupture, requiring at least flank irradiation; however the same principles are not used in the European studies, where percutaneous biopsy is not considered a criterion for upstaging [12]. At this time, we do not

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have enough evidence to determine the consequences of percutaneous biopsy of hepatic malignancies, though biopsy through the liver segment that is to be resected is currently recommended. The impact of this approach on potential recurrence in the abdominal wall/peritoneal lining along the biopsy tract will be evaluated in the upcoming PHITT.

While endovascular and percutaneous interventions are well established in the management of adult hepatocellular carcinoma, data in children are based on small series [13]. In the second and third articles in this journal series, the authors have summarized current literature and provided an overview of options based on their collective experience at seven children's hospitals in North America and the United Kingdom [2, 3].

The fourth paper in this series is based on a single institution's experience with increased prevalence of fractures in children with hepatoblastoma [4]. At this time it is unclear whether this is a metabolic side effect or a paraneoplastic manifestation. Heightened awareness of this association is prudent so that we can identify these fractures and potentially avoid incorrectly upstaging a child as having bone metastasis.

In summary, this four-part series is an excellent update on pediatric hepatic malignancies. We are eager to learn from this group's experience in the ongoing PHITT study.

Compliance with ethical standards

Conflicts of interest None

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