

News and Views From the Literature

Pediatric Urology

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Computerized Tomography Findings in Pediatric Renal Trauma—Indications for Early Intervention?

Cannon GM Jr, Polsky EG, Smaldone MC, et al.

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In patients with grade IV blunt renal trauma, urinomas lead to the majority of delayed interventions in children. The objective of the study from the Children's Hospital of Pittsburgh was to evaluate findings on initial computed tomography (CT) scans of pediatric patients following grade IV blunt renal trauma with urinary extravasation, and to determine what radiographic factors predict the need for surgical intervention. Between 2000 and 2007, the CT scans of 17 patients (13 boys and 4 girls; mean age, 11.1 years) with trauma and gross hematuria were studied via CT scan of the abdomen and pelvis with delayed images. The location, size, and number of extravasation sites were determined, as well as the presence of contrast in the ipsilateral ureter. These radiographic findings were

correlated with the need for subsequent ureteral stent placement, percutaneous urinoma drainage, angiographic embolization, and nephrectomy. A follow-up CT was obtained at 48 hours to evaluate improvement in urinary extravasation. The authors postulated that extravasation located medially would be less likely to resolve than that located laterally or posteriorly because there was less of a compressive effect of the parenchyma by the renal pelvis.

These investigators intervened in patients with no urinary extravasation who had progressive flank pain, persistent fever, and no extravasation resolution after 2 weeks of observation. Almost 50% of patients (8/17) required delayed intervention. As expected, conservative treatment was not successful when contrast was absent from the ipsilateral ureter. Conservative treatment was not successful when there was a large separation of the upper and lower poles. Three of 5 patients with multiple areas of extravasation and 4 of 5 patients with transfusion requirements failed conservative treatment. The authors found that the size and location of extravasation were not predictors of the need for intervention. Intervention was required for symptomatic urinomas due to posterior extravasation in 2 of 5 patients. Of the 2 patients with lack of contrast in the ipsilateral ureter, 1 patient underwent delayed intervention with preservation of the kidney and 1 patient was treated nonoperatively and has minimal function of the kidney. The authors conclude that lack of drainage from either an upper pole or the entire kidney into the ureter may be the single most important radiographic finding that suggests the need for early surgical intervention.

Ileal Enterocystoplasty and B₁₂ Deficiency in Pediatric Patients

Rosenbaum DH, Cain MP, Kaefer M, et al.

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The Children's Hospital in Indiana reviewed its series of 500 bladder augmentations performed from July 1978 to July 2003 to determine the timing and risk of vitamin B₁₂ deficiency in this population. Vitamin B₁₂ deficiency leads to megaloblastic anemia, myelopathy, and neuropathy. The potential for B₁₂ deficiency is of concern because 20 to 25 cm of ileum are removed at the time of bladder augmentation. Seventy-nine patients under the age of 18 had 105 serum vitamin B₁₂ tests available for review. Normal (200-1000 pg/mL) vitamin B₁₂ values were found in 62% of tests. Nine percent of patients had low (200 pg/mL or less) values and 29% had low-normal (201-300 pg/mL) values. The authors found that low vitamin B₁₂ levels started approximately 7 years following surgery. Vitamin B₁₂ stores in the body can be sustained at normal levels for approximately 5 years in patients who are unable to absorb the vitamin. Therefore, it is not surprising that their data show an abrupt downward trend in vitamin B₁₂ levels starting 7 years postoperatively in patients with follow-up of 7 years or longer, with 62% of this group (18/29) having low or low-normal values. In addition, complete blood counts were obtained and were normal except in 7 cases, where there was anemia that did not involve an increased mean corpuscular volume as seen with vitamin B₁₂-related anemia. The authors suggest that vitamin B₁₂ levels should be obtained 5 years postoperatively. Treatment should be provided for those with low to low-normal levels. This approach differs for adult patients who have undergone lower tract reconstruction involving at least 50 cm of ileum because intramuscular vitamin B₁₂ is started 1 year postoperatively.

Several interesting comments were made by both the authors and the reviewers of this article. Because they did not find megaloblastic anemia, it is unclear whether patients may have some type of neuropathy because most of the patients in the series had spina bifida with underlying neurologic deficits. Dr. Scott McDougal notes that if a patient does develop megaloblastic anemia, one should be certain that folate metabolism is normal before implicating vitamin B₁₂ deficiency. He also notes that neurologic problems—including peripheral neuropathy, loss of positional and vibration sense, difficulty with balance, and dementia—may not be reversible unless they are of short duration. The variability in postoperative vitamin B₁₂ levels may also reflect the preoperative ability of the liver to store vitamin B₁₂. If these levels are normal in an ade-

quately nourished preoperative patient, the liver can provide sufficient vitamin B₁₂ for as long as 3 to 5 years in the absence of vitamin absorption. Therefore, it may take 15 to 20 years for a deficiency to occur. Importantly, low levels of vitamin B₁₂ do not equate to metabolic deficiency and clinical side effects. Dr. McDougal suggests that to assess the impact of vitamin B₁₂ levels, *one must determine serum homocysteine and/or methylmalonic acid levels*. Vitamin B₁₂ serves as a coenzyme in their metabolic pathways, so these metabolites are a sensitive indicator of whether a low level of vitamin B₁₂ is clinically significant. If the metabolites are increased and the serum vitamin B₁₂ level is low, a significant deficiency is present. The opposite, though, is true: if the metabolites are normal, then it is unlikely that the current level of vitamin B₁₂ is causing a metabolic abnormality.

Risk Assessment of Incidentally Detected Complex Renal Cysts in Children: Potential Role for Modification of Bosniak Classification

Wallis MC, Lorenzo AJ, Farhat WA, et al.

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The Bosniak scoring system has been used to evaluate complex cysts in adults. There are currently no guidelines for the management of complex renal cysts in children because they are rare; however, complex renal cysts pose a diagnostic and therapeutic dilemma in children. The authors retrospectively identified patients with complex renal cysts and determined the potential usefulness of the Bosniak classification, especially its ability to evaluate malignancy risk. Thirty-nine children with a mean age of 7 years (range, 4 months-14 years) were found to have a complex renal cyst with a mean size of 1.6 cm (range, 0.4-5 cm). Imaging was performed for a variety of initial diagnoses, including Beckwith-Wiedemann syndrome, neurofibromatosis, reflux, abdominal and flank pain, abnormal prenatal ultrasonographic findings, history of liver and lung transplant, history of acute lymphoblastic leukemia, and neuroblastoma. Other patients had a history of stones or cystinuria. Additional initial diagnoses included posterior urethral valve, VACTERL association, spina bifida, nephrogenic diabetes insipidus, epispadias, trauma, sickle cell anemia with a history of hepatic abscess, febrile urinary tract infection, anorectal malformation, and incontinence. The diagnosis was made in 36 cases using ultrasound; 3 cases were found on computed tomography (CT). Of the 36 cases, 18 diagnosed by ultrasound were observed with only serial sonographic evaluation, and the appearance of the cyst remained unchanged during a mean follow-up of 26.8 months (range, 9-70 months).

Table 1
Proposed Modification of Bosniak Classification Applied to Renal Cysts in Children

Category	Description
I	Round, smooth thin walled cyst. No echogenic foci and enhanced throughout transmission on ultrasound. Homogeneous content consistent with water density and absence of enhancement after intravenous contrast on CT scan.
II*	Cyst with thin septa with or without minimal/smooth thickening of the cyst wall or septation(s). Calcifications and/or high attenuation detected on CT scan. No evidence of enhancement after contrast administration. No detectable flow by Doppler ultrasound in septations or cyst wall.
III	Presence of thick or irregular septations. Thick/irregular calcifications detected on CT scan. Enhancement of septa or wall may be present after intravenous contrast administration. Detectable flow by Doppler ultrasound may be present in septations or cyst wall. If category III by ultrasound, contrast axial imaging study should be strongly considered.
IV	Cystic mass with thick wall, solid internal components or nodular areas. Enhancement and marked heterogeneity after contrast administration. Detectable flow detected by Doppler ultrasound in cyst wall, septations, nodular component. If category IV by ultrasound, contrast axial imaging study should be strongly considered.

CT, computed tomography.

If both ultrasound and CT scan or magnetic resonance imaging scan are obtained, in case of discrepancy the findings on the contrast enhanced axial imaging study should be favored for classification purposes.

Children found to have renal cysts should be considered for evaluation for hereditary cystic renal diseases.

*Children with category II cysts should be periodically followed with serial imaging studies until further experience is gained with this classification scheme.

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In 21 of 39 patients (54%), contrast-enhanced imaging by CT or magnetic resonance imaging was performed and the diagnosis of a complex renal cyst was confirmed in 12. Simple cysts were diagnosed in 7 patients despite the clear visualizations of septations. There were multiple simple cysts in 1 patient and a calyceal diverticulum was observed in another. Five patients underwent surgical intervention based on surgeons' judgment and the worrisome features of the cysts, such as enhancing components, and all were amenable to partial nephrectomy. Pathology revealed a benign cyst in 3 (modified Bosniak class II in 2 patients and class III in 1) and renal cell carcinoma in the remaining 2 patients (class III in 1 and class IV in 1). The authors conclude that children who have cysts with enhancing soft tissue densities will benefit from surgical intervention. The 2 patients with cysts having these characteristics were found to have renal carcinoma. This approach parallels the recommendations of the Bosniak classification where class III and class IV complex cysts are surgically excised due to the high incidence of malignancy in these cystic lesions.

The Bosniak classification was modified in this study because the original classification is based on contrast-enhanced CT. Because most children undergo ultrasound, half of the patients in this retrospective study had no contrast-enhanced imaging study. This fact suggests that

most cysts were not of a disconcerting nature and a contrast imaging study was not recommended. The authors modify this system by adding ultrasound findings that would parallel those of axial imaging (Table 1). The most recent reports of the Bosniak classification divide category II cysts into those that can be ignored (category II) and those that require follow-up (category IIF). That modification has not been applied to children because all with category II cysts have been thought to have characteristics that do not require imaging other than ultrasound. This study has also shown that ultrasound imaging is more sensitive than CT in detecting septations. Presence of flow within any septations found on ultrasound should be an indication for further evaluation, although in such instances, further imaging studies have not identified any malignancies. The authors also express enthusiasm for magnetic resonance for the evaluation of renal masses because CT is now one of the most significant sources of radiation exposure for children. Although the risk in an individual is small, children are 10 times more sensitive to radiation-induced neoplasms than adults. Although there are limitations to this study, it is the first attempt to apply a modified Bosniak classification to complex renal cysts in children, obviating the need for CT scan imaging in patients with Bosniak class I or II cysts. ■