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Diagnosis of ectopic ureter as a cause of urinary incontinence

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Abstract *Introduction and objective:* Female pediatric patients with continuous drip incontinence present a diagnostic challenge. At times, these symptoms may be due to an ectopic ureter inserting below the external sphincter. The evaluation may consist an ultrasound and voiding cystourethrogram (VCUG), but these may not be diagnostic and further evaluation may be necessary. We reviewed our experience with imaging modalities used to make the diagnosis of ureteral ectopia.
Methods: We reviewed the records of 24 female patients with incontinence after toilet training or other symptoms caused by ureteral ectopia. We focused on the initial imaging methods, the modality providing the definitive diagnosis, and outcome.
Results: Twenty-four patients were identified with an ectopic ureter. Two patients had bilateral ectopia for a total of 26 ectopic ureters. Of the 24 patients, 19 initially had negative diagnostic tests. These combined tests consisted of 15 intravenous pyelograms (IVPs), 18 VCUGs, 14 ultrasound, five cystoscopies, one nuclear VCUG and one MRI. Two patients underwent computed tomography (CT) as the primary test revealing an ectopic system. Of the 26 ectopic ureters, the diagnosis was made by CT scan in 13, IVP in five, cystoscopy in six, and ultrasound in one. One ectopic ureter was identified by exploration. In no cases did a CT scan fail to identify an ectopic system.
Conclusion: Patients with an ectopic ureter often will have no abnormality on initial imaging studies. Our experience has shown that a CT scan with delayed contrast is the most sensitive, economic and readily available test for diagnosing ecoptic ureters and renal systems.

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Introduction

The evaluation and management of young female patients who present with urinary incontinence after toilet training or recurrent urinary infections can often be difficult. Many etiologies can contribute to these symptoms including dysfunctional voiding and detrusor instability, as well as ureteral ectopia.

Ureteral ectopia has been used to describe any ureter that empties either at the bladder neck or caudally. If the ureteric bud arises in a more proximal position during development, the ureteral orifice can ultimately be incorporated into one of the Müllerian structures [1] instead of into the bladder. In females, it is possible that the orifice may be distal to the urethral sphincter allowing continuous urinary incontinence. As ectopic ureters usually drain poorly functioning renal segments with low urine production, these patients may also present with intermittent incontinence as well.

The incidence of ureteral ectopia has been estimated to be approximately 1/1900 but several studies have suggested the true prevalence may be higher than commonly thought. In patients who are suspected to have ureteral ectopia, ultrasonography has been a first-line tool for evaluation. Excretory urography has classically been described as the confirmatory test, but is limited by poor visualization of hypofunctioning renal units and lack of anatomic detail needed for surgical management.

Several authors have evaluated CT [1—3], MRI [4,5] or nuclear medicine scans [6,7] as confirmatory modalities or to help guide surgical care. We evaluated our experience with imaging modalities used to make the definitive diagnosis of ureteral ectopia in the setting of continuous urinary incontinence.

Materials and methods

Institutional Review Board approval was obtained for a retrospective review of clinical records. We obtained the medical charts of 24 female patients who were ultimately diagnosed with an ectopic ureter. We assessed the clinical and radiographic evaluations that provided the definitive diagnosis of ureteral ectopia as well as the surgical and long-term outcomes for these patients.

Results

A total of 24 patients who were evaluated for continuous urinary incontinence or recurrent urinary tract infections were found to have ectopic ureters. Patient demographics and details of the surgical management of these patients are given in Table 1. Two patients had bilateral ectopic ureters giving a total of 26 ectopic ureters. All patients were ultimately evaluated and managed by two pediatric urologists (JPM, JMG) at a dedicated pediatrics hospital.

Preliminary work up of these patients varied. Initial imaging studies are presented in Table 2. Of the 24 patients, 19 initially had negative diagnostic tests. These combined tests consisted of 15 IVPs, 18 VCUGs, 14 ultrasounds, five cystoscopies, one nuclear VCUG and one MRI. Two patients underwent CT as the primary diagnostic test revealing an

Table 1 Patient demographics

Total number of patients	24
Female patients	24/24
Number of ectopic ureters	26
Number of dysplastic kidneys	3
Number of single-system ectopic ureters	3
Average age at surgery	6.48 Years (range 1.7—13.5 years)
Mean duration of follow up	12.3 Months (range 0.5—75 months)
Dry at follow up	24/24
Heminephrectomy (total)	15
Laparoscopic heminephrectomy	3
Open heminephrectomy	12
Ureteral reimplantation	5
Ureteral reimplantation plus ureteroureterostomy	1
Ureteroureterostomy	2
Nephrectomy (total)	3
Laparoscopic	2
Open	1