Perineal Sonography in Diagnosis of an Ectopic Ureteric Opening Into the Urethra

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Objective. To study the role of perineal sonography in the diagnosis of an ectopic ureteric opening into the urethra. Methods. In this study, carried out over about 4 years, perineal sonography was done to look for a ureter opening ectopically into the urethra in patients for whom abdominal sonography showed the ureter descending below and beyond the urinary bladder. Results. Perineal sonography was done on 11 patients because there was a suggestion of an ectopic ureteric opening shown on abdominal sonography. In all of them, an ectopic ureteric opening into the urethra was shown on perineal sonography. The collecting system was seen to be nonduplicated in 6 patients and duplicated in 4 patients, and a triple ureter was present in 1 patient. Conclusions. Perineal sonography is a simple, quick, beneficial, and noninvasive technique that can be used as an extension of abdominal sonography to diagnose an ectopic ureteric opening into the urethra. Key words: ectopic ureteric opening; perineal sonography; ureteric duplication; urethra.

Perineal sonography has been used to study the lower uterine segment and cervix in pregnancy and to diagnose posterior urethral valves in male children. The objective of this study was to determine the role of perineal sonography in the diagnosis of an ectopic ureteric opening into the urethra. Current methods of diagnosing an ectopic ureteric opening include excretory urography, abdominal sonography, and magnetic resonance imaging.3

Materials and Methods

Generally, abdominal sonography is performed on patients with a urinary tract infection, flank pain, or a mass and when an antenatal scan shows hydronephrosis. When dilatation of calyces and the pelvis of the kidney is seen on abdominal sonography, a search for dilatation of the ureter is done. This procedure applies to both duplicated and nonduplicated collecting systems. If the ureter is dilated, it is traced to the site of the
obstruction or up to its opening into the urinary bladder. For patients in whom the ureter is not opening into the urinary bladder and is seen to descend beyond the urinary bladder, perineal sonography is done.

Perineal sonography was performed with ATL UM9, HDI 3500, and HDI 5000 scanners (Philips Ultrasound, Bothell, WA). A linear probe of 5 to 12 MHz was used mostly; sometimes, particularly in older patients, a convex probe of 4 to 7 MHz was used. Patients lay in the supine position with the thighs slightly abducted. In female patients, an adequate amount of scan gel was applied over the vulva, and the probe was placed longitudinally over the vulva (Fig. 1) to study the urethra in its long axis. When the probe was moved slightly back and forth in a sagittal plane and also from side to side, the distal ureter was identified, and its opening into the urethra was viewed. In male patients, a longitudinal scan was done to view the posterior urethra through 2 portals: (1) between the pubic symphysis and the root of the penis (Fig. 2) and (2) posterior to the root of the scrotum (Fig. 3). Fine movements in anteroposterior and lateral directions were used to identify the distal ureter and its opening into the urethra.

In female patients, the entire urethra was viewed in a perineal scan. It was seen as a hypoechoic line with walls of soft tissue on either side along the posteroinferior surface of the pubic symphysis. The vagina was seen postero-caudal to this. The lumen of the vagina was seen as an echogenic line with walls of soft tissue on either side. The adjacent walls of the urethra and the vagina appeared inseparable in the image. The air-filled rectum was visible below the vagina (Fig. 4). The differentiation of these planes was better with increasing age (Fig. 5). If the ureter had an ectopic opening into the urethra, its distal part was seen between the urethra and the vagina, and it could also be seen opening into the urethra (Fig. 6). In young male children, the posterior urethra was seen in close apposition to the posteroinferior aspect of the pubic symphysis and in continuity with the urinary bladder. The rectum was seen inferiorly (Fig. 7). In older male children, the enlarging normal prostate was seen as hypoechoic tissue of increasing thickness around the posterior urethra (Fig. 8). In patients with an ectopic ureteric opening into the urethra, the distal ureter could be seen between the bladder and the rectum and could be traced to its connection to the posterior urethra (Fig. 9).

There was a suggestion of an ectopic ureter in 11 patients who underwent abdominal sonography from January 1998 to February 2002. The age of the patients ranged from 12 days to 25 years. These patients were studied with perineal sonography to see whether the ureter had an ectopic opening into the urethra.

Figure 1. Technique for perineal sonography in female patients. BL indicates urinary bladder; PS, pubic symphysis; R, rectum; and UT, uterus.

Figure 2. Technique for perineal sonography in male patients through the portal between the pubic symphysis (PS) and the root of the penis. BL indicates urinary bladder; and R, rectum.
Results

The results of the perineal sonographic study carried out on the 11 patients are shown in Table 1. An ectopic ureteric opening into the urethra was seen in all of them. It was a single, nonduplicated system in 6 patients, and in 1 of those, the ectopic ureter was bilateral (Fig. 10). In 2 of the patients with a nonduplicated system, the kidney with the ectopic ureteric opening was ectopic in position. The patient with the bilateral ectopic ureteric opening had undergone surgery in the newborn period for esophageal atresia with a tracheoesophageal fistula. One patient with a recurrent abscess on the medial aspect of the left thigh had a history of left nephrectomy for multicystic dysplasia at 1 year of age. He had a stump of the left lower ureter, which had an ectopic opening into the posterior urethra. There was a tract extending from the left ureteric stump to the abscess. Four patients had a duplicated collecting system. In them, the ureter of the upper moiety had an ectopic opening into the urethra. In 1 of these patients, there were 2 calculi in the dilated lower ureter. One patient in the series had a triple ureter. The upper 2 ureters were dilated; they joined together very low and opened ectopically into the urethra.

All but 1 patient had intravenous urography, either before or after sonography. The intravenous urography did not contribute to the diagnosis of the ectopic ureteric opening. The reason was poor or no visualization due to obstruction or atrophy in all patients except 1. In 1 patient, the visualized lower ureter was masked by a contrast agent–filled urinary bladder. Postevacuation urography was not done on this patient. Eight patients underwent micturating cystourethrogram after sonography. In 6 of them, including the patient with bilateral ectopic ureters, there was reflux of contrast material into the ectopic ureter from the urethra, which confirmed the sonographic diagnosis. In 1 patient with a double col-
lecting system and gross hydronephrosis of the upper moiety due to an ectopic ureteric opening into the urethra, micturating cystourethrography did not show reflux. In the boy with the thigh abscess, micturating cystourethrography showed leakage of contrast material from the posterior urethra into the abscess.

The patient who had undergone nephrectomy earlier and was subsequently found to have a left ureteric stump opening into the urethra was given long-term antibiotic prophylaxis. All the other patients underwent surgery. Of the 5 patients with a nonduplicated collecting system,

Figure 6. Perineal scan in an infant girl with a dilated distal ureter (UR) seen between the urinary bladder (BL) and the bladder neck anteriorly and the vagina (arrowheads) posteriorly. The ureter is shown opening into the proximal urethra (arrow).

Figure 7. Perineal scan in an infant boy. Arrows indicate urethra; BL, urinary bladder; PS, pubic symphysis; and R, rectum.

Figure 8. Perineal scan in an 8-year-old boy showing the prostate (arrowheads) around the posterior urethra. BL indicates urinary bladder.

Figure 9. Perineal scan in an infant boy with an ectopic ureter showing the dilated distal ureter (UR) between the urinary bladder (BL) and rectum (R). The ureter is shown opening into the posterior urethra (arrow).
3 underwent reimplantation of the ectopic ureter. This included the patient with bilateral ectopic ureters. Two patients underwent nephroureterectomy, 1 for an ectopic atrophic kidney and the other for gross hydronephrosis. Four patients with a duplicated collecting system and the patient with the triple ureter underwent partial nephroureterectomy. No attempt was made to dissect the lower ureter in any of the patients.

Discussion

The prevalence of ureteric anomalies is 2% to 3% at autopsy. Ureteric ectopia is more common in females (70%-90%). It is more commonly associated with duplication (80%-90%). The most common site of an ectopic opening of the ureter is into the urethra in both sexes. The other sites in males are the seminal vesicle, ejaculatory duct, and vas deferens. In females, other sites are the vagina and uterus. Embryologically, the ureteric ectopia results when the ureter is carried caudally with the mesonephric duct. Duplication of the collecting system results from division of the metanephric diverticulum or ureteric bud. Associated anomalies in males are agenesis or dysplasia of the kidney and agenesis or cysts of the seminal vesicles.

In females, it can be uterine anomalies and duplication or atresia of the vagina. Patients with ureteric ectopia can have symptoms of urinary tract infection, pain or a mass in a loin, dribbling of urine, pelvic pain, or a perineal abscess. The most common clinical manifestation in this series was urinary tract infection.

Abdominal sonography is, at present, the first investigation used in patients with these symptoms. Hydronephrosis and hydroureter are easily seen both in single and duplicated
The dilated ureter is traced down, and causes such as ureterocele and primary megaureter are seen. If the ureter does not seem to open into the bladder and is seen descending below and beyond the bladder, however, an ectopic ureteric opening is suggested. On abdominal sonography, sometimes the ectopic opening into the posterior urethra in male patients and the vagina in female patients can be seen, particularly in older patients. Most of the time, however, the ectopic ureteric opening into the urethra is not visible on abdominal sonography.

In light of the limitations of abdominal sonography, we have described a perineal scanning technique, which has shown the ectopic opening of the ureter into the urethra in all our cases. All patients except 1 underwent surgery. Reimplantation of the ectopic ureter or partial or total nephroureterectomy was done. In the literature, ureteric ectopia has been reported to be more common on the left side and in a duplicated system. In this series, it was seen to be more common on the left side and in a nonduplicated system, which may be due to the small number of patients in the series. In 2 patients with a nonduplicated system and an ectopic ureteric opening, the kidneys were ectopic in position. The patient with bilateral ureteric ectopia had undergone surgery for esophageal atresia with a tracheoesophageal fistula. None of the patients with a double collecting system had associated anomalies. Only 1 female patient in the series had dribbling of urine since birth. In her, the ectopic ureteric opening was farther down into the urethra, away from the internal urethral meatus (Fig. 11). In this study, perineal sonography was done only on those patients in whom a dilated ureter was evident and it was seen to descend beyond the urinary bladder. It is still possible to miss other cases of ectopic ureters without dilated ureters.

In conclusion, the technique of perineal sonography has been described as an extension of abdominal sonography for diagnosing an ectopic ureteric opening into the urethra. Perineal sonography can be done to look for the ectopic ureteric opening into the urethra on all patients in whom the ureter is seen to go beyond the urinary bladder. With the high resolution of the sonographic machines available now, this technique is a simple, quick, beneficial, and noninvasive method for diagnosing an ectopic ureteric opening into the urethra.

**References**


