Fetal perineal sonography in the diagnosis of ectopic ureteric opening

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ABSTRACT

We describe the technique of fetal perineal sonography and its use in the diagnosis of ectopic ureteric opening. Using a high-frequency probe, sagittal ultrasound imaging of the fetal perineum, pelvis and external genitalia was performed and proved useful in the diagnosis of ectopic ureteric opening into the urethra in one female and two male fetuses. Copyright © 2007 ISUOG. Published by John Wiley & Sons, Ltd.

CASE REPORTS

Sagittal ultrasound imaging of the fetal perineum, pelvis and external genitalia can be performed using a high-frequency probe. The approach can be anterocaudal or posterocaudal, depending on the fetal position. The application of this technique to study fetal micturition has been described previously. In the female fetus the urinary bladder with urethra is seen anteriorly, the vagina in the middle and the rectum and anal canal are seen posteriorly (Figure 1). In the male fetus the urinary bladder and the urethra are seen anteriorly and the rectum and anal canal are seen posteriorly (Figure 2).

Case 1

A 27-year-old primigravida was referred with suspected fetal bilateral hydronephrosis. The female fetus had biometry consistent with a gestational age of 31 weeks. The amniotic fluid volume was normal. The fetus showed bilateral gross hydrourerteronephrosis. Both the ureters were dilated and tortuous, showing hyperperistalsis. The urinary bladder appeared normal. Because of the bilateral hydrourteronephrosis, fetal micturition was examined by perineal ultrasonography as described and was found to be normal. The urinary bladder emptied completely.

Perineal sonography also revealed extension of the distal ends of the dilated ureters, low into the pelvis beyond the urinary bladder (Figure 3). As peristalsis of the distal ureter was observed, it was seen to progress down and continue as a distension of the urethra (Videoclip S1). These features were suggestive of bilateral single-system ectopic ureters opening into the urethra. Spontaneous delivery occurred at term and the neonate was found to have a covered anus, which was later corrected. Follow-up ultrasound examination was carried out on the 27th postnatal day and showed bilateral moderate hydrourteronephrosis. Both the ureters were grossly dilated. The urinary bladder was empty and did not fill up during the 30 min of scanning. On perineal sonography, both the ureters were seen to open ectopically into the urethra. The micturating cystourethrogram (MCU) showed a small capacity urinary bladder. During the MCU the catheter entered into the left ureter from the urethra, confirming ectopic ureteric opening into the urethra. At surgery the capacity of the urinary bladder was 30 mL. The trigone was absent, with ectopic opening of the ureters. Bilateral ureteric reimplantation was carried out. The child was doing well postoperatively.

Case 2

An 18-year-old primigravida with first-degree consanguinity was referred for an evaluation of fetal bilateral hydronephrosis. The male fetus had biometry consistent with a gestational age of 24 weeks. The amniotic fluid volume was normal. There was a duplex collecting system of both fetal kidneys with gross hydrourteronephrosis of the upper moiety on both sides. The collecting system of the lower moiety was not dilated on both sides.
The ureters of the upper moiety were grossly dilated and tortuous with hyperperistalsis. The urinary bladder was normal. Perineal sonography revealed extension of the dilated ureters of the upper moieties, low into the pelvis beyond the urinary bladder, with ectopic openings (Figure 4). Spontaneous delivery occurred at term and the neonate was started on antibiotic prophylaxis. Postnatal ultrasound examination was carried out at 8 months, which confirmed a duplex collecting system of both the kidneys, with gross hydronephrosis of the upper moiety on both sides. The ureters of the upper moiety were grossly dilated. On perineal ultrasound examination, they were seen to open ectopically into the urethra (Figure 5).
Case 3

A 22-year-old primigravida with a fetus whose biometry was consistent with a gestational age of 26 weeks underwent ultrasound examination, which revealed a duplex collecting system of the left kidney with gross hydrenephrosis of the lower moiety (Figure 6a). The corresponding parenchyma was echogenic, with tiny cysts. The ureter of the lower moiety was grossly dilated. On tracing, it extended low into the pelvis beyond the urinary bladder. Perineal ultrasound imaging suggested ectopic ureteric opening (Figure 6b). Ultrasound imaging on the first postnatal day confirmed a double collecting system of the left kidney with gross hydroureteronephrosis of the lower moiety. Perineal sonography revealed extension of the dilated ureter low into the pelvis beyond the urinary bladder and an ectopic opening into the urethra.
DISCUSSION

The incidence of ureteric anomalies at autopsy is 2–3%. Ureteric ectopia is more common in females (70–90%) and is usually associated with duplication (80–90%). In both sexes, the most common site of an ectopic opening of the ureter is into the urethra. Other sites are, in males, the seminal vesicle, ejaculatory duct and vas deferens, and in females, the vagina and uterus. During normal development the ureteric buds are incorporated into the urogenital sinus. This is followed by caudal movement of the mesonephric duct and cranial migration of the ureter, with the mesodermal tissue between them differentiating into the bladder neck and trigone. In ureteric ectopia separation of the two orifices and cranial migration of the ureter do not occur. If it is bilateral, because of lack of appropriate stimuli, there is deficient development of the bladder neck and trigone. 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, these can be uterine anomalies and duplication or atresia of the vagina. Ectopic ureter causes urinary incontinence. In cases with bilateral single system ectopic ureters, incontinence partly results from deficient development of the bladder neck and trigone. Many affected children continue to have incontinence if only standard ureteric re-implantation is performed.

Perineal sonography has been used to study the lower uterine segment and cervix in pregnancy. It has also been used to diagnose posterior urethral valves and ectopic ureteric opening in children. Recently fetal perineal ultrasound examination has been used to study fetal micturition. Sagittal ultrasound imaging of the fetal perineum and lower pelvis can be performed using a high-frequency probe. The approach can be either anterocaudal or posterocaudal, depending on fetal position. In male fetuses the urinary bladder and urethra are seen anteriorly and the rectum and anal canal are seen posteriorly. In female fetuses the urinary bladder with urethra, vagina and rectum with anal canal are seen from anterior to posterior. In cases of ectopic ureteric opening, the dilated ureter is seen to extend low in the pelvis beyond the urinary bladder, indicating an ectopic opening below the urinary bladder. Real-time visualization of the continuity of ureteric peristalsis as a distension of the urethra, although rare, can confirm an ectopic ureteric opening into the urethra.
In conclusion, fetal perineal sonography is a useful technique in the diagnosis of ectopic ureteric opening below the urinary bladder.

REFERENCES


SUPPLEMENTARY MATERIAL ON THE INTERNET

The following material is available from the Journal homepage: http://www.interscience.wiley.com/0960-7692/suppmat (restricted access)

**Videoclip S1** Parasagittal perineal ultrasound image of the fetus, showing distal end of the ureter and the wave of ureteric peristalsis extending as distention of the urethra (arrow).