

# Fetal perineal sonography in the diagnosis of ectopic ureteric opening

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**KEYWORDS:** ectopic ureteric opening; fetal perineal ultrasound

## 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 antero-caudal or postero-caudal, depending on the fetal position. The application of this technique to study fetal micturition has been described previously<sup>1</sup>. 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 hydroureteronephrosis. Both the ureters were dilated and tortuous, showing hyperperistalsis. The urinary bladder appeared normal. Because of the bilateral hydroureteronephrosis, fetal micturition was examined by perineal ultrasonography as described<sup>1</sup> and

was found to be normal. The urinary bladder emptied completely.

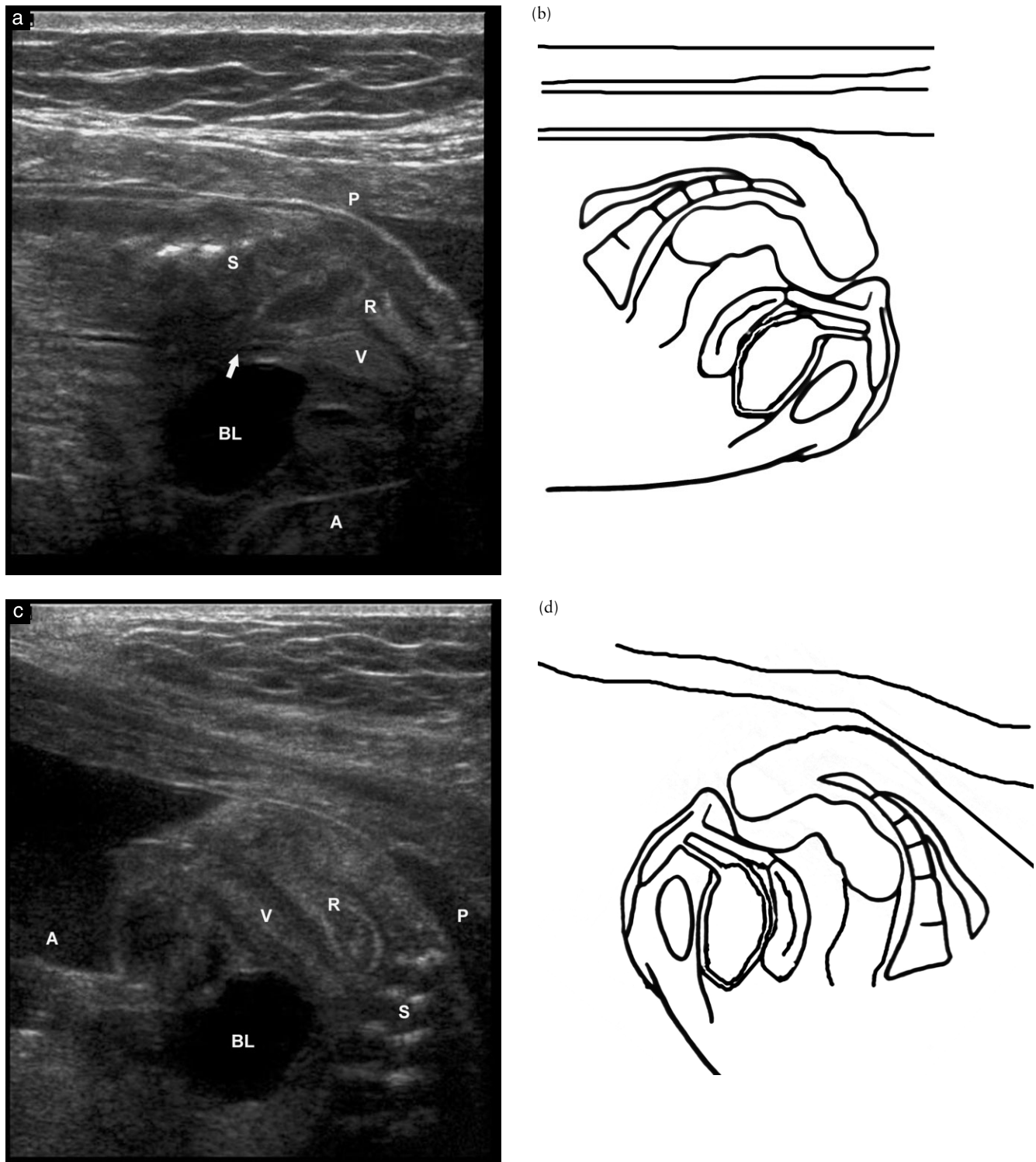
Perineal sonography also revealed extension of the distal ends of the dilated ureters, low into the pelvis beyond the urinary bladder (Figure 3). As peristalsis of the distal ureter was observed, it was seen to progress down and continue as a distension of the urethra (Videoclip S1). These features were 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 27<sup>th</sup> postnatal day and showed bilateral moderate hydroureteronephrosis. 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 hydroureteronephrosis of the upper moiety on both sides. The collecting system of the lower moiety was not dilated on both sides.

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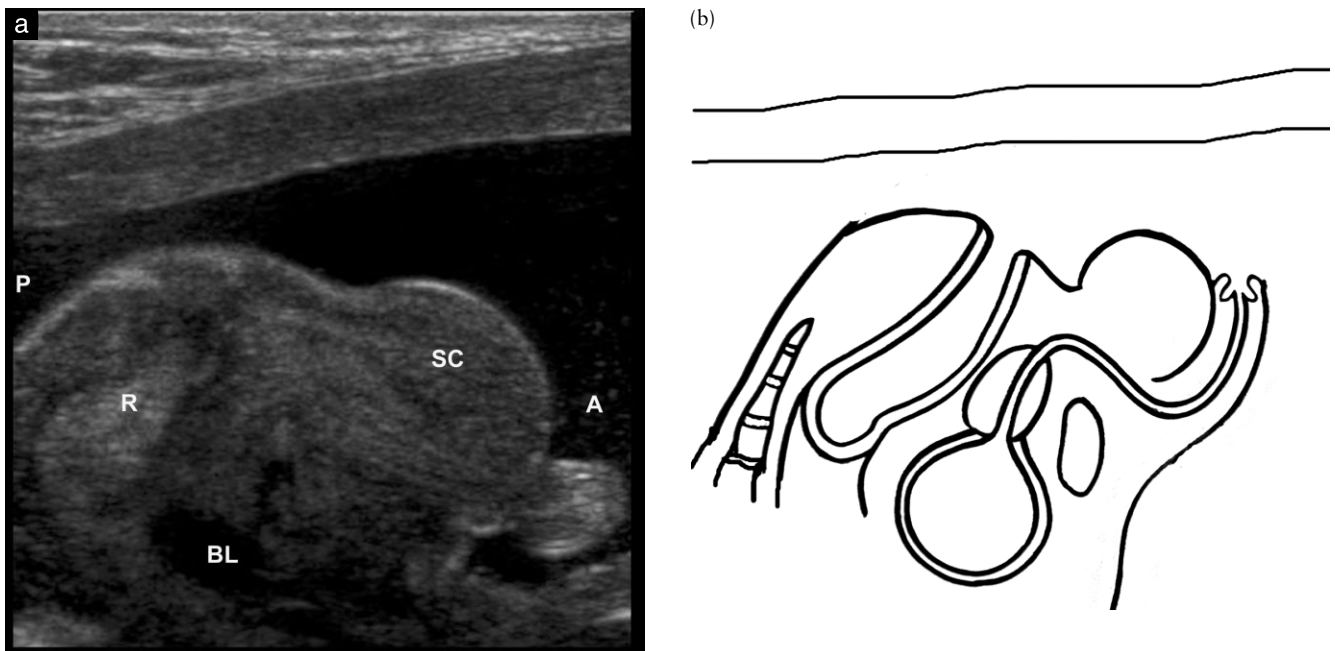
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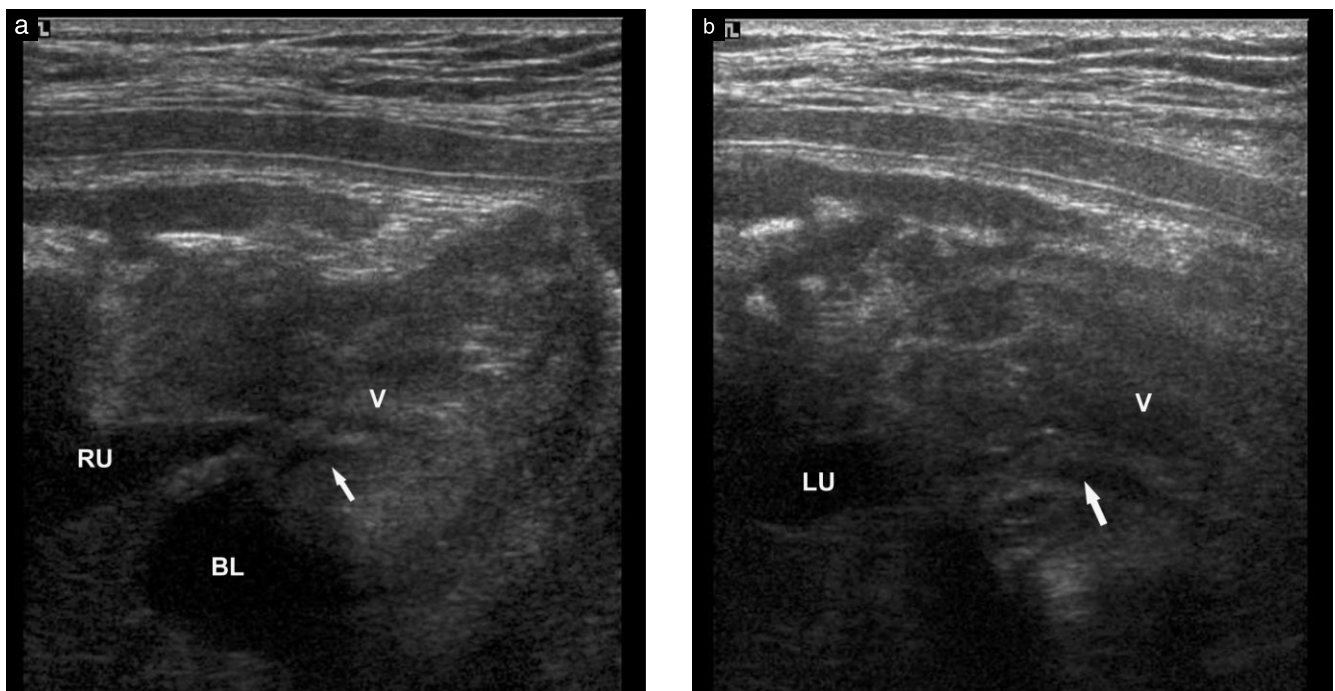
**Figure 1** Perineal ultrasound image of a female fetus from a postero-caudal approach (a, shown diagrammatically in b) and antero-caudal approach (c, shown diagrammatically in d) showing the urinary bladder (BL) and urethra anteriorly, the vagina (V) and uterus (arrow) in the middle and the rectum (R) posteriorly. A, anterior; P, posterior; S, sacrum.

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).



**Figure 2** Perineal ultrasound image of a male fetus (a, shown diagrammatically in b) showing the urinary bladder (BL) and urethra anteriorly and the rectum (R) posteriorly. A, anterior; P, posterior; SC, scrotum.

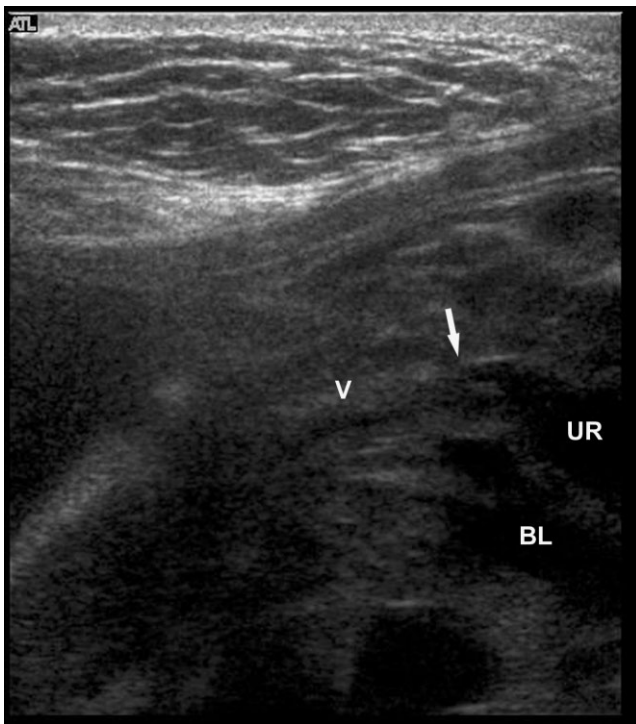


**Figure 3** Parasagittal perineal ultrasound image showing the distal ends of the right ureter (RU) (a) and the left ureter (LU) (b), extending beyond the urinary bladder (BL) and opening into the urethra (arrow). V, vagina.

**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 hydronephrosis 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.

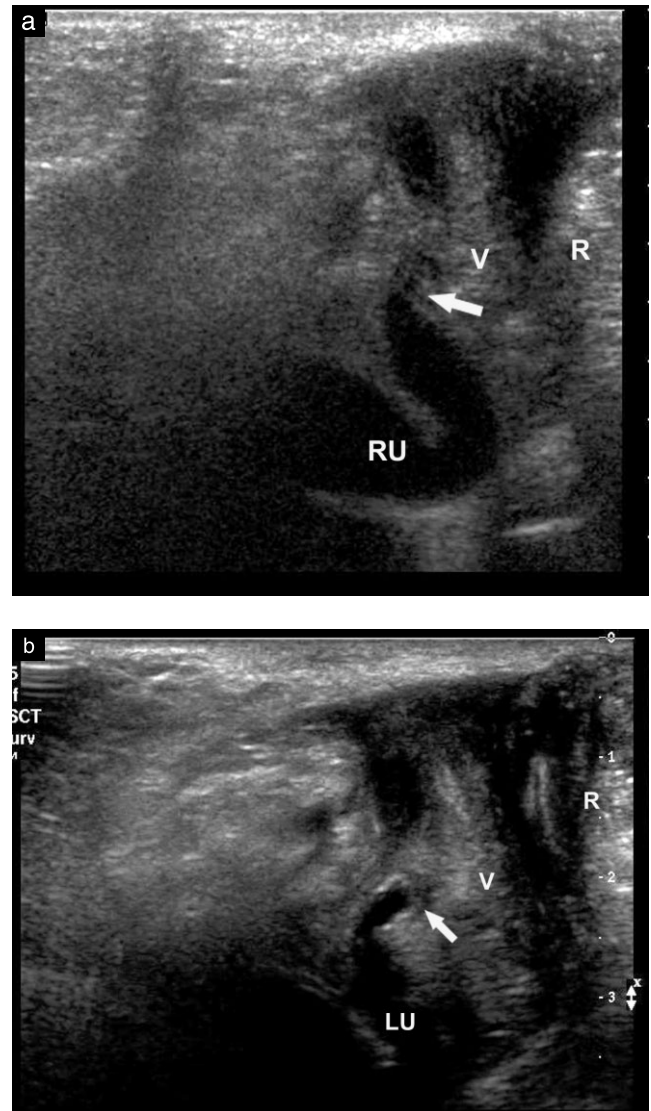


**Figure 4** Fetal perineal ultrasound image showing the ectopic opening (arrow) of the upper moiety ureter (UR). BL, urinary bladder; V, vagina.

## DISCUSSION

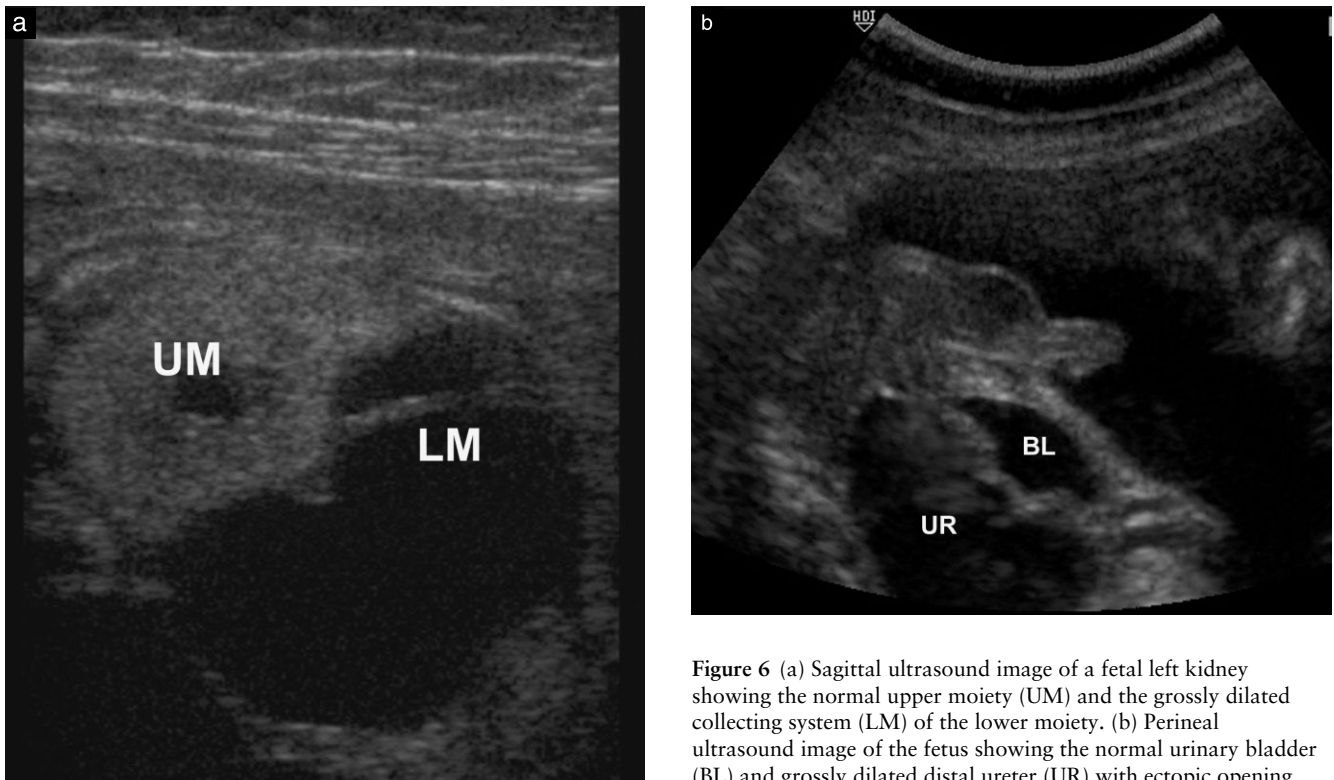
The incidence of ureteric anomalies at autopsy is 2–3%. Ureteric ectopia is more common in females (70–90%) and is usually associated with duplication (80–90%)<sup>2,3</sup>. In both sexes, the most common site of an ectopic opening of the ureter is into the urethra. Other sites are, in males, the seminal 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<sup>4,5</sup>. 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<sup>5</sup>.

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



**Figure 5** Postnatal right (a) and left (b) parasagittal perineal ultrasound images showing the ectopic opening (arrow) of the upper moiety ureters (RU and LU) into the urethra. R, rectum; V, vagina.

ectopic ureteric opening in children<sup>6</sup>. Recently fetal perineal ultrasound examination has been used to study fetal micturition<sup>1</sup>. Sagittal ultrasound imaging of the fetal perineum and lower pelvis can be performed using a high-frequency probe. The approach can be either antero-caudal or postero-caudal, 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.



**Figure 6** (a) Sagittal ultrasound image of a fetal left kidney showing the normal upper moiety (UM) and the grossly dilated collecting system (LM) of the lower moiety. (b) Perineal ultrasound image of the fetus showing the normal urinary bladder (BL) and grossly dilated distal ureter (UR) with ectopic opening.

In conclusion, fetal perineal sonography is a useful technique in the diagnosis of ectopic ureteric opening below the urinary bladder.

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## 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).