Prenatal ultrasound diagnosis of urinary tract anomalies and postnatal outcome

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Aims and objectives

Kidney and urinary tract anomalies are among the most frequently identified congenital malformations accounting for 20-30% of all ultrasound-detected anomalies[1]. Antenatal US is an excellent technique for their detection, with an overall sensitivity of approximately 90%[1,2].

Antenatal hydronephrosis (ANH) is the dilation of the fetal renal collecting system and corresponds to the most common urinary tract anomaly detected on prenatal ultrasonography (US), being reported in approximately 1-5% of all pregnancies[3]. Usually ANH is physiologic or transient, having no pathological meaning[4]. However it can represent important conditions such as posterior urethral valves or vesicoureteral reflux. Most frequently its etiology cannot be determined before birth, requiring postnatal US follow-up and eventual voiding cystourethrogram.

Our objectives are to determine the frequency of each urinary tract anomalies diagnosed with prenatal ultrasound, to correlate prenatal and postnatal diagnoses and to establish prognostic factors.

Methods and materials

A retrospective analysis of our institution's database for fetal urinary tract anomalies was made. Ultrasound database of the Obstetrics and Radiology departments were reviewed and all prenatal diagnosis of urinary tract anomalies between January 2012 and July 2017 were included.

Follow-up data was obtained from the clinical records of Pediatrics and Pediatric Surgery departments. Newborns with either prenatal or postnatal ultrasound performed at other institution and patients without proper follow-up data were excluded.

The diagnosis of ANH was based on the measurement of the anterior-posterior pelvic diameter (APPD) > 5mm in the 2^{nd} trimester and > 7mm in the 3^{rd} trimester. A severe hydronephrosis was considered when the APPD of the pelvis was >10 mm in either the 2^{nd} or 3^{rd} trimester ultrasound. Prenatal US examinations were compared with postnatal US diagnoses and surgical reports when newborns were submitted to surgery.

Data processing was made using SPSS version 20.0. Statistical analysis was performed using linear regression and p-values <0.05 were considered statistically significant.

Results

A total of 54 urinary tract anomalies were reviewed. The mean maternal age at prenatal diagnosis was 31 years old and the median gestational age was 27 weeks. More than two thirds of the fetus were male (68.5%).

Urinary tract dilatation was the most frequent diagnosis present in 51 patients (94.4%). Severe hydronephrosis, with anterior-posterior renal pelvis diameter above 10 mm, was diagnosed in 35.3% of the cases. Multicystic dysplastic kidney was the most frequent detected structural malformation of the urinary tract, present in 5 patients (9.2%). Other findings consisted of duplex system (three cases), kidney agenesia (one case), ureterocele (one case) and congenital megaureter (one case).

Prenatal diagnoses corresponded to the postnatal ones in 85.2% of cases. This is a high level of correspondence and is similar to previous reports[5] on page ,[6] on page . Diagnoses that did not correspond consisted of urinary tract dilatations that normalized after birth (13%), following natural disease history. The other diagnosis that did not match was a prenatal diagnosis of mild ANH that was found to be a duplex system. However, when one of the pelvis is not dilated, this condition cannot be identified in antenatal US.

There was a significant association between prenatal severe hydronephrosis and the need for surgery (p-value < 0.01). This could be explained by the higher grade of obstruction and risk of renal function impairment. Nonetheless, there are several reports of ANH that had spontaneous resolution. Therefore, close US follow-up after birth is essential in these cases.

Limitations of this study were the lack of data on false-negative cases or postnatal diagnosis cases that were not identified in the prenatal screening.

Images for this section:

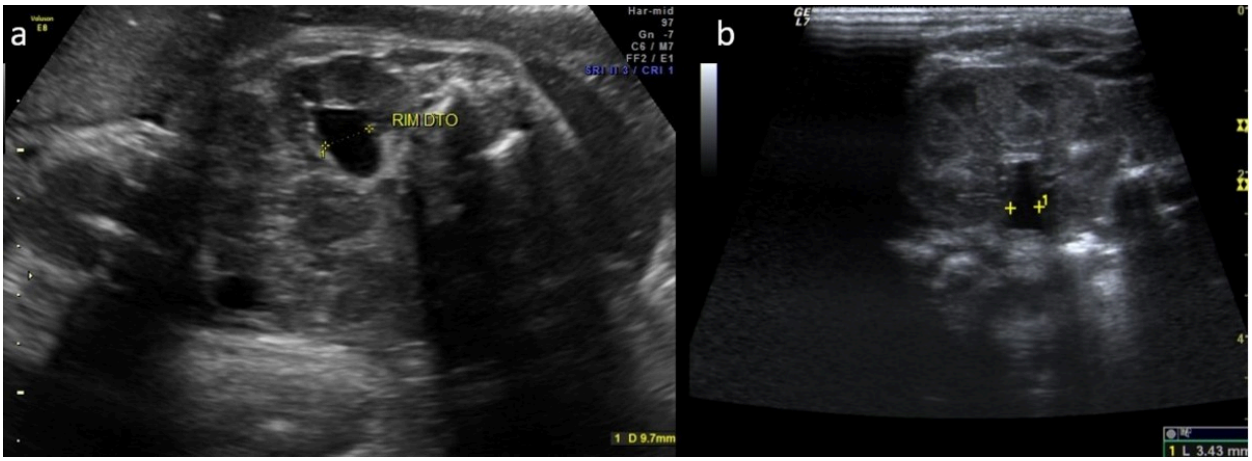

Fig. 1: Mild pyelectasis. Prenatal (a) ultrasound image show a mild right pelvis dilation (<10 mm). Postnatal examination (b) identifies a normal calibre of the pelvis (3.4 mm). This is consistent with the natural history of mild pyelectasis, which tends to resolve after birth.

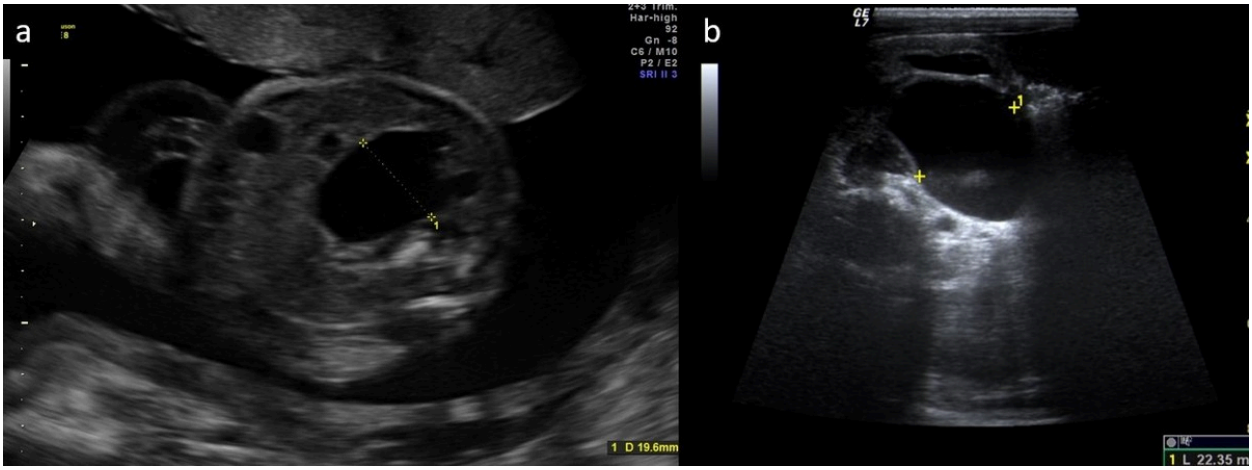

Fig. 2: Severe hydronephrosis. Prenatal (a) and postnatal (b) ultrasound images demonstrating a right pelvis dilation, with an APPD of 19.6 mm (prenatal) and 22.35 mm (postnatal), consistent with severe hydronephrosis. Surgery was required 6 months after birth.

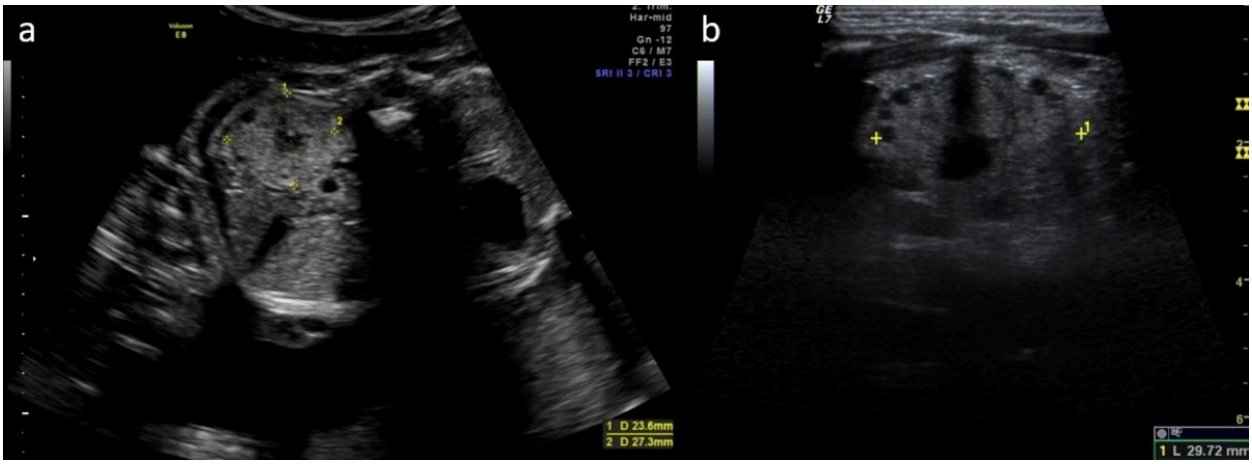

Fig. 3: Multicystic dysplastic kidney. Prenatal (a) and postnatal (b) ultrasound images demonstrating a small kidney, with multiple non-communicating peripheric cysts. The parenchyma is echogenic, with small hilar vessels. This is consistent with multicystic kidney disease.

Conclusion

ANH was the most frequent urinary tract malformation (94.4%) and multicystic dysplastic kidney was the most diagnosed structural malformation (9.2%). The presence of a severe ANH, with an APPD superior to 10 mm can help to predict postnatal outcomes and the need for surgery.

There was a high level of correspondence between prenatal and postnatal diagnosis, demonstrating that prenatal US is a reliable method to establish the diagnosis of urinary tract malformations.

References