

Postnatal outcome of isolated antenatal hydronephrosis

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ABSTRACT

الأهداف: تقييم اتساع حوض الكلى في الأطفال حديثي الولادة اللذين تم تشخيصهم بالموجات الصوتية أثناء الحمل وقبل الولادة.

الطريقة: أجريت هذه الدراسة الاستيعادية على 61 من الأجنة وجد أن توسع الحوض الكلوي من قبل المرضى في الموجات الصوتية خلال الفترة من يناير 2008م إلى يناير 2012م في مستشفى قوى الأمن (SFH) تم استبعاد 5 من الأجنة توفيت داخل الرحم أو وفاة الأطفال حديثي الولادة في وقت مبكر؛ لذلك تم استبعادهم. من 56 حالة متبقية، لم تتم متابعة 22 حالة وكنا غير قادرين على التواصل معهم لذلك تم استبعادهم. 34 حالة حيث تم تحديد نسبة انتشار اتساع حوض الكلى في المترددين وكذلك درجة اتساع حوض الكلى ونوعية العلاج المستخدم بعد الولادة.

النتائج: 61 حالة من بين 990 حالة من السيدات الحوامل اللاتي تم تشخيصهن بالموجات الصوتية تشخيص ووجد عيب خلقي تم تشخيص وجود اتساع في حوض الكلى بنسبة 6.1% وقد أمكن جمع بيانات وتحليل النتائج 34 حالة فقط. منهم 15 مرضية تعاني من اتساع شديد (44% حالة)، 41% حالة (14 مرضية) تعاني من اتساع متوسط أما الإلتساع بسيط فقد وجد 15% في 5 مريضات، وقد احتاجت 7 مريضات (21%) إلى تدخل جراحي بعد الولادة.

الخاتمة: فحص الأجنة بالموجات الصوتية يؤدي إلى الاكتشاف المبكر للعيوب الخلقية للجهاز البولي والتي قد تحتاج إلى تدخل جراحي بعد الولادة.

Objectives: To assess the postnatal outcome of fetuses with renal pelvis dilatation (RPD).

Methods: A retrospective study was conducted to review 61 fetuses found to have RPD by ultrasound (US) carried out from January 2008 to January 2012 at the Security Forces Hospital in Riyadh, Kingdom of Saudi Arabia. Five ended with intra uterine fetal

death or early neonatal death, and were excluded. Of the remaining 56 cases, 22 cases were lost to follow up, and we were not able to contact them so were excluded. The remaining 34 cases were followed-up in our hospital, and their outcome were analyzed. The main outcome measures include: incidence of RPD diagnosed in our population, degree of hydronephrosis, postnatal diagnosis, and need for surgical intervention. Data on pregnancy and fetal outcome were collected from the files of the patients.

Results: Out of the 990 cases with sonographic abnormalities detected by antenatal US, the incidence of isolated RPD was 6.1%. Out of 34 cases, 15 patients had severe RPD (44% of cases), 41% of cases (14 patients) had moderate RPD, and 15% of cases (5 patients) had mild RPD, only 7 patients (21%) required surgery after delivery.

Conclusion: The routine use of antenatal ultrasonography will lead to early diagnosis of urologic conditions that have postnatal consequences.

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With fetal systematic ultrasound (US), dilatation of the urinary tract commonly indicates congenital urine flow impairment (UFI), this dilatation may be unilateral or bilateral, occur at any level of the collecting system, and could be localized to the renal pelvis, the ureter, or both.¹ Pyelectasis (also called fetal pelviectasis) refers to isolated renal pelvis dilatation (RPD) and is likely physiologic in origin, but may be due to ureteropelvic junction obstruction or reflux.² Fetal hydronephrosis is the most common congenital condition that is detected by prenatal US, and is one of the common fetal defects. Causes of antenatal hydronephrosis include transient or physiologic hydronephrosis, pelviureteric junction (PUJ) obstruction, vesicoureteric reflux (VUR), ureterovesical junction obstruction (megoureter), posterior urethral valves, ureterocele, dilatation of one moiety of a duplex kidney due to either obstruction or reflux.^{3,4} Diagnosis of antenatal hydronephrosis can be early at the twelfth week of gestation; however, the fetal kidneys are definitely visualized by 20 weeks of gestation.⁵ Most antenatal uropathies are identifiable by 33 weeks of gestation (90%), while only around 10% are identified at 17 weeks.⁶ The incidence of second trimester pyelectasis is generally between 2-4.6%.^{7,8} The current definitions of pyelectasis in the second and third trimester are as follows: in the second trimester, mild RPD is defined as an anterior-posterior diameter (APD) of 5-6.9 mm, moderate is 7-8.9 mm, and severe if >10 mm. While in the third trimester, mild RPD refers to an APD of 7-8.9 mm, moderate if 9-14.9 mm, and severe if >15 mm.⁹

Prenatal US enables us to detect the correctable causes of hydronephrosis.⁹ The most important aspect of management of antenatal hydronephrosis is determination of its underlying cause, as the grade of hydronephrosis has been correlated to the need for later surgical intervention, and the potential for development of urinary tract infections.¹⁰ Prognosis is excellent for cases of mild hydronephrosis found at 18-23 weeks gestation, while moderate to severe cases of hydronephrosis need thorough urological assessment of these neonates. Higher grades of hydronephrosis appear to correlate with greater potential for both the need for surgery and urinary tract infections.⁸ The aim of our study is to assess postnatal outcome of isolated fetal hydronephrosis detected by antenatal US in our obstetric population.

Methods. In this retrospective study we reviewed pregnant ladies who underwent US during pregnancy, and their fetuses were found to have RPD by antenatal US antero-posterior (AP) diameter of

renal pelvis > 4mm. The study was carried out at the Security Forces Hospital (SFH) Riyadh, Kingdom of Saudi Arabia, between January 2008 and January 2012. Approval was obtained from the SFH Institutional Review Board. All included cases were selected from patients attending the antenatal outpatient clinics at the Security Forces Hospital. In total, 61 cases were available and reviewed, 5 of them ended with intra uterine fetal death or early neonatal death, so they were excluded. Of the remaining 56 cases, 22 cases were lost to follow up, and we were not able to contact them so were excluded. The remaining 34 cases were followed in our hospital, and their outcome was analyzed.

Data on pregnancy and fetal outcome were collected from the files of the patients. For all fetuses, gestational age at diagnosis was determined. The collected prenatal and postnatal findings included: extent of pyelectasis (AP diameter of renal pelvis), development of hydronephrosis, progression, or regression of pyelectasis, number of antenatal US scans per patient, gestational age at delivery, type of delivery, and weights of the newborns. The prenatal urological US was compared with the postnatal study. The main postnatal outcome measures included incidence of RPD diagnosed in our population, degree of hydronephrosis, postnatal diagnosis, and need for surgical intervention. An US was usually carried out 7 to 14 days after birth to re-evaluate the infant's kidneys.

Statistical analysis. Computer entry of data was carried out with software provided by the Statistical Package for Social Sciences version 17 (SPSS Inc., Chicago, IL, USA). The data were analyzed and tabulated.

Results. Over the study period from January 2008 to January 2012, antenatal US was carried out for 69310 pregnant patients. Out of them, we found 990 cases of fetal abnormalities. Among them, we had a total of 61 cases with isolated RPD, with an incidence of 6.1% of all abnormal cases diagnosed. The analysis of maternal characteristics showed that most of our patients were <35 years (26 patients; 76%). The mean maternal age was 32 years. In terms of parity, 10 cases (29%) were either primiparous or had only one delivery before, 14 cases (42%) had 2 or 3 previous deliveries, and 10 cases (29%) had 4 or more previous deliveries. The mean parity was 2.3. In our study; the analysis of cases in view of gestational age at diagnosis was carried out. It was found that 35% (12 cases) were diagnosed between 31 and 35 weeks, 32% (11 cases) between 20 and 25 weeks, 27% (9 cases) between 26 and 30 weeks, 3% (one case) was diagnosed at less than 20 weeks, and 3% (one case)

after 35 weeks. We found that 44% (15 patients) had dilatation bilaterally with different degrees of dilatation, 32% (11 patients) had left sided dilatation, while 24% (8 patients) had right-sided dilatation.

In our study group, 56% of the cases had between 3 and 4 scans carried out in the antenatal period, 32% had between one and 2 scans, and more than 4 scans were carried out for 12% of the cases (Table 1). Analysis of the degree of hydronephrosis revealed that 15% of the cases had mild RPD (Figure 1), 41% of cases had moderate RPD, and 44% of cases had severe RPD (Figures 1 & 2). Antenatal sonographic follow up was carried out to look at the natural history of the hydronephrosis, whether it is going to progress, improve, or remain the same. We found out that 53% of our patients (18 cases) had a worsening of RPD during antenatal follow up, 29% (10 patients) had improvement of RPD, and in 18% (6 patients) there was no change in the degree of RPD. The gestational age at delivery was reviewed in our study. It was found that 53% of our patients (18 cases) were delivered between 38 and 40 weeks, 32% (11 patients) delivered between 35 and 37 weeks, and 15% (5 patients) delivered at >40 weeks. There were no deliveries <34 weeks. With regard to neonatal characteristics 82% (28 patients) delivered vaginally, and 18% (6 patients) delivered by cesarean section. Regarding the weights of the newborns; 68% (23 babies) weighed between 2.6-3.5 kg, 20% (7 babies) were between 3.6-4 kg, 9% (3 babies) were between 2-2.5 kg, 3% (one baby) was >4 kg, and no babies weighed <2 kg. As for gender distribution, 94% of the babies included in our study (32 babies) were boys, and 6% (2 babies) were girls. Out of them, 12% (4 babies) were admitted to the Neonatal Intensive Care Unit (NICU), while 88% (30 babies) needed no admissions. Analysis of postnatal diagnosis of antenatal RPD revealed that 79% of the cases were diagnosed as PUJ obstruction, 15% were diagnosed as VUR, and 6% were diagnosed as non-obstructed RPD (Table 2). Babies whom required surgery post-delivery also were reviewed, and we found that 21% required surgical intervention; most of them were those who

were diagnosed to have severe RPD antenatally, while 79% did not require any surgical intervention (Table 3).

Discussion. The appropriate postnatal management of fetal pyelectasis remains controversial, and it is found in approximately 1-5% of pregnancies.⁹ Mild isolated pyelectasis is usually a self-limited condition and may resolve, or stabilize. It improves during follow

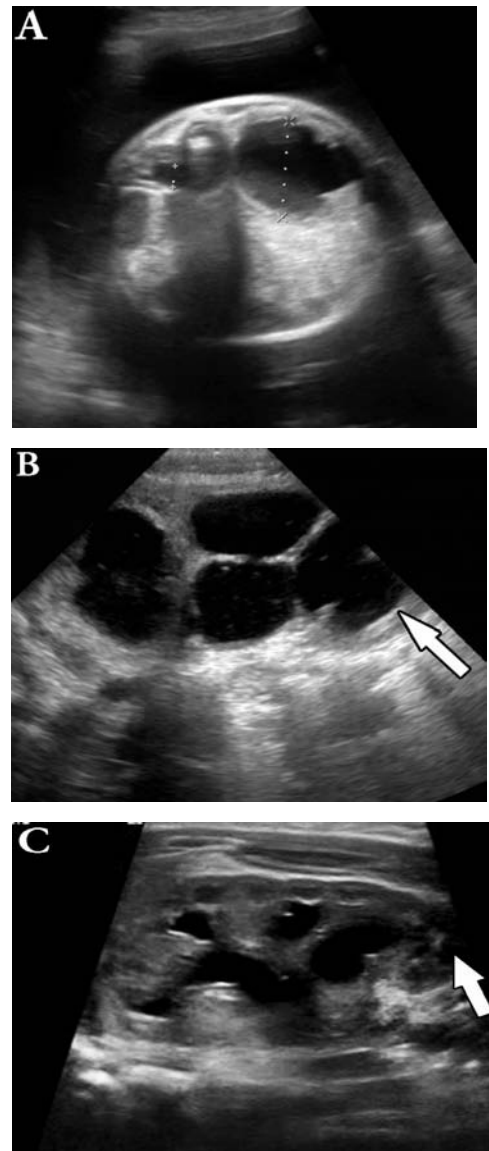


Figure 1 - Prenatal ultrasound study showing: A) measurement of antero-posterior (AP) diameter of the renal pelvis at both sides in transverse view. Left renal AP = 3.5 cm, while right renal AP = 0.7 cm. Postnatal study of the same patient showing: B) marked left hydronephrosis with thin parenchyma (arrow); and C) mild right hydronephrosis (arrow). This patient underwent surgery.

Table 1 - Number of ultrasonography scans/patients in RPD fetuses.

Scans no.	No.	(%)
1-2 scans	11	(32)
3-4 scans	19	(56)
> 4 scans	4	(12)
Total	34	(100)
RPD - renal pelvis dilatation		

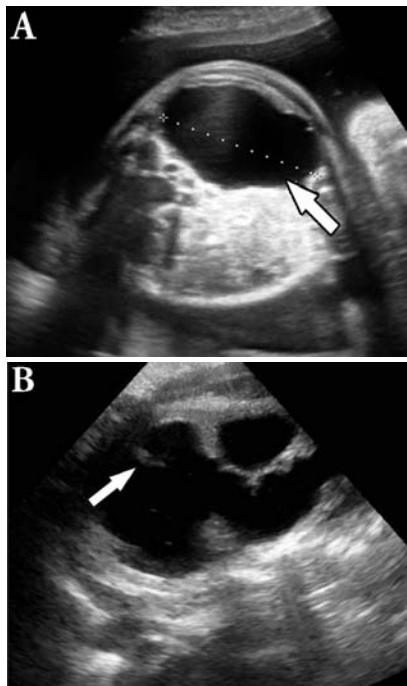


Figure 2 - Prenatal ultrasound (US) study showing A) marked renal pelvis dilatation measurement of antero-posterior diameter (arrow) of the left renal pelvis in the transverse view = 6.1 cm. B) Postnatal US study of the same patient showing marked left hydronephrosis (arrow).

Table 2 - Postnatal pathology reported after prenatal detected pyelectasis in renal pelvis dilatation fetuses.

Pathology	No.	(%)
Pelviureteric junction obstruction	27	(79)
Vesicouretral reflux	5	(15)
Non obstructed	2	(6)
Total	34	(100)

Table 3 - Postnatal management of renal pelvis dilatation fetuses.

Surgery	No.	(%)
Carried out	7	(21)
Not carried out	27	(79)
Total	34	(100)

up in most of cases (80-98%), and needs minimal investigation.¹¹⁻¹³ However, moderate to severe pyelectasis is associated with variable outcomes, and needs further imaging to rule out associated pathologies such as PUJ obstruction, VUR, and posterior urethral valves.^{4,8,9} This retrospective study was carried out to investigate the incidence, progression, and postnatal outcome of fetal hydronephrosis detected by US in our obstetric population.

Antenatal hydronephrosis may develop secondary to transient dilation of the collecting system, upper/lower urinary tract obstructive uropathy, and non-obstructive processes such as VUR, megaureters, and prune belly syndrome.¹¹ PUJ obstruction is the most common diagnosis, and increases in frequency with the severity of hydronephrosis. In contrast, VUR, the second most common diagnosis, is not associated with the severity of hydronephrosis,¹² and this was similarly found in our work.

The reported incidence of antenatal hydronephrosis in the literature ranges from 0.6-4.5% of pregnancies. Differences in reported data may be due to different criteria used to define the disorder and the level of attention to the urinary system by the ultrasonographer,^{9,13,14} which is close to the incidence in our study population of 6.1%.

An important point to mention in our study is that, more than one third of the cases were diagnosed at >31 weeks of gestation, which is late, but may be related to the nature of our patients and the tendency toward late booking. On the other hand, once the abnormality is diagnosed, most of the patients had regular scans for follow up, and it is clear from the findings that more than half of the patients had 3-4 subsequent scans. We suggest undergoing postnatal renal US after the first week of life (7-14 days of age) to ensure normal hydration of the infant.

As reported in almost all publications regarding this issue, RPD is more common in boys than girls, and this was also confirmed by our findings where 94% of this problem occurred in boys. From the data collected, neither the time of delivery nor the mode of delivery was affected by the presence of this abnormality. The rate of cesarean section was 18%, which is comparable to the rate in the general population in our hospital. In the literature review, 85% of the children with a prenatal diagnosis of hydronephrosis do not have a real obstruction, did not require surgery, and improved spontaneously. However, true ureteropelvic obstruction should be operated on as soon as possible to avoid kidney damage.¹⁵ In our study, 79% of children did not require surgery, and only 21% required surgery, which is again comparable with the figures elsewhere. Our study showed that the incidence of isolated RPD is around 6.1%. Most of our patients were diagnosed in the third trimester. Most cases were severe, and those who required surgery were from this group. We can use this information to council our patients, and those who are diagnosed to have fetuses with mild to moderate degree of hydronephrosis can be reassured, as most of them will have a benign course with spontaneous improvement or resolution.

Our study had certain limitations; it was carried out on small sample volume (n=34), which lowers the statistical significance of the study. However, including all antenatal cases with isolated RPD did help in compensating results. Selection criteria of patients provided us ideal cases, which let us focus on this abnormality with no other associated congenital anomalies.

In conclusion, our study showed that the incidence of isolated RPD in our population is approximately 6.1%. Most of our patients were diagnosed in the third trimester. Most cases were of the severe degree and those who required surgery were from this group. We can use these information to council our patients, and those who are diagnosed to have fetuses with mild to moderate degree of hydronephrosis can be reassured as most of them will have a benign course with spontaneous improvement or resolution.

Finally, we conclude that follow up antenatal US is an important indicator of post natal outcome of pelvictasis, as the progression of renal pelvis dilatation significantly increases the risk of postnatal abnormalities that require postnatal surgery, and on the other hand, the regression of dilatation lowers the risk of postnatal surgery.

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