Analysis of postnatal outcomes of prenatally detected fetal hydronephrosis

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Abstract

Background: Prenatal hydronephrosis comprises 20% of the anomalies detected on ultrasound. Adequate information is required to counsel the parents regarding the diagnosis and possible need for further evaluation and postnatal therapy including surgery. The aim of the study is to analyse the postnatal outcomes of neonates with prenatal diagnosis of hydronephrosis.

Material and Methods: Fetuses diagnosed with hydronephrosis from January 1, 2014 to May 31, 2015 were identified from the obstetric ultrasound database. 27 fetuses had a diagnosis of hydronephrosis and had complete postnatal follow-up. These were classified on the basis of the severity and bilaterality of hydronephrosis. Postnatal data and follow up was obtained from the hospital records and from the parents over phone when delivery had occurred at another institution.

Results: Of 27 fetuses, 15 were diagnosed in second trimester and 13 in the third trimester due to late booking. No fetuses with a normal scan at second trimester subsequently developed hydronephrosis. Of 18 fetuses with mild hydronephrosis, 17 were seen to be normal at prenatal follow up or postnatally. Only one progressed and became severe requiring postnatal surgery. Of the nine fetuses classified as moderate or severe, seven neonates required surgery in the neonatal period. On comparing the two groups, this was found to be statistically significant. (p:0.005). The effect of bilateral hydronephrosis on outcomes could not be assessed due to the small numbers of fetuses in this category.

Conclusion: Antenatal diagnosis of fetal hydronephrosis may progress and so parents need to be counselled regarding the need for a follow up scan which will then determine the need for post-natal follow up or treatment. Severity of the hydronephrosis seen antenatally influences the need for surgery in the neonate.

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Introduction

Fetal hydronephrosis is a condition which is often diagnosed on antenatal ultrasound. It accounts for 20% of the anomalies detected on antenatal ultrasound.[(1)] Antenatal diagnosis is important as it triages the fetus at risk and enables parental counselling regarding the need for follow up. Careful postnatal management is required in persistent hydronephrosis, to avoid permanent renal damage. Prenatal fetal diagnoses require antenatal counselling to help the parents understand the condition.[(2,3)] Counselling provides information, reassurance and guidance regarding the need for postnatal care. Most parents when confronted with a fetal problem would like to know if there are a prenatal solution and whether the problem is likely to be life threatening. In some countries, depending on the local law, the option of termination of pregnancy may also be considered.[(4)] Therefore, when hydronephrosis is diagnosed, since it is a condition that can evolve with gestational age, in order to counsel the parents, robust information is required, including post natal information. Many (if not most) cases resolve without any further treatment particularly when the dilation is mild or moderate and possibility of resolution reassures parents.[(3,4)] This could help to guide prenatal management, and expectantly manage until delivery and treat post-natally.[(1,3,4)]

Antenatal series of fetal hydronephrosis have been described before. However there is paucity of Indian data describing the prenatal ultrasound findings and post-natal follow up of the same. This study follows the prenatal and postnatal course of fetuses with antenatal diagnosis of fetal hydronephrosis. The study analyses a cohort of fetuses prenatally diagnosed fetal hydronephrosis, to determine the nature and progression of the disease and review literature.

Materials and Methods

The Obstetric Ultrasound data base was searched to look for all antenatal scans performed from January 1, 2014 to June 30, 2015. (18 months). Fetuses having hydronephrosis were identified and the gestational age at diagnosis and whether any prior scans had been performed in the institution were noted. The examinations were carried out on Voluson 730E or Voluson E8 ultrasound machine, (GE, Austria) and all findings were confirmed by a single operator to ensure uniformity.

Fetal kidneys were assessed in all fetuses in standard views in both second trimester and third trimester scans. The kidneys were assessed in axial plane with the fetal spine in dorso-anterior or dorso-posterior position to measure the renal pelvis. The renal

pelvis was measured as a vertical line at the maximal dilation of the pelvis. The fetal kidneys were also assessed in the sagittal sections to assess the renal calyces.(Fig. 1) The fetuses were classified based on whether the diagnosis was made in the second or third trimester and whether unilateral or bilateral. In addition the fetuses were further subdivided based on whether they had a mild/ moderate or severe hydronephrosis. A value of less than 4mm was taken as normal, 4–7mm as mild, 7–10mm as moderate and greater than 10mm was taken as severe hydronephrosis at a gestational age of less than 28 weeks. At gestational age of greater than 28 weeks, less than 7mm was normal, 7–10mm: mild, 10–15 mm moderate and greater than 15mm was classified as severe hydronephrosis.[4,5] In addition at the time of fetal examination the ureters were examined for visualization and signs of vesico-ureteric reflux. The bladder was examined for filling and emptying and the amniotic fluid index was also assessed. The fetus was subjected to a thorough examination to rule out other anomalies prior to prenatal counselling.

Postnatal management was carried out by the neonatal team and the pediatric urologist. All infants with persistent antenatal hydronephrosis underwent postnatal KUB scan prior to discharge from the hospital. Follow up scans and treatment options were planned based upon the first post natal scan findings and the clinical condition of the neonate. The neonatal investigations included micturating cystourethrography and imaging with DMSA. Surgery was performed if recurrent infections occurred despite adequate prophylactic antibiotics, or hydronephrosis was seen to increase. The relationship of severity and laterality of the hydronephrosis to the need for postnatal surgery was evaluated. The chi square test was used to test for the significance of severity of hydronephrosis and need for postnatal surgery. A value of 0.05 was taken as significant.

Results

The fetuses were grouped according to the gestational age at diagnosis and the severity and bilaterality of the fetal hydronephrosis.

A total of 29 fetuses with hydronephrosis on antenatal ultrasound were identified from the database for the study period. The diagnoses were made at second trimester targeted scan, or later in gestation in fetuses who were referred for scan at the third trimester. Of these 29 fetuses, two were not included in the analysis due to neonatal deaths unrelated to the fetal renal system. One fetus was referred to this hospital only at 34 weeks. All prior scans had been performed at another center where an important finding of hypoplastic left heart syndrome had been missed. At 34 weeks (which was the first visit to this unit), the couple was counselled regarding the guarded prognosis due to severe fetal cardiac ailment. The fetus was delivered at term but despite adequate care, the neonate succumbed following cardiac surgery. The other fetus was diagnosed at 28 weeks and referred with severe maternal preeclampsia. The fetus had a finding of severe bilateral hydronephrosis and severe growth restriction with fetal hypoxia on Doppler. Unfortunately, the parents declined immediate caesarean delivery and intrauterine fetal demise resulted within 24 hours despite adequate maternal treatment.

Of the 27 cases which were included in the study, 15 had been diagnosed in the second trimester (18–28 weeks) (Table 1) and the remaining 12 cases were first seen in the third trimester. (Table 2) There were no fetuses who had been diagnosed as normal at the time of targeted scan who subsequently developed hydronephrosis. Hydronephrosis was classified as mild, moderate or severe based on the antero- posterior diameter of the fetal renal pelvis measured on a transverse section. This was done as per guidelines to standardize the measurements. In addition the SFU grading was noted with the fetal kidneys examined in the sagittal plane and coronal planes.

Of a total 27 fetuses, there was a male preponderance. (Table 3) This is expected as the incidence of obstructive urologic problems is greater in males than in females.(Fig. 2)

Among the ten fetuses with mild unilateral hydronephrosis, follow up revealed that nine had resolution of findings at the second scan at 28 – 32 weeks. These fetuses were the followed as normal. (Fig. 3)There was no further incidence of hydronephrosis in these fetuses and the neonatal course was normal also. Of these, in 9 of 10 cases the postnatal KUB scan was performed between 3–14 days. The scan was normal in all these neonates. One fetus had progression of the hydronephrosis which was seen to be severe at 32 weeks. The neonate subsequently was operated at 5 months of age and is currently doing well. Among the eight fetuses with mild bilateral disease, all eight had normal scans at 32–34 weeks and postnatal scans were normal also. In total among 18 fetuses with mild hydronephrosis (unilateral or bilateral), 17 required no interventions and were normal in the third trimester scan.

Among three fetuses with moderate hydronephosis (2 moderate unilateral and one moderate bilateral, one required surgery (open dismembered pyeloplasty for pelvi-ureteric junction obstruction) which was performed at 9 months of age. The other two remain on follow up at ages of 6 and 4 months respectively following normal micturating cystourethrography. (Table 4)

The six fetuses with severe hydronephrosis were also followed with postnatal KUB scans. Five underwent pyeloplasty for pelvi ureteric junction obstruction at ages ranging from two weeks to two months of life. Fig. 4 shows the follow-up of one such neonate who was diagnosed with right severe hydronephrosis of 14mm at 20 weeks. The fetal bladder

was normal and both ureters were not dilated indicating pelvi-ureteric junction obstruction. The fetus was followed till term when ultrasound showed right renal pelvis was at 21 mm at 36 weeks with normal bladder and ureters. The neonate underwent pyeloplasty at 2 weeks of life and is well at follow up at 9 months of life. One neonate with bilateral severe hydroureteronephrosis and right hydroureter underwent valve fulgration for posterior urethral valve. The baby is doing well at present and is on follow up.(Table 4)

To summarize the findings based on the severity of hydronephrosis irrespective of the gestational age at diagnosis, of 27 fetuses, 15 were diagnosed in second trimester and 13 in the third trimester due to late booking. No fetuses with a normal scan at second trimester subsequently developed hydronephrosis. Of 18 fetuses with mild hydronephrosis, 17 were seen to be normal at prenatal follow up or postnatally. Only one progressed and became severe requiring postnatal surgery. Of the nine fetuses classified as moderate or severe, seven neonates required surgery in the neonatal period. On comparing the two groups, this was found to be statistically significant. (p:0.005). The effect of bilateral hydronephrosis on outcomes could not be assessed due to the small numbers of fetuses in this category.

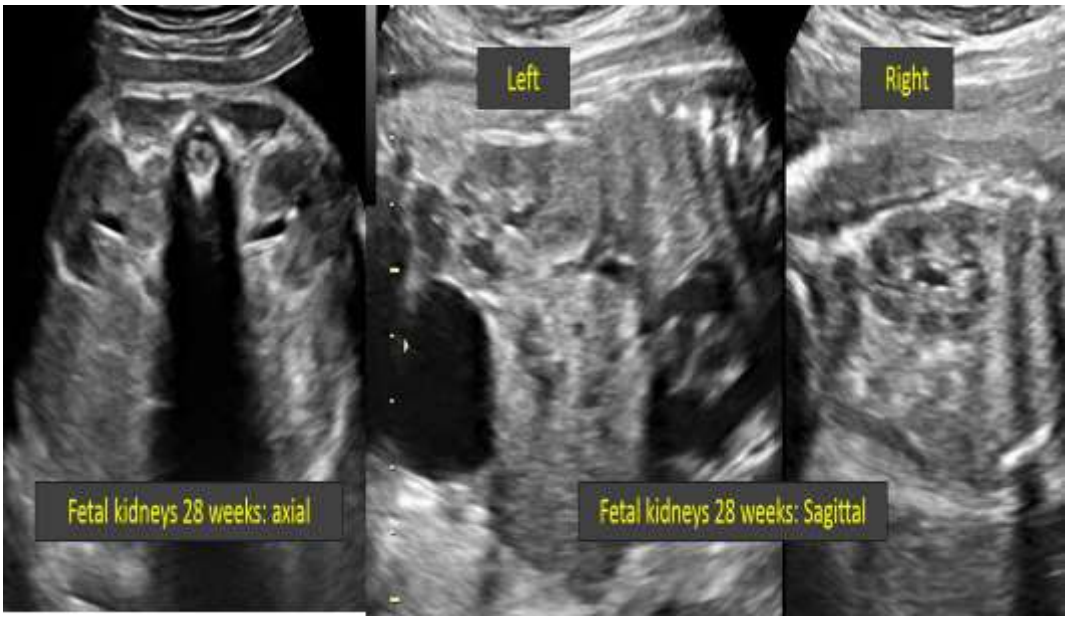

Fig. 1:

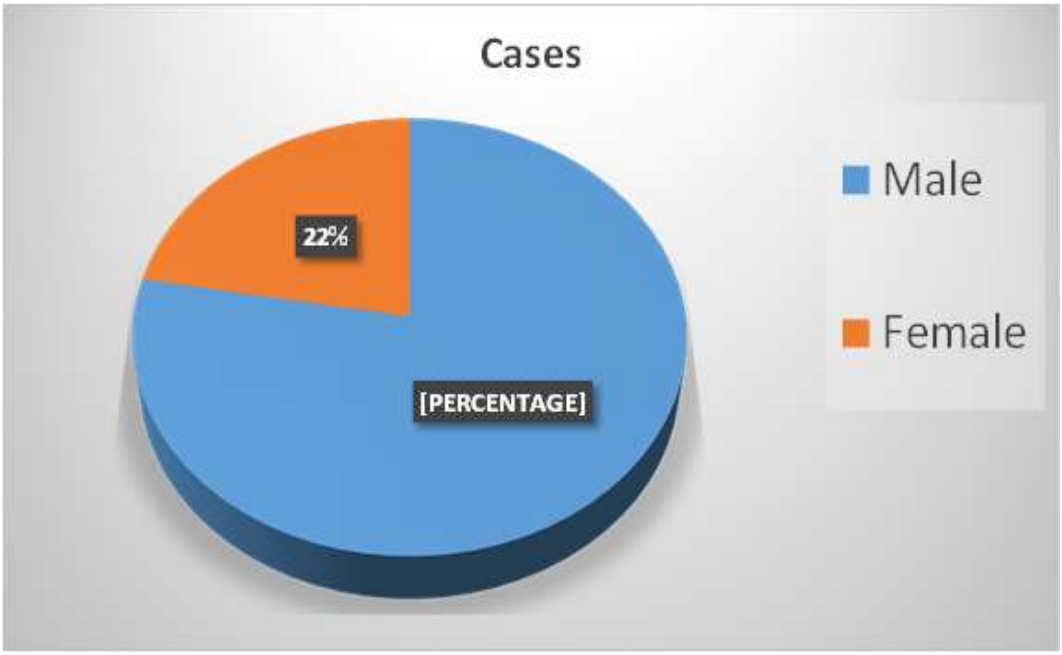

Fig. 2: Gender distribution of fetal hydronephrosis cases

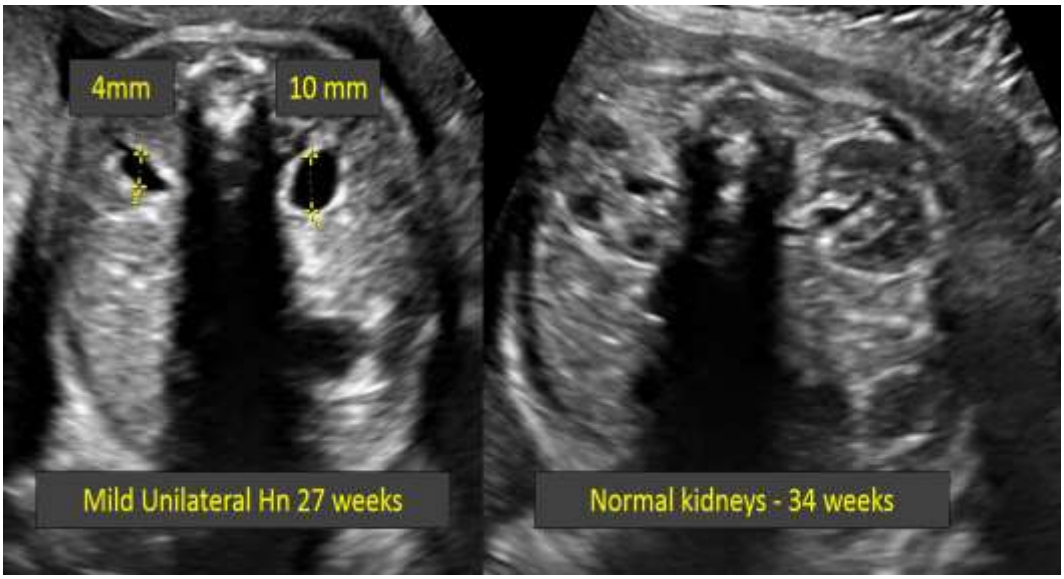

Fig. 3:

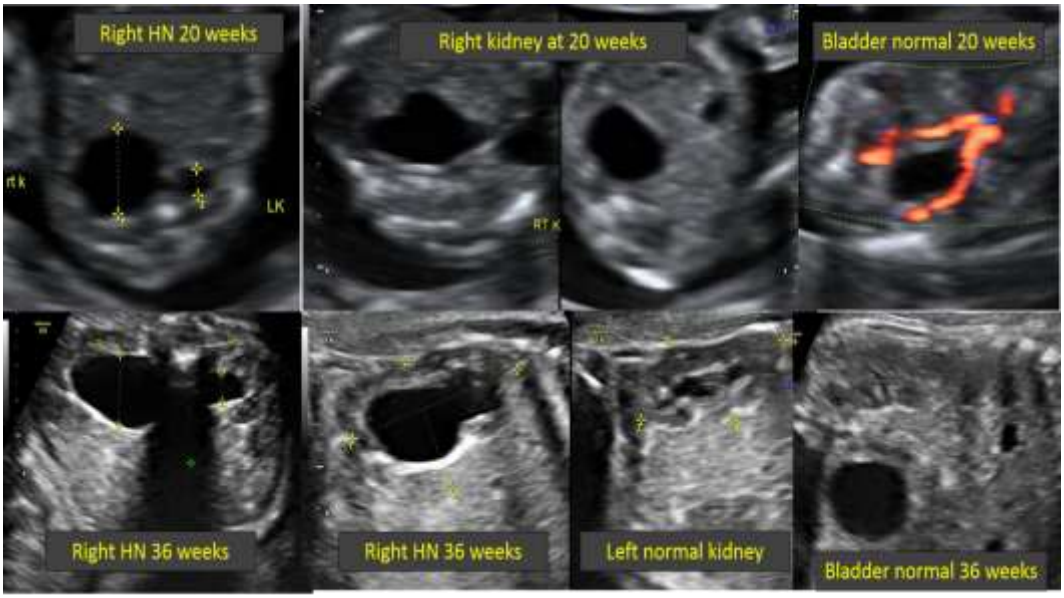

Fig. 4:

Table 1: Diagnosis made in second trimester and outcomes based on severity

	Total	Normal scan PN	PN surgery
Mild unilateral HN	6	5	1
Mild Bilateral HN	3	3	
Moderate Unilateral HN	1		1
Moderate Bilateral HN	1		1
Severe unilateral HN	1		1
Severe bilateral HN	3		3

Table 2: Diagnosis made in third trimester and outcomes based on severity

	Total (N=13)	Normal scan PN	PN surgery
Mild unilateral HN	4	3*	0
Mild bilateral HN	5	5	
Moderate Unilateral HN	1		On follow up
Moderate Bilateral HN	0	0	0
Severe Unilateral HN	2		2

Table 3: Distribution between the sexes

		Male	Female
Mild HN	Unilateral (N=10)	8	2
	Bilateral (N=8)	5	3
Moderate HN	Unilateral (N=2)	1	1
	Bilateral (N=1)	1	0
Severe HN	Unilateral (N=3)	3	0
	Bilateral (N=3)	3	0

Table 4: Hydronephrosis grade and postnatal surgical treatment

		Total cases	Surgery
Mild HN	Unilateral	10	1
	Bilateral	8	0
Moderate HN	Unilateral	2	1
	Bilateral	1	0
Severe HN	Unilateral	3	3
	Bilateral	3	3

Discussion

In the present study, there was a significant association between the severity of hydronephrosis and the need for surgery. Nine out of ten cases with mild hydronephrosis were followed up and normal at birth. Only one case required surgery in the postnatal period. In comparison, all six fetuses with severe hydronephrosis required surgery during the first year of life. This is similar to the findings of Dias and colleagues who studied 371 new-born infants over a period of ten years and found that an anteroposterior renal pelvis diameter of 18 mm had the best prenatal diagnostic odds ratio to identify infants who needed pyeloplasty. Using only if fetal renal pelvic dilatation was greater than 18 mm and postnatal dilatation was greater than 16 mm, sensitivity was 100% and specificity was 86% (95% CI 80.7–89.9).[7] An older study by Coelho and colleagues also concluded that in fetuses with mid renal dilation, the need for surgery is minimal. They however recommended that close monitoring for detection of urinary tract infection would be ideal.[8]

Conclusion

The results of the present series are similar to that seen in various other series reported in literature previously. Mild hydronephrosis seen in second trimester was seen to regress in majority of cases. The cases which regressed did not have subsequent recurrence of the renal pelvic dilation. The cases which required postnatal evaluation.

The majority of cases of mild and moderate hydronephrosis did well with regression seen in the prenatal period. This provides a background against which the parents can be reassured when the hydronephrosis is less severe.

Prenatal counselling and close follow up with a pediatric urologist with appropriate surgery can optimise the outcome of fetuses with hydronephrosis.

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