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Fetal Hydronephrosis: Optimal Renal Pelvic Measurement to Increase Detection Rate for Renal Pathology

**Abstract**

We reviewed the outcome of fetal hydronephrosis with a renal pelvic dilatation (RPD) of 4 - 7 mm to assess whether a RPD > 7 mm had a higher predictive value for renal pathology. 373 fetuses were diagnosed with hydronephrosis giving an incidence of 2.2%. The male: female ratio was 1.8:1. 5 (1.34%) fetuses with an RPD of 4 - 7 mm had resolved by 34 weeks gestation with 10 (3.1%) having moderate to severe hydronephrosis. The resolution rate for RPD > 7 mm was 60.7% (17) with 11 fetuses (39.3%) requiring long term follow up.

**Introduction**

Antenatal ultrasound offers many benefits including detection of fetal abnormalities which may benefit from timely medical and surgical intervention. A potential limitation is the false positive rate associated with antenatal detection which is often attributed to the lack of agreement on which RPD measurement warrants karyotyping and the postnatal consequences of the antenatal measurements. The aims of this study were to review the outcome of all fetal hydronephrosis cases and to determine which RPD measurement correlates with an increased risk of postnatal complications. Studies have also shown that there is an increased incidence in those with chromosomal abnormalities with emphasis being placed on Down syndrome.

Despite this knowledge, there is a lack of consensus among fetal medicine specialists or robust data to clarify the cut-off measurement of RPD for continuing antenatal and postnatal monitoring in cases of isolated hydronephrosis (no associated renal abnormalities or extra renal abnormalities). The cut-off value should be one with a high diagnostic rate for an underlying renal abnormality and a low false positive rate. This helps to minimise parental anxiety, reduces the number of unnecessary investigations both pre and postnatally, and provides a cost efficient and effective service without missing any significant renal pathology. There is also a lack of agreement on which RPD measurement warrants karyotyping and the postnatal consequences of the antenatal measurements. The aims of this study were to review the outcome of all fetal hydronephrosis cases and to determine which RPD measurement correlates with an increased risk of postnatal complications.

**Methods**

Ultrasound scans performed between 2008 and 2009 in a tertiary referral ultrasound and fetal medicine unit in a large university teaching hospital were reviewed retrospectively. The Coombe Women & Infants University Hospital is a university teaching hospital. Over the two year period all cases diagnosed were either unilateral or bilateral isolated hydronephrosis which was defined as an anterior-posterior pelvic diameter with respect to gestation (Figure 1). These scans were carried out by midwife sonographers and consultants in the ultrasound and fetal medicine department on 2D ultrasound scanners. Over the two year period, all cases diagnosed were either unilateral or bilateral isolated hydronephrosis which was defined as an anterior-posterior pelvic diameter with respect to gestation. The unit policy for follow up was to review these patients at 34 weeks gestation with the following diagnostic criteria: Mild hydronephrosis 8 mm - 9.9 mm, moderate hydronephrosis 10 14.9 mm and severe hydronephrosis ≥15 mm. A follow up scan if the RPD was > 14 mm was carried out depending on the measurement at diagnosis and any associated findings.

As hydronephrosis is associated with an increased risk of aneuploidy, this risk was calculated using previous rate of aneuploidies based on maternal age or nuchal translucency when appropriate, as background risk. If the estimated risk was higher than 1:250, an amniocentesis was offered. The postnatal follow up included ultrasound scans on day 3-5 of life on all babies with a dilatation of greater than 8 mm at the 34 week scan. Further diagnostic scans were then requested depending on the ultrasound findings and at the requests of the paediatric nephrologist. If the postnatal ultrasound examination revealed RPD > 7 mm, follow-up was discontinued. These cases were then classified as postnatal normal. In cases where the RPD was larger or additional findings were revealed, the management was individualised. In such cases, prophylactic antibiotic treatment was given to all newborns.

**Results**

A total of 373 fetuses out of 18,250 scans performed were diagnosed with hydronephrosis over the two year period giving an incidence of 2.2%. The majority (34%) (94.9%) were diagnosed at the 20-22 week scan and 19 (5.1%) were diagnosed in the third trimester after a normal 20-22 weeks scan. There was a male preponderance with 240 (64.3%) cases of fetal hydronephrosis being male and the remaining 133 (35.7%) cases being female giving a male to female ratio of 1.8:1. There were 2 (1.34%) fetuses diagnosed in the antenatal or postnatal period with Down Syndrome. The mean maternal age was 32.7 years and the mean gestational age at delivery was 39.2 weeks (Range 28.3 - 42.3 SD=2.1). During the same two year period, there were 91 cases of Down Syndrome. Studies have also shown that there is an increased incidence in those with chromosomal abnormalities with emphasis being placed on Down syndrome.

The overall results are depicted in Flow Chart 1. The resolution rate for a RPD of 4 - 7 mm was high with 91.7% (299 cases) of the entire group having resolved by the 34 week scan. Of those that did not resolve, Table 2 details the reasons for the outcome. The mean RPD in these cases was 6.8mm. 17 fetuses had an RPD 4mm of which all resolved. Of those diagnosed at the 20-22 week scan (n=74) 28 (37.9%) had a RPD > 7mm. The resolution rate was less in these cases (55.6%) (60.7%) resolving and 11 (39.3%) requiring long term follow up. Of the 19 diagnosed in the third trimester (9.473%) had an underlying renal abnormality. Overall an underlying abnormality / pathology was present in 29 (7.8%), 11 (37.9%) of which were female and 18 (62.1%) male. These cases included: Pelvi-ureteric junction obstruction (8), vesico-ureteric junction obstruction (5), strictures (6), duplex systems (7) and posterior urethral valves (3). These cases required on going long term follow up. Table 2 details the results from the third trimester scans.

(RPD: renal pelvic dilatation)

Flow Chart 1: A representation of the overall breakdown of results into resolved or diagnosed renal pathology for those who had fetal hydronephrosis between 4 - 7mm, > 7mm and those diagnosed in third trimester.

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necessarily need a third trimester or a postnatal scan, but 10 (3.1%) cases of possible pathology could be missed. As stated the mean RPD in these cases was 6.5 mm, which may suggest that a 6mm cut off may be more sensitive for a higher detection rate with a low false positive rate. However, the unit policy for soft markers at that point, did not include nuchal pad or humerus length, so in fact, this group may include other soft markers and hence not represent isolated hydronephrosis. Regarding the sex distribution, the male preponderance was also reflected in the resolution rate, hence this indicates that female fetuses with renal pelvic dilatation have a higher probability of non-resolution and underlying pathology. In summary, this review suggests that a RPD of 6 mm at 20-22 weeks has a high detection rate for renal pathology with a low false positive rate. Ten of the eleven cases with RPD at 20-22 weeks > 7mm were found to have renal pathology in the neonatal period and required long term follow up. The structured antenatal follow up of a 34 week scan enables an assessment of those with progression to be followed up promptly in the neonatal period hence minimising parental anxiety and reducing the number of unnecessary investigations.

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References