Prenatal Mild Pyelectasis

Evaluating the Thresholds of Renal Pelvic Diameter Associated With Normal Postnatal Renal Function

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Objective. To determine the threshold of the renal pelvic anteroposterior (AP) diameter that predicts normal postnatal renal outcome in the follow-up of cases with mild pyelectasis. Methods. A retrospective review of our sonography database was conducted over a 3-year period for cases of mild pyelectasis diagnosed between 18 and 30 weeks. Cases were evaluated for the association between different thresholds of renal pelvic anteroposterior diameter and normal postnatal function after 32 weeks’ gestation and also for the initial renal pelvic anteroposterior diameter at 18 to 30 weeks. Results. In the 3-year period, 7416 women were evaluated, and 150 cases with a diagnosis of pyelectasis (2%) were identified. Among the 115 women meeting our inclusion criteria, complete outcomes were available for 66. Persistent postnatal renal anomalies were seen in 20 cases (30%). On the basis of receiver operating characteristic curves, the renal threshold that best predicted normal postnatal outcome was an anteroposterior diameter of less than 7.0 mm after 32 weeks, yielding sensitivity and specificity of 87% and 85%, respectively (odds ratio, 0.31; 95% confidence interval, 0.11–0.86; P < .02). Conclusions. In the follow-up of fetuses with a diagnosis of mild pyelectasis between 18 and 30 weeks, a renal pelvic anteroposterior diameter of less than 7.0 mm after 32 weeks is highly predictive of normal postnatal renal function. Therefore, only those with an anteroposterior diameter of greater than 6 mm after 32 weeks deserve follow-up. Key words: postnatal; prenatal; pyelectasis; renal pelvis.

Pyelectasis is one of the most common diagnoses made in the prenatal period, with prevalence varying from 2% to 5%. Reports on thresholds of the renal anteroposterior (AP) diameter, which warrants prenatal and postnatal follow-up for mild pyelectasis, are conflicting. Some of these reports have suggested thresholds varying from 4 to 10 mm to be associated with abnormal postnatal function. Others have suggested the term “physiological” pyelectasis for those situations in which the renal pelvis is just above the normal range for that gestation.

One reason for the conflicting thresholds is a poor understanding of the natural history of mild pyelectasis diagnosed in the prenatal period. Sairam et al reported a 96% resolution rate after a diagnosis of mild pyelectasis. This is in contrast to previous reports showing poorer resolution rates. This has resulted in inconsistent counseling of women with a prenatal diagnosis of pyelectasis.

The aim of this study was to determine the threshold of the renal pelvic AP diameter that best predicted normal postnatal renal outcome in the follow-up of cases with mild pyelectasis.
Materials and Methods

This was a retrospective review of our sonography database over a 3-year period (1999–2002) for cases of mild pyelectasis diagnosed between 18 and 30 weeks. The study was approved by our Institutional Review Board. Mild pyelectasis was defined as an AP diameter of the renal pelvis of greater than 4.0 mm. All gestational ages were confirmed by either first- or second-trimester sonographic scans.

In our unit, any fetus with a diagnosis of pyelectasis undergoes a detailed anatomic survey for other anomalies and markers of aneuploidy. In the absence of any other findings, the patients are usually seen every 4 weeks to detect any worsening or resolution of the pyelectasis. Neonates with persistent pyelectasis at term receive prophylactic antibiotics after delivery and have postnatal sonographic evaluation after 2 days of life. Those with persistent postnatal pelvic dilatation have either voiding cystourethrogram, a renal medicine nuclear scan, or a technetium Tc 99m mercaptoacetyltriglycine scan as indicated.

For the purposes of this study, we excluded all cases with pyelectasis of greater than 10 mm, multiple anomalies, and aneuploidy. Cases were evaluated for the association between different thresholds of renal pelvic AP diameter and normal postnatal function. Normal postnatal function was defined as the absence of pelvic dilatation. The renal pelvic AP thresholds evaluated included diameters of less than 6.0, 7.0, 8.0, and 9.0 mm, respectively. The evaluation was performed on the follow-up measurements after 32 weeks, and a secondary analysis was performed with the use of the initial measurements at 18 to 30 weeks.

The statistical efficacy of each renal threshold was computed, and a receiver operating characteristic (ROC) curve was constructed to determine the optimal threshold associated with normal postnatal function. All statistical analyses were performed with Stata version 7 statistical software (StataCorp, College Station, TX).

Results

During the 3-year period, among 7416 women having sonography in our unit, there were 150 cases with a diagnosis of pyelectasis, giving a prevalence of 2%. One hundred fifteen of these met our inclusion criteria, and complete outcomes were obtained in 66 of these cases. Persistent renal anomalies in the postpartum period were seen in 20 (30%) of these 66 cases. Table 1 depicts the postnatal anomalies found. None of our cases with mild pyelectasis had postnatal surgery. The most common postnatal anomalies seen were hydronephrosis of uncertain etiology (35%) and ureteropelvic or ureterovesical junction obstruction (35%).

The efficacy of using different thresholds of the AP diameter to predict normal postnatal function is shown in Table 2. Using the information from this table, we plotted an ROC curve (Figure 1). The optimal operating slope for the ROC curve corresponded to a renal threshold of less than 7 mm, with sensitivity, specificity, and positive and negative predictive values of 87%, 85%, 93%, and 74%, respectively (odds ratio, 0.31; 95% confidence interval, 0.11–0.86). The likelihood ratio for a normal outcome with an AP diameter of less than 7 mm was 5.8. The area under the ROC curve was 0.88. The cases missed with the use of an AP diameter of less than 7.0 mm were cases of duplex ureters and hydronephrosis of uncertain etiology.

In a secondary analysis, we evaluated the renal thresholds that predict normal postnatal renal function using the initial renal pelvic diameters at 18 to 30 weeks. The results of this secondary analysis are depicted in Figure 2. The optimal renal AP diameter associated with a normal outcome was a diameter of less than 6.0 mm, with sensitivity, specificity, and positive and negative predictive values of 71%, 80%, 89%, and 53%, respectively (odds ratio, 0.1; 95% confidence interval, 0.03–0.3). The likelihood ratio for a normal outcome with an AP diameter of less than 6.0 mm between 18 and 30 weeks was 3.6. The area under the ROC curve for the secondary analysis was 0.81.

Discussion

There is an increasing rate of maternal anxiety caused by the diagnosis of pyelectasis. Our study found an AP renal pelvic diameter of less than 7.0 mm to be predictive of a normal postnatal renal outcome. The prevalence of mild pyelectasis in our study population was 2%. This is similar to the 2.3% prevalence reported by Sairam et al,1 despite the use of different entry criteria.
We found that 30% of cases with mild pyelectasis had persistent postnatal renal anomalies. This is consistent with a report by Persutte et al,9 who also reported 30% progression from mild pyelectasis to hydronephrosis. Conversely, Sairam et al1 reported a lower progression rate of only 4% in cases with mild pyelectasis. The conflicting findings may be due to different entry criteria. In the study by Sairam et al,1 one of the entry criteria was an AP diameter of greater than 10 mm after 28 weeks, and they used an arbitrary cutoff of greater than 7.0 mm irrespective of the gestation or the presence of calyceal dilatation to define moderate to severe pyelectasis. In our study, we excluded cases with AP diameters of greater than 10 mm at the time of diagnosis because these have been consistently reported in the literature to have a higher rate of persistent postnatal abnormalities. We were mainly interested in determining the outcome in cases with mild pyelectasis.

Guidelines for the thresholds of renal pelvic AP diameters in the third trimester that require postnatal follow-up have varied between 7 and 10 mm. In one previous report, the false-positive rate with the use of a threshold of greater than 8 mm for follow-up was 60%.4 We sought to determine a threshold that was highly sensitive and specific in predicting normal postnatal outcome. The area under our ROC curve suggests a good predictive test. The false-positive rate from this study, using a threshold of less than 7.0 mm,

Table 1. Persistent Postnatal Renal Anomalies Seen in Cases With the Prenatal Diagnosis of Mild Pyelectasis

<table>
<thead>
<tr>
<th>Postnatal Finding</th>
<th>n</th>
<th>AP Diameter, mm</th>
</tr>
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<tbody>
<tr>
<td>Hydronephrosis (uncertain etiology)</td>
<td>7</td>
<td>8 ± 0.6*</td>
</tr>
<tr>
<td>Ureteropelvic or ureterovesical junction obstruction</td>
<td>7</td>
<td>9 ± 0.5*</td>
</tr>
<tr>
<td>Vesicoureteric reflux</td>
<td>2</td>
<td>8 ± 0.3*</td>
</tr>
<tr>
<td>Duplex ureters</td>
<td>3</td>
<td>8 ± 0.5*</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>9</td>
</tr>
</tbody>
</table>

*Mean ± SD.

Table 2. Efficacy of Different Thresholds of Renal Pelvic AP Diameter After 32 Weeks’ Gestation in Predicting Normal Postnatal Renal Function

<table>
<thead>
<tr>
<th>AP Diameter, mm</th>
<th>Sensitivity, %</th>
<th>Specificity, %</th>
<th>PPV, %</th>
<th>NPV, %</th>
<th>Accuracy, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6.0</td>
<td>69</td>
<td>90</td>
<td>94</td>
<td>55</td>
<td>75</td>
</tr>
<tr>
<td>&lt;7.0</td>
<td>87</td>
<td>85</td>
<td>93</td>
<td>74</td>
<td>86</td>
</tr>
<tr>
<td>&lt;8.0</td>
<td>89</td>
<td>75</td>
<td>89</td>
<td>75</td>
<td>84</td>
</tr>
<tr>
<td>&lt;9.0</td>
<td>93</td>
<td>60</td>
<td>84</td>
<td>80</td>
<td>83</td>
</tr>
</tbody>
</table>

NPV indicates negative predictive value; and PPV, positive predictive value.

Figure 1. Receiver operating characteristic curve for the prediction of normal postnatal renal function by different thresholds of renal pelvic AP diameters on follow-up after 32 weeks. The arrow corresponds to the optimal threshold cutoff.

Figure 2. Receiver operating characteristic curve for the prediction of normal postnatal renal function by different thresholds of renal pelvic AP diameters between 18 and 30 weeks. The arrow corresponds to the optimal threshold cutoff.
was 15%, which is more acceptable than the false-positive rate of 59% with an 8-mm cutoff after 28 weeks reported by Adra et al.\textsuperscript{4} Our findings suggest that patients with a diagnosis of pyelectasis can be reassured of a high likelihood of a normal postnatal outcome if the AP diameter of the renal pelvis is less than 7.0 mm after 32 weeks.

The secondary analysis was performed to determine whether there was a threshold of renal pyelectasis before 32 weeks associated with a normal postnatal outcome. Although this analysis suggests that an AP diameter of less than 6.0 mm was associated with normal postnatal renal findings, the increase in the false-positive rate to 20% with no associated improvement in sensitivity compels us to recommend using the assessment after 32 weeks for counseling parents. An alternative approach could be to follow only pregnancies with AP diameters of greater than 6.0 mm after 32 weeks' gestation, based on the findings of our secondary analysis. If on follow-up at 32 weeks the AP diameter remains less than 7.0 mm, then parents can be counseled regarding the association with a good postnatal outcome.

The limitations of our study include the retrospective design, with the possibility of incomplete follow-up. The number of cases with complete outcomes was small, and the period of follow-up was short (<4 years). The small number of pregnancies with complete ascertainment may have skewed our results toward the pathologic end of the spectrum. Within the short period of follow-up, no case requiring postnatal surgery was detected. Our exclusion of cases with AP diameters of less than 10 mm may have contributed to this finding, or it may have suggested that mild pyelectasis is associated with a good prognosis. Because our objective was to define the threshold for reassuring women and not for detecting abnormalities, our study design is justified. Although a cutoff of less than 7.0 mm after 32 weeks was highly predictive of a normal postnatal outcome, some cases still had abnormal postnatal findings, suggesting that factors other than the AP diameter may be associated with the development of postnatal pyelectasis.

We also excluded cases with aneuploidy such as Down syndrome from our analysis. It is known that mild pyelectasis has been associated with aneuploidy\textsuperscript{2}; therefore, our findings and recommendations do not apply to aneuploidy screening. Pregnancies with the finding of mild pyelectasis, especially in the presence of other markers of chromosomal aneuploidy, should continue to be counseled accordingly. One final limitation of our study was the ascertainment of renal function in the study cohort. We assumed that the absence of postnatal pyelectasis was indicative of normal renal function. The ideal evaluation should include biochemical tests of renal function, such as creatinine clearance. Because this information was not available for most of our study population, we decided to limit our definition to radiologic findings only.

In the follow-up of cases with a diagnosis of mild pyelectasis before 30 weeks' gestation, the finding of an AP diameter of less than 7.0 mm after 32 weeks is highly predictive of a normal postnatal outcome. This information is useful in the counseling of women with a fetal diagnosis of mild pyelectasis.

References


