Incidence Based Fetal Urological Counseling Using the Virtual Pediatric Urology Registry: Importance of Insignificant Fetal Pyelectasis (Sonographically Evident Renal Pelvis)

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Purpose: Since 1985, counseling for fetal renal pelvic dilatation has been done to determine whether there is need for newborn urological evaluation. This is likely if the anteroposterior width of the renal pelvis exceeds categorical cutoffs, ie 4 mm or greater before gestational age 33 weeks, or 7 mm or greater after 33 weeks. Cases below these categorical cutoffs are deemed not to merit newborn testing. We examined our fetal registry to determine the incidence of urological pathology in cases deemed not to merit newborn testing.

Materials and Methods: Since 1980, we have prospectively input fetal ultrasound and postnatal followup data into customized Virtual Pediatric Urology Registry software. The Virtual Pediatric Urology Registry compares index case findings against those archived in the registry and then outputs the incidence of newborn diagnoses. Diagnoses are grouped as having limited or extensive urological care.

Results: The Virtual Pediatric Urology Registry has 1,128 cases registered and data on 2,292 fetal ultrasound studies that were done between gestational ages 12 and 43 weeks (average ± SD 29.3 ± 7). There are measurements of anteroposterior pelvic width for 1,712 cases. Pediatric data include ultrasound for 2,596 cases, diuretic renal scan for 449 and voiding cystourethrogram for 574. Surgery was done for renal/bladder obstruction or vesicoureteral reflux in 358 cases (32%). Mean followup was 9.8 months old (range 1 day to 14 years). Of the total of 1,128 fetal cases 148 (13%) showed anteroposterior pelvic width below categorical cutoffs, so that they were deemed not to merit newborn testing. However, the Virtual Pediatric Urology Registry incidence based method identified that extensive urological care extended to 30 of these 148 cases (20%). There were 31 cases identified at less than gestational age 33 weeks, which showed newborn urological pathology in 11 (35%), including hydronephrosis in 4, surgery in 3, vesicoureteral reflux in 2, solitary kidney in 1 and death in 1. There were 117 cases identified at gestational age 33 weeks or greater, which showed newborn urological pathology in 19 (16%), including vesicoureteral reflux in 8, hydronephrosis in 7 and surgery in 4.

Conclusions: We found that about 13% of cases of fetal renal pelvic dilatation were insignificant because the measurement was below currently accepted cutoffs that merit postnatal followup. However, 20% of these cases in fact showed extensive urological care needs. The Virtual Pediatric Urology Registry provides an array of likely newborn diagnoses in neonates. Counseling by the incidence based method is more effective than by the current cutoff method.

Key Words: kidney, fetus, prenatal diagnosis, hydronephrosis, ultrasonography

Fetal sonography is the most efficient method of detecting urological anomalies and predicting the need for immediate urological care in a newborn. Fetal sonographers and urologists examine ultrasound results for signs of pyelectasis, otherwise known as renal pelvic dilatation, which is the most common cause of urological abnormalities in infants. Currently diagnosing fetal pyelectasis is based on the measurement of AP pelvic width, which is easily sized using ultrasound and by evaluating that value in regard to patient GA. Cases are divided into significant and insignificant with significance defined as 4 mm or greater at GA less than 33 weeks or 7 mm or greater at 33 weeks.[1] A diagnosis of significant pyelectasis results in close fetal monitoring, a newborn urological examination and followup urological care.

The problem with this current prognostic system has become apparent since patients who were originally diagnosed with insignificant results show urological conditions after birth.[2] In our practice we noted a number of patients who were initially diagnosed as normal, who then returned to our pediatric care after birth as their conditions ultimately required intervention. We addressed this problem by examining our load of fetal cases in the last 25 years using the VIPUR database.

We examined the group of patients with insignificant pyelectasis and followed their care after birth. We used VIPUR to examine the percent of cases deemed insignificant that subsequently needed postnatal urological care. We hypothesized that a substantial number of insignificant cases would show significant anomalies. We believed that our

Study received institutional review board approval.

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results would indicate the need for a change in cutoff criteria for the significant and insignificant determinations.

MATERIALS AND METHODS

Study Design

We examined newborn outcomes in cases of fetal pyelectasis less than 4 mm at GA less than 33 weeks or less than 7 mm at 33 weeks or greater. We used incidence based methodology to evaluate cases showing AP pelvis measurement levels that are normally dismissed by the categorical cutoff counseling method as insignificant and, therefore, considered not to merit newborn urological examination. The methods are described.

Inclusion Criteria

All cases with prenatal ultrasound showing pyelectasis without a specific diagnosis and with newborn followup data available were examined for the postnatal outcome.

Exclusion Criteria

Cases were excluded if fetal ultrasound showed an anomaly of which the outcome was already predictable, including 1) a specific anomaly, eg ureterocele or multicystic kidney, 2) detected pyelectasis that was not an isolated finding, eg associated with myelomeningocele, or 3) an abnormal kidney that was not dilated, eg echogenic. Fetal cases with known aneuploidy were excluded. The normal twin of an affected fetus was not included in this study.

Definitions

We underscore the use of the acronym SERP.[3] Briefly, while the extent of fetal pyelectasis is the current gold standard to predict the newborn outcome, the term is problematic because there is no consensus on the thresholds for newborn urology pathology. Furthermore, the term pyelectasis fosters misconceptions regarding expected poor newborn outcomes. Therefore, we substitute the neutral term SERP as an acronym.

Significant fetal renal pelvic dilatation as significant SERP represents 4 mm or greater at GA less than 33 weeks, or 7 mm or greater at GA 33 weeks or greater. Insignificant fetal renal pelvic dilatation as insignificant SERP represents less than 4 mm at GA less than 33 weeks, or less than 7 mm at GA 33 weeks or greater.

For this study cases with a clinical diagnosis of SERP were grouped as newborns needing limited or extensive care. That is, limited care involved patients who had a normal urinary tract on ultrasound and did not undergo further testing; while extensive urological care involved those with abnormal findings on postnatal ultrasound that led to further radiological investigation of the urinary tract,[4,5] as described. We regard a normal urinary tract on ultrasound as when the kidneys did not show the likelihood of obstruction, as in SFU grade 2 or less hydronephrosis,[4] when they are not echogenic, and when they are within the normal length range. In this database duplication anomalies with a symmetrical appearance of the renal pelvis of the affected renal unit are considered normal.

Maternal-Fetal Counseling Methods

There is currently 1 prevailing course for counseling fetal urological cases, namely using the categorical cutoff method. Cases showing significant SERP are counseled to undergo followup pediatric care based on these categorical cutoffs. There is no dialogue regarding likely newborn diagnoses.

We offer an alternative approach to counseling using an incidence based method. This involves presentation to the family of the predicted incidences of newborn diagnoses by GA and the extent of SERP. The families along with their caregivers can make personal decisions based on this information. The incidence is newly able to be predicted because of the new availability of the large VIPUR database, as described.

Description of VIPUR Database

The registry includes prenatal and newborn data acquired from 1980 to 2005. Clinical data were input into an Access® database and then loaded into customized VIPUR software[6] capable of exacting the frequency distribution of archived information. Using VIPUR data SERP measurements from index cases are compared to archived matched data of cases showing a similar extent of SERP and GA with a known postnatal outcome. The result is an array of predicted urological newborn diagnoses and their corresponding urological care (fig. 1).

The VIPUR database currently comprises 1,128 cases. There are 2,292 fetal ultrasound studies done at between GA 12 and 43 weeks (average 29.3), providing a total of 1,712 measurements of fetal SERP. Pediatric data include 3,619 records of ultrasound (2,596), diuretic renal scan (449) and VCUG (574). Surgery was performed for renal obstruction, bladder obstruction or VUR in 358 children (32%). Mean followup is 9.8 months (range 1 day to 14 years).

Performance of Fetal Ultrasound

All fetal ultrasound was performed by a registered diagnostic medical sonographer who was supervised by a maternal-fetal medicine specialist. GA was determined by the best obstetric estimate.

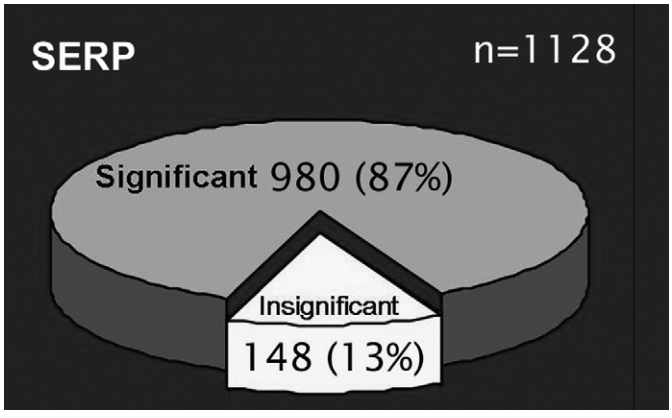

FIG. 1. About 87% of fetal cases in VIPUR show significant SERP since they are above categorical cutoffs, so that newborn testing is suggested. Of the cases 13% show insignificant SERP since they are below such cutoffs and, therefore, newborn testing is not recommended by conventional categorical cutoff method.