CLINICAL COURSE OF FETAL PELVI-CALYCEAL DILATATION DIAGNOSED ON EARLY SECOND TRIMESTER ULTRASOUND.

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Abstract

Aims and Objectives: Incidental finding of fetal pelvi-calyceal dilatation is common finding on early second trimester anomaly scan. [18 to 23 weeks] It causes significant parental anxiety. The present study aims to apply stringent criteria for accurate assessment. It also studies the natural course of such findings, pathological cause for such findings and its postnatal outcomes.

Study Design: This study includes 9500 cases that underwent anomaly at 18 to 23 weeks gestation period.

1. The fetal pelvi-calyceal dilatation [PCD] was diagnosed and categorized according to criteria set by European Society for Pediatric Radiology [1]. PCD 0 – renal calyces and pelvis not or hardly visible. PCD 1 – renal calyces not visible and axial renal pelvis diameter is less than 7 mm. PCD 2 – some calices are visible but with normal forniceal and papillary shape, axial renal pelvis less than 10 mm. PCD 3 - marked dilatation of calices and pelvis. Pelvic axial width usually more than 10 mm with flattened papilla and rounded fornices but without parenchymal thinning. PCD 4- gross dilatation of entire collecting system and thinning of renal parenchyma. PCD 5- Only thin membrane like residual renal parenchymal rim.

Result: Among 9500 women who underwent routine anomaly scan at 18 to 23 weeks gestation, total 390 had PCD findings [4.1 %] Single kidney taken as one case while bilateral findings were taken as 2 cases.

98 [25.1 %] pregnancies had bilateral PCD findings and rest 292[74.9%] had unilateral PCD changes. These findings correlate well with as shown by S Sairam et al, Livera et al, Gunn et al [2, 3, 4]

PCD 1 findings were noted in 317 cases, PCD2 findings were noted in 38 cases, PCD3 findings in 23 cases and PCD4 findings in 12 cases. All these fetuses were followed till either PCD findings resolved naturally or till 2 years of their life. These findings also compare well with S Sairam et al, and Persutte et al [2, 5]

About 00 cases of PCD1, 3 cases of PCD2 and 2 cases of PCD3 were lost for follow up for various reasons.

Two cases of PCD1 were lost due to additional diagnosis of Down syndrome in one case and multiple anomalies in other cases. Both were excluded from the present study.

Rest of them [383] were studied and analyzed for this paper.

Out of 315 PCD1 cases, all turned out to be normal

Out of 35 PCD2 cases, 19 were resolved, 12 remain unchanged at second year of child age rest were 4 worsened

Out of 21 PCD 3, 2 cases resolved *spontaneously*, 5 remain unchanged and 14 cases worsened

Out of 12 PCD 4 cases, all needed and underwent surgical intervention. 04 kidneys were saved and rest 8 had nephrectomies.

Introduction

Fetal urinary tract anomalies is common finding in obstetric ultrasound practice. The dilatation of renal pelvis and calyceal system [PCD] is very common. [6,7,8] Several studies are published to document these findings. [9,10,11] Studies were conducted to precisely correlate ultrasound findings to the ultimate fetal

outcome. These studies use different criteria for fetal pelvic and calyceal dilatation grading.[8, 12, 13] A unified grading system will help to rule out discrepancies arising from such thing. The knowledge of accurate correlation between ultrasound findings and fetal outcome will help in directing all needed intervention in required cases and avoiding unnecessary procedures and load on utilization of medical resources. The progressive

renal damage can be prevented. This will help in alleviating parental anxiety. The confidence of healthcare professional regarding decision making will also boost. [16, 17]

Patients and methods

This is prospective study carried out from 2017 to 2019 at large community based hospital attached to teaching medical institute. Out of 9500 cases undergoing anomaly scan at 18 to 23 weeks, cases meeting PCD criteria as European Society for Pediatric Radiology were included and followed wherever necessary. [1]

The European Society for Pediatric Radiology has come up with more accurate sonographic grading of postnatal pelvi-calyceal distention / dilatation. These criteria have been used in present antenatal study. These criteria are as follows

1. PCD 0 – renal calyces and pelvis not or hardly visible.
2. PCD 1 – renal calyces not visible and axial renal pelvis diameter is less than 7 mm.
3. PCD 2 – some calices are visible but with normal forniceal and papillary shape, axial renal pelvis less than 10 mm.
4. PCD 3 - marked dilatation of calices and pelvis. Pelvic axial width usually more than 10 mm with flattened papilla and rounded fornices but without parenchymal thinning.
5. PCD 4- gross dilatation of entire collecting system and thinning of renal parenchyma.
6. PCD 5- Only thin membrane like residual renal parenchymal rim.

Results

390 cases [4.1 %] of PCD were diagnosed from 9500 pregnancies. Findings are summarized in Table 1.

Details showing findings of this study

Table 1:

PCD Grading	Total	Resolved completely	unchanged	Worsened
PCD0	000	000	000	00
PCD 1	315	315	00	00
PCD2	35	19	12	4
PCD 3	21	2	5	14
PCD4	12	00	0	12
PCD5	00	00	00	00
Total	383	336	17	30

Fetuses with PCD -1 All fetuses have complete PCD resolution at time of third trimester. One fetus had Down syndrome and other had multiple anomalies were removed from study

Fetuses with PCD -2 19 fetuses showed complete resolution of PCD. 12 fetuses had no change in appearance till 2 years of age and no intervention or antibiotic needed.

4 fetuses worsened and needed frequent antibiotic courses.

Fetuses with PCD -3 --- Only 2 fetuses showed complete resolution of PCD. 5 fetuses had no change in appearance till 2 years of age and no intervention or antibiotic needed. 14 fetuses worsened and needed frequent antibiotic courses. 5 fetuses needed some surgical interventions.

Fetuses with PCD -4 --- All fetuses needed some sort of surgical procedure. 8 nephrectomies were needed. Rest 4 kidneys were saved.

Out of 383 cases only 17 cases [4.4 %] from PCD 3 and 4 needed some sort of surgical intervention at end of follow up 2 years. Its details are discussed below.

Discussion

This is one of the largest prospective studies done to study natural course of fetal pelvi-calyceal dilatation. It uses a very specific criteria set out by European Society of Pediatric Radiology. This helps in preventing any ambiguity in reporting criteria and avoids any confusion arising thereof.

Prevalence

The prevalence of fetal PCD at initial anomaly scan at early second trimester [18 to 23 weeks] is 4.1 %. This finding is consistent with multiple other large prospective studies. Liver et al found out prevalence of 2.6 %. [3] It was large study done on 6300 pregnancies. Jawson et al have also estimated similar findings. They estimated the prevalence of 3.6 % Variation in prevalence can be explained by lack of uniformity in the diagnostic criteria applied by the investigators. Gestational age of the pregnancy will significantly affect the estimates of prevalence as spontaneous resolution is very common with increase in gestation period. Most studies use conventional use of the antero-posterior length of fetal pelvis for diagnosis of fetal hydronephrosis. Gunn et al used a renal pelvis length of 15 mm or more in sagittal plane at 28 weeks and estimated higher prevalence of 7.7%. [4] Persutte et al used the smallest of the two transverse lengths to define pyelectasis and reported prevalence of 5.5%. but this study was done on selected referred patients and had no defined screening policy. [5] Thus it does not truly reflect the prevalence rate in unselected population.

Other studies are retrospective in nature or are done on highly selected tertiary referral population.

Natural history of fetal PCD.

The outcome of the mild PCD [Grade 1] is excellent. Almost all 100 % of the kidneys showing complete resolution on the follow up studies. However as the severity of PCD increases the outcome become more and more bleak. It is main purpose of this study to set out more defined and stringent criteria so that accurate prediction of fetal outcome can be predicted. This help in correct counseling and management of CPD cases.

The mild PCD cases are due to normal physiological changes and development and growth of the fetal kidneys.

Persutte et al [5]found that 30 % of the mild pyelectasis progressed to frank hydronephrosis. This can be explained by the wide range of the of criteria employed them. Their follow up of cases was also inadequate. Most other studies also showed the poorer outcomes.[ ] Bias towards selection of severe cases and differing criteria perhaps lead these conclusions.

The current have very few cases that are lost for follow up and uses very specified criteria of diagnosis and therefore appear to be very good for predicting accurate outcome.

Postnatal surgery

In present study, only 17 cases [4.4 %] needed surgery. It is 1.7 cases per 1000 live births. All of these cases are from PCD 3 and PCD 4 category. Previous population based prospective studies reported need of 2.5 to 5.5 surgeries per 1000 live births.[10,11,12] This can be due to changing surgical practices in urological surgery in recent advanced medical practices. Thus this study again highlights the proper use of diagnostic criteria for evaluation of fetal PCD cases.

Pathophysiology and classification of PCD

The ambiguity regarding the classification and criteria used for grading fetal PCD has lead to multiple studies showing widely differing results. This causes significant confusion among healthcare professional regarding proper management of such cases. If properly defined criteria as led down by European Society of Pediatric Radiology are used to classify and categorize fetal PCD cases, an accurate assessment and prediction can be

done regarding outcome. The present study underscores this fact.

As early second trimester anomaly scan is established protocol in routine antenatal care. This timing can be taken as proper, if not ideal, as need for multiple repeated studies can be avoided and some uniformity can be introduced.

Regarding the measurement of fetal renal pelvic size and amount calyceal dilatation, stringent criteria used in present study avoids all pitfalls in previous studies.

Anderson et al.[9] have found the 76 % sensitivity in detecting obstructed kidneys using cutoff point of 4 mm of anteroposterior renal diameter. In the same study it was shown that chances of renal obstruction was higher if larger renal pelvis diameter criteria was used. In present study, using stringent criteria of European Society of Pediatric Radiology accurately assesses this antenatal feature. All the PCD 1 cases resolved completely. Scott et al. Used criteria of 5 mm diameter for maximum pelvic diameter for cutoff. S Sairam et al [2] used 7 mm diameter as arbitrary point for cutoff to signify the moderate/ severe hydronephrosis. Presence of calyceal dilation was important finding that would lead to higher rate of postnatal surgery and renal compromise. Calyceal dilatation is consistent criteria rather than size of pelvic dilation. It figures out normal physiological dilatation from real abnormal obstructed kidneys.

As gestation progresses to third trimester, higher lower values of pelvic dilatation have really favorable outcomes. [12,13, 14] The studies done by Corteville et al [9] and Anderson et al [9] also confirm it.

Conclusion

This is one the largest prospective study done to study natural course of fetal PCD. It uses stringent criteria for classification of PCD as prescribed by European Society of Pediatric Radiology. It provides accurate assessment of PCD cases and thus straightens out all ambiguity arising from previous studies using differing and arbitrary criteria. This really helps in proper management of fetal cases. Now the parents and healthcare professional have accurate guidelines without anxiety and fear of renal damage.

Sonographic grading of postnatal pelvicalyceal distention/dilatation (PCD) (18)

Figure 1:

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