

RETROSPECTIVE STUDY ON ANTENATALLY DIAGNOSED HYDRONEPHROSIS WITH POSTNATAL FOLLOW UP AND SURGICAL INTERVENTION IN PEDIATRIC SURGICAL CASES

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Abstract

Background: Hydronephrosis (HN) is one of the most common anomalies detected on antenatally by ultrasound. This study is to classify and correlate the patients based on the severity of hydronephrosis that are leading to postnatal surgical intervention. **Material and Methods:** This was a retrospective study done in a tertiary care centre which included patients who were diagnosed with antenatal hydronephrosis on ultrasound over a period of 3 years. Severity of HN was classified into mild, moderate, or severe. Data were analysed to correlate the association between antenatal HN severity with postnatal surgical intervention. The surgical intervention was based on various factors like recurrent urinary tract infections, evidence of renal scarring, and/or reduced renal function. **Results:** 142 infants were prenatally diagnosed with hydronephrosis; 38.7% (n =55) of hydronephrotic (HN) kidneys required surgical intervention, including 6.8% of kidneys diagnosed with mild HN, 28.6% of those diagnosed with moderate HN, and 64.6% of those diagnosed with severe HN. Patients with severe HN were 12.2 times more likely to require surgery than patients with mild HN, and 2.9 times more likely to require surgery than patients with moderate HN. Additionally, moderate HN patients were 4.3 times more likely to require surgery than mild HN patients. Median age at surgery was 11.8 months among patients with mild HN (IQR 11.7–14.1 months), 6.6 months among patients with moderate HN, and 5.4 months among patients with severe HN (3.7–12.4 months). Postnatal surgical intervention was required among 67.3% (n = 35) of kidneys with severe HN, and patients received surgery at a median of 3.2 months of age (2.7–10.4 months). **Conclusion:** With our experience in our centre, we have concluded that the severity of Antenatal Hydro Nephrosis correlated with increased likelihood of postnatal surgical intervention. Continued follow up of patients with prenatal HN must be made mandatory.

INTRODUCTION

Hydronephrosis is a descriptive term to define the swelling of one or both kidneys. Hydronephrosis occurs as a result of renal pelvis and/or calyces enlargement. Hydronephrosis diagnosed prior to infant's birth is termed as antenatal hydronephrosis (AHN). It is one of the most common antenatally detected anomalies by ultrasound.^[1] and is observed in one to five percent of pregnancies.^[2,3] Increased prenatal screening has enabled Paediatric surgeons to

diagnose HN, follow up and make prompt surgical intervention whenever required. Renal ultrasonography (US) and voiding cystourethrogram (VCUG) are often performed postnatally to assess renal function and formulate treatment plans.

The Society for Foetal Urology (SFU) has classified HN into 4 grades based on the degree of pelvic dilation, presence of calyceal dilation, and thinning of parenchymal tissue in the kidneys.^[4] And the need at which surgical intervention is needed is still under discussion. Demographic factors like age, gender and

the presence of urinary symptoms are the various factors to be considered during the course of treatment.

After detection of HN on antenatal ultrasound, prenatal counselling with Paediatric surgeons is done in order to form appropriate management plans. Initial management would be to start antibiotic prophylaxis in neonates with AHN in order to reduce the risk of urinary tract infections (UTIs),^[5] which is followed by monitoring with serial ultrasound of KUB to assess the progression and potential resolution of HN. While current literature shows resolution of majority of the cases with medical management,^[1,3,6] other studies have reported varying findings regarding the percentage of patients requiring surgery. A recent review showed that there is complete resolution of antenatally-diagnosed HN without any surgery in about 33 to 70% patients.^[7] Discrepancies in the rates of patients may vary depending on HN severity between populations.^[8-13] Variation in the proportion of patients with antenatally diagnosed HN requiring surgery after birth may pose difficulty in explaining the prognosis of the patient to antenatal mothers during prenatal counselling. Various surgical indications in antenatally diagnosed HN patients are to prevent or manage recurrent UTIs, kidney dysfunction, ureteropelvic junction obstruction (UPJO) and/or vesicoureteral reflux (VUR).^[1,6-8,3] Depending on the aetiology of hydronephrosis, various surgeries indicated include pyeloplasty for UPJO, ureteral reimplantation for VUR, and in some cases, nephrectomies for symptomatic, nonfunctional kidneys.^[7,9,13,14] The aim of this study is to assess the number and proportion of patients diagnosed with mild (SFU Grade 1 or 2), moderate (SFU Grade 3), and severe (SFU Grade 4) prenatal HN at a tertiary care centre that progress to surgery, and to assess the correlation between severity of antenatal diagnosis of HN and the probability of postnatal surgical intervention. The study results may provide guidelines to health care providers in making more accurate prenatal counselling to parents following antenatal detection of HN, explain the need for the prenatal visits, and may also aid paediatric surgeons in taking decisions regarding conservative management vs surgical intervention.

MATERIAL AND METHODS

Medical records were reviewed of all the patients diagnosed with antenatal HN by neonatologists and referred to Paediatric surgeon at our tertiary care centre during the period of 2021 and 2023. Information on antenatal HN and its severity was recorded from mothers' antenatal scans. Patients' demographic, clinical, and surgical information were similarly recorded and compared to their mothers' data. The study included patients with antenatally detected HN at the prenatal visit, who came postnatally for follow up and managed since then. as

these patients were considered to be managed conservatively. Patients were excluded if they did not survive to term. Antenatal scans were reviewed and hydronephrosis severity was classified as mild (SFU 1-2), moderate (SFU 3), or severe (SFU 4). Classifications were based on the status of the renal major or minor calyces, pelvic dilation extent, and presence of cortical parenchymal thickness.

The probability of undergoing surgical intervention was based on severity of HN classified postnatally. In patients with transient HN, specific diagnosis could not be made so regular follow-ups advised. Decision for surgical intervention was based on the clinical characteristics of the patient including history of multiple recurrent urinary tract infections, evidence of renal scarring, and/or decreased renal function. Surgical intervention included various procedures: pyeloplasty, nephrectomy, ureteral reimplantation, ureterostomy, Ureterocele incision, and posterior urethral valve fulguration. Among patients who underwent surgery, age at time of surgery was recorded. probability of surgery between patients with severe versus mild HN, severe versus moderate HN, and moderate versus mild HN were noted.

RESULTS

Overall results This study included 142 infants prenatally diagnosed with HN. Mean gestational age at first detection of hydronephrosis was 23.5 weeks, there were no significant differences in gestational age at HN detection by HN severity. Postnatally, patients were followed for a median of 0.9 years (0.8-1.8 years). The majority of patients were male (n = 96, 67.6%), and. Approximately 76.7% of patients were diagnosed with unilateral HN (n = 109), and 23.3% with bilateral HN (n = 33). Overall, 38.7% (n = 55) of hydronephrotic kidneys required surgical intervention, including 6.8% of kidneys diagnosed with mild HN, 28.6% of those diagnosed with moderate HN, and 64.6% of those diagnosed with severe HN. Of the remaining kidneys, 25 (17.6%) spontaneously resolved, and 62 (43.7%) did not yet require surgical intervention and were being conservatively managed with serial ultrasound. The need for surgery varied predominantly with antenatal HN severity. Additionally, among those patients in need for surgery, age at surgery varied by severity of HN; i.e, patients with moderate and severe HN generally underwent surgery at younger ages than patients with mild HN. Patients with severe HN were 12.2 times more likely to require surgery than patients with mild HN, and 2.9 times more likely to require surgery than patients with moderate HN. Additionally, moderate HN patients were 4.3 times more likely to require surgery than mild HN patients. Patients with severe prenatally diagnosed hydronephrosis Kidneys with severe HN accounted for 36.6% of kidneys included in the study (n = 52). Postnatal surgical intervention was required among 67.3% (n = 35) of kidneys with severe HN, and

patients received surgery at a median of 3.2 months of age (2.7–10.4 months). Of the remaining kidneys, four self-resolved and 13 were being followed conservatively. UPJO remained the most common HN-related diagnosis among patients with severe HN who underwent surgery, occurring in 82.8% (n = 29) of these patients. Other indications of HN needing surgery included posterior urethral valves (PUV), Ureterocele, ureterovesical junction obstruction (UVJO), VUR, and megaureter. Among the 55 kidneys requiring surgery, 45 underwent pyeloplasty. Additional surgical interventions included valve ablation, partial nephrectomy, cutaneous ureterostomy, vesicostomy, Ureterocele incision, ureteral reimplantation, and circumcision for recurrent urinary tract infections.

DISCUSSION

Antenatal HN is the most common antenatal anomaly detected on Ultrasound. The aim of this study was to classify the percentage of patients into mild, moderate, and severe HN who eventually require surgical intervention based on which the parents of the patients will need to be counselled regarding the prognosis of a prenatally diagnosed HN. PUJO is the most common indication for surgery in our study, but transient HN is the most overall common cause for HN.^[6]

Among patients with mild HN, 74.5% had a transient aetiology that resolved postpartum, who did not require surgical intervention. 8.5% of patients with mild prenatal HN required surgical intervention, suggesting that postnatal follow-up of patients diagnosed with mild prenatal HN making it mandatory. As with the patients with moderate HN, with transient HN did not require surgical intervention. Approximately 25% antenatally diagnosed with moderate HN required surgery. The median time for patients leading to surgery with moderate HN was 5.6 months, compared to 9.8 months in those with mild HN and 3.2 months in those with severe HN. Liu et al. noted that the rate of pathology in those with moderate prenatal HN was 45.1% (25.3–66.6).^[15] The patients with severe antenatal HN were more likely to require surgical intervention, which occurred at the earliest median time, as compared to mild and moderate groups. Almost 80% of patients with severe HN required surgical intervention due to UPJO.

Surgical interventions required for mild or moderate HN-related diagnoses, were valve ablation, vesicostomy, cutaneous ureterostomy, partial nephrectomy, and circumcision in some cases recurrent UTI's. Data from this study suggest that patients with severe prenatal HN require close postnatal follow-up and may require surgery within the first six months of life. The experience from this tertiary care centre provides proof that patients with transient HN will not need a surgical intervention usually, despite its severity. Regardless of the

severity of HN, those with moderate and severe HN do require further urologic work up apart from postnatal renal US to evaluate for other potential differential diagnoses and prevent infection or loss of renal function. Furthermore, it emphasizes the importance of prenatal counselling for close postnatal follow-up, irrespective of severity of Hydronephrosis as it is difficult to predict need for surgery or resolution of HN based on prenatal ultrasound alone. Even the patients with mild form of antenatally diagnosed HN, may have pathology that necessitates surgical intervention. However, patients who are diagnosed with prenatal HN are significantly more likely to require surgical intervention and at an early age if they are found to have severe HN. Close follow-up and adequate family counselling in those with more severe HN prenatally are warranted.

Limitations

Due to the retrospective nature of this study, various systems of classifications of HN severity were being used; like some paediatricians used SFU grades, while others used descriptions of “mild,” “moderate,” or “severe” to diagnose antenatal HN severity. Thus, there is no standard method to classify HN. Additionally, with small study population, our study is underpowered to be able to adequately stratify the severity of HN with the type of surgical procedure; however, it was possible to assess the association between increased HN severity and increased risk of surgical intervention of any type. The decision to recommend surgery was based on the patients' clinical conditions and paediatric surgeon's opinion, which may vary depending on the surgeon.

CONCLUSION

This study concludes that patients with transient HN will not need a surgical intervention usually, despite its severity. Regardless of the severity of HN, those with moderate and severe HN do require further urologic work up. Furthermore, it emphasizes the importance of prenatal counselling for close postnatal follow-up, irrespective of severity of hydronephrosis. Even the patients with mild form of antenatally diagnosed HN, may have pathology that necessitates surgical intervention. Patients who are diagnosed with severe prenatal HN more likely to require surgical intervention at an early age.

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