

## OBSTRUCTIVE UROPATHY IN NEWBORNS

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**Abstract :** One percent babies are born with varying grades of obstructive uropathy. In less than half of them surgical intervention may be necessary at the right time to protect the kidney from deterioration. Bilateral obstruction is commonly due to infravesical obstruction secondary to lesions as bladder outlet or urethra i.e., posterior urethral valves in boys and ureterocoele in girls. Majority of them are symptomatic and may require intervention in the neonatal age. The corner stone of diagnosis is a well performed micturating cystourethrogram. Endoscopic procedure under direct vision and video recording can take care of the vast majority of the lower urinary tract lesions in newborns. The commonest aetiology of upper urinary tract obstruction are pelviureteric junction obstruction and vesicoureteric junction obstruction. A pelvic diameter of more than 15 mm and ureteric diameter more than 10 mm are significant dilatation and requires serious attention. The low GFR of a newborn kidney does not allow the functional imaging to be very reliable. Accurate and serial measurement of the pelvic dilatation along with drainage studies with isotope renogram can allow an reliable assessment by one month. In a small percentage, intervention may be necessary as early as the first month.

**Key words :** Obstructive uropathy, posterior urethral valve (PUV), ureterocoele, Pelviureteric junction obstruction (PUJ obstruction).

### INTRODUCTION

Obstructive uropathy is defined as obstruction to the urinary tract in such a way that the renal function of individual kidney is at risk from deteriorating. One percent babies are born in our country with various grades of urinary dilatation and approximately half of these may need intervention<sup>1</sup>. It is important to segregate those babies who are at risk from deterioration and prevent renal dysfunction. This review paper is an attempt to introduce the physicians to common causes of obstructive uropathy in newborns, early detection and currently available technology to treat them and prevent renal damage.

The urinary tract develops in the third month of intrauterine life and the urine starts flowing at about the same time. Any obstructive disease in the urinary tract at this stage leads to changes in the urinary bladder, ureter, and kidneys depending on the level of obstruction. Progressive dilatation is a definitive evidence of significant evolving obstruction. The decision regarding the need for intervention in a baby with upper tract urinary obstruction is not an easy one as the obstruction is never absolute, however if left alone, it has the potential to lead to renal deterioration in a significant majority.

### ANTENATAL DIAGNOSIS AND INTERVENTION

In the last decade there has been ever increasing availability of antenatal fetal ultrasound being done in our country. It is important to appreciate that in fetal life, towards the third trimester the fetal urine production is as high as 30mL/hr which is 90 % of the amniotic volume. There are two implications of this knowledge, that babies with lower urinary tract obstruction have oligohydramnios and mild dilatation of the upper urinary tract (Pelvic anteroposterior diameter 5 – 10 mm) does not require any investigation other than serial US follow up. In general, earlier the diagnosis of urinary tract dilatation (<28 weeks), prognosis is poorer.

There is a popular grading system for antenatal dilatation of kidneys and ureter which is the objective system accepted by the society of fetal urology<sup>2</sup>.

The dilatation of the urinary tract reflects the level of possible obstruction. In case of infravesical obstruction, one is able to see a persistently dilated bladder with bilateral hydronephrosis. When the obstruction is at the level of vesicoureteric junction, there is hydronephro-nephrosis. However, if the obstruction is at the level of pelviureteric junction one will see only hydronephrosis. Whereas, the milder grades of dilatation in third trimester

**Table 1. :** Growing of Antinature dalation of Pelvicalycecal system

Renal image	Renal Complex Pelvis, calyces	Renal Parenchymal thickness
0	Intact	normal
1	Slight splitting	normal
2	Splitting, Pelvis within	normal
3	Wide splitting, pelvis extra renal	normal
4	Calyceal dilatation Pelvic and calyceal dilatation	thin

Grade of ureteric dilatation (UD) (I)<7 mm; (II) 7 – 10 mm ; (III)> 10 mm

may reflect minimal obstruction or fetal diuresis leading to transient dilatation, severe grades are associated with obstructive uropathy.

In a case of infravesical obstruction, the situation is far more serious than unilateral obstruction. This is because of the potential for damage to both kidneys ! Therefore, the effort to evolve prognostic criterion to predict outcome for infravesical obstruction and segregate those who need are likely to benefit from antenatal intervention has been going on. The *poor prognostic criteria* worse outcome include<sup>3</sup>.

- Dilatation before 24 weeks gestation.
- Moderate/severe hydronephrosis (Pelvis AP dia > 10 mm).
- Thick walled bladder with oligohydramnios.
- Echobright renal cortex with microcystic changes.
- Fetal urine NA > 100 meq/L, Cl >90 meq/L and osmolality > 210 mosm/L.

Whereas, for obvious reasons in unilateral obstructive uropathy there is no role for fetal intervention, those babies who have evidence of bilateral dilatation need a much more serious evaluation in a dedicated centre. If the evaluation suggests a poor outcome the parents may exercise the option of terminating pregnancy. Fetal intervention is available in select centres world wide in the form of vesico amniotic shunt and even direct cystoscopic ablation of posterior urethral valves<sup>4,5</sup>. However, majority of the centres have not been able to demonstrate a huge difference in the outcome in favour of fetal intervention. However, that should not be used as evidence to discredit the technology of fetal intervention as this has been offered to selectively only those who were going to have the worst outcome anyway ! while, the technology of fetal intervention continues to undergo continuous refinement, at present there is limited role of fetal intervention, only in those babies with bilateral obstructive uropathy and poor prognosis.

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## POST NATAL INVESTIGATIONS

The babies who are born with obstructive uropathy generally have had serial ultrasound scans and in properly performed scans the diagnosis is made before birth. However, in our country largely only screening ultrasound is done outside dedicated fetal centre. The vast majority are asymptomatic at birth unless they have associated pulmonary hypoplasia and bilateral obstructive uropathy with infravesical / urethral obstruction. The symptoms in these babies may be related to the presence of obstruction to urine flow or secondary complications like urinary infection or renal failure. The obstruction in urine flow depending on the degree and level of obstruction leading to dribbling, overflow incontinence, palpable bladder, renal lump and rarely palpable ureters. Urinary tract infection can be severe and is commoner in the first three months. The role of prophylactic antibiotics continue to be debated, however a recent large series over a ten year period has supported its use<sup>6</sup>.

In a asymptomatic baby, investigations should be started 48 – 72 hours after birth in order to allow the fetal urine production to recover from oliguric phase and serum levels to reflect the true levels in the baby. The investigations should start with an ultrasound measuring renal pelvis AP diameter and micturating cystourethrogram. If renal pelvis is less than 15 mm, no further investigation may be necessary other than US at 3 months. However, if renal pelvis measurement is greater than 15 mm a micturating cystourethrogram has to be done. If it shows vesicoureteric reflux, prophylactic antibiotic has to be used. However, if the MCU demonstrates a primary pathology like posterior or anterior urethral valves and vesicoureteric reflux is secondary, the primary pathology needs treatment. A DMSA scan should be done in either case of primary or secondary vesicoureteric reflux. If MCU does not show reflux, an isotope scan MAG3/DTPA has to be done between 4-6 weeks.

Obstruction to the urinary tract in baby can be conclusively proven on palpable lump (bladder, kidney), progressive dilatation of urinary tract, falling differential function on MAG3/DTPA over a period of observation. The other features are an initial differential function less than 35 % and dilated pelvis greater than 30 mm or recurrent urinary tract infection with dilated and slow draining systems. The correlation of a pelvis with greater than 50 mm pelvis alone versus need for surgical intervention based on fall of differential function was 100 % in the largest published series<sup>7</sup>. Therefore, in a case of PUJ obstruction with pelvic dilatation larger than 30 – 50 mm, there may be need for intervention earlier than three months.

## MANAGEMENT OF NEONATAL OBSTRUCTIVE UROPATHY

### *Infravesical Obstruction*

The most serious symptoms in neonatal period are produced by significant infravesical obstruction. This leads to dribbling micturition, palpable abdominal lump, septicaemia, dyselectrolytaemia, features of acute renal failure and palpable abdominal lump.

The common lesions in a newborns producing these symptoms in newborns include posterior urethral valve, ureterocoele. Rarely, anterior urethral valve, congenital urethral stenosis, syringocoele, urethral diverticulum, urethral atresia can produce similar symptoms. The initial management of all these conditions is insertion of a urethral catheter, assessment of biochemical parameters and intravenous antibiotics. If the metabolic and infective parameters reverse with these simple measures, the current management includes cystoscopic ablation of valves, deroofting ureterocoele or syringocoele depending on the diagnosis. The diagnosis is based on a good voiding cystourethrogram done under intravenous antibiotic cover.

The technical feasibility of doing a satisfactory clearance of obstruction endoscopically is dependent on the size of urethra. Usually, a 3 kg baby

has a urethral caliber which allows a neonatal resectoscope to be safely negotiated and obstruction relieved satisfactorily. However, if the baby is smaller than term, that can be difficult and in that case a cystoscope with straight working channel with cold knife could be used. The use of any other instruments as in the past and continuing even now in many centres for the want of appropriate instrumentation has lead to a lot of morbidity seen in older children. In current day and age one can video record all the neonatal endoscopic procedures and that is the surest way of ensuring that appropriate treatment for the pathology has been done. It is reproducible and can be used to compare with future findings. All babies must undergo a check cystoscopy at three months to ensure that adequate clearance has been done.

The resolution of the pathology is suggested by the improvement of symptoms, but the follow up must include radiological evaluation and biochemical tests. For example, in a baby with posterior urethral valve a pre and post ultrasound evaluation can tell the reduction in bladder wall thickness, post voiding residue, and dilatation of upper tract. Similarly, endoscopic deroofting of ureterocoele, diverticulum etc requires careful follow up and delayed reconstruction in 50 % of the babies who undergo endoscopic management in the neonatal period<sup>8</sup>.

In a small but significant proportion it is not possible to relieve obstruction by endoscopic technique or because of the associated bladder neck hypertrophy. Under those circumstances it may be necessary to temporarily divert the urine at the level of the bladder called vesicostomy. Although, initial studies raised concerns about harmful effects on the function of bladder more recent studies have failed to show any ill effects.

In fact, there should be no hesitation in considering vesicostomy in the interest of long term safety of the baby<sup>9</sup>.

However, if a baby continues to have a raised serum creatinine level or persistent urosepsis there may be a case for high diversion. In some units, one would consider a percutaneous nephrostomy before going on to high ureterostomy.

### *Vesicoureteric junction obstruction*

This is a rather uncommon abnormality in a newborn and characterised by unilateral or bilateral hydroureteronephrosis. In a case of hydroureteronephrosis, if there is no vesicoureteric reflux seen than the probable diagnosis intervention include symptoms, diameter of ureter (>10 mm) differential function <35% or fallen by 10% during the period of observation.

In a newborn, ureteric reimplantation is associated with a very high failure rate in case if obstructed megaureters. Therefore, one can try endoscopy, dilatation and insertion of DJ stent; the same procedure can be done with much higher success rate by open technique. However whereas this certainly can take the baby and the kidney through, the risk of insertion with foreign body remains. The other alternative is lateral or end ureterostomy.

### *Pelviureteric junction obstruction*

This is one of the commonest obstructive uropathy in newborns. However a very small proportion of those who have antenatal diagnosis of pelviureteric junction obstruction actually will need intervention. The pelviureteric junction obstruction can be due to an actual atresia/stenosis at PUJ, high insertion of ureter, anteriorly crossing vessels etc.

Whereas, the vast majority do not need intervention, there are a few who may need intervention if the pelvic AP diameter has progressed to higher than 40-50 mm with an obstructed curve and differential function of less than 35%.

In these cases in our hospital the protocol is to do a retrograde pyelogram, DJ stenting and Anderson Hynespyeloplasty. Unless there is poorly developed parenchyma, the post operative results are worth all the efforts in doing the procedure in newborn period.

The Apollo experience (2004-2007) with neonatal obstructive uropathy

is outlined in the accompanying Table 2.

**Table 2:** Apollo experience with neonatal obstructive uropathy 2004 – 2007 (n = 49)

Diagnosis		
<i>Bladder outlet obstruction</i>		
Posterior urethral valve	17	
Ureteroceles		07
Anterior urethral valve	01	
Congenital urethral stenosis		01
Dysfunctional voiding	03	
<i>Vesicoureteric junction obstruction</i>		
<i>Pelviureteric junction obstruction</i>	15	
Follow up results 15 PUJ		01-36 months
		Mean = 12
Death due to renal failure		
Living with renal failure	01	
Fall in differential renal function	03	
Improvement in Diff renal function	05	
No significant change	05	
Improvement in drainage		10
Growth of cortical matter		10
Success defined as stable differential renal function or improvement, reduction in pelvic dilatation, improvement in drainage and increase in cortical thickness 10/15.		

Pelviureteric junction obstruction can be severe enough in a small proportion of babies to require intervention early. The outcome of surgery in newborn is dependant on the quality of renal parenchyma, length of the obstructing segment, quality of surgery and feasibility of DJ stenting.

## CONCLUSION

Neonatal obstructive uropathy is one of the commonest cause of reversible urosepsis and renal failure in newborns. The symptoms are more

pronounced if there is infravesical obstruction or obstruction in a single functioning system. The corner stone of diagnosis of infravesical obstruction is a micturating cystourethrogram.

The vast majority with obstructive pathology below the bladder can be managed by a neonatal resectoscope (9 F) or a cystoscope and cold knife (7.5 F). The babies who undergo such treatment must have a check at 3 months for improvement in clinical symptoms and radiological sign with reversal of biochemical parameters. A small proportion will need temporary urinary diversion.

Vesicoureteric junction is not common. However, in case it warrants intervention, it is usually temporary and definitive repair is done at one year.

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