

Surgical Management of Uretero-Pelvic Junction Obstruction in Pediatric and Adolescent Patients based on CECT Findings.

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Abstract

Purpose of this study is to evaluate the role of CECT (Contrast Enhanced Computer Tomography) for planning Surgical Management of ureteral pelvic junction obstruction in paediatric and adolescent patients.

Keywords : Hydronephrosis, CECT, UPJ Obstruction, Pyeloplasty.

Introduction

Hydronephrosis is defined as dilation of the renal collecting system as a result of either inadequate drainage or retrograde flow of urine often it is thought to be caused by a simple mechanical impairment. Hydronephrosis is typically detected during maternal fetal ultrasound and accounts for approximately 0.5% To 0.6% of all uropathies seen in the neonatal period [1].

In neonates with persistent hydronephrosis after birth, uretero-pelvic Junction (UPJ) obstruction is the leading cause of postnatal hydronephrosis and represent 44% of all postnatal causes of hydronephrosis [1].

There are two types of UPJ anomalies that are discovered at the time of surgical exploration, the first is the extrinsic type typically related to mechanical factors such as crossing vessels, adhesive bands, arterio-venous malformation and fetal folds. Extrinsic factors create an abrupt angulation by kinking or compressing the UPJ which leads to obstruction of urine flow and progressive hydronephrosis. The clinical significance of crossing vessels is attributed to the lower success rate of

endopyelotomy when they are present and associated with high grade hydronephrosis [2, 3].

The second most common UPJ anomaly is the intrinsic type classically known as the 'adynamic' segment. An intrinsic type anomaly interferes with the peristaltic wave necessary for transporting a bolus of urine into the distal ureter and hence causes hydronephrosis. Histologically, they are deficient in circular muscle fibres which tend to be disorganised and dysmorphic.

CECT may depict uretero-pelvic Junction obstruction when it is used as a primary study for evaluating common presenting symptoms.

CECT provides superior anatomic delineation of the urinary tract system. The use of intravenous contrast material offers some degree of functional information. CT scan reliably reveals existing hydronephrosis and the chronicity of obstruction may be correlated with renal cortical thinning it is particularly useful for diagnosing acquired UPJ obstruction such as those caused by stones or extrinsic compression.

Thus we conducted this study to evaluate the role of CECT in planning surgical treatment for uretero-pelvic junction obstruction.

Materials and Methods

The study was conducted in the paediatric surgery division of surgery department in GSV Medical College,

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Kanpur a tertiary care Institute. It is a prospective observational study from January 2009 to December 2017.

Inclusion Criteria

Age- 3 months to 18 years.

Unilateral hydronephrosis.

UPJ obstruction.

Exclusion Criteria

Age < 3 months and > 18 years.

Bilateral hydronephrosis.

Other causes of unilateral hydronephrosis like structural anomalies.

Total 700 patients were assessed initially in the study with typical urinary complaints viz recurrent UTI, back or flank pain, haematuria, palpable abdominal mass, failure to thrive, facial puffiness. All patient underwent routine blood investigations (CBC Serum-Creatinine, BUN, Serum-electrolytes), X-ray KUB, USG- KUB. CECT done only in unilateral hydronephrosis.

Out of the 700, only 80 patients had unilateral hydronephrosis so remaining 620 patients were excluded from the study & in the remaining 80 patients only 30 patients had a UPJ obstruction so only these 30 patients were further included in the study.

The patients were properly hydrated and parents were requested to keep the child nil per orally for solids for last 4-6 hours prior to the procedure. Infants and younger children who were difficult to control during the procedure were sedated using lorazepam (1 in 10 dilution of normal saline) used intravenously by a paediatric resident. A plain CT abdomen was first obtained to visualise the radio-opaque structures followed by injection of 1.5 ml/Kg Body weight of Ultravist-300 (Non Ionic, Iopromide injection) intravenously.

After injection a delay of 3 minutes observed and subsequently a film was taken which was comparable to a Nephrogram. Thereafter, abdominal binder/ corset was applied and films were taken after 10 and 15 minutes. If the entire urinary tract was not visualised in 15 minutes study time was extended to 30 minutes.

The child was taken out of the gantry after the procedure and Inj. Avil (Chlorpheniramine) 1 amp i.v. stat given to prevent any allergic manifestation to the dye. No oral contrast was used during the procedure.

The reports were interpreted with special focus on the cortical thickness, status of contra lateral kidney and delay in dye excretion from the renal pelvis and the status of

urinary tract distal to UPJ obstruction.

Based on cortical thickness on CECT, patients underwent either nephrectomy if cortical thickness were less than 1 mm or kidney sparing surgery if cortical thickness were more than or equal to 1 mm.

In case of kidney sparing surgery patient either underwent dismembered pyeloplasty or flap technique depending on the anatomy of renal pelvis in association with other intraoperative findings. Tissue excised during pyeloplasty was sent for histopathological examination.

Results

Out of 80 patients of unilateral hydronephrosis UPJ obstruction was cause in only 30 patients.

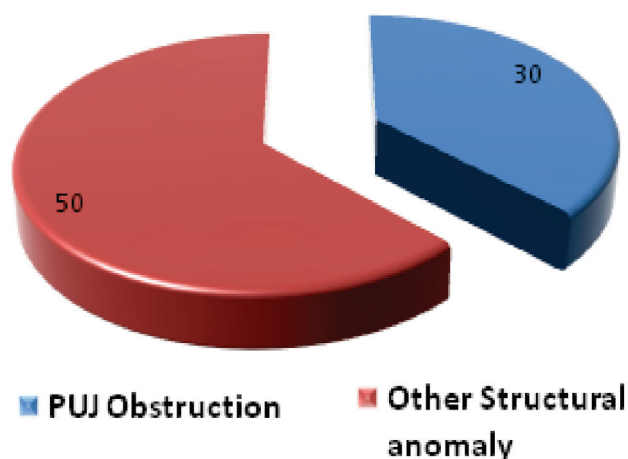


Fig. 1: Incidence of PUJ obstruction in unilateral hydronephrosis (n=80)

Out of 30 patients of UPJ obstruction 22 were male patients while 8 were female patient that shows a clear male preponderance.

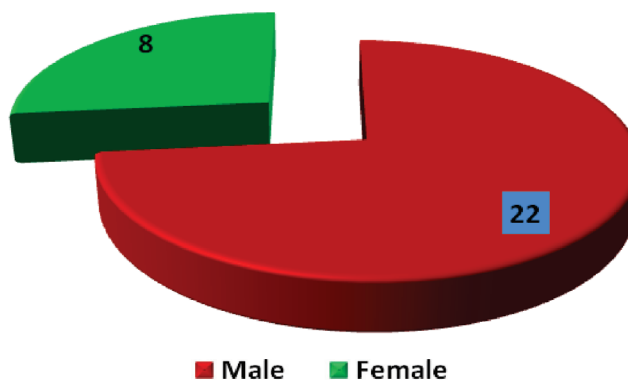


Fig. 2: Sex distribution of PUJ obstruction Patients (n=30)

Following table showing complaints at presentation in patients of UPJ obstruction, commonest was a palpable abdominal mass followed by fever and burning micturition. Poor Urinary stream and haematuria were the least common symptoms.

Complaints	No. of patients (Percentage)
Fever	20 (66.6 %)
Poor stream/dribbling	03 (10 %)
Palpable abdominal mass	25 (83.3 %)
Failure to thrive	16 (53.3 %)
Vomiting & pain abdomen	12 (40 %)
Burning micturition	20 (66.6 %)
Facial puffiness	05 (16.6 %)
Haematuria	03 (10 %)

22 (73.3%) patients of UPJ obstruction had obstruction at left Pelvic-Ureteric Junction while other 8 (26.6%) patients had right pelvic-ureteric junction obstruction, which shows a left side preponderance.

Among aetiologies of UPJ obstruction Intrinsic cause was most common, in which after histopathological examination circular muscle layer was found to be deficient

Cause	No. of patients (Percentage)
Intrinsic/Primary	16 (53.3 %)
Stones impacted at PUJ	10 (33.3 %)
Crossing vessels	03 (10 %)
Intraluminal polyp	01 (3.3 %)

In 2 patients Renal cortex was found to be < 1 mm while in rest of the 28 patients it was more than 1 mm. Hold up of dye in renal pelvis was prolonged (>10 min) in all cases.

CECT FINDINGS	No. of patients (Percentage)
Renal cortex < 1 mm	02 (6.6 %)
Renal cortex > 1 mm	28 (93.3 %)
Renal Pelvis AP diameter >5cm	20 (66.6 %)
Renal Pelvis AP diameter <5cm	10 (33.3 %)
Dye hold-up in pelvis<10 min	0 (0 %)
Dye hold-up between 10-15 min	05 (16.6 %)
Dye hold-up in pelvis>15 min	25 (83.3 %)

Based on CECT findings and intraoperative findings 2 patient underwent nephrectomy while 28 patients underwent dismembered pyeloplasty.

Discussion

UPJ obstruction is a blockage that occurs in the area that connects the renal pelvis (part of kidney). UPJ obstruction generally occurs when a baby is still growing in the womb. Most of the time blockage is caused when the connection between the ureter and renal pelvis narrows, this causes urine to build up, damaging the kidney. The condition can also be caused by a blood vessel located in the wrong position over the ureter. In older children and adults UPJ obstruction can be due to scar tissue, infection and previous treatments for a blockage or kidney stones.

It is the most frequently diagnosed cause of urinary obstruction in children. It is now commonly diagnosed during prenatal ultrasound studies. In some cases the condition isn't seen until after birth, children may have an abdominal mass or a urinary tract infection. In the paediatric age group it is the most common cause of upper urinary tract dilatation accounting for 80% of all dilated collecting system identified antenatally by ultrasonography. A significant number of these dilated systems will require intervention eventually some patients may not present with functional obstruction until adulthood.

Now- a-days CECT serve as state-of-the-art technique for evaluating many abdominal diseases. Although CECT offers many advantages for assessing patients with UPJO, there are some limitations and disadvantages. These include exposure to radiation and use of intravenous contrast material which may lead to dreaded complication like anaphylaxis and nephrotoxicity and hence we excluded bilateral hydronephrotic patient from our study. The incidence of crossing vessels in UPJO is 32–79%; The clinical significance of crossing vessels is attributed to the lower success rate of endopyelotomy when they are present and associated with high grade hydronephrosis [2-6]. Although in our study we didn't do any endopyelotomy though it is really helpful to know about the status of crossing vessels for preventing catastrophic events during surgeries.

The 3-dimensional helical CT is reliable in detecting ureterovascular hydronephrosis preoperatively and in presenting better operative methods for ureteropelvic junction obstruction [6].

Chertin B et al reported in their study that right sided UPJ obstruction was seen in 32% of cases and left sided UPJ obstruction was seen in 68% of cases[7], similar results were seen in our studies which shows a left side preponderance.

In most of the studies male to female ratio was 2-3:1 [7, 8] and our results were not different with male to female ratio being 2.75:1 thus we can see a male preponderance.

El-Nahas AR et al used helical CT in their study & showed that hyperdense renal stones were detected in precontrast images in 25% patients, significant crossing vessels in 55% patients and anterior malrotation of the renal pelvis in 38% of patients [9]. We find stones as PUJ obstruction in 33.3% cases while crossing vessel were only 10 percent in our study as UPJ obstruction.

Conclusion

In India where the gold standard investigations like nuclear scanning are either too expensive or conspicuous

by their absence, in such situations there is rising need for cheaper, easily available investigations to establish general consensus among surgeons and radiologists for the correct operative guidelines and thus we conclude that CECT can be helpful in deciding surgical management of uretero-pelvic junction obstruction by providing better anatomical delineation pre-operatively.

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Ethics:	There is no ethical violation as it is based on voluntary anonymous interviews
Funding:	No external funding
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