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A Study to Evaluate the Outcome Following Anderson Hynes Pyeloplasty in Hydronephrosis Patients with Cummings Stent and D-J Stent

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Abstract: Introduction: *Ureteropelvic junction obstruction (UPJO) is the most common cause of prenatally diagnosed hydronephrosis and accounts for nearly half of all prenatally[1] detected uropathies .The incidence of UPJO is high & often leads to development of hydronephrosis that is dilation of renal collecting system.*
Materials and methods: *This study was conducted in the Department of Paediatric Surgery, Medical College & Hospital, Kolkata from April 2014 to August 2015. All patients (Age 2-12 years) admitted in paediatric surgery ward for Anderson Hynes pyeloplasty for Hydronephrosis due to pelvi-ureteric obstruction in Medical College Hospital, Kolkata. Medical records including OPD tickets, BHTs for relevant history & chemical examination, reports of previous & current investigations (biochemical, hematological, microscopical & radiological investigations as stated above).*
Results:
The mean hospital stay was lesser in DJ stent group (8.4±2.13) compared to Cummings stent group (11.4±0.68), not only in respect to primary admission, but also including readmission for cystoscopic stent removal. The incidence of complications was also fewer in Cumming stent group. Stent migration and urinary tract infection (UTI) were more associated with DJ stent (2 each) than Cumming stent (0 each). However, dysuria was more in case of cumming stent (2 patients) than DJ stent (1 patient).
Conclusion: *The mean hospital stay in DJ stent insertion is less even if duration for cystoscopic removal is considered. The complication of stent removal and UTI are more with DJ stent though dysuria is more in case of Cummings stent.*
Key Words: *Anderson-Hynes pyeloplasty, Cumming stent, DJ stent, Hydronephrosis, Uretero-pelvic junction obstruction*

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I. Introduction

Ureteropelvic junction obstruction (UPJO) is the most common cause of prenatally diagnosed hydronephrosis and accounts for nearly half of all prenatally[1] detected uropathies .The incidence of UPJO is high & often leads to development of hydronephrosis that is dilation of renal collecting system.

Though it has been seen that one in five neonates[1] with prenatal diagnosis of hydronephrosis will demonstrate spontaneous resolution but those with uretero pelvic junction obstruction usually pose a challenge to physicians.

The cause of UPJO remains largely unknown, except for a small group in which crossing vessels have been considered etiological.Koff[2] described two types of UPJ obstruction, intrinsic and extrinsic, mainly these variants are found at the time of surgical exploration. The most common UPJ obstruction is the intrinsic type, classically called adynamic variety. When put under histological examination these portions are deficient in circular muscle fibers [3], which tend to be disorganized and dysmorphic. A narrowing of the UPJ is often found, but whether this is a result of developmental arrest or of incomplete recanalization of the ureter is not yet known.

At the time of surgical intervention a narrowed probe patent part of ureter at UPJ is found. It may occur due to interruption in the development of the circular musculature of the UPJ as demonstrated by Murnaghan, 1958 [4] or an alteration of the collagen fibres and compositions between and around muscle cells. Intrinsic obstruction at UPJ may be caused by valvular muscular folds, persistent fetal convolutions and upper ureteral polyps. Besides an aberrant, accessory, or early-branching lower pole vessel may obstruct ureter extrinsically.

The treatment of children with apparent UPJ obstruction is controversial and before 1980 UPJ obstruction was an incidental finding for those being evaluated for abdominal pain or urinary tract infection [1]. But in recent era pre-natal ultra sonography is detecting dilated urinary tract before development of symptoms [5].

One group suggests following up the asymptomatic patients non-operatively by monitoring their renal function [8, 9]. Other study goes against this modality since the patients are already having radiological evidence of urinary flow obstruction [10, 11].

Almost all the reports that go in favour of non-operative management of UPJ obstruction are based on differential renal function obtained from the diuretic renogram. But this differential renal function is extremely variable [12]. So, the significance of differential renal function is uncertain and its uncertainty has been proved by several investigators [13].

II. Materials And Methods

STUDY AREA: Department of Paediatric Surgery, Medical College & Hospital, Kolkata
STUDY POPULATION: All patients (Age 2-12 years) admitted in paediatric surgery ward for Anderson Hynes pyeloplasty for Hydronephrosis due to pelvi-ureteric obstruction in Medical College Hospital, Kolkata
STUDY PERIOD: April 2014 to August 2015
SAMPLE SIZE: 20 patients in each group, Cummings Stent group and DJ stent group
SAMPLE DESIGN:
Consecutively selected with inclusion criterion of all patients with UPJO without any syndromic association
Inclusion Criteria: Patients with Hydronephrosis due to pelviureteric junction obstruction in paediatric age group (2 to 12 years of age)
Exclusion Criteria: Patients with Vesico-ureteric reflux, Redo-pyeloplasty, Hydroureteronephrosis or associated any other cause of distal obstruction or renal pathology

METHODS OF DATA COLLECTION:
Medical records including OPD tickets, BHTs for relevant history & chemical examination, reports of previous & current investigations (biochemical, hematological, microscopical & radiological investigations as stated above).

EXPERIMENT DESIGN:
Interventional study. Study group was assessed clinically, radiologically and microbiologically. Serum levels of urea, creatinine, USG abdomen, IVU, VCUG, renal isotope scan, urine for routine & microscopical examination and urine for culture and sensitivity, RE of blood, temperature measurement were done in all cases in order to assess the morbidity. Moreover hospital stay, cost of treatment of each patient was noted.

STATISTICAL ANALYSIS:
Appropriate statistical technique was applied using available statistical software
CONFLICT OF INTEREST:
None declared
STUDY TOOLS:

- All patients with UPJ obstruction admitted in our institute in the above mentioned period was clinically examined systematically.
- All patients underwent routine blood investigation, renal function test and coagulation profile and urine examination.
- All patients included in this study underwent radiological investigation-USG KUB (**figure 1**).
- SFU USG Grading- Grade I- slight splitting of central renal complex, normal renal parenchyma, Grade II- evident splitting of central renal complex and pelvis dilatation confined within renal border, normal renal parenchyma, Grade III- wide splitting of central renal complex, pelvis dilated outside renal border with dilated calices, normal renal parenchyma, Grade IV- wide splitting with pelvis dilated outside renal border with dilated calices which may appear convex, renal parenchymal atrophy.

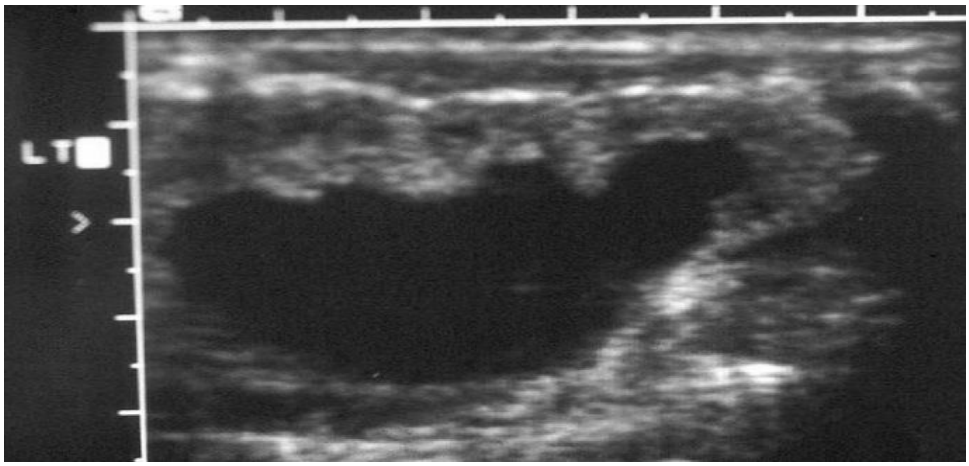


Figure 1- Showing left sided severely hydronephrotic kidney.

All patients in this study with a abnormality in the USG KUB underwent an isotope renogram (figure 2) & IVU (figure 3).

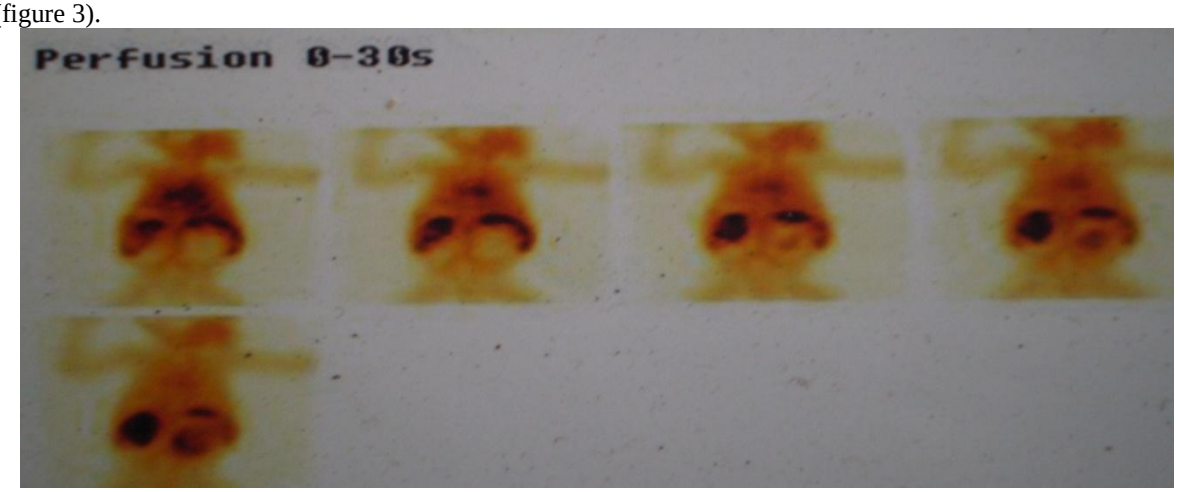


Figure 2a- showing an obstructed right kidney with poor tracer uptake.

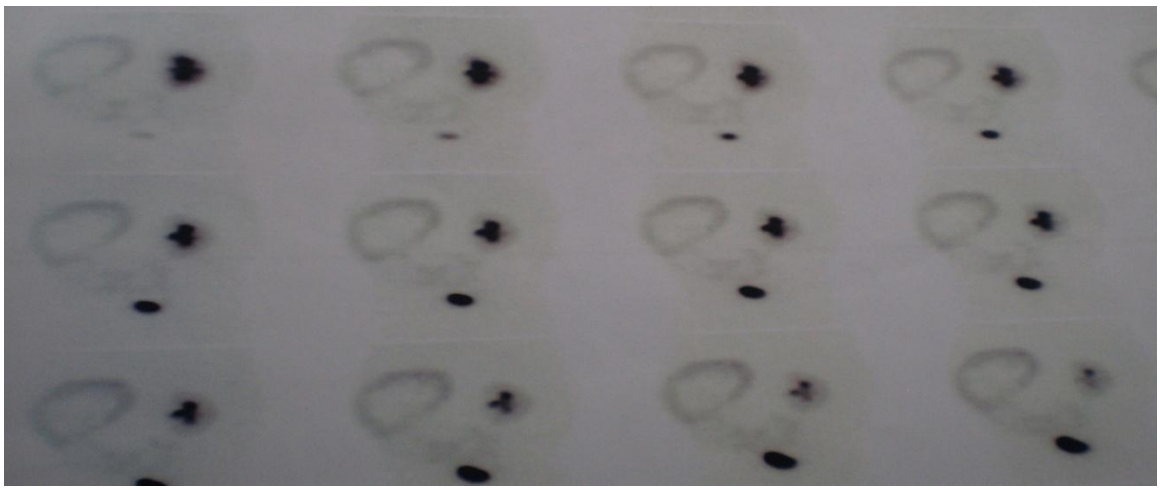


Figure 2b- Showing an obstructed left kidney with PUJ obstruction.

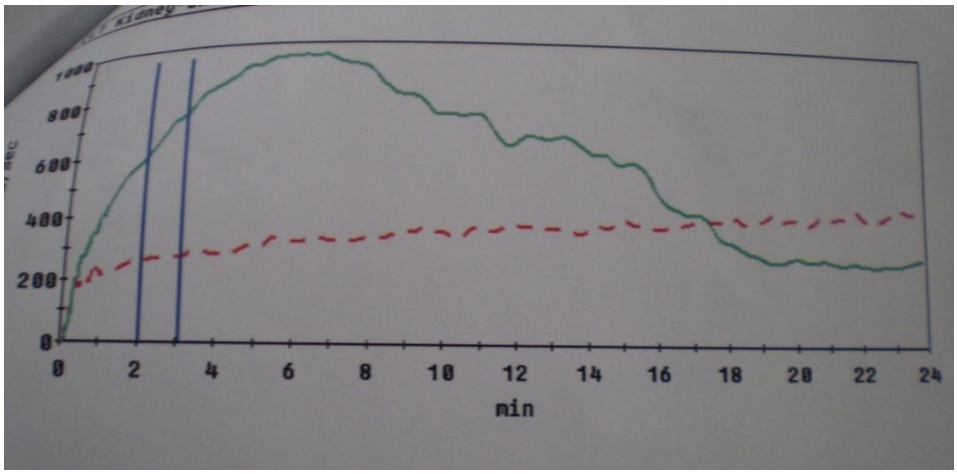


Figure2c- Showing delayed washout of isotope in left kidney due to PUJ obstruction.

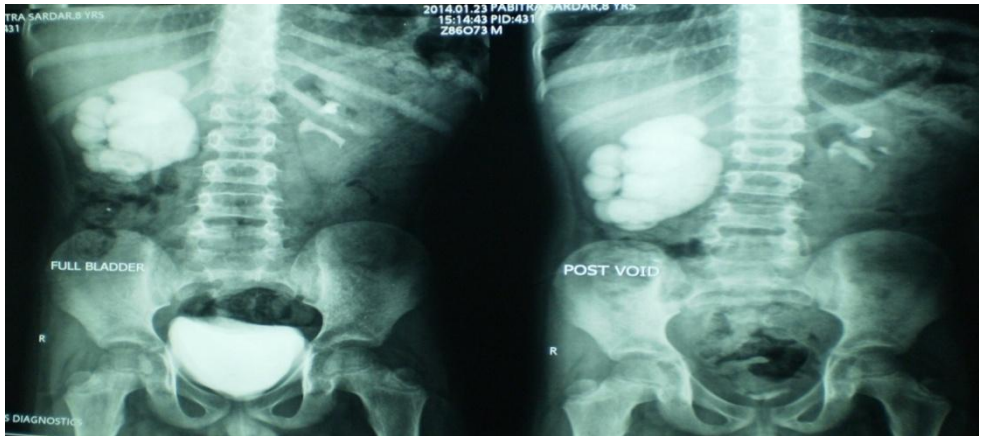


Figure3- Showing PUJ obstruction in right kidney and there is non excretion of dye on left side.

All patients who fulfilled the criteria for surgery underwent anesthetic check-up.

- Indications for surgery were –
- ➢ All symptomatic patients e.g. flank pain, recurrent urinary tract infection, haematuria, renal lump.
- ➢ Asymptomatic patients with-
  - o Differential renal function <40%
  - o Half time on diuretic renal scintigraphy >20min
  - o Progressive deterioration of affected kidney status on serial investigations.

Cummings Stent

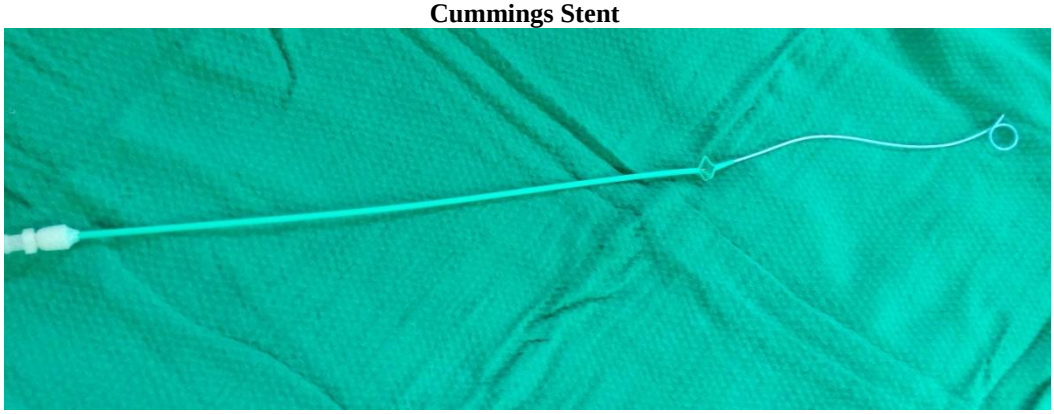


Figure 4a

It's a combination of simultaneous nephrostomy tube and trans-anastomotic stent. The distal blue coloured curly portion acts as trans- anastomotic stent and its diameter is of 4 Fr. and length is 20 cm, suitable to use for children aged 2-12 years. Cummings stent is not available in various diameters. That is why this stent is

not suitable to use for children less than 2 yrs. This portion is placed in the ureter and passed to the urinary bladder through Vesico ureteric junction. The middle fenestrated portion (Malecot) acts as nephrostomy tube and it is placed in the dilated pelvis. Proximal wide bore green coloured tube is passed through the renal parenchyma and the skin and acts as a nephrostomy tube. The diameter of this proximal tube is 8 Fr. and length is 30 cm.

DJ Stent

Figure 5

This is conventional DJ stent. Usually 4 Fr. diameter is used in children aged between 2-12 years. Length of DJ stent varies according to the length of ureter which is determined by the distance from tip of 11th rib to ipsilateral pubic tubercle. Available in 12, 14, 16, 18, 20, 22, 24 and 26 cm lengths. It is placed in trans-anastomotic site in ureter and passed to the urinary bladder through Vesico ureteric junction. DJ stent is also available in various diameters like 3 Fr, 3.5 Fr, 4 Fr, 5 Fr and above. That is why this stent can be used for children from 2 months to 12 years and above.

This was a prospective study of 40 patients with UPJO, divided into 2 groups consecutively, each consisting of 20 patients. All patients underwent open Anderson-Hynes pyeloplasty. Cummings stent were given in one group for drainage and conventional DJ stent were used for other group.

Children aged 2 to 12 years of either sex; having obstructed drainage pattern on renal dynamic scan (DTPA) and intravenous urogram with unilateral obstruction were included. Patients were admitted a day prior to surgery and informed consent taken including discussion about both methods of diversion. Rough estimate of the required length of DJ stent was determined by measuring the distance from the tip of the 11th rib to ipsilateral pubic tubercle in centimetres.

Anderson-Hynes pyeloplasty was performed through an anterolateral extra peritoneal flank incision. After dissecting out the pelviureteric junction the dismembered pyeloplasty was done. Conventional DJ stent was passed distally to the bladder and placed at transanastomotic site as a stent in one group of patients. On the other hand, the distal curly portion of the Cummings stent was placed in the bladder as the same process like DJ, the middle fenestrated Malecot like portion, which acted as nephrostomy tube, was kept in the dilated pelvis and the wide bore proximal tube was kept outside the parities after piercing it through the renal parenchyma. Perinephric tube drain was placed in all the patients before closure of the abdomen.

Insertion of Cummings stent (Figure6a to 6f)

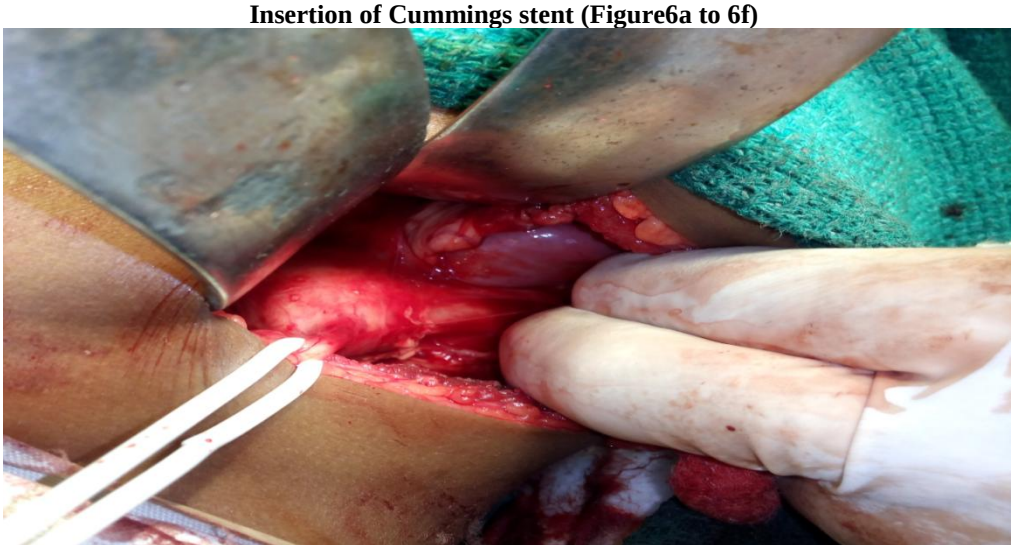


Figure 6a

Figure 6b

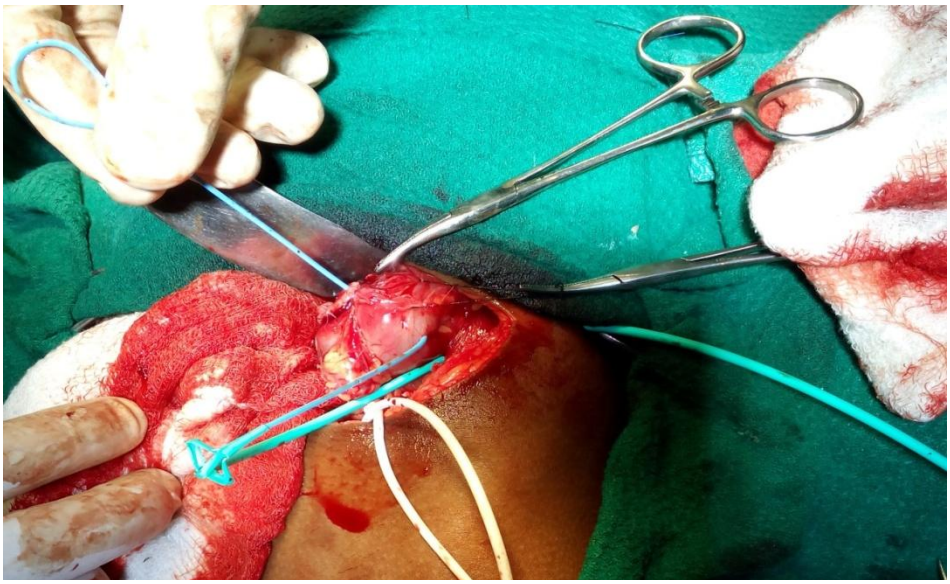


Figure 6c

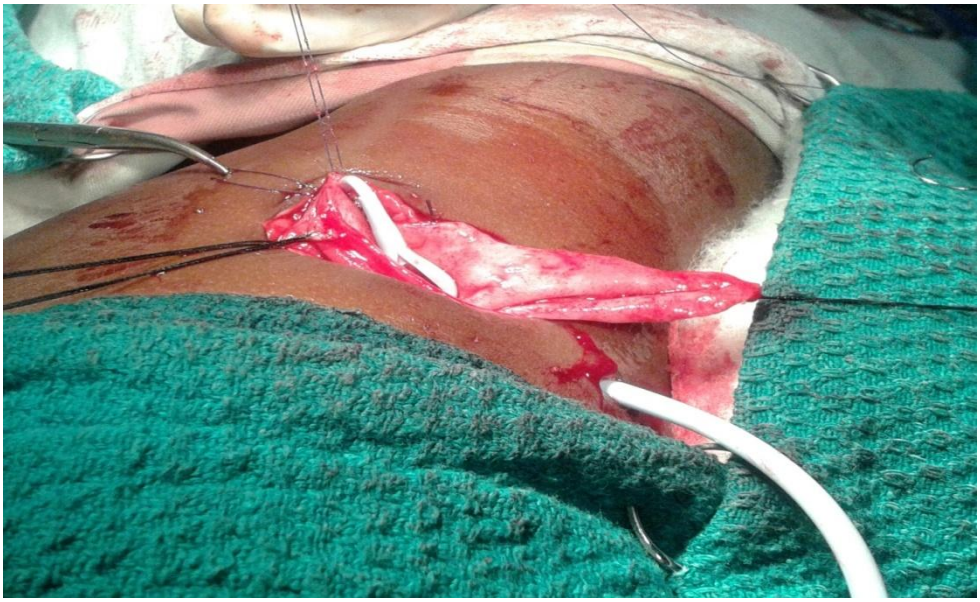


Figure 6d

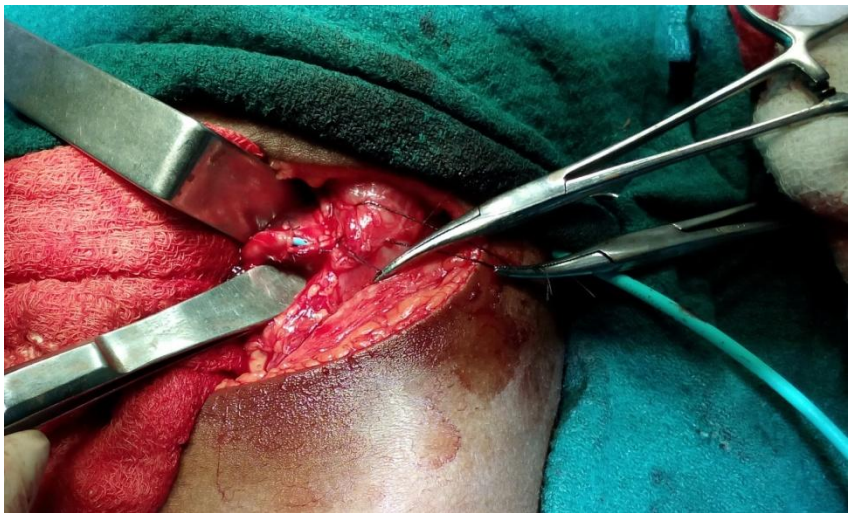
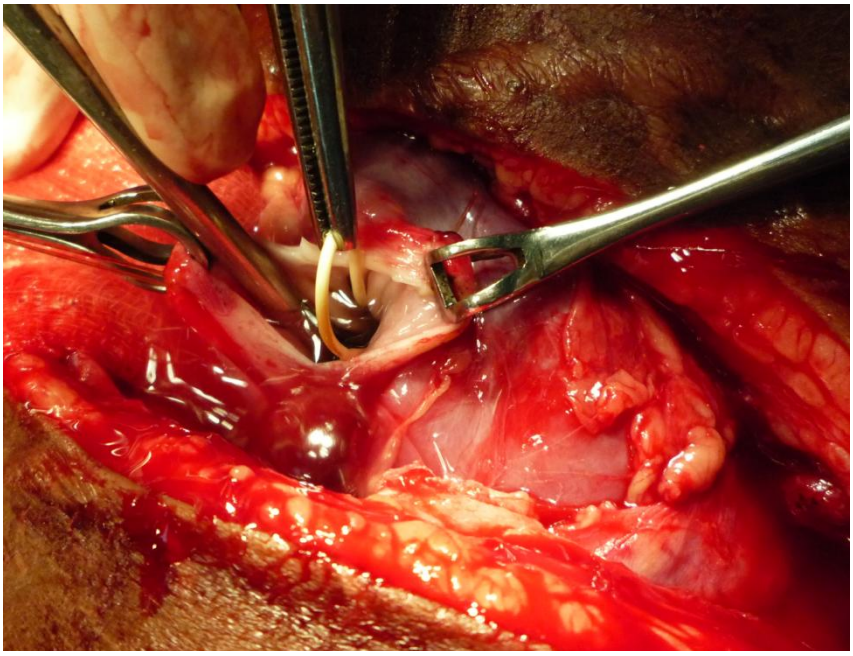


Figure 6e

Figure 6f

Insertion of DJ stent



Post operative analgesia and antibiotics were provided as required. Patients with DJ stent were discharged after adequacy of oral food tolerance and removal of perinephric drain, usually by 5 days with oral antibiotics.

In first few postoperative days, urine collected in nephrostomy tube bag in patients with Cummings stent. But with time it dried up in 6^{th}-7^{th} post operative day. The stent was removed after the drain dried up usually on 8^{th} post operative day and was discharged after removal of perinephric drain usually on 10^{th} post operative day. In case of persistent nephrostomy tube drainage, tube was clamped periodically, if the patients had no pain or discomfort and no increase in perinephric drainage volume, the stent was removed usually after 2 days of clamping.

Patients were followed up in OPD one week after discharge. Uro-prophylaxis was stopped one week after discharge in Cummings stent group. Antibiotic prophylaxis was continued in DJ stent group till they re-admitted for cystoscopic DJ stent removal usually after 4 to 6 weeks. And that time average hospital stay of DJ stent group was 2 to 3 days. Again prophylactic antibiotics were given to DJ group after stent removal for at least 7 days.

III. Results

Age group wise distribution of Cummings and DJ stent: Mean age group for Cumming Stent was 7±2.86 years and that for DJ stent was 5.45±2.91 years (Figure 1).

Age Group (Yrs.)	Cummings Stent	D-J Stent
2-4	3	6
4-6	4	5
6-8	4	4
8-10	5	3
10-12	3	1
12-14	1	1

Figure 1: Distribution of Cumming stent and D-J stent age group wise

Mean Age Cummings stent: 7 ± 2.86

Mean Age D-J stent: 5.45 ± 2.91

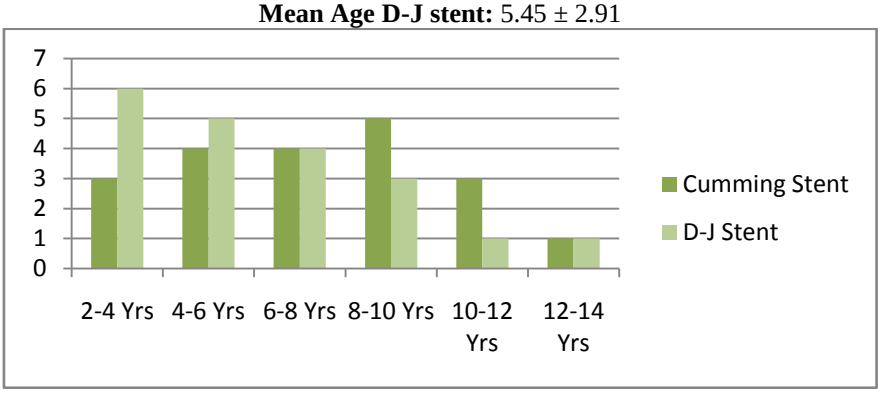
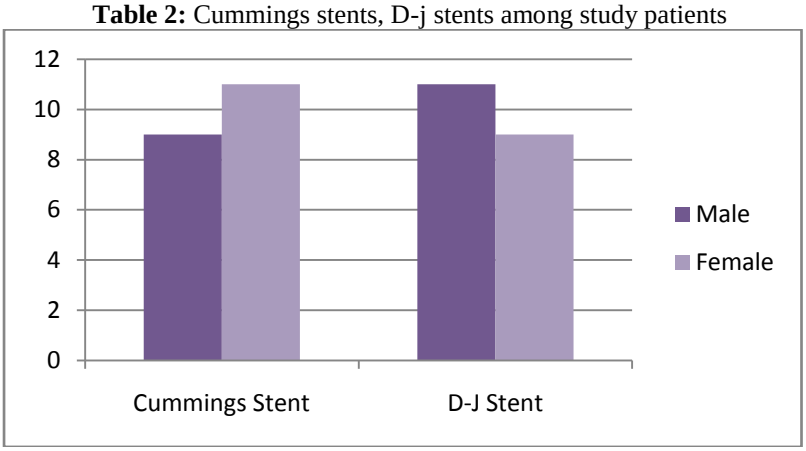


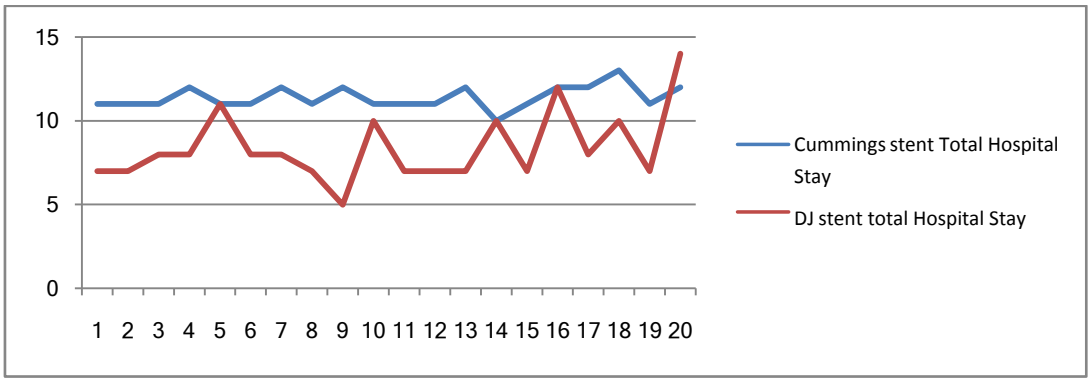
Table 2: Distribution of Cumming stent and D-J stent age group wise

Sex	Cummings Stent	D-J Stent
Male	9	11
Female	11	9

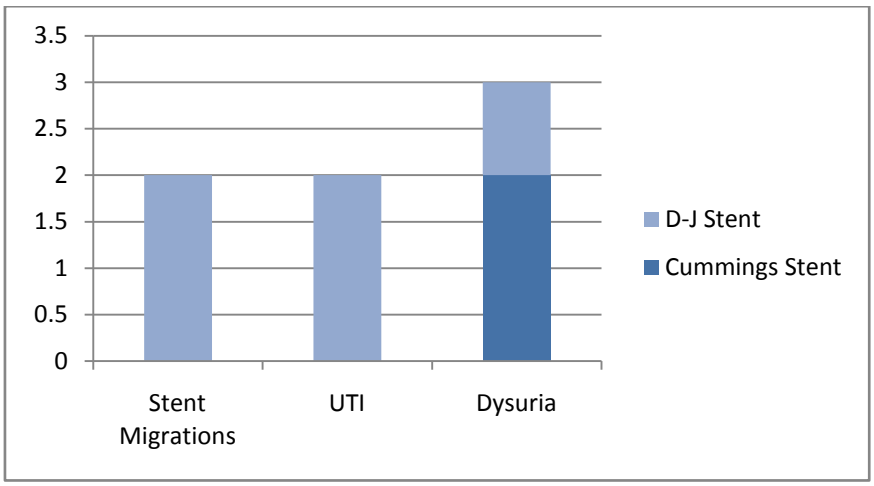
Table 2: Cummings stents, D-j stents among study patients



Mean Hospital Stay (Days)	Cummings Stent	D-J Stent
	11.4 ± 0.68	8.4 ± 2.13



Complications	Stent Migration	UTI	Dysuria
Cummings Stent	0	0	2
D-J Stent	2	2	1



IV. Discussion

The Anderson-Hynes dismembered pyeloplasty, the most commonly used type of repair for UPJO hydronephrosis was first described as a stentless procedure.* Over the years, drainage techniques were added as perianastomotic leakage of urine and infection were thought to be the cause of stenosis or stricture formation requiring re-operation. Drainage tubes may be external, e.g. nephrostomy tube; completely internal, e.g. DJ stent; or partly external and partly internal, e.g. Salle stent* and Cummings stent.

Problems are associated with all types of drainage procedures. This can occur during insertion, especially in small children*. We were unable to negotiate the UVJ while inserting the DJ stent in a 2 yrs. old patient for whom we did no stent technique (this patient was excluded from the study). A gentle traction of the ureter from above to straighten the UVJ has been found to be helpful*.

DJ stent can cause mechanical irritation of the bladder of the bladder trigone. McMullin et al. noticed urinary urgency in 11.1% patients*. Braga et al. noted bladder spasm symptoms in 2.9% patients requiring early stent removal in some because of severity of symptoms*. Though in our study, we did not encounter this problem in both the groups.

V. Conclusion

Morphometric features of transverse and sigmoid sinus with other superficial landmarks is essential during posterlateral approaches to the posterior cranial fossa. The measurements of asterion with other bony landmarks provide database for the clinical-surgical practice and also for forensic and anthropological application

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