

# Revisiting Vertical Flap Pyeloplasty in Pelviureteric Junction Obstruction: A Case Series

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## ABSTRACT

Pelviureteric Junction Obstruction (PUJO) can cause recurrent Urinary Tract Infections (UTIs), pain, and loss of renal unit function. Surgical intervention is often required, and numerous treatment strategies have been employed. Vertical flap pyeloplasty was initially described as the technique of choice in PUJO patients with the large box-shaped extra-renal pelvis and longer segment strictures (usually >2 cm). In the present case series, 11 patients underwent vertical flap pyeloplasty for PUJO with a large extra-renal box-shaped pelvis. Demographic, perioperative, and follow-up data were recorded. Success was defined as symptomatic improvement and an improvement in early Diethylenetriamine Pentaacetate (DTPA) renogram at six months. In the present series, all 11 patients showed an improvement in Glomerular Filtration Rate (GFR) with an average improvement of 11.9 mL. The procedure was technically easier, less time-consuming, and produced acceptable results. Vertical flap pyeloplasty could be considered as a practical, technically easier, and effective treatment option in PUJO with a large extrarenal pelvis and long segment strictures.

**Keywords:** Diethylenetriamine pentaacetate, Extra-renal pelvis, Glomerular filtration rate

## INTRODUCTION

The PUJO may be defined as a functional or anatomical obstruction of urine flow from the renal pelvis to the proximal ureter, resulting in symptoms or renal damage. PUJO can cause pain and recurrent UTIs due to Hydronephrosis (HDN), and it can eventually lead to loss of renal unit function. It can present at any time, from foetal life to infancy, childhood, or early or late adulthood. It does not characterise a solitary anatomical unit but rather a set of obstructive processes resulting from numerous aetiological factors [1]. Congenital Ureteropelvic Junction (UPJ) obstruction is most often a result of an intrinsic process, specifically the presence of an aperistaltic segment of the ureter [2]. PUJO can be classified into two types based on aetiology: congenital or acquired. Congenital cases are usually present since birth but may manifest at any time from childhood through adulthood. Acquired cases are often due to urological procedures, especially endourological surgeries for renal stone diseases, or they may be a sequelae of the inflammatory process. It can also be classified based on whether the cause is extrinsic or intrinsic. Extrinsic cases are usually due to lower polar vessels, and dismembered pyeloplasty is the treatment of choice, while intrinsic cases usually involve a developmental defect in the pelviureteric junction causing obstruction [2,3]. There is a variety of surgical procedures available for the correction of PUJO, including open, endoscopic, laparoscopic, and robotic techniques. The role of surgery in PUJO was first established by Trendelenburg, who performed the first-ever reconstructive surgery in 1886 [4]. The first successful dismembered pyeloplasty was performed five years later, but the technique was prone to strictures [5]. Following the description, open dismembered pyeloplasty became the gold standard [3,5]. Scardino PL and Prince CL reported on the vertical flap technique in 1953 [5]. It utilises a vertical flap to reconstruct the PUJ in PUJO cases with a large extrarenal pelvis. PUJ ischaemia, missed crossing vessels, and restenosis can occur in 18%-50% of cases [2,5,6]. Most of these complications and treatment failures occur within the first one and a half years following the surgery [2,5-7].

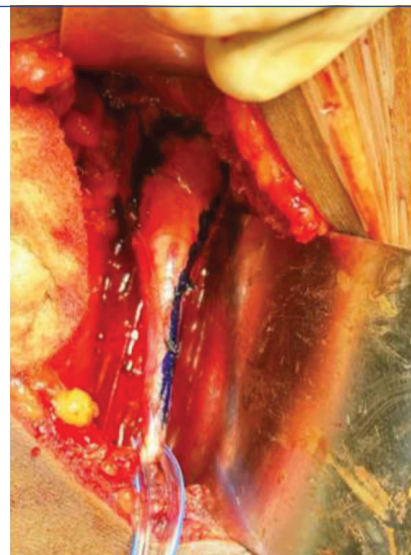
## CASE SERIES

Vertical flap pyeloplasty was initiated in the Department of Urology at Nil Ratan Sircar Medical College and Hospital, Kolkata, West Bengal, India, in January 2021. The present series includes patients

who reported to the Institution for at least six months post-surgery. Patients with at least 15% renal function, an obstructive curve on preoperative DTPA scan, and a large box-shaped extra-renal pelvis in preoperative imaging were selected. The final decision was based on on-table Retrograde Pyelography (RGP) and intraoperative findings.

The patients ranged in age from five years to 52 years, with six females and six males. All patients presented with either flank pain or recurrent fever. Preoperative renal function was normal for all patients, and they underwent preoperative anatomical evaluation by Contrast Enhanced Computerised Tomography (CECT) urography. Two of them underwent the laparoscopic procedure, while the rest underwent open vertical flap pyeloplasty.

During the procedure, after dissection of the renal pelvis, the strictured part was identified. A vertical pelvis flap was raised, starting at the side of the renal lower pole and extending beyond the strictured segment [Table/Fig-1,2]. The medial edge of the flap was sutured with the lateral edge of the PUJO segment. A DJ stent was placed, and the remaining flap was positioned over it [Table/Fig-3,4]. Intraoperative data, such as operative time, any complications, and the ease of



[Table/Fig-1]: Outline of flap.



[Table/Fig-2]: Flap raised.



[Table/Fig-3]: DJ stent placement.



[Table/Fig-4]: Completion of the procedure.

surgery, were recorded. Immediate postoperative complications, if any, were documented. The DJ stent was removed after six weeks, and patients were followed-up monthly with clinical examination, renal function tests, and Ultrasonography (USG) every six months, with a DTPA scan three months after DJ stent removal. All data were documented and analysed along with the preoperative findings.

The operative time for open surgery ranged from one hour and 15 minutes to two hours and 30 minutes, with an average time of 1.5 hours and a standard deviation of 0.62. Two laparoscopic procedures were performed, with an average operative time of 3.5 hours. Postoperative DTPA scans were conducted three months after DJ stent removal. Diuretic DTPA scans were performed following the FO protocol, administering the diuretic and starting the scan simultaneously. The improvement in percent function and GFR of the affected side was reassessed. All patients demonstrated improvement in percent fraction and GFR compared to preoperative values. The average GFR improvement was 11.9 mL.

One patient developed recurrent fever two weeks after DJ stent removal. On USG, they were found to have HDN. RGP was performed, but no anatomical obstruction was observed. A DJ Stent had been placed, and this patient is currently under close follow-up. No other patients experienced flank pain or fever after the surgery. Routinely, USG was conducted in all patients postoperatively after DJ stent removal. At three months, three patients showed mild HDN on USG but remained asymptomatic. No other patients exhibited symptoms or abnormalities on imaging.

## DISCUSSION

The UPJ obstruction is likely the most common congenital abnormality of the ureter [8,9]. Although the problem is congenital, it may not become apparent until later in life. Intermittent flank pain with nausea and/or vomiting is a frequent presentation. Traditionally, repair of UPJ obstruction is performed using either dismembered pyeloplasty or non-dismembered flap pyeloplasty. Dismembered pyeloplasty involves dividing and re-anastomosing the ureter, while non-dismembered flap pyeloplasty involves making an incision along the length of the stenosis, creating a broad flap from the renal pelvis, and subsequently anastomosing this flap [8,9].

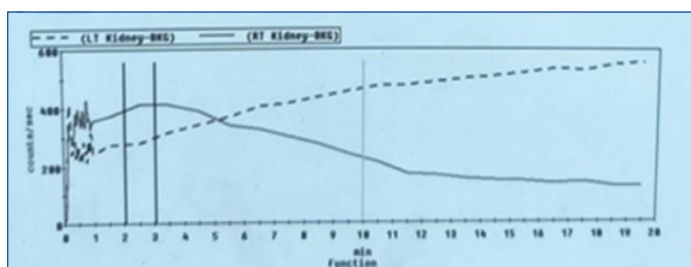
In the present case series of 11 patients, vertical flap pyeloplasty required less operative time and less handling of the ureter, leading to successful outcomes [Table/Fig-5]. There are not many studies comparing dismembered and non-dismembered pyeloplasty techniques. Kamal H and Kshetrapal K, conducted a comparative study between vertical flap pyeloplasty and non-dismembered pyeloplasty in 22 patients [10]. The average operation time was 30 minutes shorter in the case of vertical flap pyeloplasty, and blood loss was significantly reduced. Vertical flap pyeloplasty also showed promise for cases where pyeloplasty could not be performed. Among the 11 patients, all showed improvement in GFR, with an average improvement of 11.9 mL [Table/Fig-6]. [Table/Fig-7] displays the preoperative DTPA scan of a patient with left PUJO showing an obstructive curve, while the postoperative DTPA scan demonstrates curve improvement. Han C et al., described the

S. No.	Age/sex	Preoperative imaging (CECT)	Preoperative DTPA	Operation	Postoperative DTPA
1.	40/Male	Right-sided moderate HDN	Rt- 20.7%, 24.3 mL Lt- 79.3%, 93.4 mL	Laparoscopic pyeloplasty (R)	Rt- 30.5%, 35.4 mL Lt- 65.5%, 76.4 mL
2.	23/Female	Rt-sided moderate HDN	Rt- 26.7%, 15.88 mL Lt- 73.3%, 43.59 mL	Laparoscopic pyeloplasty (R)	Rt- 30%, 20.5 mL Lt- 70%, 42.2 mL
3.	29/Male	Gross HDN left kidney	Rt- 75.5%, 78.8 mL Lt- 24.5%, 25.6 mL	Open flap pyeloplasty (left)	Rt- 64.5%, 79 mL Lt- 35.5%, 39 mL
4.	34/Male	Moderately dilated pelvicalyceal system (L)	Rt- 67.54%, 66.84 mL Lt- 32.46%, 32.12 mL	Open flap pyeloplasty (left)	Rt- 59.9%, 67.5 mL Lt- 40.1%, 42.12 mL
5.	45/Female	Thinned out renal cortex, dilated pelvis (L)	Rt- 58.85%, 74.18 mL Lt- 41.15%, 51.87 mL	Open flap pyeloplasty (left)	Rt- 50.01%, 59.37 mL Lt- 49.99%, 59.35 mL
6.	11/Female	Right-sided gross HDN	Rt- 36%, 26.5 mL Lt- 64%, 67 mL	Open flap pyeloplasty (right)	Rt- 42%, 37.6 mL Lt- 58%, 60 mL

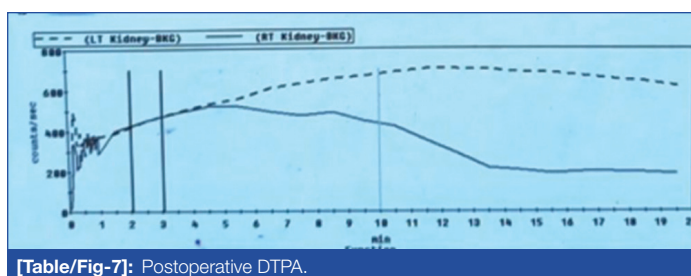
7.	41/Male	Gross HDN in right kidney	LK absent, RK- GFR 23.36 mL	Open flap pyeloplasty (right)	Rt- 31 mL
8.	14/Female	Right-sided grossly dilated PCS	Rt- 45%, 44 mL Lt- 55%, 51 mL	Open flap pyeloplasty (right)	Rt- 55.49%, 62 mL Lt- 44.51%, 49.48 mL
9.	48/Male	Left-sided grossly dilated PCS	Rt- 74%, 76.9 mL Lt- 26%, 27.1 mL	Open flap pyeloplasty (left)	Rt- 67%, 77 mL Lt- 33%, 38.1 mL
10.	22/Male	Gross right-sided HDN	Rt- 19.6%, 17.23 mL Lt- 80.4%, 70.8 mL	Open flap pyeloplasty (right)	Rt- 25.5%, 30.5 mL Lt- 74.5%, 67.9 mL
11.	54/Male	Left-side gross HDN	Rt- 75.5%, 86 mL Lt- 24.5%, 32.3 mL	Open flap pyeloplasty (left)	Rt- 59.6%, 84 mL Lt- 30.4%, 42 mL

**[Table/Fig-5]:** Table comparing all the patients undergoing vertical flap pyeloplasty.

results of robot-assisted laparoscopic pyeloplasty using long flaps in 13 patients, with a follow-up of 36 months. They showed significant improvement in split renal function in all patients, from 37%±5 to 46%±2 at six months after surgery [11]. Then the flap pyeloplasty was founded to be technically easier, less time-consuming, and capable of producing satisfactory results.



**[Table/Fig-6]:** Preoperative DTPA.



**[Table/Fig-7]:** Postoperative DTPA.

Since the ureter is handled less, the risk of devascularisation is reduced. Nowadays, vertical flap pyeloplasty is not widely practiced, as most centres are more familiar with the dismembered technique. Further studies are needed in this area, as vertical flap pyeloplasty was found to be a viable alternative to traditional dismembered

pyeloplasty, yielding comparable or even better results. Long-term follow-up is also necessary to observe future outcomes.

## CONCLUSION(S)

Vertical flap pyeloplasty is technically easier, less time-consuming, and suitable for longer strictures, while producing comparable results.

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