COMPARATIVE STUDY OF DISMEMBERED AND NON-DISEMEMBERED PYELOPLASTY

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ABSTRACT: Ureteropelvic Junction Obstruction is a disease of newborns although it is manifested in later years of life in many cases. Various modalities for management of UPJ Obstruction are available today ranging from time tested open dismembered pyeloplasty to Robot assisted laparoscopic pyeloplasty. Various minimally invasive procedures in forms of endopyelotomy (both ante-grade and retro-grade), laparoscopic pyeloplasty, and robot assisted laparoscopic pyeloplasty are available for the urologist to choose from. In less advanced centers with little or no minimally invasive procedures availability, both in terms of lack of equipment and skilled surgeon open pyeloplasty remains the gold standard in management of ureteropelvic junction obstruction. Ever since its introduction by Anderson & Hynes dismembered pyeloplasty is preferred worldwide due to its universal application and excellent success rates. Non dismembered techniques of pyeloplasty are considered useful only in specific conditions. Increased vascularity of the anastomotic segment due to incomplete resection is very helpful for better outcome. This study aims to compare the outcome of dismembered pyeloplasty with non dismembered pyeloplasty (when not contraindicated). If the results obtained are comparable then it could be assumed that when not contraindicated non dismembered pyeloplasty can be considered in place of dismembered pyeloplasty to utilize the advantage of having better blood supply at the site of anastomosis.

Obstruction of the urinary tract can occur during fetal development, childhood, or adulthood. The point of obstruction can be as proximal as the calyces and as distal as the urethral meatus. The cause of obstruction may be congenital or acquired and benign or malignant. The impact of the obstruction is influenced by the extent or degree of obstruction (partial or complete, unilateral or bilateral), its chronicity (acute or chronic), the baseline condition of the kidneys, the potential for recovery, and the presence of other mitigating factors such as urinary infection. These may ultimately lead to permanent renal damage, which may result in limiting the excretion of metabolic wastes and altering water and electrolyte balance.

AIMS & OBJECTIVES: A comparative study of dismembered and non dismembered pyeloplasty is done with following aims and objectives.

- Access the advantages and disadvantages of both techniques
- Advantages of keeping a JJ stent in situ for 4 weeks post operatively
- Whether a per operative nephrostomy is essential or not
- Limitations of Dismembered and Non Dismembered Flap Pyeloplasty

MATERIAL AND METHODS: The study was conducted in Dhiraj General Hospital attached to S.B.K.S Medical College from October 2010 to August 2012. For this study the number of patients selected were 12 each from both dismembered and non dismembered groups. Patients with

previous history of pyeloplasty on the same side, secondary stones along with ureteropelvic junction obstruction, bilateral disease, patients who underwent nephrectomy and those who showed vesico ureteric reflux were excluded from the study.

All patient underwent open pyeloplasty. The decision to choose the type of pyeloplasty was taken on the bases of presence of crossing vessels on pre-operative imaging studies and intra-operative findings. Data was collected as per proforma and analyzed; patients were followed up for 6-8 weeks.

RESULTS AND ANALYSIS: Median age of our patients at time of surgery was 20.21 ± 12.50 . The majority of patients were male (79.2%, n = 24) and 58.3% (n = 14) had right sided disease. There were none of complications in early post-operative period: four required pre-operative per cutaneous nephrostomy. There was only one case of recurrence with the need of reoperation. Comparing pre-operative and post-operative imaging results, we found that 91.67% had normal renal function, 8.33% diminished but better than before.

DISCUSSION AND CONCLUSION: When not contraindicated, non dismembered pyeloplasty can be considered in place of dismembered pyeloplasty to utilize the advantage of having better blood supply at the site of anastomosis and ability to gain adequate length of the flaps, in spite of the fact that roughly around 25% of adynamic segment is kept in situ. Keeping the JJ stent in situ for 6 weeks is helpful in obtaining favorable results from both dismembered and non dismembered pyeloplasty. Full antibiotic coverage should be given for 3 weeks followed by three weeks of chemo prophylaxis to prevent infection in view of the presence of JJ stent Per-operative Nephrostomy is not essential for successful pyeloplasty

KEYWORDS:

- ✓ Ureteropelvic junction
- ✓ Ureteropelvic junction obstruction
- ✓ Dismembered Pyeloplasty
- ✓ Non dismembered pyeloplasty

INTRODUCTION: Ureteropelvic Junction Obstruction is a disease of newborns although it is manifested in later years of life in many cases. Various modalities for management of UPJ Obstruction are available today ranging from time tested open dismembered pyeloplasty to Robot assisted laparoscopic pyeloplasty. Various minimally invasive procedures in forms of endopyelotomy (both ante-grade and retro-grade), laparoscopic pyeloplasty, and robot assisted laparoscopic pyeloplasty are available for the urologist to choose from. In less advanced centers with little or no minimally invasive procedures availability, both in terms of lack of equipment and skilled surgeon open pyeloplasty remains the gold standard in management of ureteropelvic junction obstruction. Ever since its introduction by Anderson & Hynes dismembered pyeloplasty is preferred worldwide due to its universal application and excellent success rates. Non dismembered techniques of pyeloplasty are considered useful only in specific conditions. Increased vascularity of the anastomotic segment due to incomplete resection is very helpful for better outcome. This study aims to compare the outcome of dismembered pyeloplasty with non dismembered pyeloplasty (when not

contraindicated). If the results obtained are comparable then it could be assumed that when not contraindicated non dismembered pyeloplasty can be considered in place of dismembered pyeloplasty to utilize the advantage of having better blood supply at the site of anastomosis.

Obstruction of the urinary tract can occur during fetal development, childhood, or adulthood. The point of obstruction can be as proximal as the calyces and as distal as the urethral meatus. The cause of obstruction may be congenital or acquired and benign or malignant. The impact of the obstruction is influenced by the extent or degree of obstruction (partial or complete, unilateral or bilateral), its chronicity (acute or chronic), the baseline condition of the kidneys, the potential for recovery, and the presence of other mitigating factors such as urinary infection. These may ultimately lead to permanent renal damage, which may result in limiting the excretion of metabolic wastes and altering water and electrolyte balance.

MATERIAL AND METHOD: This is a Retrospective Comparative study of 24 cases of Ureteropelvic Junction Obstruction which were treated with open pyeloplasty at Dhiraj Hospital.

The aim of the study is to compare non-dismembered pyeloplasty with dismembered pyeloplasty.

AIMS & OBJECTIVES: A comparative study of dismembered and non dismembered pyeloplasty is done with following aims and objectives

- Access the advantages and disadvantages of both techniques
- Advantages of keeping a JJ stent in situ for 4 weeks post operatively
- Whether a perioperative nephrostomy is essential or not
- Limitations of Dismembered and Non Dismembered Flap Pyeloplasty

INCLUSION CRITERIA: Patients included in this study were those who had

- UPJ obstruction

EXCLUSION CRITERIA: Patients excluded from this study were

- B/L UPJ Obstruction
- Stone disease with UPJ Obstruction
- Who required nephrectomy
- UPJ Obstruction with VUR
- Previous history of pyeloplasty on the same side

EVALUATION AND MANAGEMENT: Once the patient was selected for study, information was obtained via

- ✓ Meticulous history of the patient was obtained and then detailed clinical examination undertaken.
- ✓ All patients were subjected to the routine investigations and special investigations that included CT - IVU.
- ✓ After confirming the diagnosis on IVU patients were posted for open pyeloplasty with JJ stenting.
- ✓ Patients showing no excretion of dye on IVU were advised radio-isotope renal scan.

- ✓ According to pre-operative imaging techniques and intra operative findings decision was taken for selecting the type of pyeloplasty to be done.
 - The Foley Y-V-plasty was selected for repair of a UPJ obstruction secondary to a high ureteral insertion
 - The Scardino-Prince vertical flap technique was used only when a dependent UPJ was situated at the medial margin of a large, square extra renal pelvis.
 - Spiral flap was selected for relatively long areas of proximal ureteral obstruction with the ureteropelvic junction are already in a dependent position.
 - Andersons & Haynes dismembered pyeloplasty was done in cases where crossing blood vessels were suspected on pre operative imaging studies and were confirmed in intra-operative findings.
- ✓ Antibiotics based on culture and sensitivity pattern & analgesics and anti-inflammatory drugs were continued for 7 days.
- ✓ Following the surgery retro-peritoneal drain was removed once urine leak was ruled out and drain output was less than 10 ml / 24 Hours.
- ✓ PUC was removed 24 hours after removal of retro-peritoneal drain if no flank fullness noted.
- ✓ Patients were discharged the following day

FOLLOW UP PROTOCOL OF THE STUDY: Patients were asked to follow up after 6 weeks.

On follow up apart from general clinical examination patient was evaluated with

- Ultrasound
- CT - IVU
- Radio-isotope scan (when pre operative radio-isotope scan was performed)

RESULTS AND ANALYSIS: Age distribution of patients

- Youngest patient in our study was 1 month old while the oldest one was 45 years old.
- Most patients under the age 10 were chosen for non dismembered pyeloplasty while patients between the age group 11-20 were chosen for dismembered pyeloplasty.
- Maximum number of our patients were below the age of 20 at the time of presentation.
- Only one patient above the age of 40 was noted.

Sex distribution of patients

- Maximum of patients in our study were male.
- All the patient under the age of 10 were males
- The only patient above the age of 40 was female

Symptoms

- About 90% of patients complained of pain at the time of presentation
- Nausea and or vomiting was the prime complain of many patients
- 75% patients who underwent dismembered pyeloplasty had presented with Nausea and or vomiting as their main complaint.
- Loss of weight was seen in only one of the total 24 patient analyzed.

Side distribution: Side distribution of patient was almost equally divided with right side having slight dominance with 58.3% incidence. Among the patients chosen for Non- dismembered pyeloplasty 66% were operated on the right side.

Pre-operative per cutaneous nephrostomy

- Pre-operative PCN insertion was not part of the protocol for the study however total 4 patients required it due to one of the indications
- Among the patients who required pre-operative PCN insertion 75% were later chosen for dismembered pyeloplasty.
- Only one patient who was chosen for non dismembered pyeloplasty was later operated with one of the flap technique.

Grade of Hydronephrosis on intra-operative findings

- Maximum patients in this study were found to have grade 5 hydronephrosis
- 60% of patients with grade 5 hydronephrosis were ultimately treated with dismembered pyeloplasty
- Lowest number of patients had grade 3 hydronephrosis among them only one underwent dismembered pyeloplasty
- Grade 4 hydronephrosis was found in 9 patients which were almost equally divided between dismembered and non dismembered pyeloplasties

Stricture segment length

- In the current study 11 patients were seen with stricture segment length more than 1 centimeter
- Among the cases with stricture length more than 1 centimeter 58% underwent non dismembered pyeloplasty
- Total number of patients with short stricture length were 13 and 66.7% were chosen for dismembered pyeloplasty

Position of insertion of ureter on intra-operative findings

- None of the patient with high insertion of ureter were chosen for dismembered pyeloplasty
- 12 cases with normal insertion of ureter were operated with dismembered pyeloplasty technique
- Among the total non dismembered pyeloplasties 33.3% had high ureteral insertion

Post-operative urine analysis

- Significant amount of pus cells were present on post-operative microscopic urine examination in 54.2% of cases
- Presence of significant pus cells in microscopic urine examination post-operatively was almost equally divided between dismembered and non dismembered pyeloplasty with slight elevation (58.3%) in the dismembered pyeloplasty group

GRADE OF HYDRONEPHROSIS IN CT IVU:

- All the patients who were included in this study had pre-operative grade of hydronephrosis of four or higher on CT IVU with one exception of grade 3 hydronephrosis
- Patients chosen for dismembered pyeloplasty were maximum (91.67%) having grade 4 hydronephrosis on pre-operative CT IVU
- Most cases(75%) taken up for non dismembered pyeloplasty had grade 4 hydronephrosis on pre-operative CT IVU
- Among the cases selected for non dismembered pyeloplasty one each had grade 3 and grade 5 hydronephrosis
- 91.67% of cases showed no hydronephrosis on follow up CT IVU when treated with dismembered pyeloplasty
- Only one patient treated with non dismembered pyeloplasty had grade 2 hydronephrosis on follow up CT IVU

Radio Isotope Renal Scan

- Radio Isotope Renal Scan was conducted in 16.67% of cases
- All patient who were advised renal scan were asked to do a follow up scan as well
- 75% of cases who had to undergo radio isotope renal scan were later treated with non dismembered pyeloplasty
- One patient who underwent radio isotope renal scan was considered for dismembered pyeloplasty showed almost 70% increase on follow up scan

DISCUSSION AND CONCLUSION: Technologic advances have significantly improved both the diagnostic and therapeutic alternatives available in the contemporary management of upper urinary tract obstruction. Furthermore, making an accurate diagnosis of obstruction can also be challenging. The treatments for upper tract obstruction range from ureteral stent placement to complex procedures involving ileal interposition or autotransplantation. Myriad skills are required for total surgical management of upper urinary tract obstruction. Not surprisingly, endourology, laparoscopy, and robotics are more prominent in the surgical management of upper urinary tract obstruction. As a result of the wide array of available treatments, the practicing urologist must have an understanding of the indications and risks of all the options.

Open dismembered pyeloplasty has withstood the test of time with its excellent results. With advances in technology various minimally invasive techniques for management of ureteropelvic junction obstruction have been developed. Despite excellent results, widespread acceptance of the laparoscopic dismembered Anderson-Hynes pyeloplasty is hampered by its steep learning curve^{1, 2, 3}. Laparoscopic non- dismembered pyeloplasty techniques, although simpler, have not matched the results of AH^{2, 3, 4}. The advantages of endo urologic approaches include reduced hospital stays and postoperative recovery. However, the success rate does not approach that of open, laparoscopic, or robotic pyeloplasty⁵. Furthermore, whereas open, laparoscopic, or robotic pyeloplasty can be applied to almost any anatomic variation of UPJ obstruction, consideration of any of the less invasive alternatives require that the surgeon take into account the degree of hydronephrosis, ipsilateral renal function, concomitant calculi, and possibly the presence of crossing vessels. Of note, Albani and colleagues (2004) reported contemporary long term results with various endopyelotomy

approaches to have a success rate of 67%, with the majority of failures in the first 32 months. More recently, DiMarco and colleagues (2006) reported long-term follow-up of more than 400 patients undergoing either percutaneous ante grade endopyelotomy or pyeloplasty. The 3-, 5-, and 10-year success rates were superior for pyeloplasty, 85% versus 63%, 80% versus 55%, and 75% versus 41%. Moreover, Rassweiler and colleagues (2007) compared retrograde laser endopyelotomy with laparoscopic retroperitoneal pyeloplasty in 256 patients in a 10-year single surgeon experience and found success rates were 73% for laser endopyelotomy compared with 94% for pyeloplasty⁵. The robotic-assisted laparoscopic pyeloplasty in the experimental setting was first reported by Sung and colleagues (1999). Its feasibility was subsequently confirmed with worldwide clinical application in recent years^{6, 7}. Robot-assisted Laparoscopic Dismembered Pyeloplasty for Ureteropelvic Junction Obstruction is a safe, efficacious, and viable option for either primary or secondary repair of UPJO with reproducible outcomes, a high success rate, and a low incidence of complications⁷. With steeper learning curves for newer laparoscopic, robot assisted laparoscopic pyeloplasty and endopyelotomy combined with cost factor open pyeloplasty remains the mainstay for management for ureteropelvic junction obstruction in India.

At present, most urologists in the surgical repair of UPJ obstruction prefer a dismembered pyeloplasty because this procedure is almost universally applicable to the different clinical scenarios except long and or multiple stricture segments. This approach can be used regardless of whether the ureteral insertion is high on the pelvis or already dependent. It also permits reduction of a redundant pelvis or straightening of a tortuous proximal ureter. Furthermore, anterior or posterior transposition of the UPJ can be achieved when the obstruction is due to accessory or aberrant lower pole vessels. In addition, unlike the flap techniques, only a dismembered pyeloplasty allows complete excision of the anatomically or functionally abnormal UPJ itself.

In this retrospective comparative study we have analyzed 24 cases of ureteropelvic junction obstruction which were treated with open pyeloplasty at Dhiraj Hospital. 12 cases were treated with non dismembered (flap) technique and 12 were treated with dismembered technique. The aim of the study is to compare non-dismembered pyeloplasty with dismembered pyeloplasty. Our observations and results were discussed and compared with other studies on the similar lines^{8, 9, 10, 11}.

In my study youngest patient was 1 month old while the oldest one was 45 years old. Of the patients chosen for non dismembered pyeloplasty most were from age group of 0-10 while patients who underwent dismembered pyeloplasty maximum were from the age group 11-20. Maximum of our patients were below the age of 20 at the time of presentation. Only one patient above the age of 40 was noted. Mean age of the patient at the time of presentation was higher than those seen in other studies probably due to wide spread use of antenatal diagnostic tools in advanced countries compared to India.

Maximum of patients in our study were male. All the patients under the age of 10 were males. This finding is consistent with other case series^{8, 10, 11}

In this study about 90% of patients complained of pain at the time of presentation Nausea and/or vomiting was the prime complaint of many patients. Patients who underwent dismembered pyeloplasty had nausea and vomiting as their presenting complaint.

Loss of weight was seen in only one of the total 24 patient analyzed. The symptoms of patients at the time of presentation were consistent with other case series^{8, 9, 11}.

Renal angle tenderness was seen in half of the total number of patients.

Of the 12 patient posted for dismembered pyeloplasty half had renal angle tenderness on clinical examination.

Palpable kidney was present in more than 60% of patients. Among the patients chosen for dismembered pyeloplasty 7 had palpable kidney on examination. Only 25 % of patients were found to be clinically pale while 38% patients presented with pallor in comparable case studies. Our study showed 58% patients with right side disease which defers from comparable studies which has left side predominance⁹.

Pre-operative per-cutaneous nephrostomy insertion was not part of protocol in our study however 4 patients required per-cutaneous nephrostomy. Per-operative nephrostomy insertion has been advocated in literature however none of the patients in this study required per-operative nephrostomy.

Maximum patients in this study were found to have grade 5 hydronephrosis. In this study among the patients treated with dismembered pyeloplasty, 6 had grade 5 hydronephrosis while 5 had grade 4 hydronephrosis on intra-operative findings. Only one patient treated with dismembered pyeloplasty was found to have grade 3 hydronephrosis. Patients chosen for non dismembered pyeloplasty were equally divided in form of hydronephrosis on intra-operative findings, 4 each for grade 3, 4 and 5 hydronephrosis.

In this study 11 patients were seen with stricture segment length more than 1 centimeter. Among the 12 patients selected for dismembered pyeloplasty in this study 4 had long segment stricture while 8 showed short segment stricture on intra-operative findings. 7 among the 12 selected for non dismembered pyeloplasty had long stricture segment. 5 patients who underwent non dismembered pyeloplasty showed short segment stricture. Patients were chosen for dismembered pyeloplasty were selected on the basis of presence of crossing blood vessels on pre-operative imaging findings as well as intra-operative findings.

In this study none of the patients chosen for dismembered pyeloplasty had high insertion of ureter. Among the patients operated by non dismembered pyeloplasty 33.3% had high insertion of ureter since high insertion of ureter was considered an indication for flap procedure via Foley Y-V plasty.

No major immediate or late complications were encountered in patients in this case study.

Significant amount of pus cells were present on post-operative microscopic urine examination in 54.2% of cases. Presence of significant pus cells in microscopic urine examination post-operatively was almost equally divided between dismembered and non dismembered pyeloplasty with slight elevation (58.3%) in the dismembered pyeloplasty group.

In my study the patients who were selected for dismembered pyeloplasty had grade 4 and 5 hydronephrosis on pre-operative CT IVU, maximum of which (91.67%) had grade 4 hydronephrosis on pre-operative hydronephrosis. Among the patients chosen for non dismembered technique maximum patients (75%) showed grade 4 hydronephrosis on pre-operative CT IVU while Grade 3 and 5 was seen in one patient each. Only 1 of the patient showed grade 2 hydronephrosis on post-operative CT IVU. Residual hydronephrosis was seen in 5 patients on post-operative CT IVU.

Radio Isotope Renal Scan was conducted in 16.67% of cases. All patients who were advised renal scan were asked to do a follow up scan as well. 75% of cases that had to undergo radio isotope renal scan were later treated with non dismembered pyeloplasty. One patient who underwent radio

isotope renal scan was considered for dismembered pyeloplasty showed almost 70% increase on follow up scan.

Radioisotope renal flow does not significantly increase after relief of chronic obstruction. The goals of relieving chronic renal obstruction should be to maintain renal function and relieve symptoms, but not to regain renal function¹².

Improvement of hydronephrosis was evident in all patients, except in two patients one of which underwent secondary procedure.

None of the patients were lost in follow up and they continue to do well.

The data collected from both dismembered and non dismembered group was compared with each other with Pearson Chi-Square method. Comparison was done for immediate post operative complications, number days retro-peritoneal drain was kept, number of days per urethral catheter was kept, number of days of post operative hospital stay, number of non symptomatic weeks for which the JJ stent was in situ, and renal emptying time on post operative CT IVU.

CONCLUSION:

- When not contraindicated, non dismembered pyeloplasty can be considered in place of dismembered pyeloplasty to utilize the advantage of having better blood supply at the site of anastomosis and ability to gain adequate length of the flaps, in spite of the fact that roughly around 25% of adynamic segment is kept in situ.
- Keeping the JJ stent in situ for 6 weeks is helpful in obtaining favourable results from both dismembered and non dismembered pyeloplasty.
- Full antibiotic coverage should be given for 3 weeks followed by three weeks of chemo prophylaxis to prevent infection in view of the presence of JJ stent

Per-operative Nephrostomy is not essential for successful pyeloplasty

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Grade	Dismembered Pyeloplasty		Non Dismembered Pyeloplasty	
	Pre-op	Post-op	Pre-op	Post-op
I	0	1(8.33%)	0	4 (33.33%)
II	0	0	0	1(8.33%)
III	0	0	1(8.33%)	0
IV	11(91.67%)	0	9 (75%)	0
V	1(8.33%)	0	1(8.33%)	0

Grade of Hydronephrosis in CT IVU – Comparison of pre-operative and post-operative in dismembered and non dismembered pyeloplasty.

Case number	Split renal function on affected side (Pre-op)	Split renal function on affected side (Post-op)	% increase in split renal function
1(I/901234002)	32	47	46.88
13(I/1204230116)	34	47	38.24
15(I/1204300135)	12	41	241.67
22 (I/1209170094)	26	44	69.23

Radio Isotope Scanning before and after in 4 cases

Variable	Group	N	Mean	Std. Deviation	Std. Error Mean	p-value
Age	Dismembered Pyeloplasty	12	22.83	10.232	2.954	0.315
	Non Dismembered Pyeloplasty	12	17.59	14.378	4.151	
Retro Peritoneal Drain kept for (Days)	Dismembered Pyeloplasty	12	3.67	.778	.225	0.408

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	Non Dismembered Pyeloplasty	12	3.92	.669	.193	
PUC kept for (Days)	Dismembered Pyeloplasty	12	4.83	1.030	.297	0.670
	Non Dismembered Pyeloplasty	12	5.00	.853	.246	
Post-operative Hospital Stay (Days)	Dismembered Pyeloplasty	12	5.83	1.030	.297	1.000
	Non Dismembered Pyeloplasty	12	5.83	.835	.241	
JJ Stent removed after (Weeks)	Dismembered Pyeloplasty	12	7.58	.515	.149	0.436
	Non Dismembered Pyeloplasty	12	7.42	.515	.149	
Renal Pelvis Emptying time on Post-operative CT IVU	Dismembered Pyeloplasty	12	1.2767	1.31000	.37816	0.917
	Non Dismembered Pyeloplasty	12	1.3325	1.27992	.36948	

Comparison for dismembered and non dismembered pyeloplasty -

	t - value	df	p-value
Age	1.029	22	0.315
Retro Peritoneal Drain kept for (Days)	-0.844	22	0.408
PUC kept for (Days)	-0.432	22	0.670
Post-operative Hospital Stay (Days)	0.000	22	1.000
JJ Stent removed after (Weeks)	0.793	22	0.436
Renal Pelvis Emptying time on Post-operative CT IVU	-0.106	22	0.917

P-value for comparison of dismembered and non dismembered pyeloplasty - immediate & late complication, renal function and duration of JJ stent placement

Stay sutures taken during dismembered pyeloplasty

Dilated pelvis due to ureteropelvic junction obstruction

Dissecting the dilated pelvis from the surrounding structures

Dilated Pelvis requiring reduction during dismembered pyeloplasty

Dismembered pyeloplasty- Ureteropelvic junction

Dismembered Pyeloplasty- Repaired Ureteropelvic junction with D-J stent in situ.
Nephrostomy seen in situ.

Completed Pyeloplasty with interrupted sutures

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