

# **Study on Retroperitoneoscopic surgeries in our department**

*Dissertation submitted in partial fulfillment of the requirements  
for the degree of*

**M.Ch (Genitourinary Surgery)**



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## **CERTIFICATE**

This is to certify that the dissertation entitled **Study on Retroperitoneoscopic surgeries in our department** done under our supervision and is the bonafide work of **Dr.Meganathan K.** It is submitted in partial fulfillment of the requirement for the M.Ch. (Genitourinary surgery) examination.

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## INTRODUCTION

The concept of large incisions so dominated surgical thought that the myriad possibilities that “key hole surgery ” had to offer were not contemplated.

Gynecologists took the initial lead in introducing laparoscopy for diagnostic and therapeutic uses in the 1960s and 1970s.it was only after the phenomenal success of laparoscopic cholecystectomy that surgical community started to take notice.

The meaning of “lapara” in Greek being flank, laparoscopy should only represent inspection of the structures in the lumbar region. Since the term laparoscopy was first used by Jacobeus in 1910 for the inspection of peritoneal cavity with the cystoscope, it is still being used for its historical significance.

Retroperitoneoscopy was used for the following procedures:

1. Nephrectomy for benign renal diseases
2. Radical nephrectomy
3. Radical nephroureterectomy
4. Ureteric surgeries – Ureterolithotomy

Ureterolysis

Ureteroureterostomy

5. Adrenalectomy
6. Pyelolithotomy

## 7. Pyeloplasty

In our institution we are doing laparoscopy work since April 2004. We have done about 120 laparoscopic procedures till now and among them retroperitoneoscopic procedures were 64.

This study was done to analyze the effectiveness of retroperineoscopic procedures .

## HISTORY OF RETROPERITONEAL LAPAROSCOPY

**Wittmoser** first explored retroperitoneoscopic approach for performing lumbar sympathectomy in 1973.

**Wickham** in 1979 introduced the application of retroperitoneoscopic approach for ureterolithotomy.

**Figenshau and colleagues** in 1991 , described the initial retroperitoneoscopic nephrectomy.

The real stimulus for the development of retroperitoneal laparoscopic surgery was provided by **Clayman**'s historical report of a transperitoneal laparoscopic nephrectomy in 1991.

**DD.Gaur** in 1991 gave seminal description of creating an adequate working space in the retroperitoneum by atraumatic balloon dilatation.

Gaur developed this technique after observing a CT picture of a patient with a large retroperitoneal cyst displacing the kidney .

Some modifications were made over the years like using saline instead of air to inflate the balloon, inflating the balloon under endoscopic monitoring and using part of the balloon instead of whole balloon.

**Gill and associates** performed radical nephrectomies and nephroureterectomies by retroperitoneoscopic approach.

## APPLIED ANATOMY OF RETROPERITONEUM

The lumbar retroperitoneal space is bounded anteromedially by the peritoneum, posteriorly and laterally by the paraspinal and flank muscles and superiorly by the diaphragm, its inferior extent is continuous with the pelvic extraperitoneal space.

Although its posterior and lateral boundaries are composed of anatomically fixed structures, its anterior and anteromedial boundaries are formed by the peritoneum which is mobile and can be displaced by mechanical means such as balloon dilatation.

The retroperitoneal space is only a potential space that contains the great vessels, adrenal gland, kidney and proximal ureter on either side. The lateral conal space connects Gerota's fascia to lateral peritoneum. The space between lateroconal fascia and the peritoneum is the anterior renal space;

The space dorsolateral to this fascia is the posterior pararenal space. It is this space that is balloon dilated during retroperitoneoscopy.

In contrast to the supine position, the flank position causes the intraperitoneal viscera to be displaced laterally and spontaneously results in a two fold increase in the AP dimension of retroperitoneal space.

In the flank position, gravity related traction exerted on the mesocolon results



in anterior displacement of the lateral peritoneal reflection.

Retroperitoneal anatomic landmarks identifiable immediately after balloon dilatation include :

Psoas muscle

Gerota's fascia

Lateral peritoneal reflection

Lower pole of the kidney.

Because retroperitoneoscopy involves a subcostal approach to the kidney and adrenal gland , renal orientation is caudad to cephalad.

## AIMS OF THE STUDY

1. To analyse the various procedures done through retroperitoneoscopy.
2. To analyse the results and complications of retroperitoneoscopic procedures
3. To compare the results of retroperitoneoscopic and open ureterolithotomies for large upper and mid ureteric calculus.
4. To compare the results of retroperitoneoscopic and open nephrectomies for benign non functioning kidneys

## PATENTS AND METHODS

We have done 64 retroperitoneoscopic procedures in our department during the period between April 2004 –August 2005

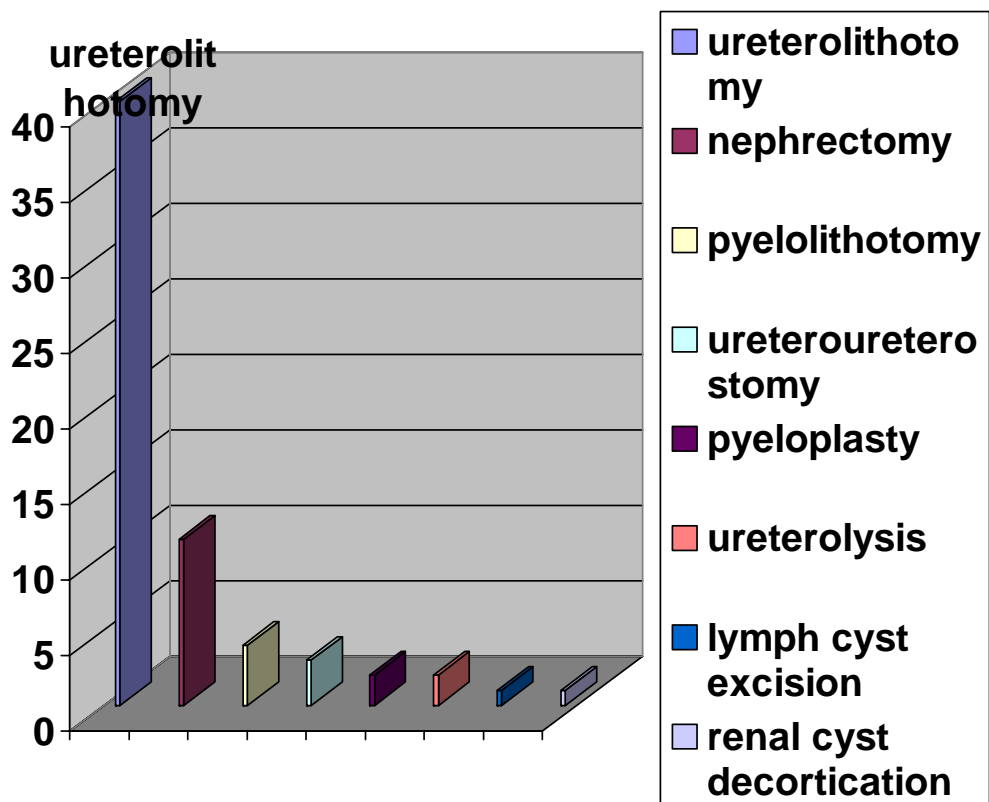
Among them 46 were males and 18 females.

Right side predominant in the ratio of 1.3: 1

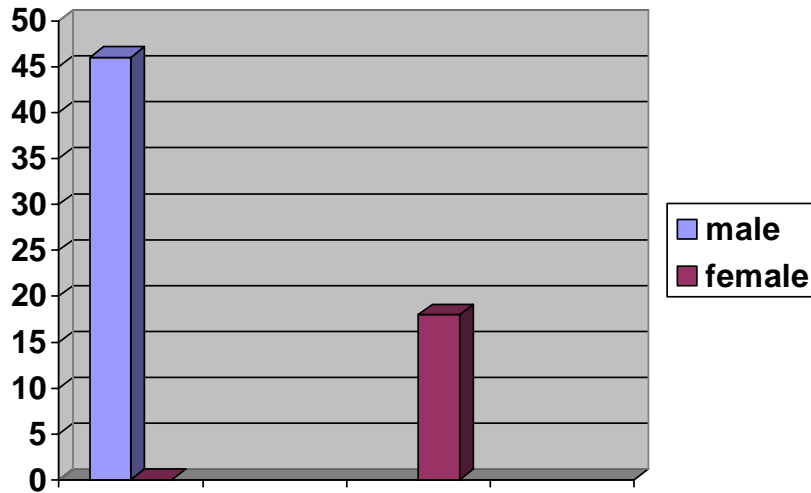
The retroperitoneoscopic procedures that were done during this period , were

1. Ureterolithotomy - 40
2. Nephrectomy - 11
3. Pyelolithotomy - 4
4. Ureteroureterostomy - 3
5. Ureterolysis - 2
6. Pyeloplasty - 2
7. Lymph cyst excision -1
8. Renal cyst deroofing -1

## RETROPERITONEOSCOPIC PROCEDURES DONE IN OUR INSTITUTE



SEX RATIO



## RETROPERITONEOSCOPIC URETEROLITHOTOMY :

### PATIENTS AND METHODS :

Between April 2004 and August 2005 ,40 patients harboring large hard and impacted ureteral stones [ mean size 2.1 cm ] underwent retroperitoneoscopic ureterolithotomy. In this study , 10 cases had already undergone ureteroscopic lithotripsy which was not successful .

All patients were evaluated with USG and IVU .

### TECHNIQUE :

All patients were stented retrogradely using cystoscopy. Then patients were positioned in lateral flank position . A 2 cm incision was made just below 12<sup>th</sup> rib in mid axillary line and deepened upto the retroperitoneum . By finger dissection peritoneum was pushed anteriorly .An indigenously

built gloved finger balloon was inserted into retroperitoneum. Retroperitoneal space was created by inflating the balloon with 500 ml of normal saline and kept for 5 minutes ,then deflated.

Pneumoretroperitoneum was created with CO2 and maintained at 12 mm Hg.

One 5 mm port was introduced in the subcostal region and one 10 mm port in the point one inch above and medial to anterior superior iliac spine .0 degree telescope was introduced through 10 mm port.

After introducing the camera anatomical landmarks like Psoas muscle , Gerota's fascia and lower pole of the kidney were identified. Then using blunt and sharp dissector ureter was dissected and stone identified. Ureterotomy was done using endoknife and stone was delivered . Then stent was repositioned into the pelvis .

Ureterotomy site was closed with 3-0 vicryl. Stone was delivered through the camera port and drainage was kept through flank port. The 10 mm port wound was closed in layers.

Mean follow up was 10 months [ range 2- 19 months]. IVU was performed 3-4 months after ureterolithotomy.

## RESULTS :

Mean patient age was 36.1 years[ range 19 to 54 ] and male to female ratio

was 3: 1. Ureteral stones were located in the upper ureter.

There were 3 conversions due to difficulties in dissection and peritoneal injury only during the initial period of our laparoscopy. There was stone migration in 7 cases especially the stones near the PUJ which was retrieved by introducing the ureteroscopy through 10 mm port and ureterotomy site and stone was basketed out. There was no failure in ureterolithotomies.

The mean blood loss was 85 ml [range 50-150 ml]. Mean operating time 100 minutes [ range 70-170 min ]. The mean analgesic requirement [ diclofenac sodium ] was 210 mg .

The drain was removed after 48 hrs. However 3 patients with persistent urine drainage for more than 72 hrs were treated conservatively.

The average hospital stay was 3.5 days[ range 3 to 8 days]

The lengths of incision – 2cm for camera port , 0.5 cm for three other ports .

#### OPEN URETEROLITHOTOMIES :

We analysed 32 open ureterolithotomies that were done during the last 2 years retrospectively in our institution. These ureterolithotomies were done for large upper or mid ureteric calculus.

In most of the cases ureterolithotomies were done through sub costal incision or 11 or 12<sup>th</sup> rib bed incision .

After stone removal, ureterotomy site was sutured after placing the stent in

all cases and drainage tube was kept.

## RESULTS:

The mean age was 41 years [ range 26-55] and male to female ratio was 2: 1. Right side is predominant with the ratio of 1.3: 1. The average stone size was 2.0 cm [range 1.3-3.5cm].

There was no major complications reported. The mean operative time was 93.6 minutes [range 50-120].

The mean hospital stay was 7.72 days [ range 6-10 days] and the mean analgesic requirement as mentioned in the records was 431 mg of Diclofenac sodium.

The drain prolonged in one case for 6 days and was settled with repositioning of stent.

Minor complications like wound infections were found in 8 cases.

Length of incision varied from 4-5 inches.

## RETROPERITONEOSCOPIC NEPHRECTOMY:

### PATIENTS AND METHODS :

During this study period 11 retroperitoneoscopic nephrectomies were done



for benign non functioning kidneys .

The indications were :

1. Non functioning kidneys secondary to PUJO - 8
2. Calculous pyonephrosis - 2
3. Multicystic dysplastic kidney - 1

Patients were evaluated with Ultrasonography , Excretory Urography and Diuretic renography when indicated.

Percutaneous nephrostomy was done for 3 patients preoperatively.

#### PROCEDURE :

Patients were placed in lateral flank position.

A 2 cm incision was made just below 12<sup>th</sup> rib in the mid axillary line.

Retroperitoneal space was created .

1\*10 mm port was introduced through the flank incision for the camera.

1\*10 mm port in the point 1 inch above and medial to ant.superior iliac spine,

1\*5mm port posterior to camera port in the posterior axillary line and another 5 mm port in the sub costal region for traction of kidney.

Pneumoretroperitoneum was created and maintained at 12 mm Hg. Gerota's was dissected posteriorly.

Renal artery and vein were dissected , ligated individually with 1-0 silk using intracorporeal suture techniques. Dissection of the kidney was completed all around and ureter was dissected , clipped and cut.

Then whole specimen was removed through camera port.

Drainage tube was kept through the 5 mm port in the posterior axillary line.

The mean follow up was 6.6 months [range 2-15 months]

#### RESULTS AND COMPLICATIONS :

The mean patient age was 33years [20-62 yrs] and the male to female ratio was 1.2: 1.

There was one conversion to open surgery in this series because of bleeding while dissecting the hilum in a case of calculous pyonephrosis.

The mean operative time was 135 minutes[90-190 min]. The mean blood loss was 169 ml[ range of 90-400ml].Mean analgesic requirement was 315 mg of Diclofenac sodium.

The drain was removed after 48 hrs according to the amount of drainage.

However, in 3 patients it was removed on 3<sup>rd</sup> or 4<sup>th</sup> day. The mean hospital stay was 3.6 days [range 3-5 days ].

Length of incision – 2cm for camera port and 0.5 cm for three other ports each.

## OPEN NEPHRECTOMIES :

During the same period 7 open nephrectomies were done in our institution for the following indications:

1. Non functioning kidneys secondary to PUJO - 4 cases
2. Calculous pyonephrosis - 3 cases

PCN was done for all cases preoperatively.

The nephrectomies were done through 11<sup>th</sup> rib bed incision measuring about 5-6 inches.

Mean follow up was 7 months[ range 5-16 months].

## RESULTS AND COMPLICATIONS :

The mean patient age was 35 years [ range 26-46 years] and male to female ratio was 2.5: 1.

The mean operative time was 114.2 min[ range 90- 130 min]. There were no peroperative major complications.

The mean blood loss was 193 ml [ range 100-300ml].

The drain was removed on 4<sup>th</sup> or 5<sup>th</sup> day. Subcutaneous collections and wound infections were found in 3 patients with calculous pyonephrosis who underwent this procedure.

Mean hospital stay was 7.1 days [ range 4-10 days]. Mean analgesic requirement was 468.75 mg of diclofenac sodium.

Length of incision varied from 4- 6 inches

#### OTHER RETROPERITONEOSCOPIC PROCEDURES:

During this period we have done the following procedures also :

#### PYELOLITHOTOMY :

4 patients underwent pyelolithotomies by retroperitoneoscopic approach using 3 or 4 port technique for large renal pelvic calculus. Patients were evaluated preoperatively with USG and IVU. Patients with calculus in the extra renal pelvis were selected. We did pyelolithotomies by 4 port technique as already mentioned.

In all cases preoperative stenting was done retrogradely. After completely extracting the stone, stent was repositioned and pyelotomy wound was sutured with 3-0 vicryl.

#### RESULTS AND COMPLICATIONS:

Mean age was 37 yrs[ range 32-45 yrs]. One case was converted to open pyelolithotomy because of difficulty in dissection of pelvis.

Mean operative time was 170 min[ range 130-180 min]. Mean blood loss was 200ml [ range 150-250 ml]. Mean hospital stay was 7 days [ range 6-8 days].

The drain was removed on 4<sup>th</sup> or 5<sup>th</sup> day. The analgesic requirement was 412.5 mg of Diclofenac sodium.

The check X ray was taken to confirm the complete extraction of stones and position of stent.

## URETEROURETEROSTOMY :

Indications :

1. Retrocaval ureter - 2 cases
2. Stricture ureter - 1 case

These patients were evaluated preoperatively with USG, IVU and retrograde pyelogram.

This procedure was done using 4 port technique.

The narrowed portion was excised and spatulated anastomosis was done using intracorporeal suturing technique.

The pigtail stent was kept in all cases.

## RESULTS AND COMPLICATIONS:

Mean patient age was 35.6 years [ range 27- 48 yrs]. There were no conversions to open surgery in this group. The mean operative time was 180 minutes and mean blood loss was 225ml.

The mean analgesic requirement was 450 mg of Diclofenac sodium.

The drain was removed on 8<sup>th</sup> POD for the first case and next two cases it was removed on 4<sup>th</sup> day.

The mean hospital stay was 7.3 days. Follow up was in the range of 3-12 months.

For the first case, IVU was taken at 3 months of follow up and found to have good excretion without obstruction.

#### PYELOPLASTY:

Till now we have done 4 pyeloplasties, two through retroperitoneoscopic and another two through transperitoneal approach.

Among the 2 retroperitoneoscopic pyeloplasties, one case was converted to open surgery because of difficulty in suturing.

The operative time was 210 minutes and blood loss was 175 ml.

The drain was removed on the 7<sup>th</sup> day and patient was discharged on the 10<sup>th</sup> day.

#### URETEROLYSIS :

Retroperitoneoscopic ureterolysis was done for 2 patients with upper ureteric obstruction.

These patients were evaluated with USG, IVU and retrograde ureterogram and cause could not be made.

By 3 port technique , diagnostic retroperitoneoscopy were done and was found to be having ureteric kink with periureteric adhesions in one case which was released and ureter was freed.

For another case there was a crossing vessel , that supplying the lower pole of the kidney causing kink at the level of upper ureter which was released and

stenting was done.

The mean patient age was 32 years. Mean blood loss was 100ml. The average duration of procedure was 80 minutes .

The drain was removed on the 2<sup>nd</sup> day and patient was discharged on the 3<sup>rd</sup> day. There was no post operative complications. The average analgesic requirement was 150 mg of Diclofenac sodium.

#### LYMPH CYST EXCISION :

This was a 50 year old lady who presented with left loin pain and she was evaluated with USG and CT Abdomen and diagnosed as retroperitoneal lymph cyst of size 6\*5cm.

This patient underwent lymphcyst excision by retroperitoneoscopic approach using 4 port techniques.

The blood loss was 150ml and duration of procedure was 130 minutes. The drain was removed after 48 hours and patient was discharged on the 3<sup>rd</sup> day. She required only one dose of diclofenac sodium.

#### RENAL CYST EXCISION :

This was a 36 year old man who presented with dull aching pain in the right loin and on evaluation he was diagnosed to have 3 large cysts with Bosnaik type 2 in the upper pole and middle portion of the right kidney.

By 4 port technique , renal cyst excision was done and cyst wall was sent for

histopathological examination and it was confirmed of its benignity. It was done with blood loss of 100ml and was completed in 100 minutes. The drain was removed on the 2<sup>nd</sup> day and patient was discharged on the same day.

#### REVIEW OF LITERATURE :

Retroperitoneoscopy is one of the most important advances of this decade in urology. The major breakthrough came with the description of balloon dissection technique by Gaur in 1992 to create a retroperitoneal space for an adequate pneumoretroperitoneum to facilitate operative procedures.

Nevertheless the experience with this technique is still limited and especially when performed without training may lead to serious complications.

In recent multinational review of 1043 cases of retroperitoneoscopic procedure , the overall complication rate was 4.7%

The majority of these were visceral 2.5% and vascular 2.2% complications . The conversion rate was 6.6% and about 40% of these conversions were emergency procedure for vascular or visceral injuries.

These observations stress the need for open surgery before hand and have complete set of instruments for open surgery readily available in the operating



room.

**Fahlenkamp et al** in a review of laparoscopic urologic surgery found an overall complication rate 4.4%. They further classified the procedures as easy , difficult and very difficult and they found the corresponding complication rate 1.0%, 3.9%, and 9.2% respectively. In this study, the complication rate in first hundred cases in each centre averaged 13.3% as compared to 3.6% for the subsequent cases.

**Rassweiler et al** observed a significant learning curve during the first 50 cases shown by a longer operating time and a higher complication rate

Complications can occur at the following stages :

1. access to retroperitoneum
2. balloon dissection
3. CO2 insufflation to create pneumoperitoneum
4. insertion of primary port
5. insertion of secondary ports
6. complications during dissection

**1. Access to retroperitoneum :**

During access to retroperitoneum , the main complication is peritoneal tear. This is particularly likely in case of previous retroperitoneal operation or inflammations like xanthogranulomatous pyelonephritis, renal TB or perinephric abscess. This problem can be tackled by appropriate case selection .

**2. Balloon dissection :**

The complications are

Loss of orientation due to inflation in an incorrect plane

Injury to the abdominal muscles

Rupture of peritoneum

Rupture of balloon

The balloon is inflated within the Gerota's fascia for renal surgery for most benign conditions, as the kidney and ureter serve as important landmarks for the operator. Insertion outside the Gerota's may result in operator disorientation and injury.

### **3. Insertion of primary port :**

If primary port was inserted by a closed technique as described by McDougall et al , there was a risk of injury to kidney. Thus open technique is preferred in most centers. In open technique of insertion of the primary port , the fascial opening may be made too wide resulting in carbon dioxide leak and subcutaneous emphysema.

### **4. CO2 insufflation :**

The complications are :

Subcutaneous emphysema

Hypercapnia

Gas embolism

Hemodynamic and respiratory disturbance

Oliguria

**5. Placement of secondary ports :**

The possible complications are :

Injury to peritoneum

Pneumothorax

Abdominal wall hematoma

**6. Complications related to dissection :**

These are injury to retroperitoneal vessels , peritoneum , intraperitoneal viscera and injury to retroperitoneal structures like Kidney, ureter and bladder.

**URETEROLITHOTOMY :**

**Clayman et al** introduced laparoscopy in urology with pioneering nephrectomy. The urologists have been slow to embrace the concept of laparoscopic ureterolithotomy because endourological procedures and ESWL have been effective.

The panel on ureteral stones clinical guidelines of AUA that even for stones greater than 1 cm , the initial treatment options should be shock wave lithotripsy, Ureteroscopy or percutaneous antegrade removal.

The panel also observed that open surgery may be appropriate for non standard cases and as a salvage measure. However there was no mention of laparoscopic ureterolithotomy, perhaps because enough data and reports were not available in the literature. Similarly there is no clear guideline about large stone such as

ureteral calculi more than 2 cm.

Minimally invasive surgery is the preferred modality for ureteral stones [ **Segura .J.W et al**].

However for large ureteral stones in nonstandard situations and when minimally invasive techniques have failed, open ureterolithotomy is a logical step. The same results can be achieved with laparoscopic approach in a minimally invasive manner.

Laparoscopic ureterolithotomy may be done transperitoneally or retroperitoneally.

The advantages of retroperitoneoscopic surgery over transperitoneal access are that bowel mobilisation is not required, the risk of inadvertent gut injury and ileus is minimised and there is a lower incidence of long term complications. The duration of urine leakage is probably highest when the ureterotomy is neither sutured nor stented.

**Hemal et al** modified the technique to make the procedure less invasive and more cost effective by not stenting the sutured ureterotomy. The pigtail stent was placed only if there was persistent urine leakage.

In **Gaur et al** series, Laparoscopic ureterolithotomy was successful in 93 patients, with the eight failures being mostly early in the series. The mean operative duration was 79 min (66 min when the ureter was left open and 92

min when it was sutured). The overall mean duration of urinary leakage was 5.5 days, which was reduced to 3.2 days by stenting and suturing the ureter. The mean (range) blood loss was 25 (5100) mL. The overall complication rate was high (31%) because of prolonged urinary leakage in 20 patients. No patient required morphine for pain relief and the mean for oral analgesic use was 2.5 days.

The mean hospital stay was 3.5 days and that for resuming work 14 (728) days

In **Hemal et al** series a prospective unrandomized comparison of retroperitoneoscopic and open ureterolithotomy for upper and mid-ureteric stones was done. In his series ,the mean operative duration and blood loss for RPUL and open surgery were 108.8 and 98.8 min, and 58.5 and 50.5 mL, respectively (not significant).

The mean analgesic (pethidine) requirement and hospital stay for RPUL and open surgery were 41.1 and 96.9 mg, and 3.3 and 4.8 days, respectively ( $P < 0.001$ ). The duration of convalescence was significantly less after RPUL than open surgery (1.8 weeks vs 3.1). There were 10 conversions, which occurred early in the series, and one significant complication amongst patients who underwent RPUL.

In **Demirci D et al** , the stones in 17 patients were successfully removed in a median operating time of 105 (min-max 45-190) min. Urine

extravasation in all cases and pneumoscrotum in 2 cases were observed as postoperative complications. The median hospital stay was 6 (min-max 3-22) days with minimal analgesic requirement.

**Lee WC et al** published an article in Chang Gung Med J. regarding

**Retroperitoneoscopic ureterolithotomy for impacted ureteral stones.**

In his study retroperitoneoscopic ureterolithotomy was performed in 5 patients with ureteral stones, in whom treatment with other minimally invasive procedures had failed.

Using Gaur's technique of balloon dissection of the retroperitoneal space, retroperitoneoscopic ureterolithotomy was successfully performed in all cases. All the patients were treated successfully with the retroperitoneoscopic maneuver. The average operating time was 125 (90 to 175) minutes, and the average blood loss was 75 (20 to 200) ml.

No patient required an analgesic injection postoperatively. The average postoperative hospital stay was 5.5 (4 to 8) days, and there were no immediate operative complications in any case.

Patients were followed an average of 18.5 (13 to 24) months. A ureteral stricture developed in one patient and was resolved by ureteroureterostomy 3 months after the first operation.

**RETROPERITONEOSCOPIC NEPHRECTOMY:**

Various centers all over the world reported their experience in this field. The indications have varied and have come to include all causes of benign non functioning kidneys. The success rates have varied from 85 to 100%.the major cause for conversion have been perinephric adhesions with non progress of dissection. The other causes included intraoperative complications including vascular injuries .

Operative time is another important consideration. While it is that the time taken is usually greater than that in open surgery, the difference is not significant.

While **Mcdougall's** initial report in 1994 recorded operative time of 335 minutes , current series including ours have noted times of 90 -190 minutes which are within an acceptable range.

**Hemal et al** published their experience in Journal of Urology on retroperitoneoscopic nephrectomy for benign non functioning kidneys.

Their study comprised 185 patients who underwent retroperitoneoscopic nephrectomy or nephroureterectomy during a 57 month period . 32 patients had a history of previous surgery , 20 patients had a percutaneous nephrostomy and 12 patients had mild renal impairment .18 patients required conversion to open surgery. The operative time was 100 minutes [ range 45 – 240 min],mean blood loss was 133 ml [ 30-1200 ml] and mean hospital stay was 3 days [range 2- 8 days] with 37 complications .

In another study by **Hemal et al** compared the retroperitoneoscopic nephrectomy with open surgery for tuberculous non functioning kidneys. They concluded that retroperitoneoscopic nephrectomy was beneficial in all respects except for slightly longer operative time .

**Rassweiler et al** evaluated 200 cases of retroperitoneoscopic procedures including 65 nephrectomies. In comparison of retroperitoneoscopy with transperitoneal and open nephrectomies ,they noted higher operating time in the retroperitoneoscopy group [211.2 min Vs 117 for open 206.5 for transperitoneal] but similar complication rate with lower analgesic requirements and shorter hospital stay.

**Gill et al** reported 36 retroperitoneoscopic nephrectomies for benign non functioning kidneys with the complication rate of 2 %.

### **RETROPERITONEOSCOPIC PYELOLITHOTOMY:**

**Gaur DD et al** published their experience with retroperitoneoscopic approach for staghorn calculi. In their study they performed retroperitoneoscopic pyelolithotomy for three patients with impacted staghorn calculi between 22 and 45 mm in largest diameter and removed the stones successfully in all three.

**Gupta NP et al** published their experience in retroperitoneoscopic surgery in the management of urolithiasis. Laparoscopic retroperitoneal



surgery was undertaken in 72 male and 42 female patients with calculus disease. Among them 40 underwent ureterolithotomies[RPUL],7 underwent pyelolithotomies[RPPL] , 53 underwent nephrectomies[RPN] and 14 underwent nephroureterectomies[ RPNUT].

The procedure was successful in 75%,71%,90.5% and 86% of patients subjected to RPUL,RPPL,RPN and RPNUT respectively. The mean operating time for RPUL was 106.3 min and for RPPL was 108.2 minutes , whereas it was 99.7 minutes for RPN and 147 minutes for RPNUT. The mean blood loss was 69.8,127.4,135.6 and 206.5ml for RPUL,RPPL,RPN and RPNUT respectively. The average hospital stay ranged from 3-4 days.

So far nearly 26 cases of successful laparoscopic pyelolithotomy have been reported in the literature.

**Gaur et al** performed retroperitoneal laparoscopic pyelolithotomy in 8 patients and were successful in 5 with the success rate of 62.5%. the failure was attributed mainly to the initial inexperience and lack of sophisticated laparoscopic instruments.

**Valdivia et al** successfully treated two cases of complex lithiasis in horseshoe kidneys.

**Hemal et al** have experience of 7 patients with solitary large partial staghorn calculus, two underwent retroperitoneoscopic pyelolithotomy. These stones were too large to be treated by shock wave lithotripsy. In 5

patients complete stone clearance was achieved. In one patient the stone migrated into the upper calyx required conversion to open surgery due to want of flexible nephroscope. Another patient had to be converted because of excessive adhesions and inability in dissecting out the renal pelvis.

Retroperitoneoscopic pyelolithotomy presents a viable alternative for the patients who refuse PCNL or on account of technical reasons. In recent years technology has further evolved making laparoscopic stone surgery easy and allowing for successful reconstructive surgery in the same sitting if required as in cases of UPJ obstruction with renal stones.

A large number of patients with renal calculus disease in the developing countries are still being treated by an open operative procedure as either the minimally incasive modalities are not available or they are beyond their approach due to economical reasons. Retroperitoneal laparoscopic pyelolithotomy can be considered as an economically viable alternative in developing countries like India.

## **RETROPERITONEOSCOPIC PYELOPLASTY :**

**A.EL .Ghoneimi et al** from canada published their experience with dismembered laparoscopic pyeloplasty by a retroperitoneal approach in children with PUJO. Dismembered laparoscopic pyeloplasty by a retroperitoneal approach was attempted in 21 children. In flank position with 4 ports , PUJ was resected and the anastomosis was made using 6-0

absorbable sutures. A double J stent was inserted in all patients.

The procedure could not be completed by laparoscopy in 4 patients because of difficulty in completing anastomosis. The mean operative duration was 228 minutes and the mean hospital stay was 2.56 days. All children returned to full activities within a week. They concluded that retroperitoneoscopic approach for pyeloplasty was safe and feasible in children.

In **Rassweiler et al** ,33 patients underwent dismembered laparoscopic pyeloplasty by a retroperitoneal approach for congenital PUJO. The mean operative time was 190 minutes. The mean hospital stay was 5.5 days. The success rate was 90%.

In **Gaur et al** series ,21 patients underwent laparoscopic pyeloplasty by a retroperitoneal approach. There were 5 open conversions , mostly in their early part of learning curve due to dense adhesions in 2 and for planned extra corporeal suturing in 3 patients. The radiographic success was achieved in 93.8%. The mean operative time for all pyeloplasties was 173 minutes. It was 280 minutes for dismembered, 121 for exopyelotomy and 192 for flap pyeloplasties. The mean hospital stay was 6.8 days, mean analgesic intake was for 2.4 days.

Due to the anecdotal reports of laparoscopic pyeloplasty, it is difficult to make a definitive opinion about its superiority over the other techniques.

Nevertheless using the transperitoneal approach , the **Kavoussi group** has reported 90% clinical and 98% radiographic success in 42 patients with a minimum follow up of 12 months.

Retroperitoneal laparoscopic dismembered pyeloplasty was first reported by **Chiu and Eden** , with good post operative results. Subsequently , **Gaur et al and Riccoti et al** reported good results of dismembered pyeloplasty with retroperitoneal approach , but had problems during laparoscopic suturing and consequently , the latter had to perform an open conversion in 45.5% of their 11 patients.

## **RETROCAVAL URETER**

There have been four anecdotal reports of laparoscopic correction of circumcaval ureter. These have been performed through transperitoneal or retroperitoneal approach .

**Salomon et al** performed retroperitoneoscopic ureteroureterostomy for a 24 year old man with homozygous sickle disease presented with right flank pain and evaluation confirmed the diagnosis of obstructed retrocaval ureter. The operative duration was 4.5 hours and blood loss less than 20 ml and patient was discharged after seven days.

## **RETROPERITONEOSCOPIC URETEROLYSIS**

**Kavoussi et al** first reported the use of laparoscopy for ureterolysis for retroperitoneal fibrosis.

**Matsuda et al** performed ureterolysis and subsequent intraperitonealisation laparoscopically in 2 patients with unilateral idiopathic retroperitoneal fibrosis. The operative procedure was easily accomplished , and the outcome was excellent.

**Mattellaer et al** reported 5 cases with retroperitoneal fibrosis with upper tract dilatation with 100% success rate.

**Nezhat et al** described laparoscopic ureterolysis in 28 women with severe urinary tract Endometriosis. After ureteral catheter placement , the affected ureter was dissected free from surrounding tissues with hydrodissection and CO2 laser.

Mean postoperative hospital stay was 1.8 days. Of the follow up evaluation ,20 of 21 [95%] patients had patent ureters and functional kidneys.

**Elashry et al** evaluated the role of laparoscopy in the management of extrinsic ureteral obstruction due to benign retroperitoneal fibrosis or ovarian pathology. The results of laparoscopic ureterolysis were compared to those of a contemporary series of open ureterolysis performed for the same pathological conditions.

**RETROPERITONEOSCOPIC RENAL CYST DECORTICATION :**

Historically open decortication was the modality of choice for a symptomatic renal cyst. Open Surgical management is also associated with significant post operative pain and a post operative Convalescence of 1 month or more.

Laparoscopic renal cyst ablation has been described using both transperitoneal and retroperitoneal Approach ; It has been used as both a primary and secondary modality for cyst therapy, but it should be used only when percutaneous aspiration and sclerosis fails in the treatment of a documented , symptomatic benign cyst . The laparoscopic retroperitoneal approach has advantage of not handling the bowel.

**Jahnsen and Solhaug** first described laparoscopic management of symptomatic renal cyst.

**Rubenstein et al** subsequently reported a series of ten patients with symptomatic renal cysts that were managed laparoscopically. Six patients had simple cysts ; two had polycystic renal disease and there was a single case of peripelvic cyst and multiple simple cysts. Operative times ranged from 50 min to 4 hours. There were no intraoperative complications and only two post operative complications.

**Rassweiler et al** reported experience with retroperitoneal management of 50 renal cysts. This report incorporated patients with septated or suspicious cysts, large simple cysts after failure of sclerotherapy. Operative time

ranged from 30 -130 minutes[ mean of 80 minutes] and average hospital stay was 5.4 days. Mean opiate dose was 1.2 doses per patient.

## **DISCUSSION**

### **RETROPERITONEOSCOPIC URETEROLITHOTOMY:**

Recent series from various centres shown that total of 179 retroperitoneoscopic ureterolithotomies were previously reported. However, we prefer the retroperitoneal approach with our refined technique and the present series of 40 shows that this approach can be used for stones situated anywhere in the ureter above the iliac vessel crossing.

There is no doubt that the main indication for LU is as a salvage procedure for failed ureteroscopy and ESWL, as an alternative to an open procedure. However, this was applicable to only 10 of the present patients. In the remaining 30 patients laparoscopic approach was used as a primary procedure, the chances of failure with existing minimally invasive procedures was considered to be

high because the stones were large and impacted. In our series, laparoscopy was used as a primary procedure, as it gave a better chance of success in one session.

Since ESWL is not available in our institute we were doing open ureterolithotomies for patients with large stones. Now as laparoscopic instruments are available we preferred this technique .

Although retroperitoneal LU is simple, identifying the ureter can sometimes be difficult, time-consuming and frustrating. In 10 of the 40 retroperitoneal procedures, > 30 min was lost looking for the ureter, with success in only 8. In the remaining 2 patients the ureter could not be located because of dense adhesions in periureteric region in one case and in another case peritoneum was opened inadvertently.

The key to early identification of the ureter is gaining access to the retroperitoneal space deep to the transverse fascia, which can be done during the laparoscopic exploration;

However, we prefer to use the balloon for this dissection by placing it deep to the transverse fascia. Nevertheless, this may not be possible every time because of chronic inflammatory reaction.

A laparoscopic search for the ureter can be initiated anywhere in the lumbar region, but we prefer the iliac crossing, because the iliac artery can be identified easily on either side and there is less chance of damage to the lumbar vessels at this level. However, if the retroperitoneal space deep to the transverse fascia has



already been dissected by the balloon, there should be no problem in identifying the ureter arched above the great vessels.

The gonadal vein crosses the ureter to become medial in the upper part of the lumbar retroperitoneal space and the formation of this ureterovenous angle can also sometimes help in ureteric identification . Placing a stent in the ureter beforehand was not much help in finding the ureter, as the stent could be felt only when the ureter was visible.

The procedure is easy with three ports, although sometimes a fourth port is needed for retraction.

Ureteric stones below S2 are more difficult to remove even in open surgery and it is the same in retroperitoneoscopic approach also. Stones in the upper ureter are more easily removed but there is a risk of their migration into the dilated pelvicalyceal system during dissection of the ureter, which happened in seven of the present patients. To prevent this the proximal ureter should first be dissected from above downwards and if possible held with an endo-Babcock until the stone has been removed.

In all these seven patients ,problem was tackled by introducing the ureteroscope through 10 mm port and ureterotomy site and stone was basketted out .

Even after many procedures making an accurate incision over the ureter can

sometimes be difficult.

During an open procedure the ureter is fixed between the fingers before making an incision, but during LU such ureteric fixation is impossible with any of the available instruments.

Moreover, there can be problems if the endoknife approaches the ureter almost at a right angle. Making an incision from inside out with a curved endoknife can simplify the incision.. A grasper should be used to extract the stone from the ureter only when the stone is hard, otherwise grasping the stone can create problems if it breaks and small pieces migrate into the dilated proximal ureter. The best way to extract a stone impacted in the ureter is to lever it out, as there is less chance of breakage.

A stone lost in the retroperitoneal space can create problems and the simplest way to locate and remove it is by using the index finger.

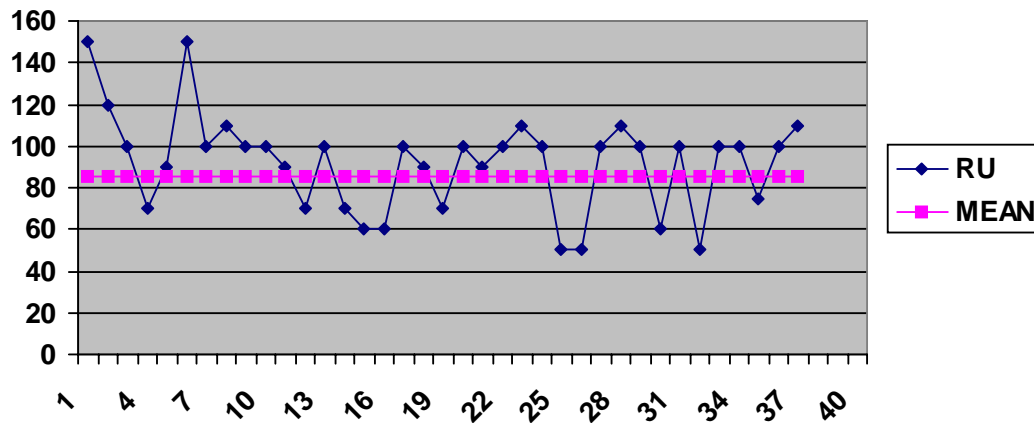
Another patient was converted to open surgery because of excessive bleeding which was not controlled .

Although stenting and suturing of the ureterotomy site was always helpful in reducing urinary leakage,we experienced the complication of prolonged drainage of urine for more than 5 days in 2 patients. This settled on its own by the 7<sup>th</sup> day. This was possibly because the suturing was poor, but the main reason was that these ureters were chronically inflamed, oedematous and friable after infection and prolonged impaction. The urine in some of these patients was even purulent. Therefore, under such circumstances, the ureter should only be

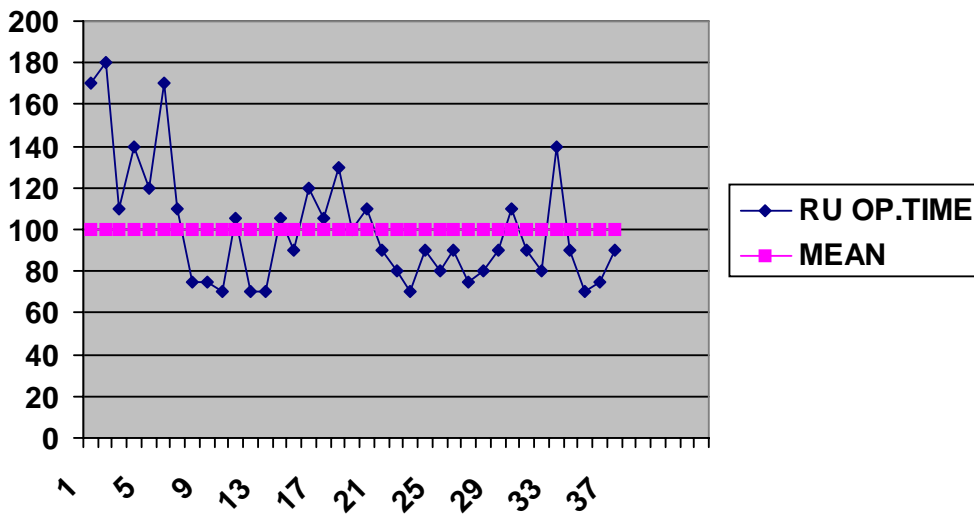
stented and not sutured.

The mean stone size, operative duration, hospital stay, success rate and early complication rate are comparable with those of other series . Although there were no major complications in our series,wound infections occurred in 8 patients. Patients were followed up with USG every three months and IVU was taken if necessary. As we are doing the laparoscopic procedures only for the past 15 months ,we have not encountered the long term complications. From our present series ,it was concluded that retroperitoneoscopic ureterolithotomy was a better alternative for the management of large impacted upper ureteric stones.

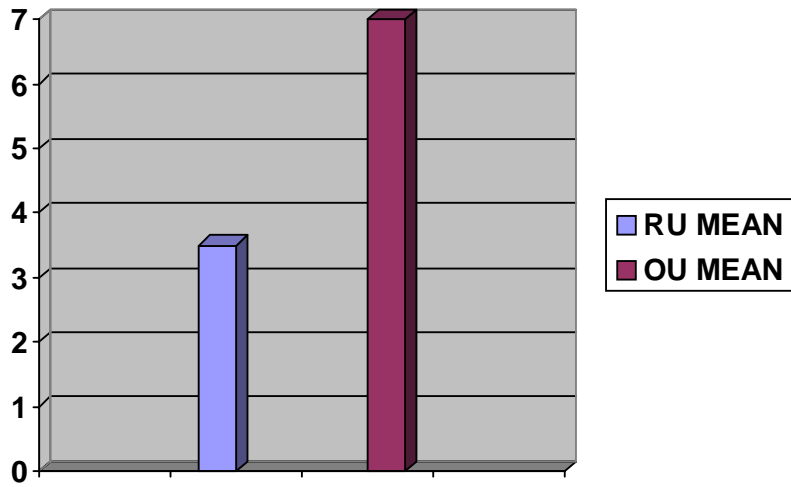
### **BLOOD LOSS IN RETROPERITONEOSCOPIC URETEROLITHOTOMY**



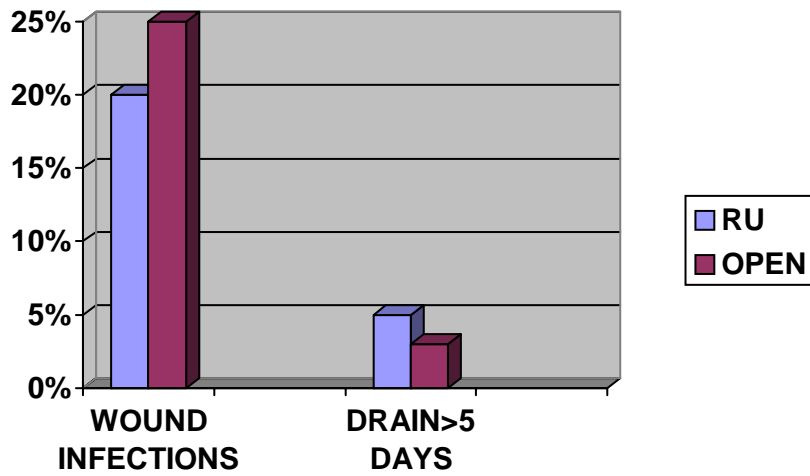
# OPERATIVE TIME IN RETROPERITONEOSCOPIC URETEROLITHOTOMY



## MEAN HOSPITAL STAY



### NO OF COMPLICATIONS



**COMPARISON OF VARIOUS PARAMETERS IN  
RETROPERITONEOSCOPIC AND OPEN  
URETEROLITHOTOMIES**

S.NO	PARAMETERS	Retro - Ureterolithotomy	Open Ureterolithotomy	P value
1	NO OF CASES	40	32	
2	AGE[RANGE]	36[19-54]	41 [26-55 ]	
3	MALE: FEMALE	3:1	2:1	
4	RIGHT:LEFT	1.1: 1	1.3 : 1	
5	MEAN OPERATIVE TIME [RANGE]	100[70-170 min]	93.6 [50- 120]	p>0.05
6	MEAN HOSPITAL STAY	3.41days[3-8 days]	7.72days[6-10 days]	p<0.05
7	STONE SIZE	2.1cm[1.4-3.2 cm]	2.0 [1.3-3.5cm]	p>0.05

8	ANALGESIC REQUIREMENT-	210 mgs	431mgs	P <0.05
9	WOUND INFECTIONS	8 CASES	8 CASES	
10	DRAIN > 5 DAYS	2 CASES	3 CASES	

## COMPARISON WITH INTERNATIONAL STUDIES

Parameters	Sinha et al	Hemal et al	Gaur et al	Our series
No	24	55	101	40
Stone size	NA	2.1	1.6	2.1
Operative time	61 min	108.8min	79min	100min
Blood loss	NA	58.5ml	NA	85 ml
Hospital stay	3.6 days	3.3 days	3.5 days	3.5 days
Success	100%	NA	92%	92%
Conversions	NA	10 cases	8cases	3 cases
Complications-minor	NA	NA	11%	20%



## **RETROPERITONEOSCOPIC NEPHRECTOMY**

Initially we started doing laparoscopic nephrectomy through transperitoneal approach but we have found that mean hospital stay , complications rate were comparable to that of open procedure and it was not advantageous in comparing to the open except cosmetic scar. Then we started retroperitoneoscopic nephrectomy for non functioning kidneys secondary to PUJO. We did retroperitoneoscopic nephrectomy by 4 port technique and renal artery and vein were ligated individually by 1-0 silk by intracorporeal knotting.

During the early learning curve , the duration of procedure and blood loss were higher but it later it was less , comparable to that of international studies. The blood loss and duration of procedure was not stastically significant in comparing open nephrectomies( 135 min Vs 114 min and 169ml Vs 193ml with  $p>0.05$ ).but the mean hospital stay and analgesic requirement were statistically significant ( 3.6 days Vs 7.1 days and 315 mg Vs 468 mg with  $p<0.05$ ).

In one case with calculous pyonephrosis , there was dense adhesions around the hilum and while dissecting the hilum there was uncontrolled bleeding for which procedure was converted to open.

In all other patients procedure was completed successfully without any

major complications. The wound infections were found in 2 cases which was treated with appropriate antibiotics.

The length of scar in comparing to open surgery was significantly small (9-13 cm in open surgery and 2cm for camera port and 0.5 cm for the remaining ports).

In comparing with open nephrectomy, retroperitoneoscopic nephrectomy had shorter hospital stay, less analgesics and cosmetically small scar.

Eventhough our series was very small in comparing to Hemal et al , other parameters like mean operative time , blood loss , hospital stay and conversion rate are comparable.

Retroperitoneoscopic nephrectomy has passed the test on all counts. It offers advantages ascribed to minimally invasive surgery. There is a shorter hospital stay and minimal analgesic requirement. The added benefit of cosmesis makes this an attractive alternative to open surgery.

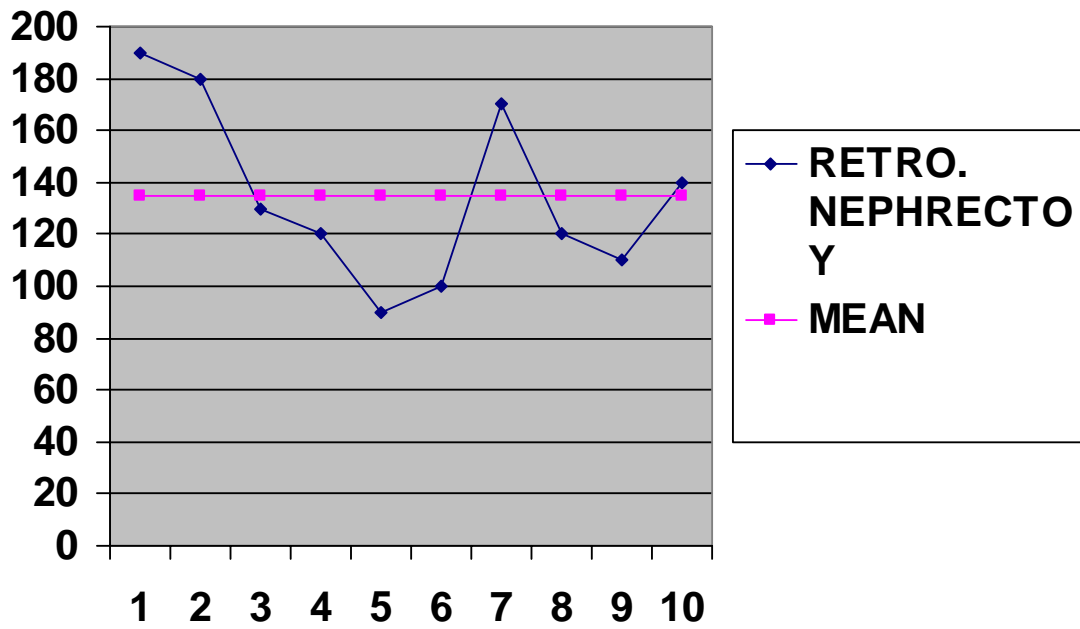
These advantages are particularly important in case of nephrectomy which otherwise is one of the most morbid surgeries for benign diseases.

The extensive flank incision with muscle cutting is prone to multiple problems of post operative pain and poor scar formation. These are areas where laparoscopic access scores over open surgery.

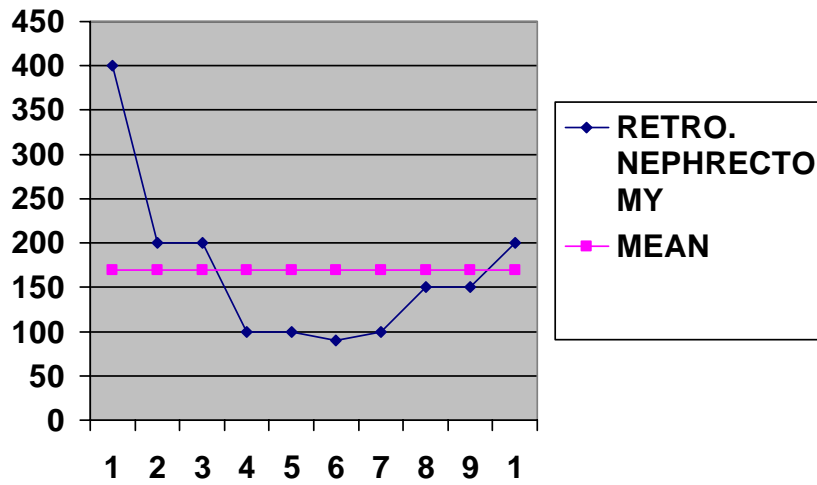
The kidneys are retroperitoneal organs and there should be no need to violate the peritoneal space. This prevents injuries during the dissection and post operative adhesions and intestinal obstruction.

The possible disadvantages would be a limited working space.

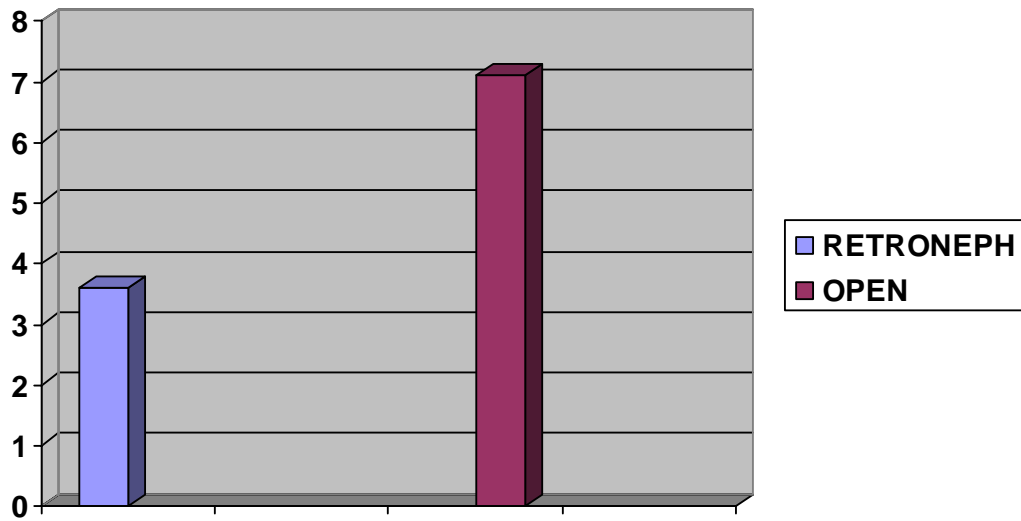
## OPERATIVE TIME IN RETROPERITONEOSCOPIC NEPHRECTOMY



### BLOOD LOSS IN RETROPERITONEOSCOPIC NEPHRECTOMY:



### MEAN HOSPITAL STAY



**COMPARISON OF VARIOUS PARAMETERS IN  
RETROPERITONEOSCOPIC AND OPEN NEPHRECTOMIES**

S.No	Parameters	Retroperitoneoscopic Nephrectomy	Open Nephrectomy	P value
1	No Of Cases	11	7	
2	Age [Range]	33[20-62 ]years	35[26-46 ] years	
3	Male: Female	1.2 : 1	2.5 : 1	
4	Right : Left	1.2 : 1	1: 1.3	
5	Mean Operative Time	135 min[90-190 min]	114 min[90-130 min]	P>0.05
6	Mean Blood Loss	169ml [90-400ml]	193 ml[100-300ml]	P >0.05
7	Mean Hospital Stay	3.6 days[3-5 days]	7.1 days[4-10 days]	P < 0.05
8	Analgesic Requirement	315mg	468mg	P < 0.05
9	Wound Infection	2 cases	3 cases	

## RETROPERITONEOSCOPIC NEPHRECTOMY

Parameters	Rassweiler et al	Hemal et al	Our series
No .	17	185	11
Operative time	112min	100 min	135 min
Blood loss	NA	133ml	169 ml
Conversion	1 case	18 pts[9%]	1 case
Hospital stay	3.6 days	3 days	3.6days

## **RETROPERITONEOSCOPIC PYELOLITHOTOMY :**

We have attempted 4 pyelolithotomies in our institution for large pelvis stones with extra renal pelvis but we succeeded in three cases. In one patient we experienced difficulty in dissecting the pelvis because of dense adhesions, so we converted into open procedure. The mean operative time and hospital stay were comparable to that of international studies.

Parameters	Hemal et al	Gaur et al	Our series
No of cases	7	3	4
Operative time	108.2 min	120min	170 min
Blood loss	127.4 ml	130ml	200ml
Hospital stay	4 days	4.5 days	7 days
Success rate	71%	100%	75%

## **RETROPERITONEOSCOPIC URETEROURETOSTOMY :**

We have done retroperitoneoscopic ureteroureterostomy for 2 cases of retrocaval ureter and one case of stricture ureter. By 4 port technique we did retroperitoneoscopic exploration and confirmed the diagnosis then proceeded with excision of narrowed portion of ureter and ureteroureterostomy was completed. In all cases we passed the guidewire retrogradely into the ureter and before transecting the ureter guidewire was withdrawn a little. Then after completing the posterior anastomosis , guidewire with open ended stent was passed ,then guidewire was removed. Retroperitoneoscopic approach was found to be best for the correction of retrocaval ureter.in the first case , there was prolonged drainage and drain was removed on the 8<sup>th</sup> day. In other 2 cases , drain was removed on the 4<sup>th</sup> day and patients were discharged on the next day.

We have attempted retroperitoneoscopic pyeloplasty in two cases but we succeeded in one case. This is because of small working space to do intracorporeal suturing for pyeloplasty

We also done retroperitoneoscopic ureterolysis for 2 Patients with upper ureteric obstruction and retroperitoneoscopic renal cyst decortication in one case.



## **CONCLUSION:**

1. Laparoscopic retroperitoneal surgery is better alternative in patients requiring open surgery especially in ureteric stone disease because of shorter hospital stay ,less analgesic requirement, cosmetically good scar and complete stone clearance in single session.
2. Retroperitoneoscopic nephrectomy should be offered as primary modality to patients with benign renal diseases scheduled for elective nephrectomy.
3. Retroperitoneoscopic procedures for retrocaval ureter, renal cyst, retroperitoneal lymph cyst and ureteric obstruction requiring ureterolysis should be considered as primary modality .

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**PROFORMA**

**PROCEDURE :**

**NAME:**

**AGE/SEX :**

**IP NO:**

**DOS :**

**DIAGNOSIS ;**

**APPROACH ;**

**NO OF PORTS;**

**DURATION OF SURGERY;**

**BLOOD LOSS;**

**CONVERSION IF ANY ;**

**PER OPERATIVE COMPLICATIONS ;**

**POST OPERATIVE ANALGESIC REQUIREMENT ;**

**DAY OF DRAIN REMOVAL ;**

**HOSPITAL STAY ;**

**POST OPERATIVE COMPLICATIONS ;**

**WOUND INFECTION ;**

**PROLONGED DRAIN > 5 DAYS :**

**MANAGEMENT OF COMPLICATIONS :**