Retroperitoneoscopic Versus Open "Simple" Nephrectomies

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ABSTRACT

To compare our 10 year results of retroperitoneoscopic nephrectomies (RPN) with the standard technique of open nephrectomy (ON) due to benign conditions. This article retrospectively compares the clinical results of 1050 RPN and 334 ON, respectively. The evaluation of clinical statistics included operative time, blood loss, dose of analgesic use, postoperative suggest visual analogue pain rating (day 3) and postoperative hospitalization. The basic operative period for RPN was 82.3 (13-260) min and for ON 86.9 (60-180) min. The amount of estimated blood loss was 134.4 (10-3000) ml for RPN and 195.81 (25-1000) ml for ON groups, consequently ($p<0.05$). Doses of analgesic medication requirement per patient was 75 (0-225) mg and 304.8 (75-1025) mg of diclofenac for RPN and ON groups respectively. The postoperative hospital stay averaged 2.71 (1-15) days for RPN and 5.60 (2-30) days for ON ($p<0.05$). The visual analogue pain score (VAS) at third postoperative day was 2.8 (2-5) and 5.8 (3-8) for RPN and ON groups respectively ($p<0.05$).Our research results show that the overall advantage of the RP approach over open surgery and the minimally invasive approach is clear.

Introduction

The nephrectomy procedure was introduced to the practice of surgeons in XIX century. Based on this experience, the approaches, technical details, steps of the operation has been changed and modified and has become a standard all over the world for the treatment of different renal diseases [1, 2].

In 1990, Clayman et al. [3] the first laparoscopic nephrectomy was performed and this method has become popular around the world. The introduction of the Gaur balloon dissection technology in 1992 made it possible to overcome technical difficulties in accessing the retroperitoneal space and the impossibility of creating an effective large alveolar peritoneum [4]. Later, this new approach was modified to perform various peritonoscopy (RP) procedures [5, 6]. Despite the technical feasibility, the use of a retroperitoneal approach is currently not very popular among urologists. In this study, we assessed our experience with RP and open nephrectomy (ON) in the clinic. The two groups were balanced in terms of indications (Table 1) and compared for surgery time, morbidity, blood loss, analgesic dose, mean analogue pain score in the afternoon (3 days), and postoperative hospitalization.

Material and Methods
Patients

In a time of ten years (2010–2020), we performed more than 2300 RP and laparoscopic operations in our clinic. Among them 1050 cases were simple RPN, due to benign conditions. We compared our results with 334 consecutive ON also due to benign conditions, which was performed by the another team of experienced urologists at the same period of time. The both of two patient groups were similar in indications (i.e., renal pathology), but differed in age and sex (Table 1).

Table 1. Data of the patients

Procedure	N	Age	Sex	Side	Indications
RPN	1050	39.1 (5-80)	M -499 (47.5%) F – 551 (52.5%) Not comparable or similar to 68% and 32%	Right: 539 Left: 511	Non-functioning kidney due to stone disease (N: 683; 65%) PUJ stricture (N: 245; 23.3%) Ureteral stricture (N: 86; 8.2%) Urinary tract infection (N:20) Renovascular disease (N:10) Cystic kidney malformation (N:6)
ON	334	46.1 (6-80)	M – 158, (47.3%) F – 176 (52.7%)	Right: 168 Left: 166	Non-functioning kidney due to stone disease (N: 166; 50%); Urinary tract infection, pyonephrosis (N: 56; 17%); PUJ stricture (N: 40; 12%); Ureteral stricture (N: 40; 12%); Anomaly, dystopic kidney (N: 32; 10%)

Notes: "RPN" – Retroperitoneoscopic nephrectomy; "M" – male, "F" – female, "PUJ" – pyelo-ureteral junction, "ON" – Open nephrectomy, "RCC" – renal cell carcinoma

We used the preferred method for the RP procedure.

RPN. In distinction to the transperitoneal approach, three multi-usable, valve-equipped metallic trocars have been predominantly utilized (2-10 mm, 1–5 mm). Balloon dissection method in accordance to Gaur was once carried out to create retroperitoneal access. We used standard instrumentations for dissection. Titanium clips and hem-o-loc clips were used on demand to clip the ureter, renal artery and renal vena.

Patient Preparation: All diseased took identical perioperative curing, including preoperative bowel preparation, crossover blood count, circulating antibiotics, low molecular weight heparin and elastic stocking prophylaxis of deep vein thrombosis, and signed informed consent.

Patient Positioning: The patient underwent a lumbar dissection using the standard techniques described by Rassweiler [5, 6]. Following a balloon incision in the retroperitoneal space, three trocars were inserted, Gerota's fascia was dissected, and the ureter was examined. The renal pedicle is usually surgically removed and the renal vessels are cut individually.

The exposed kidney was removed using a supracostal incision of 11–12 ribs in the lumbar region [1]. After dissecting Gerot's fascia, the kidneys and ureters were separated. On the back, the leg is dissected by incisions and ligation of the renal veins and arteries.

At the final stage of both procedures, the drainage remains in the retroperitoneal space.

Parameters of Analysis

Perioperative complications have been classified according to modified classification of Clavien-Dindo [7] (Table 2).

Table 2. Classification of complications according to Clavien-Dindo [7]

Grade of complications	RPN N=199 (18.9%)	ON n=146 (43.7%)	P
Grade I	164 (82.4%)	118 (80.8%)	p>0.05
Grade II	19 (9.5%)	4 (2.7%)	
Grade IIIa	8 (4.0%)	2 (1.4%)	
Grade IIIb	7 (3.5%)	8 (5.5%)	
Grade IV	-	12 (8.2%)	
Grade V	1 (0.5%)	2 (1.4%)	

Notes: "RPN" – Retroperitoneoscopic nephrectomy; "ON" – Open nephrectomy

Clinical outcome parameters such as time of surgery, blood loss, analgesic dose, postoperative visual analogue pain outcome (day 3), and postoperative hospitalization were compared as recorded in the patient's record.

Statistical Analysis

All relevant information were statistically analyzed using the Student's t test; $p < 0.05$ is statistically important.

Results

The results are summarized in Table 3.

Operative Time

Basic operational time was 82.3 min (13–260) for RPN and 86.9 min (60–180) for ON, $p < 0.05$ (Table 3). The time of surgery is mainly divided into two groups depending on the situation within the operation, for example, the size of the kidney or the degree of perinephric adhesion (Fig. 1).
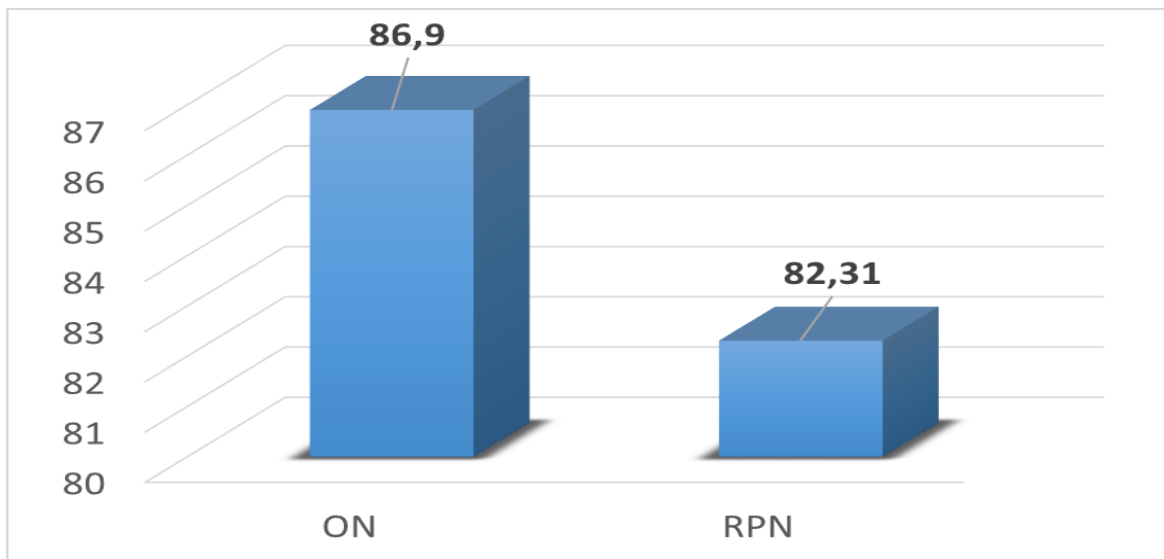

Fig. 1. Comparison of basic operative times for RPN and ON ($p > 0.05$)

The amount of Blood Loss and Blood Transfusion

The amount of estimated blood loss was 134.4 (10-3000) ml for RPN and 195.81 (25-1000) ml for ON groups, consequently ($p < 0.05$).

Blood transfusion was required in 11 patients (1.0%) in the RPN and in 26 patients (7.8%) in the ON group. However, there were no statistically important differences between the groups.

Complications

Complications are summarized according to Clavian-Dindo's modified classification [7] in Table 4.

In the RPN group, surgery had to be converted to an open approach in 36 cases, due to uncontrolled bleeding in 16 cases, colon injury in one case, and assimilation of the technique because others did not develop during surgery (mostly early cases in the period). In four postoperative patients, a subcutaneous abscess appeared at the site of the enlarged trocar incision to extract the sample and required local review and debridement. Four cases in both groups developed incisional hernia formation, which was

surgically restored within 6 months after the initial procedure.

In short, there was no important difference in terms of the overall rate of complications (Table 3). It is also notable that the majority of complications in both groups were minor (Grade 1 and 2).

In conclusion, there was no important difference in terms of the overall level of complications (Table 3). It is noteworthy that the majority of complications in both groups are minor (grades 1 and 2).

Table 3. Conclusion of results

Criteria	RPN	ON	p value
Operative time, min	82.3 (13-260)	86.9 min (60–180)	n.s.
Complication rate, %	18.9	43.7	<0.05
Doses of analgesics (diclofenac), mg	75 (0-225)	304.8 (75-1025)	<0.05
Postoperative hospital stay, days	2.71 (1-15)	5.60 (2-30)	<0.05
VAS of pain	2.8 (2-5)	5.8 (3-8)	<0.05

Notes: "RPN" – Retroperitoneoscopic nephrectomy; "ON" – Open nephrectomy; "n.s." = not significant; "VAS" – Visual analogue scale

Table 4. Complications following nephrectomy

Procedure	Complications/notes	Management
RPN	16 – bleeding during dissection	Conversion
	1- colonic injury	Conversion
	4 - subcutaneous abscess	Revision and debridement
	4- incisional hernia	Surgical repair
ON	24 – bleeding during dissection	Surgical control, blood transfusion
	24 – pleural dissection	Conservative treatment
	6 - bowel damage	

Notes: "RPN" – Retroperitoneoscopic nephrectomy; "ON" – Open nephrectomy

Analgesic Use

This was registered in the patients' charts as the dose of required analgesic medication (diclofenac) during the postoperative period. After ON the patients required on average 304.8mg (75-1025) of diclofenac over a period of 4 (1–10) days, whereas after RPN only 75 mg (0–225) was administered over a time of 2 (0–4) days, p<0.05 (Table 3).

Hospital Stay

The postoperative health facility continue to be was once drastically greater after ON with 6.76 (4–11) days in contrast to the RPN with a common of 2.71 (1–15) (RPN), respectively, p<0.05 (Table 3).
Postoperative hospital stay was p <0.05 for 6.76 (4–11) days compared with RPN, compared with an average of 6.71 (1–15) (RPN) after ON (Table 3).

Postoperative Mean Visual Analogue Pain Score (VAS)
The mean VAS of pain was significantly lower on postoperative day 3 in RPN 2.8 versus 5.8 of ON group, $p < 0.05$ (Table 3).

Discussion

Minimally invasive methods of simple or radical nephrectomy (laparoscopic or retroperitoneoscopic) replace traditional open nephrectomy. The identified benefits of these approaches are patient comfort, improved cosmetic results, and reduced recovery [8].

As initially described with the aid of Clayman et al. [3], the approach of laparoscopic nephrectomy covered various steps: re-positioning of the patient from the supine to the lateral decubitus position after acquiring a pneumoperitoneum. Furthermore, dissection of the colon, which is carried out in order to gain get admission to to the retroperitoneum, ought to be the volatile of damage to the liver or spleen. These negative aspects supported the search for standardizing a retroperitoneal strategy which – as being similar to the open get admission to [1] – may want to with any luck overcome these issues.

Weinberg and Smith [10] attempted to remove an embolized pig kidney using a retroperitoneal approach subcutaneously using an endoscopic ultrasound aspirator, but failed due to colon injury. Kerbl et al. [11] reported good results with retroperitoneal laparoscopic nephrectomy in animal models, but encountered difficulties in clinical cases. These issues were mainly related to the inability to establish the pneumometroperitoneum with CO_2 inflation.
In 1992, Gaur [4] introduced his revolutionary technique based on the inflation of a special balloon catheter that allowed the retroperitoneum to be dissected correctly, and he reported his experience with the first retroperitoneal laparoscopic nephrectomy [12]. In 1994, Rassweiler JJ et al. described their similar balloon disintegration technique based on a hydraulic mechanism [13, 14].

For the transperitoneal laparoscopic approach, there are some absolute contraindications, for example, in the anamnesis or active peritonitis, significantly enlarged bowel, numerous preoperative adhesions, uncorrected coagulopathy, and hypovolemic shock [13, 15, 16]. However, in retroperitoneal procedures, a history of previous open abdominal surgery or peritonitis is not considered a contraindication. However, severe perinephric adhesions caused by previous lumbotomies, paranephritis, xanthogranulomatous pyelonephritis, renal tuberculosis, traumatic renal atrophy, or post-embolic nephrectomy may make the retroperitoneoscopic method impossible [14].

It was noted that a large complication rate of 3.5% and a complication rate of up to 30% were also described among healthy patients on open donor nephrectomy. The operative time, although short (90–140 min), is followed by a long hospital stay of 6.4–10.5 days [17, 18]. Blohme et al. [19] consisted of their own 490 live open donor nephrectomies, with a major complication rate of 1.4% and a minor complication rate of 13.6%.

We also compared the RPN data with the ON performed at our facility for similar performance. Relatively, the average operating time is shown to be much longer for RPN. However, the

difference was found to decrease after the first 100 surgeries and remained the same after 300 cases.

The need for analgesic medications and the length of hospital stay clearly favored RPN. The postoperative RPN hospital stay averaged 3.2 days, while the ON group required 6.76 days.

Often the basic criticisms of the laparoscopic approach focus on complications that is more common than open nephrectomy. Cavoussi et al. [16] possible complications include needle and trocar injuries, insufflation, dissection and closure injuries, and Gill et al. [15] Experiments and laparoscopic nephrectomy in the United States have provided information on the degree of complications. Vascular injuries are the most common injuries that occur during separation of the renal hilum or accessory vessels. Influenza-related complications can lead to heart-lung problems, hypercarb with associated acidosis, and eventually pulmonary gas embolism. Postoperative incisional hernias have been described in trocar sites larger than 10 mm [20, 21].

The issues of surgical operation can be uniformly in contrast according to the modified classification described Clavien-Dindo [7] (Table 2). We also have located similar usual complication rates for each crew (Table 3). It is additionally high-quality that the majority of problems in each organization used to be minor and used to be comparable with different series of open or RPN [15-19, 22, 23].

In short, based on of our research results we can conclude that RPN should be currently recognized as the method of choice for most diseases requiring nephrectomy. The fundamental dangers in phrases of operation time may be broadly compensated via way of means of the blessings of much less analgesia, decreased medical institution live and beauty benefits. The beauty look after such strategies is extra appealing to the affected person who's pretty happy with the general result.

In our experience, the duration of the surgical period depends mainly on the study curve, individual pathology, that is, on the size of the kidney, number of renal arteries, and peri-renal adhesions.

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