ACCEPTED MANUSCRIPT

Accepted manuscripts are the articles in press that have been peer reviewed and accepted for publication by the Editorial Board of the Vojnosanitetski Pregled. They have not yet been copy edited and/or formatted in the publication house style, and the text could still be changed before final publication.

Although accepted manuscripts do not yet have all bibliographic details available, they can already be cited using the year of online publication and the DOI, as follows: article title, the author(s), publication (year), the DOI.

Please cite this article: RETROPERITONEOSCOPIC NEPHRECTOMY FOR A NONFUNCTIONING KIDNEY – SINGLE SURGEON EXPERIENCE

RETROPERITONEOSKOPSKA NEFREKTOMIJA AFUNKCIONALNOG BUBREGA – ISKUSTVO JEDNOG HIRURGA

Authors: Vuk Sekulić *, Jovo Bogdanović ††, Ranko Herin †, Senjin Djozić †, Mladen Popov †; Vojnosanitetski pregled (2017); Online First September, 2017.

UDC:

DOI: https://doi.org/10.2298/VSP170215112S

When the final article is assigned to volumes/issues of the Journal, the Article in Press version will be removed and the final version appear in the associated published volumes/issues of the Journal. The date the article was made available online first will be carried over.
RETROPERITONEOSCOPIC NEPHRECTOMY FOR A NONFUNCTIONING KIDNEY – SINGLE SURGEON EXPERIENCE

Vuk Sekulić *†, Jovo Bogdanović *†, Ranko Herin *, Senjin Djozić *, Mladen Popov *

*Clinical Center of Vojvodina, Clinic of Urology. Hajduk Veljkova 1, 21000 Novi Sad, Serbia

†University of Novi Sad, Faculty of Medicine, Hajduk Veljkova 3, 21000 Novi Sad, Serbia

Corresponding author

Jovo Bogdanović, MD, Ph.D., Associate Professor of Urology

Clinical Center of Vojvodina, Clinic of Urology

Hajduk Veljkova 1

Fax ++ 381 21 529926

e-mail: jovo.bogdanovic@mf.uns.ac.rs

Short title: Retroperitoneoscopic nephrectomy
Apstrakt

Uvod i cilj: Cilj ovog rada je prikaz hirurške tehnike retroperitoneoskopske nefrektomije i naših iskustava sa primenom ove metode u lečenju bolesnika sa afunkcijom bubrega.


Zaključak: Retroperitoneoskopska nefrektomija afunkcionalnog bubrega je izvediva, sigurna i efikasna minimalno invazivna metoda u našim rukama. Hospitalizacija i period oporavka su relativno kratki.

Ključne reči: Odrasli, Hirurgija, Retroperitoneoskopija, Afunkcija bubrega, Nefrektomija, Minimalno invazivna hirurgija

Abstract

Background/Aim: The objective of this paper is to present the surgical technique of retroperitoneoscopic nephrectomy and to review our experience with this procedure in removal of non-functioning kidneys

Material and methods: This was a retrospective study comprising 55 patients who underwent retroperitoneoscopic nephrectomy at our institution during the period from January 2011 to November 2016. All patients had an unilateral non-functioning kidney confirmed by intravenous or CT urography and renal scintigram. Their medical records were analyzed for demographic data, duration of surgery, average blood loss, duration of hospital stay as well as time to return to normal life activities,
Results: The mean age of patients was 43 years (range 23 to 78). Perioperative or early postoperative mortality has not been recorded. Mean operative time was 82 minutes (range 45 -210). The average blood loss was 90 ml (40-450 ml). Average hospital stay was 4 days (3-7). Return to life activity was in average after 12 days (9-15).

Conclusions: Retroperitoneoscopic nephrectomy for a non-functioning kidney is a feasible, safe, and effective minimally invasive method in our hands. The length of hospital stay and convalescence was relatively short.

Keywords: Adult, Surgery, Retroperitoneoscopy, Nonfunctioning kidney, Nephrectomy, Minimally invasive surgery

Introduction

The first minimally invasive laparoscopic nephrectomy was reported by Clayman et al in 1991 1. Removal of the right kidney with renal mass measuring 3 cm lasted for 7 hours. The same group attempted laparoscopic nephrectomy using retroperitoneal approach, but they found it less comfortable and a more hazardous for the development of pneumothorax 2.

The retroperitoneoscopic approach was further popularized by Gaur with his innovative creation of retroperitoneal space using balloon dilatation3. With improvements in technical equipment and experience gained, this approach was used for more complex procedures like heminephrectomy, pyeloplasty, ureterolithotomy or partial nephrectomy for malignancies 4.

The objective of this paper is to present the surgical technique of retroperitoneoscopic nephrectomy for a non-functioning kidney and to review our experience of the first 55 cases.

PATIENTS AND METHODS

This retrospective study is based on the review of medical data of 55 patients who underwent retroperitoneoscopic nephrectomy for a nonfunctioning kidney during the period January 2011 to November 2016. Diagnosis of a nonfunctioning kidney was made by IVU or CT urography and confirmed with renal scintigram. Morphology of nonfunctioning renal
units was assessed by retrograde and/or antegrade pyelography, when necessary. Each renal unit with less than 8% of functional parenchyma was considered to be nonfunctional. Removal of the nonfunctioning kidney was indicated in the presence of recurrent pyelonephritis, stone, or hypertension that can not be controlled by medications. Following the standard preoperative evaluation, patients were subjected to surgical treatment. All procedures were performed by the single surgeon (V.S) under general anesthesia.

Surgical Technique
After being introduced into general anesthesia, each patient received placement of the urinary catheter. Thereafter the patient was placed in an adequate (left or right) lateral flank position. The operative field was prepared in a standard way. Three trocars are placed by open technique. A 2 cm incision is made above the iliac crest and after an opening of lumbodorsal fascia, blunt finger dissection technique is used for the creation of retroperitoneal space (Figure 1a). The posterior port is placed under tactile control 2 cm beneath the 12th rib (Figure 1b), close to the paraspinal musculature, taking care to avoid injury to neurovascular structures. The anterior port was placed after blunt dissection of the peritoneum. At the beginning of the study, the anterior port was placed under visual control, but with experience, it was found that blunt dissection of the peritoneum, using the index finger is sufficient for safe placement of trocar under tactile control (Figure 1c). The anterior port is placed beneath the tip of the 12th rib, on the anterior axillary line, taking care to avoid injury of a peritoneal sac. Finally, a 12 mm medial port is placed through the initial incision (Figure 1d) and a camera is introduced. Leakage of gas is prevented by two stitches around the trocar. Two 12 mm trocar and 5 mm trocar were used for the retroperitoneoscopy, and 12 mm is placed on the dominant surgeon’s hand (anterior port for the right sided procedure or posterior port for the left sided procedure). Gas is insufflated to create pneumoretroperitoneum to the pressure of 12 mmHg. The next step is an orientation in the operative field and identification of Gerota fascia that is incised posteriorly (Figure 2a & b). The lower pole of a kidney is identified and dissected. Thereafter, the ureter (Figure 3a) and gonadal vessels are identified and dissected. The ureter is clipped and transected (Figure 3b). Proximal ureteral stump is pulled laterally in order to lift lower pole of the kidney and proceed with dissection of renal hilum. The
artery is identified and meticulously dissected as well as the renal vein subsequently. The ENDO Gia vascular stapler is used to secure renal artery (Figure 4a) and vein (Figure 4b). The procedure is continued to cephalad using a harmonic scalpel for dissection of attachments of the upper pole of the kidney. Removal of the surgical specimen depends on the size of the kidney. Small hypoplastic kidneys were removed using specimen retrieval bags (Figure 5a & 5b), but a removal of bigger sized specimen required widening of the initial incision. The procedure is completed with control of hemostasis and leaving the drain in the retroperitoneum. Finally, port sites are sutured.

On the first postoperative day, the urinary catheter was removed. A drainage tube was removed when an amount of the drained liquid was less than 20 ml/24 hours. Patients were discharged upon removal of the drain. Routine check-up visits were scheduled 2 weeks after surgery at outpatients, and thereafter annually.

Statistical analysis was made using an Excel program. Parametric data was analyzed using descriptive methods, mean value and range. The study is approved by Ethical Committee of Clinical Center of Vojvodina.

RESULTS
A total of 55 patients (38 males and 17 females) underwent retroperitoneoscopic nephrectomy for a nonfunctioning kidney. The mean age of the patient was 43 years (range 23-78). Etiology of nonfunctioning kidneys is reviewed in Table 1.

The average duration of surgery was 82 minutes (range 45 - 210), Mean blood loss was 90 ml (range 40 - 450 ml). Four patients (7.3%) underwent conversion to open surgery: two cases due to severe fibrosis and another two due to the size of the kidney. Postoperative complications were noted in 5 patients (9,1%) paralytic ileus, fever, and prolonged drainage. The average duration of hospital stay was 4 days. Patients returned to normal lifestyle activities after 12 days (range 10 to 15). There was no perioperative and early postoperative mortality.

Discussion
Traditionally, urologists have used a more frequently open retroperitoneal approach for renal surgery. Surprisingly, almost the majority of laparoscopic surgeons dealing with renal pathology are not familiar with retroperitoneoscopy. The main disadvantage of retroperitoneoscopy seems to be reduced working space that can cause problems with
trocar placement, orientation in a surgical field, and entrapment of the organ. On the other hand, posterior access enables easier and faster identification of anatomical structures of the upper urinary tract and keeps peritoneal cavity isolated, reducing the risk from inadvertent organ injuries.

Indications for retroperitoneoscopic nephrectomy include chronic pyelonephritis, obstructive or reflux uropathies, renovascular hypertension, nephrosclerosis, dysplastic kidney, acquired renal cystic disease, polycystic kidneys, renal tuberculosis and end-stage kidney disease before transplantation. This procedure is contraindicated in case of uncontrolled coagulopathy and untreated infection associated with hemodynamic instability. Morbid obesity and previous retroperitoneal surgery have been considered relative contraindications for retroperitoneoscopy. Inexperienced surgeons should refrain from performing retroperitoneoscopy in cases with xanthogranulomatous pyelonephritis and renal tuberculosis because these conditions are associated with severe perirenal scarring and the higher rate of conversions to open surgery.

Complications associated with the retroperitoneoscopic approach are possible at each step of the procedure. Access related complications are lesions of abdominal wall vessels, lesions of peritoneum or pleura, injuries of solid and hollow organs. Bleeding is the most unpleasant complication during surgery. It should be carefully inspected at the end of the procedure after lowering of gas pressure in the operative field.

Rassweiler et al have found a significant advantage of the laparoscopic and retroperitoneoscopic over the open approach for nephrectomy in terms of duration of surgery, consumption of analgesics and duration of hospital stay. Also, they found that retroperitoneoscopic nephrectomy was more favorable than laparoscopic nephrectomy in terms of lower transfusion rate (5.9% vs 16.7%), lower conversion rate (5.9% vs 11.1%) and lower complication rate (29.4% vs 38.9). Garg et al have published recently similar findings. They found significantly higher visual analog score in nephrectomized patients who were treated by laparoscopic approach than those who received retroperitoneoscopy (4.9 vs 2.7 on day 1 and 3.2 vs 1.1 on day 2).

Table 2. is showing summarized characteristics of previously reported series. Certainly, with experience gained and technical improvements of instrumentaria, the duration of surgery, complication and conversion rates are minimized. However, patients
should be warned of possible conversion to open surgery, particularly in cases of pyonephrosis or severe perirenal adhesions.

CONCLUSION

Retroperitoneoscopic nephrectomy for a nonfunctioning kidney is a feasible, safe and effective minimally invasive method in our hands. The length of hospital stay and convalescence was relatively short. Results obtained with retroperitoneoscopic nephrectomy in this study are comparable with reported series.

Acknowledgements: The authors thank to Mrs Giorgia Solaja for her valuable assistance in improving the writing style of the manuscript and to Mr. Raša Kojčić for his technical assistance in the preparation of illustrations.

REFERENCES

Table 1. Etiology of non-functioning kidneys

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ureteral calculi</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>UPJ stricture</td>
<td>10</td>
<td>18.2</td>
</tr>
<tr>
<td>Ureteral stricture</td>
<td>12</td>
<td>21.8</td>
</tr>
<tr>
<td>Renal atrophy/hypotrophy</td>
<td>20</td>
<td>36.4</td>
</tr>
<tr>
<td>Stenosis a renalis</td>
<td>2</td>
<td>3.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>55</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 2. Results of reported series of retroperitoneoscopic nephrectomies

<table>
<thead>
<tr>
<th>First author</th>
<th>Year</th>
<th>Patients</th>
<th>Mean duration of surgery (min)</th>
<th>Blood loss (ml)</th>
<th>Complications rate n (%)</th>
<th>Covers ion rate (%)</th>
<th>Hospital stay (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quintela</td>
<td>2006</td>
<td>43</td>
<td>160</td>
<td>200</td>
<td>4 (9,3%)</td>
<td>13.9%</td>
<td>2.1</td>
</tr>
<tr>
<td>Gupta</td>
<td>2005</td>
<td>351</td>
<td>98</td>
<td>65</td>
<td>22</td>
<td>13.3%</td>
<td>3</td>
</tr>
<tr>
<td>Gaur</td>
<td>2000</td>
<td>38</td>
<td>132</td>
<td>84</td>
<td>6 (4,4%)</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Hemal</td>
<td>1999</td>
<td>43</td>
<td>114</td>
<td>na</td>
<td>2 (4,7%)</td>
<td>5%</td>
<td>3.4</td>
</tr>
<tr>
<td>Gill</td>
<td>1998</td>
<td>36</td>
<td>263</td>
<td>117</td>
<td>2 (5.6%)</td>
<td>na</td>
<td>5.4</td>
</tr>
<tr>
<td>Rassweiler</td>
<td>1998</td>
<td>17</td>
<td>188</td>
<td>na</td>
<td>2 (11.8%)</td>
<td>5.9%</td>
<td>6</td>
</tr>
</tbody>
</table>

na – not available data
Figure 1a. Primary incision
Figure 1b Blunt finger dissection of retroperitoneal space
Figure 1c Placement of anterior 5 mm trocar under tactile control
Figure 1d Placement of medial 12 mm (camera) port
Figure 2a Dissection of Gerota fascia

Figure 2b Incision of Gerota fascia
Figure 3a. Dissection of the ureter

Figure 3b. Transection of the previously clipped ureter
Figure 4a Control of dissected renal artery with ENDO Gia stapler

Figure 4b Control of dissected renal vein with ENDO Gia stapler
Figure 5a Entrapment of kidney in Endobag

Figure 5b Removal of surgical specimen
Received on February 16, 2017.
Accepted on September 11, 2017.
Online First September, 2017.