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Original Research Article

A Hospital Based Study to Determine the Minimally Invasive Nephrectomy for Inflammatory Renal Disease

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Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to determine the minimally invasive nephrectomy for inflammatory renal disease.

Methods: This was a observational study conducted in the Department of Surgery for the period of 2 years and we included 100 patients.

Results: In the present study, 70% were women and 30% were men. Left side nephrectomy was performed in 65% of the cases. A positive history of urolithiasis was present in 54% of the cases, followed by urinary tract infections (UTI) (44%), high blood pressure (HBP) (32%) and Type II diabetes mellitus (DM II) (10%). Mild complications consisted in 6 cases of surgical site infection (SSI) that were treated with antibiotics, 4 dehisced the skin incision and 4 presented ileum that resolved with medical treatment. The mean operative time for patients who did not required conversion to open surgery was 204±86 min, for the conversion ones was 386±174 min. The mean estimated blood loss for patients who did not required conversion to open surgery was 214±220 mL, for the conversion ones was 1477±748mL and for all the patients was 256±422 mL, with a range of 55-3275 mL. The mean length of hospital stay after surgery was 2.9± 2.2 days, being longer for the converted ones compared to the no converted ones ranged between 1 and 14 days.

Conclusion: Laparoscopic nephrectomy for IRD is a reproducible technique with low risks and complication rates despite the surgical challenge it represents. Our experience supports that releasing the kidney first and leaving the hilum for the end is a safe approach when vascular structures are embedded into a single block of inflammatory and scar tissue. There were minimal surgical and post-surgical complications, few conversions to open nephrectomy, blood loss, operative time and days hospitalized.

Keywords: nephrectomy, complications, inflammatory renal disease

Introduction

Inflammatory renal disease (IRD) is a group of chronic conditions that affect the kidney and develops an inflammatory process that extends beyond the renal parenchyma. [1] This process can be promoted by obstruction of the urinary tract specially by stones. These chronically non-functioning kidneys are removed in most cases when they are associated with pain, recurrent urinary tract infections, or renovascular hypertension. [1,2] In the past decades, the open nephrectomy has been considered as the standard of care for this condition. However, this approach is related to wide, painful incisions with higher risk of surgical site infections, higher analgesic dose requirements, longer hospital stays and prolonged convalescence periods. [1,2]

Laparoscopic nephrectomy has become the gold standard procedure in both benign and malignant renal conditions requiring surgical removal since it was first introduced by Clayman et al. in 1991. [3] With the increasing experience of laparoscopic techniques, the indications of laparoscopic nephrectomy (LN) have been gradually extended to inflammatory renal disease (IRD), such as xanthogranulomatous pyelonephritis (XGPN), tuberculosis, hydronephrosis, pyelonephritis, and pyonephrosis. [4] Xanthogranulomatous pyelon - ephritis is more common in women than in men, with a peak of incidence within the fifth and sixth decades of life. [5] In rare cases, younger people may be affected by XGP. [6]

In the past decades, the open nephrectomy has been considered as the standard of care for this condition. However, this approach is related to wide, painful incisions with higher risk of surgical site infections, higher analgesic dose requirements, longer hospital stays and prolonged convalescence periods. [1,2]

Due to the significant inflammatory process, the difficult dissection of the renal pedicle and adhesions to adjacent organs, makes this operation a technically demanding approach for minimally invasive surgery (MIS). MIS conversion rates in these type of cases is about 28%. In addition, laparoscopic nephrectomy (LN) requires extensive experience for minimizing vascular and adjacent organ injuries that can be present in 18% of the procedures. These certain conditions are often associated with marked chronic inflammation, dense adhesion, and anatomical disorganization, leading to higher complication rates and conversion rates in laparoscopic procedures. [4]

In an effort to minimize technical difficulties and complications, some authors recommend the hand-assisted laparoscopic approach. The direct access of the hand would make the dissection of planes easier, as well as the ligation of the vascular pedicle and the control of eventual complications, reducing the surgical time, technical difficulties and morbidity of the surgery. [7,8]

The aim of the present study was to determine the minimally invasive nephrectomy for inflammatory renal disease.

Materials and Methods

This was a observational study conducted in the Department of Surgery, MVASMC, Mirzapur , UP, India for the period of 2 years and we included 100 patients.

Methodology

100 patients who underwent a LN for IRD were included in this study. Interstitial nephritis, chronic pyelonephritis, renal tuberculosis and xanthogran - ulomatous pyelonephritis. The demographics, pre-operative diagnosis based on images (computed tomography [CT], magnetic resonance imaging [MRI], ultrasound and/or renal scintigraphy), and intraoperative variables such as operative time, blood loss, need for open conversion, length of hospital stay, intra and postoperative complications following the Clavien-Dindo classification were analyzed.

After data collection, we calculated the mean and standard deviation of the operative time, blood loss and length of hospital stay for all 100 patients, including both, those who required conversion and those who did not. Then, we did the same statistical analysis excluding patients with conversion to open surgery. Following this, we obtained the percentage of patients with mild and severe peri-surgical complications. We applied the Clavien- Dindo's classification to the post-surgical complications.

Surgical Technique

LN was considered an option for all inflammatory renal units, preferring transperitoneal approach for all cases. Patient positioning and prepping follow the usual laparoscopic approach in a semi lateral decubitus position. No significant bed breaking is usually required. Patient is well secured and padded to the surgical table, as tilting might be necessary during the procedure. For trocar placement, we use three trocars of 10 mm for adult patients and for pediatric patients 3 mm or 5 mm depending on patient's weight. For the placement of the first trocar, we always perform a Hasson's open technique at the base of the belly- button. Subsequent trocars are placed at the subcostal region at Palmer's point and the other trocar above the iliac spine at the anterior axillar line. If the case can be completed with those three ports, we try to avoid the need of a fourth one. The fourth port is usually needed to retract the liver. For this purpose, we used a trocar of 5 mm.

Results

Table 1: Demographic profile of the patients

Demographic profile	N
Age (range)	6-75
Sex	
Women	70
Men	30
Side, *n* (%)	
Right	35
Left	65
Personal history Urolithiasis	54
UTI	44
HBP	32
VUR	12
DM II	10
Ureteral stricture	20
Primary obstructive mega ureter	3
Duplex collecting system	3
Neurogenic bladder	2

In the present study, 70% were women and 30% were men. Left side nephrectomy was performed in 65% of the cases. A positive history of urolithiasis was present in 54% of the cases, followed by urinary tract infections (UTI) (44%), high blood pressure (HBP) (32%) and Type II diabetes mellitus (DM II) (10%).

Table 2: Post-operative complications classified by Clavien-Dindo's grading system

Post-surgical complications	Clavien-Dindo score	*N*=100
Pleural effusion	IIIa	4
Dehiscence	I	4
SSI	II	6
Ileum	II	2
AMI	Iva	4
PTE	Iva	2
Evisceration	IIIb	2

Mild complications consisted in 6 cases of surgical site infection (SSI) that were treated with antibiotics, 4 dehisced the skin incision and 4 presented ileum that resolved with medical treatment.

Table 3: Operative data on inflammatory renal conditions

Parameter	No conversion to open	Conversion to open	Total, *n*=50
Operative time, mean SD, min	204±86	386±174	216±114
Estimated blood loss, mean SD,mL	214±220	1474±746	256±422
Days hospitalized, mean SD,day	2.8±2.2	5.6±2.3	3.2±2.4

The mean operative time for patients who did not required conversion to open surgery was 204±86 min, for the conversion ones was 386±174 min. The mean estimated blood loss for patients who did not required conversion to open surgery was 214±220 mL, for the conversion ones was 1477±748mL and for all the patients was 256±422 mL, with a range of 55-3275 mL. The mean length of hospital stay after surgery was 2.9± 2.2 days, being longer for the converted ones compared to the no converted ones ranged between 1 and 14 days,

Discussion

With the increasing experience of laparoscopic techniques, the indications of laparoscopic nephrectomy (LN) have been gradually extended to inflammatory renal disease (IRD), such as xanthogranulomatous

pyelonephritis (XGPN), tuberculosis, hydrone-phrosis, pyelonephritis, and pyonephrosis. These certain conditions are often associated with marked chronic inflammation, dense adhesion, and anatomical disorganization, leading to higher complication rates and conversion rates in laparoscopic procedures. [9] Also as a minimally invasive approach, hand assisted laparoscopic nephrectomy (HALN) was first introduced in 1997 as a transition from open surgery to standard laparoscopic surgery. [10] Hand assisted laparoscopic surgery might offer more convenience and possibilities in those challenging situations, as it can provide surgeons with the assistance of tactile feedback, effective dissection, and facilitated control of the renal hilar vessels. [11]

In the present study, 70% were women and 30% were men described also in other publications. [12,13] Left side nephrectomy was performed in 65% of the cases. A positive history of urolithiasis was present in 54% of the cases, followed by urinary tract infections (UTI) (44%), high blood pressure (HBP) (32%) and Type II diabetes mellitus (DM II) (10%). Mild complications consisted in 6 cases of surgical site infection (SSI) that were treated with antibiotics, 4 dehisced the skin incision and 4 presented ileum that resolved with medical treatment. In other studies, similar to the present one, reported that hydronephrosis, kidney enlargement, poor excretion of contrast medium and air in the urinary tract were some of the common findings in urologic imaging. [12] The misdiagnosed neoplasia is also a frequent feature, especially in XGP, considered the "Great imitator". [13-16]

The mean operative time for patients who did not required conversion to open surgery was 204±86 min, for the conversion ones was 386±174 min. The mean estimated blood loss for patients who did not required conversion to open surgery was 214±220 mL, for the conversion ones was 1477±748mL and for all the patients was 256±422 mL, with a range of 55-3275 mL. The mean length of hospital stay after surgery was 2.9± 2.2 days, being longer for the converted ones compared to the no converted ones ranged between 1 and 14 days. The minimally invasive nephrectomy is the modality of choice for benign renal diseases; however, inflammatory conditions have been considered a relative contraindication for this surgical approach. [17,18]

Liang et al [19] analyzed the experience in LN with a method of outside Gerota's fascia dissection and

en-block ligation and division of the renal pedicle similar to our re- ported cases. They reported 11% of conversions to hand- assisted laparoscopy and only one conversion to open nephrectomy. Mean operative time was 99.6 29.2 min, blood loss was 75.2 83.5 mL and average hospital stay was 4:8 1:4 days. Comparing these results to our study, we had longer operative time and more bleeding, considering the conversion and non-conversion groups. XGP is a chronic inflammatory process in most cases due to renal parenchyma infection secondary to tract urinary obstruction. [20] In 2007, Vander brink and associates [21] reported LN had longer operative times but shorter post- operative hospital stay compared to open surgery, without any differences in blood loss, transfusion rates or analgesics.

Conclusion

Laparoscopic nephrectomy for IRD is a reproducible technique with low risks and complication rates despite the surgical challenge it represents. Our experience supports that releasing the kidney first and leaving the hilum for the end is a safe approach when vascular structures are embedded into a single block of inflammatory and scar tissue. There were minimal surgical and post-surgical complications, few conversions to open nephrectomy, blood loss, operative time and days hospitalized.

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