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Comparative study of morbidity and mortality pre- and postoperative of laparoscopic nephrectomy for inflammatory versus tumoral cause according to the Clavien–Dindo classification: prospective study over 2 years

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Abstract

Background: For 29 years, Laparoscopic Nephrectomy has steadily established itself as a technique for kidney excision. Patients as well as surgeons appreciate the benefits of this less invasive technique. Although the morbidity and mortality of this minimally invasive technique are relatively low, the risks it entails must be taken into account seriously. The purpose of this study is to evaluate and compare the intra- and postoperative morbidity and mortality factors connected to Laparoscopic Transperitoneal Nephrectomy for inflammatory kidney versus tumoral kidney according to the Clavien–Dindo classification.

Methods: A prospective comparative mono-centric study was carried out over a period of 24 months (January 2018–January 2020) on patients having benefited from a Laparoscopic Transperitoneal Nephrectomy for Inflammatory (Group 1) or Tumoral (Group 2) causes. Postoperative morbidity and mortality were assessed according to the Dindo–Clavien classification.

Results: This study included 60 patients. Group 1 consisted of 32 patients (median age: 50.4 years) and Group 2 of 28 patients (median age: 61 years). Drainage of inflammatory kidneys was done preoperatively by nephrostomy drain (11 cases) and double J probe (3 cases). The mean operating time was longer in Group 1 (234 vs 186.8 min, $p = 0.1$). The conversion rate was statistically significant in Group 1 (6 vs 1, $p < 0.05$). The rate of Grade 1 complications is very significant in Group 1: ileus (6 vs 2, $p = 0.02$), postoperative antibiotic therapy (26 vs 3, $p = 0.001$) and infection of the wall (4 vs 0, $p < 0.001$). The rate of severe complications (Clavien ≥ 3) was the same in the two groups. The average length of hospital stay was higher in Group 1.

Conclusion: Our work (study) showed a higher rate of severe complications in Laparoscopic nephrectomies for inflammatory causes.

Keywords: Nephrectomy, Laparoscopy, Morbidity, Clavien–Dindo

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1 Background

Laparoscopic Nephrectomy (LN) is one of the first procedures in Laparoscopic surgery and one of the most common in our daily practice. The first LN was reported by Claymen 29 years ago. Since then laparoscopy has increasingly taken more space in renal pathology. For both inflammatory and tumoral causes, LN allows a remarkable reduction in peri- and postoperative morbidity. The same goes for the duration of hospitalization compared to open surgery.

Our study, however, aims to compare the morbidity and mortality factors between LN for tumoral causes and LN for inflammatory causes.

2 Methods

2.1 Patient selection

Between January 2018 and January 2020, 95 nephrectomies have been carried out. Including 60 Laparoscopically for different pathologies ranging from tumor to inflammatory. The exclusion criteria included conventional Nephrectomy, partial Nephrectomy and Laparoscopic sample from living donors.

2.2 Surgical intervention

Laparoscopic transperitoneal surgery was performed on all our patients in accordance with universal procedures: 4 to 5 trocars on the right and 4 trocars on the left. After colonic homolateral detachment, the lower pole of the kidney is released and the ureter is then individualized and dissected until released. Two hem-o-lock clips are placed allowing its later section. The next step is the dissection of the vascular pedicle away from the hilum. The artery is identified then dissected on all sides and clipped by 3 Hem-o-locks. Two upstream and one downstream and then sectioned. In the same way, the vein will then be dissected, clipped and then ligatured. Finally further dissection of the kidney, releasing it from all sides then the extraction by an endobag.

2.3 Studied criteria

This is a comparative, prospective single-center study. Morbidity was defined at 90 days and staged according to the classification of Clavien–Dindo. A major complication corresponding to a Clavien–Dindo score higher than or equal to 3.

2.4 Statistical analysis

The results will be expressed as an average (for quantitative variables) or as a percentage (for qualitative variables). The bilateral Student’s *t* test will be used to compare the quantitative values between the two

groups. The bilateral $\times 2$ test will be used to compare the qualitative variables between the two groups. A *p* less than 0.05 was considered statistically significant. Statistical analyzes were performed using SPSS® version 20.

3 Results

3.1 Patients’ demographics and characteristics

During the inclusion period, 60 patients were included. Group 1 consisted of 32 patients (inflammatory pathology), and group 2 consisted of 18 patients (tumor pathology).

The characteristics of the patients are presented in Table 1. The average age was 51 years (31–88) in group 2 and 50.4 years (15–80) in group 1 (*p* = 0.2). No significant differences were observed between the two groups in terms of demographic characteristics. Patients histories were comparable in the two groups. The diagnostic time for all pathologies combined was 18.8 months, with an average diagnostic time of 5.2 months (range: 1 to 10 months) for group 2 and 33.21 month (range: 12 to 120 months) for group 1 (*p* < 0.001).

4 Perioperative morbidity

The operating time between the introduction of the trocars and the skin closure was not different between the two groups. 234 min for group 1 and 186.6 min for group 2 (*p* = 0.1). The same goes for blood loss (180 ml for group 1 and 120 ml for group 2 (*p* = 0.05).

All patients benefited from the installation of a Redon drain at the operating site. Conversion was necessary in 7 cases, including 6 for group 1 and one case for group 2 (*p* < 0.05), for two reasons. The first one is the difficulty of approaching the renal pedicle is either due to uncontrolled bleeding at the hilum or by the presence of several adhesions making access to the pedicle almost impossible in 80% of the cases. The second one is the intraoperative discovery of a pyonephrosis in 20% cases (Table 2).

Table 1 Demographic data and patient characteristics

	Group 1 (n = 32)	Group 2 (n = 28)	<i>p</i>
Male gender	17 (53%)	18 (64%)	
Age	50.4 (15–80)	51 (31–88)	0.2
HTA	2	8	
smoking	4	9	
Diabetes	5	1	
Tuberculosis	3	0	
Lithiasis	11	0	

Table 2 Perioperative morbidity

	Group 1	Group 2	<i>p</i>
Operating time	234	186.8	0.1
Blood loss	180	120	0.05
Drainage	32	28	
Conversion	6	1	< 0.05
Transfusion	5	3	0.001

No significant difference was observed between the two groups in terms of intraoperative complication. 2 for group 1 and 2 for group 2 (*p* = 0.97).

However, we noticed a lesion of the pleura which was attached to the posterior surface of the kidney (sutured with Vicryl 3/0 thread after Valsalva maneuver) and 3 vascular wounds (in particular two cases of breach on a branch of the renal vein, controlled by a Hem-O-Lock clip and a breach on the medial side of the IVC sutured with Prolene 4/0).

These complications occurred twice on a tumor kidney and twice on an inflammatory kidney. Eight patients required transfusion of blood cells (average of 2 blood cells) for intraoperative bleeding: 5 cases for group 1 versus 3 cases for group 2 (*p* = 0.1).

4.1 Postoperative morbidity

The study of this chapter is made according to the Clavien–Dindo classification. The mean length of hospital stay was longer in group 1 (5 days vs 2, *p* = 0.1).

The rate of Grade 1 complications is very significant in the Group 1: ileus (6 vs 2, *p* = 0.02), use of postoperative antibiotic therapy (26 vs 3, *p* = 0.001) and infection of the incision site (4 vs 0, *p* < 0.001).

The rate of severe complications (Clavien ≥ 3) was the same in the two groups.

The postoperative mortality rate was identical in the two groups. One patient died in group 2 by bronchial inhalation syndrome and one patient in group 1, operated for pyonephrosis, died by septic shock on D14 post-operatively (Table 3).

5 Pathology results

The anatomopathological results of the 60 surgical pieces of nephrectomies sent to anatomopathologists are as shown in Table 4.

6 Discussion

Twenty-nine years have passed since the first Laparoscopic Nephrectomy performed by Clayman in 1991 in the USA [1] and patients, like surgeons, appreciate the advantages of this less invasive technique. However,

Table 3 Postoperative morbidity according to the Clavien–Dindo classification

	Group 1	Group 2	<i>p</i>
Grade I	36	5	
Infection of the incision site	4	0	< 0.001
Antibiotic therapy	26	3	0.001
Iléus	6	2	0.02
Grade II	5	3	0.001
Transfusion	5	3	
Grade III	0	0	
–	–	–	
Grade IV	0	0	
Grade V	1	1	
Bronchial inhalation	0	1	
Septic shock	1	0	

this is a complex gesture and involves certain risks. The occurrence of only one of its complications is enough to lose all the advantage that we had sought to gain by choosing the Laparoscopic route. The objective of our study is to compare the factors of comorbidity between Laparoscopic Nephrectomy for inflammatory pathology and for tumor pathology. The main result of our study is that there were more complications in the case of Laparoscopic surgery for inflammatory kidney. 22% versus 7% for tumor pathologies (*p* < 0.001).

In the literature, authors have objectified that many perioperative factors can influence the overall complication rate after Laparoscopic Nephrectomy, namely, the ASA score, operating time, operative bleeding and obesity. They confirmed, however, the multifactorial nature of each parameter [2, 3]. Studies have shown, for instance, that operative bleeding and the transfusion rate are strongly correlated with an increase in the rate of complications. Knowing that intraoperative blood loss in the case of patients who have many comorbidities and therefore are less able to tolerate significant blood loss and changes in blood volume may explain certain complications (cardiac, thromboembolic, infectious, etc.).

Table 4 Pathological results of the operating pieces

Histological type	Number	Percentage
Kidney tumor	25	41.6
Upper excretory tract tumor	3	5
Total	28	46.66
Chronic pyelonephritic lesions	15	25
Kidney tuberculosis	3	5
Pyonephrosis	14	23.33
Total	32	53.33

Literature data on postoperative consequences contain fairly variable results. It is difficult to make a comparison because there is no homogeneity in the definitions of postoperative complications.

In fact, most authors in their comparative series classify their complications as being either minor complications, requiring only medical treatment and/or simple monitoring, or major complications, requiring hospitalization in intensive care units, reoperation, or can be fatal. This classification is, however, not standardized, and the criteria for distinguishing between minor and major post-Laparoscopic complications remain variable from one center to another [4].

In our study, we adopted the Clavien–Dindo classification [5], which is used worldwide for all types of surgeries and is currently the reference classification. All studies found in the literature study the Clavien–Dindo classification for nephrectomies regardless of the cause. The absence of similar studies does not allow us to compare our results. Compared to different studies, the numbers concerning grades II, III and IV remain close. Except for the team of Ebbing [6] which reports higher rates. This can be explained by the sample size which includes 128 patients unlike the rest of the teams. As for grade V, we recorded 2 cases of death in our study. A result which is similar to that of studies in Scalabre [7] and Vasdef [8] and different from those found in other series of literature which did not note any case of death. This study has several limitations. First of all, this is a single-center retrospective study including its inherent biases. Second, nephrectomies have been performed by several senior surgeons well experienced in Laparoscopic surgery, which may affect the validity of the results. Third, unfortunately, data relating to postoperative management such as time to resume oral feeding, pain treatment were not available in both groups.

7 Conclusion

Our work showed a higher rate of severe complications in Laparoscopic nephrectomies for inflammatory causes as well as increased number of conversions and increased operative time.

Whether it's for a benign or a malignant cause and despite the complications encountered especially with regard to inflammatory pathology, Laparoscopic Nephrectomy remains therapeutic and is increasingly used in our daily practice.

Abbreviations

LN: laparoscopic nephrectomy.

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Authors' contribution

Our Professors, ML, ZD, SM, IS, are the main surgeons experienced in laparoscopic surgery. ME provided the data analysis, and MO assisted in the translation. I confirm that I have read and approved the final manuscript, HN, ME, MO, ML, ZD, SM, IS.

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Competing interests

The authors declare that they have no competing interests.

Availability of data and material

I declare by being the main author that the data and the material are available.

Ethics approval and consent to participate

I declare that my study has been seen and approved by the biomedical research ethics committee of the CHU Mohammed VI of Marrakesh.

Ethics committee reference numbers

The approval of the ethics committee on 02-12-2020 under Reference Number 88/20. The consent obtained from participants was written, so the ethics committee does not find any problem in this subject.

Consent for publication

Not applicable.

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