

A Comparison between Laparoscopic Nephrectomy and Open Nephrectomy in Terms of Analgesic Requirements

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Abstract

Objective: In this study, we aimed at making a comparison between the laparoscopic nephrectomy and open nephrectomy in terms of post-operative pain and morphine consumption.

Method: The study has been designed with patients who underwent prospective and randomized laparoscopic and open nephrectomy operation. We assessed the post-operative pain through visual analogue scale (VAS) at the 0st, 2nd, 4th, 8th, 12th, 18th, and 24th post-operative hours. We carefully recorded the intra-operative and post-operative results along with the post-operative pain-relieving analgesic doses.

Results: A total number of 54 patients were included in this study. The VAS scores of the two groups did not demonstrate a significant difference, but the analgesic (morphine) requirement was significantly lower in the laparoscopic group ($p=0,031$). The groups demonstrated no difference in terms of adverse effects.

Discussion: Along with similar perioperative results, laparoscopic nephrectomy offers an advantage in case of post-operative pain with regard to analgesic requirement and hospital stay duration.

Keywords: HLaparoscopic nephrectomy, Open nephrectomy, Pain, Morphine consumption

Introduction

Today, endourological interventions have replaced many classical surgical intervention methods. The most important reason for the preference of these surgical intervention methods by surgeons lies in their advantage of being minimally invasive. In this respect, ureterorenoscopic, percutaneous renoscopy and laparoscopic treatment approaches are the most preferred treatment methods in today's urology. However, classical surgery remains as the best alternative in some indications. In general, subcostal flank incision is used in open surgical approaches employed for upper urinary system. This approach offers the surgeon a wide operative field. However, according to the general consensus, it requires a considerable amount of muscle cutting, and leads to more post-operative pain and longer recovery period.

Since it leads to pain, secretion of the potent mediators of inflammation, and tissue trauma, surgery might be considered as an injury [1]. Consequently, post-operative pain is an expected case, but it is not expected to be the same in all surgical

procedures [2]. There is a close association between the effective management of post-operative pain and patient satisfaction, early mobilization, short hospital stays and decrease in costs. Therefore, routine surgical procedures shall principally consider reducing the post-operative pain.

Materials and Methods

Patients with an ASA physiological condition of I-III, who were planned for elective surgery early in the morning (8 am-3 pm), were included in the study. Exclusion criteria were morbid obesity (BMI >35), central nervous system dysfunctions or psychiatric diseases, substance-use, chronic or recent analgesic use (<2 months), cardiovascular, hepatic or renal failure, pregnancy and being underage (<18 years). All patients were prepared in the same way (informed consent form, bowel prep, etc.) in the pre-operative process. The patients were operated with the same surgical technique, by the same experienced surgeons and the same anesthesia team. We standardized the intra-operative

anesthesia protocol and applied for all cases. We monitored all patients through electrocardiogram, non-invasive blood pressure, end-tidal CO₂, and oxygen saturation. We used 1,5-2 mg/kg propofol for the general anesthesia induction; rocuronium infusion for promoting intra-operative muscle relaxation; 2-3 µg/kg fentanyl for intra-operative analgesia; and a mixture of oxygen nitric oxide enriched with isoflurane (ratio 1:1) to the extent deemed necessary by the anesthesiologist for the inhalation anesthesia. Prior to the surgical procedure, we performed nasogastric tube and urinary catheter insertion for all patients. We positioned the patients into lateral lumbotomy position under general anesthesia, and the operation table, therefore the patient were fixed in a 30 degree oblique position toward the surgeon. We performed laparoscopic nephrectomy through the transperitoneal or retroperitoneal track in accordance with the principles previously defined in detail by the literature [3]. We performed the laparoscopic surgical procedure in lateral decubitus position with 12 mmHg CO₂ insufflation by employing laparoscopy standard automatic insufflator and we did not use local analgesic during the perioperative period.

We reversed the neuromuscular relaxation pharmacologically at the end of the operation by using atropine and neostigmine. We evaluated the postoperative pain by using the 10-point VAS taught the patients in the premedication period. In addition to the pain scores, we also recorded data regarding nausea, vomiting, dizziness, fatigue, loss of concentration, blurred vision, itching, number of post-operative vomits, as well as the amount of the analgesic used at the 0th, 2nd, 4th, 6th, 8th, 12th and 24th hours. All patients received single-dose prophylactic antibiotic 1 hour before the operation, and low-molecular-weight heparin and antithrombotic prophylaxis through a week starting one day before the operation. The patients wore compression stockings until the full-mobilization. Surgical operations, advanced laparoscopic procedures and traditional open surgery were administered by the same experienced surgery team.

Statistical analysis

In order to compare the classifiable variables, we used the χ^2 test and Mann-Whitney U test for the constant variables. We made the assessments with SPSS ver. 11.0. This study considered the p values lower than 0,05 as significant

Results

From 2011 to 2014, we operated 68 patients with renal tumor, atrophic kidney and non-functional kidney in our clinic during the study. 60 patients met the inclusion criteria and attended the study. We excluded 6 (10%) patients from the study as they refused to participate. We randomly included 25 patients into the laparoscopic nephrectomy (LN) group and 29 patients into the open nephrectomy (ON) group. **Table 1** outlines the basic characteristics of the study; we compared the two groups in terms of demographic characteristics and perioperative data. Average operation duration for the LN and ON groups were 104 (50-180) and 112 (70-150) respectively (p=0.508). None of the groups developed intra-operative complications and required transition to laparotomy. The study found no difference in post-operative complications. **Table 2** and **Table 3** demonstrate the

post-operative pain scores regarding VAS assessment. Comparing the patients in the LN group to those in the ON group, the former had significantly less pain and displayed a significant reduction with respect to analgesic requirement. The amount of analgesic required by the patients was associated with the surgical technique. Especially, the patients operated with laparoscopy required less morphine injection than those operated with laparotomy (p=0.031, **Table 4**). The laparoscopy group demanded less PCA than the laparotomy group (p=0.005, **Table 5**). With regard to adverse effects, this study found no difference between the two groups.

Discussion

As the less invasive endoscopic, percutaneous and laparoscopic methods have gradually developed and become widespread, open surgery, which is the most important element of urological practices, has started to be used less frequently. One of the main reasons for this change lies in the more invasive nature of the classical surgery than the modern surgical methods. However, due to the necessary equipments for the modern methods and the difficulties in gaining experience in these approaches, classical surgery remains the only alternative for some significant indications, and it holds its indispensable position in urology owing to its advantages in terms of costs and such reasons as specialist physician training and patient preferences in spite of being preferred less frequently in these days. Subcostal flank incision is generally employed in open surgery approaches for upper urinary system. This approach offers a wide operative field. However, according to the general consensus, it requires a considerable amount of muscle cutting, and leads to more post-operative pain and longer recovery period. Since laparoscopic nephrectomy was defined by Clayman et al. [4], it has been increasingly used in the field of urological laparoscopic surgery. Especially, most significant advantages of the retroperitoneal approach, which was popularized in the last 10 years, can be

	Laparoscopy (n:25)	Lumbotomy (n:29)	P
Age (yr)	49 ± 5	48 ± 7	p=0.854
BMI	28,9 ± 3,6	30 ± 4,5	P=0.750
Male/Female	13/12	15/14	p=0.810
Duration of surgery(min)	104 ± 29	112 ± 42	p=0.508
Endication	Tumor: 21 Atrophic kidney: 4	Tumor : 20 Non-fonc. kidney: 9	
PACU(0-4hr) diclofenonac Use (n)	3	2	P=0.860
Early(5-9hr)in ward diclofenac use(n)	5	5	P=1
Values are mean ± Sd P>0,05 N,number of patients or events; PACU, post-anesthesia care unit			

Table 1 Demographic and perioperative features.

VAS	Laparoscopy	Lumbotomy	p
0 hour	5,96 ± 2,01	5,72 ± 1,81	P=0.87
2 hour	3,80 ± 1,58	4,60 ± 1,46	P=0.76
4 hour	3,20 ± 1,28	3 ± 1,19	P=0.88
8 hour	2,48 ± 1,15	2,66 ± 1,31	P=0.89
12 hour	2,16 ± 1,06	2,45 ± 1,18	P=0.79
18 hour	1,56 ± 1,08	1,76 ± 0,83	P=0.88
24 hour	1,04 ± 0,61	1,31 ± 0,89	P=0.86

Values are mean ± Sd P>0,05, Visual analogue scale (VAS) score

Table 2 Post-operative pain scores regarding VAS assessment.

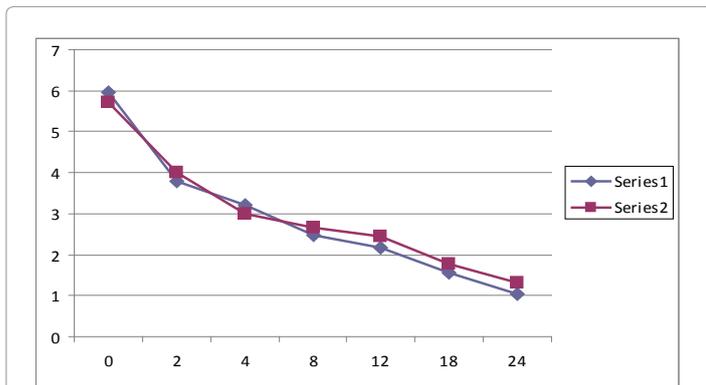


Table 3 Series 1 Laparoscopy, Series 2 : Lumbotomy, Visual analogue scale (VAS) score, P>0,05.

	Laparoscopy	Lumbotomy	P
Delivery pca dose (mg morphine)	20,48 ± 12,54	27,93 ± 11,96	0,031
Demand pca dose (mg morphine)	39,80 ± 28,27	84,38 ± 63,96	0,004

Table 4 Patients operated with laparoscopy.

named as early control of the renal artery, maintenance of peritoneal integrity, and lesser dissection requirement (e.g. column deflection). Gaur et al. [5] defined the retroperitoneal approach in 1993. Thanks to this method, it is possible to access the renal artery and vein in a shorter time frame [6]. Orientation and narrow operative field are its most significant disadvantages. This approach shall be preferred in patients with a history of prior abdominal surgery. Reported to produce very successful results, this technique has some advantages over the standard laparoscopy such as enabling quicker vascular control, shorter operation duration, and earlier oral intake tolerance by the patients [5-9]. LRN has become the standard surgical approach in many centers for the surgical treatment of renal tumors. Beyond the discussion over the preference of transperitoneal approach or retroperitoneal approach, current observations demonstrate the perioperative advantages of laparoscopic approach over open surgery approach. In a multi-centered study, Ono et al. [10] have compared the results of 103 LRN (85 transperitoneal; 18 retroperitoneal) operation with 46 classical open radical nephrectomy operation. They have reported an average blood loss figure of 254 ml vs. 465 ml and a transfusion figure of 5% vs. 9% respectively. In a similar comparative study, Gill et al. [11] have reported a blood loss figure of 97 ml vs. 295 ml, and a complication rate of 13% vs. 24%. An assessment of the data found in the

literature demonstrates a minor complication rate of 3%–15%, and a major complication rate of 3%–8%. The complication rates in open surgery approaches employed at similar clinical phases have been reported to be between 10% and 20% [12]. While the average operation duration was reported to be 240 minutes in the initial period, it has reduced to an average of 150 minutes along with the enhanced experience in this approach. Up until today, studies have reported a significant advantage in favor of LRN in terms of hospital stay: Gill et al. (9) have reported 1,4 vs. 5,8 days whereas Abbou et al. [11] have reported 4,8 vs. 9,7 days.

Laparoscopic practices have recently become popular due to such benefits as quick mobilization and early discharge, low rate of late and early post-operative complication, and early post-operative recovery [12-16]. Despite their potential of temporary intra-operative cardiovascular and respiratory dysfunctions, even the old patients with accompanying diseases are more frequently planned for such practices [17]. Our study and other prior studies have found that some post-operative patients feel constant pain [18,19]. These are more similar to the incidences prolonging the return to normal activity and resulting from severe pain such as respiratory and hemodynamic changes. Patients coming up with a complaint of severe pain resistant to the morphine of the equal standard are those who are controllable by standard IV morphine in PACU, Our experiences have shown that post-laparoscopic patients might have complaints of severe pain. In this study, we observed same level of reduction in pain and feeling good at the 24th hour in both groups (**Tables 2-3**). A survey has been developed based on the thesis that the painful stimulant is objectively countable and predictable, and proportional subjective pain scale is the only viable and effective method to assess pain [20]. And this study employed this method. When pain is more characterized, it has an experimental experience notably associated with multifactorial physical origin and the peripheral and central neural feedback mechanism and inhibition of senses [21,22]. Pain score might be associated with a patient’s preoperative preparation, pain sensitivity and personal expectations [22,23]. As all the patients included in this study were prepared in a similar way, preoperative patient preparation and the differences in their sensitivity do not lead to the changes in our findings. Demographic differences might lead to the distribution of pain expectation and – theoretically – might explain some results of this study [22]. Since the data obtained are similar, this should be ignored for the patients included in this study. According to the findings of this study, pain scores are similar in both groups, but the morphine consumption is lesser in the LN group than the ON group.

Between 1998 and 2006, Hemal et al. [24] retrospectively compared the results of LRN (41 patients) and ORN (71 patients) operations on T2 tumors. They did not randomize the patients, and performed laparoscopy by employing transperitoneal or retroperitoneal approach. The findings of this study demonstrated the advantages of LRN over ORN in terms of blood loss (246 ml vs. 537 ml), transfusion rate (15% vs. 32 %) requirement for morphine-like analgesic (16 mg vs. 35 mg), hospital stay (3,6 days vs. 6,6 days), and recovery period (1,6 weeks vs. 3,3 weeks). Post-operative complication rates were similar (12% vs. 15%). In an average follow-up period of 51 and 57 months, non-recurrent

(90% vs. 92%), cancer-specific (94% vs. 95%), and general (89% vs. 88%) survival rates demonstrated no statistical difference. Both groups had an average tumor size of 10 cm approximately. Authors acknowledge the short-term advantages of laparoscopic approach. However, there is only one randomized controlled study comparing LRN and ORN designed on the hypothesis that such big-sized tumors are challenging and only experienced surgeons should make an intervention on such tumors [25]. Although surgical intervention was performed for both benign and malign diseases and the maximum tumor size was 8 cm, the groups formed among 45 patients were well-matched. There was no significant difference between the groups with regard to operation duration (105 minutes vs. 93 minutes) or unexpected hospital stay (4 days vs. 5 days). Not surprisingly, postoperative pain was less in the LRN group (3,6 vs. 5,4 on a 10-point visual analogue scale), but there was no difference in the third month.

Quick return to normal activities was again in favor of the laparoscopic group (42 days vs. 62 days).

Study limitations

A questionnaire used to evaluate the pain. In the future more than one questionnaires can be used for the same groups. On the other hand groups have small sample size and they can have more samples.

Conclusion

As a result, laparoscopic applications compared to open surgery; early mobilization, early and late postoperative complication rate is low and is more advantageous in terms of short-term hospitalization. However, in the early postoperative recovery period morphine requirement is more in opensurgery, but shows similar characteristics in terms of pain scores.

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