



## Complications of radical and partial nephrectomy for renal cell carcinoma up to 7 cm

### Komplikacije radikalne i parcijalne nefrektomije kod karcinoma bubrežnih ćelija manjih od 7 cm

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#### Abstract

**Background/Aim.** Renal cell carcinoma (RCC) is the third most frequent urological carcinoma. Radical nephrectomy (RN) is considered as the gold standard in the treatment of localized RCC, but recently the use of minimally invasive techniques are more frequently used. The aim of this study is to determine is there a difference in the incidence of complications in the group of patients treated by RN and partial nephrectomy (PN) for renal cell carcinoma up to 7 cm. **Methods.** The retrospective study included the analysis of the medical history of patients surgically treated in the six years period. The inclusion criteria were RCC size up to 7 cm and no detectable metastasis. The exclusion criterion was the presence of a bilateral tumor. Intraoperative and early postoperative complications were followed-up. The Clavien-Dindo grade system was used for classification of surgical complications. **Results.** In six years period 481 (76.35%) radical transperitoneal nephrectomies and 149 (23.65%) partial nephrectomies were performed. Bilateral RCCs were verified

in 2.06% (13/630), an initial metastatic disease in 15.8% (100/630) and lymph node involvement in 7.14% (45/630) of the patients and their data were not included in analysis. Therefore, data from 120 patients with RN and 97 patients with PN who fulfill inclusion criteria were analyzed. Complications were recorded in 29.5% (64/217) of patients. Significantly less patients had complications in the RN group [22.5% (27/120)] compared to the PN group [38.1% (37/97)] ( $p = 0.006$ ). These complications were mostly grade I and II. Complications grade III and IV were only present in the group of patients treated by PN. **Conclusion.** Based on our data in selected patients with renal cell carcinoma in stage T1, PN is a proper and safe choice. The patient must be involved in making the definitive decision of modalities of surgical treatment.

#### Keywords:

kidney neoplasms; urologic surgical procedures; intraoperative complications; postoperative period; postoperative complications.

#### Apstrakt

**Uvod/Cilj.** Karcinom renalnih ćelija (*renal cell carcinoma* – RCC) treći je najčešći urološki karcinom. Radikalna nefrektomija (RN) smatra se zlatnim standardom u terapiji lokalizovanog RCC, ali u novije vreme sve češće se koriste minimalno invazivne tehnike. Cilj ove studije bio je da se definiše razlika u incidenci intraoperativnih i postoperativnih komplikacija kod bolesnika podvrgnutih RN ili parcijalnoj nefrektomiji (PN) zbog RCC veličine do 7 cm. **Metode.** Retrospektivno su analizirani podaci iz medicinske dokumentacije bolesnika operisanih u šestogodišnjem vremenskom periodu. Kriterijumi za uključivanje u studiju bili su

tumor bubrega veličine do 7 cm i odsustvo metastaza. Kriterijum za isključivanje iz studije bilo je prisustvo bilateralnog tumora. Praćene su intraoperativne i rane postoperativne komplikacije. Clavien-Dindo sistem klasifikacije korišćen je za klasifikaciju komplikacija. **Rezultati.** U periodu od šest godina urađeno je 481 (76.35%) RN i 149 (23.65%) PN. Bilateralni tumori urađeni su kod 2.06% (13/630) bolesnika, inicijalna metastatska bolest kod 15.87% (100/630) i zahvaćenost limfnih čvorova kod 7.14% (45/630) bolesnika i njihovi podaci nisu uzeti u analizu. Analizom je obuhvaćeno 120 bolesnika sa RN i 97 sa PN koji su ispunjavali kriterijume za uključenje u studiju. Komplikacije su zabeležene kod ukupno 29.5%

(64/217) bolesnika. Značajno niži broj bolesnika imao je komplikacije u RN grupi [22.5 % (27/120)] u poređenju sa PN grupom [38.1% (37/97)] ( $p = 0,006$ ). Komplikacije su uglavnom bile gradusa I i II. Komplikacije gradusa III i IV zabeležene su jedino u PN grupi. **Zaključak.** Na osnovu analize podataka naših bolesnika, PN je dobar i siguran izbor kod RCC veličine do 7 cm, T1 stadijuma. Bolesnik

mora biti uključen u donošenje odluke o hirurškom modalitetu koji će biti primenjen.

#### Ključne reči:

**bubreg, neoplazme; hirurgija, urološka, procedure; intraoperativne komplikacije; postoperativni period; postoperativne komplikacije.**

## Introduction

Renal cell carcinoma (RCC) is the third most frequent urological carcinoma<sup>1</sup>. Radical nephrectomy was for decades considered as the golden standard in the curative treatment of localized renal cell carcinoma (RCC)<sup>2-4</sup>. Recently preservation surgery of renal parenchyma and the use of minimally invasive techniques are more frequently used in the treatment of RCC.

Partial nephrectomy (PN) is a surgical resection of the tumor in total with a remained part of normal surrounding renal parenchyma<sup>5</sup>. Today PN is performed not only for classic indications as a tumor of the solitary kidney and bilateral tumors but also in patients with a normal contralateral kidney<sup>6,7</sup>. The introduction of modern diagnostic techniques, as the use of abdominal ultrasound and computer tomography scans led to an increased number of newly diagnosed incidental renal tumors, which are smaller and asymptomatic, with a better prognosis than symptomatic tumors of the same size and clinical stage<sup>8-10</sup>.

Open PN is accepted as a golden standard, mainly in the treatment of younger patients with incidentally diagnosed renal tumors smaller than 4 cm<sup>5</sup>. Based on literature data, this surgical technique has excellent results, similar to RN and generally is proposed as an option in the treatment of patients with stage T1 11, 12. The patients have an overall better survival rate and preservation of renal function compared to patients treated by RN<sup>13</sup>. The benefit of renal function preservation must exceed than intra and postoperative complications in RN<sup>14</sup>.

The aim of this study was to determine the incidence of complications in the group of patients with RCC up to 7 cm treated by radical and partial nephrectomy.

## Methods

This retrospective study included the analysis of the medical history of patients surgically treated in the period of 2006 until the end of 2012. The inclusion criteria were renal tumor size up to 7 cm and no detectable metastasis. The size of the tumor and the absence of metastasis were determined by multislice computer tomography (MSCT). The exclusion criterion for this study was the presence of a bilateral tumor.

Intraoperative and early postoperative complications were followed up. The Clavien-Dindo grade system was used for classification of surgical complications (Table 1)<sup>15,16</sup>. Acute renal failure was defined as an increase of creatinine level more than 50% of the preoperative level or need for hemodialysis<sup>17</sup>.

The data are presented as median (range) or mean  $\pm$  SD. Pearson's  $\chi^2$  and Likelihood ratio  $\chi^2$  -test, were used for statistical analysis. For intergroup comparisons, Crosstabs statistical procedure was used to evaluate differences between groups.  $P < 0.05$  was considered statistically significant.

## Results

In this retrospective study we analyzed data of 630 patients diagnosed with RCC and underwent surgical treatment in the period from 2006 till the end of 2012, 356 patients were in stage T1. In total 481 (76.35%) patients radical transperitoneal nephrectomy and 149 (23.65%) patients PN were performed. The initial metastatic disease was verified in 15.87% (100/630) lymph node involvement in 7.14% (45/630) of the patients' bilateral tumors in 2.06 % (13/630) and their data were not included in the analysis of patients.

**Table 1**

The Clavien-Dindo Classification of Surgical Complications <sup>15,16</sup>		
Complication grade	Definition	Severity
I	Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions. Surgical site infections.	minor
II	Requiring pharmacological treatment with drugs other than such allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included.	minor
III	Requiring surgical, endoscopic or radiological intervention.	major
IV	Life-threatening complication.	major
V	Death	major

Therefore, data from 120 selected patients with RN and 97 patients with PN were analyzed as they fulfilled the inclusion criteria for this study and had complete medical documentation (Table 2). The intraoperative and early postoperative complications were followed-up.

Patients had significantly less complications in the RN group [22.5 % (27/120)] compared to the PN group [38.1% (37/97)] ( $p = 0.006$ ). These complications were mostly grade I and II (Figure 1). Complications grade III and IV were only present in the group of patients treated by PN (Figure 1). Grade V complications were not reported in study groups.

Patients with grade I complications had a temperature over 38°C that lasted from 1 to 4 days and did not prolonge hospital stay. The mean postoperative blood loss in patients in the RN

drainage. Intraoperative injury of the spleen with consequent splenectomy were recorded in two patients with RN. In one PN patient, a double J stent was placed intraoperatively followed by the restitution of the renal pelvis and renal parenchyma. Acute renal failure was reported in 10.3% (13/120) of RN patients and in 11.3% (11/97) PN patients.

The duration of hospitalization was significantly shorter in the PN group compared to the RN group [7 (5–12) vs 8 (4–18) days;  $p = 0.015$ ].

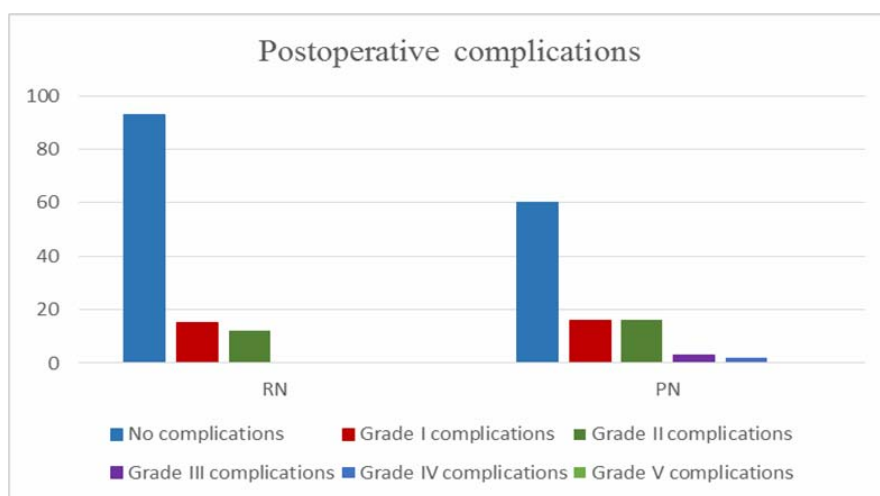
## Discussion

So far, this is the only study solely concentrated on RCC up to 7 cm large in special, economically restricted medical en-

**Table 2**

**Basic clinical data for patients in T1 stage treated by partial and radical nephrectomy**

Parameters	Radical nephrectomy (n = 120)	Partial nephrectomy (n = 97)
Age (years), mean (range)	60 (26–82)	58 (25–86)
Sex, n (%)		
male	79 (65)	79 (81)
female	41 (35)	18 (29)
Side, n (%)		
left	62 (52)	52 (54)
right	58 (48)	45 (46)
Tumor localization, n (%)		
upper pole	43 (36)	26 (27)
interpolare	46 (38)	39 (40)
lower pole	31 (26)	32 (33)
Tumor size (mm), mean (range)	51 (20–70)	39 (20–70)



**Fig. 1 – The incidence of postoperative complications in the patients after radical (RN) and partial nephrectomy (PN) according to the Clavien-Dindo Classification of Surgical Complications<sup>15, 16</sup>.**

group was 157.5 (5–1380) mL compared to 324.5 (10–1,480) mL in the PN group. Blood transfusion was necessary in 16.5% (16/97) of patients who were treated with PN and in 10% (12/120) of patients treated by RN.

Thoracic drainage was needed in two patients with grade III complications in the PN group. A delayed nephrectomy was performed in one patient because of hemorrhage in the PN group. Two patients who were treated by PN were with Grade IV complications (pulmonary thromboembolism and acute myocardial infarction). In two patients with PN, the intraoperative pleural injury was reported and managed without thoracic

environment like developing countries. In our retrospective study, we found an increased incidence of complications in patients treated by PN compared to those treated by RN. The majority of these complications were minor (grade I and II). Two complications were consequence of surgical approach and two were non-surgical complications. The only major complication recorded in studied patients was postoperative bleeding that necessitated re-operation and nephrectomy.

Some studies reported the similar incidence of complications following PN and RN or increased incidence of complications following PN<sup>17–21</sup>. Based on their study, Lesage et al.<sup>20</sup>

comparing intraoperative complications found that the incidence of complications was increased in the PN group, but this increase was not statistically significant. The result of a phase III randomized trial comparing PN and RN in the treatment of renal masses up to 5 cm, has shown a slightly higher incidence of intraoperative complications in the PN group, primarily considering bleeding and development of a urinary fistula. They concluded that PN can be used safely, with just slightly more complications compared to RN<sup>21</sup>.

The risk of urinary fistula in published studies ranges from 1.4% to 17.4%<sup>22</sup>. In our analyzed group of patients, no urinary fistulas were recorded. This can be explained by adequate selection of patients and surgical technique. In one case when there was reasonable doubt of possible postoperative urinary fistula development due to insufficient closure of the calicial system of the kidney a double J stent was introduced intraoperatively.

The incidence of blood transfusion was higher in the PN group (16.49%), compared to the RN group where it was necessary for only 10% of patients. Shvarts et al.<sup>23</sup> data showed that 18% of patients treated by RN and up to 30% of patients treated by PN needed a blood transfusion which is higher than in our study.

The incidence of re-operations following PN was 1.03%, without reoperations in the RN group. Literature data shows

that reoperation rate is very low after RN (0–3.1%)<sup>22–24</sup>. Lau et al.<sup>18</sup>, found that one out of 164 patients in the PN group had undergone nephrectomy after preservation surgery due to postoperative bleeding. In three patients with urinary fistula, only one patient underwent nephrectomy because of a perirenal abscess. In the RN group, there was no need for reoperations just like in our study<sup>18</sup>.

There is a higher incidence of complications in patients treated by PN. The majority of these complications are minor and are presented as elevated body temperature and blood loss that needed blood transfusions. In both groups, complications were solved in a conservative manner. Only in one patient, a reoperation was necessary due to postoperative bleeding.

### Conclusion

Based on our data in selected patients with RCC up to 7 cm (stage T1), PN can be a proper and safe choice. If the urologist has no experience in performing PN and there is a possibility for complications the patient should be referred to a specialized center. A patient must be involved in making the definitive decision of modalities of surgical treatment. However, multicenter studies are needed for justification of our experience.

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