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# Role of Partial Nephrectomy in Renal Carcinoma

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**Abstract** **Original Research Article**

The standard treatment for a small mass has shifted from radical nephrectomy to partial nephrectomy. The benefits of partial nephrectomy, including preserving renal function, prolonging overall survival, preventing postoperative chronic kidney disease, and reducing cardiovascular events, have been discussed in many studies. With the accumulation of surgeons' experience and simplification of the operative procedures, the warm ischemic time has become shorter despite the indication of tumor size becoming larger. We report our experience with partial nephrectomy for renal tumor: From January 2004 to October 2015, we performed this technique in urological department at the Military Hospital Moulay Ismail in Meknes, Morocco; we present the result of 21 patients idergoing partial nephrectomy.
**Keyword:** Nephrectomy, carcinoma, renal tumor, cardiovascular.


## INTRODUCTION

Renal cancer represents 3 % of all cancers worldwide. It is ranked as the third urological cancer after the prostate and bladder cancers. Surgical treatment remains the gold standard in handling localized renal tumors. While the radical nephrectomy was the therapeutic dogma for more than 30 years, partial nephrectomy is now a validated option with equivalent oncologic outcomes and improved quality of life and increased survival associated with renal preservation.We report our experience with partial nephrectomy for renal tumor.

## MATERIALS AND METHODS

From January 2004 to October 2015, we performed this technique in urological department at the Military Hospital Moulay Ismail in Meknes, Morocco. 21 patients (12 men and 9 women) aged between 22-76 years with a mean age of 57 years.

Among risk factors research; Smoking (28.57% of cases), high blood pressure (14.28% of cases) were the most encountered factors. While in 12 cases (57.14%) no risk factor was found. **Figure 1** The tumor was localized in the right kidney, left kidney and bilateral in 16, 4 and 1 patient respectively.

The most common way of discovering the cancer was a low back pain. Hematuria and the alteration of the general condition were found in 27% and 11% respectively. There is only one case where the mode of revelation was a left varicocele of incidental discovery, in which the duplex ultrasound of the renal veins was normal. Preoperative renal function was normal for all our patients with a mean creatinine 12.45mg / l. Indication for partial nephrectomy was judged as elective in 17 patients, relative in 3 cases (HBP and diabetes), and necessary in 1 case (for bilateral renal tumor).

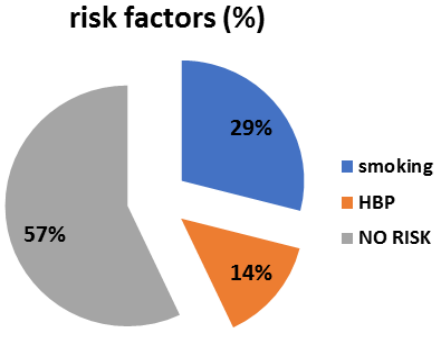



**Fig-1: Prevalence of Risk Factors**

The average tumor size was 6.7 cm (3.8 - 13cm).The tumor was localized in the upper pole, lower pole and the middle portion of the kidney in 14, 5 and 2 patients respectively.

**Surgical Technique**

The first operative step consists usually in a ureteral catheter rise. Sub-costal (12 patients) or lobotomy (9 patients) makes the incision. We perform a release of the kidney with preservation of the peri renal fat in relation to the tumor. Subsequently, we do a parenchymal clamping, 2 cm from the edge of the tumor, with curved clamp floor by Kehr's drain. Sometimes, tumor location does not allow parenchymal clamping, we perform a pedicle clamping instead. After the tumor section, we do a hemostasis and an urostase guided by a test of injection of methylene blue using the ureteral catheter. The slice of kidney section is closed or marked by X symbols supported over bolsters of Spongel*, Surgicel* or perirenal fat.

## RESULTS

The incision was a lombotomy in 9 patients and subcostal in 12 patients. The average intraoperative bleeding was 300cc. The average time of clamping was 20 min and the average duration of intervention was 2H35min. The postoperative course was uneventful in the majority of cases.

The complication rate was 19.04%: three cases of urinary fistulas was noted (14.28%) (one of which requires totalization and the other 2 have dried up after insertion of a double j stent), as well as a case of early postoperative hemorrhage (requiring totalization), a case of digestive fistula (4.76%) and a case of early mortality (4.76%)

The average hospital stay was 7 days (4 to 28 days).The surgical margin was negative in all cases. Histological examination of the specimen revealed: a clear cell carcinoma in 13 cases, papillary carcinoma in 4 cases with Fuhrman grade: 2 (1-3) and oncocytoma in 4 cases. **Figure 2**

Monitoring is clinical, biological and radiological:

- We did not observe any alteration in the renal function on the short or the long run.
- We noted two cases of local recurrence:

The first case had a superior polar recurrence on the same kidney with secondary hepatic localization after 1 year of PN and therefore re-intervention and enlarged total nephrectomy was performed. **Figure 3** The second case had a tumor recurrence at the partial nephrectomy box with an alteration of the general state and death after 5 years of the intervention. **Figure 4**

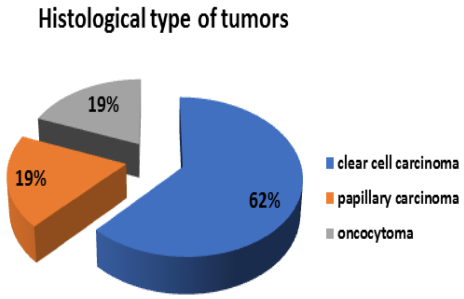
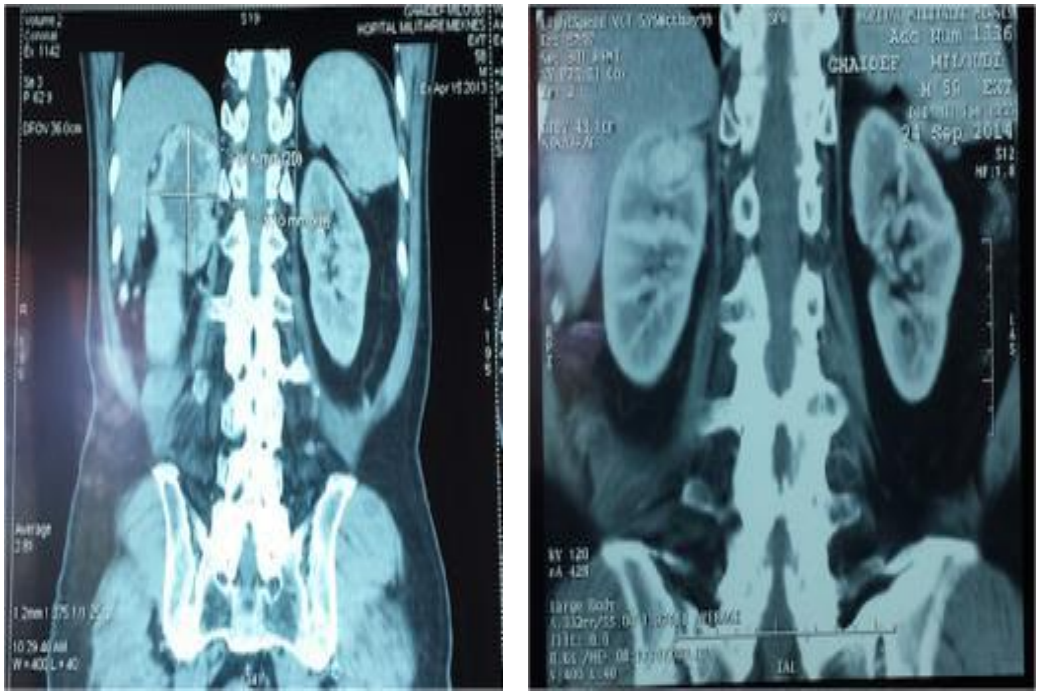



**Fig-2: Distribution of lesions by histological type**



**A** **B**

**Fig-3: A: Computed tomography scan showing an 8 cm tumor of the right kidney.**
**B: Control after 18 months showing a superior polar recurrence of the right kidney.**

**A** **B**

**Fig-4: A: CT scan showing a necrotic tumor in the center of the left kidney 6 cm.**
**B: Control after one year showing a tumor recurrence at the PN box.**

## DISCUSSION

The use of PN has been steadily increasing, particularly in tertiary care centers. This trend is now strengthened by evidence supporting the role of PN in reducing the risk of chronic kidney disease in patients with renal masses ≤4 cm. Our series consists mainly of men (57%) with a sex ratio of 1.22 (11 men / 9 women), which is consistent with the epidemiology of renal cancer [1], Bernhard and al. [2], and Tuker and al. [3]

The average age during nephrectomy in our patients is 57 years with extremes ranging from 22 to 75 years. The patient population in our series is younger than Western literature who is 59 years old in France [1], but which remains close to the Tucker et al series about 60 patients where the average age was 56 years [3].

Several situations expose to kidney cancer, including: hemodialysis with acquired multi-cystic dysplasia, the transplanted patient, the patient "family at risk" (von Hippel Lindau, phacomatoses) and the hypertensive. The environment also plays a role in the genesis of kidney cancer: essentially in the context of occupational exposure, smoking and some painkillers such as phenacetin. In our series we found that the most common risk factors are: smoking and hypertension, which joins the results of Western literature [4, 5].

Kidney cancer was accidentally discovered in 2 patients, 10% of patients which is vastly inferior to data from Western literature: 40% [6]. This can be explained by the delayed diagnosis in our Moroccan context. The discovery of kidney cancer was made mostly because of 3 symptoms: hematuria, low back pain and AEG. The classic triad: low back pain + tumor mass +hematuria were only found in 2 patients that is 9.52% of the cases. Patard et al had found the same results in a study of 388 renal tumors where he sought to determine the correlations between clinical presentation, anathomopathological features and overall survival [7]. In our series, pain was present in 58% of cases. She was under form of renal colic by cloting and obstruction of the excretory or distension of the renal capsule or by nervous invasion. These results are comparable to the Kharbach reports, which report 60% of cases of lumbar pain observed over a period of 18 years [8].

In our series hematuria was present in 27% of cases, 4 patients had isolated hematuria or 19.04% of cases, which is different from statistics reported by some authors:

- Gayet *et al* count 27 cases of isolated hematuria, 30.68% [9].
- Kharbach estimates this rate at 8.5% [7] and Belemlih at 6.66% [10].

This can be explained by the fact that the majority of patients consults tardily. The alteration of the general condition usually shows an aggressive tumor or metastatic and represents an important prognostic element. In our series 11% of the patients presented an AEG associating to varying degrees: asthenia, slimming and anorexia. These results are different from those found by Leguillou, 45% of patients had AEG [11].

Partial surgery includes elective indications (are today small tumors up to 4 cm, with a healthy contro-lateral kidney, in a patient with a low operative risk), imperative indications (cancer on a single kidney,

bilateral tumor, contro-lateral kidney with little or no function, tumor revealed in the context of a hereditary disease at risk of CRC), and relative indications (patients for whom the field could in the future lead to impaired renal function: uropathy, urinogenesis, chronic pyelonephritis, renal artery stenosis, arterial hypertension, diabetes).

In our series, the majority of patients undergoing partial nephrectomy are elective, 84.21% of cases, relative in 4 patients 21.05% of cases. and only 1 case of imperative indication (5.26%).In agreement with our study and about 305 patients operated by PN, Rouach et al noted that 74.42% of cases are operated as part of an indication elective and 25.57% of the cases in the imperative indication [12]. This technique was initially developed for patients that the total enlarged nephrectomy would have rendered anephric. It is understandable then that in the first large PN series, the imperative indication rate could reach 80% [13, 14]. Progressively, excellent long-term cancer results have been reported for tumors smaller than 4 cm treated by PN in the context of an elective indication [15, 16]. At the same time, improved imaging methods have led to earlier detection of kidney damage and the diagnosis of smaller and smaller tumors [17]. So today, the vast majority of patients operated on an NP are an elective indication.

With regard to T1b lesions, some authors suggest that they could also benefit from partial nephrectomy, without any impact on the oncological findings, but at the cost of a higher complication rate [18, 19]. Many articles have boasted the benefits in terms of results of partial nephrectomy on total nephrectomy. Lau et al compared a series of more than 1,500 patients who had either partial nephrectomy or total nephrectomy for a single lesion with healthy contralateral kidney. The rate of chronic renal failure ten years after surgery was 11.6% for partial surgery and 22.4% for nephrectomy total [20]. Similarly, Huang et al retrospectively analyzed a cohort of 662 patients renal function initially normal, and who benefited from a partial or radical surgery, for single lesion of less than 4 cm. The probability of maintaining a GFR greater than 60 ml / min ten years after surgery was of the order 80% in the case of partial surgery, and would collapse to 35% in case of total nephrectomy [21].

Clamping may involve the entire renal pedicle, the renal artery alone or hyper-selective arteries branches intended for the tumor or sometimes even clamping renal parenchyma. Intermittent clamping of the renal pedicle is to be avoided because it causes more renal damage than continuous clamping [22, 23]. When the tumor is located at one of the two poles of the kidney, the renal vein is not clamped, this to reduce the operative ischemia, facilitate the venous return and improve the hemostasis of severed vascular branches. In some cases where the tumor is para-hilar or intra-parenchymal, the renal vein is clamped to decrease blood loss [24].In our series, the control of bleeding was insured by parenchymal clamping in 66.66% of cases, pedicle clamping in 19.06% of cases and without clamping in 14.28% of cases. The results of our study are comparable to those reported in contemporary literature. In a review of 40 patients regarding conservative kidney cancer surgery, Arroua et al performed parenchymal clamping in 72.5% of cases. Pedicle clamping was only necessary in 27.5% of cases [25].

The literature seems to agree that, in order to preserve renal function, the duration of hot ischemia should strive to be less than 30 minutes [26]. Funahashi et al conducted a prospective study of 20 patients who underwent partial nephrectomy. They performed in addition to a measurement of the glomerular filtration rate (GFR), a Mag3 renal scintigraphy pre- and post-operative. The scintigraphy showed a significant loss of functionality of the operated kidney if the duration of hot ischemia exceeded 25 minutes. Thus, one week postoperatively, the functional value of a kidney with ischemia greater than 25 minutes was only 61.8%, while she was in the order of 87% when the duration of ischemia was less than 25 minutes [27].

In our series, the duration of intervention was 2H15min to 3H30min. The average duration of clamping was 20min, which is in line with those of other series. The mean preoperative bleeding was 300ml (200ml-700ml). In 4.76% of the cases (1/21), a postoperative transfusion was performed at the rate of 3 packed red blood cells. The average hospital stay was 7 days with extremes of 4 and 28 days.

**Table -1: The operating characteristics of the different series**

| **Operative characteristics** | **our series** | **Tucker PE (2015)** | **Simon Jorg (2009)** | **Verhoest.G (2008)** | **Khedis.M (2007)** |
|---|---|---|---|---|---|
| Number of patients | 21 | 60 | 23 | 418 | 37 |
| Operating time (min) | 155 | 157 | 157 | 142.5 | 147 |
| Hot ischemia time (min) | 20 | 27 | 19 | 19.5 | 25 |
| Blood loss (ml) | 300 | | 300 | 341.5 | 191 |
| Blood transfusion (%) | 4.76 | 1.7 | 0 | 3.11 | 0 |
| Hospital stay (days) | 7 | 4 | | | |

In comparison, Tucker et al. have produced results that align with our series; involving 60 patients operated by NP, with an average operative time of 157 minutes, an average ischemia time of 27 min, a blood transfusion rate of 1.7% and a median length of stay of 4 days [3]. Khedis et al published a series including 37 patients operated on renal tumor with parenchymal clamping. They had found an operating time of 147min (90-240min) and an average clamping time of 25min (15-30min). The mean bleeding was 191ml (50-450ml) and no patient required transfusion [28]. From a study involving 23 patients, Simon Jorg et al reported an average operating time of 157min (62-2177min) and an average clamping time of 19min (12-31min). The mean bleeding was 300ml (100-500ml) and no patient required transfusion [29].**Table 1**

In our series, the majority of lesions found are malignant (81%), with the main histological type being renal cell carcinoma with clear cells (62%), followed by papillary carcinoma (19%). What joins roughly the results published in the UAE Guidelines 2019 [30].Fuhrman nuclear grade, proposed in 1982, is currently the retained prognostic criteria. It is mainly used to recognize among patients whose tumor is localized, those whose evolution in the medium term may be derogatory. [31]

Most of the lesions in our series are of low aggressiveness, with a low Fuhrman grade (grades 1 and 2 represent 80% of lesions). This is consistent with the results of the epidemiological survey of the French Association of Urology [32]. In our work, we found that tumors with a size> 7cm had a significantly higher nuclear grade. This says that there is a significant relationship between tumor size and nuclear grade. The biggest tumors (11, 12.7 and 13cm) had a high nuclear grade (grade 3) and were potentially more aggressive, which is consistent with literature [33, 34].Our data on the histological type of tumors (62% of clear cell carcinomas, 19% of papillary carcinomas and 19% of oncocytomas) are in line with the series of Nemr and al. [35] and Rouach and al. [12].

Like Nemr and al. [35] and Verhoest and al. [36], we did not demonstrate any significant alteration of renal function, whether in early postoperative or remotely, with a mean postoperative creatinine of: 10.66 mg / l against 9.45 mg / l preoperatively. Urinary fistula is seen in 18 to 20% of cases [37, 38], and the evolution is often favorable with spontaneous drying up in the majority of the cases. The reintervention where the Placement of a jj stent is more rarely indicated [37].

Hemorrhage: is seen in 1.8 to 2.5% of cases [39], reintervention for surgical complication between hands trained is <2% [40]. Arteriovenous fistula and false anevrysms are rare <0.5% [40]. Acute renal failure: It is observed in 15 to 26% of cases [37, 41]. Mortality ranges from 0 to 4.8% and a need for reintervention in 0 to 5.4% of cases [25]. At the end of the follow-up and for an average follow-up of 5 years, the rates of local recurrence and deaths in our series were 9.52% and 9.52% respectively. Regarding overall survival, it is in the literature of 89 to 100% at five years for all indications [42, 43], which joins the results of our series with a rate of 90.48%. Several authors have been interested in studying the long-term monitoring of PN. Thus from the carcinological item, in a review of 17 studies ranging from 1980 to 2006 involving more than 2400 patients: the 10-year specific survival is 82 to 100%, locoregional recurrence is 4 to 6% [44, 45].

## CONCLUSION

The key advantage of partial nephrectomy of the renal tumor is to preserve as much as possible the nephronic capital of the patient and ultimately preserve the functioning of the kidney. The encouraging results in terms of nephronic preservation and survival confirm that in the coming years, the limit will be only technical and neither the size nor the location will be limiting factors in this indication.

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