

ORIGINAL ARTICLE

Nephrological and Oncological Outcomes of Nephron Sparing Surgery for Renal Tumors in Solitary Functioning KidneyLIAQAT ALI¹, MUHAMMAD SHAH², MOHAMMAD SHAHZAD³, FAIZA HAYAT⁴, MOHAMMAD HANIF⁵, NASIR ORAKZAI⁶¹Associate Prof Department Of Urology & Transplantation Institute Of Kidney Diseases Peshawar²Asst. Prof Department Of Surgery Mti Hayatabad Medical Complex Peshawar³Associate Prof Department Of Urology & Transplantation Institute Of Kidney Diseases Peshawar.⁴Consultant Department Of Urology & Transplantation Institute Of Kidney Diseases Peshawar⁵Consultant Department Of Urology & Transplantation Institute Of Kidney Diseases Peshawar⁶Prof Department Of Urology & Transplantation Rehman Medical Institute PeshawarCorresponding authors: Muhammad Shah, Mohammad Shahzad, Email: drmuhammadshah@yahoo.com, shahzadtauni@hotmail.com**ABSTRACT**

Introduction: Renal cell carcinoma accounts for 90% of all cases of kidney cancer. The major treatment option available is radical Nephrectomy with 93% survival rate. In the literature, partial nephrectomy, nephron sparing surgery and cryoablation all have been mentioned with similar effects. The unavailability of cryoablation in a third-world country like Pakistan has forced urologists to undergo Nephron Sparing Surgery.

Objective: To assess the nephrological and oncological outcomes of nephron sparing procedures in individuals with single functioning kidney and renal tumor.

Methodology: This retrospective study was piloted at the Department of Urology & Transplantation, Institute of Kidney Diseases Peshawar for duration of eight years from 2012 to 2020. There were 45 patients enrolled in our study. All the required information was collected on a predesigned Performa. Data analysis was carried out by using IBM SPSS version 24.

Results: In the current study, 45 patients with a solitary functioning kidney and renal tumor were selected. There were 39 (86.67%) males and 6 (13.33%) female patients in our study. The serum urea and creatinine levels in 44 (97.78%) patients were normal, while one patient had a preoperative creatinine level of 3.1mg/dl. Oncocytoma was the only tumor in which creatinine levels were improved after surgery. Only one patient with T3 disease developed liver metastasis and died after 38 months of surgery with normal urea and creatinine levels. There had been no recurrence, progression, or metastasis in 44 patients (97% percent).

Conclusions: Nephron sparing surgery is equally effective in terms of Nephrological and Oncological outcomes in patients having solid renal tumors in solitary functioning kidneys.

Keywords: Nephrological, Oncological, Outcome, Renal tumors, Clear cell carcinoma

INTRODUCTION

In adults, Renal cell carcinoma (RCC) accounts for 2–3 % of all cancer cases [1]. Its prevalence is booming at a rate of around 2.5 % annually for unclear causes [2]. This form of cancer is the ninth and fourteenth most prevalent types of cancer in both men and women, respectively. Moreover, it is the sixteenth major cause of cancer-related mortality. In Asian nations, there has also been a rise in its occurrence. In 2012, 121,099 cases of kidney cancer were reported in Asian countries. The three Asian nations with the greatest prevalence are China, Japan, and India [3]. Unfortunately, there's no reliable data on the prevalence of RCC in Pakistan, which would need a large-scale enrolment and involvement of the institutes managing renal tumors.

Due to the extensive obtainability and application of advanced imaging, only a small proportion of subjects presents with the traditional triad of hematuria, loin pain and mass. The majority of RCC cases are discovered incidentally [4] during routine imaging procedures like as ultrasonography, computed tomography (CT) and MRI (magnetic resonance imaging). Tumors of less than 2cm and tumors of 2-4 cm are becoming more common in Stage 1 malignancies [5]. This rise in frequency implies that, in parallel to the radical nephrectomy (RN) initially reported by Robson et al. [6], other therapeutic options for RCC are needed as well. Nephron-sparing surgery (NSS) via partial nephrectomy (PN) is the most extensively used surgical option available. This treatment has undergone substantial research and is now considered gold standard for smaller kidney cancers [7].

PN was only given to individuals with a solitary functioning kidney or those who had bilateral renal tumors, hereditary tumors of the kidney, renal impairment, or concomitant conditions that increased their risk of renal failure. For individuals with minor tumors and functional contralateral kidneys, PN is currently done regularly and voluntarily [8].

As a consequence, PN is increasingly being used to treat individuals with minor kidney malignancies. Globally, practice with this surgical method is growing, resulting in positive outcomes such as improved survival [9] and preservation of renal

function [10]. In our country, a comparable tendency has been seen. Although variables such as the development of essential training and facilities such as histology of frozen section will undoubtedly lead the way for this technique (PN) to become a frequent treatment option for the therapy of most unexpectedly detected small kidney tumors. In June of 2010, the first surgery of PN was performed. The selection of individuals who were the candidates for partial instead of radical nephrectomy has been a point of contention, and the basic logic of minor kidney tumors does not appear to be enough to satisfy both urologists and patients. As a consequence, decision criteria that are scientific, rational, and evidence-based are required.

When treating renal masses in individuals with a single kidney, nephron-sparing surgery is the preferred treatment option [11]. However, this is not always practicable, resulting in the patient becoming anuric and necessitating the use of renal replacement therapy. This is a difficult issue for the urologist because cancer management is mandatory while preserving as much functional parenchyma as possible. Because the likelihood of a synchronized contralateral renal tumor does not seem to diminish with time [12], the frequency of patients with a single kidney tumor is expected to rise. Because this patient group lacks a properly regulating contralateral kidney, it is an "excellent" model for studying the functional characteristics of the kidney after partial nephrectomy. On the basis of literature search, no such study has been conducted in Pakistan. Thus this study was carried out to assess the nephrological and oncological outcomes of nephron sparing procedures in individuals with a single working kidney and a renal tumor.

MATERIALS & METHODS

This retrospective study was piloted at the Department of Urology & Transplantation, Institute of Kidney Diseases Peshawar for duration of eight years from 2012 to 2020. The technique used for sampling was Non probability consecutive sampling. Proper approval of the study was taken from the committee of research and ethics. The inclusion criteria was all the patients with solid

renal tumors in solitary functioning kidneys from T1 till T3 stage of any age and gender whereas the exclusion criteria was all the patients with Metastatic TCC. On the basis of inclusion criteria only 45 patients were enrolled our study. All the required information was collected on a predesigned Performa. The data was collected with a follow up of 48 months. Data analysis was carried out by using IBM SPSS version 24. Continuous variables and categorical variables were stated as mean (SD) and frequency (%).

RESULTS

In the current study, 45 solitary kidney patients with tumor were selected. The patient's average (SD) age was 55 (±12) years. On a CT scan, the average (SD) tumor size was 6.33 (±1.0) cm. (Table 1) figure 5. There were 39 (86.67%) males and 6 (13.33%) female patients in our study. (Figure 1) In 36 (80%) of the patients, the kidney was on the left side whereas right kidney was observed in 9 (20%) patients. (Figure 2) Concerning the status of a single functioning kidney, 25(55.5%) patients had a history of radical Nephrectomy in the past, 14 (31.1%) had a congenitally absent kidney and 6 (13.3%) had a history of simple Nephrectomy due to Urolithiasis in the past. All patients underwent open Nephron sparing surgery with 1 cm free margins; 30 (66.67%) underwent Enucleation, 9 (20%) underwent wedge resection, and 6 (13.33%) underwent polar partial Nephrectomy. The average (SD) operation time was 69.7 (±5) minutes. The average (SD) hospital stay was 5.61 (±2) days. The serum urea creatinine levels in 44 (97.78%) patients were normal, while one patient had a preoperative creatinine level of 3.1mg/dl. 27 (60%) patients had no deterioration in BUN or creatinine levels, while 17 (37.78%) had creatinine levels rise from 1.2mg/dl to 2.3mg/dl and then return to normal within 48 hours. One patient with elevated creatinine of 3.1mg/dl miraculously improved to 0.8mg/dl after tumor enucleation at 72-hour interval.

Histopathology revealed that 34 (75.5 percent) of patients had clear cell carcinoma, 5 (11.1 percent) had papillary cell carcinoma, 5 (11.11%) had chromophobe cell carcinoma, and 1 (2.22%) patient had oncocytoma. Oncocytoma was the only tumor in which improvement in creatinine levels after surgery was observed. (Figure 4) All patients had free resection margins at a mean (SD) distance of 4.1 (±1.2) mm. (Table 1) Only one patient with T3 disease developed liver metastasis and died after 38 months of surgery with normal urea and creatinine levels. There had been no recurrence, progression, or metastasis in 44 patients (97% percent).

Table 1: Continuous variables with their mean and standard deviation

Parameter	Mean (SD)
Mean age	55 (±12) years
Mean tumor size	6.33 (±1.0) cm
Mean operation time	69.7 (±5) minutes
Mean hospital stay	5.61 (±2) days
Mean resection margins distance	4.1 (±1.2) mm

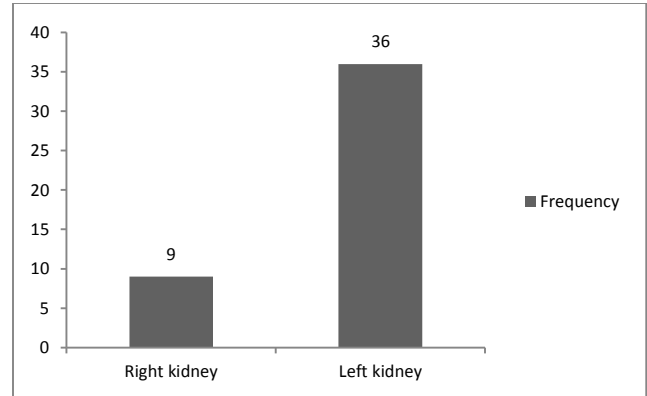


Figure 2: Showing distribution of renal tumors in solitary functioning kidney based on the sides.

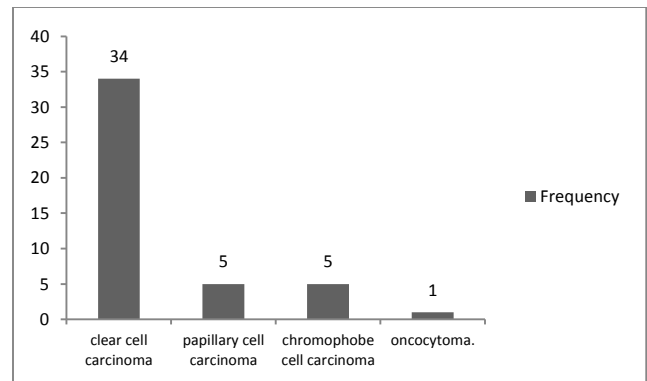


Figure 3: Showing Histo-pathological profile of the participants

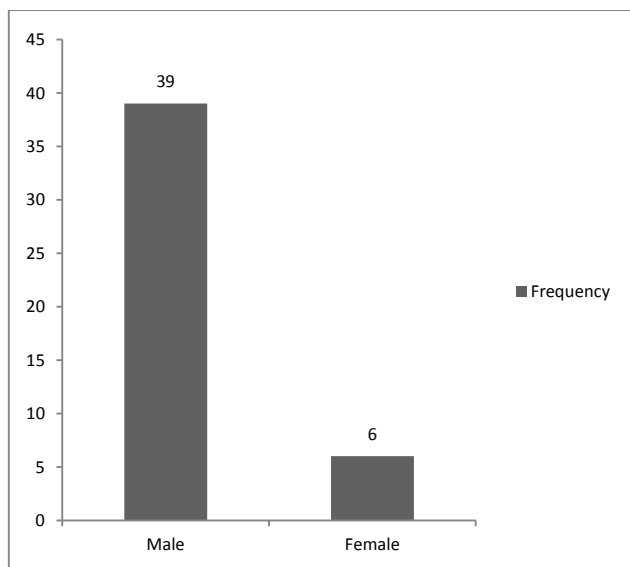


Figure1: Showing gender distribution in solitary function kidney and renal tumor



Figure 4: showing renal mass removed via nephron sparing surgery

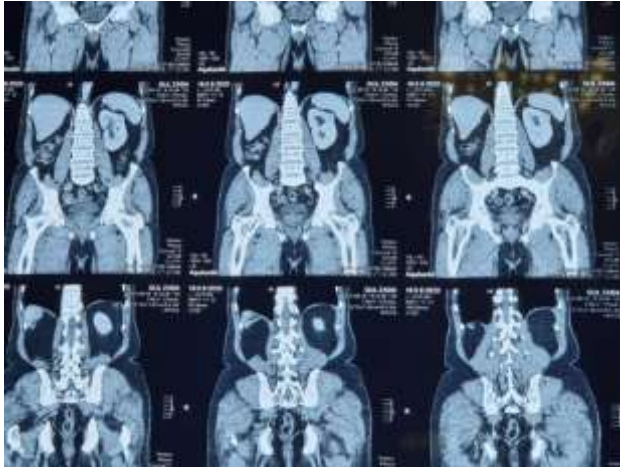


Figure 5: CT scan showing a left upper pole renal mass

DISCUSSION

For more than 50 years, RN has been the therapeutic option for renal tumors [13], and it is the gold standard with which all surgical therapies for renal cell carcinoma are measured. In around 30% of patients of renal cancers, RN is still used.

Over 60% of kidney cancers are now found by chance, due to advancements in the availability and affordability of diagnostic imaging equipment [14]. As a consequence, the degree and size of kidney tumors upon presentation are reduced.

Advances in surgical method have resulted in a reduction in the incidence of NSS-related early surgical complications [15]. NSS in a single kidney, on the other hand, presents distinct surgical complications since many of these malignancies do not adapt themselves to NSS. Urine extravasation (7.5%), bleeding (5%), and infection (1.1%) were among the postoperative complications in this series that required intervention [16].

In our study, there were 39 (86.67%) males and 6 (13.33%) female patients in total. A previous study also reported male predominance [17].

In our study, the serum urea creatinine levels in 97.78% patients were normal, while one patient had a preoperative creatinine level of 3.1mg/dl. 60% patients had no deterioration in BUN or creatinine levels, while 37.78% had creatinine levels rise from 1.2mg/dl to 2.3mg/dl and then return to normal within 48 hours. One patient with elevated creatinine of 3.1mg/dl miraculously improved to 0.8mg/dl after tumor enucleation at 72-hour interval. The main concerns in individuals with NSS of renal cell carcinoma in a single kidney are oncological effectiveness and long-term function of kidney. A single kidney is the important risk factor for acute renal failure following NSS [18]. A 0.6 mg/dl rise in postoperative serum creatinine was seen in 35.7 percent of patients with a single kidney in a sequential series of 64 patients having NSS, whereas no rise was reported in 23 normal contralateral kidney individuals [19].

In the current research work, histopathology revealed that 34 (75.5 percent) of patients had clear cell carcinoma, 5 (11.1 percent) had papillary cell carcinoma, 5 (11.11%) had chromophobe cell carcinoma, and 1 (2.22%) patient had oncocytoma. Oncocytoma was the only tumor in which improvement in creatinine levels after surgery was observed. These findings are comparable with the previous study [20]. Only one patient with T3 disease developed liver metastasis and died after 38 months of surgery with normal urea and creatinine levels. There had been no recurrence, progression, or metastasis in 44 patients (97% percent) in our study. After NSS, the total recurrence rates range from 0 -10.6%, depending on the length of time followed [21]. A previous study carried out by Shvero et al. reported local recurrence in 2.8 percent of participants [22]. In accordance with our study, a 7% recurrence rate was found in a

research by Levy et al. [23], and the duration to metastasis for T1 tumors was 38months. Other research have shown a similar interval [24].

CONCLUSIONS

Our study concludes that nephron sparing surgery is equally effective in terms of Nephrological and Oncological outcomes in patients having solid renal tumors in solitary functioning kidneys.

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