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The surgical and oncological rational of partial nephrectomy for the treatment of localized renal cell carcinoma

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Abstract

Background and objectives: The more frequent use of partial nephrectomy (nephron sparing surgery) in renal cancer treatment derives from a spectacular rise in the incidental diagnosis of renal tumors in patients undergoing abdominal ultrasound or computed tomography for abdominal diseases. This has markedly increased the detection of small, asymptomatic tumors. The aim of this study is to analyze the current evidence of efficacy and safety of open partial nephrectomy in patients with renal cell carcinoma and to speculate its indications and complications. **Methods:** Hospital based case-prospective & retrospective study. A Total of 36 patients with renal cell carcinoma who underwent nephron sparing surgery between september 2017 and March 2019 at Rizgary Teaching Hospital and Zheen International Hospital were investigated, Tumor related characteristics, indication for nephron sparing surgery, postoperative complications, full histopathological data, and follow up results were reviewed. **Results:** Open partial nephrectomy was done successfully to treat patients with renal cell carcinoma; during the follow-up period one patient developed bleeding at day of surgery, three patients suffered from haematuria at 4th day, two weeks & one month postoperatively & one patient complicated by urine leakage & fistula formation, all complications were managed successfully. No patients were experienced disease progression (local recurrence and distant metastasis), there were no deaths from surgery, there was no acute renal failure, no postoperative dialysis & the disease specific survival rate was 100 %. **Conclusions:** artial Nephrectomy appears to be safe and effective procedure to control cases of renal tumors with relative and absolute indications for NSS.

Key words: Open partial nephrectomy, Renal tumors, Renal cell carcinoma.

Introduction

Partial nephrectomy (PN) was first performed in 1887 when an angiosarcoma resected from the kidney of a 30-year-old person by Czerny[1,2].

Despite the fact that the standard radical nephrectomy (RN) was principally used to resect small renal tumors in patients with a normal contralateral kidney, the way that at any rate 20% of these tumors were benign and 25% were inactive combined with similar oncological results for both RN and PN, lead to the present period of nephron saving surgery[3,4].

Nowadays PN is considered the gold standard treatment for treating T1a renal tumors (<4 cm) and can likewise be utilized to treat T1b renal tumors (4–7 cm). Given that it is actually simple, recently utilized just for the particular indications, is presently viewed as a helpful option in contrast to RN for treatment of T1 tumors, with adequate renal capacity, and two normal kidneys. Different Studies from the United States and abroad have demonstrated that PN has yielded equal tumor control rates for tumors of 4 cm or less compared to RN[5].

At the point when actually conceivable, partial nephrectomy can be securely reached out to tumors up to 7 cm or more, with identical disease free intervals to those treated with RN over all histologic subtypes[6].

As of late PN replaces the RN, and is viewed as best option for selected patients as both long term survival and recurrence rates are practically identical to those seen with RN, with better preservation of renal capacity and improved quality of life[7,8].

Nephron-sparing procedure is demonstrated for cases in which RN would render the patient anephric with a result-

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ing prompt requirement for dialysis; such cases incorporate synchronous bilateral renal cell carcinoma (RCC), tumors in a solitary kidney, and unilateral tumor with a poorly functioning contralateral kidney. Further indications for PN are patients with unilateral RCC and normal other kidney with an unsure future capacity, the primary explanations behind the last condition incorporate renal arterial stenosis, hydronephrosis, chronic pyelonephritis, and other systemic diseases, for example, diabetes and hypertension that result in arteriosclerosis and renal impairment (relative indications) [9]. Another indication incorporates patients with small (7 cm or less), unilateral tumors with a normal contralateral kidney (elective indication)[9,10]. Nephron-paring surgery is performed utilizing Several methods, including the enucleation, polar segmental nephrectomy, wedge resection[11,12]. Local tumor recurrence in the ipsilateral kidney, with an occurrence running somewhere in the range of 0% and 10%, is The significant hindrance of NSS for treating RCC[13,14]. These Ipsilateral recurrences are all more frequently the consequence of tumor multifocality as opposed to a truly positive surgical margins[15-17]. PN is related with major Surgical implications, that can be mainly subdivided into three noteworthy classifications; bleeding, urinary fistula, and infection[18,19]. Other detailed entanglements incorporate urinary leak, ureteral clot obstruction, renal impairment, retroperitoneal hemorrhage, nearby organ damage, pneumothorax and small bowel obstruction[19,20]. The aim of this study is to analyze the current evidence of efficacy and safety of open partial nephrectomy in patients with renal cell carcinoma and to speculate its indications and complications.

Patients and methods

From September 2017 to March 2019, 36 patients with renal cell carcinoma who underwent PN in Rizgary Teaching Hospital and Zheen International Hospital at Erbil city were investigated. Twenty six prospective cases and 10 retrospective cases were included; patients were excluded if they had benign tumors or malignant tumors other than RCC. All patients preoperatively staged with CT or magnetic resonance imaging (MRI) of the abdomen, CT angiography to locate the main renal artery and its branches in selected cases, CT of the chest or chest x-ray, complete blood count (CBP), liver function test (LFT), serum electrolyte and renal function test (RFT).

A nephrometry scoring system (R.E.N.A.L. for Radius of tumor, Exophytic/Endophytic, Nearness to collecting system or sinus, Anterior or posterior, and Location relative to the polar line) was used as a mean to document and describe surgical difficulty for a planned PN, based on its sum, all of the renal tumors were divided into 3 groups: low (4 to 6 points), moderate (7 to 9 points) and high (10 to 12 points) complexity lesions[21].

Table (1): Nephrometry score.

	1point	2points	3points
(R)adius(maximal diameter in cm)	<4	>4 but <7	>7
(E)xophytic/endophytic	>50%	<50%	Entirely endophytic
(N)earness of the tumor to the collecting system or sinus in (mm)	>7	>4 but <7	<4
(A)nterior/posterior	No point	given	
(L)ocation relative to the polar lines. Suffix (h) assigned if the tumor touches the main renal artery or vein	Entirely above the upper or below the lower polar lines	Lesion crossing polar lines	>50% of mass across polar lines(a) or mass cross the axial renal midline(b) or mass entirely between the polar lines(c)

During operation an extraperitoneal flank incision through the bed of the 11th or 12th rib was utilized for both clamped and non-clamped open PN. The kidney was completely mobilized in the perirenal fat & leaving fat overlying the tumor in place.

In all patients, the renal hilum was released; vessel loops were usually placed loosely around the renal artery and/or vein for vascular control if necessary. One hundred cc of mannitol of 20% was given to the patient 5-10 minutes before the clamping of the renal pedicle. Hilar clamping with warm ischemia was used in moderate to severe complex lesions, only in one patient who had solitary kidney with moderate complex lesion cold ischemia was used, Time for both warm & cold ischemia was less than 20 & 35 minutes respectively. For low complex lesions the procedure was done without renal artery occlusion. Unfortunately; due to non-availability of frozen section intraoperatively, so to overcome this problem we made 1-2 cm safety margin beyond the visual appearance of safe resection of renal mass. For peripheral tumors and those with an exophytic component, the resection margin around the lesion was scored with electrocautery. The electrocautery pencil was used to deepen the scored resection line while the assistant provided a dry field using the Frazier suction tip. The assistant continued to provide exposure during the resection using the Frazier suction tip. Smaller cortical vessels were controlled with electrocautery. Intraparenchymal vessels were identified and controlled by suture ligation with 4-0 Vicryl. The mass was palpated to guide the resection margin. Such dissection was carried out until the entire tumor was completely mobilized. At the base of the tumor, in contact with the collecting system or pelvicalyceal fat, a pediatric right angle clamp can be employed before transection of larger vessels. After removal of the specimen all bleeding vessels and those previously controlled with pediatric right-angled clamps were over sewn with 4-0 Vicryl. If calyces entered, closure of calyces done and DJ was inserted in selected cases. The parenchymal defect was closed by parenchymal approximation or by coverage with Gerota's, with or without a Surgicel. For more central tumor, Kidney mobilized in the perirenal fat, leaving fat overlying the tumor in place. Vessel loops were placed around the main renal artery and its branches and around the ureter. Frazier suction tip used to provide exposure during dissection. The hilar vessels, arterial or venous, were mobilized and the tumor is excised using the same principles. A Penrose drain was placed at the surgical site.

Follow up was done, based on Novick and Campbell guidelines22, which includes: History, physical examination, blood tests, chest X-ray, and abdominal CT scan.

Blood tests include serum creatinine, blood urea nitrogen, electrolytes, serum calcium, alkaline phosphatase, and a liver function panel. In addition to the above imaging, ultrasound was done for all cases every 6 months by an experienced ultrasonologist. The statistical package of social science software (SPSS, version 20.1) were used for data entry and analysis, appropriate statistical tests (t-test and chi square) for both categorical and numerical variables were used p-value > 0.05 was regarded as statistically significant.

Results

A total of 36 patients (22 men, 61%; 14 women, 39%) who underwent PN for RCC are included in the study.

The mean age of patients was 56.4 years, the mean tumor size was 3.7 cm, the mean postoperative hospital stay was 3.3 days and the mean postoperative follow up was 16 months, Table 2.

Table (2): Age of patients, tumor size, postoperative hospital stay, postoperative follow up

Statistics	Age	tumor (cm)	Postoperative remaining in hospital(days)	Postoperative follow-up(months)
No.	36	36	36	36
Minimum	31.00	2.5	3.00	14
Maximum	78.00	7.00	7.00	18
Mean	56.4438	3.7432	3.3132	١6

In this study, one patient(2.8%) had an absolute indication for NSS (due to single kidney), 11 patients (30.5%) had a relative indication(presence of pre-existing renal disease in the contralateral kidney such as: 7 patients had systemic diseases as diabetes & hypertension, 2 patients had chronic pyelonephritis & 2 patients had hydronephrosis secondary to renal stone), 24 patients (66.7%) had an elective indication (normal contralateral kidney, and no medical diseases that predisposes to renal failure).

Table (3): Deepness of RCC in relation to the parenchyma.

Exophytic/Endophytic	No.	%
>50%Exophytic	20	55.5%
<50%Exophytic	11	30.6%
Entirely endophytic	5	13.9%
Total	36	100.0%

Depending on Nephrometry score, Table 1, the frequency of low, moderate and high complex renal lesions were highlighted below in Table 4.

Table (4): Frequency of complex renal lesions.

Complex Renal lesions	No.	%
Low complex lesions	26	72.2%
Moderate complex lesions	9	25%
High complex lesions	1	2.8%
Total	36	100%

First case suffered from hemorrhage postoperatively which was treated by bed rest, hydration, blood transfusion and follow up.

Second and 3rd case suffered from haematuria at 4th day & 2nd weeks postoperatively and treated by bed rest, hydration and follow up.

Fourth case complicated by haematuria one month after the operation which was diagnosed as arterio-venous fistula and treated by selective arterial embolization.

The last one complicated by urine leak and fistula, it lasted one month & resolved conservatively without surgical intervention.

No patient experienced disease progression (local recurrence and distant metastasis), there were no deaths from surgery, no ARF, no postoperative dialysis& the disease specific survival rate was 100 %, Table 5.

Table (5): Post- operative complications.

Postoperative complication	Frequency	Percent	p-value
No postoperative complications	31	86.11%	<0.05
Haemorrhage requiring blood transfusion	1	2.78%	<0.05
Haematuria treated conservatively	2	5.55%	<0.05
Haematuria requiring surgical intervention	1	2.78%	<0.05
urine leak & fistula	1	2.78%	<0.05
Total	36	100.0%	<0.05

Discussion

These days, OPN is the primary treatment alternative for small renal tumors in numerous centers with a restricted facilities including progressed laparoscopic expertise[23].

The most-acknowledged preferred standpoint of NSS is the safeguarding of the renal parenchyma to keep up renal function. So patients with basic indications, PN for various tumors ought to most likely be performed in certain patients to guarantee quality of life by forestalling the requirement for dialysis[24, 25]. In this study, we saw that there was low rate of complications in short and intermediate term follow up. Overall complication rate was 13.89% (5 cases), the low complexity rate may be owing to a generally little sample size. In this study, no change in the serum creatinine level among patients experienced PN were noted amid the intermediate term of follow up. A Mayo Clinic study demonstrated that patients experiencing radical nephrectomy were bound to have serum creatinine levels raised to more than 2 ng/mL and proteinuria [26]. The MSKCC contemplate brought about comparable findings. In the two studies, oncological results were very good (>90% survival rates) regardless of whether partial nephrectomy or radical nephrectomy was finished [27]. Northwestern specialists broke down 127 back to back PN between 2001 and 2007. Overall, 21 patients (13.3%) encountered a urine leak. While in this study just a single patient (2.8%) created urine leak and fistula development, chance Factors expanding the risk of urine leak were larger tumor size, endophytic tumor and injury to the collecting system during tumor resection. Worry about local tumor recurrence after PN is counteracted by a 1% to 2% occurrence of contralateral RCC on longitudinal surveillance. In this investigation, no local recurrence of tumor was noted at an interim of 14.7 months follow up, which may be due

to a moderately shorter time of follow up. The defect of this investigation may be the non accessibility of intra operative histopathological determination of resected masses, to overcome this we based our experience with the preservation of 1-2 cm safe margin past the gross appearance of tumor, additionally cross sectional imaging (CT and MRI) are utilized to legitimately delineate the size and proximity of the tumor in respect to the collecting tract and intrarenal vasculature. Late investigations have inferred that gross resection of all tumors gives phenomenal local tumor control without an expanded danger of local tumor recurrence.

Conclusions

Open PN appears to be safe and effective procedure to treat cases of renal tumors with relative and absolute indications for NSS with experienced hands, in centers provided with specific measures for intra operative vascular control and pathological evaluation of resected renal masses, In summary, OPN is a safe and well-established surgery for SRMs. However, knowledge of common complications should be kept in mind to prevent significant morbidity from this surgery. Lessons from OPN will need to continue to be translated to minimally-invasive surgery as time progresses and OPN becomes more and more rare.

Recommendation

This study may represent a starting point to build up our experience with partial nephrectomy by increasing number of cases and extend the application of this procedure to more advanced and complex lesions and use other approaches for performing the procedure with laparoscopic and robotic techniques as many Iraqi surgeons started their training in highly advanced centers.

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