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PARTIAL NEPHRECTOMY FOR THE MANAGEMENT OF EARLY STAGE RENAL CANCER- IS IT TRENDING!

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Abstract: Partial nephrectomy is performed more commonly for small, low-stage renal tumors. The main advantage of partial nephrectomy over radical nephrectomy is the avoidance of renal insufficiency. The major disadvantages are the possibility of local recurrence and perioperative complications. In this article, we discuss the technical aspects of the nephron-sparing surgery and review the literature pertaining to it, in order to put the management of renal cancer into a modern perspective.

INTRODUCTION

The latest trends in the surgical treatment of renal cell carcinoma (RCC) are tending towards conservative approach to the renal parenchyma. Partial nephrectomy (PN) is not only done in patients with a single kidney or bilateral renal tumors but is also a viable alternative to radical nephrectomy in selected patients with a normal contralateral kidney.¹

This article pertaining to open PN; describes the technical aspects of PN experienced by the surgical team and also provides an update on the indications, benefits and risks, limitations and post-surgical complications of it.

CASE REPORT

An Asian male, 69-year-old presented with history of vague, nonspecific abdominal pain for two months. He was referred for urological evaluation after the incidental discovery of right renal mass suspicious of being RCC on ultrasonography. He denied any episode of apparent hematuria. He was an occasional smoker otherwise his past medical, surgical and family histories were unremarkable. Physical examination findings were within normal limits. Urinalysis demonstrated neither microscopic hematuria nor pyuria and urine culture was sterile. Complete

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blood count and serum biochemistry panel were within normal limits. Contrast enhanced computed tomography revealed a well-defined, 3.0 cm x 2.5 cm soft tissue lesion at the lower pole of right kidney with exophytic perinephric extension. The lesion had a peripheral enhancement suggestive of RCC (Figure 1).

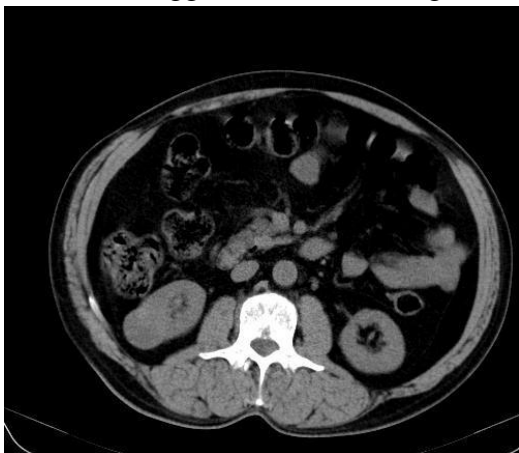


Figure 1

Regional lymph node enlargement was not evident on cross-sectional images. After thorough patient counseling, we elected to perform partial nephrectomy.

A right open partial nephrectomy was performed through right subcostal incision. After entering the retroperitoneum, right renal artery was identified, dissected and controlled with vessel loop. Thereafter, the upper pole and lateral borders of the kidney were mobilized within Gerota's fascia, without dissecting the peri-renal fat overlying the tumor. To decrease the warm ischemic time, renal hypothermia with the use of intra-operative peri-renal ice slush was achieved. The mass was resected with a 1-centimeter rim of normal looking renal parenchyma overlying its pseudocapsule (Figure 2).



Figure 2

Frozen section evaluation of the surgical margin revealed benign findings. After repairing collecting system defects with 3/0 polyglactin sutures, the cortical edges were approximated by interrupted 2-0 monofilament sutures with hemaseel buttressing. Total operation and warm ischemia times were 98 and 19 minutes, respectively. Estimated blood loss was 150 cc. Patient was discharged after an uneventful course on the fourth postoperative day.

Histopathological examination revealed conventional renal cell carcinoma, Fuhrman nuclear grade II with a negative surgical margin. His postoperative serum creatinine level was 0.76 mg/dL and abdominal CT scan, which was conducted 6 and 12 months after the surgery, detected no evidence of disease.

DISCUSSION

In recent years, incidental detection of RCC has increased with the frequent use of imaging techniques like ultrasonography and abdominal computerized tomography.^{2,3}

Studies from western countries have demonstrated that incidentally detected RCC tends to be smaller in size, of early stage, and results in better survival outcomes than that of

checkups and therefore cases are detected at an
 advanced stage.⁴

Standard indications for PN are
 categorized as - absolute, relative and elective
 (shown in Table 1).

Table 1: Indications of partial nephrectomy

<p>(A) Absolute</p> <ul style="list-style-type: none"> (i) Single kidney (ii) Bilateral renal tumor (iii) Severe renal failure
<p>(B) Relative</p> <ul style="list-style-type: none"> (i) Abnormal contralateral kidney (nephropathy, nephrolithiasis, trauma, etc.) (ii) Metabolic disease associated with renal failure (iii) Genetic syndrome with tumor multifocality (e.g. VHL syndrome)
<p>(C) Elective</p> <ul style="list-style-type: none"> (i) Tumor <4 cm in young and healthy patients (ii) Peripheral tumor

The most common indication of PN is in
 those cases in which a radical nephrectomy
 would render the patient anephric with a
 subsequent and immediate need for dialysis.

Partial nephrectomy is a technically
 advanced procedure requiring considerable
 expertise. The main surgical issues are the time
 limitations caused by warm ischemia, wherein
 the tumor must be excised and precise hemostatic
 repair be performed expeditiously.

In patients with small peripheral located
 tumors resection is easily achieved with a safety
 margin of one centimeter of normal renal
 parenchyma. If there is no major bleeding as the
 resection proceeds, PN is completed without
 recourse to any type of renal ischemia. In
 doubtful cases of the surgical margins, the
 specimen is sent for frozen section or imprint
 cytology until the tumor free margins of at least 1
 cm is achieved.

Hemostasis of the resection bed is
 achieved using spray-coagulation on secondary
 vessels with an electric scalpel, harmonics or

ligasure. In addition single stitches of 4/0 vicryl
 is applied at the main bleeding points. This takes
 considerable time to achieve hemostasis. To
 reduce the hemostatic time, some authors
 advocate use of fibrinogen hemostatic patch such
 as Hemaseel or Gelfoam. Once the hemostasis is
 achieved, most authors suggest closure of the
 resection bed with mattress stitches of absorbable
 sutures.^{5,6}

Where PN is absolutely indicated, in
 patients with relative large renal tumors, many
 authors prefer to clamp the renal artery to
 produce ischemia after administering intravenous
 mannitol. This minimizes the risk of
 postoperative acute tubular necrosis. It may also
 be necessary to clamp renal artery in centrally
 located tumors that affect major vessels (e.g.
 arcuate arteries) or in cases of unexpected
 bleeding that can only be controlled by ischemia.
 Thereby it is prudent to have the renal pedicle
 prepared in advance, allowing ischemia to be
 produced within a few seconds and minimizing
 blood loss.

Renal hypothermia has been shown to decrease ischemia induced renal damage and minimize reperfusion injury, which occurs from renal hilar clamping.⁷⁻⁹ Ward first described the benefits of renal hypothermia. He stated that the optimal temperature for reno-protective effect during temporary ischemia is between 15° to 20° C. Renal hypothermia is achieved with intraoperative peri-renal ice slush, cool saline irrigation or arterial infusion of cooled saline. Long term renal damage is minimal if the warm ischemia time is less than 20 minutes.¹⁰ However recent publications suggest that every minute of warm ischemia can affect the risk of developing stage IV chronic kidney disease.¹¹

The main complications of PN are urinary fistulae, hemorrhage, ureteral obstruction and renal insufficiency. The risk of urinary fistula and acute renal failure after PN ranges from 1.8-21% and 0-18% respectively. The risk of urinary fistulas after PN is lesser with better surgical techniques and in patients with small, peripheral located renal tumors. Most urinary fistulae close if the intrarenal urinary drainage is not obstructed. With the routine use of Double J

stent, the risk of urinary fistulas after PN is further minimized. Risk factors for postoperative acute renal failure were tumor size >7 cm, excision of more than half the renal parenchyma, and ischemia >60 minutes.¹²

Surveillance for cancer recurrence, particularly local recurrence, is critical in those patients treated for renal malignancies. Literature reports a local recurrence of 0-7.3% after PN thereby mandating a 6 monthly close follow-up and annual computerized tomography.

CONCLUSION

Partial nephrectomy as compared to radical nephrectomy is an emerging, safe and effective surgical technique in patients with localized renal tumors. The primary goal of partial nephrectomy is to preserve as much renal function as possible, without compromising the oncological clearance. With the use of energy based resections, hemostatic agents and renal hypothermia techniques, it is feasible to do partial nephrectomy with least postoperative complications.

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