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Is perioperative examination of frozen sections necessary in nephron-sparing surgery?

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Aim: To evaluate the role of perioperative freezing in the management of surgical procedures in patients with malignant renal masses.

Materials and methods: The study group consisted of 17 patients diagnosed with renal masses who underwent nephron-sparing surgery. The group included 5 females and 12 males aged from 44 to 68 years (mean = 54.6). The mean mass size was 5.5 cm. Mass locations were as follows: 9 were in the lower pole, 4 were in the mid-pole, and 6 were in the upper pole. Perioperative freezing was not carried out. The patients were followed-up in a period ranging from 3 months to 7 years.

Results: Tumor pathology was reported as renal cell carcinoma in all cases, and surgical margins were negative in all of them. One patient died after 1 year because of tumor metastasis. In another patient, the tumor reoccurred in the same kidney and a radical nephrectomy was performed. Other patients were followed without recurrence.

Conclusion: Imaging of the renal vascular system and freezing during surgery is not necessary for nephron-sparing surgery for renal cell carcinoma; however, we should be careful in terms of capsule invasion because of tumor recurrence.

Key words: Frozen section, nephron sparing, renal cell carcinoma

1. Introduction

Standard treatment for renal tumors is radical nephrectomy. Nephron-sparing surgery (NSS) was initially performed by necessity in patients with a solitary kidney or bilateral tumors. However, oncologic outcomes similar to those of radical nephrectomy were observed, and the method became routinely used in cases of systemic disease where the contralateral kidney is threatened and in all cases with suitable tumors (1–3).

Although NSS is a frequently used treatment, the necessity of perioperative pathologic examination of frozen sections remains controversial. Furthermore, there is no consensus in the centers using this method about the necessity of imaging modalities demonstrating the anatomy of renal vascular system preparation (4).

In this retrospective study, we studied the outcomes of patients who underwent NSS having no detailed preoperative radiologic examination and perioperative frozen sections.

2. Materials and methods

The records of 17 patients undergoing NSS for treatment of a renal mass between May 1995 and November 2011 were retrospectively examined. Records examined included routine blood biochemistry, full urine analysis, abdominal ultrasonography, computed tomography, posteroanterior chest radiographs, and, in some cases, additional magnetic resonance imaging and whole-body bone scintigraphy. Extraperitoneal and extrapleural flank incisions were performed on all patients. During the operation, the Gerota fascia was routinely opened and the kidney was released. The perirenal fatty tissue on the mass was retained. Upon reaching the renal pedicle, the renal artery and vein were isolated. Particularly in patients with masses in the mid-pole, pedicle dissection was continued up to the inner sides of the kidneys, and the intrarenal anatomy of the renal pelvis and renal artery and vein was defined. After mannitol renal perfusion, the renal artery, and in some cases the renal vein, was clamped. The kidney was cooled in an ice slush, the renal parenchymal tissue was marked at a distance of 3–10 mm, and the mass was excised with sharp dissections. After NSS was completed, the collecting system was closed using 4/0 chromic catgut or polyglactin (Vicryl Rapide, Ethicon, USA). Parenchymal bleeding from the release of the renal artery was controlled with surgical sutures under direct vision. In some cases,

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minimal bleeding occurred and was controlled using a hemostatic absorbable gelatin sponge (Surgicel or Spongostan, Ethicon, USA) and perirenal fat tissue. A double J stent was also used in one patient. Patient follow-up periods ranged from 3 months to 7 years (mean = 3.5 years) to detect and treat early and late complications.

3. Results

A total of 17 patients (12 males and 5 females) aged from 44 to 68 years (mean = 54.6 years) had renal masses with sizes differing from 2 to 12 cm (mean = 5.5 cm).

There were 2 patients who had synchronized tumors in both kidneys and 1 patient had a solitary kidney. All of the remaining 14 patients had histories of at least one pathology threatening the contralateral kidney, such as renal calculi, hypertension, or diabetes mellitus. Renal tumors were detected incidentally in 15 cases. In one case, the contralateral kidney was previously removed because of a tumor and the patient was receiving follow-up care. One patient had presented to the urology clinic for treatment of macroscopic hematuria and had a palpable mass. Demographic features of the patients are shown in Table 1.

None of the patients developed significant complications during the operation. Cold ischemia time ranged from 20 to 65 min (mean = 32.5 min). During the follow-up period, no complications occurred in 15 of the patients during the early period (first 2 weeks). In 1 case, 2 units of blood transfusion were required. A ureteral stent was used for one patient, for whom the caliceal system was considered but could not be closed sufficiently. Urinary leakage developed in 1 patient, which persisted up to 15 days and ceased spontaneously. Incisional hernia occurred in 2 patients (after about 6 months). Both patients were female and diabetic. After 1 year, 1 of the patients with unilateral renal tumor died from tumor metastasis. In another case, the tumor reoccurred at 5 cm in size in the same kidney and, thereupon, radical nephrectomy was performed. The other patients were followed without recurrences, and also without any parenchymal or collection system abnormalities. There was no reported vascular damage in our records.

The histopathological exams reported renal cell carcinoma in all patients. Surgical margins were negative in 19 cases; however, surgical margin was also negative in 1 case despite the presence of capsular invasion. The pathologic stage was evaluated as pT1a in 11 renal units, pT1b in 6 renal units, and pT2 in 2 renal units. The histopathological subtypes of the tumors was found as clear cell in 11 renal units, papillary in 5 renal units, and chromophobe type in 2 renal units. Peri- and postoperative clinical-pathological findings and complications are provided in Table 2.

Table 1. Patient demographic features.

Characteristic	Description
Sex	12 males; 5 females
Age	44–68 years (mean = 54.6 years)
Symptoms	Hematuria: 1 Incidental: 15 Follow-up due to renal tumor: 1
Absolute indications	Solitary kidney: 1 Bilateral tumor: 2
Relative indications	Renal calculus: 2 Hypertension: 5 Hypertension and diabetes mellitus: 7
Side	Unilateral: 14 Bilateral: 2 Solitary kidney: 1
Mass size	2–12 cm (mean = 5.5 cm)
Follow-up duration	3 months to 7 years (mean = 3.5 years)

Table 2. Peri- and postoperative clinical-pathological findings and complications.

Complication	Findings
Perioperative complication	No
Cold ischemia time	20–65 min (mean = 32.5 min)
Blood transfusion	2 units (1 case)
Late complications	1 prolonged urine drainage (15 days) 2 incisional hernia
Recurrence	1 (3rd year, same side)
Metastasis	1 (Ex, after 1 year)
Pathologic diagnosis	Renal cell carcinoma (12 clear cell, 5 papillary, 2 chromophobe)
Surgical margin	19 negative
Capsular invasion	1 positive
Pathologic stage	11 pT1a 6 pT1b 2 pT2

4. Discussion

The number of incidental renal tumors is increasing because of the use of improved ultrasonography machines in clinical practice. Because these tumors are usually detected when they are small in size and at an early stage, they have a good probability of cure (5). Long-term oncologic outcomes of NSS performed in response to these tumors have been found similar to those for radical nephrectomy (2,6,7). Hence, NSS is increasingly performed in patients with a normal contralateral kidney who do not have any additional clinic diseases such as hypertension, diabetes mellitus, or renal calculus (1,2,8,9,10).

Three of our patients had absolute indications for NSS (1 had a solitary kidney and 2 had bilateral renal tumors), while 14 patients had at least 1 disease threatening the contralateral kidney. There was 1 patient with absolute indication who had bilateral renal tumors of 12 cm on the right side and 10 cm on the left side. This patient presented with hematuria and a clinical stage of T3 No Mo. This 44-year-old patient had first undergone NSS on the left kidney, and after 20 days received a radical nephrectomy for the right kidney. This patient retained approximately one-quarter of the renal tissue; however, renal function was protected and only proteinuria persisted. Unfortunately, this patient developed distant metastasis (brain) 1 year after the operation and died. The other case with absolute indication was a 56-year-old female patient whose right kidney was removed 7 years previously because of a tumor. The tumor that developed in the remaining kidney was 2 cm in diameter and with a hilar localization. In the preoperative evaluation, differential diagnosis of a renal pelvis tumor could not be achieved. During the operation, the renal collection system was first evaluated using a flexible ureteroscope. After the observation was found to be normal, the renal pelvis was dissected. The renal artery and the branches of the renal vein and pelvis were exposed. The tumor, which was situated in very close proximity to the vascular system, was excised with a negative surgical margin. In such a situation, magnetic resonance angiography or tomography can be ordered before surgery to demonstrate the preoperative vascular anatomy (4). However, in clinics where these imaging facilities are not available, it is also possible to skeletonize the vascular anatomy and isolate the branches to the tumor by pedicle dissection.

Postural bending on the incision side developed because of muscle weakness in 2 patients. Abdominal wall hernia could not be detected on physical exam. We thought that the possibility of injury of nerves during surgery was responsible for the hernias.

Local recurrence was observed in 1 patient after 3 years. The initial pathology of this case was pT1a Fuhrman grade. In one case, a tumoral lesion having capsule invasion did not extend into the perirenal fatty tissue. Radical nephrectomy was performed in this patient. On pathological examination of the excised tissue, a satellite tumor with the same characteristics was detected in another location. In this case, it was unclear whether the local recurrence was caused by the satellite tumor or the capsular invasion during the previous NSS. The patient was followed without evidence of tumor recurrence.

Rates of local recurrence of up to 7.3% have been reported in patients receiving NSS (11,12). Akman et al. observed local recurrence in 2 of their 29 patients having a pathology of renal cell carcinoma and being treated by NSS. They attributed the recurrences to positive surgical margins or the existence of multifocal tumors (9,13).

Incidental satellite tumors have been reported at rates from 3.75% to 25% in renal tumors, and these may be responsible for recurrences (14,15). In our patient, the surgical margin was negative and no visible satellite tumors were observed. However, we think that capsular invasion in this patient could be responsible for the recurrence. Although there are studies in the literature advocating examination of frozen sections during surgery, there are also several studies suggesting that this is not necessary and even that just follow-up is adequate without the need for nephrectomy in cases with positive surgical margins (8,16,17).

There are also studies supporting the successful performance of NSS in hospitals where the capability for frozen examination is unavailable. In their extensive evaluation of 301 patients, Duvdevani et al. reported that although frozen examinations were routinely performed, only 2 patients had positive surgical margins and no tumor was detected in the nephrectomies performed in these patients. The same authors demonstrated that the tumor was observed in paraffin sections in 4 cases reported with negative surgical margins (16). Akman et al. emphasized that frozen section analysis does not contribute significantly to the treatment outcome and, thus, sufficient parenchymal excision during NSS would adequately ensure negative surgical margins (13).

Based on these results, it seems that examination of the tumor bed by an experienced surgeon in a bloodless medium may be sufficient; however, the small number of cases is a limitation of this study. Although perioperative frozen examination promotes greater confidence in the negative surgical margin, its routine application must be evaluated in more extensive studies.

In conclusion, NSS for treatment of renal cell carcinomas can be safely performed with sufficient and sound parenchymal excision without preoperative renal vascular imaging or perioperative examination of frozen sections in hospitals with limited technical facilities. Curative treatment in patients at risk for local recurrence can be performed without distant metastasis through closer follow-up.

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