Case report

Nephron-sparing surgery with autotransplantation for high-grade upper urinary tract urothelial carcinoma in a patient with solitary kidney

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ARTICLE INFO

Article history:
Received 6 June 2013
Received in revised form 2 July 2013
Accepted 19 August 2013
Available online 2 October 2013

Keywords:
nephron-sparing surgery
renal transplantation
uremia
urothelial carcinoma

ABSTRACT

Instead of nephroureterectomy with bladder cuff excision, nephron-sparing surgery can be considered in selected patients with non-muscle invasive upper urinary tract urothelial carcinoma. The role of kidney-sparing surgery has been established for the management of low-grade urothelial carcinoma. We report a solitary kidney patient with high-grade renal pelvis urothelial carcinoma treated with nephron-sparing surgery by ex vivo tumor excision and autotransplantation. The results of the surgery were excellent.

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1. Introduction

Nephroureterectomy with bladder cuff excision is still the gold standard therapy for upper urinary tract urothelial carcinoma (UUT-UC). However, for patients with anatomically or functionally solitary kidneys, significant renal insufficiency or bilateral UUT-UCs, dialysis will be inevitable after operation. Several nephron-sparing approaches have been advocated to prevent the patient from becoming anephric. Here, we report a solitary kidney patient with high-grade renal pelvis urothelial carcinoma treated with nephron-sparing surgery by laparoscopic nephrectomy, ex vivo tumor excision, and autotransplantation.

2. Case report

A 64-year-old female had received nephroureterectomy with bladder cuff excision for the right renal pelvis UC (pT1N0M0, high-grade) 6 years earlier. Gross hematuria occurred and urothelial carcinomas of the left middle third of the ureter and renal pelvis were found. The pelvic tumor caused dilatation of the collecting system. A decision was made to perform a nephron-sparing procedure. Laparoscopic nephrectomy was performed peritoneally with about a 5-cm segment of distal ureter preserved. The kidney was taken out through a Gibson incision. On the bench, we flushed the kidney with cold HTK (histidine–tryptophan–ketoglutarate) solution. A 4 cm × 3 cm × 3 cm papillary tumor at the anterior aspect of the renal pelvis with a tumor stalk about 1 cm × 0.4 cm was found after pyelotomy (Fig. 1A). Wedge resection was done with a safety margin of approximately 5 mm, which was confirmed by frozen section (Fig. 1B and C). All the calyces and proximal ureter were checked with flexible ureteroscope (Fig. 1D). Pyeloplasty was performed by continuous suture with 4–0 vicryl. We resected the middle third ureter around 7 cm where the UC was located. The tumor was 0.5 cm × 0.5 cm × 0.5 cm. Meanwhile, left external iliac vessels were isolated and looped. The kidney was then transferred back through the Gibson incision, and blood supply was restored by anastomosing to the external iliac vessels in an end-to-side fashion. Finally, ureteroureterostomy was done with double J stenting. The procedure time was as follows: laparoscopic nephroureterectomy 110 minutes, warm ischemic time 4 minutes, cold ischemic time 90 minutes, and vessel anastomosis 45 minutes. We removed the double J stent 44 days after the operation. The postoperative course was uneventful.

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http://dx.doi.org/10.1016/j.urols.2013.08.008
The pathology reported a high-grade UC with invasion to the lamina propria of the renal pelvis and carcinoma in situ in the ureter. This patient was followed up by flushing urine cytology as well as ureteroscopy and retrograde pyelography alternatively every 3 months in the first 2 years and every 6 months thereafter (Fig. 2). No tumor was noted 44 months after the procedure, and the obstructive uropathy was relieved. The preoperative glomerular filtration rate was 22 mL/min, and 3 years after the operation was 76 mL/min.

3. Discussion

For the management of non-muscle-invasive UUT-UC with low-grade status, the 5-year survival rate after local resection was comparable to that after radical nephroureterectomy. However, kidney-preserving operations are not suggested for high-grade tumors. In our case, nephroureterectomy would have necessitated hemodialysis, which may cause complications and involve significant medical expenses. In one study, the cost savings ranged from 3-fold to 10-fold for a patient with UUT-UC who received renal preservation in comparison with patients in the hemodialysis cohort. In addition, the quality of life becomes impaired once hemodialysis has been commenced. In Taiwan, the 5-year survival rate of patients with hemodialysis was 53.7%. To date, no evidence has indicated that the overall survival rate of dialysis is better than that after renal preserving procedures in patients with resectable UUT-UC. Hence, for single-kidney patients with high-grade UUT-UC, nephron-preserving procedures could be considered.

Several reports demonstrated pyelovesicostomy during renal autotransplantation. It facilitates access to the collecting system and allows further tumor resection or Bacillus Calmette–Guérin (BCG) instillation. Instead of pyelovesicostomy, ureteroureterostomy

Fig. 1. (A) Urothelial carcinoma located at anterior renal pelvis with a narrow tumor base (white arrow). (B) The tumor was excised with the scissor. (C) Biopsy forceps was used to sample the tumor base for frozen section. (D) Flexible ureteroscope was engaged in the collecting process to check for residual tumor.

Fig. 2. (A) Preoperative retrograde pyelography reveals filling defect in renal pelvis and dilated collecting system. (B) Postoperative retrograde pyelography showed no tumor recurrence in the upper urinary tract and relief of obstructive uropathy.
was introduced in our case. We think that this approach is useful at least for the prevention of deterioration of renal function. In our patient, the glomerular filtration rate improved from 22 mL/min (pre-operation) to 76 mL/min (3 years after surgery). In addition, ureteroureterostomy offers a good and easy way for clinical follow-up, including retrograde pyelography and ureteroscopy.

We did not perform BCG instillation although a high-grade tumor had formed in this case. For UUT-UC, BCG instillation has its own limitations. It has more severe side effects than when used intravesically, and it is difficult to achieve BCG retention in the collecting system. In addition, there are no proven benefits for survival and recurrence rates.

For the management of low-grade UUT-UC, the advantages of nephroureterectomy were overestimated, whereas those of nephron-sparing surgery were underestimated. Nephron-sparing surgery is not suggested in the management of high-grade UUT-UC.16 Holmäng and Johansson1 reported a series involving the treatment of tumors with local resection and autotransplantation after 20 years of follow-up. Tumor recurrence was not specifically found in high-grade tumors, but was noted in low-grade tumors. The authors concluded that tumor size, location, and number may be important factors for tumor recurrence. In our case, the high-grade tumor was easily handled because it was a single lesion and narrow at the base. No local recurrence was noted during regular follow-up.

In managing such a case, there are choices other than Bence operation, including ureteroscopic or percutaneous nephroscopic tumor ablation and open pyelotomy with tumor resection. The ureteroscopic or nephroscopic approach provides comparable outcomes to nephroureterectomy in early-stage and low-grade tumors.11,12 In high-grade tumors, the recurrence rate was as high as 60% after ureteroscopic tumor ablation and 42% after nephroscopic procedures.13 Endoscopic approaches have several limitations, such as limited working space, difficulty in determining the depth of tumor invasion, problems controlling massive bleeding, and urinary tract penetration. Percutaneous access was indicated for bulky intrarenal tumors (>2 cm). Nevertheless, the complication rate of percutaneous access (10–20%) is higher than that of ureteroscopy (5–10%).14 Tumor seeding of the percutaneous tract has been reported.15 As an alternative in these patients, pyelotomy with tumor excision is rarely done. The recurrence rate was as high as 65%, owing to tumor spillage or incomplete tumor resection during the operation.10

Because there have been few randomized prospective studies, the decision to perform nephron-sparing surgery in UUT-UC has to be justified according to the patient’s individual situation. The current consensus about preserving the kidney is limited to cases of low-grade tumors. In high-grade tumors, the operation should only be performed in selected patients, such as those with superficial lesions, solitary tumor, small tumor, and impending renal failure. The patient should be informed about the high recurrence rate and possible disease progression with UUT-UC.

In conclusion, we performed nephron-sparing surgery for a patient with high-grade UTT-UC. The results were excellent in terms of oncological control, preservation of renal function, lower cost, and convalescence. In selected patients, laparoscopic nephrectomy combined with ex vivo tumor excision and autotransplantation is a viable option, even in cases of high-grade tumors.

Conflicts of interest

The authors declare that they have no financial or non-financial conflicts of interest related to the subject matter or materials discussed in the manuscript.

Sources of funding

No funding was received for the work described in this article.

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