Laparoscopic Nephroureterectomy for Upper Tract Transitional Cell Carcinoma: Comparison of Laparoscopic and Open Surgery

Masao Tsujihata*, Norio Nonomura, Akira Tsujimura, Kazuhiro Yoshimura, Yasushi Miyagawa, Akihiko Okuyama
Department of Urology, Osaka University Graduate School of Medicine, Suita Japan

1. Introduction

The standard treatment for upper tract transitional cell carcinoma has traditionally been radical nephroureterectomy. In 1991, Clayman firstly described the technique of LNU as a treatment option for upper tract transitional cell carcinoma [1]. Laparoscopic surgery has found wide acceptance...
because of its minimally invasive nature, and it is now performed in the field of urology at many institutes. With increasing acceptance of LNU for upper tract transitional cell carcinoma, several centres recently reported their initial experiences [2–4]. We have been performing LNU since July 2000. In the present study, we compared the results of LNU with the results of ONU performed in contemporary patients.

2. Methods

From July 2000 to February 2005, 49 patients underwent total nephroureterectomy for upper tract transitional cell carcinoma at Osaka University Medical Hospital. Of the 49 patients, twenty-five were treated with LNU, and twenty-four with ONU (Table 1).

All patients were hospitalized and surgery was performed by multiple surgeons under general anesthesia. In cases of LNU, the surgery was performed by the retroperitoneal approach. Patients were placed in a lateral position and the first port was made at the center between the subcostal level and the crista iliaca on the posterior axillary line. After a 15-mm skin incision was made in the midaxillary line at the level of the umbilicus, the retroperitoneal space was entered by blunt finger dissection. After a retroperitoneal working space had been created using a balloon dissector, a 12-mm trocar was inserted and the pneumoretroperitoneum was maintained with carbon dioxide gas at 8 mmHg. Two additional trocars (10-mm) were inserted under laparoscopy (anterior axillary line below the costal margin and posterior axillary line at the tip of the 12th rib) (Fig. 1). The posterior peritoneum was mobilized medially so that dissection of Gerota’s fascia and the renal pedicle could be fully performed. After the lymphatic channels around the renal pedicle were excised to expose the renal artery, this artery was isolated, clipped, and divided. The renal vein was mobilized and secured with a vascular stapler (EndoGIA, Autosuture Japan). Caudally, the fatty tissue around the ureter was divided to the cross with the iliac vessels. An 8-mm suction drain was placed using the second trocar, and the trocar wound was closed. Lymphoadenectomy was not performed routinely for renal pelvic cancer.

An approximately 7-cm pararectal incision was made, and the entire distal ureter with a small bladder cuff was dissected. The entire nephroureterectomy specimen was removed en bloc using the pararectal incision without opening urinary tract. The bladder was closed with two-layer 3-0 polyglactin sutures. A 5-mm suction drain was inserted, and the incision was closed with 2-0 polyglactin sutures. Intraoperative and post-operative parameters including operative time, blood loss, dose of analgesics, insertion period of the urethral catheter and the recovery time for oral intake and ambulation were evaluated. Comparisons between the two groups were carried out using the Mann-Whitney U test. Disease specific survival was calculated from the time of surgery to the date of last follow-up and was analyzed by the Kaplan-Meier method. For all statistical tests, \( p < 0.05 \) was considered to indicate a significant difference.

3. Results

3.1. Patients

The characteristics of the patients who underwent LNU and ONU are shown in Table 1. The preoperative stages of the 25 cases of LNU were T1N0M0 (10 cases) and T2N0M0 (15 cases).

3.2. Perioperative parameters

A comparison of the perioperative parameters between the two groups is shown in Table 2. The operative time, blood loss and insertion period of the urethral catheter tended to be longer in LNU, but not to a significant extent. The recovery time for oral intake and ambulation, and the dose of analgesics

Table 1 – Comparison of patient characteristics between LNU and ONU

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>LNU</th>
<th>ONU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients (n)</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>Mean age</td>
<td>66.6 (34–85)</td>
<td>68.3 (50–87)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Operative side</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Left</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Tumor location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renal pelvis</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>Ureter</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Preoperative stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1N0M0: 12</td>
<td>T1N0M0: 3</td>
<td></td>
</tr>
<tr>
<td>T2N0M0: 13</td>
<td>T2N0M0: 12</td>
<td></td>
</tr>
<tr>
<td>N0M0: 4</td>
<td>N0M0: 5</td>
<td></td>
</tr>
</tbody>
</table>
were significantly reduced in LNU. No major postoperative complications were observed in either group of cases. No cases of port site metastasis were observed during the follow-up period.

### 3.3. Pathologic outcome and prognosis

The histopathological diagnoses are shown in **Table 3**. The median follow-up was 22.4 months in the LNU group and 22.1 months in the ONU group.

Bladder tumor recurrence occurred in 7 patients in LNU group and 8 patients in the ONU group. Distant metastasis in lung occurred in 2 patients in ONU group.

After adjusting for follow-up period in LNU versus ONU group, no significant difference was detected in disease-free survival rate between the two groups ($p = 0.8166$, Fig. 2). Two patients in ONU group with distant metastasis in lung died of cancer during the follow-up period.

### 4. Discussion

The standard treatment for upper tract transitional cell carcinoma has traditionally consisted of radical nephroureterectomy with excision of a bladder cuff. However, several investigators have recently introduced laparoscopic procedures to radical nephroureterectomy and suggested their benefit for patient recovery with disease control comparable to that of traditional open surgery [4–6]. Minor complications after LNU have been reported in 7–40% of patients and major complications in 4.8–8% [4–10]. In comparison, ONU has been reported to have a 29% complication rate [4,5]. However, with recent technical improvements, the rate of complications with LNU has been decreased. In our institution, no major postoperative complications were observed in either group of cases. Our findings support the effectiveness of laparoscopic procedures compared with the standard open procedure.

Regarding the procedure of radical nephroureterectomy, the disposal method of the distal ureter and bladder cuff is one of the controversial points. For complete removal of the upper urinary tract with a bladder cuff of tissue surrounding the ureteral orifice, two incisions were traditionally necessary to provide an adequate surgical field. The distal ureter and bladder cuff are controlled by various endoscopic, laparoscopic and open methods. In our institution, in the case of LNU, the distal ureter was treated at the looking straight lower part approximately 7 cm from the pararectal incision. Recently, a combined endoscopic approach to the distal ureter, including stripping and pluck techniques, has been reported [11–14]. However, if an ureterectomy is performed with a small pararectal incision, which just allows for intact specimen removal, we believe
patients who underwent open surgery [18]. They compared the results to those in a group of 15 diseases treated with laparoscopic surgery and LNU. Doehn et al. reported 16 cases of benign renal the dose of analgesics were significantly reduced in recovery time for oral intake and ambulation and be longer in LNU, but not to a significant extent. The insertion period of the urethral catheter tended to institution, the operative time, blood loss and a more rapid recovery than ONU. In our institution, no cases of port seeding recurrence were observed. In our institution, no cases of port site metastasis were observed during the follow-up period. Klingler et al. point out that the usage of the harmonic scalpel for tissue dissection results in uncontrollable tissue and fluid evaporation which might be an origin of tumour cell spreading [15].

LNU results in less blood loss, less postoperative pain, quicker oral intake, shorter hospitalization and a more rapid recovery than ONU. In our institution, the operative time, blood loss and insertion period of the urethral catheter tended to be longer in LNU, but not to a significant extent. The recovery time for oral intake and ambulation and the dose of analgesics were significantly reduced in LNU. Doehn et al. reported 16 cases of benign renal diseases treated with laparoscopic surgery and compared the results to those in a group of 15 patients who underwent open surgery [18]. They found earlier oral intake, less use of postoperative analgesics, shorter hospital stay and quicker return to normal activities in the laparoscopic group. Their result that the average operative time of the laparoscopic group was not significantly different from that of the open surgery group was the same as our institution. Those authors concluded that the patient benefit is obvious in the postoperative period and therefore laparoscopy is the preferred approach for nephrectomy and nephroureterectomy in patients with renal diseases.

For LNU, we did not routinely perform lymphadenectomy. McNeill et al. reported favorable long-term outcomes after laparoscopic nephroureterectomy compared with open nephroureterectomy; however, information on nodal status was available in only 4% of cases [6]. Although the therapeutic effectiveness of lymphadenectomy for upper urinary tract transitional cell carcinoma has been controversial, extensive lymphadenectomy is presently recommended in high-grade or high-stage tumors, because microscopic lymph node metastasis may be cured by surgery alone or with adjuvant chemotherapy. In our institution, the preoperative stages of the 25 cases of LNU were T1N0M0 (10 cases) and T2N0M0 (15 cases). Because we assume that LNU is indicated for low stage cases, we think that lymphadenectomy do not have to be performed routinely for LNU. We should always be aware of this complication, and the fact that laparoscopic surgery might not be indicated for high stage, advanced upper urinary tract malignancies should be stressed. In conclusion, because LNU reduces postoperative pain and enables early ambulation, we think it should reduce the risk of complications of the respiratory system. LNU could be extremely useful for upper tract transitional cell carcinoma because of its safety and low in invasiveness.

References


