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Surgery in Motion

Robot-assisted Laparoscopic Implantation of Brachytherapy Catheters in Bladder Cancer

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Please visit www.europeanurology.com and www.urosource.com to view the accompanying video.

Abstract

Background: Robot-assisted laparoscopic (RAL) implantation of brachytherapy catheters (BTCs) can be a minimally invasive alternative to open retropubic implantation. Descriptions of the surgical technique and outcomes are sparse.
Objective: To describe our technique and perioperative outcomes for RAL BTC implantation in urothelial carcinoma (UC) and urachal carcinoma (UraC).
Design, setting and participants: Between June 2011 and May 2016, 26 patients with cN0M0 solitary T1G3 or T2G1–3 UC of ≤5 cm or cN0M0 UraC were scheduled for external beam radiotherapy (20 × 2 Gy), RAL BTC implantation, and pulsed-dose (29 × 1.04 Gy) or high-dose rate brachytherapy (10 × 2.50 Gy). Median follow-up was 12 mo (interquartile range 4–20).
Surgical procedure: RAL BTC implantation with or without pelvic lymph node dissection and/or partial cystectomy.
Measurements and statistical analysis: Perioperative data, complications, disease-free-survival (DFS), local recurrence-free survival (LRFS), and cystectomy-free survival (CFS) were evaluated as well as the feasibility of the technique.
Results and limitations: BTC implantation was successful in 92% of the patients. Median hospitalisation was 5 d (interquartile range 4–7) and blood loss <50 ml in all cases. DFS was 74% at 1 yr and 63% at 2 yr. LRFS was 80% at 1 and 2 yr, and CFS was 87% at 1 and 2 yr. Early (≤30 d) high-grade complications (Clavien-Dindo ≥3) occurred in 8% of the patients. The study is limited by the small sample size and short follow-up time.
Conclusions: RAL BTC implantation is technically feasible and could serve as safe, minimally invasive alternative to open surgery in selected patients. The results of this study should be confirmed in larger studies.
Patient summary: Brachytherapy catheter (BTC) implantation is traditionally carried out via open retropubic surgery. We describe robot-assisted laparoscopic BTC implantation as a minimally invasive alternative. Perioperative outcomes are described and confirm the safety and feasibility of this procedure.

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1. Introduction

Bladder cancer is the most common cancer of the urinary tract, causing substantial morbidity and mortality. Approximately 25% of the patients present with muscle-invasive bladder cancer (MIBC) [1]. Standard management of nonmetastatic MIBC is radical cystectomy (RC) with extended pelvic lymph node dissection (ePLND). Less common are bladder-preserving strategies, including a combination of transurethral resection of the bladder tumour (TURB), external-beam radiotherapy (EBRT), and brachytherapy. Patients with either a solitary T1G3/T2G1–3 cN0M0 urothelial carcinoma (UC) of the bladder of $\leq$5 cm or cN0M0 urachal carcinoma (UraC) are eligible for this strategy [2].

The implantation of brachytherapy catheters (BTCs) is traditionally performed via an open retropubic approach [3]. As a minimally invasive alternative, a robot-assisted laparoscopic (RAL) approach can be offered. In this paper and the accompanying video, we report our surgical technique and perioperative outcomes for RAL BTC implantation.

2. Patients and methods

2.1. Patients

All data were reviewed for patients who underwent RAL BTC implantation from June 2011 to May 2016 in two hospitals in Amsterdam, the VU University Medical Centre (VUMC, $n = 9$) and the Netherlands Cancer Institute (NCI-AvL, $n = 21$). After seven patients had been treated, a 1-yr pause was implemented to confirm safety compared to open surgery. Indication for surgery was a solitary T1G3/T2G1–3 cN0M0 UC of the bladder of $\leq$5 cm or cN0M0 UraC. Patient characteristics and perioperative data were recorded. Follow-up data included the presence and date of local or metastatic recurrence and death. Complications were reported using the Clavien-Dindo grading [4].

2.2. Diagnosis and staging

Diagnosis and staging consisted of TURB and computed tomography (CT) of the thorax/abdomen. Perioperatively, the tumour size and location were established. Patients with a tumour in the bladder trigone were only considered eligible if the distance to the ureteral orifice was at least 2 cm. Otherwise, ureteral reimplantation was discussed.

A medical history was taken, including the presence of comorbidities and previous abdominal surgery.

2.3. EBRT

To prevent tumour-cell seeding, all patients were treated with EBRT (20×2.0 Gy). The clinical target volume (CTV) included only the bladder.

2.4. Perioperative care

All patients were treated according to an enhanced recovery program with respect to preoperative counselling, medical optimisation, perioperative feeding, prevention of venous thromboembolism, and antimicrobial prophylaxis [5]. Postoperatively, antiemetics and analgesics were administered, the nasogastric tube was removed directly, and an early oral diet was supported.

2.5. Surgical technique

2.5.1. Positioning and port placement

Patients are placed in the lithotomy position under general anaesthesia and a transurethral catheter (TUC) is placed. A 12-mm camera port is introduced 3 cm supraumbilically using the Hasson (open) technique and the pneumoperitoneum is generated [6]. At left and right positions lateral to the camera trocar, an 8-mm robot trocar is introduced 8 cm from the camera port. In addition, a third robot trocar can be placed at the dominant hand of the surgeon. A 12-mm assistant trocar port is placed lateral to the left or right robot trocar (Fig. 1).

The patient is placed in the Trendelenburg position (30°). The robot is docked laterally or caudally to the patient. The camera (0° or 30° binocular lens) and surgical instruments (Intuitive Surgical) are introduced under sight. Monopolar curved scissors (hot shears), Maryland or fenestrated bipolar forceps, and a single robotic needle driver (large) are typically used. The assistant uses a fenestrated grasper, suction device, and monopolar scissors and/or clips.

2.5.2. ePLND

ePLND was routinely performed in the VUMC, but only in cases with suspicion of lymph node involvement in the NCI-AvL. The template included the following anatomical boundaries: cranially and laterally, the genitofemoral nerve; dorsally, the obturator nerve; medially, the crossing of the ureter over the common iliac artery or external iliac artery; and caudally, the pelvic pubic bone. Lymph nodes were placed in an endobag and removed through the 12-mm-trocar.

2.5.3. Partial cystectomy

Partial cystectomy (PC) was performed in cases of tumour in a diverticulum or UraC. For the latter, the urachal ligament and umbilicus were also resected. In these patients, the BTCs were placed in and around the scar.

2.5.4. BTC implantation

To gain optimal exposure of the implantation area (IA), it is often necessary to mobilise the bladder. A peritoneal incision is made laterally to the median umbilical ligament and is extended on one or both sides to the level of the vasa deferentia or round ligaments.

Flexible cystoscopy is performed and the IA is identified via laparoscopic and cystoscopic views using the TilePro function of the da Vinci Si system. The IA includes a scar or tumour remnants. The cystoscope is visualised from the abdominal cavity to identify the IA.

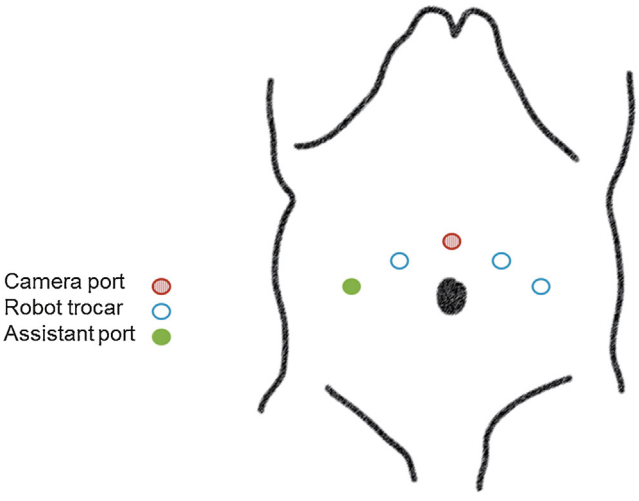

Fig. 1 – Schematic presentation of trocar placement.

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