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CASE REPORT

Robot-assisted laparoscopic prostatectomy in a 68-year-old patient with previous heart transplantation and pelvic irradiation

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Abstract We report the case of a 68-year-old man who had previously undergone heart transplantation and pelvic irradiation for Hodgkin's lymphoma and who was under active surveillance for prostate cancer. In response to his increased prostate-specific antigen levels and elevated Gleason score, he was offered robot-assisted laparoscopic prostatectomy.

Keywords Prostate cancer · Robot-assisted laparoscopic prostatectomy · Heart transplant · Pelvic irradiation

Case report

The patient was diagnosed with Hodgkin's lymphoma in 1985 and treated with 30 Gy of mediastinal and pelvic external-beam irradiation. In 1998, the patient suffered from an anterior heart infarction, and postinfarction heart failure (New York Heart Association class III/IV) developed. The patient received a heart transplant in 2002. He also suffered from insulin-dependent diabetes mellitus. His body mass index was 33.70 kg/m^2.

The patient's concomitant daily medication was: cyclosporin 100 mg × 2, mycophenolate mofetil 1,000 mg × 1, prednisolone 6.25 mg × 1, doxazosin 8 mg × 1, bendroflumethiazide 5 mg × 1, metoprolol 50 mg × 1, allopurinol 100 mg × 1, pantoprazole sodium sesquihydrate 40 mg × 1, potassium 1,500 mg × 3, bumetanide 4 mg + 2 mg, pravastatin 40 mg × 1, long-acting insulin 16 IU × 2, and short-acting insulin 14–16 IU × 3.

Because the patient's prostate-specific antigen (PSA) level was 10 ng/ml, a series of prostate gland biopsies was performed in 2006. Two of eight biopsies showed prostate carcinoma with Gleason score of 3 + 3 = 6. The clinical prostate cancer stage was T1c, and with the patient's consent, he was enrolled in an active surveillance program [1]. A new set of octant biopsies was taken in April 2010, at which time the patient's PSA had risen to 14 ng/ml. Two of eight biopsies now showed Gleason score of 4 + 4 = 8 in a length of 3.5 mm of 99 mm. The clinical stage of the prostate cancer was deemed to be T1c.

Because the patient had previously received external-beam radiation treatment (EBRT) for pelvic manifestations of Hodgkin's lymphoma, EBRT was not favored as a radical treatment in this case.

Cardiologists' preoperative assessment of cardiac function: A preoperative transesophageal echocardiographic examination revealed a well-functioning left ventricle and a slightly dilated right ventricle, with middle tricuspidal insufficiency. One year earlier, coronary angiography had shown no pathology. Preoperative cardiac investigations

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showed no definite contraindication to surgery, as judged by the cardiologist. The surgeons were advised not to change the patient's immunosuppressive therapy preoperatively, but to continue his immunosuppressive regimen in the pre- and postoperative periods. Therefore, the patient was offered robot-assisted laparoscopic prostatectomy (RALP).

Operative procedure: The patient was treated with RALP in June 2010. A 12-mm camera trocar was placed under the umbilicus. For surgery, the patient was placed in steep Trendelenburg position (45°). A three-armed robotic da Vinci system was docked to the patient, together with two robotic trocars. Two additional 12-mm trocars were placed in the abdomen for surgical assistance. The intra-abdominal pressure was 10 mmHg. In the left robotic arm, a Maryland bipolar grasp (40 W power) was used, and curved monopolar scissors (60 W power) were placed in the right robotic arm. The operation was performed according to the previously published Vattikuti technique [2]. The differences apparent when operating on previously irradiated tissue were mainly attributable to the slightly modified appearance of the tissue. The fatty tissue seemed to be less perfused in the perivesical space, and the normal avascular planes were not present in the same way as they are in nonirradiated tissue. Because of the previous irradiation and the "stickier" appearance of the tissues surrounding the prostate, the apical portion of the prostate was mainly dissected using cold scissors, to minimize the negative consequences of electrocoagulation on urinary sphincter function. The plexus of Santorini was sewn with a monofilament Biosyn® 3.0 continuous suture. Similarly, the dissection of the bladder neck was slightly more complicated because the tissue between the bladder neck and the prostate was slightly less clearly demarcated. Therefore, monopolar scissors were used to dissect the bladder neck, instead of blunt dissection with cold scissors, in the space between the urinary bladder and the basal portion of the prostate. A Charriere 18 silicone urinary catheter was placed in the urinary bladder, and the bladder–urethra anastomosis was sewn continuously with a monofilament Biosyn® 2.0 suture with two needles according to van Velthoven.

Anesthesiological considerations: The robotic operation time was 70 min; total operative time was 101 min. Blood loss was estimated to be 150 ml. Two intravenous lines and standard monitoring were established, with electrocardiography, pulse oxymetry, and noninvasive blood pressure, end-tidal carbon dioxide, and sevoflurane monitoring. Anesthesia was induced with fentanyl 0.25 mg, midazolam 5 mg, thiopental 350 mg, and cisatracurium 15 mg. The patient was intubated and ventilated with 40% oxygen in air, using the pressure-controlled ventilation mode. Anesthesia was maintained with sevoflurane (with minimum alveolar concentration of 0.7–1.0) and fentanyl. Blood pressure measurements were deemed to be in acceptable ranges, with lowest systolic pressure of 95 mmHg. The patient's pulse rate was between 60 and 70 beats per minute. The maximal ventilation pressure did not peak above 26 mmHg, and end-tidal CO_2 was below 5.6 kPa at all times.

Histopathological results and postoperative convalescence: The patient's postoperative convalescence was normal, and he was discharged on the second postoperative day. The urinary catheter was removed on postoperative day 14, according to the routine in our department. The final histopathological report showed adenocarcinoma of the prostate with Gleason score of $4 + 3 = 7$b, surprisingly at pathological stage pT3b (Fig. 1), with free resection margins. The patient's postoperative PSA levels at 6 weeks and 6 months were <0.2 ng/ml. At 3-month outpatient clinical follow-up, the patient displayed urinary continence.

Discussion

Only two case reports of four heart-transplanted patients treated with radical prostatectomy can be found in the

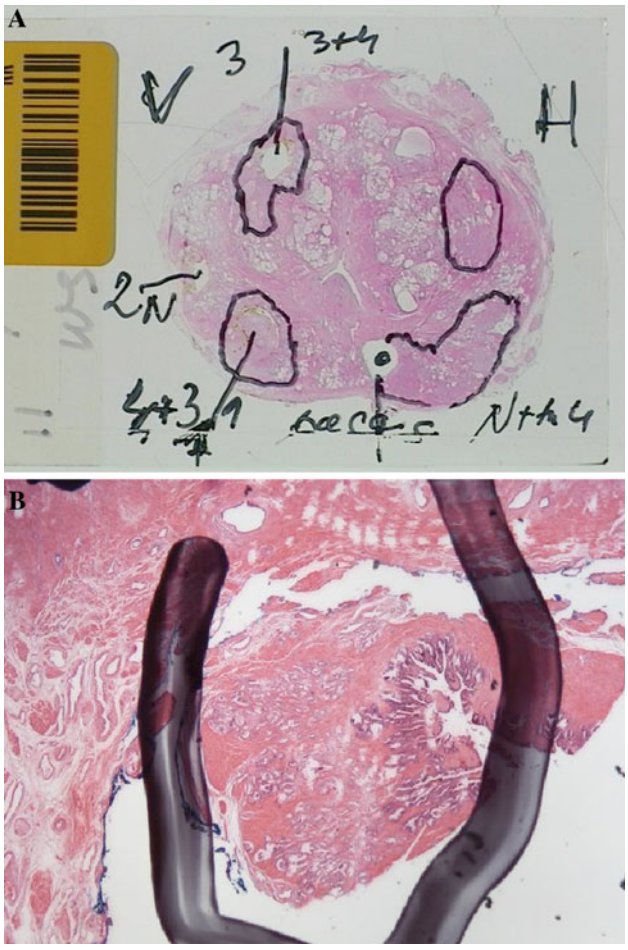

Fig. 1 Whole hematoxylin–eosin-stained section of the prostate with multiple foci of adenocarcinoma illustrated with *black-circled areas* (**a**). **b** Adenocarcinoma infiltration of the seminal vesicles (200×)

literature [3, 4]. The patients were treated with retropubic radical prostatectomy. To the best of our knowledge, we present here the first case of a heart-transplanted patient treated with RALP. The steep Trendelenburg positioning of the patient, which is required for robot-assisted radical prostatectomy, is an anesthetic challenge, especially in heart-transplanted patients. An anesthetized patient with heart transplant may show exaggerated responses to hypovolemia, sudden changes in posture, or reductions in systemic vascular resistance. No autonomic reinnervation occurs in humans after heart transplantation, and therefore the normal sympathetic responses to stimuli are absent. The heart does respond to circulating catecholamines, although this response may take 5–6 min to manifest. The normal baroreceptor reflexes are absent, and carotid sinus massage and the Valsalva maneuver have no effect on the heart rate [5, 6]. However, these challenges did not present any practical problems for our patient, who underwent the procedure with no clinical problems. Therefore, RALP is a feasible treatment approach for heart-transplanted patients.

Another challenge illustrated by this case is the possibility of operating on patients who have previously been treated with pelvic irradiation. The feasibility of operating on patients previously treated with EBRT, with only minor changes in the procedure, offers an opportunity to consider neoadjuvant radiation therapy as part of a multimodal treatment approach, which has been of significant benefit in the treatment of locally advanced rectal carcinoma. Patients at risk of profound peroperative bleeding might therefore be considered for RALP, rather than open retropubic radical prostatectomy.

Conflict of interest The authors have nothing to disclose and have no conflicts of interest.

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