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Perioperative and oncologic outcomes of robot-assisted vs. open radical cystectomy in bladder cancer patients: A comparison of two high-volume referral centers

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Abstract

Objectives: To examine perioperative and oncologic outcomes of open (ORC) and robot-assisted radical cystectomy (RARC) in bladder cancer (BCa) patients.
Methods and materials: 368 consecutive patients with cT1-4 M0 BCa treated at two high-volume European centers between 2004 and 2013 were evaluated. Data on complications, operative time, blood loss, postoperative transfusion, reoperation, length of stay (LOS), positive margins, recurrence, cancer-specific mortality (CSM), and overall survival were evaluated. Uni- and multivariable regression analyses tested the impact of the surgical approach on perioperative and oncologic outcomes.
Results: Overall, 230 (62.5%) and 138 (37.5%) patients were treated with ORC and RARC. In multivariable analyses RARC patients had higher odds of prolonged operative time and low-grade complications (all $P \leq 0.001$). Patients treated with ORC had higher odds of blood loss >500 ml and prolonged LOS (all $P \leq 0.03$). No differences were observed in high-grade complications and positive margins (all $P \geq 0.06$). No differences were observed in 5-year recurrence-free and CSM-free survival rates between patients treated with ORC vs. RARC (57.1 vs. 54.2% and 61.9 vs. 73.5%; all $P \geq 0.3$). This was confirmed in multivariable analyses, where the surgical approach was not associated with the risk of recurrence and CSM (all $P \geq 0.1$).
Conclusions: Although ORC might be associated with a shorter operative time, RARC led to lower blood loss and shorter LOS. No differences exist in high-grade complications and positive margins. RARC and ORC provide similar oncologic control.

Keywords: Radical cystectomy; Bladder cancer; Robot-assisted; Open; Comparative effectiveness

Introduction

Over the last few years a widespread diffusion of minimally invasive surgery was observed in the treatment of Urologic diseases.[1,2] Although this phenomenon was initially restricted to prostate and kidney cancer,[1–3] recent studies supported the feasibility of robot-assisted radical cystectomy (RARC) in bladder cancer (BCa) patients.[4–10] In this context, a randomized trial reported that RARC might be associated with lower blood loss as compared to open radical cystectomy (ORC),[11] which currently represents the treatment of choice for patients with cT2-4 N0M0 disease or treatment failures in non-muscle invasive

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BCa.[12] Additionally, retrospective investigations demonstrate better perioperative outcomes for RARC patients.[4,8,13–15] Given the high morbidity commonly associated with ORC,[16] potential benefits in terms of perioperative outcomes associated with minimally invasive approaches raised enthusiasm. Nonetheless, the relatively short follow-up of prospective randomized trials,[11,14] as well as the lack of a control group in retrospective studies evaluating cohorts from high-volume robotic centers,[5,17,18] precluded the direct comparison of strong oncologic endpoints between patients treated with RARC and ORC. Moreover, the few retrospective studies directly comparing the two techniques include small cohorts representing the initial experience with the robotic approach.[9,19–21] Therefore, the effectiveness of RARC vs. ORC in terms of relevant oncologic outcomes is still a matter of debate. Under this light, we aimed at comparing the perioperative and oncologic outcomes of RARC and ORC in a contemporary cohort of BCa patients treated at two high-volume centers.

Materials and methods

Study population

After Institutional Review Board approval, data from patients treated with RC for non-metastatic BCa were retrieved from Institutional databases. All patients treated with RARC underwent surgery at the Onze-Lieve-Vrouw Hospital by two surgeons, as previously reported.[22,23] All patients treated with ORC underwent surgery at the Ludwig-Maximilians-University, Munich, Germany. One high-volume surgeon performed ORC. The indication for RC was either treatment failure in non-muscle invasive BCa or muscle-invasive disease. Neoadjuvant chemotherapy was selectively adopted, according to treating physicians' preferences and Institution protocols. Overall, 425 patients treated with RC between 2004 and 2013 were evaluated. Overall, 57 patients were excluded due to missing data or unavailable follow-up information. This resulted in a final population of 368 patients.

Covariates

Clinical stage was based on histological report of the transurethral resection specimen, chest X-rays, and abdominal CT. Bone scans and brain CT were performed when suggested by signs and symptoms. Preoperative overall health status was assessed by the American Society of Anesthesiologists (ASA) score.[24] Clinical and pathological staging was reported according to the 2002 TNM system. The WHO 1998 classification was used to assign tumor grade.[25]

Perioperative outcomes

All complications within 90 days from surgery were recorded, defined and graded according to the Clavien–Dindo system.[26] Data on complications developed after hospital discharge were collected by reviewing the electronic medical records at outpatient clinics, where most patients were evaluated after discharge, and by individually contacting patients, relatives, general practitioners or local physicians.

Oncologic outcomes

Patients were evaluated according to Institutional protocols. Follow-up visits consisted of a physical examination, serum chemistry evaluation, and diagnostic imaging. Abdominal and chest imaging were performed at least annually or when clinically indicated. Primary outcome measures consisted of recurrence-free survival (RFS), CSM-free survival, and overall survival (OS). RFS was defined as time from surgery to local and/or metastatic recurrence based on histologic and/or radiologic evidence. CSM was defined as death from BCa. Overall mortality (OM) was defined as death from any causes.

Statistical analysis

Medians and interquartile ranges (IQR) were reported for non-normally distributed continuous variables. Frequencies and proportions were reported for categorical variables. The Mann–Whitney U and chi-square tests were used to compare medians and proportions between the two groups. Our statistical approach consisted of several steps. First, multivariable logistic regression analyses tested the association between the surgical approach and peri- and postoperative outcomes. Second, Kaplan–Meier analyses assessed time to recurrence, CSM, and OM in the overall population and after stratifying patients according to the surgical approach. These analyses were repeated to test the impact of RARC on the risk of recurrence and CSM after stratifying patients according to pathologic stage, nodal stage, and surgical margins. Finally, uni- and multivariable Cox regression analyses were performed to assess the association between the surgical approach and the risk of recurrence, CSM, and OM after adjusting for age, pathologic stage, nodal status, surgical margins, and the administration of neoadjuvant or adjuvant chemotherapy.

All statistical tests were performed using the R statistical package (v.3.0.2). All tests were two sided with a significance level set at $P \leq 0.05$.

Sensitivity analyses

We repeated our analyses on perioperative outcomes after including exclusively RARC patients undergoing intracorporeal urinary diversion. Multivariable logistic regression analyses tested the association between the surgical approach (RARC vs. ORC) and perioperative outcomes.

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