ORIGINAL ARTİCLE

Robotic-assisted laparoscopic radical prostatectomy: Initial outcomes of 500 cases

Prostatectomía radical laparoscópica asistida por robot: resultados iniciales de 500 casos

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Abstract

Introduction: *We aimed to present our experience of robot-assisted laparoscopic radical prostatectomy (RARP).* **Material and Methods:** *The study was a retrospective review of 500 patients who underwent RARP between March 2015 and July 2021 in our clinic. A transperitoneal approach was used in all patients. All patients had clinically organ-confined prostate cancer (≤ cT2c).* **Results:** *The mean age of the patients was 64.6 ± 5.7 years. The median PSA was 11.4 ng/dL (range 0.3-92.7). The mean operative time was 183.5 min. Positive surgical margin rate was 19.4%. During a mean follow-up of 23.5 months, 96 patients (19.2%) received adjuvant radiotherapy due to the biochemical recurrence and 28 patients (16%) with lymph node positivity received early adjuvant hormone therapy. Considering the continence rates, 69% of the patients were total continence in the 3rd month, while this rate increased to 83 in the 6th month and 91% in the 12th month.* **Conclusion:** *RARP is a safe and feasible method for experienced centers with patient comfort, surgeon comfort, and successful oncological and functional results.*

Keywords: *Prostatectomy. Prostate cancer. Robotic. Outcomes.*

Resumen

Introducción: *Nuestro objetivo fue presentar nuestra experiencia de prostatectomía radical laparoscópica asistida por robot (RARP).* **Material y métodos:** *El estudio fue una revisión retrospectiva de 500 pacientes que se sometieron a una (RARP) entre marzo de 2015 y julio de 2021 en nuestra clínica. En todos los pacientes se utilizó un abordaje transperitoneal. Todos los pacientes tenían cáncer de próstata limitado al órgano clínicamente (≤ cT2c).* **Resultados:** *La edad media de los pacientes fue de 64.6 ± 5.7 años. La mediana de PSA fue de 11.4 ng/dL (rango 0.3-92.7). El tiempo operatorio medio fue de 183.5 min. La tasa de márgenes quirúrgicos positivos fue del 19,4%. Durante un seguimiento medio de 23.5 meses, 96 pacientes (19.2%) recibieron radioterapia adyuvante debido a la recurrencia bioquímica y 28 pacientes (16%) con ganglios linfáticos positivos recibieron terapia hormonal adyuvante temprana. Considerando las tasas de continencia, el 69% de los pacientes tenían continencia total en el 3er mes, mientras que esa tasa aumentó a 83 en el 6° mes y 91% en el 12° mes.* **Conclusión:** *RARP es un método seguro y factible para centros experimentados con comodidad para el paciente, comodidad para el cirujano y resultados oncológicos y funcionales exitosos.*

Palabras clave: *Prostatectomía. Cáncer de próstata. Robótica. Resultados.*

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Date of reception: 23-05-2022
Date of acceptance: 29-07-2022
DOI: 10.24875/CIRU.22000289

Cir Cir. 2022;90(6):770-774
Contents available at PubMed
www.cirugiaycirujanos.com

Introduction

Prostate cancer (Pca) is the second most frequently diagnosed cancer and the fifth leading cause of cancer death in men worldwide[1]. At present, radical prostatectomy is the gold standard surgical treatment of localized PCa. Minimally invasive radical prostatectomy surgeries have historically progressed from laparoscopic radical prostatectomy described by Schuessler et al. in 1992[2] to robot-assisted radical prostatectomy (RARP) described by Binder et al. in 2000[3]. With robotic surgery, the technical difficulty and long learning curve of laparoscopic surgery have been minimized[4]. Compared to laparoscopic surgery, robotic surgery provides advantages with its 3D enlarged view, improved ergonomics, and robotic arms with wide range of motion. High cost and lack of tactile sensation are disadvantages of robotic technique[5]. Since 2000, robotic surgery has been increasingly used in the field of urology. Today, in the USA, approximately 85% of radical prostatectomy surgeries are performing with robotic approach[6]. In this article, we aimed to present the results of 500 RARP that we have performed in our institution since 2015.

Materials and methods

Between March 2015 and July 2021, 500 patients who underwent RARP were enrolled in the study. Preoperative, perioperative, and post-operative data were scanned and recorded retrospectively from our data collecting system. Pre-operative clinical data included age, body mass index (BMI), serum prostate-specific antigen (PSA), biopsy Gleason score, and number of positive cores. Perioperative parameters included operation time, blood loss, intraoperative complications, and whether bilateral pelvic lymph node dissection (BPLND) is done and neurovascular bundle (NVB) is preserved. Post-operative parameters included hemoglobin change, discharge time, cathater removal time, pathological Gleason score, positive surgical margin status, extracapsular, lymphovascular, perineural and seminal vesicle invasion, and lymph node invasion. Clavien-Dindo classification was used to classify postoperative complications[7].

We used D'Amico risk stratification for preoperative risk determination and patients were classified as low, intermediate, and high risk[8]. Both the D'amico classification and the 2012 Briganti nomogram were used in the decision to perform lymph node dissection[8,9]. We performed BPLND in all high risk patients and/or patients with a > 5% probability of lymph node invasion according to the Briganti nomogram.

Transperitoneal approach was used for all RARP procedures. The procedures were performed by four surgeons who were previously experienced in open and laparoscopic radical prostatectomy. We used a conventional 3-arm da Vinci XI system with 4 robotic trocars and 2 assistance trocars. Surgery was initiated by performing seminal vesicle dissection and posterior dissection of the prostate, as described by Zorn et al.[10] Subsequently, the dorsal venous complex was separated by passing to the anterior aspect of the prostate. In eligible patients, NVB was completely liberated and preserved. After dissection of the prostate from the bladder neck and urethra, vesicourethral anastomosis done with continuous suturing using 3.0 V-lock sutures and 18 French Foley catheter.

Results

The preoperative and perioperative outcomes of our 500 consecutive patients were collected retrospectively and are summarized in Table 1. The mean age of the patients was 64.6 ± 5.7 years and the median PSA level was 11.4 ng/dL (range 0.3-92.7). All patients had clinically organ-confined prostate cancers (≤ cT2c). The mean operative time was 183.5 min and the mean decrease in hemoglobin between pre- and postoperatively was 1.35 ± 0.8 g/dL.

According to the final pathology results, non-organ-confined prostate cancer was detected in 32.6% of the patients. The positive surgical margin (SM) rate was 19.4% among all cases. According to pathological stages, positive SM rate was 11.58% and 38.8% for pT2 and pT3 patients, respectively, and it was statistically significant ($p < 0.05$). Lymph node (LN) metastasis was detected in 28 of 175 patients who underwent BPLND. The median postoperative length of hospital stay was 3.63 days (range 2-17 days) and median time to urethral catheter removal was 9 days (range 7-17 days). During a mean follow-up of 23.5 months, 96 patients (19.2%) received adjuvant radiotherapy to the prostatic fossa due to the biochemical recurrence and 28 patients (16%) with LN positivity at the final pathology received early adjuvant hormone therapy. Pathological results and clinical outcomes are presented in Table 2. Considering the continence rates, 69% of the patients were total continence in the 3rd month, while this rate increased to 83% in the 6th month and 91% in the 12th month.

Table 1. Preoperative clinical characteristics and perioperative outcomes

Variable	Result
Age, years (mean ± SD)	64.6 ± 5.7
BMI, kg/cm median (min-max)	26.8 (21-38)
PSA, ng/dL median (min-max)	11.4 (0.3-92.7)
Prostate volume, g median (min-max)	54.8 (20-190)
Number of cores positive, median (min-max)	4 (1-12)
Pathological Gleason score, n (%)	
4-6	304 (60.8)
3 + 4	99 (19.8)
4 + 3	44 (8.8)
8	42 (8.4)
9-10	11 (2.2)
D'Amico Risk group, n (%)	
1	241 (48.2)
2	167 (33.4)
3	92 (18.4)
Operating time, min (mean ± SD)	183.5 ± 47.2
Post-operative decrease in hemogram level, g/dL mean	1.35 ± 0.8
BPLND, n (%)	175 (35.0)
NVB preservation, n (%)	228 (45.6)
Bladder neck reconstruction, n (%)	16 (3.2)

BMI: body mass index, PSA: prostate-specific antigen, BPLND: bilateral pelvic lymph node dissection, NVB: neurovascular bundle.

Table 2. Pathological results and clinical outcomes

Variable	Result
Positive surgical margin, n (%)	97 (19.4)
Extracapsular invasion, n (%)	144 (28.8)
Lymphovascular invasion, n (%)	84 (16.8)
Perineural invasion, n (%)	324 (64.8)
Seminal vesicle invasion, n (%)	61 (12.2)
Pathological Gleason score, n (%)	
4-6	198 (39.6)
3 + 4	157 (31.4)
4 + 3	82 (16.4)
8	29 (5.8)
9-10	34 (6.8)
Lymph node positivity, n (%)	
Yes	28 (16)
No	147 (84)
Pathological stage, n (%)	
pT2	337 (67.4)
pT3	163 (32.6)
Biochemical recurrence, n (%)	68 (13.6)
Drain removal, day median (min-max)	2.87 (2-16)
Length of hospital stay, day median (min-max)	3.63 (2-17)
Catheter removal, day median (min-max)	9.0 (7-17)
Duration of follow-up, months median (min-max)	23.5 (4-71)
Additional treatment, n (%)	96 (19.2)

Complications are presented in Table 3. A total of 55 patients (11%) had complications (each with a single event). Perioperative repair was performed in two patients with rectal injuries. One patient required surgical intervention within the first 48 h after surgery due to ileum perforation. Urethrovesical anastomotic stricture developed in 8 (1.6%) patients. Urethral stricture developed in 5 patients (1%).

Table 3. Classification of complications using Clavien-Dindo system

Complication	n	%	Clavien-Dindo grade
Intraoperative			
Ureteral injury	3	0.6	Grade 4
Ileum/rectum injury	3	0.6	Grade 4
Vascular injury	5	1	Grade 4
Postoperative			
Urethra-vesical anastomosis stricture	8	1.6	Grade 3
Lymphosel (required drainage)	5	1	Grade 3
Lymphosel (not required drainage)	11	2.2	Grade 2
Urine leakage	3	0.6	Grade 2
Urethral stricture	5	1	Grade 3
Medical			
Wound infection	5	1	Grade 2
Blood transfusion	7	1.4	Grade 2
Total	55	11	

Discussion

In today's urology practice, RARP has become very popular compared to the open procedure in the treatment of prostate cancer and its use has become widespread[11]. In the study of Lowrance et al., 67% of radical prostatectomy operations in the USA were performed with robot assistance in 2010[12]. In recent years, this rate has reached up to 80%[13]. Robotic surgery provides a three-dimensional and 10 times magnified image during surgery. It also prevents hand tremors with its laparoscopic instruments that imitate human wrist and hand movements. Despite these general advantages, the imperceptibility of the push-pull force and the relatively high cost can be counted as disadvantages[14].

Regardless of the approach, the goal of radical prostatectomy is complete eradication of cancer and, if possible, the procedure should be performed with preserving pelvic organ function[15]. In RARP, optimal oncologic outcomes, best continence and erectile function rates, and minimal morbidity should be aimed[16].

In the light of the current literature, short-term clinical results of robotic surgery are one step ahead compared to open radical prostatectomy in terms of postoperative complications such as bladder neck contracture, wound infections, post-operative transfusion rates, and death. Especially early continence rates are quite remarkable in favor of robotsic surgery[17]. We think that longer-term results are needed to obtain evidence for oncological control of the disease, such as recurrence.

When we started to perform RARP in our clinic, our goal was to demonstrate that this surgical technique is reliable with the best results. For this reason, we aimed to share our results with this study by reviewing the literature. We also aimed to improve our surgical technique, bring it to the best possible level and learn about the results.

Although it has been 20 years since its first application[3] in 2000, RARP is a newer technique compared to open radical prostatectomy, it has become widespread rapidly and there are multiple series published in the literature. In their series of more than 1000 consecutive cases, Menon et al. found that the mean operative time was 140 min, and the average perioperative blood loss was 100 ml on. No patient required intraoperative blood transfusion. More than 95% of the patients were discharged within 24 h, and the complication rate was 5%[4,18]. In our series, the mean operation time was 183.5 ± 47.2 min and we determined that the operation time decreased as the whole team gained experience. The mean hospital stay was 3.6 days. We are the first clinic in our region to perform robotic surgery. For this reason, since we have patients coming from long distances, we acted a little protectively and kept the length of stay in our hospital consciously at first. As our experience increased, we reduced our hospital stays to 48 h. The drainage catheters of the patients who underwent LN dissection were removed after routine sonographic control, and the median drainage catheter removal time was 2.87 days. We performed routine sonographic control to control lymphocele formation. None of the patients required perioperative blood transfusion and the decrease in postoperative hemoglobin level was 1.35 ± 0.8 g/dL.

Fischer et al. reported a total complication rate of 26% in RARP cases, of which 82% were minor complications. The Clavien grade 3b and 4a complication rate was 3%. They also reported that complications rates decreased after 200 operations[16]. Complications developed in 55 (11%) patients in our series, and 11 (2.2%) of them were intraoperative. When we grouped them according to Clavien-Dindo, ureteral injury developed in three patients, ileum/rectum injury in three patients, and vascular injury in five patients as grade 4 complications, and our grade 4 complication rate was 2.2%. All of these patients had a Gleason score of ≥ 8, and all but one were among the first 250 patients in our series. There has been no death. The mean urethral catheter removal time was 9 days and was consistent with the literature. No retention developed after urethral catheter removal. Urethrovesical anastomotic stricture developed in 8 (1.6%) patients. Urethral stricture developed in 5 patients (1%). Eight patients with urethra-vesical anastomosis stricture and five patients with urethral stricture were treated with endoscopic intervention.

The fact that RARP increases the comfort of the surgeon cannot be ignored in the spread of RARP, but its real success is undoubtedly related to the disease control, and we can evaluate this success only with long-term oncological results. Long-term oncological results are still not fully sufficient in this regard. We can have information on this subject by looking at the rates of positive SM and LN positivity. The mean SM positivity after open retropubic RP has been reported as 28%[19]. In the same study, the rate of SM positivity for T3 disease was reported as 53%. Menon et al. reported SM positivity as 9% in the RARP series they published[20]. In Europe-centered RARP series, general SM positivity was reported as 22%[21]. In our series, while the rate of SM positivity was 19.4% in all cases, when grouped according to pathological stages; SM positivity was 11.58% in patients with pT2. This rate increased to 38.8% in patients with pT3 and was statistically significant ($p < 0.05$). Biochemical recurrence-free survival was 80.8% at a mean follow-up of 23.5 months. Further treatment was required in 96 (19.2%) patients due to biochemical recurrence.

In the meta-analysis published by Ficarra et al., 12-month continence recovery rates ranged from 84% to 97%[22]. Patel et al. reported the rate of total continence as 89% at 3 months and 95% at 6 months[14]. In our series, 69% of the patients were total continent at 3 months. This rate increased to 83% in the 6th month and 91% in the 12th month.

There were some limitations in our study. First; we did not create subgroups of outcomes for variables such as prostate volume or obesity. However, we have seen that studies on long-term results comparing different surgical modalities are still insufficient in the literature[23,24]. Second; we did not group to understand the learning curve. Third and finall, although the follow-up period was acceptable in terms of oncological results, it was not long enough because we think that there is a need for more studies in the literature evaluating long-term results in terms of oncological results, and we recommend this.

The fact that the use of robots in surgery has become widespread all over the world can be interpreted as an indication that robotic surgery is a very important technological development that makes a difference. It is obvious that experience in this surgery is increasing. In conclusion, RARP is both a safe and feasible option in the treatment of prostate cancer. Experience with sufficient case volume can be obtained in a short time. With experience, this surgery yields satisfactory results comparable to open and laparoscopic surgery.

Funding

The authors declare no funding was received.

Conflicts of interest

The authors have no conflicts of interest to declare.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that no patient data appear in this article.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

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