Chula Med J Vol. 60 No. 6 November- December 2016

Postoperative outcomes of robot-assisted laparoscopic radical prostatectomy from initial 100 cases at King Chulalongkorn Memorial Hospital

Suvapong Tantasutthanon* Kamol Panumatrassamee*
Kavirach Tantiwongse* Julin Opanuraks*
Supoj Ratchanon* Apirak Santi-ngamkun*

Tantasutthanon S, Panumatrassamee K, Tantiwongse K, Opanuraks J. Ratchanon S. Santi-ngamkun A. Postoperative outcomes of robot-assisted laparoscopic radical prostatectomy from initial 100 cases at King Chulalongkorn Memorial Hospital. Chula Med J 2016 Nov – Dec; 60(6): 591 - 601

Background : *Prostate cancer is the second most frequently diagnosed cancer and the sixth leading cause of cancer death in males. Robot-assisted laparoscopic radical prostatectomy (RALP) is an evolving minimally invasive treatment for localized prostate cancer.*

Objective : *We analyzed the perioperative outcomes of RALP from our initial 100 cases experience.*

Patients and Methods : *From May 2011 to February 2015, 100 consecutive patients with clinical localized prostate cancer underwent RALP at our institution. All patients' demographic data, postoperative parameters and pathological results were recorded and analyzed.*

* Department of Surgery, Faculty of Medicine, Chulalongkorn University

Results : *The mean age of the patients was 64 (45 - 80) years; mean preoperative PSA was 14.1 ng/ml (2 - 75.4 ng/ml). Six patients had previous abdominal surgery and four patients had previous transurethral resection of the prostate. Mean operative time was 276 min (150 - 500). Mean estimated blood loss was 716 ml (100 - 3,000). The overall postoperative complication rate was 41% including 33% of transfusion. Two (2%) major complications, pelvic collection and ureteric injury with recto-vesicle fistula, were found. No mortality occurred in this study. There were 65 patients with pT2 disease, 34 patients with pT3 disease and 1 patient with pT4 disease. Overall positive surgical margin status was 43% (38.5% for pT2, 50% for pT3 and 100% for pT4). Only one patient (1%) had pelvic lymph node metastasis. Sixteen patients required adjuvant radiation or hormonal treatment. The mean catheterization time and mean postoperative hospital stay were 8.1 days.*

Conclusions : *RALP is a safe procedure carrying a low risk of complications even during the initial learning curve. Complications were mostly minor and could be managed conservatively. This confirms that RALP is a good treatment option for patients with clinical localized prostate cancer.*

Keywords : *Prostate cancer, robotic surgery, prostatectomy, outcome.*

Correspondence to: Tantasutthanon S. Division of Urology, Department of Surgery, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

Received for publication. February 26, 2016.

ศุวพงษ์ ตันทสุทธานนท์, กมล ภานุมาตรัศมี, กวิรัช ตันติวงษ์, จุลินทร์ โอภานุรักษ์, สุพจน์ รัชชานนท์, อภิรักษ์ สันติงามกุล. ผลการรักษาและภาวะแทรกซ้อนของการผ่าตัด Robotic assisted Laparoscopic Prostatectomy ผู้ป่วยมะเร็งต่อมลูกหมากหนึ่งร้อยรายแรก ในโรงพยาบาลจุฬาลงกรณ์. จุฬาลงกรณ์เวชสาร 2559 พ.ย. – ธ.ค.; 60(6): 591 – 601

เหตุผลของการทำวิจัย : *มะเร็งต่อมลูกหมากเป็นมะเร็งที่พบเป็นอันดับสองและเป็นมะเร็งที่ทำให้เกิดการเสียชีวิตเป็นอันดับหกในเพศชาย ในปัจจุบันมีพัฒนาการผ่าตัดโดยใช้หุ่นยนต์ช่วยผ่าตัด (Robotic assisted Laparoscopic Prostatectomy) เพื่อผลการรักษาที่ดีขึ้น*

วัตถุประสงค์ : *ต้องการศึกษาภาวะแทรกซ้อนและผลของการรักษาผู้ป่วยมะเร็งต่อมลูกหมากที่รักษาด้วยวิธีการผ่าตัด Robotic assisted Laparoscopic Prostatectomy ในโรงพยาบาลจุฬาลงกรณ์หนึ่งร้อยรายแรก*

ตัวอย่างและวิธีการศึกษา : *ในการศึกษานี้ทำโดยการเก็บรวบรวมข้อมูลผู้ป่วยมะเร็งต่อมลูกหมากที่มารับการรักษาด้วยวิธีการผ่าตัด Robotic assisted Laparoscopic Prostatectomy หนึ่งร้อยรายแรกในช่วงระหว่างเดือนพฤษภาคม พ.ศ.2554 ถึงเดือนกุมภาพันธ์ พ.ศ. 2558 โดยเก็บข้อมูลทั่วไปของผู้ป่วย, ข้อมูลในช่วงระหว่างผ่าตัดร่วมถึงภาวะ แทรกซ้อนระหว่างผ่าตัดและผลชิ้นเนื้อหลังการผ่าตัด*

ผลการศึกษา : *อายุเฉลี่ยของผู้ป่วย คือ 64 ปี (45 - 80 ปี) ค่าเฉลี่ย Prostate-specific antigen (PSA) ก่อนผ่าตัดอยู่ที่ 14.1 ng/ml (2.0 - 75.4 ng/ml) มีผู้ป่วยหกรายที่เคยผ่าตัดในช่องท้องมาก่อน และมีผู้ป่วยสี่รายที่เคยทำผ่าตัด transurethral resection of the prostate มาก่อน ค่าเฉลี่ยของระยะเวลาการผ่าตัด คือ 276 นาที (150 - 500 นาที) ค่าเฉลี่ยของการเสียเลือดระหว่างผ่าตัด คือ 716 มิลลิลิตร (100 - 3,000 มิลลิลิตร) ภาวะแทรกซ้อนระหว่างผ่าตัดอยู่ที่ร้อยละ 41 โดยมีอัตราการให้เลือดระหว่างการรักษาคิดเป็นร้อยละ 33 และมีภาวะแทรกซ้อนที่รุนแรงร้อยละ 2 ได้แก่ pelvic collection และ ureteric injury ร่วมกับ rectovesical fistula ไม่มีผู้ป่วยที่เสียชีวิต ในการศึกษานี้ มีผู้ป่วยจำนวน 65 รายที่มีผลชิ้นเนื้ออยู่ในระยะ pT2, 34 รายอยู่ในระยะ pT3 และหนึ่งรายอยู่ในรยะ pT4 มี positive surgical margin โดยรวมอยู่ที่ร้อยละ 43 โดยแบ่งเป็นร้อยละ 38.5 ใน pT2, ร้อยละ 50 ใน pT3 และร้อยละ 100 ใน pT4 มีผู้ป่วยหนึ่งรายที่มีมะเร็งลุกลามไปที่ต่อมน้ำเหลือง ในการศึกษานี้มีผู้ป่วยจำนวน 16 รายที่ต้องได้รับการรักษาเพิ่มโดยการฉายแสงหรือฮอร์โมนต่อระยะเวลาเฉลี่ยของการใส่สายสวนและระยะเวลาเฉลี่ยของการนอนโรงพยาบาลอยู่ที่ 8.1 วัน*

สรุป : *การรักษามะเร็งต่อมลูกหมากโดยการใช้หุ่นยนต์ช่วยผ่าตัด เป็นวิธีที่มีความปลอดภัย และมีภาวะแทรกซ้อนน้อยแม้ว่าอยู่ในช่วงเริ่มต้นของการผ่าตัด โดยภาวะแทรกซ้อนส่วนใหญ่ไม่รุนแรง และสามารถรักษาได้โดยไม่ต้องผ่าตัด จากการศึกษานี้ช่วยยืนยันว่าการรักษามะเร็งต่อมลูกหมากโดยการใช้หุ่นยนต์ช่วยผ่าตัดเป็นวิธีการรักษาที่ดีในผู้ป่วยมะเร็งต่อมลูกหมากในระยะไม่ลุกลาม*

คำสำคัญ : *มะเร็งต่อมลูกหมาก, การผ่าตัดโดยใช้หุ่นยนต์ช่วยผ่าตัด, การผ่าตัดต่อมลูกหมาก, ผลการรักษา.*

Prostate cancer is the second most frequently diagnosed cancer and the sixth leading cause of cancer death in males, accounting for 14% (903,500) of the total new cancer cases and 6% (258,400) of the total cancer deaths in males. Its incidence rates vary more than 25-fold worldwide, with the highest rates recorded primarily in the developed countries of Oceania, Europe, and North America. The African descents in the Caribbean region have the highest prostate cancer mortality rates in the world, which is thought to reflect partly difference in genetic susceptibility.[1] The wide utilization of prostate-specific antigen (PSA) testing detected more clinically localized prostate cancer that can be treated by radical prostatectomy. In Thailand, prostate cancer is the fifth most frequently diagnosed cancer. Age-Standardized incidence and mortality rates are 6.5 and 2.0 per 100,000 men[2]

Since the era of minimally invasive surgery, laparoscopic radical prostatectomy (LRP) was initially described by Schuessler *et al.* in 1992. [3] The laparoscopic procedure has been standardized by Guillonneau and Vallancien.[4] However, LRP is universally considered a challenging procedure. In fact, besides perfect knowledge of the local anatomy, LRP requires advanced laparoscopic skills including laparoscopic suturing and intracorporeal knotting that makes a steep learning curve.

In 1999, the da Vinci Surgical System® was developed by Intuitive Surgical Inc. Then, Binder *et al.* described the first ten robotic-assisted laparoscopic radical prostatectomy (RALP) procedures in 2000. [5] Many features of the robotic surgical system are benefits of this kind of surgery: (i) the improvement in visualization by the In Site Vision System, through three dimensional (3D) vision with ten-fold magnification; (ii) the stability of the camera and instruments; (iii) the Endowrist system that can facilitate the movement of instrument which helpful filling dissection and suturing in the deep pelvic space; and (iv) the better control of instrument and camera at the console. These advantages of the robotic platform have proved to reduce the learning curve and improve the treatment outcomes in radical prostatectomy.[6, 7]

In this study, we present the postoperative outcomes of RALP from our initial 100 patients at King Chulalongkorn Memorial Hospital.

Patients and Methods

From May 2011 to February 2015, 100 consecutive patients diagnosed clinically localized prostate cancer underwent RALP at our institution. All patients' characteristics, postoperative outcomes and pathological reports were retrospectively collected and analyzed. The study parameters included age, body mass index (BMI), baseline PSA level, Gleason score, clinical stage, operative time, estimated blood loss (EBL), transfusion, prostate size, catheterization time, length of stay (LOS), postoperative complication and pathological reports.

Complications within 30 days after surgery were graded according to Clavien-Dindo Classification. [8] Positive margin status (PMS) was defined by the presence of cancer cells at the inked margin.[9, 10]

As for the surgical techniques, all patients receivedtransperitoneal approach by using the da Vinci Si system. After general anesthesia, oro-gastric tube and urethral catheter were inserted. The patient

was then placed in low lithotomy with steep Trendelenberg position. Four robotic trocars and one or two assistant trocars were placed in W-configuration. (Figure 1.) Pneumoperitoneum was created by CO_2 gas with pressure 12 mmHg.

Our RALP was performed according to the standard procedure which was described by Menon *et al*. with a few modifications.[11] Firstly, a space of Retzius was entered followed by bladder neck dissection, mobilization of the seminal vesicles and ligation of the prostatic pedicles. The neurovascular bundle (NVB) preservation was selectively performed with a thermal technique in sexually-active patients with clinical localized disease. Dorsal venous complex (DVC) was controlled with suture ligation with vicryl 3/0 before apical dissection. Bilateral pelvic lymphadenectomy was done in patients with moderate and high-risk disease according to D'Amico Classification. Urethro-vesicle anastomosis was performed by continuous running suture with two of 3-0 V-lock suture. The 20-Fr urethral catheter was placed for 5 - 7 days. In patients with prolonged urine leakage, the catheter was placed longer.

The study protocol has been approved by the Institutional Review Board (IRB) of the Faculty of Medicine, Chulalongkorn University before launch.

Results

The patients' demographic data and operative outcomes are presented in Table 1. The mean age of the patients was 64.3 years and mean BMI was 24.2. The mean preoperative PSA was 14.1 ng/ml (2.0 - 75.4 ng/ml). Half of the patients had Gleason score 6; six had previous abdominal surgery; four had previous transurethral resection of the prostate.

Intraoperative results

The mean (range) total operative time from skin incision to closure was 276 minutes (150 -500). Mean EBL was 716 ml (100 - 3,000). Neurovascular bundle preservation was performed in 44 patients; 27 patients with bilateral sparing and 17 patients with unilateral sparing. Pelvic lymph node dissection was performed in 25 patients.

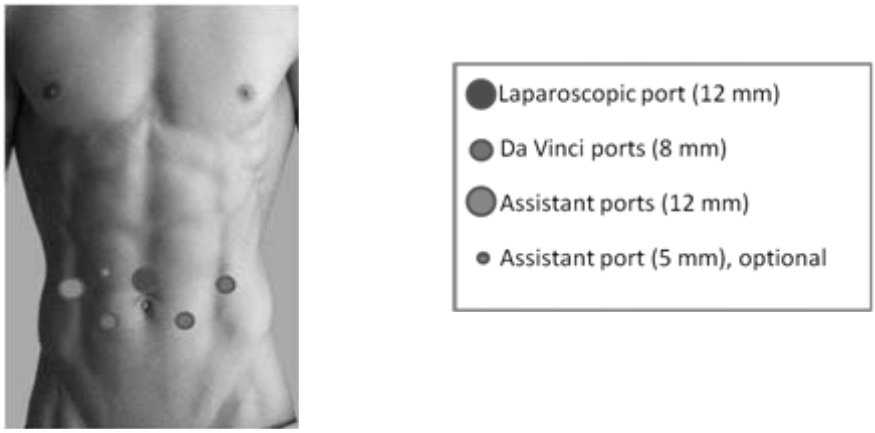

Figure 1. Trocars placement.

Table 1. Patient's demographic data and intraoperative outcomes.

Variables	Mean (SD)	Median (IQR)	Range
Age, (years)	64.3 (7.0)	64 (59.3 - 70)	45 - 80
Body mass index	24.2 (3.6)	23.8 (21.1 - 26.5)	18.3 - 35.6
Preoperative PSA level, (ng/ml)	14.9 (11.8)	9.7 (7.1 - 16.1)	2 - 75.4
Preop. Gleason score (n)			
4	5		
5	1		
6	50		
7	28		
8	12		
9	4		
Operative time (mins)	276 (80.3)	225 (220 - 315)	150 - 500
Estimate blood loss (ml)	716 (689.3)	500 (300 - 1000)	100 - 3000

Six intraoperative complications occurred in this study, however. Three patients had bladder injuries that were subsequently repaired. Another three patients had rectal injuries during posterior dissection. All lacerations were less than 2 cm and were recognized intraoperatively. Copious irrigation and 2-layer primary repair were performed robotically without diverting colostomy.

Post-operative results and complications

The mean catheterization time and mean length of stay were 8.1 days (5 - 28). Complications occurred in 41 patients which were 33% of transfusion (Clavien grade 2). The details of complications were reported in Table 2. Four patients had prolonged anastomosis leakages that required prolonged catheterization.

Table 2. Postoperative complications classified by Clavien-Dindo Classification.

Clavien		No. of patient	Management
1	Prolonged anastomosis leakage	4	Prolonged catheterization
	Wound infection	1	Dressing
2	Partial small bowel obstruction	1	Conservative treatment
	Transfusion	33	Transfusion
3a	Urinary retention and Pelvic collection	1	Flexible cystoscopy Percutaneous drainage (PCD)
3b	Ureteric injury and Rectovesical fistula	1	Ureteric reimplantation Low anterior resection with ileum conduit diversion

Two major complications (Clavien grade 3 - 5) occurred in this study, however. The first patient couldnot urinate after removing the catheter. The urethral catheter was reinserted by flexible cystoscope-assisted after failure with the ordinary method. Afterwards, the patient developed low-grade fever and pelvic collection was found by CT scan. Percutaneous drainage (PCD) was placed (Clavien grade 3a). The other patient had locally advanced prostate cancer and received neoadjuvant hormonal therapy. There was severe adhesion around the fibrotic prostate. Rectal injury occurred and primary closure was performed with 2-layer technique. Immediately after operation, the patient had anuria from bilateral ureteric injury and laparotomy with bilateral ureteric reimplantation was performed. Moreover, rectovesicle fistula developed after 1 week. Low anterior resection with ileum conduit diversion was performed after the failure of conservative treatment. Tumor cells were presented on the rectal tissues from pathological examination. No mortality (Clavien grade 5) and open conversion occurred in this study.

Oncologic data

The oncologic results are showed in Table 3. Most of the patients had Gleason grade 6 (40%) and grade 7 (42%). Sixty-five patients had pT2 disease; 34% pT3 disease and one pT4 disease. Only one patient had lymph node metastasis (pN1).

The overall positive margin status (PMS) was 43%; 38.5% in pT2 disease and 50% in pT3 disease. Lateral and posterolateral margins were the most common site of PMS, in 18 patients.

Table 3. Oncological outcomes.

Specimen weight (gm), mean (SD)	42.71 (17.9)
Pathological Gleason score (n)	
4	1
5	2
6	40
7	42
8	10
9	4
10	1
Pathological stage (n)	
T2a	16
T2b	9
T2c	40
T3a	20
T3b	14
T4	1
Location of positive margin (n)	
Lateral	18
Multifocal	14
Apex	7
Bladder neck	4
No. positive margin by stage (%)	
T2	38.5
T3	50
T4	100

Discussion

The application of robotic technology provides certain inherent advantages which includes binocular 3-dimensional visualization with 10-fold magnification, tremor filtration, motion scaling and wristed instrumentation with 7degrees of freedom. These technical innovations have potential to provide significant advantages to urological surgeons working within the deep part of the male pelvis. Therefore, this technology is technically ideal for radical prostatectomy.

Our initial objective was to ascertain whether RALP was a safe and feasible treatment option for patients with prostate cancer in the learning curve period in Thailand. We estimated the initial number of procedures for training was 30 cases which was the point that allowed the surgeon gain more confidence with the procedure, and hence received good surgical outcomes.

The major challenges during the initial experience were related to the lack of haptic feedback, unfamiliarity with the technical aspects of the robotic platform and the novelty of the remoteness of the surgeon from the patient. The lack of haptic feedback was overcome with surgical experiences. The improvement of visual clue and dexterity of the instrumentation soon outweighed the lack of tactile feeling. The technical skills can be improved by studies and reviews of the videotapes recorded before and after the procedure.

So far the largest RALP experience to date was reported by Menon *et al*., [13] consisting of 2,652patients. In their series, the mean age of patients was 60.2 years with BMI of 27.6. The mean operative time was 148 minutes, EBL was 100 ml and a postoperative complication rate was 2.3%. From the oncologic standpoint, an overall PMR was 13%. Moreover, Patel *et al.*[6] reported the result from another large series of operations in 1,500 patients. The mean operative time was time was 105 minutes, mean EBL was 111 ml and conversion rate was 0.6%. Post-operative complication rate was 4.3%. Overall PMS was 9.3% (4% inpT2 disease, 33% in pT3 disease and 40% in pT4 disease). The most common sites of PMS were the lateral margin (36.7%) and the apical margin (23%).

As for other smaller series, Costello *et al.*[14] reported results from initial experience with RALP in their first 150 patients. Intraoperative complications occurred in 3.3% of the patients (hemorrhage/transfusion) with no conversion to open surgery needed. Mean operative time was 292 minutes in the first 20 patients and decreased significantly after that (191 minutes for cases 130 - 150). Positive margin rate was 17%.

Some authors compared their own radical prostatectomy results between open and robot-assisted approach. Ahlering *et al.*[15] found no statistic difference between the open approach versus RALP in term of PSM.

Menon *et al.*[16] performed a prospective comparison of 30 consecutive patients undergoing RRP and 30 initial patients undergoing RALP evaluating the baseline of the patients and tumor characteristics (age, body mass index, serum prostate-specific antigen, Gleason score, and clinical stage), intraoperative parameters (operative time, blood loss, and need for transfusion), postoperative parameters (pain score, hospitalization and catheterization time), histopathologic parameters, and complications between two groups. They concluded that although RALP had longer operative time than RRP, blood loss was minimal and postoperative pain was less and patients can discharged earlier from the hospital. Margin status and complication rates were comparable for both techniques.

This study has some limitations, It is a retrospective and descriptive design. The procedure was performed by multiple surgeons. And oncological and functional outcomes were not evaluated in this study.

Conclusions

RALP is a safe and feasible option for treating localized prostate cancer. During the initial experience is challenging. Complications are mostly minor that could be managed conservatively, suggesting that RALP is a good choice for clinically localized prostate cancer.

References

1. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. CA Cancer J Clin 2011 Mar - Apr; 61(2): 69 - 90
2. Sriplung H, Wiangnon S, Sontipong S, Sumitsawan Y, Martin N. Cancer incidence trends in Thailand, 1989 - 2000. Asian Pac J Cancer Prev 2006 Apr-Jun; 7(2): 239 - 44
3. Schuessler WW, Schulam PG, Clayman RV, Kavoussi LR. Laparoscopic radical prostatectomy: initial short-term experience. Urology 1997 Dec; 50(6): 854 - 7
4. Guillonneau B, Vallancien G. Laparoscopic radical prostatectomy: the Montsouris technique. J Urol 2000 Jun; 163(6): 1643 - 9
5. Binder J, Kramer W. Robotically-assisted laparoscopic radical prostatectomy. BJU Int 2001 Mar;87(4): 408 - 10
6. Patel VR, Palmer KJ, Coughlin G, Samavedi S. Robot-assisted laparoscopic radical prostatectomy: perioperative outcomes of 1500 cases. J Endourol 2008 Oct; 22(10): 2299 -305
7. Stolzenburg JU, Rabenalt R, Do M, Kallidonis P, Liatsikos EN. Endoscopic extraperitoneal radical prostatectomy: the University of Leipzig experience of 2000 cases. J Endourol 2008 Oct; 22(10): 2319 - 25
8. Clavien PA, Barkun J, de Oliveira ML, Vauthey JN, Dindo D, Schulick RD, de Santiba es E, Pekolj J, Slankamenac K, Bassi C, et al. The Clavien-Dindo classification of surgical complications: five-year experience. Ann Surg 2009 Aug; 250(2): 187 - 96
9. Ohori M, Wheeler TM, Kattan MW, Goto Y, Scardino PT. Prognostic significance of positive surgical margins in radical prostatectomy specimens. J Uro 1995 Nov; 154(5): 1818 - 24
10. Wieder JA, Soloway MS. Incidence, etiology, location, prevention and treatment of positive surgical margins after radical prostatectomy for prostate cancer. J Uro 1998 Aug; 160(2): 299 - 315
11. Menon M, Tewari A, Peabody J, Team VIP. Vattikuti Institute prostatectomy: technique. J Uro 2003 Jun; 169(6): 2289 - 92
12. D'Amico AV, Whittington R, Malkowicz SB, Weinstein M, Tomaszewski JE, Schultz D, Rhude M, Rocha S, Wein A, Richie JP. Predicting prostate specific antigen outcome preoperatively in the prostate specific antigen era. J Uro 2001 Dec; 166(6): 2185 - 8
13. Menon M, Shrivastava A, Kaul S, Badani KK, Fumo M, Bhandari M, Peabody JO. Vattikuti Institute prostatectomy: contemporary technique and analysis of results. Eur Urol 2007 Mar; 51(3): 648 - 57
14. Van Appledorn S, Bouchier-Hayes D, Agarwal D, Costello AJ. Robotic laparoscopic radical prostatectomy: setup and procedural techniques after 150 cases. Urology 2006 Feb; 67(2): 364-7

15. Ahlering TE, Woo D, Eichel L, Lee DI, Edwards R, Skarecky DW. Robot-assisted versus open radical prostatectomy: a comparison of one surgeon's outcomes. Urology 2004 May; 63(5): 819-22

16. Walsh PC. Prospective comparison of radical retropubic prostatectomy and robot-assisted anatomic prostatectomy: the Vattikuti Urology Institute experience. J Urol 2003 Jul; 170(1): 318-9