Early Experience of Robotic Assisted Laparoscopic Radical Prostatectomy

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Introduction: *Quality of life after laparoscopic radical prostatectomy has been a discussed issue among patients. Robotic Assisted Laparoscopic Radical Prostatectomy (RALRP) has been shown to provide the best surgical outcomes in terms of potency and continence. The program of robotic prostatectomy was started at Siriraj Hospital. Early result of the author's experience was evaluated.*

Objective: *To evaluate the feasibility of Robotic Assisted Laparoscopic Radical Prostatectomy done at Siriraj Hospital.*

Material and Method: *From March 2007 to November 2007, 34 patients (Group 1) with localized prostate cancer underwent Robotic Assisted Laparoscopic Radical Prostatectomy (RALRP). Perioperative data was evaluated and compared to those of 34 patients (group 2) who underwent Laparoscopic Radical Prostatectomy (LRP) during the same period by the same surgeon.*

Results: *There were no demographic differences between the two groups. Catheterization time was significantly shortened in the RALRP group ($p < 0.05$). There was no major complication in the RALRP group, one LRP patient suffered bilateral ureteric injuries and required bilateral reimplantation. In pathological T2 patients of the last 17 consecutive cases, positive surgical margin rate was similar (14%) in both groups.*

Conclusion: *The author early experience has shown that RALRP is feasible and safe. Oncological outcome can be improved with more experience and long term follow up is needed to evaluate functional outcome including potency rate and incontinence rate.*

Keywords: *Radical prostatectomy, Prostate cancer, Robotic prostatectomy, Impotency*

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Open radical prostatectomy has been accepted as one of the standard treatments in clinically localized prostate cancer for many decades[1]. In 2006, the author has reported 56 cases of transperitoneal laparoscopic radical prostatectomy[2]. Since then the number of laparoscopic radical prostatectomy is increasing dramatically at Siriraj Hospital. Subsequently, the authors have changed the approach to extraperitoneal laparoscopic radical prostatectomy. Extraperitoneal laparoscopic radical prostatectomy is as good as open retropubic radical prostatectomy at Siriraj Hospital[3]. Since 2001, Robotic Assisted Laparoscopic Radical Prostatectomy has been reported[4]. The procedure has been popular among potent patients who suffered from prostate cancer. Since the author have experience in laparoscopic radical prostatectomy, the author therefore started our program of robotic prostatectomy. Early experience of Robotic Assisted Laparoscopic Radical Prostatectomy has been analyzed and reported here.

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Material and Method

From March 2007 to November 2007, 34 patients (group 1) with localized prostate cancer underwent Robotic Assisted Laparoscopic Radical Prostatectomy (RALRP) at the department of surgery, Faculty of Medicine Siriraj Hospital. All patients were histologically proven as having adenocarcinoma of the prostate from biopsy. All patients gave informed consent for the procedure. Patients' data was collected

and compared to those 34 patients (group 2) undergone Laparoscopic Radical Prostatectomy (LRP) by the same surgeon during the study period.

Operative technique is described here

Robotic Assisted Laparoscopic Radical Pros tatectomy is usually performed with the patient under general anesthesia. Patients are placed in a dorsal supine position with 30-45° head down tilt.

The next step in the procedure is to create a pneumo-peritoneum and the placement of the first camera canula. The author then placed the 2nd and 3rd 8 mm working canulas 9 cm lateral to the first canula at the level of 1 cm below the umbilicus. The 4th and 5th-12mm assisting trocars are placed at the right and left anterior axillary line to the level of umbilicus. Finally the 6th trocar is 5 mm size, placed in the right subcostal area.

The first step in the procedure is the dissection of the space of Retzius with the incision on the peritoneum. The anterior surface of the bladder neck, the anterior surface of the prostate and the endopelvic fascia are exposed and the fatty tissue overlying these structures is gently swept away. Often, a superficial branch of the deep dorsal vein complex runs along the anterior aspect of the prostate and divides at the bladder neck into two branches. This vein is fulgurated with bipolar forceps and divided. Then, the endopelvic fascia is incised on both sides exposing the fibers of the levator-ani muscle.

The bladder neck can be identified after the removal of all of the prevesicular fatty tissue. It overlaps the prostate in the shape of a triangle. The dissection starts at a 12 o'clock position at the tip of this triangle. Palpation with the forceps can help to identify the border between the mobile bladder neck and the solid prostate in difficult cases. The incision of the bladder neck is enlarged from the 10 to the 2 o'clock position, and the urethra is developed. The urethra is incised and the deflated balloon-catheter is pulled up into the retropubic space by the assistant under continuous tension. The dissection is now continued in the lateral direction, in the plane between bladder neck and prostate.

Once, the bladder neck is completely dissected. Care is taken to carry down the dissection in the correct plane between the prostate and the bladder neck in order to avoid any intraprostatic penetration. This pitfall may occur in the case of a penetration directed too caudally. The bladder neck is first completely divided between at the 5-7 o'clock position; this is then extended bilaterally by blunt and sharp dissection. After this step, the anatomical landmarks of the ampullae and the seminal vesicles are visualized.

After complete dissection of the bladder neck, the prostate is elevated anteriorly by the assistant. The seminal vesicles are easily identified and completely dissected. However, the tips of the seminal vesicles can be left in place in order to avoid damage to the neurovascular bundles which run in close proximity to them. After dissection of the seminal vesicles, the assistant holds the right ampulla and the right seminal vesicle, the surgeon the left ampulla and the left seminal vesicle in a craniolateral direction. With this maneuvre, a "window" is developed which reaches from the dorsal aspect of the prostate to the prostatic pedicles. Between these structures, the posterior layer of Denonvillier's fascia is incised and the prerectal fatty tissue visualized. The posterior dissection is continued as far as possible towards the apex of the prostate.

(If nerve sparing laparoscopic radical prostatectomy is performed, the lateral prostatic fascia is incised at the antero-lateral surface of the prostate gland prior to the posterior dissection. During the posterior dissection care must be taken not to injure the neurovascular bundles by avoiding using heat of any kind and stay in the middle with medial to lateral dissection. Using this principle the neurovascular bundles should be easily retracted from the prostate gland and urethra distally.)

Puboprostatic ligaments are divided sharply. After this step, the urethra and the dorsal vein complex can be easily visualized at the level of the prostatic apex. The prostate is now retracted caudally by the assistant for good access to the Santorini plexus. The Santorini plexus is ligated with 0 Vicryl by selective passage of the needle underneath the plexus from right to left.

The urethra is sharply divided at the apex. Coagulation of the urethral stump is to be avoided in order to prevent damage to the external striated sphincter. In case of minor bleeding in this area, the CO2-pressure can be increased temporarily to 16-18mmHG. For creation of the urethra-vesical anastomosis, the author uses a running suture with 3-0 monocryl double RB-1 needles tying ends together. The posterior layer is completed first and the catheter was inserted into the bladder. The anterior layer is then completed.

The water-tightness of the anastomosis is finally checked by filling the bladder with 200 ml sterile water. At the end of the procedure, a Jackson drainage catheter is placed into the retropubic space.

LRP was performed by the technique as previously described by the author[3]

Cystography is performed on post-operative day 7 and a urethral catheter is removed if there is no leak of contrast media from urethro-vesicle anastomosis. Peri-operative data, operative results, clinical outcomes and complication were analyzed. Data of the two groups were compared by t-test. The p-value of < 0.05 was considered as statistically significant difference.

Results

Of 34 patients who underwent RALRP, 1 patient had previous transurethral prostatectomy and 24 patients underwent RALRP with nerve sparing procedure.

The mean ages of the patients were 67.1 ± 6.5 years and 68.6 ± 7.7 years in the RALRP group and the Laparoscopic Radical Prostatectomy (LRP) group, respectively. Mean PSA was 14.4 ng/ml and 13.4 ng/ml in RALRP and LRP groups, respectively. In the RALRP group the average operative time was not significantly longer than in the LRP group (239.4 ± 107.4 minutes in RALRP and 226.5 ± 64.2 minutes in LRP, $p > 0.05$). Average blood loss was not much reduced in RALRP compared to those of LRP [(657.4 ± 319.1) ml vs. (772 ± 291.6) ml, $p = 0.57$]. Transfusion rate was not much different between the two groups (26.4% and 29.5% in group1 and group 2, respectively. Mean catheterization time was shorter in RALRP group [(7.6 ± 2.8) days vs. (8.8 ± 3.1) days, $p < 0.05$]. Median hospital stay was not different between the two groups at (6.9 ± 2.0) days and (8.0 ± 2.8) days in RALRP and LRP groups, respectively. Mean prostatic weight was slightly higher in LRP than in RALRP, but it did not reach statistically significant level (54.7 ± 29.9 gm in LRP and 47.0 ± 26.3 gm in RALRP). All data is shown in Table 1.

Extra-prostatic disease was found 41% in RALRP but 50% in the LRP group. In pathological stage T2, surgical margin was positive at a rate of 11.8% (2/17) in LRP but was slightly higher in RALRP at the rate of 30% (6/20). However, in the last 17 consecutive cases the surgical margin positive rate was similar in the two groups with 14.2% and 14.3% in LRP and RALRP groups, respectively (Table 2).

Table 3 shows the early result of continence (pad free) rate at 1 month. There was no difference among the two groups (29% vs. 15%, in RALRP and LRP, respectively).

Table 4 shows complications in both groups. In the LRP group: one case of bilateral ureteric injury required bilateral reimplantation; one case of urinary

Table 1. Shows mean varies of PSA, Blood loss, Catheter time, Hospital stay in both groups

	RALRP (n = 34)	LRP (n = 34)	p-value
Age (years)	67.1±6.5	68.6±7.7	0.34
PSA (ng/ml)	14.4±17.8	13.4±12.4	0.40
IPSS	11.4±6.9	12.7±7.4	0.95
SHIM	16.1±6.5	10.0±7.8	0.22
OR time (minutes)	239.4±107.4	226.5±64.2	0.30
Blood Loss	657.4±319.1	772.1±291.6	0.57
Prostatic weight (gram)	47.0±26.2	54.7±29.9	0.19
Catheter time (day)	7.6±2.8	8.8±3.1	<0.05
Post operation stay (day)	6.9±2.0	8.0±2.8	0.06

Note: p-value by t-test
IPSS: International prostatic symptoms scores
SHIM: Sexual health inventory for men

Table 2. Shows pathological results in both groups

	RALRP (n = 34)	LRP (n = 34)
Extraprostatic disease	41.2%	50.0%
Surgical margin positive in pT3	35.7%	70.6%
Surgical margin positive in pT2	30.0%	11.8%
Surgical margin positive in pT2 (last 17 consecutive cases)	14.3%	14.2%

Table 3. Shows continence rate at 1 month in both group

	RALRP	LRP
Continence Rate at 1 month (no pad require)	29%	15%

Table 4. Shows peri-operative and immediated post-operative complications

	RALRP (n = 34)	LRP (n = 34)
UTI	0	3
Urinary retention after catheter removal	1	1
Pulmonary emboli	0	1
Ureteric injury	0	1

retention after catheter removal on post-operative day 8th; three cases of UTI; and one case of pulmonary emboli. In the RALRP group there was one case of urinary retention after removal of the urethral catheter. There was no open conversion in both groups.

Discussion

Robotic Assisted Laparoscopic Radical Prostatectomy (RALRP) was firstly reported in 2001[4]. With the use of three-dimension view and endo-wrist technology, RALRP is comparable to the value of conventional laparoscopic radical prostatectomy[5]. Patients who undergo RALRP can gain benefit of minimally invasive surgery. The recent developed surgical techniques provide a good oncological control with excellent functional outcomes[6-12]. The largest cohort study has shown that 5-year biochemical recurrence of PSA was 2.3%. Median duration of incontinence was 4 weeks; 0.8% of patients had total incontinence at 12 months. The intercourse rate was 93% in men with no preoperative erectile dysfunction[13]. With experienced surgeons, the complication rate was considerably low[14].

In the RALRP group of the present study, positive surgical margin rate was 30%, which is higher than the author's experience in conventional laparoscopic radical prostatectomy[3]. However, of the last 17 consecutive cases the positive surgical margin rate had been reduced to 14.3%, which was in the same range of positive marginal rate of the LRP group. This is probably due to the author's early experience in recognizing the tissue plan without tactile sensation using the new approach of the robotic surgery. Transfusion rate was too high compared to other world series[7,15,16]. However, there was no major complication, and no conversion of RALRP to either open prostatectomy or laparoscopic prostatectomy. Complication rate and operative time can be reduced with experience in laparoscopic prostatectomy prior to RALRP. This has been shown in the recent study from the USA[15]. Oncological outcome is affected by the experience of robotic prostatectomy. Positive surgical margin rate can be reduced after approximately 30 cases of robotic prostatectomy[17]. To gain a better functional outcome one needs to gain experience of more than 150 cases of robotic prostatectomy[18].

RALRP appears to offer a significant benefit to laparoscopically naive surgeons with respect to learning curve when compared to laparoscopic radical prostatectomy. This, however, comes at an increased cost[16,19-22]. At Siriraj Hospital, the cost of RALRP is approximately 2-2.5 times more than that of laparoscopic radical prostatectomy. Therefore, more cases are required to make use of the robotic machine efficiently.

Conclusion

In the present study, Robotic Assisted Laparoscopic Radical Prostatectomy is feasible. The surgical technique has been improved in order to match with oncological outcome of those of conventional Laparoscopic Radical Prostatectomy. A long term study comparing nerve-sparing laparoscopic radical prostatectomy to robotic assisted laparoscopic radical prostatectomy is required to access quality of life after radical prostatectomy.

References

1. Walsh PC. The status of radical prostatectomy in the United States in 1993: where do we go from here? J Urol 1994; 152(5 Pt 1): 1816.
2. Nualyong C, Srinualnad S, Taweemonkongsap T, Amornvesukit T. Laparoscopic radical prostatectomy: preliminary result of Thailand series. J Med Assoc Thai 2006; 89: 1440-6.
3. Srinualnad S, Nualyong C, Udompunturak S, Kongsuwan W. Endoscopic extraperitoneal radical prostatectomy (EERPE): a new approach for treatment of localized prostate cancer. J Med Assoc Thai 2006; 89: 1601-8.
4. Abbou CC, Hoznek A, Salomon L, Olsson LE, Lobontiu A, Saint F, et al. Laparoscopic radical prostatectomy with a remote controlled robot. J Urol 2001; 165(6 Pt 1): 1964-6.
5. Menon M, Shrivastava A, Tewari A, Sarle R, Hemal A, Peabody JO, et al. Laparoscopic and robot assisted radical prostatectomy: establishment of a structured program and preliminary analysis of outcomes. J Urol 2002; 168: 945-9.
6. Ahlering TE, Skarecky D, Borin J. Impact of cautery versus cautery-free preservation of neurovascular bundles on early return of potency. J Endourol 2006; 20: 586-9.
7. Menon M, Shrivastava A, Sarle R, Hemal A, Tewari A. Vattikuti Institute Prostatectomy: a single-team experience of 100 cases. J Endourol 2003; 17: 785-90.
8. Ahlering TE, Eichel L, Edwards RA, Lee DI, Skarecky DW. Robotic radical prostatectomy: a technique to reduce pT2 positive margins. Urology 2004; 64: 1224-8.
9. Kaul S, Savera A, Badani K, Fumo M, Bhandari A,

Menon M. Functional outcomes and oncological efficacy of Vattikuti Institute prostatectomy with Veil of Aphrodite nerve-sparing: an analysis of 154 consecutive patients. BJU Int 2006; 97: 467-72.
10. Savera AT, Kaul S, Badani K, Stark AT, Shah NL, Menon M. Robotic radical prostatectomy with the "Veil of Aphrodite" technique: histologic evidence of enhanced nerve sparing. Eur Urol 2006; 49: 1065-73.
11. Tewari AK, Rao SR. Anatomical foundations and surgical manoeuvres for precise identification of the prostatovesical junction during robotic radical prostatectomy. BJU Int 2006; 98: 833-7.
12. Zorn KC, Gofrit ON, Orvieto MA, Mikhail AA, Zagaja GP, Shalhav AL. Robotic-assisted laparoscopic prostatectomy: functional and pathologic outcomes with interfascial nerve preservation. Eur Urol 2007; 51: 755-62.
13. Menon M, Shrivastava A, Kaul S, Badani KK, Fumo M, Bhandari M, et al. Vattikuti Institute prostatectomy: contemporary technique and analysis of results. Eur Urol 2007; 51: 648-57.
14. Bhandari A, McIntire L, Kaul SA, Hemal AK, Peabody JO, Menon M. Perioperative complications of robotic radical prostatectomy after the learning curve. J Urol 2005; 174: 915-8.
15. Hu JC, Nelson RA, Wilson TG, Kawachi MH, Ramin SA, Lau C, et al. Perioperative complications of laparoscopic and robotic assisted laparoscopic radical prostatectomy. J Urol 2006; 175: 541-6.
16. Joseph JV, Vicente I, Madeb R, Erturk E, Patel HR. Robot-assisted vs pure laparoscopic radical prostatectomy: are there any differences? BJU Int 2005; 96: 39-42.
17. Atug F, Castle EP, Srivastav SK, Burgess SV, Thomas R, Davis R. Positive surgical margins in robotic-assisted radical prostatectomy: impact of learning curve on oncologic outcomes. Eur Urol 2006; 49: 866-71.
18. Herrell SD, Smith JA Jr. Robotic-assisted laparoscopic prostatectomy: what is the learning curve? Urology 2005; 66: 105-7.
19. Burgess SV, Atug F, Castle EP, Davis R, Thomas R. Cost analysis of radical retropubic, perineal, and robotic prostatectomy. J Endourol 2006; 20: 827-30.
20. Nelson B, Kaufman M, Broughton G, Cookson MS, Chang SS, Herrell SD, et al. Comparison of length of hospital stay between radical retropubic prostatectomy and robotic assisted laparoscopic prostatectomy. J Urol 2007; 177: 929-31.
21. Rassweiler J, Hruza M, Teber D, Su LM. Laparoscopic and robotic assisted radical prostatectomy - critical analysis of the results. Eur Urol 2006; 49: 612-24.
22. Rozet F, Harmon J, Cathelineau X, Barret E, Vallancien G. Robot-assisted versus pure laparoscopic radical prostatectomy. World J Urol 2006; 24: 171-9.

ประสบการณ์แรกเริ่มของการผ่าตัดต่อมลูกหมากโดยใช้หุ่นยนต์ช่วยผ่าตัด

สิทธิพร ศรีนวลนัด

บทนำ: *คุณภาพชีวิตหลังจากการผ่าตัดส่องกล้องเพื่อรักษามะเร็งต่อมลูกหมากนั้นเป็นสิ่งสำคัญ และได้รับการวิพากษ์วิจารณ์ในผู้ป่วยมะเร็งต่อมลูกหมาก การผ่าตัดมะเร็งต่อมลูกหมากโดยใช้หุ่นยนต์ช่วยผ่าตัดนั้นสามารถช่วยให้ผู้ป่วยมีคุณภาพชีวิต โดยเฉพาะอย่างยิ่งภาวะเสื่อมสมรรถภาพทางเพศ การกลั้นปัสสาวะไม่อยู่จากการผ่าตัดดีขึ้น ที่โรงพยาบาลศิริราชได้เริ่มทำผ่าตัดมะเร็งต่อมลูกหมากโดยใช้หุ่นยนต์ช่วยผ่าตัด และผลของการรักษาได้ถูกนำมาวิเคราะห์และแสดงในรายงานฉบับนี้*

วัตถุประสงค์: *ศึกษาถึงความเป็นไปได้ของการรักษามะเร็งต่อมลูกหมากโดยใช้หุ่นยนต์ช่วยผ่าตัด ที่คณะแพทยศาสตร์ศิริราชพยาบาล มหาวิทยาลัยมหิดล*

วัสดุและวิธีการ: *ระหว่างเดือนมีนาคม พ.ศ. 2550 ถึงเดือนพฤศจิกายน พ.ศ. 2550 ผู้ป่วยมะเร็งต่อมลูกหมากในระยะเริ่มต้น จำนวน 34 คน ได้รับการผ่าตัดมะเร็งต่อมลูกหมากโดยใช้หุ่นยนต์ช่วยผ่าตัด (กลุ่มที่ 1) ข้อมูลของการผ่าตัดผู้ป่วย และผลของการผ่าตัดในระยะเริ่มต้นได้ถูกนำมาวิเคราะห์และเปรียบเทียบกับผู้ป่วยจำนวน 34 คน ที่เข้ารับการผ่าตัดมะเร็งต่อมลูกหมากโดยการส่องกล้อง (กลุ่มที่ 2) โดยศัลยแพทย์ท่านเดียวกัน*

ผลการศึกษา: *ไม่พบว่ามีความแตกต่างกันระหว่างข้อมูลพื้นฐานของผู้ป่วยทั้ง 2 กลุ่ม ระยะเวลาใส่สายยางในท่อปัสสาวะจะสั้นกว่าในกลุ่มที่ใช้การผ่าตัดโดยใช้หุ่นยนต์ช่วยผ่าตัด ($p < 0.05$) ไม่พบว่ามีผลแทรกซ้อนที่อันตรายในกลุ่มที่ใช้หุ่นยนต์ผ่าตัด พบว่ามีผู้ป่วย 1 คน ที่รับการผ่าตัดแบบส่องกล้องมีการทำอันตรายต่อท่อไตจำเป็นต้องใช้การฝังท่อไตใหม่ นอกจากนี้พบว่าในกลุ่ม T2 ตรวจพบเซลล์มะเร็งที่ขอบของชิ้นเนื้อ จำนวน 14% ทั้ง 2 กลุ่ม*

สรุป: *จากประสบการณ์ในระยะเริ่มต้น พบว่าการผ่าตัดมะเร็งต่อมลูกหมากโดยใช้หุ่นยนต์มีความปลอดภัยและสามารถทำได้ อย่างไรก็ตามเทคนิคการผ่าตัดควรได้รับการพัฒนาเพิ่มขึ้น เพื่อให้ได้การควบคุมมะเร็งที่ดีขึ้นกว่าระยะเริ่มต้น นอกจากนี้การติดตามผู้ป่วยในระยะยาวมีความจำเป็นที่จะประเมินถึงสมรรถภาพทางเพศ และภาวะการกลั้นปัสสาวะไม่อยู่ในผู้ป่วยเหล่านี้*