Original Article

Extraperitoneal Laparoscopic Radical Prostatectomy: Early Experience in Thailand

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OBJECTIVE: The transperitoneal approach is the conventional technique for laparoscopic radical prostatectomy. There are, however, several disadvantages of the approach, such as damage to intraperitoneal organs and long-term ileus. To prevent these complications, we propose an extraperitoneal approach that has been successfully used for open radical prostatectomy in treating patients with localized prostate cancer. The aim of this study was to evaluate the feasibility of extraperitoneal laparoscopic radical prostatectomy (ELRP). The outcomes of ELRP and open radical prostatectomy were also assessed and compared.

METHODS: There were two groups of patients with localized prostate cancer confirmed by transrectal ultrasound biopsy. Patients were included if they had no previous hormonal treatment and no previous transurethral prostatectomy. Group I comprised patients in whom open radical prostatectomy was performed between February 2001 and August 2005 ($n = 55$). Group II comprised patients in whom ELRP was performed between December 2005 and October 2006 ($n = 41$). Early postoperative results, clinical outcomes and complications were analysed among the two groups using χ^2, t and Mann-Whitney tests.

RESULTS: Group I and Group II did not show significant differences regarding age, clinical staging, hospitalization time, or pathological stage. Group II had a longer mean operative time than Group I (t test, $p < 0.001$). Median blood loss was significantly less in Group I (Mann-Whitney test, $p < 0.001$). Group II also demonstrated shorter catheter removal time (Mann-Whitney test, $p = 0.003$). In Group II, there were two rectal complications, including rectal injury and rectal necrosis, which were treated laparoscopically and conservatively without long-term problems.

CONCLUSION: With experience, ELRP is feasible with equal oncological outcomes to open radical prostatectomy. Although a certain disadvantage was presented by ELRP, the less invasive surgery and reduction in operative blood loss were major advantages. It is suggested that a large and longitudinal trial be conducted to investigate the effectiveness of such an approach in managing functional outcomes. [*Asian J Surg* 2007;30(4):272–7]

Key Words: extraperitoneal laparoscopic radical prostatectomy, laparoscopy, prostate cancer

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Introduction

Open retropubic radical prostatectomy has been accepted as one of the standard treatments in clinically localized prostate cancer for many decades.[1] In the last decade, open surgery has moved towards a minimally invasive technique, namely, laparoscopy. After laparoscopy, patients may gain benefit from less trauma to tissues, less pain, less bleeding, a shorter hospital stay and a faster recovery period. We previously reported 56 cases of laparoscopic radical prostatectomy in Thailand.[2] Since then, the number of laparoscopic radical prostatectomies has increased dramatically at our institute. Using the transperitoneal approach adapted from the Montsuris technique,[3] we encountered many problems, including unfamiliar anatomy (as surgeons normally open the abdominal wall entering into the extraperitoneal cavity to perform radical prostatectomy), risk of bowel injuries, intraperitoneal contamination of urine, and prolonged postoperative ileus. Furthermore, patients with previous abdominal surgery may be contraindicated for laparoscopic radical prostatectomy using the transperitoneal approach. To reduce the problems which we found during our early experience of transperitoneal laparoscopic radical prostatectomy, we devised a new method of laparoscopic radical prostatectomy using an extraperitoneal approach. The early postoperative results were analysed and compared to those of open radical prostatectomy.

Patients and methods

This retrospective study was approved by our institution's ethics review board. Between December 2005 and October 2006, 62 patients with clinically localized and transrectal ultrasound biopsy proven prostate cancer underwent extraperitoneal laparoscopic radical prostatectomy (ELRP) by a single surgeon (S Srinualnad) at the Department of Surgery, Faculty of Medicine, Siriraj Hospital. The operative technique was modified as reported by Stolzenburg et al as described below.[4]

Following general anaesthesia, patients were placed in a dorsal supine position with 10–15° head-down tilt. In contrast to transperitoneal laparoscopic radical prostatectomy, the bowel does not interfere with this procedure. An extreme head-down tilt position can be avoided.

The first step in the procedure was to create a preperitoneal space and to place the first trocar. A paraumbilical incision and incision of the anterior rectus sheath was followed by a blunt dissection of the rectus muscle and "finger dissection" of the preperitoneal space. A balloon catheter was introduced along the posterior rectus sheath and insufflated. Next, the balloon catheter was exchanged for an optical trocar (Hassan type). We then placed the second 5-mm working trocar two to three fingers left lateral to the midline. The third 5-mm working trocar was placed in the right iliac fossa two fingers medially to the anterosuperior iliac spine. The fourth 5-mm assisting trocar was placed at the right pararectal region. Finally, the fifth trocar, 12 mm in size, was placed in the left iliac fossa three fingers medially to the anterosuperior iliac spine. Pelvic lymph node dissection was performed as a staging procedure within the following anatomical landmarks: bifurcation of the common iliac artery (cranial border), the iliac vein (lateral border), the medial umbilical ligament (medial border), the pubic bone (caudal border) and the obturator nerve (posterior border).

The next step in the procedure was the dissection of the space of Retzius. The anterior surface of the bladder neck, the anterior surface of the prostate and the endopelvic fascia were exposed and the fatty tissue overlying these structures was gently swept away. A superficial branch of the deep dorsal vein complex was exposed with bipolar forceps and divided. Then, the endopelvic fascia was incised on both sides, exposing the fibres of the levator ani muscle.

Puboprostatic ligaments were divided. After this step, the urethra and the dorsal vein complex could be easily visualized at the level of the prostatic apex. The prostate was then retracted caudally by the assistant for good access to the Santorini plexus. The Santorini plexus was ligated with 0 vicryl by selective passage of the needle underneath the plexus from left to right. The bladder neck could be identified after the removal of all of the prevesicular fatty tissue. It overlaps the prostate in the shape of a triangle. The dissection started at the 12 o'clock position at the tip of this triangle. Palpation with the forceps helped to identify the border between the mobile bladder neck and the solid prostate in difficult cases. The incision of the bladder neck was enlarged from the 10 to the 2 o'clock position. At the bladder neck area, the urethra was incised and the deflated balloon catheter was pulled up into the retropubic space by the assistant under continuous tension. The dissection was then continued in the lateral direction, in the plane between the bladder neck and prostate.

The bladder neck was first completely divided between the 5 and 7 o'clock positions, then extended bilaterally by blunt and sharp dissection. Having opened the anterior layer of Denonvillier's fascia, the anatomical landmarks of the ampullae and the seminal vesicles were visualized. The seminal vesicles were easily identified and completely dissected. After dissection of the seminal vesicles, the assistant held the right ampulla and the right seminal vesicle and the surgeon held the left ampulla and the left seminal vesicle in a craniolateral direction. With this technique, a space was developed to reach from the dorsal aspect of the prostate to the prostatic pedicles. Between these structures, the posterior layer of Denonvillier's fascia was incised and the prerectal fatty tissue was visualized. The dissection continued as far as possible towards the apex of the prostate, strictly in the midline in order to avoid injury to the neurovascular bundles. Laterally to the seminal vesicles, prostatic pedicles were ligated with 12-mm clips and divided. The urethra was sharply divided at the apex. Coagulation of the urethral stump was avoided in order to prevent damage to the external striated sphincter. For creation of the urethrovesical anastomosis, we used a needle holder (right hand of the surgeon) and a forceps (left hand of the surgeon) and 2-0 vicryl with a UR-6 needle. The first stitch started at the 8 o'clock position (backhand-backhand) followed by stitches at the 7, 6 and 5 o'clock positions (forehand at the bladder neck, backhand at the urethra). Starting at the bladder neck (outside-in), the assistant pulled up the catheter anteriorly. The anastomotic stitches were then completed at the urethra inside-out. After each urethral stitch, the catheter needed to be pulled back in order to rule out fixation by the anastomotic suture. The 4 o'clock stitch was then done forehand (bladder neck)-forehand (urethra). After the dorsal circumference had been completed, the catheter was placed into the bladder and the anastomosis was completed anterolaterally and ventrally. On the left side, the stitches were thrown backhand-backhand and on the right side forehand-forehand. All ties were thrown intracorporally. The water-tightness of the anastomosis was finally checked by filling the bladder with 150 mL of normal saline. At the end of the procedure, a Jackson drainage catheter was placed into the retropubic space.

Open radical prostatectomy was performed using the technique as previously described.[5] Cystography was performed on postoperative days 7, 10, 14 and a urethral catheter was removed if there was no leakage of contrast media from the urethrovesicle anastomosis.

Of 62 patients, 41 had neither previous transurethral prostatectomy nor previous nerve-sparing laparoscopic radical prostatectomy. The data of these 41 patients were compared to that of 55 patients who underwent open radical prostatectomy between February 2001 and August 2005 for clinically localized and transrectal ultrasound biopsy proven prostate cancer. None of the 96 patients had hormonal treatment prior to surgery, and all underwent the same postoperative protocol of care. Perioperative data, operative results, clinical outcomes and complications were analysed between the two groups using χ^2, *t* and Mann-Whitney tests. A *p* value of less than 0.01 was considered to be a statistically significant difference.

Results

Of 62 patients undergoing ELRP, four had previous transurethral prostatectomy and 17 had undergone ELRP with a nerve-sparing procedure. Only 41 patients with ELRP were included in the study.

The mean age of the patients was 68.76 ± 6.84 years in the open radical prostatectomy group and 68.46 ± 5.6 years in the ELRP group. Median prostate-specific antigen level was 15.07 (4–242) ng/mL and 8.6 (0.4–100) ng/mL in the open radical prostatectomy and ELRP groups, respectively. In the ELRP group, the average operative time was significantly longer than in the open radical prostatectomy group (274.76 ± 97.08 minutes *vs.* 157.26 ± 43.91 minutes, $p < 0.001$). Median blood loss was reduced in ELRP as compared to in open radical prostatectomy, 600 (100–2,200) mL versus 1,000 (400–4,000) mL ($p < 0.001$). Furthermore, in pathological T2 disease (pT2), the transfusion rate was significantly higher in the open radical prostatectomy group with a relative risk of 2.06 (95% CI, 1.20–2.96; $p < 0.001$). Median catheterization time was shorter in the ELRP group, 14 (7–30) days versus 7.5 (5–35) days ($p = 0.003$). Median hospital stay was not different between the two groups at 7 (3–23) days and 8 (6–38) days in the open radical prostatectomy and ELRP groups, respectively. Mean prostatic weight was slightly higher in the ELRP group than in the open RP group, but it did not reach a statistically significant level (51.79 ± 23.3 g in ELRP and 49.48 ± 23.8 g in open radical prostatectomy). All data are shown in Tables 1 and 2.

Extraprostatic disease was found in only 12% of the ELRP group but in 31% of the open radical prostatectomy

Table 1. Age, operative time and prostatic weight in both groups*

	Open RP ($n=55$)	ELRP ($n=41$)	$p^\dagger$
Age (yr)	68.76 ± 6.84	68.46 ± 5.6	0.81
Operative time (min)	157.26 ± 43.9	274.76 ± 97.08	< 0.001
Prostatic weight (g)	49.48 ± 23.8	51.79 ± 23.3	0.66

*Data are presented as mean ± standard deviation; †*t* test. RP = radical prostatectomy; ELRP = extraperitoneal laparoscopic radical prostatectomy.

Table 2. Prostate-specific antigen (PSA), blood loss, catheter time and hospital stay in both groups*

	Open RP ($n=55$)	ELRP ($n=41$)	$p^\dagger$
PSA (ng/mL)	15 (4–242)	8.6 (0.4–100)	0.004
Blood loss (mL)	1,000 (400–4,000)	600 (100–2,200)	< 0.001
Catheter removal time (d)	14 (7–30)	7.5 (5–35)	0.003
Hospital stay (d)	7 (3–23)	8 (6–38)	0.12

*Data are presented as median (range); †Mann-Whitney test. RP = radical prostatectomy; ELRP = extraperitoneal laparoscopic radical prostatectomy.

Table 3. Pathological results in both groups

	Open RP ($n=55$)	ELRP ($n=41$)	p*
Surgical margin positive (pT2)	32%	25%	0.85
Extraprostatic disease	31%	12%	0.049

*χ^2 test. RP = radical prostatectomy; ELRP = extraperitoneal laparoscopic radical prostatectomy.

Table 4. Continence rate at 3 months in both groups

	Open RP ($n=44$)	ELRP ($n=35$)	p*
Continence rate	21/44 (48%)	16/35 (46%)	0.95

*χ^2 test. RP = radical prostatectomy; ELRP = extraperitoneal laparoscopic radical prostatectomy.

group. In pathological stage T2, the surgical margin was positive at a rate of 25% (9/36) in ELRP subjects but was slightly higher in open radical prostatectomy at a rate of 32% (12/38). However, this was not significantly different using the χ^2 test ($p=0.6$), as shown in Table 3.

Table 4 shows the early continence (pad-free) rate at 3 months. There was no difference between the two groups (48% *vs.* 46%, open radical prostatectomy *vs.* ELRP).

Table 5 shows the complications in both groups. In the ELRP group, one case of rectal injury was immediately repaired using one layer suturing with vicryl 2-0 interrupted stitches. One case of late rectourethral fistula was successfully treated by conservative measures including 1 week of nothing via mouth and cystostomy tube placement. There was no open conversion in the ELRP group. In the ELRP group, there was no complication after removal of the urethral catheter, as opposed to three cases of haematuria in the open radical prostatectomy group.

Discussion

Laparoscopic radical prostatectomy was first reported in 1997.[6] Patients benefit from minimally invasive surgery and the procedure has become more popular among urologists all over the world.[7–12] In those studies, the authors reported a transperitoneal approach. We first reported our initial experience with transperitoneal laparoscopic radical prostatectomy in 2006.[2] It is our belief that using the extraperitoneal approach is much more beneficial to our patients, as the patients had a lower risk of bowel injury, intraperitoneal contamination of urine, and prolonged postoperative ileus. Furthermore, patients with previous abdominal surgery can undergo laparoscopic radical prostatectomy using the extraperitoneal route.[13] ELRP was first reported in 1997.[14] It was popularized in Europe.[15–18] The present study reports our early experience in ELRP comparing it with open radical prostatectomy done by the same surgeon. There was no difference among the two groups in age, clinical staging, hospital

Table 5. Perioperative and immediately postoperative complications

	Open RP ($n = 55$)	ELRP ($n = 41$)
Urinary tract infection	0	1
Rectal injury	0	1
Late rectal necrosis with rectourethral fistula	0	1
Prolonged drainage (> 7 d)	4	3
Diarrhoea	0	1
Ileus	2	0
Haematuria post catheter removal	3	0
Pulmonary embolism	1	0
Wound infection	1	0
Upper haemorrhage	1	0
Sepsis	1	0

RP = radical prostatectomy; ELRP = extraperitoneal laparoscopic radical prostatectomy.

stay, and size of the prostate gland. In the ELRP group, the average operative time was significantly longer than in the open radical prostatectomy group (274 minutes *vs.* 157 minutes, $p < 0.001$). This was probably due to our initial experience in such an approach. We believe that our operative time can be shortened as our experience increases. ELRP has been reported to have a shorter operative time as compared to transperitoneal laparoscopic radical prostatectomy.[14] Median blood loss was reduced in ELRP as compared to open radical prostatectomy (600 mL *vs.* 1,000 mL, $p < 0.001$). This was probably due to pneumo-extraperitoneal-pressure created by air insufflation during ELRP that helped to compress the venous bleeding during the procedure.

Oncological outcomes were not different between the two groups. Our result of a positive surgical margin in the ELRP group was 25%. This is within the upper limit in a world series of studies, reported to be 10.8–26.4%.[10,12,16,19] Obviously, this can be improved as our experience increases. However, long-term follow-up is essential as a positive surgical margin can probably do no harm in some cases.[20] In the ELRP group, there was no postoperative prolonged ileus found, particularly in two cases who had prolonged drain leakage. This can be explained by the fact that operation through the extraperitoneal route has little effect on the return of bowel function during the postoperative period. This is confirmed in that using the transperitoneal route, postoperative ileus can be found in up to 10% of cases.[21] There were two cases of rectal complications in the ELRP group. This happened in the initial stage of our experience as laparoscopic surgery reduced our tactile sensation during the operation particularly at the posterior apical dissection. We therefore recommend preparing the large bowel prior to the operation, particularly with less experienced laparoscopic urologists and in locally advanced patients undergoing laparoscopic radical prostatectomy. To prevent late rectal necrosis, cauterization should be used as sparingly as possible, particularly at the anterior rectal wall.[22]

Using the laparoscopic approach may enhance postoperative continence and reduce the rate of impotence after the operation. We believe that a longer length of urethra and neurovascular bundles can be more easily preserved with the help of magnification from a laparoscopy lens. Eden et al reported 100 cases of ELRP with a 56% continence rate at 3 months following the operation, and a 12-month total continence rate of 96%.[15] In our present study, the 3-month continence rate was not very different between the two groups and it looked as though open radical prostatectomy provided a slightly better outcome (48% *vs.* 46%), but this was not statistically significant. However, long-term follow-up is needed to evaluate patients' quality of life, including incontinence and impotency rates.

In conclusion, ELRP is a feasible option for the treatment of patients with localized prostate cancer. There is no doubt that patients can benefit from a minimally invasive procedure. The procedure can mimic the gold standard treatment of localized prostate cancer, namely, open radical prostatectomy. Patients undergoing ELRP have a lower chance of requiring a transfusion and have an equal oncological outcome to those undergoing open radical prostatectomy. However, our technique needs to be refined in order to reach an international standard, particularly with respect to operative time, intraoperative blood loss and positive surgical margin rate.

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