

# Laparoscopic Radical Prostatectomy: Transperitoneal Laparoscopic Radical Prostatectomy versus Extraperitoneal Endoscopic Radical Prostatectomy

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**Objective:** To compare the perioperative results between Transperitoneal Laparoscopic Radical Prostatectomy (T-LRP) and Extraperitoneal Endoscopic Radical Prostatectomy (E-LRP).

**Material and Method:** Retrospective reviews of 125 patients who underwent laparoscopic radical prostatectomy by single surgeon (C.N) for stage T2-T3 adenocarcinoma of the prostate between May 2001 and July 2006 at Siriraj Hospital. Fifty-six cases had T-LRP and 69 cases had E-LRP. The preoperative data (age, presenting PSA, and Gleason score), perioperative data (prostatic weight, operative time, intraoperative blood loss, the day of full oral diet, length of drain, and catheter time), pathologic stage, and margin status were compared.

**Results:** Mean age and Gleason score were comparable in both groups. Mean presenting PSA was lower in T-LRP (9.93) as compared to E-LRP (21.84) ( $p = 0.046$ ). The mean prostatic weight was comparable in both T-LRP and E-LRP. The mean operative time of T-LRP (350) was significant longer than E-LRP (220) ( $p < 0.001$ ). Mean intraoperative blood loss was more in T-LRP (883) as compared to E-LRP (605) ( $p = 0.001$ ). Average blood transfusion was higher in T-LRP (1.23 unit) as compared to E-LRP (0.32). Postoperative full oral diet, length of drain, and catheter time in E-LRP were shorter than T-LRP (full diet: median 2 days vs. 3 days,  $p = 0.001$ ) (length of drain: 4.98 days vs. 6.69 days,  $p = 0.002$ ) (Catheter time: 8.9 days vs. 11.9 days,  $p = 0.002$ ). Margin status were comparable in both groups but mean postoperative Gleason score was higher in E-LRP as compared to T-LRP (7.2 vs. 6.85,  $p = 0.022$ ).

**Conclusions:** E-LRP resulted in significant less operative time, intraoperative blood loss, postoperative oral diet, length of drain and catheter time where as the pathological margin status was the same in both T-LRP and E-LRP.

**Keywords:** Laparoscopic, Prostatectomy, Compare

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Standard treatment of localized prostate cancer is radical prostatectomy. Laparoscopic radical prostatectomy (LRP) was first performed by Schuessler et al in 1992 and the technique was standardized by Guillonnet and Vallancien as transperitoneal approach since 1998<sup>(1)</sup>. There are advantages over open surgery such as optical magnification, less blood loss, less

postoperative pain and more rapid convalescence<sup>(2-5)</sup>. Extraperitoneal approach was developed by Raboy et al<sup>(6)</sup> and demonstrated technical feasibility by Bollens et al<sup>(7)</sup>. Extraperitoneal approach, compared to transperitoneal approach, has less risk of bowel injury, intraperitoneal contamination of urine and more familiar approach to the urologist. LRP is today comparable to open surgery in oncological and functional results<sup>(5)</sup>. The comparison between transperitoneal laparoscopic radical prostatectomy (T-LRP) and extraperitoneal

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laparoscopic radical prostatectomy (E-LRP) is a difficult task. In the present study, T-LRP and E-LRP performed by one surgeon were compared.

### Material and Method

The authors performed a retrospective review of 125 patients who underwent LRP between May 2001 and July 2006 in Siriraj Hospital by the same surgeon (CN). Fifty-six patients underwent T-LRP between May 2001 and Dec 2005, and 69 patients underwent E-LRP between Dec 2005 and July 2006. All patients were clinically localized or had locally advanced disease. Previous abdominal surgery was not contraindication for the operation. Neurovascular preservation was considered in localized disease, no palpable nodule, PSA < 10, Gleason score  $\leq 7$  and no severe adhesion at the dissection plane. Conversions to open surgery in the first nine cases were excluded from the present study. The preoperative parameters of age, presenting PSA and Gleason score from biopsy were evaluated. The perioperative parameters of prostatic weight, operative time, intraoperative blood loss, day of full oral diet, length of drain and catheter time, TMN stage, and marginal status were evaluated.

### Preoperative care

A single intravenous dose of third generation cephalosporin was injected before the operation. Under general anesthesia, the patient was set in dorsal supine position. A Foley catheter was inserted to empty the bladder.

### Surgical techniques

#### Transperitoneal approach<sup>(8)</sup>

The patient is in extreme trendelenburg position. Laparoscopic access is provided with five trocars (Fig. 1). Camera port is placed at infraumbilical area with open technique and pneumoperitoneum is created.

Anterior approach is started by entering Retzius space to expose the prostatic apex, incision of endopelvic fascia, section of puboprostatic ligament and ligating dorsal venous complex with vicryl no. 0. The bladder neck is identified precisely and dissected until Foley catheter is exposed. The tip of the catheter is lifted up to identify both ureteric orifice and circumferential division of bladder neck is accomplished. At the posterior aspect of prostate, vas deferens and seminal vesicles are freed from surrounding fatty tissue then Denonvilliers fascia is incised. Prostatic pedicles are clipped or cauterized and the posterior aspect of prostate is dissected antegradely. In this step, the dis-

section should be visualized at all times to avoid rectal injury. Dorsal venous complex is tangentially incised and prostatic apex is carefully dissected, urethra and rectourethralis muscle are transected just distal to the prostatic apex. Prostate specimen is put in the endobag and placed in the left iliac region for later removal. Bleeding point is checked at dorsal venous complex, neurovascular bundle, anterior aspect of rectum, and bladder neck.

Bilateral pelvic nodes are dissected. Boundary of the lymph node is pubic bone (inferior border), bifur-

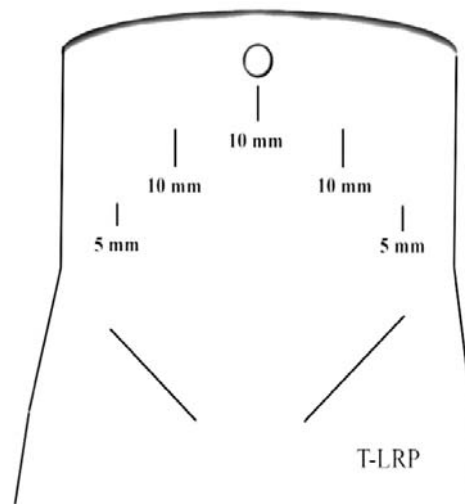


Fig. 1 T-LRP port position

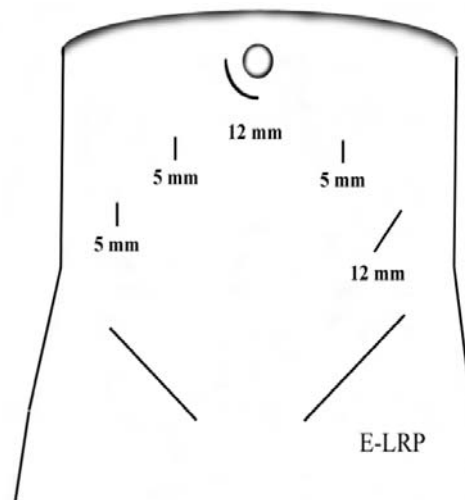


Fig. 2 E-LRP port position

cation of common iliac artery (superior border), external iliac vein (lateral border), obturator nerve (posterior border).

Urethro-vesical anastomosis is done with either interrupted stitches or running suture and tested for water-tightness by filling sterile water 150mL into the urinary bladder to identified anastomotic leak point. Jackson-Pratt drain is placed at the anterior aspect of the bladder and prostate is extracted via camera port incision.

#### ***Extraperitoneal approach<sup>(9)</sup>***

The patient is placed in dorsal supine position with 10-15° head tilt down. Laparoscopic access is provided with five trocars (Fig. 2). Right inferior radial umbilical incision is done and preperitoneal space is developed by blunt dissection and balloon catheter. Then Hassan-type trocar is placed as camera port. 12 mm trocar is inserted at left iliac region and three other 5mm trocars are inserted at right iliac region and both pararectal area.

The procedure is started by entering the Retzius space and incising the endopelvic fascia at the reflection line to dissect the pelvic floor muscle from the prostate. Puboprostatic ligament is identified and cut sharply. Ligation of dorsal venous complex is done with vicryl no. 0. After perivesical fat removal, the bladder neck is identified and dissected until the urethra is developed. Urethra is transected, then the tip of the catheter is pulled up and circumferential dissection is completed. Seminal vesicles and vas deferens are freed and Denonvilliers fascia is incised transversely. Dissect prostatic pedicle and mobilized prostate antegradely. Apical dissection is completed with the same technique as the transperitoneal approach.

Bilateral pelvic nodes are dissected. Urethro-vesical anastomosis is done with 2-0 vicryl UR-6 needle, suture started at 8 o'clock then 7 o'clock, 6 o'clock, 5 o'clock, 4 o'clock then the catheter is inserted into the bladder and anastomosis is completed at the rest of the anterior part.

In the situation of widening bladder neck, bladder neck reconstruction is performed in tennis-racquet fashion. Water-tightness is checked by filling bladder with sterile water. Jackson-Pratt drain is placed into the retropubic space. Prostate and endobag are removed via left iliac port incision.

#### ***Postoperative care***

The patients started oral intake as soon as possible. Drain was removed when the content less than 100mL per day for 2 days. Cystogram was per-



**Fig. 3** Postoperative cystogram

formed at postoperative day 7 and Foley catheter was removed if no urinary leakage was demonstrated. The patients were discharged the day after catheter removal and seen at 1 month postoperatively and then every 3 month for follow-up PSA level.

#### ***Statistical analysis***

Mean (+ standard deviation, SD), median, range, and frequency (%) were used to describe demographic characteristic data, perioperative results, and complications. Preoperative and perioperative data of both groups were compared using student t-test or Mann-Whitney test. The nominal data was compared using Chi-Square test. A p-value less than 0.05 was considered statistically significant.

#### **Results**

Mean age and biopsy Gleason score was comparable in both groups. Mean presenting PSA was lower in T-LRP (9.93) as compared to E-LRP (21.84) ( $p=0.046$ ) (Table 1).

From Table 2, neurovascular bundles preservation was done in 13 (27.7%) for the T-LRP group and 19 (27.5%) for the E-LRP group. The mean operative time of T-LRP was significant by longer than E-LRP (350 vs. 220 min,  $p<0.001$ ). Mean intraoperative blood loss and amount of blood transfusion were higher in T-LRP (883 vs. 605 mL,  $p=0.001$  and 1.23 vs. 0.32 unit). Mean prostatic weight was 43.96 gm in T-LRP and

**Table 1.** Demographic characteristic data

	T-LRP: n = 56	E-LRP: n = 69	p-value
Mean age	65.00 ± 11.46 (50-77)	65.56 ± 13.62 (51-84)	0.806
Biopsy gleason score	6.47 ± 2.04 (3-8)	6.71 ± 2.08 (4-9)	0.471
Mean presenting PSA	9.93 ± 10.16 (2.1-33.8)	21.84 ± 69.56 (0.93-227)	0.046

**Table 2.** Perioperative results

	T-LRP: n = 47	E-LRP: n = 69	p-value
Mean operative time (min)	350	220	<0.001
Mean intraoperative blood loss (mL)	883	605	0.001
Neurovascular preservation (%)	27.70	27.50	
Mean prostatic weight (gm)	43.96	38.01	0.031
Mean day of full oral diet (days)	2.80	2.15	0.001
Mean length of drain (days)	6.69	4.98	0.002
Mean catheter time (days)	11.90	8.90	0.002
Positive surgical margin (%)	29.80	27.54	0.957

**Table 3.** Pathological staging

Patho T stage	T-LRP		E-LRP	
	No. (%)	Margin positive	No. (%)	Margin positive
< T2	36 (76.6%)	9/36 (25%)	53 (76.8%)	8/53 (15.1%)
T3	11 (23.4%)	5/11 (45.5%)	16 (23.2%)	11/16 (68.8%)
T4	0	0	0	0
Total	47	14 (29.79%)	69	19 (27.54%)

38.01gm in E-LRP ( $p = 0.031$ ). Postoperative full oral diet, length of drain and catheter time in T-LRP were longer than E-LRP (full diet mean 2.8 vs. 2.15  $p = 0.001$ , length of drain 6.69 vs. 4.98 days  $p = 0.002$ , catheter time 11.9 vs. 8.9 days  $p = 0.002$ ). Rate of positive margin was comparable in both groups but mean Gleason score was higher in E-LRP (T-LRP 29.8%, E-LRP 27.54%,  $p = 0.957$ ) (Gleason score E-LRP 7.2 vs. T-LRP 6.85,  $p = 0.022$ ). Pathological staging is shown in Table 3.

Postoperative PSA at 1 month was declined in both groups (T-LRP = 0.089, E-LRP = 0.091) but long-term data about PSA level was not yet published.

There was no postoperative mortality. In the transperitoneal approach, the authors observed two (4.25%) stricture urethra, five (10.64%) urinary leakage, one (2.13%) recto-urethral fistula, and one (2.13%) incisional hernia. In E-LRP, the authors observed three

(4.35%) urinary leakage, three (4.34%) recto-urethral fistula, one (1.45%) reoperation from pelvic hematoma, one (1.45%) postoperative stroke, one (1.45%) urinary retention, and one (1.45%) urinary tract infection. All patients with urinary leakage were easily managed with conservative treatment. All cases with rectourethral fistula were successfully managed by urinary diversion with suprapubic cystostomy. Overall complications were 16.38%.

### Discussion

Laparoscopic radical prostatectomy has become more popular because of the benefits of minimal invasive procedure. In each approach, there are its own advantages that concern the authors. Compared with T-LRP, E-LRP has limited working space, more tension of urethro-vesical anastomosis and more CO<sub>2</sub>

**Table 4.** Perioperative complications

	T-LRP: n = 47 (%)	E-LRP: n = 69 (%)
Stricture urethra	2 (4.25)	-
Urinary leakage	5 (10.64)	3 (4.35)
Recto-urethral fistula	1 (2.13)	3 (4.34)
Incisional hernia	1 (2.13)	-
Reoperation from pelvic hematoma	-	1 (1.45)
Postoperative stroke	-	1 (1.45)
Urinary retention	-	1 (1.45)
Urinary tract infection	-	1 (1.45)

**Table 5.** Positive surgical margins

	Rozet et al <sup>(13)</sup>	Stolzenburg et al <sup>(4)</sup>	Lein et al <sup>(14)</sup>	Present study
T2 positive margin	14.6%	10.8%	15%	19.1%
T3 positive margin	25.6%	31.2%	55%	59.0%

**Table 6.** Postoperative complications

Details	Reported series <sup>(17)</sup>	Present study
Anastomotic leakage	1-19.4%	6.9%
Urinary retention	2.6%	0.9%
Anastomotic stricture	1.2-3.3%	1.7%
Trocar hernia	0.5-2%	0.9%
Rectal fistula	0.7-2%	3.4%

absorption but there are advantages in management of urinary leakage and no interference of bowel to operative field and more familiar to the urologist. In the intraperitoneal approach, the patient was in extreme trendelenburg position to decrease bowel interference and it could be more hemodynamic disturbance than extraperitoneal approach. In the present study, shorter operative time in E-LRP was similar to reports from Cathelineau et al<sup>(10)</sup> and Ruiz et al<sup>(11)</sup> because there is no preliminary dissection of seminal vesicles and identification of prevesical space like in intraperitoneal approach. In Porpiglia et al<sup>(12)</sup>, there were no differences in mean oral intake when transperitoneal group was compared to extraperitoneal approach. However, in the present study, the day to start oral intake was significantly earlier, which may be because of no intraperitoneal contamination of urine. The shorter time of catheter time in E-LRP in the present study compared

to the T-LRP may be caused by increased experience rather than the approach effects.

Positive surgical margin is a preventable prognostic factor in radical prostatectomy. With similar case selection, Dahl et al found that LRP and RRP (retropubic radical prostatectomy) could achieve similar pathological outcome. The locations of positive margin are at peripheral and apical tissue respectively<sup>(15)</sup>. Positive surgical margin in recent studies that reported about 20-25% and no statistically significance comparing T-LRP and E-LRP were similar to the present study (Table 5). The positive margin rate was still high. To reduce positive margin rate, Poulakis et al modified the technique that was more thorough and wider resection of posterolateral prostatic pedicles and extensive excision of periprostatic soft tissue at the apex. Positive surgical margin was decreased from 28% to 10%<sup>(16)</sup>. In case of neurovascular preservation, the extent of dissection is limited by interfascial and intrafascial plane and avoiding positive margin is still challenged. Presently, the authors tried to improve the present technique by carefully dissecting and visualizing the prostatic apex, especially the posterior part, before transecting the urethra.

Overall perioperative complications reported in the various published series<sup>(17)</sup>. The data are comparable to the present study. Anastomotic leakage, the most frequent complication, can be managed conservatively. The most serious complication in the present

study was rectal complication. The injury happened particularly at the posterior apical dissection. All cases in the present study were successfully managed by suprapubic cystostomy.

For LRP, the present study has shown that there was benefit of minimal invasive surgery particularly E-LRP. Pathological outcome was acceptable and complications were manageable in both approaches.

### Conclusions

In the present study, E-LRP resulted in significant less operative time, intraoperative blood loss, postoperative oral diet, length of drain, and catheter time whereas, the pathologic margin status was the same in both T-LRP and E-LRP. E-LRP is now a feasible treatment option of prostate cancer. Overall, complication rate was acceptable. Long-term result of PSA level, incontinence, and impotence should be followed.

### References

1. Guillonnet B, Vallancien G. Laparoscopic radical prostatectomy: the Montsouris technique. *J Urol* 2000; 163: 1643-9.
2. Rassweiler J, Schulze M, Teber D, Seemann O, Frede T. Laparoscopic radical prostatectomy: functional and oncological outcomes. *Curr Opin Urol* 2004; 14: 75-82.
3. Salomon L, Sebe P, De la Taille A, Vordos D, Hoznek A, Yiou R, et al. Open versus laparoscopic radical prostatectomy: part I. *BJU Int* 2004; 94: 238-43.
4. Stolzenburg JU, Rabenalt R, DO M, Ho K, Dorschner W, Waldkirch E, et al. Endoscopic extraperitoneal radical prostatectomy: oncological and functional results after 700 procedures. *J Urol* 2005; 174(4 Pt 1): 1271-5.
5. Toohar R, Swindle P, Woo H, Miller J, Maddern G. Laparoscopic radical prostatectomy for localized prostate cancer: a systematic review of comparative studies. *J Urol* 2006; 175: 2011-7.
6. Raboy A, Ferzli G, Albert P. Initial experience with extraperitoneal endoscopic radical retropubic prostatectomy. *Urology* 1997; 50: 849-53.
7. Bollens R, Vanden Bossche M, Roumeguere T, Damoun A, Ekane S, Hoffmann P, et al. Extraperitoneal laparoscopic radical prostatectomy. Results after 50 cases. *Eur Urol* 2001; 40: 65-9.
8. Nualyong C, Srinualnad S, Taweemonkongsap T, Amornvesukit T. Laparoscopic radical prostatectomy: preliminary result of Thailand series. *J Med Assoc Thai* 2006; 89: 1440-6.
9. 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.
10. Cathelineau X, Cahill D, Widmer H, Rozet F, Baumert H, Vallancien G. Transperitoneal or extraperitoneal approach for laparoscopic radical prostatectomy: a false debate over a real challenge. *J Urol* 2004; 171(2 Pt 1): 714-6.
11. Ruiz L, Salomon L, Hoznek A, Vordos D, Yiou R, De la Taille A, et al. Comparison of early oncologic results of laparoscopic radical prostatectomy by extraperitoneal versus transperitoneal approach. *Eur Urol* 2004; 46: 50-4.
12. Porpiglia F, Terrone C, Tarabuzzi R, Billia M, Grande S, Musso F, et al. Transperitoneal versus extraperitoneal laparoscopic radical prostatectomy: experience of a single center. *Urology* 2006; 68: 376-80.
13. Dahl DM, He W, Lazarus R, McDougal WS, Wu CL. Pathologic outcome of laparoscopic and open radical prostatectomy. *Urology* 2006; 68: 1253-6.
14. Poulakis V, de Vries R, Dillenburg W, Altmanberger HM, Becht E. Laparoscopic radical prostatectomy: impact of modified apical and posterolateral dissection in reduction of positive surgical margins in patients with clinical stage T2 prostate cancer and high risk of extracapsular extension. *J Endourol* 2006; 20: 332-9.
15. Gregori A, Simonato A, Lissiani A, Bozzola A, Galli S, Gaboardi F. Laparoscopic radical prostatectomy: perioperative complications in an initial and consecutive series of 80 cases. *Eur Urol* 2003; 44: 190-4.
16. Poulakis V, de Vries R, Dillenburg W, Altmanberger HM, Becht E. Laparoscopic radical prostatectomy: impact of modified apical and posterolateral dissection in reduction of positive surgical margins in patients with clinical stage T2 prostate cancer and high risk of extracapsular extension. *J Endourol* 2006; 20: 332-9.
17. Gregori A, Simonato A, Lissiani A, Bozzola A, Galli S, Gaboardi F. Laparoscopic radical prostatectomy: perioperative complications in an initial and consecutive series of 80 cases. *Eur Urol* 2003; 44: 190-4.

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## การผ่าตัดส่องกล้องรักษามะเร็งต่อมลูกหมากโดยวิธีผ่านเยื่อช่องท้อง เปรียบเทียบกับวิธีผ่านช่องนอกเยื่อช่องท้อง

กิตติพงษ์ พิณสุใสภณ, ไชยรงค์ นวลยง, สิทธิพร ศรีนวลนัต, ธวัชชัย ทวีมันคงทรัพย์, ธีระพล อมรเวชสุกิจ

**วัตถุประสงค์:** เพื่อศึกษาเปรียบเทียบผลในช่วงก่อนจนถึงหลังผ่าตัดของการผ่าตัดส่องกล้องรักษามะเร็งต่อมลูกหมากโดยวิธีผ่านเยื่อช่องท้อง และวิธีผ่านช่องนอกเยื่อช่องท้อง

**วัสดุและวิธีการ:** เป็นการศึกษาย้อนหลังในผู้ป่วย 125 ราย ซึ่งได้รับการผ่าตัดส่องกล้องรักษามะเร็งต่อมลูกหมากระหว่างเดือนพฤษภาคม พ.ศ. 2544 ถึง กรกฎาคม พ.ศ. 2549 แบ่งเป็นกลุ่มที่ 1 ใช้วิธีผ่านเยื่อช่องท้อง 56 ราย และกลุ่มที่ 2 ใช้วิธีผ่านช่องนอกเยื่อช่องท้อง 69 ราย โดยศึกษาเปรียบเทียบข้อมูลในช่วงก่อนผ่าตัด (อายุ, ผล PSA, gleason score) และผลในช่วงระหว่างและหลังผ่าตัด (น้ำหนักต่อมลูกหมาก, ระยะเวลาในการผ่าตัด, การเสียเลือด, จำนวนวันที่เริ่มรับประทานได้เต็มที่, ระยะเวลาที่เอาท่อระบายและสายสวนปัสสาวะออก, ระยะของมะเร็ง และการตรวจพบมะเร็งที่ขอบของชิ้นเนื้อ)

**ผลการศึกษา:** อายุเฉลี่ย และ gleason score ไม่ต่างกันในกลุ่ม ผล PSA ในกลุ่มที่ 1 มีค่าต่ำกว่า (9.93 กับ 21.84,  $p = 0.046$ ) น้ำหนักต่อมลูกหมากของทั้งสองกลุ่มไม่ต่างกัน กลุ่มแรกใช้เวลาในการผ่าตัดเฉลี่ยนานกว่า (350 กับ 220 นาที,  $p < 0.001$ ) เสียเลือดมากกว่า (883 กับ 605 ml,  $p = 0.001$ ) และต้องให้เลือดในปริมาณที่มากกว่ากลุ่มที่ 2 (1.23U กับ 0.32U) วันที่เริ่มรับประทานเต็มที่หลังผ่าตัด (median 3 วัน กับ 2 วัน,  $p = 0.001$ ) ระยะเวลาในการคาท่อระบาย (6.69 วัน กับ 4.98 วัน,  $p = 0.002$ ) และสายสวนปัสสาวะ (11.9 วัน กับ 8.9 วัน,  $p = 0.002$ ) ในกลุ่มแรกนานกว่ากลุ่มที่ 2 การตรวจพบมะเร็งที่ขอบของชิ้นเนื้อ พบเป็นสัดส่วนที่ไม่ต่างกัน gleason score หลังผ่าตัด ในกลุ่มแรกมีค่าเฉลี่ยน้อยกว่ากลุ่มที่สอง (6.85 กับ 7.2,  $p = 0.022$ )

**สรุป:** การผ่าตัดส่องกล้องรักษามะเร็งต่อมลูกหมากโดยวิธีผ่านช่องนอกเยื่อช่องท้อง ใช้เวลาในการผ่าตัดเฉลี่ยเร็วกว่า เสียเลือดน้อยกว่า วันที่เริ่มรับประทานเต็มที่ ระยะเวลาในการคาท่อระบาย และสายสวนปัสสาวะ ใช้เวลาน้อยกว่า โดยผลทางพยาธิวิทยาไม่ต่างกันทั้งสองกลุ่ม

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