Original Article

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Comparison of the Surgical Aspects and Outcomes Between Lateral Approach–Laparoscopic Radical Prostatectomy and Anterior Approach–Laparoscopic Radical Prostatectomy: First Report in Thailand

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Abstract:

Objective: The present study assesses the overall safety, perioperative outcomes, and early functional results after Lateral Approach–Laparoscopic Radical Prostatectomy (LA–LRP) with a new approach for radical prostatectomy and compares it with Anterior Approach–Laparoscopic Radical Prostatectomy (AA–LRP).

Material and Methods: Two hundred thirty–one patients with localized prostate cancer (clinical T1–T2) underwent laparoscopic radical prostatectomy (LRP) performed by a single surgeon between October 2012 and March 2023 in Rajavithi Hospital: AA–LRP 107 cases and the LA–LRP 124 cases. The demographic data of each group were recorded, along with: prostate–specific antigen PSA, clinical staging, operative time, blood loss, date of ambulation, pathological outcome, length of hospital stay, date of catheter removal, continent recovery rate, and complications.

Results: Most of the patients with clinical T1 and T2 stages who presented with the Gleason grade group at biopsy were in grade groups 1–2. The mean operative time was 483±156 minutes in the AA–LRP group and 348±96 minutes in the LA–LRP group (p–value<0.01). The length of stay and post–operative mean catheter times were 12.26±6.8 days in the AA–LRP group and 9.3±4.4 days in the LA–LRP group (p–value<0.01). Postoperative continence recovery at 12 months after AA–LRP and LA–LRP were 78.8% and 80%, respectively (p–value=0.94). The complication rate was 24.6% in the AA–LRP group and 1.6 % in the LA–LRP group (p–value<0.01).

Conclusion: LA–LRP is one option for treating prostate cancer. Compared with AA–LRP, it provides less blood loss, shorter operative times, fewer complications, and faster recovery without diminishing the oncologic outcomes. However, LA–LRP requires more cases for a surgeon to become proficient, and the long–term consequences need to be observed.

Keywords: laparoscopy, lateral approach, radical prostatectomy

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Introduction

Many years after the first report of laparoscopic radical prostatectomy (LRP) by Guillonneau and Vallancien[1] that combined posterior and anterior approaches (AA) by transperitoneal space called "the Montsouris technique." This operative technique is more developed when compared with the transperitoneal versus extraperitoneal approach in LRP that dissects and performs radical prostatectomy from the anterior aspect of the prostate, which is usually called the standard approach-LRP or AA-LRP. A meta-analysis comparison between the outcomes of transperitoneal versus extraperitoneal approach LRP[2] from 13 studies, including 1,674 patients, was analyzed. The meta-analysis findings revealed that the transperitoneal-LRP group showed no significant differences in the most important indicators compared with extraperitoneal-LRP. Moreover, transperitoneal-LRP showed a higher rate of postoperative complications compared with extraperitoneal-LRP.

The extraperitoneal-LRP is a mimic approach to open retropubic radical prostatectomy that does not disturb bowel function. The first report of extraperitoneal LRP in Rajavithi Hospital was published in 2011, and AA-LRP was performed using the technique. The learning curve is 50 cases of AA-LRP regarding operative time and blood loss. LRP is still regarded as a technique for mature surgeons, and it has demonstrated overall comparable results with the open technique with the advantages of a less-invasive approach[4,5]. The main objectives of radical prostatectomy for clinically localized prostate cancer (PCa) are oncological clearance coupled with good functional outcomes in terms of urinary continence and erectile function, both of which affect quality of life[6]. A pioneering study forlateral approach-robotic assisted radical prostatectomy (LA-RARP) was published by Gaston in 2007[7]. The outcomes show that one-week following catheter removal, complete early urinary continence was achieved in 80% of patients, and spontaneous erections or penile tumescence were reported by 46 patients. Positive surgical margins were 12.1% in the pT2 group and 29% in the pT3 group. Ninety-three patients were available for analysis at the 4-month follow-up. Of them, 92.4% were utterly continent, 5.4% used one pad a day, and 2.2% used 2 or more pads daily, according to the technique and good outcomes of LA-RARP.

The author adapted that technique in order to perform LRP in 2013, called "lateral approach-LRP (LA-LRP)," because Rajavithi Hospital hadn't launched a robotic system then and had some problems in identifying the vas deference and seminal vesicles while cutting the posterior aspect of the bladder neck; furthermore, there were some issues with the narrow space during posterior dissection of the prostate by AA-LRP technique. The present study assesses the overall safety, pathological outcomes, and early functional results after LA-LRP with a new approach for radical prostatectomy by comparison with AA-LRP.

Material and Methods

Patient selection and data collection:

They have localized prostate cancer patients who performed LRP by a single surgeon from October 2012 to March 2023 in Rajavithi Hospital. Two hundred thirty-one prostate cancer patients (clinical T1-T2) cases were performed in the AA-LRP 107 cases and were performed in the LA-LRP 124 cases that developed the technique after AA-LRP. Each group recorded demographic data, prostate-specific antigen (PSA), clinical staging, operative time blood loss, date of ambulation, pathological outcome, length of hospital stays, date removal catheter, continent recovery rate by the number of pads/day, and complication. All the data were compared between the AA-LRP group and the LA-LRP group using ANOVA statistical analyses with IBM SPSS, version 20; Kruskal -Wallis H was used for bivariate analysis. A p-value of <0.05 was considered statistically significant. The Rajavithi Hospital Ethics Committee approved this study.

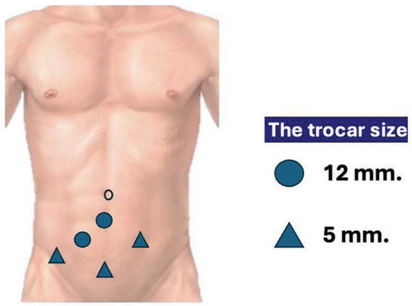
Surgical Technique of LA-LRP

Patient position

The patient is placed in an extended Trendelenburg position.

Trocar position

The trocar position was designed for extraperitoneal LRP, as shown in Figure 1. With the first trocar, an open technique is used at the infra-umbilical area, and a Retzius space is created by inserting a kidney-shaped balloon dissector. The other trocar is inserted under laparoscopic vision using the 0-degree lens.



LA-LRP=Lateral Approach-Laparoscopic Radical Prostatectomy

Figure 1 The trocar position was designed for extraperitoneal LA-LRP

Identification and elevation of the prostate gland

Identify the prostate gland and identify the bladder neck; after which, make a loop hanging suture in order to elevate the prostate gland from the anterior abdominal wall. This technique helps elevate the prostate away from the rectum, as shown in Figure 2.

Identification of the lateral pedicle and the seminal vesicle

Identify and control the lateral vascular pedicle with a small metal clip to avoid thermal injury to the neurovascular bundle (NVB). After gaining control, a small metal clip will expose the lateral vascular pedicle to a seminal vesicle (SV) and dissect it away from NVB. Elevate SV to identify the vas deference, followed by cutting it. In the case of a small volume, the prostate gland can be dissected opposite the vas deference and SV in this plane; but in the case of a large volume, the prostate will require the same technique as the lateral vascular pedicle on the opposite side, as shown in Figure 3 and 4.

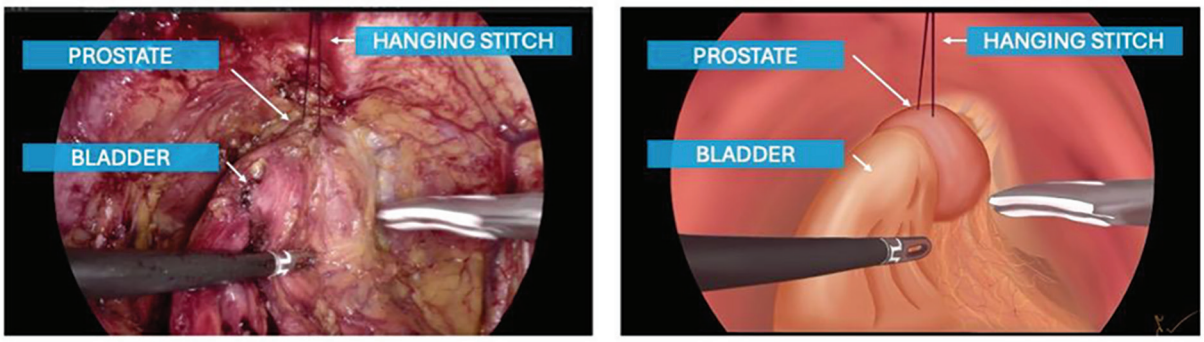


Figure 2 Identify and elevate the prostate by the hanging suture

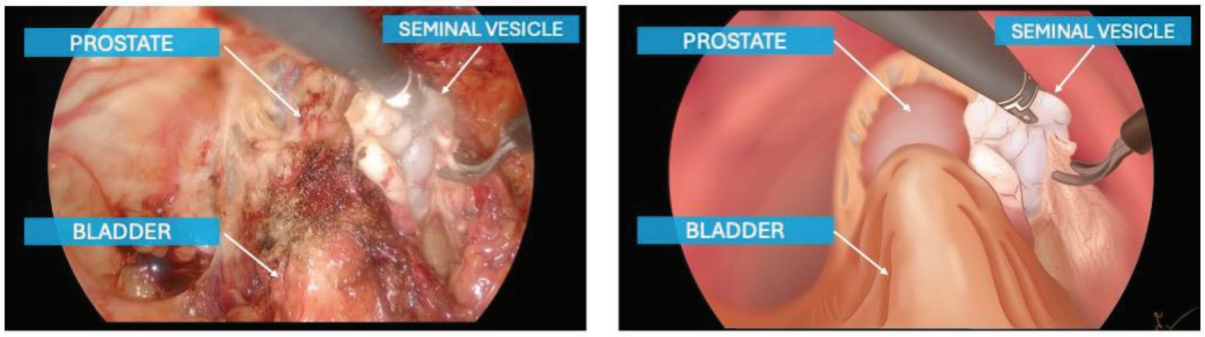


Figure 3 Identify lateral pedicle and identify seminal vesicle

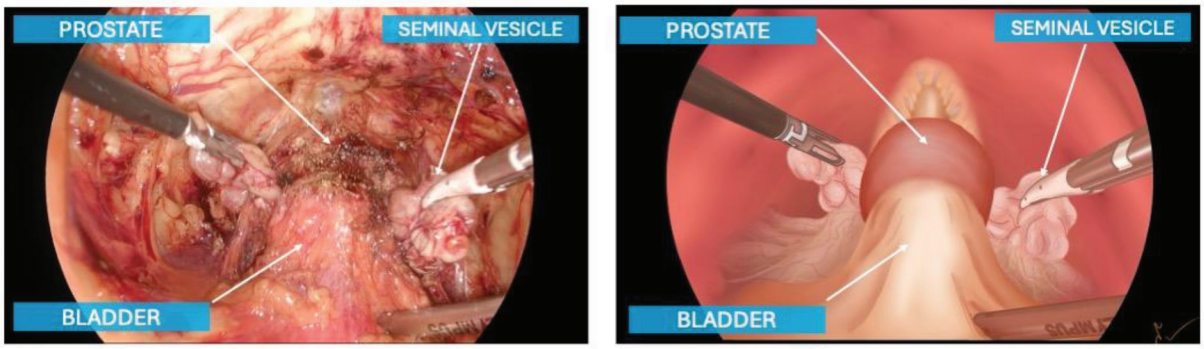


Figure 4 Identify and dissetion both seminal vesicles

NVB dissection and preservation of endopelvic fascia

NVB dissection is performed using a small metal clip until the apex of the prostate is pushed lateral to the pelvic fascia and endopelvic fascia, away from the prostate in order to avoid injury to the pelvic floor muscle, which plays a role in continence recovery.

Dissection of the posterior aspect of the prostate from the lateral aspect

Grasp the SV and flip anteromedially to the prostate in order to expose the plane between the prostate and rectum from the lateral aspect. Dissect the posterolateral aspect of the prostate and follow this plane until the apex of the prostate.

Dissection of the bladder neck and apex of the prostate from the lateral aspect

Dissect the bladder neck from the lateral aspect to preserve it, cutting the shape of the bladder neck. Bladder neck preservation plays a vital role in continence function after surgery. Dissection of the apex is performed from the lateral aspect with the advantage of identifying the margin of the apex and the plane between the apex of

the prostate and rectum. This technique is advantageous for preventing positive surgical margins, preserving striated urethral muscle, and avoiding injury to the rectum.

Vesicourethral anastomosis

The vesicourethral anastomosis is performed using a double–arm needle barb suture number 4/0. Start the suture at 5 o'clock at the urethral site to the bladder neck and the other needle from the urethral site at 6 o'clock to the bladder neck. After starting the suture, 4 stitches will pull the suture for anastomosis approximation. Continue the suturing on both sides until 12 o'clock and insert a new Foley catheter before closing the last stitch. Leakage testing is performed using an average of saline 100 cc. Insert drain and retrieve specimen bag through infra umbilical trocar and close abdomen.

Results

Preoperative clinical data:

The median age was 68.3±6.3 years in the AA–LRP group and 67.9±9.7 years in the LA–LRP group (p–value=0.02), and the mean preoperative PSA was 12.9±9.8 ng/ml in the AA–LRP group and 12.4±7.7ng/ml in the LA–LRP group (p–value=0.96). ASA classification included most of the patients in class 2, about 88%. Most patients with clinical T1 and T2 stages who presented with Gleason grade group at biopsy were grade groups 1–2, as shown in Table 1.

Perioperative clinical data:

The mean operative time was 483±156 minutes in the AA–LRP group and 348±96 minutes in the LA–LRP group (p–value<0.01), as shown in Table 1. The learning curve was analyzed by the operative time between cases in order numbers (cases no.) within each technique, demonstrating that cases no. 61–80 showed significantly shorter operative times within the AA–LRP group, but the LA–LRP group demonstrated a learning curve in cases number 80–100, as shown in Table 2. The LA–LRP group with more than 100 cases had a shorter operative time of 278.70±64.1 minutes compared with the AA–LRP group, which had an operative time of 455.00±79.5 minutes (p–value<0.01).

Table 1 Preoperative and perioperative clinical data

Data	AA–LRP	LA–LRP	p–value
Mean age (years±S.D.)	68.3±6.3	67.9±9.7	0.02
Mean preoperative PSA (ng/dl (min–max))	12.9±9.8	12.4±7.7	0.82
Mean prostate size (gm±S.D.)	53.0±24.0	47.0±27.0	0.83
Gleason grade group (%)			0.96
Grade group 1	49.4	37.4	
Grade group 2	24.7	34.8	
Grade group 3	6.7	8.7	
Grade group 4	9.0	10.4	
Grade group 5	10.1	8.7	
Clinical T stage (%)			0.12
T1a	1.0	2.5	
T1b	2.9	0	
T1c	59.8	52.9	
T2a	8.8	8.4	
T2b	3.9	0.8	
T2c	2.0	9.2	
T3a	5.9	14.3	
T3b	10.8	9.2	
T4a	4.9	2.5	
Margin Positive (%)	31.8	40.2	0.21
T2	18.1	32.0	
T3 or greater	75.0	77.2	
Mean estimated blood loss (ml±S.D.)	1,419.0± 1,217.0	660.0± 60.0	<0.01
Mean operative time (min±S.D.)	483.0± 156.0	348.0± 96.0	<0.01
Mean post–operative ambulation (day±S.D.)	2.7±1.0	1.8±0.9	<0.01
Mean catheter time and length of stay (days±S.D.)	12.2±6.8	9.3±4.4	<0.01
Mean drain time (days±S.D.)	8.5±5.1	7.6±4.7	0.47

AA–LRP=Anterior Approach–Laparoscopic Radical Prostatectomy, LA–LRP=Lateral Approach–Laparoscopic Radical Prostatectomy, PSA=prostate–specific antigen, S.D.=standard deviation

Table 2 Learning curve analysis by operative time

Order number of cases	AA–LRP Mean operative time (min±S.D.)	LA–LRP Mean operative time (min±S.D.)	p–value
0–20	698.25±131.3	397.11±99.3	<0.01
21–40	516.00±130.9	430.50±95.2	0.02
41–60	417.75±107.3	388.25±62.1	0.29
61–80	378.25±85.9	321.50±66.6	0.02
81–100	413.00±94.4	285.15±70.4	<0.01
101–120	455.00±79.5	278.70±64.1	<0.01

AA–LRP=Anterior Approach–Laparoscopic Radical Prostatectomy, LA–LRP=Lateral Approach–Laparoscopic Radical Prostatectomy, S.D.=standard deviation

Table 3 Continence recovery rate

Time	AA–LRP %Continence	LA–LRP %Continence rate	p–value
1st month	12.7	27.0	0.02
3rd month	39.4	33.3	0.07
6th month	60.6	61.2	0.99
9th month	78.8	79.0	0.89
12th month	78.8	80.0	0.94

AA–LRP=Anterior Approach–Laparoscopic Radical Prostatectomy, LA–LRP=Lateral Approach–Laparoscopic Radical Prostatectomy

Table 4 Complications between AA–LRP and LA–LRP

Complication	AA–LRP (%)	LA–LRP (%)	p–value
Rectal injury	9.5	0.0	
Lymphatic leakage	1.9	0.8	
Hematoma	0.9	0.0	
Convert	9.5	0.0	
Anastomosis leakage	2.8	0.8	
Total	24.6	1.6	<0.01

AA–LRP=Anterior Approach–Laparoscopic Radical Prostatectomy, LA–LRP=Lateral Approach–Laparoscopic Radical Prostatectomy

Postoperative clinical data:

The length of stay and post–operative mean catheter time were 12.26±6.8 days in the AA–LRP group and 9.3±4.4 days in the LA–LRP group (p–value<0.01). Positive surgical margins (PSM) AA–LRP and LA–LRP were 31.8% and 40.2% (p–value=0.21) because T3 or greater staging were included in both techniques. Most PSM areas are in the apical prostate lobe. Subgroup analysis positive surgical margins within T2 staging of AA–LRP and LA–LRP were 18.1% and 32% in order. The positive surgical margins within T3 or greater staging of AA–LRP and LA–LRP were 75.0% and 77.2% in order. Postoperative continence recovery was defined by zero pad/day at 12 months after AA–LRP and LA–LRP, which are 78.8% and 80%, respectively (p–value=0.94). However, early continence was better in the LA–LRP group than in the AA–LRP group. LA–LRP was 12.7% and 27%, respectively (p–value=0.02), as shown in Table 3. The complication rate was 24.6% in the AA–LRP group and 1.6% in the LA–LRP group (p–value<0.01), as shown in Table 4. The potency rate was evaluated by the Erection Hardness Score (EHS)[8], and EHS defined erectile dysfunction as less than level 3. The preoperative erectile dysfunction of AA–LRP and LA–LRP were 79.43% and 77.41% in order. The preoperative potency of AA–LRP and LA–LRP were 20.56% and 22.58% in order, and the post–operative potency was 9.25% and 28.57%. The mean post–operative ambulation AA–LRP and LA–LRP were 2.7±1.0 days and 1.8±0.9 days, respectively (p–value<0.01), as shown in Table 1.

Discussion

Many different technical approaches have been described, either transperitoneal or retroperitoneal, starting from reproducing the open Walsh technique[9]. He describes NVB preservation, which helps us understand the prostate and related anatomy in the pelvis. The goal of every method of LRP is to improve outcomes in functional oncology recovery and reduce complications. The knowledge of pelvic anatomy allows many surgeons to develop techniques to preserve structures and improve functional outcomes in minimally invasive surgeries. Xueyou Ma et al. published a systematic review and meta-analysis of bladder neck preservation (BNP) to improve continence time after radical prostatectomy. Thirteen trials (1,130 cases and 1,154 controls) assessing BNP versus no BNP (or with bladder neck reconstruction, BNR) were analyzed, indicating that BNP during radical prostatectomy (RP) improved early recovery and overall long-term (1 year) urinary continence while decreasing bladder neck stricture rates without compromising oncologic control[10]. Golabek et al. have stated that extraperitoneal LRP with bladder neck preservation is a safe procedure, resulting in good functional outcomes; urinary continence recovery was 59.23%, 85.86%, and 90.21% at 3, 6, and 12 months, respectively[11].

In the present study, the LA-LRP continence recovery was 33.3%, 61.2%, and 80%, respectively, as shown in Table 3. Azuma et al. published a study on LRP, which reveals 6 critical points of operative skill for achieving better urinary continence. These include: (1) minimal distal incision of the endopelvic fascia; (2) preservation of the bladder neck; (3) bilateral nerve-sparing surgery; (4) preservation of the puboprostatic ligament and its refixation to the anterior aspect of the bladder neck (bladder neck sling suspension); (5) preservation of the posterior (membranous) urethra; (6) suturing of the posterior aspect of the rhabdosphincter, the remaining portion of the Denonvilliers fascia, and the bladder neck (restoration of the Denonvilliers fascia)[12]. The present LA-LRP can preserve many critical structures that promote continence function and show early continence in the first month by AA-LRP and LA-LRP at 12.7% and 27%, respectively (p-value=0.02), which affects quality of life because the patient will suffer from incontinence and avoid social activity.

LA-LRP can provide good exposure to dissect seminal vesicles, and the posterior aspect of the prostate can offer a reduced risk of rectal injury, less blood loss, shorter operative time, earlier ambulation, shorter length of stay, and shorter catheter time when compared with AA-LRP. AA-LRP showed high complications, especially rectal injury and conversion, because of the inclusion of T3 staging and early experience in laparoscopic pelvic surgery. LA-LRP showed significantly lower complications when compared with AA-LRP, as shown in Table 4. A large number of the prostate cancer cases in this study presented with erectile dysfunction before surgery. The subgroup analysis in the potency group showed a better post-operative potency percentage in the LA-LRP group. The learning curve was analyzed using the operative time between case numbers within each technique, demonstrating that cases no. 61-80 showed significantly shorter operative times within the AA-LRP group, but the LA-LRP group demonstrated a learning curve in cases no. of 80-100, as shown in Figure 3 and Table 2. The LA-LRP group with more than 100 cases had a shorter operative time of 278.70±64.1 minutes compared with the AA-LRP group, which had an operative time of 455.00±79.5 minutes (p-value<0.01). However, a comprehensive evaluation of the LA-LRP technique requires more than just a single surgeon's experience; a multicenter study on long-term oncological outcomes and functional results should be anticipated.

Conclusion

LA-LRP is one option for treating prostate cancer. It results in less blood loss, shorter operative times, fewer complications, and faster recovery without compromising oncologic outcomes compared to AA-LRP. However, evaluating LA-LRP requires more cases and data on long-term consequences from both institutional experience and multicenter studies. Additionally, LA-LRP should be compared with robotic-assisted radical prostatectomy regarding perioperative outcomes, functionality, and long-term oncologic outcomes.

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