Original Article

Comparison of biochemical recurrence rate and oncologic outcomes between anterior and lateral approach to laparoscopic radical prostatectomy

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Prostate cancer, lateral approach laparoscopic prostatectomy, anterior approach laparoscopic prostatectomy, laparoscopic radical prostatectomy

Abstract

Objective: Malignancy of the prostate is the fourth most common malignancy in older Thai men. At present, laparoscopic prostatectomy is one of the most common forms of treatment for prostate cancer. In Rajavithi Hospital, two different approaches are used to carry out a laparoscopic prostatectomy, the anterior approach and the lateral approach. The aim of this study was to compare the oncologic outcomes between the two approaches and to follow the biochemical recurrence rate after surgery. The pathological, oncological outcomes between an anterior approach laparoscopic prostatectomy (AA-LRP) and a lateral approach laparoscopic prostatectomy (LA-LRP) were compared with a focus on pathologic outcomes including free margin, lymphovascular invasion, and seminal vesical invasion.

Materials and Methods: A retrospective review was carried out using prospectively collected data on 230 patients who underwent AA-LRP (n = 96) and LA-LRP (n = 134) carried out by a single surgeon between January 2005 and December 2022. Pathological and biochemical recurrence were also examined.

Results: No statistical significance was found in overall oncologic outcomes between the AA-LRP and LA-LRP, positive margin between the anterior approach (32.7%) and lateral approach (42.4%) (p = 0.166). No statistically significant differences were found regarding LVI-positive and seminal vesicle-positive between the two techniques. Kaplan–Meier analysis did not show any statistically significant differences with respect to biochemical recurrence between the two approaches, specifically anterior approach (mean follow-up 108 months) no biochemical recurrence = 73.0% lateral approach (mean follow-up 78 months) no biochemical recurrence = 66.7% (p = 0.371).

Conclusion: We conclude from this data from our institute that there was no statistically significant difference in oncologic outcome and biochemical recurrence rate in this single-surgeon comparative series between AA-LRP and LA-LRP. Further prospective studies are warranted to determine whether any particular technique is superior to the other in oncologic outcomes and biochemical recurrence rate.

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Introduction

Prostate cancer is a common cancer found in elderly male patients, with incidence varying by region. In Asia, including Thailand, prostate cancer is the fourth most common cancer among elderly men.[1,2] With an increasing aging population in Thailand, the incidence of prostate cancer is expected to increase.[3]

Currently, treatment of prostate cancer requires assessing the risk of the cancer spreading to nearby areas. The treatment options include surgery, radiation therapy, hormone therapy, and active surveillance.[4,5] Prostate cancer screening using prostate specific antigen(PSA) levels has improved early detection which increases the chances of successful surgical treatment.[6] At Rajavithi Hospital, a significant number of laparoscopic surgeries have been performed, utilizing both anterior and lateral approaches. These surgical techniques reflect growing experience in minimally invasive prostate cancer treatment in Thailand.[7]

The aim of this study was to report our experience in oncological outcome and biochemical recurrence rate between anterior approach laparoscopic prostatectomy (AA-LRP) and lateral approach laparoscopic prostatectomy (LA-LRP) in Rajavithi Hospital.

Material and Methods

We retrospectively collected information of patients who had undergone laparoscopic prostatectomy by either the lateral or anterior approach between 1st January 2005 and 31st March 2021 at Rajavithi Hospital with follow up until 31st December 2022. Patient data were excluded from further analysis if they had a non-prostatic primary malignancy on final pathology, had received androgen deprivation therapy or prior therapy, the procedure was converted from laparoscopic to open surgery, or there was incomplete data from hospital records. Finally, data from 230 patients diagnosed with prostate cancer were analyzed. The patients' records were retrospectively reviewed extracted data including: age, PSA, localized Pathologic report from prostate biopsy and prostate weight (Table 1).

Statistical analyses

The statistical analyses were processed using statistical software SPSS ver. 20.0. Categorical variables were assessed using the Pearson chi-square test and Fisher's Exact Test. P values were calculated, and $p < 0.05$ was considered as statistically significant.

Table 1. Clinicopathological characteristics of matched anterior approach and lateral approach laparoscopic prostatectomy

Characteristics	Surgical technique		P-value
	Anterior approach	Lateral approach	
Patients, n (%)	96 (41.7)	134 (58.3)	
Age, years (mean±SD)	68.0±6.40	68.47±7.70	0.63
Preoperative PSA (mean±SD)	15.46±18.25	16.93±22.89	0.62
Postoperative PSA (mean±SD)	0.73±4.18	0.24±1.56	0.26
Follow up, months (mean±SD)	94.36±61.08	63.90±42.36	0.00
Pathological, weight (g)	51.32±20.21	45.98±27.03	0.12
PSA, n (%)			
≤ 10	47 (54.6)	64 (51.6)	0.82
10.1-20	23 (26.7)	38 (30.6)	
> 20	16 (18.6)	22 (17.7)	
Preoperative Gleason Grade Group, n (%)			
Grade Group 1	44 (52.3)	70 (56.9)	0.21
Grade Group 2	18 (21.4)	28 (22.7)	
Grade Group 3	8 (9.5)	14 (11.4)	
Grade Group 4	11 (13.1)	5 (4.0)	
Grade Group 5	3 (3.6)	6 (4.9)	

SD = standard deviation, PSA = prostate specific antigen

Results

A total of 230 patients (134 LA-LRP and 96 AA-LRP) were included in the final analysis. Median age for the entire cohort was 70 years, and mean follow-up was 94 ± 61.08 months for the anterior approach and 63 ± 42.36 months for lateral approach (p = 0.00). The mean pre-operative PSA of LA-LRP and AA-LRP was 16.93 ± 22.89 and 15.46 ± 18.25 (p = 0.62). There were no statistically significant differences between the two surgical approaches including patient age at the time of surgery, preoperative PSA level, biopsy Gleason score, and clinical tumor stage.

Also, in this study, intraoperative data were recorded. the mean operative time was 483 ± 156 minutes in the AA-LRP group and 348 ± 96 minutes in the LA-LRP group (p < 0.01). The mean estimated blood loss (ml ± SD) was 1,419.0 ± 1,217.0 in the AA-LRP group and 660.0 ± 60.0 in the LA-LRP group (p < 0.01). The mean catheterization time and length of stay (days ± SD) were 12.2 ± 6.8 in the AA-LRP group and 9.3 ± 4.4 in the LA-LRP group (p < 0.01). The complication rate was 24.6% in the AA-LRP group and 1.6% in the LA-LRP group (p < 0.01).

Although the LA-LRP group has a more aggressive pathological outcome, with extraprostatic extension occurring in 24.0% of patients compared to 12.0% in the AA-LRP group (p = 0.037), the positive surgical margin rates were 42.4.0% for the LA-LRP group versus 32.6% for the AA-LRP group, showing no statistically significant difference (p = 0.16). Other factors, such as seminal vesicle invasion (SV), lymphovascular invasion (LVI), and lymph node (LN) invasion, were also not statistically significant.

In the LA-LRP group, 9.8% had seminal vesicle invasion, while the AA-LRP group had 8.4%. Additionally, the LA-LRP group had 8.0% with lymph node invasion, compared to 3.0% in the AA-LRP group. The results regarding lymphovascular invasion are difficult to interpret due to incomplete pathological records: in the AA-LRP group, 31.6% are affected compared to 22.1% in the LA-LRP group (Table 2).

Biochemical recurrence rate was also investigated. A Kaplan–Meier analysis showed no statistically significant differences in biochemical recurrence between the two approaches. The anterior approach (mean follow-up of 108 months) had a biochemical recurrence-free rate of 73.0%, while the lateral approach (mean follow-up of 78 months) had a rate of 66.7% (p = 0.371).

The univariate Kaplan-Meier analysis showed no significant difference in the 5-year BCR-free survival, which was 80.0% for AA-LRP group vs 68.0% for the LA-LRP group (Figure 1).

In accordance with the guidance from the National Comprehensive Cancer Network (NCCN) we divided preoperative PSA into three groups, specifically less than 10 ng/dl, 10 to 20 ng/dl and more than 20 ng/dl and we analyzed BCR-free survival into 3 groups resulting in a significant difference in BCR-free survival from the univariate Kaplan-Meier analysis for Preoperative PSA in all patients who underwent LRP. Surgical approach, whether LA-LRP and AA-LRP, was not an independent predictor of BCR (Figure 2).

Discussion

Laparoscopic prostatectomy remains the standard procedure for minimal invasive surgical treatment of prostate cancer in Thailand.[8] In 2011 our institution published a report on the technical aspects and experience of 100 cases in Rajavithi Hospital.[9] Since that time, we have started using LA-LRP to make the procedure more straightforward and less invasive for both the surgeon and the patient. Laparoscopic prostatectomy is a treatment of choice for prostate cancer, a procedure

Table 2. Oncological outcomes of anterior approach and lateral approach laparoscopic prostatectomy

Characteristics	Surgical technique		P-value
	Anterior approach	Lateral approach	
Positive surgical margin n (%)	31 (32.6)	56 (42.4)	0.166
Lymph node invasion n (%)	5 (8.0)	2 (3.0)	0.269
Seminal vesicle invasion n (%)	8 (8.4)	13 (9.8)	0.819
Lymphovascular invasion n (%)	6 (31.6)	23 (22.1)	0.386
Extraprostatic extension n (%)	11 (12.6)	31 (24.2)	0.037

SD = standard deviation, PSA = prostate specific antigen

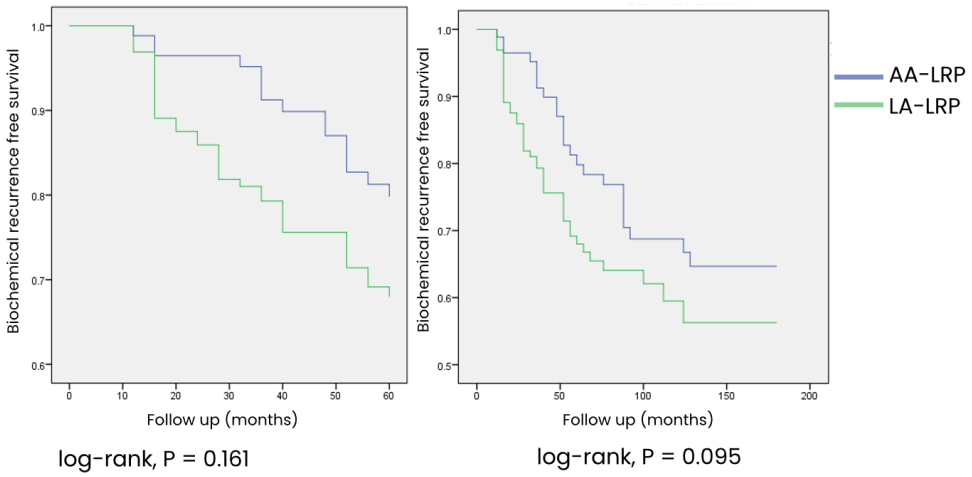

Figure 1. Biochemical recurrence-free survival for men undergoing laparoscopic prostatectomy for LA-LRP and AA-LRP

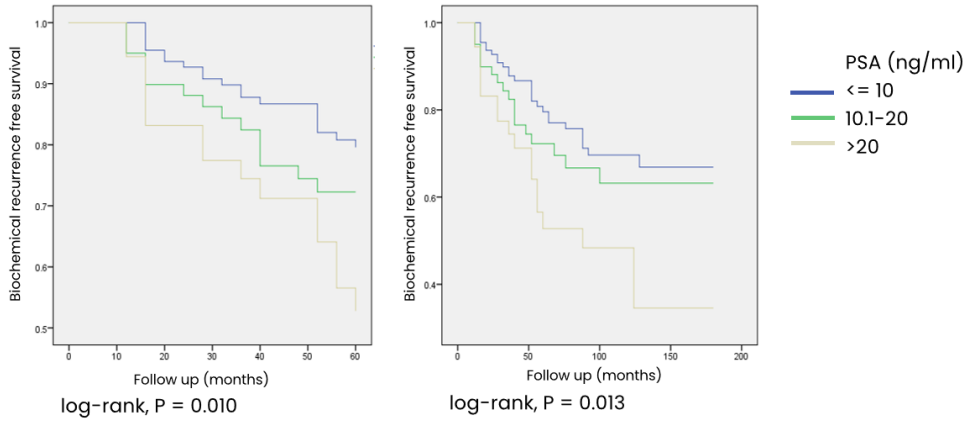

Figure 2. Biochemical recurrence-free survival for men undergoing laparoscopic prostatectomy for PSA

which is associated with decreased blood loss, less postoperative pain and shorter hospitalization[10] LRP is a challenging technique and the learning curve to successfully perform LRP is extensive.[11]

To our knowledge, this is the first study to investigate the impact of approach in LRP techniques (LA-LRP vs AA-LRP). Similar to the report by Mendoza et al.[12] we found that surgical technique was not an independent predictor of positive surgical margin rate and also that both approaches did not affect biochemical recurrence-free survival. Despite significantly higher rates of extraprostatic extension in the LA-LRP group, and the margin analysis was higher in this group there was no statistically significant difference between the two groups. We found a positive surgical margin rate of 32.0% in the AA-LRP group and 42.0% in the LA-LRP group. In this study all the procedures were performed by a single surgeon which resulted in a high level of consistency in the data. Martínez-Holguín et al.[13] conducted research titled 'Comparison between Laparoscopic and Open Prostatectomy: Oncological Progression Analysis between 2007 and 2015', and they found that the surgical approach in prostatectomy did not influence the status of surgical resection margins or biochemical recurrence in their series which was 77.0% BCR-free (mean follow up 49 months). Nyberg et al.14, compared surgical techniques between open radical prostatectomy and robotic assisted radical prostatectomy. The major outcome was BCR-free survival at 6 years, the results in the robotic assistance group was 86.0% compare with the open group which was 84.0% (not statistically significant). In our study 5-year BCR-free survival was 80.0% for the AA-LRP group and 68.0% for the LA-LRP group (mean follow up 60 months).

Magheli et al.[15] investigated the impact of surgical technique between open, robotic and laparoscopic and they found that the robotic approach has a significant positive margin rate

in comparison with the laparoscopic and open technique 19.5% vs 13.0% vs 14.4% (p = 0.01). Even though the positive margin was higher in the robotic group the BCR-free did not differ between the groups. Rozet et al.[16] reported no statistically significant differences with respect to pathological outcomes and complication rates for laparoscopic vs robotic among patients with comparable preoperative characteristics. The positive surgical margin rate in that study in the robotic group was 19.5% and 15.8% for the laparoscopic group.

In our study, we compared subgroups of laparoscopic approaches and found that the positive surgical margin rates were not significantly different between the anterior approach (32.6%) and the lateral approach (42.4%). However, in the lateral approach group, most positive margins were found at the apex. The higher rate of positive margins in LA-LRP may be because of differences in how the prostate is accessed and observed during surgery. In LA-LRP, it is harder to clearly see the apex[17], which is an important area where positive margins often happen. Also, because the lateral approach focuses on preservation of the nerves, it might affect the ability to completely remove the cancer but improving the surgical technique can help reduce this risk.[18]

There are limitations to the present study. First, because of the relatively newer LA-LRP approach for treatment of prostate cancer in comparison to AA-LRP extended follow-up was not available. Second, there is a bias present for the surgical technique offered to each patient. As AA-LRP was performed before LA-LRP the surgeon already had extensive experience with carrying out this laparoscopic prostatectomy approach which may have impacted the outcome. Vickey et al.[11] reported that more extensive surgeon experience was associated with a lower risk of 5-year biochemical recurrence following surgery in a recent study examining the learning curve of LRP which is about 250 cases. Third, we didn't include the incidence of perioperative complications and functional outcomes such as continence rate after the procedure between the two different technique. However, this has been the subject of previous studies and hence was not a primary goal in our study.[19,20]

We believe that the positive surgical margin recorded in LA-LRP is higher due to the higher rate of extraprostatic extension in the group and also that the surgeon had more experience and could select higher stage disease to perform surgery.

Conclusion

In conclusion, using BCR-free survival as a surrogate end point, we have demonstrated no difference in oncologic effectiveness between LA-LRP and AA-LRP techniques. The implication is that the patients who undergo surgery in the contemporarily significant predictors of BCR in this patient population are adverse pathologic features, including EPE, SVI, PSM, and LN involvement. Patients who are at increased risk of disease recurrence and mortality can therefore be treated with either LA-LRP or AA-LRP.

Conflict of Interest

The authors report no conflicts of interest.

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