Outcomes of Robot-assisted Radical Prostatectomy in Men Aged 75 Years Old or Older: A Single-center Study in Thailand

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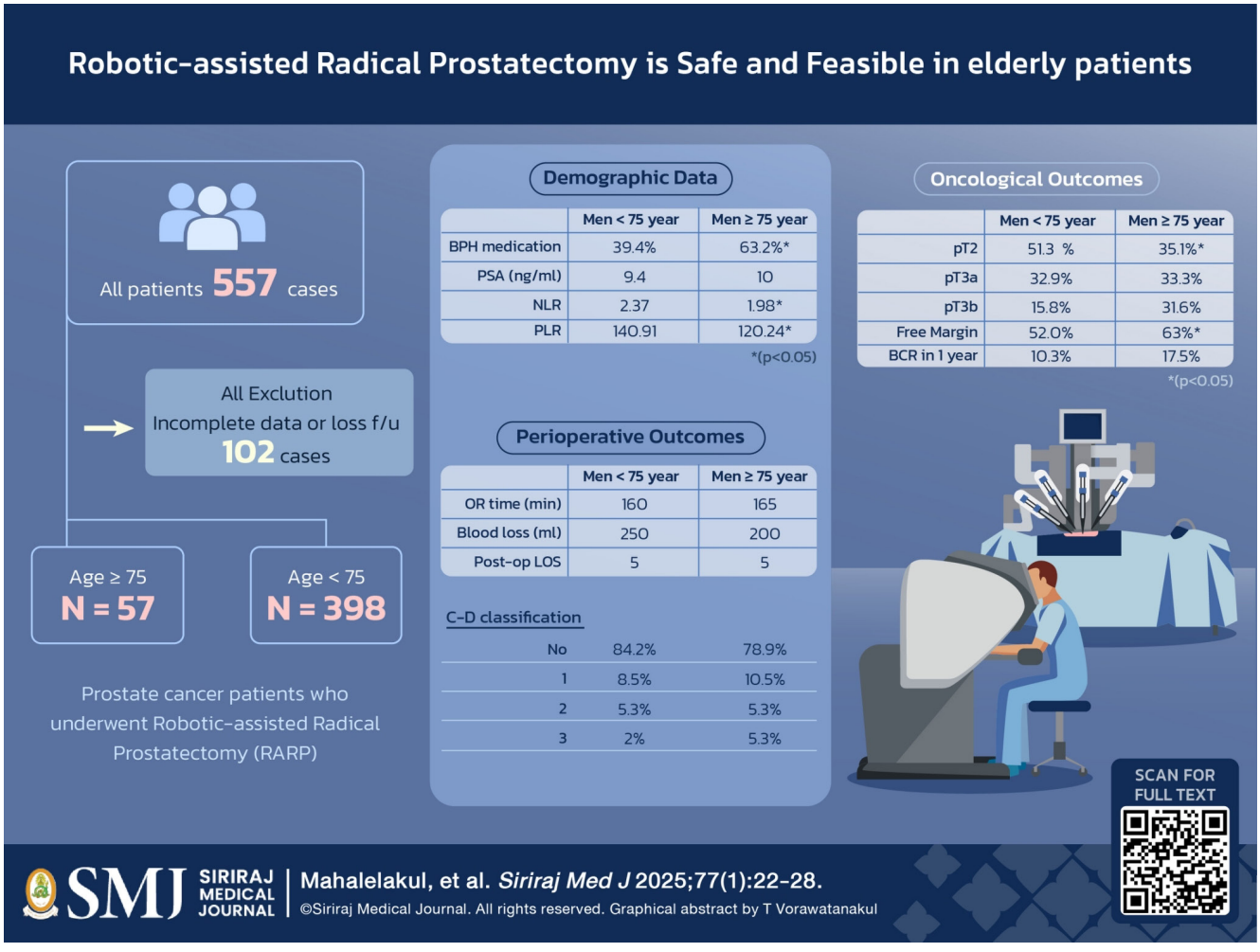

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ABSTRACT

Objective: The aim of this study was to evaluate the surgical, oncological outcomes, and complications in men ≥75 years of age who have undergone robot-assisted radical prostatectomy (RARP).

Materials and Methods: A retrospective analysis was performed on data from patients who underwent RARP between July 2018 and December 2020. This analysis included the patients' characteristics, perioperative outcomes, postoperative outcomes, oncologic outcome and biochemical recurrence(BCR) comparing an elderly group (≥75 years old) with a younger group (<75 years old).

Results: In total, 455 patients were classified into two groups: 57 patients aged ≥75 and 398 patients aged <75 years old. No significant differences were observed in BCR at 12 months10.3% vs. 17.5% (p=0.1), perioperative and postoperative complications, pathological positive lymph node, or resection margins. The pathological T-staging and Gleason grade groups were more aggressive in the older group with pT3 64.9 vs. 48.7% ($p < 0.05$) and Gleason grade group 4 and 5 41.3% vs. 25.1%, ($p < 0.05$).

Conclusion: RARP is safe and feasible procedure in selected elderly patients, offering comparable perioperative and postoperative surgical outcomes to those seen in younger patients.

Keywords: Prostate cancer; robot-assisted radical prostatectomy; elderly; outcome; biochemical recurrence (Siriraj Med J 2025; 77: 22-28)

INTRODUCTION

Prostate cancer (PCa) is the second most frequent cancer and the fifth leading cause of cancer-related death among men in 2022.[1] In Thailand, it is the fourth most common cancer in men.[2] According to WHO data from 2020, the life expectancy of Thai males at birth is 74.4 years, with a life expectancy of 22.8 years at age 60[3], and these figures are increasing annually. For urologists, this growing trend of reduced mortality in the elderly population presents challenges in choosing appropriate treatment options, such as radical prostatectomy (RP), radiation, or androgen deprivation therapy (ADT).

Previous studies have shown that elderly patients with PCa often present with more aggressive and locally advanced tumors.[4] Therefore, it is crucial for urologists to offer active treatment to selected elderly patients, as some may experience local tumor invasion or systemic metastasis. Robot-assisted radical prostatectomy (RARP), first performed in 2000, has demonstrated better outcomes and safety profiles compared to open RP[5,6], especially when combined with some surgical techniques and preoperative MRI.[7,8] Additionally, this approach spares patients from the systemic effects associated with ADT, which is commonly administered alongside radiation therapy in patients with unfavorable or high-risk PCa. However, the upper age limit for RP as a curative treatment for localized PCa remains a topic of debate.

The aim of this study was to evaluate the surgical and oncological outcomes, as well as complications, in men aged 75 years old or older who have undergone RARP.

MATERIALS AND METHODS

This retrospective cohort study was conducted at the Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok. The study proposal was approved by the Siriraj Institutional Review Board of the Faculty of Medicine Siriraj Hospital, Mahidol University (272/2565(IRB4)).

From July 2018 to December 2020, the records of 557 patients with PCa who had underwent RARP were reviewed. Patients were divided into two groups: those younger than 75 years old and those aged 75 years or older. Both groups were analyzed for assessing their preoperative characteristics, which included body mass index (BMI), American Society of Anesthesiologists classification (ASA), prior prostatic surgery, BPH medication use, prostate specific antigen (PSA), neutrophil-to-lymphocyte ratio (NLR), and platelet-to-lymphocyte ratio (PLR). Perioperative characteristics included operative time, neurovascular bundle (NVB) sparing, blood loss, and prostatic weight. Postoperative characteristics included Gleason score, pathological stage, surgical margin status, complications (classified by Clavien–Dindo), length of postoperative hospital stay, and postoperative PSA level.

All the patients were followed up with serum PSA measurements every 3 months after the surgery. Biochemical recurrence (BCR) within one year was defined as a PSA level of 0.2 ng/ml or higher.

Sample size was calculated based on the research by Burkhard Ubrig (2018), we estimated that in the group of prostate cancer patients who underwent RARP at Siriraj Hospital, those aged 75 years and older, as well as those younger than 75 years, will have a biochemical recurrence

rate after one year of follow-up of approximately 25.0% and 10.0%, respectively. We established the ratio (n2/n1) of prostate cancer patients aged 75 years and older (n1) to those younger than 75 years (n2) as 7/1, or a ratio of 7. Given a two-sided Type I error (α) of 0.05 and a power of the test of 80%, the required sample size for prostate cancer patients aged 75 years and older (n1) is at least 57 cases, while for those younger than 75 years (n2) it is at least 398 cases, totaling 455 cases overall.

Statistical analysis was performed using SPSS statistics version 23 (IBM Corp, Armonk, NY, USA). Demographic data were presented according to the distribution of quantitative variables: the mean ± standard deviation for normally distributed variables and median with interquartile range for non-normally distributed variables. T-tests were used to compare continuous values between two groups. For binary variables, the chi-square test was used. Multivariate analyses were conducted to identify significant predictors of BCR. A p-value < 0.05 was considered statistically significant.

RESULTS

Patients were divided into two groups: those younger than 75 years old (n=398) and those aged 75 years or older (n=57) (Fig 1). RARP was performed using the Da Vinci Robotic 4-Arm system with a transperitoneal approach. Pelvic lymph node dissection was performed in the majority of cases, with the extent of dissection determined at the surgeon's discretion.

Preoperative characteristics of the two groups are shown in Table 1. The mean age in the group aged <75 was 67 years old (63–70), compared to 77 years old (75–79) in the group aged ≥75 years. The percentage of patients with ASA class 3 was higher in the older group (35% vs. 23.4%). BPH medication use was also significantly higher in the elderly group (63.2% vs. 39.4%). Both the neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) were significantly lower in the older group. The median PSA levels were not significantly different between the two groups.

The perioperative and postoperative characteristics are displayed in Table 2. The non-NVB sparing technique was more commonly performed in the older group, with a significantly higher rate compared to the younger group (89.5% vs. 51.5%, p < 0.05). Prostate size was significantly larger in the older group. Similarly, pathological T-staging was more advanced in the older group, with 64.9% classified as pT3 compared to 48.7% in the younger group. The proportion of patients with a high Gleason grade group (4 and 5) was also higher in the older group (41.3% vs. 25.1%). The operative time was not significantly different between the two groups (160 min vs. 165 min, p = 0.82), nor was blood loss (250 ml vs. 200 ml, p = 0.38). Despite the higher prevalence of aggressive pathological features in the older group, there were no significant differences in surgical margin, pelvic node involvement, or postoperative complications between the two groups. The majority of patients in both groups did not experience postoperative complications. However, 8 patients (2%) in the younger group and 3 patients (5.3%) in the older group experienced Clavien–Dindo grade 3 complications.

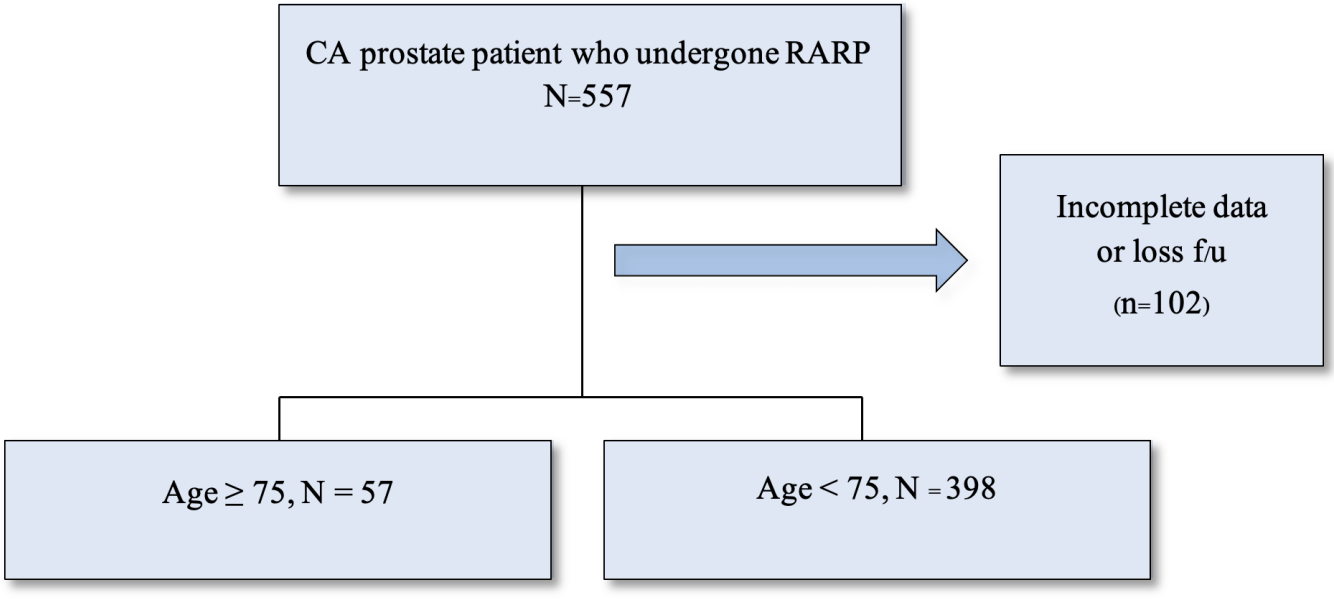

Fig 1. Patient selection.

TABLE 1. Patient characteristics.

	<75 years	≥ 75 years	*p* value
Number of patient	398	57	
Age (IQR)	67 (63-70)	77 (75-79)	
ASA			< 0.05
1	41 (10.3%)	0 (0%)	
2	264 (66.3%)	37 (64.9%)	
3	93 (23.4%)	20 (35.1%)	
BMI (kg/m^2)	24.22 (22.42-26.58)	23.82 (22.2-25.4)	0.2
BPH medication	157 (39.4)	36 (63.2)	<0.001
Previous prostate surgery	7 (1.85%)	3 (5.3%)	0.12
PSA (ng/ml)	9.4 (6.67-15)	10 (7.28-17.49)	0.5
NLR	2.37 (1.73-3.15)	1.98 (1.6-2.4)	< 0.05
PLR	140.91 (108.9-189.56)	120.24 (93.18-144.29)	< 0.05

Abbreviations: NLR = Neutrophil-Lymphocyte ratio, PLR = Platelet-Lymphocyte ratio

The duration of hospitalization was not significantly different between the two groups. BCR at one year was higher in the older group (10.3% vs. 17.5%), but this difference was not statistically significant (p = 0.1).

Multivariate analysis revealed that preoperative PSA of 15 or higher, higher Gleason grade group, and positive surgical margin were significantly associated with BCR (Table 3).

DISCUSSION

As life expectancy for men continues to increase, a larger proportion of elderly patients are being diagnosed with clinically significant PCa, with many potentially having a life expectancy extending beyond 10 years. Careful selection of candidates for surgical intervention for PCa among the elderly is therefore crucial. While a minimum life expectancy of 10 years is typically deemed necessary when considering potentially curative therapy, many urologists refrain from pursuing definitive treatment for localized PCa in elderly patients based solely on age, without considering their overall life expectancy. There is extensive literature on the oncological outcomes of RP in patients aged 65 years old or older, or 70 years old and older.[9,10] However, only a limited number of studies have specifically examined oncological outcomes for men aged 75 years old and above.[11,12]

Previous studies have shown that older patients undergoing RARP often present with higher pathological stages, Gleason scores, and PSM rates. Similarly, the older group in our study exhibited higher histological and staging characteristics compared to the younger cohort, with 64% of older patients having pT3 disease. Interestingly, while the PSM rate was lower in the older group, the difference was not statistically significant. Previous research has highlighted a strong correlation between PSM and recurrence of PCa. Yang et al.[13] identified an association of PSM, GG 4 to 5, pT3, and PSA levels greater than 10 ng/ml, reporting a 5-year BCR rate of 66.7%. Consistent with their findings, our multivariate analysis emphasized the importance of PSM in predicting BCR, while age did not predict BCR. This suggests that RARP is a viable option for selected older patients, offering comparable short-term oncological outcomes to younger adults, even when presenting with slightly more advanced disease.

Physical status and cognitive function are crucial predictors of postoperative outcomes. The Mini-Cog and G-8 screening tools[14] are recommended for comprehensive preoperative assessment in urological cancers, including RARP. In our study, the majority of older patients were classified as ASA class 2. Complications rates, as classified by the CDC, did not differ significantly between the groups,

TABLE 2. Perioperative and Postoperative outcomes.

	<75 years	≥ 75 years	*p* value
Operative time (min) (IQR)	160 (125-201.25)	165 (135-200)	0.82
NVB preservation			< 0.05
None	205 (51.5%)	51 (89.5%)	
Unilateral	51 (12.8%)	3 (5.3%)	
Bilateral	142 (35.7%)	3 (5.3%)	
Blood loss (ml)	250 (150-400)	200 (100-310)	0.38
Prostate weight (g)	38.7 (29.4-51)	45 (35.35-58.25)	< 0.05
Patho			< 0.05
pT2	204 (51.3%)	20 (35.1%)	
pT3a	131 (32.9%)	19 (33.3%)	
pT3b	63 (15.8%)	18 (31.6%)	
Gleason grade group			< 0.05
1	26 (6.5%)	1 (1.8%)	
2	164 (41.2%)	17 (29.8%)	
3	99 (24.9%)	12 (21.1%)	
4	33 (8.3%)	6 (4.5%)	
5	76 (19.1%)	21 (36.8%)	
pN1	24 (6%)	5 (8.8%)	0.56
Resection margin			0.12
Positive	191 (48%)	21 (36.8%)	
Negative	207 (52%)	36 (63.2%)	
C-D classification*			0.24
No	335 (84.2%)	45 (78.9%)	
1	34 (8.5%)	6 (10.5%)	
2	21 (5.3%)	3 (5.3%)	
3a	8 (2%)	3 (5.3%)	
Post-op LOS	5 (4-6)	5 (3-18)	0.46
BCR in 1 year	41 (10.3%)	10 (17.5%)	0.1

*Clavien-Dindo classification

TABLE 3. Multivariate analysis showing predictors of post-operative BCR in both groups.

	Adjusted OR (95%)	*p* value
PSA ≥15	2.73 (1.46-5.11)	0.002
Gleason grade group	1.41 (1.10-1.82)	0.007
Margin positive	2.96 (1.35-6.50)	0.007

with 21% of older patients experiencing postoperative complications (5.3% with grade 3 complications versus 2% in the younger group). These results align with a study by Ubrig et al.[15], which reported minor complications in 26.3% of patients over 75 years undergoing RARP, with major complications occurring in only 1.3% of cases. These findings underscore the importance of comprehensive preoperative evaluation and the integration of validated tools for patients undergoing RARP.

Frailty, a condition marked by reduced physiological reserves and impaired function across multiple systems, leads to a diminished capacity for the body to respond to stress. Systemic inflammation is a key contributor to physical decline and frailty in older adults. Meta-analyses have shown that frailty and pre-frailty are associated with elevated levels of serum inflammatory markers. The NLR and PLR are emerging biomarkers of inflammation. Previous studies have found that declines in physical function and frailty are associated with higher NLR and PLR in elderly patients.[16-19] Moreover, several studies have confirmed that these novel markers are linked to cancer progression and prognosis. In our study, both NLR and PLR were significantly lower in the older group, although their relevance to the 1-year BCR was not established. Additionally, a large population-based study in China by Meng et al.[20] reported variations in inflammatory biomarkers, including NLR and PLR, across different age groups, with higher values observed in men older than 65 years (NLR: 1.71 vs. 1.85, PLR: 106 vs.139). This suggests a potential selection bias, as healthier older adults may be more likely to undergo RARP. Research into the impact of NLR and PLR in the Thai population remains limited. However, a study by Veerakulwatana et al.[21] found no association between NLR or PLR levels and 30-day major complications following radical cystectomy, a more aggressive procedure than RARP.

PSA has been used for detection of recurrent disease. The American Urological Association (AUA) and the European Association of Urology (EAU) have recommended defining BCR as a serum PSA ≥0.2ng/mL followed by a second confirmatory level.[22,23] Approximately 20-40% of patients with clinically localized PCa will present BCR after RP.[24,25] Short time from RP to BCR has also been associated with poor clinical prognosis. Ten-year rate of systemic progression for PCa was 10% for patients who experienced BCR more than six years after RP, compared to 19% for those with BCR occurring less than 1.2 years after RP.[26] Therefore, we have chosen to conduct follow-up on BCR for one year and from our study BCR at one year was higher in the older group (10.3% vs. 17.5%), but this difference was not statistically significant ($p = 0.1$).

Recent studies have shown that elderly patients often exhibit more aggressive pathological findings, which align with the results of our own research. As such, there are potential benefits to performing RARP in selected patients aged 75 years and older, as they may achieve surgical and oncological outcomes comparable to those of younger patients. Therefore, age should not be considered a contraindication for surgical intervention.

However, there are several limitations of our study to note. First, this study involved a retrospective analysis, therefore it was restricted by the available evidence level. Second, our results might not be representative for all men over 75 years old because our cohort involved a highly selected group of patients. Third, our follow-up duration was too short to show biochemical, cancer-specific, and overall survival. Finally, there may be potential bias from the surgeons' experience.

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DECLARATION

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Conflict of Interest

The authors declare that they have no conflicts of interest.

Author Contributions

Conceptualization and methodology, S.S, A.M. and T.H. ; Investigation, S.S., T.H., V.W., S.L. and P.A. ; Formal analysis, S.S. and A.M. ; Visualization and writing – original draft, A.M. ; Writing – review and editing, S.S., A.M. and T.H. ; Supervision, S.S. All authors have read and agreed to the final version of the manuscript.

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