Journal of Surgical Radiology

Site: https://journalsurgrad.com/

ISSN Print 2156-213X| ISSN Online: 2156-4566 Volume: 5 Issue: 6 Open Access

Research Article

Robot-Assisted Radical Prostatectomy: Technique, Outcome and Complications, A Retrospective Observational Study Of 25 Cases

Dr. Rahul Singh[1]; Dr. Bhoopat Singh Bhati[2]; Dr. Paritosh Chandra[3*]; Dr. Sanjay Dhangar[4]

[1]Resident, Department of Urology, Ruby Hall Clinic, Pune

[2]Senior Consultant, Department of Urology, Ruby Hall Clinic, Pune

[3] Resident, Department of Urology, Ruby Hall Clinic, Pune

[4]Senior Consultant, Department of Urology, Bharati Hospital and Research Centre, Pune.

*Corresponding Author
Dr. Paritosh Chandra

Article History
Received: 02.05.2026
Revised: 19.05.2026
Accepted: 03.06.2026
Published: 17.06.2026

Citations:
Singh R, Singh Bhati B, Chandra P, Dhangar S, Robot-Assisted Radical Prostatectomy: Technique, Outcome and Complications, A Retrospective Observational Study Of 25 Cases. J Surg Radiol, 5(6) 286-291

Abstract: ***Introduction:*** Objective: To report the operative technique, oncologic and therapeutic outcomes, and complication rates from an initial series of 25 patients treated with robot-assisted radical prostatectomy (RARP). Furthermore, this study quantifies the surgical learning curve by evaluating perioperative metrics across consecutive cases. ***Materials and Methods:*** A retrospective observational study was conducted evaluating 25 consecutive patients with clinically localized, organ-confined prostate cancer (Gleason score <=7) who underwent RARP between January 2023 and December 2024. All procedures were performed by a single surgeon with prior expertise in laparoscopy. To mathematically validate the learning curve, the cohort was divided into an early experience group (Cases 1–12) and a late experience group (Cases 13–25), with continuous variables analyzed via unpaired Welch's two-sample t-tests. ***Results:*** The procedure demonstrated an excellent safety profile, with a 0% conversion-to-open rate and zero perioperative mortality. The overall mean operative time was 272.4 minutes. Subset analysis revealed a highly significant reduction in operative time as experience increased, dropping from 323.8 +/- 38.6 minutes in the early cohort to 232.7 +/- 18.8 minutes in the late cohort ($p < 0.0001$). Mean estimated blood loss was 327.6 ml , with an overall transfusion rate of 8%. The mean length of hospital stay was 5.6 days , showing a clinical reduction from 6.0 days to 5.2 days between cohorts, eventually stabilizing to a consistent 4-day discharge in the final quartile of cases. Oncological outcomes were favorable, with a positive surgical margin (PSM) rate of 8% and no early biochemical recurrence (BCR) observed. Functional recovery was managed proactively with pelvic floor muscle training; 28% of patients achieved complete continence at 3 months, improving to 80% dry at 9 months. Major complications were rare, with one instance of an anastomotic leak successfully managed with prolonged catheter traction. The 30-day readmission rate was 12%, and the reoperation rate was 0%. ***Conclusion:*** RARP provides excellent functional and oncological outcomes with a high safety profile. Despite the inherent complexity of the procedure, a surgeon with prior laparoscopic training can achieve a statistically significant stabilization of operative time and a reduction in hospital stay within the initial 25 cases.

Keywords: Surgical technique, Postoperative outcomes, Complications

INTRODUCTION

Radical prostatectomy remains one of the most established and effective treatments for localized prostate cancer.2 Over the years, the surgical approach has evolved significantly from open retropubic surgery to laparoscopic techniques, and currently, to robot-assisted laparoscopic radical prostatectomy (RARP).1, 6 In terms of oncological control, physical removal of the entire prostate gland and cancerous tissue ensures that the prostate-specific antigen (PSA) drops to an undetectable level, offering excellent long-term survival outcomes.2 The advent of the Da Vinci robotic system has revolutionized this procedure.1 Utilizing a 3D high-definition camera and highly articulated robotic arms controlled from a separate console, surgeons are afforded a magnified, illuminated view of the pelvic anatomy.1 This 'anatomical approach' facilitates precision in dissecting the prostate and seminal vesicles while preserving the full functional urethral length and neurovascular bundles essential for continence and erectile function.7, 8 The primary advantages of RARP include reduced blood loss, shorter hospital stays, concurrent lymph node dissection, and faster recognition of disease recurrence.3, 4

REVIEW OF LITERATURE

Open retropubic radical prostatectomy has historically been the gold standard; however, its inherent morbidity drove the pursuit of minimally invasive alternatives. Extensive literature now supports the superiority of RARP across multiple perioperative and functional domains.

Comparative meta-analyses, such as those by Junji Wang et al. and Yuefeng Du et al., demonstrate that RARP is superior to open and standard laparoscopic radical prostatectomy (LRP) in terms of hospital stay, estimated blood loss (EBL), transfusion rates, and the recovery of urinary continence and erectile function. Functional recovery is particularly accelerated; Porpiglia et al. found that the probability of achieving continence and potency

over a 5-year period more than doubled for RARP compared to LRP.

While both LRP and RARP feature steep learning curves, prior experience with high-volume LRP can significantly shorten the learning curve for RARP, improving both oncological and functional outcomes during the surgeon's initial transition to the robotic platform.

AIMS AND OBJECTIVES

To report the operative technique, therapeutic outcomes, complications, and objective statistical evaluation of the surgical learning curve from an initial series of 25 patients treated with robot-assisted radical prostatectomy.

MATERIALS AND METHODS

Study Design: A retrospective observational study was conducted at Ruby Hall Clinic, Pune, over a 2-year duration. Cohort: The study included 25 consecutive patients diagnosed with clinically localized, organ-confined prostate cancer (Stage 1 or 2) who underwent RARP between January 1, 2023, and December 31, 2024. All patients had a Gleason score of <=7 following a TRUS-guided 12-core prostate biopsy, with preoperative PSA values ranging from 5 to 25 ng/dl.

Surgical Technique: All procedures were performed by a single surgeon with established expertise in laparoscopic urological oncology. Data Collection: Evaluated clinical parameters included operative time, estimated blood loss (calculated via the weighing method), transfusion rate, conversion rate, complication rates, length of hospital stay, positive surgical margins (PSM), and return of continence. Statistical Analysis: To objectively evaluate the surgical learning curve, the patient cohort was bifurcated into an Early Experience Cohort (Cases 1–12) and a Late Experience Cohort (Cases 13–25). Continuous variables were analyzed utilizing an unpaired Welch's two-sample t-test to determine statistical significance between the cohorts.

RESULTS

Perioperative Outcomes and Learning Curve Analysis The surgical series demonstrated an excellent safety profile, with a 0% conversion-to-open rate and zero perioperative mortality within 30 days.

The overall mean operative time for the 25 cases was 272.4 minutes. A highly significant learning curve was observed. The Early Cohort required a mean operative time of 323.75+/- 38.61 minutes, whereas the Late Cohort stabilized at 232.69+/-18.78 minutes ($p < 0.0001$). This objective reduction validates the acquisition of proficiency with the robotic console.

The overall mean EBL was 327.64 ml. Major bleeding (> 500 ml) occurred in only two cases, resulting in an overall blood transfusion rate of 8% (2 out of 25 patients requiring 1 unit each).

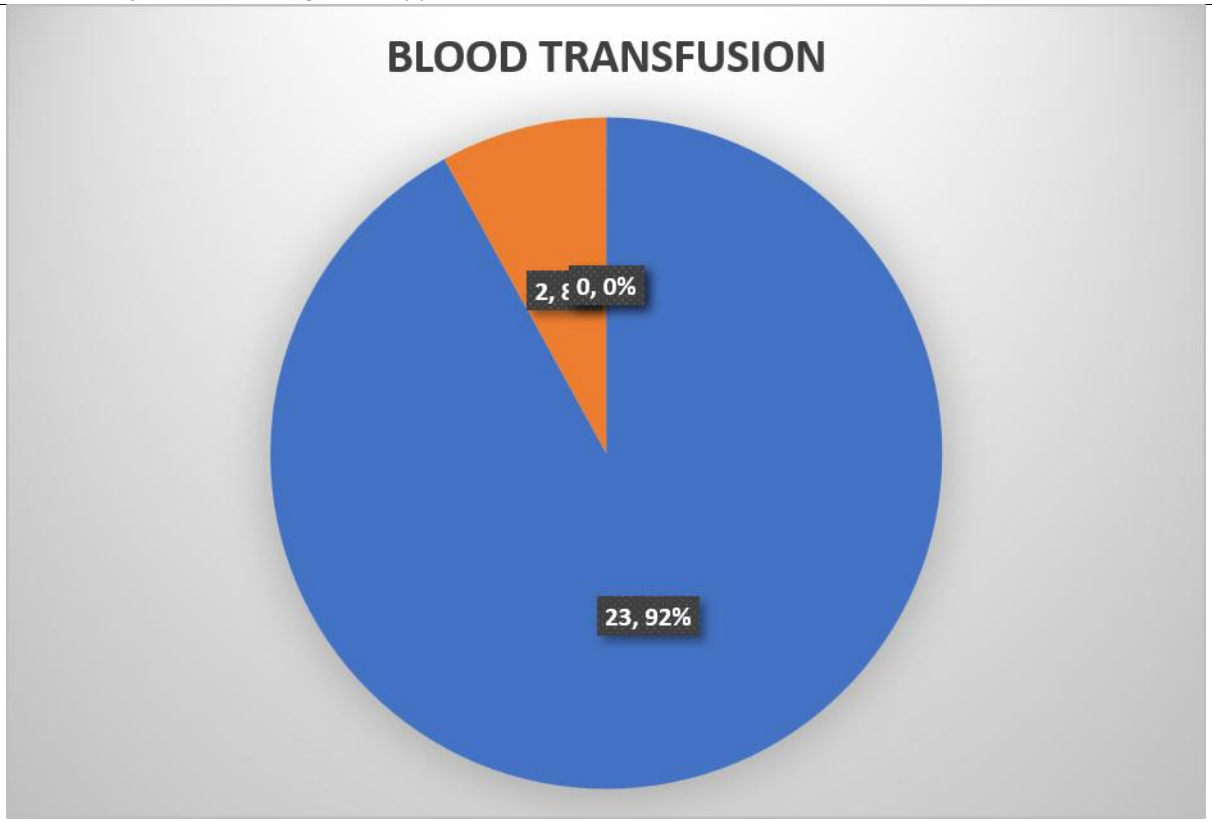
Postoperative and Oncological Outcomes The mean length of hospital stay was 5.6 days. A clinical trend toward faster discharge was noted as experience increased, dropping from an average of 6.0 days in the Early Cohort to 5.2 days in the Late Cohort ($p = 0.158$), eventually stabilizing to a uniform 4-day stay in the final 6 cases.

The overall 30-day readmission rate was 12% (n = 3), and the reoperation rate was 0%. Histopathological examination revealed positive surgical margins (PSM) in 8% (n = 2) of the cohort, who were subsequently advised surgical bed radiotherapy. Short-term follow-up indicates no biochemical recurrence, with serum PSA levels maintaining between 0.01 and 0.6 ng/ml.

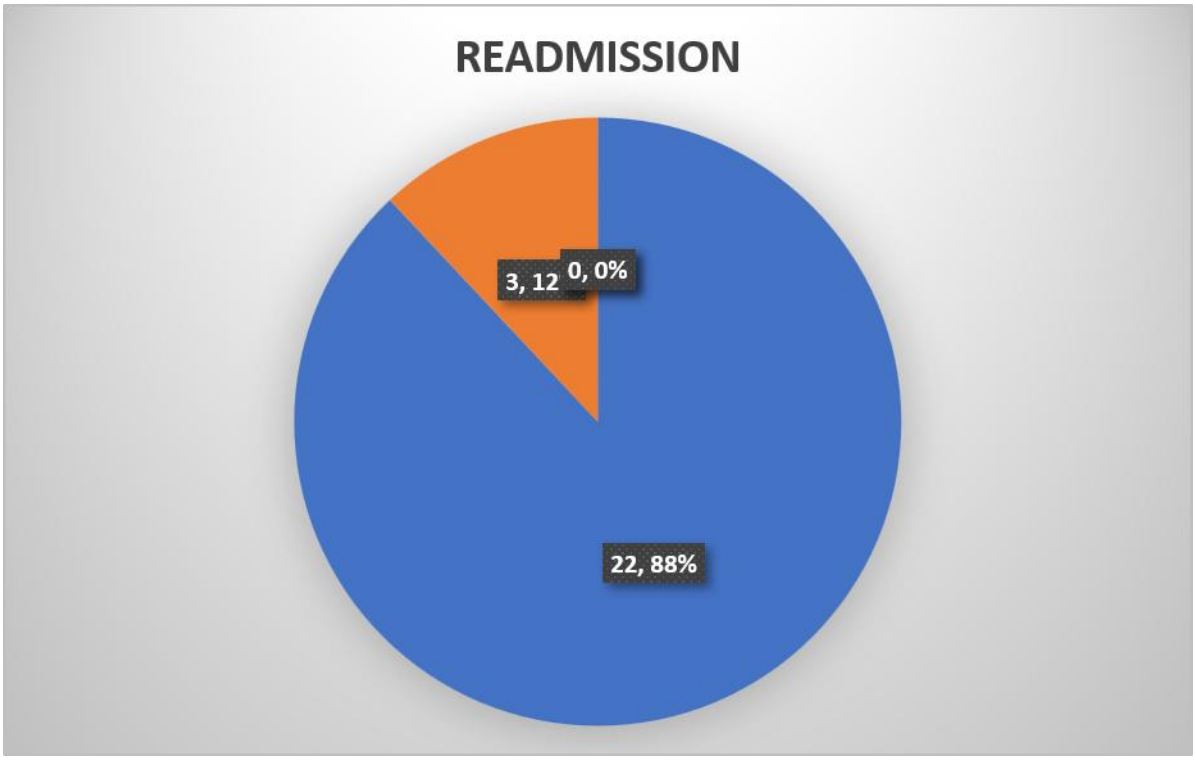
Complications and Functional Recovery Transient urinary incontinence (UI) was the most common expected complication upon catheter removal. Following rigorous pelvic floor muscle training (PFMT), 28% of patients (n = 7) achieved complete continence (pad-free) at 3 months. This improved sequentially, with an additional 52% (n = 13) achieving dry status by 9 months.

Other postoperative complications included mild pyrexia (n = 3), paralytic ileus (n = 2), and urosepsis (n = 2), all of which were successfully managed with standard conservative and pharmacological protocols. One major complication involved a moderate-sized urinoma due to an anastomotic leak 24 hours post-operatively; this was resolved conservatively utilizing broad-spectrum antibiotics and prolonged gentle traction via a 30cc inflated catheter bulb.,

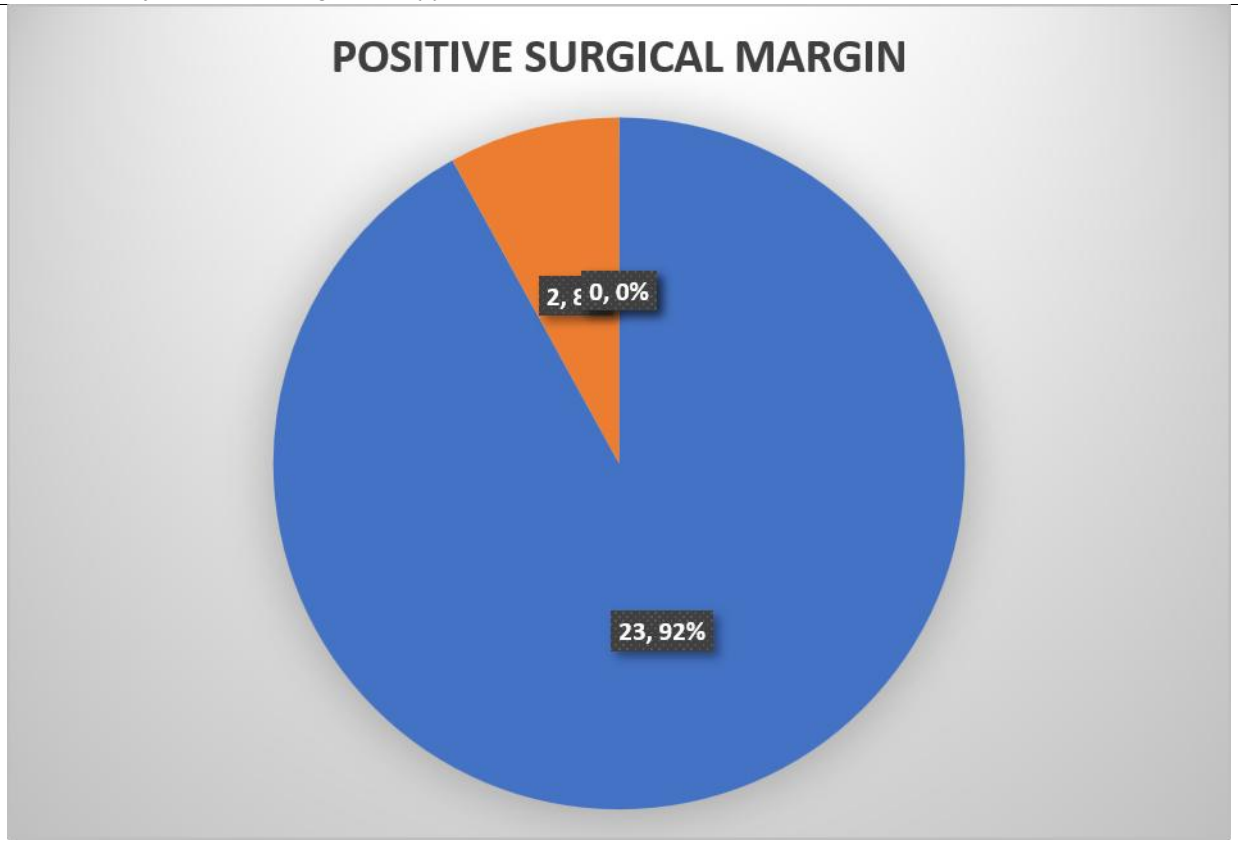
CHARTS AND DIAGRAMS



Above chart shows that only 2 out of 25 patients needed blood transfusion, that is only 8% patients. Each needed 1 unit of blood

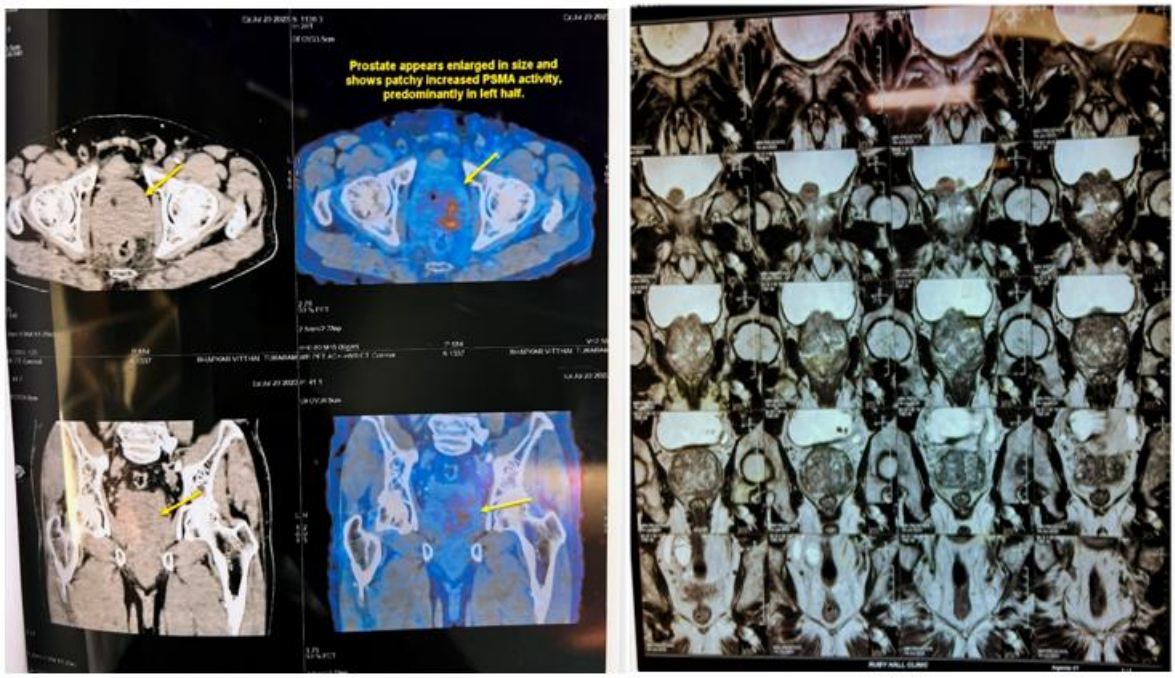


Readmission rate is only 12% , 3 out of 25 patients got readmitted within 30 days of discharge for some complications



Only 2 out of 25 patients had post-surgical margins positive on histopathological examination (8% of total).

PRE-OPERATIVEREPRESENTATIVE IMAGE SHOWING PSMA PET CT SCAN AND MULTIPARAMETRIC MRI IN IT'S T2 PHASE.



INTRA-OPERATIVE REPRESENTATIVE IMAGE

POST OPERATIVE REPRESENTATIVE IMAGE OF ROBOTIC RADICAL PROSTATECTOMY

DISCUSSION

The integration of robotic technology into radical prostatectomy yields superior outcomes but requires structured skill development.9, 10 Our initial 25-case series demonstrates that RARP provides excellent results in trained hands. The most compelling finding of this study is the mathematical validation of the operative learning curve.10 The initial cases averaged over 5 hours; however, by bifurcating the dataset, we observed a statistically significant drop of over 90 minutes in operative time between the first and second halves of the series ($p < 0.0001$). This aligns with prior literature suggesting that previous high-volume laparoscopic experience accelerates robotic proficiency.9 Estimated blood loss and hospital stays mirrored this downward trajectory, reflecting enhanced tissue handling and

refined anatomical dissection as case volume increased.10 Functional recovery in our cohort strongly supports the efficacy of early intervention.7, 8 While early urinary incontinence is virtually ubiquitous due to the disruption of the sphincter complex, the steady return to pad-free continence in 80% of our mature follow-up group highlights the precision of the robotic apical dissection.10 Complication management was highly effective, yielding a 0% reoperation rate and no mortalities.

CONCLUSION

Robot-assisted radical prostatectomy is a highly safe, effective, and oncologically sound approach for the management of localized prostate cancer. This study concludes that an initial series of 25 RARP cases is sufficient to overcome the steepest portion of the surgical learning curve for a surgeon with prior laparoscopic expertise. As operative proficiency increases, surgical time significantly decreases alongside observable reductions in blood loss and hospital stay, ensuring optimal therapeutic and functional outcomes for the patient.

REFERENCES

1. Patel VR, Chammas MF Jr, Shah S. Robotic assisted laparoscopic radical prostatectomy: a review of the current state of affairs. Int J Clin Pract. 2007 Feb;61(2):309-14. doi: 10.1111/j.1742-1241.2006.01235.x. PMID: 17263718.
2. Smith JA Jr. Robotically assisted laparoscopic prostatectomy: an assessment of its contemporary role in the surgical management of localized prostate cancer. Am J Surg. 2004 Oct;188(4A Suppl):63S-67S. doi: 10.1016/j.amjsurg.2004.08.006. PMID: 15476654.
3. Wang J, Hu K, Wang Y, Wu Y, Bao E, Wang J, Tan C, Tang T. Robot-assisted versus open radical prostatectomy: a systematic review and meta-analysis of prospective studies. J Robot Surg. 2023 Dec;17(6):2617-2631. doi: 10.1007/s11701-023-01714-8. Epub 2023 Sep 18. PMID: 37721644
4. Du Y, Long Q, Guan B, Mu L, Tian J, Jiang Y, Bai X, Wu D. Robot-Assisted Radical Prostatectomy Is More Beneficial for Prostate Cancer Patients: A System Review and Meta-Analysis. Med Sci Monit. 2018 Jan 14;24:272-287. doi: 10.12659/msm.907092. PMID: 29332100; PMCID: PMC5776881.
5. Amornratananont N, Sirisopana K, Worawichawong S, Chalermsanyakorn P, Sangkum P, Pacharatakul S, Leenanupunth C, Kongchareonsombat W. Perioperative outcomes of robot-assisted laparoscopic radical prostatectomy (RALRP) and LRP in patients with prostate cancer based on risk groups. Arab J Urol. 2020 Apr 15;18(3):187-193. doi: 10.1080/2090598X.2020.1750865. PMID: 33029430; PMCID: PMC7473109.
6. Akand M, Celik O, Avci E, Duman I, Erdogru T. Open, laparoscopic and robot-assisted laparoscopic radical prostatectomy: comparative analysis of operative and pathologic outcomes for three techniques with a single surgeon's experience. Eur Rev Med Pharmacol Sci. 2015 Feb;19(4):525-31. PMID: 25753865.
7. Ku JY, Lee CH, Lee JZ, Ha HK. Comparison of functional outcomes between laparoscopic radical prostatectomy and robot-assisted laparoscopic radical prostatectomy: a propensity score-matched comparison study. Asia Pac J Clin Oncol. 2017 Jun;13(3):212-218. doi: 10.1111/ajco.12595. Epub 2016 Sep 26. PMID: 27667779.
8. Porpiglia F, Fiori C, Bertolo R, Manfredi M, Mele F, Checcucci E, De Luca S, Passera R, Scarpa RM. Five-year Outcomes for a Prospective Randomised Controlled Trial Comparing Laparoscopic and Robot-assisted Radical Prostatectomy. Eur Urol Focus. 2018 Jan;4(1):80-86. doi: 10.1016/j.euf.2016.11.007. Epub 2016 Nov 23. PMID: 28753822.
9. Ku JY, Ha HK. Learning curve of robot-assisted laparoscopic radical prostatectomy for a single experienced surgeon: comparison with simultaneous laparoscopic radical prostatectomy. World J Mens Health. 2015 Apr;33(1):30-5. doi: 10.5534/wjmh.2015.33.1.30. Epub 2015 Apr 23. PMID: 25927060; PMCID: PMC4412005.
10. Good DW, Stewart GD, Laird A, Stolzenburg JU, Cahill D, McNeill SA. A Critical Analysis of the Learning Curve and Postlearning Curve Outcomes of Two Experience- and Volume-Matched Surgeons for Laparoscopic and Robot-Assisted Radical Prostatectomy. J Endourol. 2015 Aug;29(8):939-47. doi: 10.1089/end.2014.0810. Epub 2015 Feb 25. PMID: 25630790.