

Retrospective Study

Long-Term Follow-Up After Laparoscopic Radical Prostatectomy for Localized and Locally Advanced Prostate Cancer

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ABSTRACT**Objective**

To explore the impact of laparoscopic radical prostatectomy (LRP) on lower urinary tract symptoms and erectile function.

Materials and Methods

A retrospective study was conducted on patients who underwent LRP at the Civil Hospital Ahmedabad's Urology Department from June 2008 to June 2023.

Results

Major complications following LRP are generally rare, including bladder neck stenosis, erectile dysfunction, and urinary incontinence. The incidence of erectile dysfunction varies widely, ranging from 11-87%, and urinary incontinence ranges from 0-87%, depending on the definitions used. Functional decline typically peaks shortly after surgery, with the most rapid recovery occurring within the first year post-LRP. Some patients continue to improve gradually over time. However, for some men, these adverse effects can be long-lasting. Other, less common side effects should also be considered. Despite significant technological advancements in the past 20 years, no single surgical technique has emerged as superior in terms of long-term outcomes, as surgical volume, surgeon experience, and patient characteristics remain key determinants.

Conclusion

When discussing treatment options for prostate cancer, it is crucial to consider potential complications like erectile dysfunction and urinary incontinence following LRP, as well as the expected recovery period. Counseling is provided to patients, taking into account their age and overall health profile. Surgical advice is given to eligible patients after evaluating the risk-benefit ratio. Patients who are older or do not meet the criteria are given appropriate guidance. All patients are informed about the possible complications after surgery and are presented with the option of palliative care or surgical treatment.

Keywords

Erectile dysfunction; Laparoscopic radical prostatectomy; Lower urinary tract symptoms; Long-term follow-up; Prostate cancer.

INTRODUCTION

The concern over the adverse effects of aggressive treatment on lower urinary tract function and erectile function is a significant barrier to prostate cancer screening and therapy, in addition to the problem of overtreatment.^{1,2} Despite extensive research and clinical experience, there is still considerable variation in the extent to which lower urinary tract symptoms (including erectile function and urinary incontinence) are affected by radical pros-

tatectomy (RP).³ This variability is exemplified by the reported incidence of erectile dysfunction after laparoscopic radical prostatectomy (LRP).⁴ While centers of excellence report potency rates of 90-95%, recent meta-analyses and independent surveys in the placebo arms of randomized trials suggest much lower rates of 20-30%.^{4,5} Similarly, there are varying statistics for urinary incontinence.^{6,7} The superiority of the robotic approach over other methods in this context is still a matter of debate due to the lack of conclusive level-I evidence. Given the life expectancy following

radical prostatectomy, understanding the long-term effects of the surgery on lower urinary tract function is critically important for patients, surgeons, and from a socioeconomic perspective.⁸ The impact of aging on diminished urinary function must also be considered when evaluating the long-term outcomes of such surgeries.

In our study, we focused on men who had undergone laparoscopic RP without any additional adjuvant therapy and had a minimum follow-up of five years. We assessed each patient using the International Prostate Symptom Score (IPSS), the Bristol Lower Urinary Tract Symptoms (LUTS) questionnaire,⁹ and the International Index of Erectile Function-5 (IIEF-5).¹⁰

MATERIALS AND METHODS

Study Design

For this study, we selected only men who did not receive adjuvant therapy and had a minimum follow-up period of five years after undergoing LRP with nerve-sparing and intracorporeal vesicourethral anastomosis. This emphasis on long-term post-surgery outcomes informed our decision to set a minimum follow-up duration of five years.

Inclusion criteria: The study included patients aged between 61 and 80 years with a body mass index (BMI) of less than 35 and an Eastern Cooperative Oncology Group (ECOG) performance status score of 0 or 1. Eligible patients were those diagnosed with localized or locally advanced prostate carcinoma and who had not undergone adjuvant therapy.

Exclusion criteria: We excluded patients with metastatic disease, those older than 80 years and patients who chose non-surgical management options.

At the outset, we conducted a comprehensive evaluation of each participant. This included a review of clinical history, medical comorbidities, past surgical history, and a physical examination noting age, weight, height, BMI, heart rate, and blood pressure. The study eventually included a total of 284 men, with a mean age of 71 years (range: 61-80 years) and an average follow-up duration of 7.1 years post-LRP (range: 5-13 years). Additional

assessments included stress factors, urinalysis, seven blood laboratory parameters, such as renal and liver function tests, and a complete blood count (CBC).

Questionnaires

The questionnaire administered to the participants included a range of disease-specific questions, such as PSA levels at diagnosis, histological details of the LRP specimen, any instances of PSA relapse, and whether any adjuvant therapy was received. Additionally, the questionnaire incorporated questions from the IPSS, the IIEF-5 and the Bristol Female LUTS questionnaire.

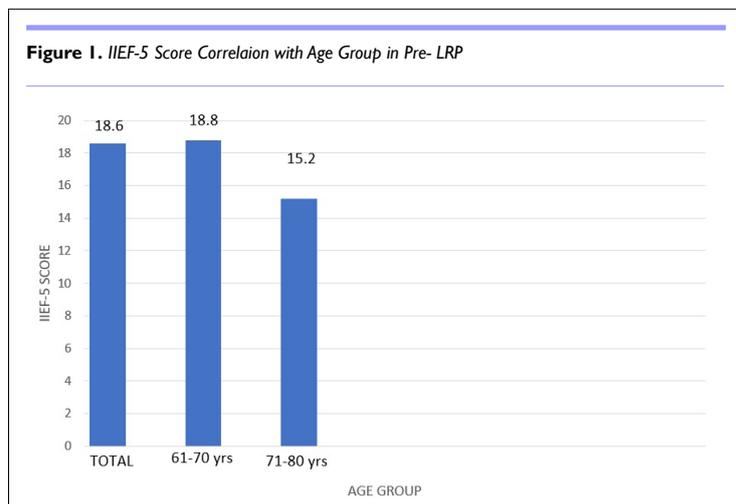
RESULTS

Characteristics of the Study Population

The study involved a total of 284 men, with a mean follow-up period of 7.1 years post-LRP (ranging from 5-13 years) and an average age of 71 years (ranging from 61-80 years). The characteristics of the tumors were as follows: mean PSA level was 8.5 ± 5.5 ng/mL (ranging from 0.3 to 56 ng/mL), 48% had a Gleason score of 6, 41% had a Gleason score of 7, and 11% had Gleason scores ranging from 8 to 10. Post-operatively, 67% had pT2 tumors, 33% had pT3 tumors, and 22.9% had positive surgical margins. To assess the impact of age, patients were categorized into two age groups: 60-70 years (n=162; mean age 66 ± 2.9 years) and 71-80 years (n=122; mean age 75 ± 2.9 years).

Erectile Function

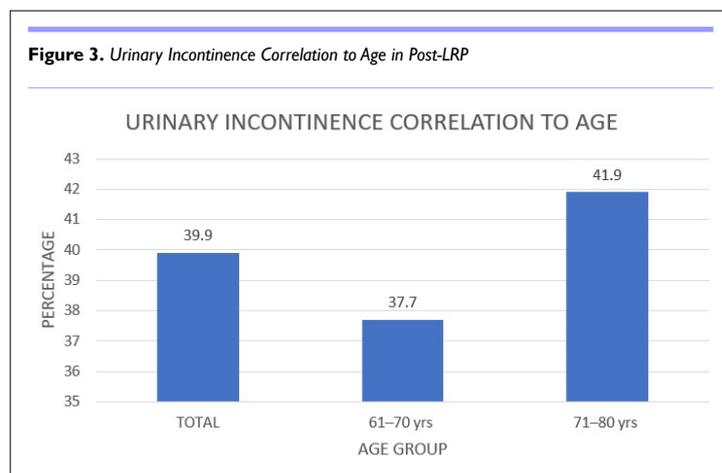
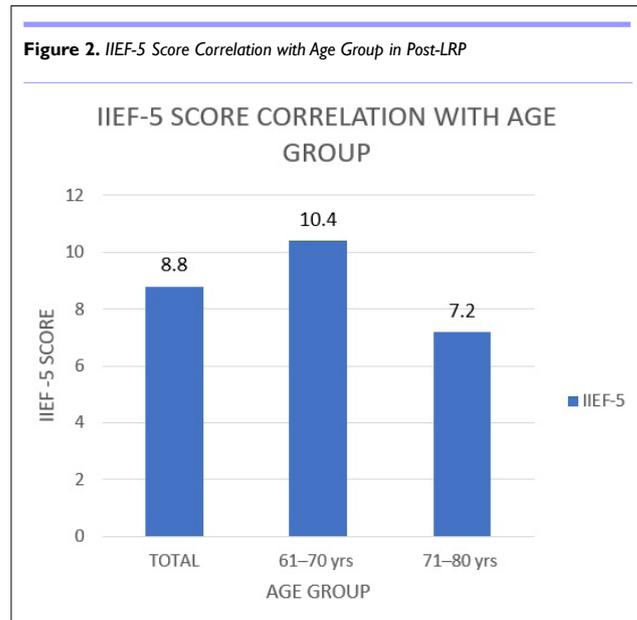
The average IIEF-5 score among LRP patients was 8.8 ± 6.5 . Erectile dysfunction (ED) was classified into five categories based on the IIEF-5 score, which ranges from 5 to 25: severe (5-7), moderate (8-11), mild to moderate (12-16), mild (17-21), and no ED (22-25). The mean IIEF-5 score was 10.4 ± 6.6 in patients aged 61-70 years post-LRP, compared to 7.2 ± 6.5 in men aged 71-80 years post-LRP. In both age groups, 81% of patients experienced moderate-to-severe ED (IIEF-5 < 18) following LRP. Figure 1 illustrates that the risk of moderate or severe ED after LRP decreased from 4.7-fold in the younger age group to 2.2-fold in the older age group.



The average IIEF-5 score among carcinoma prostate patients pre-operatively was 18.6 ± 4.5 . The mean IIEF-5 score was 18.8 ± 4.6 in patients aged 61-70 years, and in men aged 71-80 years, it was 15.2 ± 4.8 among carcinoma prostate patients pre-operatively. Some patients had erectile dysfunction pre-operatively due to older age, co-morbid conditions, and locally advanced cancer. The mean IIEF-5 score post-operatively was 10.4 ± 3.6 in patients aged 61-70 years, and in men aged 71-80 years, it was 7.2 ± 3.6 . The average IIEF-5 score among carcinoma prostate patients post-operatively was 8.8 ± 3.4 (Figure 2).

Urinary Incontinence Following LRP

The overall prevalence of urinary incontinence (UI) among men post-LRP was 39.9%. UI is defined as any involuntary loss of urine experienced during the preceding four weeks. In the age group of 60-70 years, the prevalence of UI post-LRP was 41.9%, while it was 37.7% in the age group of 71-80 years, as shown in Figure 3. In the younger cohort (60-70 years), 34.5% of men reported experiencing episodes of urinary incontinence once a week or less frequently, compared to 36% in the older cohort (71-80 years). Regarding



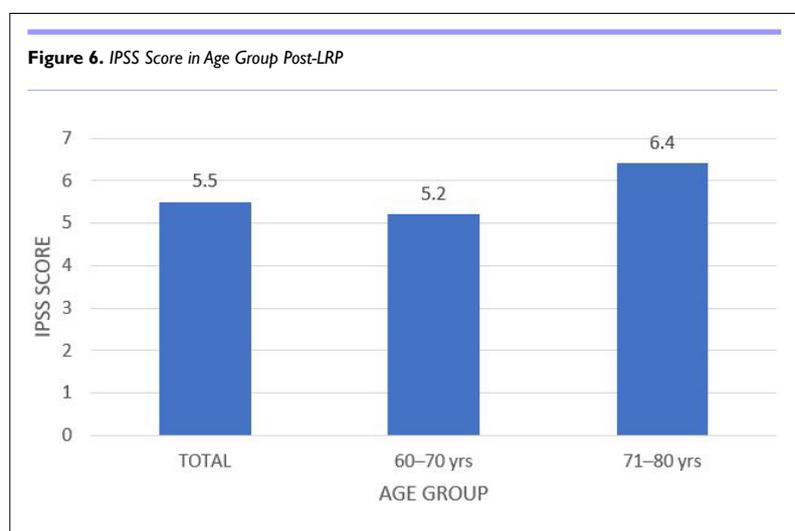
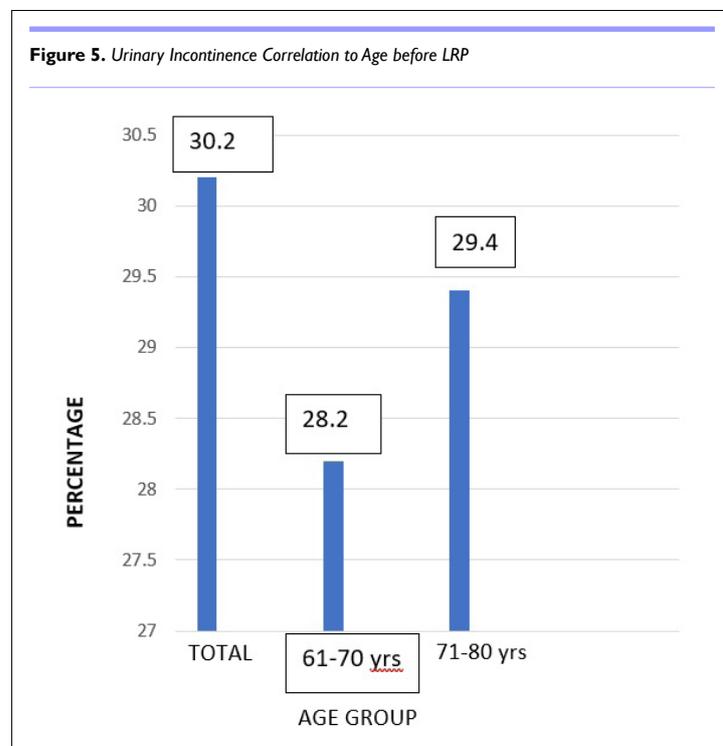
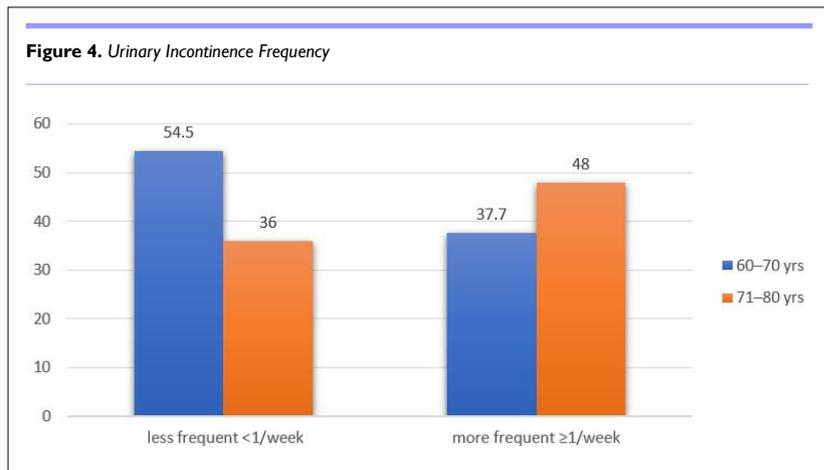
more frequent episodes of urinary incontinence (occurring at least once per week), the respective percentages were 37.7% for the 60-70 year group and 48.0% for the 71-80 year group (Figure 4). The impact of urinary incontinence on quality of life was reported to some degree by 70.1% of the younger group (60-70 years) and 66.1% of the older group (71-80 years) following LRP.

The overall prevalence of UI among men before LRP was 30.2%. In the age group of 61-70 years, the prevalence of UI before LRP was 28.2%, while it was 29.4% in the age group

of 71-80 years, as shown in Figure 5. The prevalence of urinary incontinence in patients before surgery was due to older age and associated co-morbid conditions.

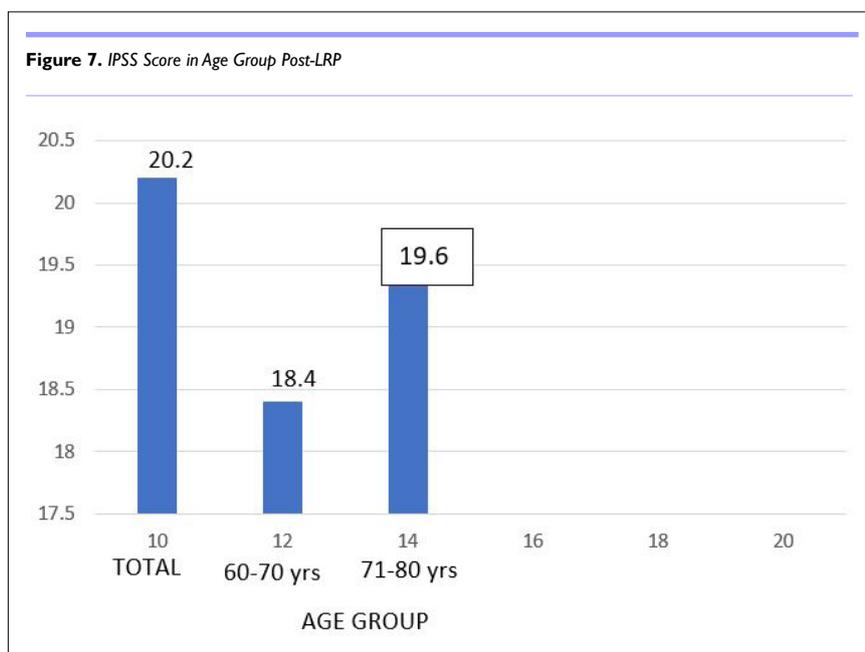
Lower Urinary Tract Symptoms

The mean IPSS in men after LRP was 5.5 ± 4.6 (Figure 3). In the younger age group, the IPSS was 5.2 ± 4.4 . The older age group after surgery had a higher IPSS of 6.4 ± 4.9 (Figure 6).



Prior to LRP, men had a mean IPSS score of 20.2 ± 4.3 (Figure 3). In the younger age group, the IPSS was 18.4 ± 4.7 . The older age group before surgery had an IPSS of 19.6 ± 4.4 (Figure 7).

There was a significant decrease in the IPSS score post-surgery due to the relief of bladder outlet obstruction.



DISCUSSION

Our study is the longest of its kind, with an average follow-up of over five years after LRP. It focuses on three main areas: lower urinary tract symptoms (using the IPSS), erectile function (assessed by the IIEF-5), and urinary incontinence (measured with the Bristol LUTS questionnaire).

Reported potency rates after LRP exhibit significant variation.^{4,5} A systematic review by Ficarra et al⁴ found that one year after surgery, the rates of regaining sexual function varied widely by surgical method: 10 to 73% for retropubic prostatectomy, 42-76% for LRP and 70-80% for robot-assisted laparoscopic radical prostatectomy (RARP). Barry et al¹¹ conducted a study involving 406 patients who underwent robotic LRP and 220 who had open LRP. In this cohort, only 2.9% of patients aged 66 years or older at the time of surgery reported no sexual difficulties, while a similar percentage (2.3%) was observed in patients who underwent robotic surgery.¹² A recent meta-analysis on penile rehabilitation by Schauer et al⁵ indicated that in most studies, only 20-25% of patients preserved normal erectile function following nerve-sparing LRP. Notably, these rates have not shown significant improvement over the past 17 years.⁵ In our study, the incidence of moderate to severe ED was 4.7 times higher in the age group of 61-70 years following LRP, but this ratio decreased to 2.2 in the 71-80 year age group. Deliveliotis et al¹³ published the only study with a similar design. They monitored 80 unoperated control patients from urological outpatient clinics and followed 105 patients who underwent LRP over two years. In their series, only 24.8% of patients achieved a firm erection post-LRP, compared to 72.8% in the control group, indicating a significant reduction in erectile function. These findings are consistent with the

outcomes of our study.

According to various studies, the incidence of UI following LRP ranges from 0% to 87%. While some centers of excellence report continence rates exceeding 90%, other sources, such as Medicare data, suggest higher rates of incontinence.^{12,14} This wide variation can be attributed to different definitions of UI, methods of assessing the return of continence, timing of post-operative reporting, and patient selection.^{12,14} In this study, we utilized the relatively strict definition from the Bristol Female LUTS questionnaire, which considers any involuntary loss of urine that occurred in the preceding four weeks.¹⁰ Men who underwent LRP exhibited a 5.5-fold increased risk of UI compared to healthy men in the 60-70 year age group; this excess risk decreased to a 3-fold risk in the 71-80 year age group. The decline was not due to lower UI rates in the surgery group but rather to a higher incidence of UI in the advanced-age control group (13.1%).

Multiple trials have investigated LUTS following LRP. Schwartz et al¹⁵ conducted a prospective study with 104 patients who had an open radical prostatectomy. One year after LRP, men suffering from moderate to severe LUTS experienced a 51% decrease (-6.4 points) in the overall American Urological Association (AUA) symptom score, a 57% decrease (-4.2 points) in the symptom problem index, and a 25% reduction (-0.7 points) in the quality-of-life score.¹⁵ All AUA symptom score parameters, except for nocturia, showed significant improvement.¹⁵ Men with minimal or non-existent LUTS exhibited no notable changes.¹⁵ In a study by Matsubara et al,¹⁶ men with moderate-to-severe LUTS exhibited lower IPSS after perineal radical prostatectomy. Wang et al¹⁷ followed 100 patients for 12 months after robotic radical prostatectomy and

found major improvements in their IPSS and IPSS-QoL scores, which changed from 14.1-2.9 and from 3.4-1.6, respectively.¹⁷ However, patients with minimal or non-existent LUTS did not show significant improvements.¹⁷ Slova et al¹⁸ prospectively followed 453 men for up to 48 months after surgery, observing comparable trends in symptoms related to storage and voiding.¹⁸ In our study, men who had surgery showed a decrease in their IPSS scores, indicating that removing the prostate changed the natural behavior of the lower urinary tract by eliminating blockage.

Donovan et al¹⁹ recently published a number of patient-reported outcomes, including LUTS and ED based on the ProtecT trial. A total of 1643 men were randomly assigned to receive active monitoring, surgery, or radiation and were then followed for up to 6 years using a range of quality-of-life measures.¹⁹ As expected, after 6 years of active monitoring (a follow-up comparable to our series), the rates of UI and ED were higher following LRP than after active monitoring.¹⁹ However, the absolute difference between surgery and conservative management in the ProtecT trial was significantly smaller,¹⁹ in contrast to our series. One explanation for this disparity may be the differing impacts of active surveillance on lower urinary tract function.

The Civil Hospital Ahmedabad's retrospective study of RP for localized prostate cancer underscores the importance of understanding the complex effects on erectile function and LUTS. The study found that major complications following LRP were generally rare. However, the frequency of significant adverse effects, such as incontinence and erectile dysfunction, varied considerably, highlighting the complexity of these outcomes. There was a peak in functional decline shortly after surgery, particularly in erectile function, indicating an immediate effect on patients.

Although long-term improvements are possible, the research suggests that the most rapid rate of recovery occurs in the first year after LRP. In terms of long-term outcomes, no single surgical technique stands out, despite technological advances. Patient characteristics, surgical volume, and surgeon experience continue to be critical determinants of outcomes. Notably, some patients may experience long-lasting negative effects, particularly regarding erectile function and urinary continence. Additionally, when evaluating the overall impact of the procedure on patients' quality of life, less common side effects should not be overlooked.

The results emphasize the importance of providing patients with comprehensive counseling about the potential side effects and recovery timeline associated with radical prostatectomy. When patients are considering prostate cancer treatment options, it is essential to understand the frequency of these side effects and their potential long-term implications. Ongoing research and a patient-centered approach remain crucial for improving surgical techniques and managing localized and locally advanced prostate cancer.

CONCLUSION

Radical prostatectomy continues to have a significant, long-term detrimental impact on erectile function and urinary incontinence.

The prevalence of side effects related to erectile function and urinary continence following LRP as well as the trajectory of recovery, should be carefully considered when counseling patients about their treatment options for prostate cancer.

CONFLICTS OF INTEREST

There are no conflicts of interest involving any of the contributing authors, including any particular financial interests, affiliations, or relationships that are relevant to the topics or materials covered in the manuscript.

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