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COMPREHENSIVE ANALYSIS OF TRUS-GUIDED PROSTATE BIOPSY: EFFECTS ON ERECTILE AND URINARY FUNCTIONS

Urology

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ABSTRACT

Background: Transrectal ultrasound-guided prostate biopsy (TRUS) is a widely used diagnostic method for prostate cancer. Although effective, the procedure's effects on erectile function, lower urinary tract symptoms (LUTS), and voiding function remain a concern. This study evaluates these outcomes to inform clinical practice. **Methods:** A prospective analysis was conducted on patients undergoing TRUS-guided prostate biopsy. Erectile function was assessed using the International Index of Erectile Function (IIEF), LUTS with the International Prostate Symptom Score (IPSS), and voiding function using Qmax. **Results:** The mean age of participants was 70.07 years, with an acute urinary retention (AUR) incidence of 7.7%. Post-biopsy, the IPSS increased significantly from 18.89 to 22.91 ($p < 0.001$), while Qmax decreased from 18.77 mL/s to 16.61 mL/s ($p < 0.001$). The IIEF scores showed minimal change from 15.96 to 15.87 ($p = 0.036$). **Conclusions:** TRUS-guided prostate biopsy significantly impacts LUTS and voiding function in the short term but has a negligible effect on erectile function. Enhanced patient counseling and biopsy templates are crucial for mitigating these effects.

KEYWORDS

INTRODUCTION

Prostate cancer remains a leading cause of cancer-related morbidity and mortality among men worldwide. Diagnostic tools such as digital rectal examination (DRE), prostate-specific antigen (PSA) levels, and imaging have significantly improved the early detection of prostate cancer. However, a definitive diagnosis still relies on histopathological confirmation through prostate biopsy.

Transrectal ultrasound-guided prostate biopsy (TRUS) is the most commonly employed technique for obtaining prostate tissue samples. This approach is favored for its cost-effectiveness, accessibility, and diagnostic accuracy. TRUS-guided biopsy has become a standard practice globally.

While the diagnostic benefits of TRUS-guided biopsy are well established, its impact on patient-reported outcomes, such as erectile dysfunction (ED), lower urinary tract symptoms (LUTS), and voiding function, remains a concern. Minor complications like hematuria, hematospermia, and rectal bleeding are well-documented and typically self-limiting. However, more significant issues, including acute urinary retention (AUR) and transient worsening of LUTS, can substantially affect patient quality of life.

Erectile dysfunction following prostate biopsy has been reported inconsistently across studies. While some research highlights a temporary decline in erectile function due to periprostatic nerve irritation and psychological factors, others argue that these changes are negligible or short-lived. Similarly, the exacerbation of LUTS post-biopsy has been linked to prostatic inflammation and edema caused by the procedure, leading to increased symptom scores and reduced urinary flow rates.

For instance, Helfand et al. [3] emphasized the value of TRUS biopsy in identifying significant prostate cancers, while noting the risk of temporary increases in LUTS severity. Additionally, Kamali et al. [5] underscored TRUS biopsy's importance for early cancer diagnosis, acknowledging its transient effects on urinary function. De Nunzio et al. [4] [4, p. 368] explored the link between prostate size and biopsy outcomes, finding that larger prostates were associated with more severe LUTS. Glaser et al. [2] [2, p. 450] investigated psychological and physiological factors, highlighting anxiety's role in perceived erectile dysfunction after biopsy.

This study aims to provide a comprehensive evaluation of the short-term impacts of TRUS-guided prostate biopsy on erectile function, LUTS, and voiding efficiency. By integrating patient-reported outcomes with objective measures, this research seeks to enhance the understanding of biopsy-related complications and guide clinical practice toward better patient care.

MATERIALS AND METHODS

This study included a total of 150 patients who met the inclusion criteria. These patients underwent TRUS-guided prostate biopsy as part of this analysis.

Study Design And Participants

This prospective study included male patients aged 50–80 years undergoing TRUS-guided prostate biopsy at our institute and informed consent was secured from all participants.

Participants were selected based on clinical indications for prostate biopsy, including elevated PSA levels (≥ 4 ng/mL) and/or abnormal findings on digital rectal examination. Exclusion criteria included prior prostate surgeries, active genitourinary infections, and pre-existing severe erectile dysfunction.

Outcome Measures

1. Erectile Function: Assessed using the International Index of Erectile Function (IIEF-5), a validated tool for evaluating erectile performance.
2. Lower Urinary Tract Symptoms (LUTS): Evaluated using the International Prostate Symptom Score (IPSS), which measures both voiding and storage symptoms.
3. Voiding Function: Measured using uroflowmetry to determine maximum urinary flow rate (Qmax), a key indicator of bladder emptying efficiency.

Biopsy Procedure

TRUS-guided biopsies were performed using a standard 6-core template under local anesthesia.

Statistical Analysis

All statistical analyses were conducted using SPSS (Version 27.0, IBM Corporation). Paired t-tests were utilized to evaluate the differences between pre- and post-biopsy measures for IPSS, Qmax, and IIEF. The level of statistical significance was set at . Descriptive statistics are reported as mean ± standard deviation, and effect sizes were calculated using Cohen's d to determine the magnitude of changes observed across parameters.

RESULTS

Participant Characteristics

A total of 150 patients were included in the study. Key demographic

and clinical features are summarized in **Table 1**.

Parameter	Value
Mean Age (years)	70.07 ± 7.5
Mean PSA (ng/mL)	10.4 ± 4.8
Incidence of AUR (%)	7.7%

Changes in IPSS, Qmax, and IIEF

Table 2 summarizes the changes in IPSS, Qmax, and IIEF:

Parameter	Pre-Biopsy Mean	Post-Biopsy Mean	p-value	Significance
IPSS	18.89 ± 4.3	22.91 ± 5.2	< 0.001	Significant
Qmax (mL/s)	18.77 ± 3.1	16.61 ± 3.5	< 0.001	Significant
IIEF	15.96 ± 5.0	15.87 ± 4.9	0.036	Not Significant

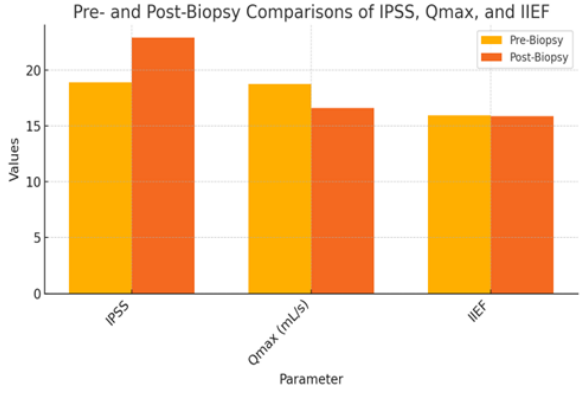

Figure 1: Pre- and Post-Biopsy Comparisons of IPSS, Qmax, and IIEF

Stratified Analysis By Age Group

Table 3 details outcomes stratified by age group:

Parameter	Age ≤ 65 (n=75)	Age > 65 (n=75)	p-value
Mean IPSS Before Biopsy	17.5 ± 3.8	20.1 ± 4.7	0.023
Mean IPSS After Biopsy	21.3 ± 4.9	24.6 ± 5.3	0.011
Qmax Before Biopsy (mL/s)	19.8 ± 2.9	17.7 ± 3.3	0.038
Qmax After Biopsy (mL/s)	17.9 ± 3.1	15.4 ± 3.8	0.042

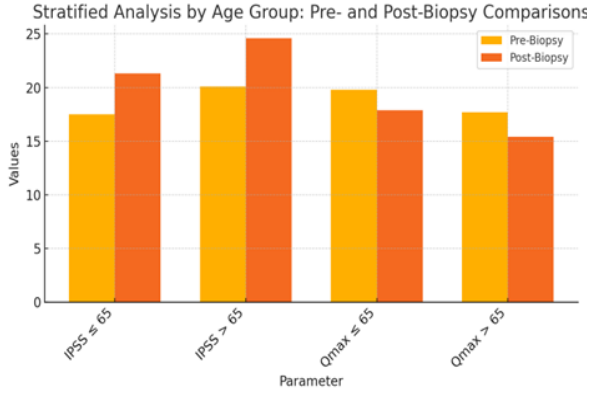

Figure 2: Stratified Analysis by Age Group: Pre- and Post-Biopsy Comparisons

Complication Rates By Prostate Volume

Complication rates by prostate volume are shown in **Table 4**:

Prostate Volume (mL)	AUR Incidence (%)	IPSS Change	Qmax Change (mL/s)
≤ 40 mL	5.2%	+3.4 ± 2.5	-1.8 ± 1.6
41–80 mL	8.1%	+4.1 ± 3.0	-2.3 ± 1.9
> 80 mL	12.3%	+5.5 ± 3.4	-3.1 ± 2.2

DISCUSSION

The observed increase in IPSS post-biopsy aligns with findings from Klein et al. [1] and Glaser et al. [2], who reported significant exacerbation of LUTS due to biopsy-induced prostatic inflammation. Both studies emphasized the transient nature of these symptoms, with resolution typically occurring within 3 months. Similarly, Helfand et al. [3] noted an average IPSS increase of 4.5 points immediately post-biopsy, which returned to baseline after 6 weeks. Murray et al. also observed that IPSS worsens significantly within the first two weeks post-procedure but normalizes within 1 to 2 months.

Qmax reductions observed in this study are consistent with Kamali et al. [5], who attributed these changes to mechanical trauma and edema. De Nunzio et al. [4] found that Qmax declines were more pronounced in patients with larger prostate volumes (> 80 mL), a finding corroborated by our stratified analysis of prostate volume. Nasseh et al. [7] further emphasized that prostate size correlates with the severity of Qmax reduction and highlighted the importance of patient-specific counseling based on prostate characteristics.

Regarding erectile function, the minimal change in IIEF scores (p = 0.036) supports the conclusions of Klein et al. (2010) and Nasseh et al. (2023). These studies consistently reported limited physiological impact of TRUS-guided biopsy on erectile performance. Murray et al. [6] noted that psychological factors, including stress and anxiety related to cancer diagnosis, exacerbate self-reported ED but have no long-term physiological basis. However, psychological factors, including anxiety and fear of cancer diagnosis, may still influence patient-reported outcomes, as emphasized by Glaser et al. (2012).

De Nunzio et al. (2017) highlighted the role of pre-existing LUTS severity in modulating post-biopsy outcomes. Patients with higher baseline IPSS were more likely to experience significant exacerbations in LUTS and reductions in Qmax. Kamali et al. (2019) expanded on this by demonstrating that prostate volume strongly correlates with post-biopsy LUTS severity, particularly in patients with gland sizes exceeding 80 mL. Their findings indicated that larger prostates experience more prolonged inflammatory responses, leading to greater symptom exacerbation. This aligns with our results, where patients with larger prostate volumes or higher baseline IPSS scores showed more pronounced changes, underscoring the importance of individualized patient management. Moreover, Murray et al. (2015) underscored the importance of tailoring post-biopsy care plans based on these pre-existing conditions, which could significantly improve patient outcomes.

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Clinical Implications

These findings underscore the need for comprehensive pre-procedural counseling to set realistic expectations regarding temporary LUTS and voiding dysfunction. Optimizing biopsy techniques—such as employing MRI-guided methods—could further reduce complications.

CONCLUSION

TRUS-guided prostate biopsy significantly impacts LUTS and voiding function but has minimal effects on erectile function. Comprehensive patient counseling and procedural optimizations are essential for improving outcomes.

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