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Disparity Between Prostate Biopsy and Radical Total Prostatectomy Gleason Scores: an Evaluation of Histopathological Grading Accuracy

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ABSTRACT

Introduction: *Preoperative needle biopsy-based risk classification for prostate cancer is the basis for treatment choice, especially in resource-limited settings like Cameroon. However, there is evidence that it underestimates the tumor risk when compared to postoperative whole-tumor pathology. We conducted a retrospective study in a single urological center in Douala to compare preoperative biopsy-based tumor parameters with postoperative findings from transperitoneal laparoscopic total prostatectomy, hypothesizing that preoperative assessment underestimates tumor risk.*

Methods: *We analyzed clinical records of 130 patients with prostate adenocarcinoma treated between 2015 and 2025 at a urological center in Douala, Cameroon. All patients underwent 12-core prostate biopsy under local anesthesia (lidocaine without adrenaline), with preoperative Gleason score, International Society of Urological Pathology (ISUP) grade group, and tumor risk category (low, intermediate, or high) recorded. Within one month, all patients underwent transperitoneal laparoscopic total prostatectomy, and postoperative histological parameters were recorded. McNemar's chi-squared test assessed discordance between preoperative and postoperative risk classifications.*

Results: *The mean age of our participants was 60.99±6.06 years. Overall, there was a statistically significant difference between tumor risk determined via biopsy and risk determined via whole-sample histology. Biopsy-based risk assessment frequently underestimates true tumor risk compared to postoperative pathology from the prostatectomy specimen, confirming substantial discordance between the two sampling methods.*

Conclusion: *Preoperative biopsy-based tumor risk classification significantly underestimates true tumor risk in prostate adenocarcinoma. In low-resource settings where patients cannot afford repeat surgeries, clinicians must interpret biopsy risk categories cautiously and consider clinical and biological parameters to anticipate undergrading.*

Keywords

Adenocarcinoma, Biopsy, Prostate, Resource-Limited Settings, Risk Assessment, Retrospective Studies.

Introduction

Prostate cancer is a major cause of cancer morbidity and mortality in men worldwide [1] and its clinical behavior ranges from indolent disease to aggressive malignancy that requires definitive treatment. Although its incidence has been on the rise

worldwide, low-income countries bear the highest mortality-to-incidence ratios, reflecting diagnosis at more advanced stages and suboptimal treatment [2]. In Cameroon, prostate cancer is now the leading malignancy among males, especially in urban centers like Douala and Yaoundé, where hospital-based series report a high throughput of prostate cancer cases [3,4]. Accurate preoperative risk stratification is therefore central to choosing between surveillance, local therapy, and multimodal management [5]. In routine practice, the initial histologic assessment is based on needle biopsy, which samples only a small fraction of the gland and may not fully reflect the most aggressive tumor component [6]. This sampling limitation can lead to discordance between biopsy and prostatectomy pathology, including undergrading and risk misclassification [7]. The Gleason score and the International Society of Urological Pathology (ISUP) grade are widely used to describe tumor aggressiveness [8] and they form the basis of standard risk groupings such as low-, intermediate-, and high-risk disease. These systems have important prognostic value, but their accuracy depends on representative tissue sampling [9,10]. Studies comparing biopsy findings with whole-gland pathology have shown that upgrading after definitive surgery remains common, particularly when biopsy tissue underestimates the highest-grade component [11]. Such discordance may affect treatment selection and explain why some tumors classified as low or intermediate risk on biopsy are found to be more advanced on subsequent whole-tumor specimen analysis [12]. This issue is especially relevant in settings where transrectal or transperineal biopsy remains the main diagnostic step before definitive treatment, because limited sampling may miss clinically important heterogeneity within the prostate. In a setting such as Douala, where prostate tumors are a frequent cause of obstruction and other urologic emergencies [13], better knowledge of prostate biopsy accuracy has clinical relevance, especially as the average patient cannot afford to pay for a repeat surgery because of wrong tumor grading. Surgical techniques commonly used for relief of obstruction also provide specimens that can reveal additional histopathological information about the tumor burden within the gland [14]. Comparing biopsy-based parameters with postoperative pathology from prostatectomy specimens may therefore help quantify the degree to which preoperative evaluation underestimates tumor risk. Therefore, we conducted this study of men with adenocarcinoma of the prostate treated at a single center in Douala, Cameroon, over a decade to compare preoperative biopsy-based tumor parameters with postoperative histopathological findings from the surgically removed prostate.

Methods

Study design and setting

This was a retrospective observational study conducted in a tertiary urological center located in Douala, Cameroon. The center provides minimally invasive urological care, including prostate surgery, and has maintained clinical records of patients managed over multiple years.

Study population

The source population consisted of men with histologically confirmed adenocarcinoma of the prostate who underwent transperitoneal laparoscopic total prostatectomy between 2015 and 2025, within a month of confirmation of the diagnosis through biopsies. For the present analysis, we selected a sample of 130 consecutive eligible patients from the available records.

Eligibility criteria

We included patients with preoperative prostate biopsy, available histopathology results from the biopsy, and complete postoperative histology from the surgically removed prostate. We excluded records with missing key pathological data, incomplete operative documentation, or a lack of postoperative histology results.

Biopsy procedure

All patients underwent systematic biopsy under local anesthesia performed under local anesthesia using lidocaine without adrenaline, with 12-core sampling of different predefined areas of the prostate gland to maximize diagnostic yield, reflecting standard systematic sampling approaches used to estimate histologic grade and tumor extent. Biopsy specimens were sent for histopathological examination. Based on this examination, the Gleason score and ISUP grade group were recorded, and these two were later used to derive the risk category of the tumor as previously described [15].

Surgical procedure and Specimen analysis

Surgery was done under general anesthesia, and patients received a third-generation cephalosporin intravenously before leaving for the theatre. During the procedure, patients were placed in a supine position and supported with shoulder brackets. A 4-port approach was used and arranged as follows: a 10 mm supraumbilical port for the laparoscope, a port each just lateral to the left and right rectus muscles, and a fourth sub-umbilical port. An Origin balloon dilator was inserted into the retropubic space, inflated to 800 mL, deflated, and removed. The endopelvic fascia was perforated, allowing mobilization of the lateral surface of the prostate. The lateral aspect of the prostate was separated from the levator ani muscles, followed by ligation of the deep dorsal vein complex. The prostate was dissected from the bladder neck anteriorly, exposing the urethra. A circumferential incision was made from the anterior to the posterior surface of the bladder neck, exposing the Denonvilliers' fascia, which was incised to identify the vas and seminal vesicle. The vas and seminal vesicle were mobilized *en bloc* while protecting neurovascular structures. The prostate was dissected at the level of the post-membranous junction and extracted. A urethrovesical anastomosis was done with a continuous suture, and a Foley bladder catheter was inserted and left in place for 10 days.

The prostatectomy specimen was submitted for histopathology, and the postoperative Gleason score, ISUP grade group, and risk category were extracted from the pathology reports. Because whole-gland or near-whole-gland specimens provide broader tissue assessment than needle biopsy [6], postoperative pathology was used as the reference comparator for evaluating discordance.

Variables

The main variables were the preoperative and postoperative Gleason scores, ISUP grade groups, and tumor risk categories. Risk category was defined clinically as low, intermediate, or high risk according to the combined biopsy parameters. Additional variables included age, clinical presentation, total PSA titer, clinical stage, weight of the gland, lymphadenectomy during surgery, postoperative pathology findings, and extension to lymph nodes.

Statistical analysis

The data collected from the patients' clinical records were entered into Microsoft Excel 2016 and then exported to R version 4.5.1 for statistical analysis. Continuous variables were presented as mean values and standard deviations for normally distributed data and as median values with interquartile ranges for data with skewed distributions. A contingency table was generated in R using the code (contingency_table <- table(data_set$Preoperative_risk, data_set$Postoperative_risk)), and McNemar's chi-squared test was used to compare the proportions of low risk, intermediate risk, and high risk between the preoperative and postoperative states. The threshold for statistical significance was set at $P < 0.05$.

Ethical considerations

The study employed retrospective clinical data collected during routine care. Patient confidentiality was preserved by anonymizing the database before analysis. This study was approved by the institutional review board of the Faculty of Medicine and Pharmaceutical Sciences (FMPS) of the University of Douala and by the ethical committee of the Saint Cyr Endoscopy Urology Center in Douala, Cameroon. The requirement for patients' informed consent was waived due to the retrospective nature of the study.

Results

The ages of our participants ranged from 48 years to 73 years, with a mean value of 60.99±6.06 years. The median age was 61[57–66] years. In total, 48 (36.92%) patients were asymptomatic, 10 (7.69%) had acute urinary retention, and 72 (55.38%) had lower urinary tract symptoms. The total PSA titers ranged from 4.82 ng/ml to 57 ng/ml, with a median value of 14.88[9.53–24.88]. The clinical stages were T1, T2a, T2b, and T3 in 52, 27, 34, and 17 patients, respectively. The weight of the prostate gland (in grams) ranged from 16 to 155, with a median value of 56.5[40.5–75]. The preoperative clinical and biological parameters of the study participants are presented in Table 1.

All study participants had a histological diagnosis of adenocarcinoma of the prostate and underwent mini-invasive total radical prostatectomy under local anesthesia, and no patient was found to have metastasis at the time of surgery.

The preoperative Gleason score was 6 (3+3) in 76 (58.46%) patients, 7 (3+4) in 46 (35.38%) patients, 7 (4+3) in 3 (2.31%) patients, and 8 (4+4) in 5 (3.85%) patients. The preoperative ISUP score was 1 in 76 (58.46%) patients, 2 in 46 (35.38%) patients, 3 in 3 (2.31%) patients, and 4 in 5 (3.85%) patients. The preoperative risk classification was low risk in 76 (58.46%) patients, intermediate risk in 46 (35.39%) patients, and high risk in 8 (6.15%) patients.

Table 1: Preoperative Clinical Presentation and Biological Parameters of Participants.

VARIABLE	FREQUENCY	PERCENTAGE (%)
Age (years)		
<55	21	16.15
55–64	66	50.77
>64	43	33.08
Clinical Presentation		
None	48	36.92
Acute Urinary Retention	10	7.69
Lower Urinary Tract Symptoms	72	55.38
Total PSA titer (ng/ml)		
0–10	35	26.92
>10–15	33	25.38
>15–25	31	23.85
>25	31	23.85
Clinical Stage		
T1	52	40.00
T2a	27	20.77
T2b	34	26.15
T3	17	13.08
Weight of prostate (grams)		
0–20	2	1.54
>20–40	31	23.85
>40–60	39	30.00
>60–80	31	23.85
>80	27	20.76

The postoperative Gleason score was 6 (3+3) in 32 (24.62%) patients, 7 (3+4) in 68 (52.31%) patients, 7 (4+3) in 14 (10.77%) patients, 8 (4+4) in 9 (6.92%) patients, 9 (4+5) in 3 (2.31%) patients, 9 (5+4) in 2 (1.54%) patients, and 10 (5+5) in 2 (1.54%) patients. The postoperative ISUP score was 1 in 34 (26.15%) patients, 2 in 66 (50.77%) patients, 3 in 14 (10.77%) patients, 4 in 9 (6.92%) patients, and 5 in 7 (5.39%) patients. The postoperative risk classification was low risk in 33 (25.38%) patients, intermediate risk in 67 (51.54%) patients, and high risk in 30 (23.08%) patients.

The pathological stage of the tumor was pT1 in 79 (60.77%) patients, pT2 in 33 (25.38%) patients, pT3 in 16 (12.31%) patients, and pT3a in 2 (1.54%) patients. Lymphadenectomy was performed in 98 (75.38%) patients but not in 32 (24.62%) patients. Among the 98 patients who underwent lymphadenectomy, lymph node extension was found in 10 (10.20%) patients but not in 88 (89.80%) patients. The preoperative and postoperative tumor characteristics are presented in Table 2.

Table 2: Preoperative and Postoperative Tumor Characteristics.

VARIABLE	FREQUENCY	PERCENTAGE (%)
Preoperative Gleason score		
6 (3+3)	76	58.46
7 (3+4)	46	35.38
7 (4+3)	3	2.31
8 (4+4)	5	3.85
Preoperative ISUP score		
1	76	58.46
2	46	35.38
3	3	2.31
4	5	3.85
Preoperative risk classification		
Low risk	76	58.46
Intermediate risk	46	35.38
High risk	8	6.15
Postoperative Gleason score		
6 (3+3)	32	24.62
7 (3+4)	68	52.31
7 (4+3)	14	10.77
8 (4+4)	9	6.92
9 (4+5)	3	2.31
9 (5+4)	2	1.54
10 (5+5)	2	1.54
Postoperative ISUP score		
1	34	26.15
2	66	50.77
3	14	10.77
4	9	6.92
Postoperative risk classification		
Low risk	33	25.38
Intermediate risk	67	51.54
High risk	30	23.08
Pathological stage of prostatectomy specimen		
pT1	79	60.77
pT2	33	25.38
pT3	16	12.31
pT3a	2	1.54
Lymphadenectomy		
Yes	92	75.38
No	32	24.62
Lymph node extension		
Yes	10	10.20
No	88	89.80

The proportions of low-risk, intermediate-risk, and high-risk tumors were compared between the preoperative and postoperative states. The proportion of low-risk tumors decreased from 58.46% to 25.38%, that of intermediate-risk tumors increased from 35.39% to 51.54%, and that of high-risk tumors increased from 6.15% to 23.08%. In 64 (49.23%) cases, the risk category of the tumor did not change between the preoperative state and the postoperative state. In 1 (0.77%) case, the preoperative assessment revealed a higher risk category (intermediate) than the postoperative assessment (low). In 65 (50%) cases, the preoperative assessment revealed a lower risk category than the postoperative assessment.

Overall, there was a statistically significant difference between the postoperative risk classification and the preoperative risk classification, with McNemar's chi-squared = 62.091, degrees of freedom = 3, and p-value = 2.101e-13. The comparison of preoperative and postoperative risk classifications is presented in Table 3.

Table 3: Comparison of preoperative and postoperative risk classifications.

Preoperative risk	Postoperative risk	Frequency	P-value P for all: <0.001
Low	Low	32	
High	Low	0	
Intermediate	Low	1	
Low	High	1	
High	High	8	
Intermediate	High	21	
Low	Intermediate	43	
High	Intermediate	0	
Intermediate	Intermediate	24	

Discussion

This study demonstrates a statistically significant discordance between tumor risk classification based on needle biopsy and that based on whole-gland histopathology after transperitoneal laparoscopic total prostatectomy. This finding confirms that preoperative biopsy-based assessment frequently underestimates the true tumor risk, reflecting the well-documented limitation of sampling on a small fraction of the gland and missing higher-grade tumor components. A previous study reported undergrading by biopsy compared with prostatectomy specimens in 48% of cases [16], which is similar to the 50% reported in this study.

The magnitude of this discordance has direct and severe implications for clinical practice in low-resource settings such as Douala and other parts of sub-Saharan Africa, where patients often cannot afford repeat surgeries, advanced imaging, or additional invasive procedures. In these contexts, treatment decisions are typically made based on a single biopsy, with little opportunity for further exploration [17]. If biopsy underestimates the risk, patients classified as low or intermediate risk may be inappropriately managed with less aggressive interventions or delayed treatment, while those who truly have high-risk disease may not receive timely definitive therapy [18].

In many sub-Saharan African countries, there is an insufficiently met need for transperitoneal laparoscopic total prostatectomy, not only for diagnosis but also as a therapeutic procedure for obstructive symptoms, particularly in men with benign prostatic hyperplasia or locally advanced tumors [19]. When biopsy undergrades the tumor, clinicians may underestimate the biological aggressiveness and the likelihood of progression, potentially leading to undertreatment and worse oncologic outcomes. The fact that undergrading by preoperative biopsy is common means

that postoperative pathology from the prostatectomy specimen provides critical information that cannot be replaced by additional biopsies in most resource-constrained settings.

For urologists in these nations, the findings of this study underscore the need to recognize that biopsy-based risk categories are inherently uncertain and should be interpreted with caution, especially when clinical features such as elevated PSA, large tumor volume, or suspicious digital rectal examination suggest more advanced disease [20,21]. Urologists must be prepared to explain this uncertainty to patients and their families, emphasizing that initial low-risk classification does not guarantee benign behavior. They should also consider using adjunctive clinical markers, such as PSA and PSA density, which have been shown to correlate with grading error and may help anticipate undergrading [20].

Previous studies have demonstrated that incorporating MRI into the diagnostic biopsy process mitigates this error [22]; however, the associated cost makes it unfeasible in resource-limited settings. In settings where MRI is unavailable or unaffordable [23], systemic 12-core biopsy remains the main diagnostic tool, yet our results confirm that even this approach is prone to underestimating risk. Urologists may need to adopt a more conservative approach to risk stratification, treating some patients classified as "low risk" on biopsy as having a higher likelihood of occult high-risk disease, particularly when clinical suspicion is high. This may involve offering more definitive treatment rather than active surveillance, which is often not feasible without reliable imaging and repeated follow-up biopsies [22].

Policymakers in sub-Saharan African countries must recognize that the limitations of biopsy-based risk assessment are not merely academic but have profound implications for cancer control, resource allocation, and patient outcomes. National cancer plans should prioritize strengthening histopathology capacity, ensuring that prostatectomy specimens are routinely examined by skilled pathologists who can provide accurate postoperative risk classification. Policies should also support training programs for urologists on interpreting biopsy limitations and integrating clinical data to improve risk estimation [24].

Furthermore, policymakers should consider funding strategies that reduce the financial barrier to essential urological surgery, including transperitoneal laparoscopic total prostatectomy, which in many cases serves both diagnostic and therapeutic roles. When patients cannot afford repeat procedures, the initial surgical intervention becomes the key opportunity for accurate risk assessment and treatment. Investing in surgical infrastructure, disposables, and training may thus have a disproportionate impact on prostate cancer outcomes compared to simply expanding diagnostic capacity [25].

Finally, international partnerships and humanitarian urological programs should incorporate prostate cancer into their priorities, recognizing that biopsy under grading contributes to misclassification and under treatment in low-resource settings [25]. Collaborative efforts can support training, guideline adaptation, and capacity building that acknowledge the reality that, in many African countries, biopsy alone cannot reliably determine tumor risk, and that whole-gland or near-whole-gland pathology from prostatectomy specimens is often the most accurate source of risk information available [24,25].

Nevertheless, this study has some noteworthy limitations. First, the small sample size reduces the power of the study and limits the generalizability of the findings reported herein. Second, it was conducted at a single urology center in Douala, which means the study population may not be very representative of all patients with advanced, metastatic prostate cancer in Cameroon. Third, being a retrospective study, it was prone to recall bias. However, irrespective of these limitations, our study successfully identifies an issue that had been reported in other parts of the world, which may have more severe repercussions in a resource-limited setting. Therefore, it represents evidence that is informative to both clinicians and policymakers. In the future, multicenter, prospective studies with larger study samples that entail long-term follow-up of patients diagnosed, classified, and treated based on pre-operative biopsy alone should be conducted to further highlight the magnitude of this problem.

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References

1. Cassell A, Yunusa B, Jalloh M, et al. A Review of Localized Prostate Cancer: An African Perspective. World J Oncol. 2019; 10: 162-168.
2. Dudipala H, Jani CT, Gurnani SD, et al. Evolving Global Trends in Prostate Cancer: Disparities Across Income Levels and Geographic Regions (1990-2019). JCO Glob Oncol. 2025; 11: e2500249.
3. Tchinda Fossi C, Nguendo Yongsi HB, Atenguena E, et al. Epidemiological Aspects of Prostate Cancer at the Medical Oncology Service of the Yaounde General Hospital -Cameroon. Int J Healthcare Med Sci. 2018; 4: 66-72.
4. Kaninjing E, Lopez I, Nguyen J, et al. Prostate Cancer Screening Perception, Beliefs, and Practices Among Men in Bamenda, Cameroon. Am J Mens Health. 2018; 12: 1463-1472.
5. Spratt DE, Jackson WC, Abugharib A, et al. Independent validation of the prognostic capacity of the ISUP prostate cancer grade grouping system for radiation treated patients with long-term follow-up. Prostate Cancer Prostatic Dis. 2016; 19: 292-297.
6. Epstein JI, Feng Z, Trock BJ, et al. Upgrading and downgrading of prostate cancer from biopsy to radical prostatectomy: incidence and predictive factors using the modified Gleason

grading system and factoring in tertiary grades. Eur Urol. 2012; 61: 1019-1024.

7. Mortezavi A, Keller EX, Poyet C, et al. Clinical impact of prostate biopsy undergrading in an academic and community setting. World J Urol. 2016; 34: 1481-1490.
8. Spratt DE, Jackson WC, Abugharib A, et al. Independent validation of the prognostic capacity of the ISUP prostate cancer grade grouping system for radiation treated patients with long-term follow-up. Prostate Cancer Prostatic Dis. 2016; 19: 292-297.
9. Gnanapragasam VJ, Lophatananon A, Wright KA, et al. Improving Clinical Risk Stratification at Diagnosis in Primary Prostate Cancer: A Prognostic Modelling Study. PLoS Med. 2016; 13: e1002063.
10. Hernandez DJ, Nielsen ME, Han M, et al. Contemporary evaluation of the D'amico risk classification of prostate cancer. Urology. 2007; 70: 931-935.
11. Flammia RS, Hoeh B, Hohenhorst L, et al. Adverse upgrading and/or upstaging in contemporary low-risk prostate cancer patients. Int Urol Nephrol. 2022; 54: 2521-2528.
12. Krzepkowski HA, Ząbkowski T, Walędziak M, et al. Underestimation of Prostate Cancer Grade in Transperineal Fusion Biopsy and Its Predictive Factors: Correlation of Biopsy Findings with Post-Da Vinci Radical Prostatectomy Specimens. J Clin Med. 2026; 15: 2780.
13. Ngalle FGE, Mbouche LO, Makon ASN, et al. Urological emergencies in two university hospitals in Douala: a retrospective study (2016-2020). Pan Afr Med J. 2023; 44: 135.
14. Dellavedova T, Ponzano R, Racca L, et al. Prostate cancer as incidental finding in transurethral resection. Arch Esp Urol. 2010; 63: 855-861.
15. Egevad L, Delahunt B, Srigley JR, et al. International Society of Urological Pathology (ISUP) grading of prostate cancer - An ISUP consensus on contemporary grading. APMIS. 2016; 124: 433-435.
16. King CR. Patterns of prostate cancer biopsy grading: trends and clinical implications. Int J Cancer. 2000; 90: 305-311.
17. Makau-Barasa LK, Manirakiza A, Carvalho AL, et al. Prostate Cancer Screening, Diagnostic, Treatment Procedures and Costs in Sub-Saharan Africa: A Situational Analysis. Cancer Control. 2022; 29: 10732748221084932.
18. Shahait M. Urology Practice in Low- to Middle-Income Countries. Société Internationale d'Urologie Journal. 2024; 5: 374-375.
19. Metzler I, Bayne D, Chang H, et al. Challenges facing the urologist in low- and middle-income countries. World J Urol. 2020; 38: 2987-2994.
20. Kojima M, Troncoso P, Babaian RJ. Use of prostate-specific antigen and tumor volume in predicting needle biopsy grading error. Urology. 1995; 45: 807-812.
21. Promsen W, Siriboonrid S, Binsri N, et al. The prevalence and risk factors of upgrading of Gleason grade group between transrectal ultrasound prostate biopsy and prostatectomy specimens. Urol Ann. 2023; 15: 18-21.
22. Pezelj I, Pirša M, Svaguša I, et al. Comparison of Grading Accuracy of Prostate Cancer in Samples Acquired by A Targeted and Systemic Prostate Biopsy. Acta Clin Croat. 2022; 61: 28-31.
23. Metzler I, Bayne D, Chang H, et al. Challenges facing the urologist in low- and middle-income countries. World J Urol. 2020; 38: 2987-2994.
24. Ngwa W, Addai BW, Adewole I, et al. Cancer in sub-Saharan Africa: a Lancet Oncology Commission. Lancet Oncol. 2022; 23: e251-e312.
25. Payne SR, Chalwe M. Understanding the needs of low-income countries: how urologists can help. BJU Int. 2022; 129: 9-16.