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Incidental Prostate Cancer Detected after Prostate Surgery: A Multicenter Retrospective Study from Burundi

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Abstract

Background: Incidental prostate cancer refers to clinically unsuspected prostate malignancy detected after surgical treatment for presumed benign prostatic disease. This study aimed to determine the proportion of incidentally detected prostate cancer among symptomatic patients undergoing prostate surgery and to describe its pathological characteristics in a multicenter cohort from Burundi. **Patients and Methods:** We conducted a retrospective observational multicenter observational study from January 1 to December 31, 2024, including consecutive patients who underwent prostate surgery in five major hospitals in Bujumbura, Burundi. Patients with a preoperative histopathological diagnosis of prostate cancer were excluded. All surgical specimens were examined histologically, and prostatic adenocarcinoma grading was performed according to the International Society of Urological Pathology (ISUP) grading system. **Results:** A total of 156 patients were included, with a mean age of 69.00 years. Lower urinary tract symptoms were the most common clinical presentation, occurring in 138 patients (88.46%). Digital rectal examination was normal in 86 patients (55.13%), while a palpable prostatic nodule was identified in 41 patients (26.28%). Transurethral resection of the prostate was the most frequently performed procedure (38.46%). Incidental prostate cancer was identified in 76 patients (48.72%; 95% confidence interval [CI]: 40.90%-56.60%), all corresponding to prostatic adenocarcinoma. Among these patients, high-

grade tumors were predominant, with ISUP grade 5 observed in 43 cases (56.58%). Benign prostatic hyperplasia was diagnosed in 55 patients (35.26%), whereas squamous cell carcinoma was identified in 25 patients (16.03%), including primary prostatic and secondary bladder-related cases. **Conclusion:** Incidental prostate cancer was frequently detected among patients undergoing prostate surgery in Bujumbura. The predominance of high-grade tumors highlights the importance of systematic histopathological evaluation of all prostate surgical specimens, particularly in resource-limited settings where access to advanced diagnostic tools remains limited.

Keywords

Prostate Cancer, Lower Urinary Tract Symptoms, Adenocarcinoma, Prostatic Specific Antigen

1. Introduction

Prostate cancer (PCa) is a common pathology in aging men. Often asymptomatic in its early stages, it may present with lower urinary tract symptoms (LUTS), or with neurological signs at an advanced stage. Benign prostatic hypertrophy (BPH) causing bothersome LUTS becomes more common in men with advancing age, presenting a growing issue in our aging population [1]. Lifelong hormonal exposure to androgens is thought to cause an ongoing growth response in the prostatic glandular tissue leading to compression of the prostatic urethra with bladder outlet obstruction and LUTS. Clinical T1 or incidental prostate cancer is defined as clinically inapparent tumor that is neither palpable nor visible by imaging [2]. Current international guidelines emphasize careful preoperative evaluation using PSA testing, digital rectal examination, multiparametric MRI when available, and targeted biopsy in selected patients to reduce the likelihood of undetected clinically significant prostate cancer before surgery for presumed benign prostatic disease [3] [4]. The exact pathophysiology of PCa and benign prostatic hyperplasia (BPH) remains unknown. However, several studies suggest that inflammation plays a pivotal role in the pathogenesis of both conditions [5]-[8]. Digital rectal examination (DRE) and PSA testing are useful for early detection, but definitive diagnosis relies on histopathological examination. PCa diagnosis continues to face challenges of over-detection and overtreatment [9]. Recently, advances in Artificial Intelligence (AI) powered risk calculators, refined biopsy strategies, and prostate specific membrane antigen (PSMA), positron emission tomography-computed tomography (PET-CT) scan have improved diagnostic and staging accuracy [10] [11]. Along with this shift in incidental prostate cancer distribution with the introduction of PSA, fewer traditional transurethral resection of the prostate (TURP) are being performed as newer techniques, such as laser vaporization, are being adopted [10]. These new technologies do not always provide tissue for pathological examination leading to potentially missed cancers [2]. Some incidental pros-

tate cancers have been shown to be clinically relevant, specifically tumors with a higher Gleason score and stage pT1b [12]. However, the best diagnostic and staging pathway has yet to be defined [9]. The management of men with bothersome LUTS may be initiated with conservative measures or medical therapies [13]. Despite this, many patients have symptomatic progression that are refractory to these therapies and that necessitates surgical intervention. Invasive surgical therapies such as transurethral resection of the prostate (TURP) and simple prostatectomy are the current gold standard surgical interventions for BPH. Treatment is guided by the ISUP grading system. This study aimed to determine the proportion of incidentally detected prostate cancer among symptomatic patients undergoing prostate surgery and to describe its pathological characteristics in a multicenter cohort from Burundi.

2. Patients and Methods

We conducted a retrospective observational multicenter study over a 12-month period, from 1 January 2024 to 31 December 2024. The study was carried out in the General Surgery and Urology departments of five major hospitals in Bujumbura, Burundi: Centre Hospitalo-Universitaire de Kamenge (CHUK), Hôpital Militaire de Kamenge (HMK), Kira Hospital, Centre Médico-Chirurgical de Kinindo (CMCK), and Polyclinique Centrale de Bujumbura (POLYCEB). All consecutive patients who underwent prostate surgery during the study period and met the eligibility criteria were included. Patients with a preoperative diagnosis of prostate cancer were excluded from the study. Patients undergoing prostate surgery for presumed benign prostatic obstruction were included.

Patients undergoing cystoprostatectomy were included because incidental prostate pathology was systematically evaluated in the removed prostate specimens; however, these cases were analyzed separately according to surgical procedure. A preoperative diagnosis of prostate cancer was established when histopathological confirmation from a prostate biopsy was available before surgery. All patients underwent a standardized preoperative evaluation including medical history, physical examination, digital rectal examination (DRE), serum prostate-specific antigen (PSA) measurement, and transabdominal ultrasonography. Transrectal ultrasound-guided prostate biopsy was performed only in selected patients with clinical suspicion of prostate cancer based on elevated PSA levels and/or suspicious DRE findings, according to the availability of diagnostic resources and the treating urologist's judgment. Patients with biopsy-confirmed prostate cancer before surgery were excluded from the study. Consequently, all patients included in this study underwent surgery with no preoperative histopathological diagnosis of prostate cancer. Histopathological results, weight of tissue resected, and amount of tissue were analyzed. All specimens were analyzed by a pathologist. Histopathological diagnoses were established according to standard pathological criteria. Squamous cell carcinomas were classified as primary when arising from the prostate and as secondary when resulting from direct extension of bladder squamous cell carcinoma into the

prostate. The ISUP grading system was applied exclusively to prostatic adenocarcinoma.

Data were collected using a pre-designed data collection form. The following parameters were retrieved from patient files, surgical reports, and hospital records: Sociodemographic characteristics, Clinical presentation, Diagnostic findings (including Digital Rectal Examination (DRE), PSA level, ultrasound), Indications for surgery, Intraoperative findings and complications.

Descriptive statistics were used to summarize the data. Categorical variables were expressed as frequencies and percentages. The overall proportion of incidentally detected prostate adenocarcinoma was reported with its 95% confidence interval (95% CI). Data analysis was performed using Epi Info version 7.2.2.6. Text processing and graphical representation were carried out using Microsoft Word 2016 and Excel 2016.

3. Results

During the study period, 156 patients underwent prostate surgery. The mean age was 69.00 years. Lower urinary tract symptoms (LUTS) (voiding and storage symptoms) were the most common presenting complaint, observed in 138 patients (88.46%). Preoperative evaluation showed that 89 patients (57.05%) had a PSA level <4 ng/mL, 43 (27.56%) had PSA levels between 4 and 10 ng/mL, and 24 (15.38%) had PSA levels >10 ng/mL. Digital rectal examination was normal in 86 patients (55.13%), while 41 (26.28%) had a palpable prostatic nodule and 29 (18.59%) had an enlarged or protruding prostate. Ultrasonography was performed in all patients, and the mean prostate volume was 35 mL.

Preoperative transrectal ultrasound-guided prostate biopsy was performed in 21 patients (13.46%) because of clinical suspicion of prostate cancer. All biopsy results were negative for malignancy. The remaining 135 patients (86.54%) underwent surgery without prior biopsy, based on the clinical diagnosis of presumed benign prostatic disease (Table 1).

Table 1. Preoperative diagnostic assessment.

Parameters		Workforce	Percentage
Clinics	LUTS	138	88.46
	Haemeturia	12	7.69
	Hypogastric tumescence	6	3.85
PSA level	<4 ng/mL	89	57.0
	4 - 10 ng/mL	43	27.5
	>10 ng/mL	24	15.38
Digital rectal examination	Normal	86	55.13
	Palpable nodule	41	26.28
	Enlarged/protruding prostate	29	18.59

Continued

Preoperative prostate biopsy	Performed	21	13.46
	Not performed	135	86.54

Transurethral resection of the prostate (TURP) was the most commonly performed procedure, accounting for 60 cases (38.46%) (Table 2). Histopathological examination identified prostatic adenocarcinoma in 76 patients (48.72%), benign prostatic hyperplasia in 55 patients (35.26%), and squamous cell carcinoma in 25 patients (16.03%). Among the squamous cell carcinomas, 17 cases (68.00%) were classified as primary squamous cell carcinoma of the prostate, whereas 8 cases (32.00%) represented secondary involvement of the prostate by bladder squamous cell carcinoma identified in cystoprostatectomy specimens. ISUP grading was applied exclusively to the 76 cases of prostatic adenocarcinoma. Histopathological findings were further analyzed according to the type of surgical procedure. Among the 60 patients who underwent TURP, prostatic adenocarcinoma was identified in 35 (58.33%), benign prostatic hyperplasia in 21 (35.00%), and squamous cell carcinoma in 4 (6.67%). Among the 58 patients who underwent transvesical adenomectomy, adenocarcinoma was found in 26 (44.83%), benign prostatic hyperplasia in 19 (32.76%), and squamous cell carcinoma in 13 (22.41%). Of the 38 patients who underwent total cystoprostatectomy, adenocarcinoma was detected in 15 (39.47%), benign prostatic hyperplasia in 15 (39.47%), and squamous cell carcinoma in 8 (21.05%). Prostatic adenocarcinoma was diagnosed in 48.71% of cases, with a predominance of aggressive forms (ISUP grade 5) in 56.57% of them. These findings are summarized in Table 3.

Table 2. Characteristics of patients.

Parameters		Workforce	Percentage
Treatment	Transurethral resection of the prostate (TURP)	60	38.46
	Transvesical adenomectomy	58	37.18
	Total cystoprostatectomy	38	24.36
Pathological findings	Prostatic adenocarcinoma	76	48.72
	Benign prostatic hyperplasia	55	35.26
	Squamous cell carcinoma	25	16.03
ISUP grade	Grade 1	9	11.84
	Grade 2	7	9.21
	Grade 3	5	6.58
	Grade 4	12	15.79
	Grade 5	43	56.58

Table 3. Histopathological findings according to the type of surgery.

Type of surgery	Adenocarcinoma n (%)	Benign prostatic hyperplasia n (%)	Squamous cell carcinoma n (%)
TURP	35 (58.33)	21 (35.00)	4 (6.67)
Transvesical adenomectomy	26 (44.83)	19 (32.76)	13 (22.41)
Total cystoprostatectomy	15 (39.47)	15 (39.47)	8 (21.05)
Total	76 (48.72)	55 (35.26)	25 (16.03)

Overall, prostatic adenocarcinoma was identified in 76 of the 156 patients, corresponding to a proportion of 48.72% (95% confidence interval [CI]: 40.90%-56.60%). Among these patients, ISUP grade 5 was the predominant pathological grade, accounting for 43 cases (56.58%).

4. Discussion

A substantial proportion of symptomatic patients undergoing prostate surgery (76/156; 48.72%; 95% CI: 40.90%-56.60%) had incidentally detected prostate cancer on histopathological examination. This finding underscores the importance of routine histopathological examination of all prostate surgical specimens, particularly in resource-limited settings where access to advanced diagnostic tools, such as multiparametric magnetic resonance imaging (mpMRI) and systematic prostate biopsy, may be limited. The proportion of incidental prostate cancer observed in our study was higher than that reported in several previous studies. This difference may be explained by the inclusion of various prostate surgical procedures, including cystoprostatectomy specimens, and by differences in patient selection.

Prostate cancer is the second most common cancer in men worldwide and according to recent data over 1.3 million cases of prostate cancer were reported worldwide [14]. Developing countries express a lower prostatic cancer incidence when juxtaposed with developed nations [15]. In our Study, the average age was 69 years. In Pakistan, the mean age of all patients who underwent TURP and having incidental prostate cancer patients was 68.51 with a standard deviation (SD) of 9.22 years respectively [16]. Transurethral resection of the prostate (TURP) was the most common procedure, performed in 38.42% of cases. In our Study, prostate cancer (PCa) was found in 48.72% of cases. In Pakistan, the incidence of prostate cancer among all 2386 TURP specimens was calculated as 10.72% [16]. Increasing number of elderly males can explain the increased overall incidence and 5-year interval rise. Secondly owing to improved medication availability, procurement and better health coverage over the years the average life span of the elderly male has also increased. Our results and past established data prove that prostate cancer maladies are positively co-related with increasing age [17] and later decades in life. Thus, a higher life expectancy can account for greater cases of BPH and resulting incidental cancers in the prostate gland. This is evident from literature

published by the Western developed nations like Germany [12], United Kingdom [18], Canada [19], Austria [20] and the United States [21] whose male elderly populations enjoy relatively higher life expectancies and regular Prostate Specific Antigen (PSA) level screenings. The persistent finding of a constant rate of incidental Ca P confirms that there is an unknown proportion of the population with the potential to develop disease progression [18]. Because the surgical principle of TURP is the removal of the transition zone of the prostate, only transition zone cancer will be detected, and no information regarding the peripheral zone will be supplied. On the other hand, routine prostate biopsy focuses on the peripheral zone, in which 75% of cancers are located. Therefore, before indicating TURP routinely, biopsy should be performed when the PSA level is elevated. However, no routine biopsy is indicated when both parameters, DRE and PSA, are normal before TURP. Thus, there is no obvious rationale to recommend routine biopsy when applying alternative treatments for BPE using the same prerequisites [20]. Such incidental Ca P occurs in the transitional zone and is therefore not usually detected by digital rectal examination or sampled in standard biopsy techniques. The diagnosis of incidental transitional zone carcinoma is therefore dependent on prostate-specific antigen (PSA) testing. Since PSA testing and transrectal ultrasound (TRUS)-guided prostate biopsies were introduced over a decade ago, earlier detection of Ca P has been observed as well as drop in the total numbers of incidental Ca P. However, whilst the incidence of pT1b disease has decreased, that of pT1a disease remains static [22].

In our study, imaging had not confirmed the prostate cancer. Men with low PSA levels and a benign TURP can be reassured about their cancer risk and do not need to be monitored differently than any other men. Patients with high PSA levels can be considered for further follow-up with prostate magnetic resonance imaging. The incidence of PCa detected in specimens after cystoprostatectomy for invasive bladder cancer has been reported to be up to 45% 10 - 12 in patients with both negative PSA and DRE findings, even greater than the rate of 30% to 40% in autopsy series [23] [24]. Several studies have compared incidental prostate cancer rates between the pre-PSA and the PSA era. First, Tombal *et al.* reported a decreased rate of incidental prostate cancer from 27% to 9% when comparing their pre-PSA era to PSA era detection rates in over 1600 patients [25]. They saw a larger decrease in T1b lesions, 15% to 2%, than in T1a lesions, which stayed relatively constant at 3% to 5% [25].

Mai et al also showed similar results in their review of almost 1000 TURP specimens. They found significant decreases in the overall detection rate, 12.9% to 8%, and the amount of pT1b lesions, 10% to 5% [22]. In addition to prostatic adenocarcinoma, 25 cases of squamous cell carcinoma were identified on routine histopathological examination. Among these, 17 were classified as primary squamous cell carcinoma of the prostate, whereas 8 represented secondary involvement of the prostate by bladder squamous cell carcinoma identified in cystoprostatectomy specimens. Primary squamous cell carcinoma of the prostate is an exceptionally

rare malignancy, accounting for less than 1% of primary prostatic cancers reported in the literature. Therefore, the relatively high number of primary cases observed in our cohort should be interpreted with caution. Since immunohistochemical confirmation was not routinely available, the diagnosis was based on conventional histopathological evaluation, which may have influenced the classification of these uncommon tumors. Further studies incorporating centralized pathological review and immunohistochemical analysis are warranted to validate these findings.

More recently, Jones *et al.*'s comparison found a decrease of incidental prostate cancer from 14.9% to 5.2% (pre versus post PSA era) in over 700 patients. They saw significant decreases in both pT1a and pT1b incidental prostate cancer (4.4% to 2.2% and 10.5% to 2.8%, resp.) between the pre-PSA and the PSA eras [26]. These studies indicate that PSA screening has decreased the detection of incidental prostate cancer, specifically T1b lesions. They also suggest that men considering ablative surgical management of BPH are informed that there is a low risk of harboring clinically significant undetected malignancy. Other possible reasons for the reduction in incidental prostate cancer include the decreased rate of surgical management of BPH due to increased use of medical therapy as well as an increased use of ablative therapies, which do not always provide tissue for pathologic analysis in patients who ultimately require surgical management of their BPH [27]. Taking the natural history and outcomes data available on incidental prostate cancer, the European Association of Urology (EAU) has provided specific guidelines for the management of incidental prostate cancer. The EAU recommends active surveillance or watchful waiting for patients with T1a tumors and patients with T1b tumors if Gleason score is 6 or less and the life expectancy of the patient is less than 10 years. For patients with T1b tumors and a life expectancy of more than 10 years, radical prostatectomy is recommended [28] [29]. The AUA guidelines do not specifically address the management of T1a or T1b lesions. For low-risk prostate cancer, they propose that active surveillance, brachytherapy, external beam radiotherapy, and radical prostatectomy are appropriate therapy options [4]. Recent international guidelines also emphasize individualized management of incidentally detected prostate cancer based on tumor grade, life expectancy, comorbidities, and postoperative PSA levels, highlighting the importance of shared decision-making between clinicians and patients [30] [31].

5. Limitations

This study has several limitations. First, its retrospective design may have resulted in incomplete clinical and pathological data. Second, the study included different surgical procedures, which may have influenced the amount of tissue available for histopathological examination. Third, histopathological diagnoses were based on routine microscopic evaluation, and immunohistochemical confirmation was not routinely available, particularly for uncommon histological subtypes such as primary squamous cell carcinoma. Finally, because the study was conducted in ter-

tiary referral hospitals, the findings may not be generalizable to the overall population.

6. Conclusion

Incidental prostate cancer was frequently detected among patients undergoing prostate surgery in Bujumbura. A substantial proportion of patients undergoing prostate surgery were found to have incidental prostate cancer on postoperative histopathological examination. These findings apply specifically to this surgical cohort and should not be interpreted as the prevalence of prostate cancer in the general population. Routine histopathological examination of all prostate surgical specimens remains essential, particularly in resource-limited settings, to avoid missing clinically significant incidental cancers.

Ethical Considerations

Ethical approval was obtained from the local ethics committee. Written informed consent was obtained from all participants.

Author Contributions

RN conceptualized the study and performed the data analysis. SN contributed to the study conception and design and drafted the initial manuscript.

APN contributed to the critical revision of the manuscript. JLB contributed to the critical revision of the manuscript. DM contributed to the critical revision of the manuscript. MAK contributed to the critical revision of the manuscript. AM contributed to the critical revision of the manuscript. FN contributed to the critical revision of the manuscript. BK contributed to the critical revision of the manuscript. JCM, SH & PB contributed to the critical revision of the manuscript. All authors reviewed the manuscript for important intellectual content and approved the final version for submission.

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Conflicts of Interest

The authors declare that there are no conflicts of interest.

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