Original Article

Correlation of Prostate Specific Antigen, Clinical Stage and Gleason Pathological Score of Prostate Cancer among the Population of South West Bihar

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ABSTRACT

Background: Among the common cancers found in older men is prostate cancer. For many years, radical prostatectomy (RP) has been the accepted method of treatment since it produces comparable oncological and functional results to radiation therapy. It is essential to forecast pathologic stage accurately in order to identify the patients who will benefit from RP. Good quality data on the variables influencing these results for the Indian population is scarce.

Aims/ objective: To assess correlation of prostate specific antigen, clinical stage and Gleason score with pathological stage in men with localized prostate cancer.

Materials and Method: 50 patients with locally advanced prostate cancer who underwent radical prostatectomy were included in our study. A digital rectal exam (DRE), determined the clinical stage. Pathologists look for the most and second most frequent patterns of cancer in each biopsy sample. Each received a score between 1 and 5. The Gleason score was then calculated by summing these grades. The surgical specimen including the prostate and seminal vesicles was evaluated and the pathologic stage was determined

Results: All the patients with seminal vesicle and lymph node involvement had PSA level of more than 8 ng/ml. 27.27% of patients with extra-prostatic extension had PSA level of more than 8 ng/ml. More than 70% of patients with organ confined pathological stage had PSA level less than 6 ng/ml. 18.18% patients with extra-prostatic extension had T1 clinical stage. All patients with lymph node involvement had biopsy Gleason score of 9-10. All patients with extra-prostatic seminal vesicle involvement had biopsy Gleason score more than 6.

Conclusion: We found significant correlation between clinical stage, biopsy Gleason score, and PSA levels in post radical prostatectomy specimen of prostate cancer.

Keywords: Prostate Cancer, Pathological Stage, Prostate Specific Antigen, Clinical Stage, Gleason Score.

INTRODUCTION

Among the common cancers found in older men is prostate cancer. For many years, radical prostatectomy (RP) has been the accepted method of treatment since it produces comparable oncological and functional results to radiation therapy.[1] It is essential to forecast pathologic stage accurately in order to identify the patients who will benefit from RP. [2, 3]

The capacity to precisely forecast results following radical prostatectomy (RP) through the use of preoperative data is still essential for men with prostate cancer in their counselling and decision-making.[4] The "Partin Tables," which were first presented in 1993, predict pathological stage at RP using clinical stage, blood PSA level, and biopsy Gleason score. [5] This simple method has since been verified in other populations both locally and globally. [6, 7]

Ninety percent of patients with newly diagnosed cancer report with local or regional disease, according to the American Cancer Society, which shows a continuous decline in CaP death rates. [8] The clinical stage of newly identified CaP patients has dramatically changed as a result of this tendency, also known as "stage migration," which may be the consequence of early diagnosis or modifications in the biology of the illness. [9]

The predictors of the results after RP have been the subject of numerous investigations. [10–12] Numerous variables have been found to be predictive of pathological stage and outcomes, including the prostate-specific antigen (PSA), clinical examination, Gleason score, baseline sexual activity, time from RP, and age at RP. [10–13] The majority of these investigations were carried out in Western countries at centres of excellence.

A grading system called the Gleason score is used to assess how aggressive prostate cancer is. The biopsy sample is examined under a microscope to ascertain the most prevalent pattern and the next most prevalent pattern, after which a score is assigned. [14] Higher scores indicate more aggressive malignancy. The score runs from 6 to 10.[14]

Prostate cancer is graded using the modified Gleason grading system created by the International Society of Urological Pathology (ISUP). [15] Higher grades indicate more

aggressive cancer. The ISUP grade is based on the Gleason score and goes from 1 to 5. [15]

Men with prostate cancer who have bone metastases are linked to high blood levels of prostate specific antigen (PSA), high Gleason grades, and advanced T stage on clinical examination. [16, 17] PSA values over 100 ng/mL have been utilized as a stand-in for metastatic prostate cancer, based on findings from a few small, single-center studies that were published at the start of the 1990s. [18, 19]

Good quality data on the variables influencing these results for the Indian population is scarce. To the best of our knowledge, the Indian population's pathological stage after RP predictors is not well-documented. Hence, this study was aimed to assess correlation of prostate specific antigen, clinical stage and Gleason score with pathological stage in men with localized prostate cancer in a tertiary care hospital India.

MATERIALS AND METHODS

This was an observational and study conducted on patients with clinically localized prostate cancer from November 2022 to October 2023 in department of pathology in collaboration with department of urology in NMCH, Sasaram (a tertiary care centre in eastern India). The study was conducted after taking written informed consent before enrolment of study participants under the guidelines of declaration of Helsinki and Good Clinical Practice.

Consecutive sampling was done and 50 patients of prostate cancer as per our inclusion and exclusion criteria were included in our study.

Inclusion Criteria: Men of age greater than 18 years with clinically localized prostate cancer who underwent radical prostatectomy and staging pelvic lymphadenectomy.

Exclusion Criteria: Patients with erectile dysfunction or with incomplete preoperative or pathological data or receiving preoperative treatment with 5-alpha reductase inhibitors, chemo-therapy, or androgenic/estrogenic herbal therapies because of potential influence on PSA. Men with pathologic diagnoses other than adenocarcinoma of the prostate were excluded.

The findings of any additional tests performed before receiving definitive treatment, such as surgery or radiation, and the urologist's physical assessment of the patient's prostate, which included a digital rectal exam (DRE), determined the clinical stage.

Pathologists look for the most and second most frequent patterns of tumors in each biopsy sample. Each received a score between 1 and 5. The Gleason score was then calculated by summing these grades. [20]

Following surgery, every pelvic lymph node excised was sectioned and checked for malignancy. The surgical specimen including the prostate and seminal vesicles was evaluated and the pathologic stage was determined as:

- **OC (organ confined):** if all cancer was confined within the prostate
- **EPE (extra-prostatic extension):** if cancer was found outside the prostate and the seminal vesicles and the pelvic lymph nodes were found to have no signs of malignancy
- **Positive seminal vesicle involvement (SV+):** if tumour was found involving the muscular wall of the seminal vesicle but with no lymph node involvement
- **Lymph node involvement (LN+):** if the pelvic lymph nodes shown malignancy on pathological examination.

Statistical Analysis:

Data collected from patients with prostate cancer was presented in tabular form using Microsoft Excel 365 and then transferred to graph pad version 8.4.3 for further statistical analysis. Descriptive statistics was used to express the finding and compare using frequency percentage and 95% Confidence Interval (CI).

OBSERVATIONS AND RESULTS

50 patients with locally advanced prostate cancer who underwent radical prostatectomy were included in our study. Their mean age was 57.39 ± 6.42. Of these 34 were of having organ confined pathological state, 11 with extra prostatic extension, 3 with seminal vesicle involvement and 2 with lymph node involvement. [Table 1]

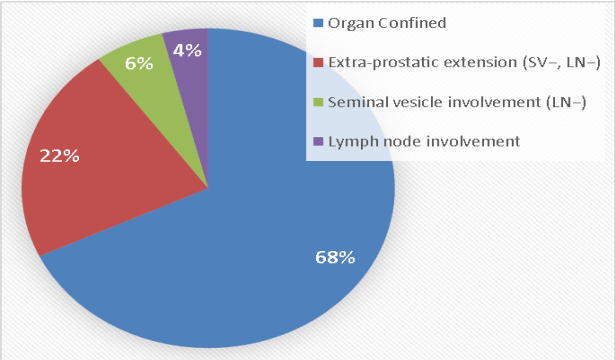

Figure 1: Distribution of patients with prostate cancer as per pathological stage

Table 1: Distribution of patients with prostate cancer as per pathological stage

Pathological stage	Number of Patients	% of Patients (n=50)	95% CI of %
Organ Confined	34	68.00	54.19 – 79.24
Extra-prostatic extension (SV–, LN–)	11	22.00	12.75 – 35.24
Seminal vesicle involvement (LN–)	3	6.00	1.64-16.21
Lymph node involvement	2	4.00	0.71 – 13.46

Table 2: Distribution of patients with respect to PSA groups and pathological stage

Pathological stage	Number of Patients in PSA Groups (ng/ml)					
	0-2.5	2.6-4.0	4.1-6.0	6.1-8	8.1-10.0	>10.0
Organ Confined	4	6	14	7	3	0
Extra-prostatic extension (SV−, LN−)	0	2	3	3	1	2
Seminal vesicle involvement (LN−)	0	0	0	0	2	1
Lymph node involvement	0	0	0	0	1	1
Total (%)	4 (8.00)	8 (16.00)	17 (34.00)	10 (20.00)	7 (14.00)	4 (8.00)

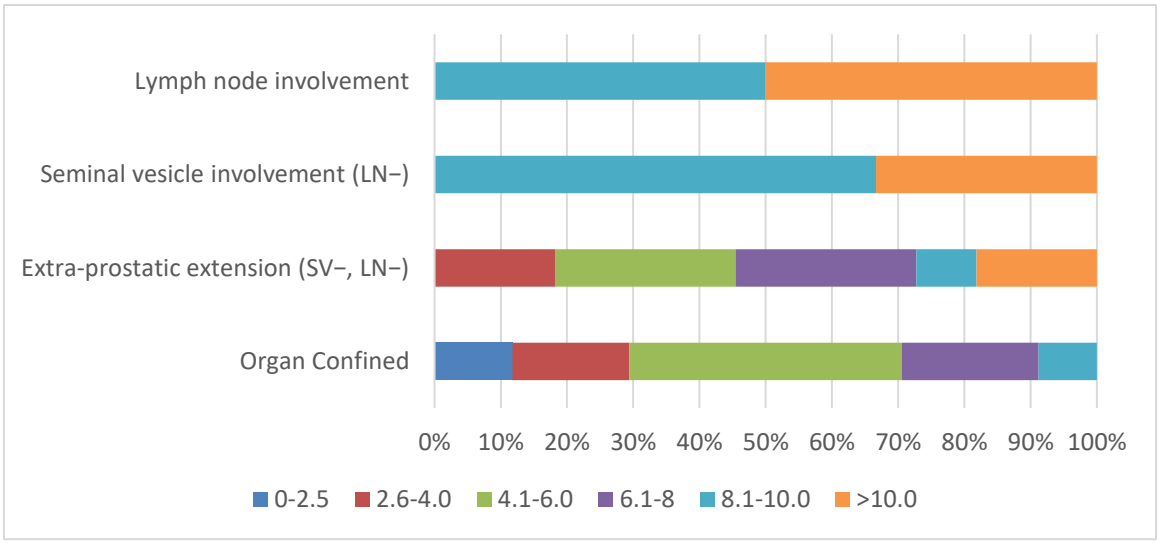

Figure 2: Distribution of patients with respect to PSA groups (ng/ml) and pathological stage

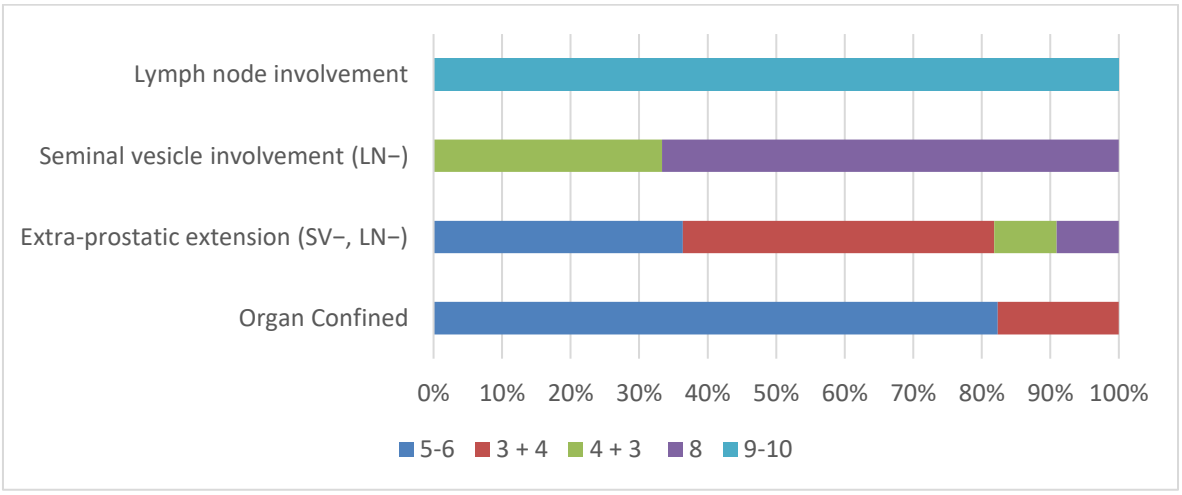

Figure 3: Distribution of patients with respect to Gleason Score and pathological stage

Table 3: Distribution of patients with respect to Clinical Stage and Pathological stage

Pathological stage	Number of Patients in Clinical Stages		
	T1	T2	T3
Organ Confined	24	10	0
Extra-prostatic extension (SV−, LN−)	2	3	6
Seminal vesicle involvement (LN−)	0	2	1
Lymph node involvement	0	1	1
Total (%)	26 (52.00)	16 (32.00)	8 (16.00)

All the patients with seminal vesicle and lymph node involvement had PSA level of more than 8 ng/ml. 27.27% of patients with extra-prostatic extension had PSA level of more than 8 ng/ml. More than 70% of patients with organ confined pathological stage had PSA level less than 6 ng/ml. [Table 2]

18.18% patients with extra-prostatic extension had T1 clinical stage. No patients with seminal vesicle or lymph node involvement had T1 stage on clinical examination. [Table 3]

All patients with lymph node involvement had biopsy Gleason score of 9-10. All patients with extra-prostatic

seminal vesicle involvement had biopsy Gleason score more than 6. 82.35% patients with organ confined pathological stage had Gleason score of 5-6.

Table 4: Distribution of patients with respect to Gleason Score and Pathological stage

Pathological stage	Number of Patients in Biopsy Gleason Score				
	5-6	3 + 4	4 + 3	8	9-10
Organ Confined	28	6	0	0	0
Extra-prostatic extension (SV−, LN−)	4	5	1	1	0
Seminal vesicle involvement (LN−)	0	0	1	2	0
Lymph node involvement	0	0	0	0	2
Total (%)	32 (64.00)	11 (22.00)	2 (4.00)	3 (6.00)	2 (4.00)

DISCUSSION

Among males with stage information who had undergone radical prostatectomy for localized prostate cancer, both the clinical and pathological stages were substantially linked to the severity of prostate cancer (PC). Clinical stage offered statistically significant prediction data for pathological stage and extent of tumour in our cohorts, with acceptable correlation, and pathological stage was significantly more strongly related with Gleason score than clinical stage. Following the widespread use of PSA screening, clinical stage was still helpful in that it offered statistically significant extra information to pathological stage for men diagnosed with prostate cancer after 1990. [4]

Research has yielded inconsistent results about the predictive power of clinical stage for prognosis. It has been suggested that clinical stage cannot reliably predict pathological stage.[21] It can serve as an indicator for post-surgical pathological stage and recurrence risk., and that it is unable to predict biochemical recurrence after surgery.[22-24]

Schroder et al. 21–25 identified 430 cases of prostate cancer out of 10,523 patients; these patients had normal DRE results and PSA levels between 3.0 to 4.0 ng/mL. [25] With a PSA cutoff of 4 ng/mL, Morgan et al. investigated age-specific reference values for PSA in 411 black men. They discovered that using conventional cutoff values would result in the missed diagnosis of 40% of malignancies in Black men. Patients with blood PSA values of 2.5 to 4 ng/mL, >4 ng/mL, and >10 ng/mL had a 27.0%, 20%–30%, and 42%–64% chance of prostate cancer, respectively, among males over 50.[26]

Our research showed a notably elevated PSA level in a more advanced pathological stage that involved lymph nodes and seminal vesicles. According to a study that used the PSA level to identify non-organ-confined illness, patients with higher PSA levels had a greater proportion of cancers with extra-prostatic expansion. For PSA levels between 4 and 10 ng/mL and greater than 20 ng/mL, the probability of extra-prostatic expansion was 50% and 80%, respectively. [27]

Our study's findings showed that, despite the good agreement, there are a number of challenges when using the biopsy Gleason score to guide treatment decisions. In a group of 628 patients, Bott et al. discovered a kappa concordance value of 0.40, an under-staging of 29 percent, an over-staging of 11 percent, and a concordance of 60 percent. [28] Lattouf et al. demonstrated a 69% correlation with 21 percent under-staging, 10 percent over-staging, and a kappa coefficient of 0.30 in a more extensive series of 393 patients. [29] Mian et al. demonstrated an association of 67 percent with 25 percent under-staging, 8 percent over-staging and a kappa coefficient of 0.43 in a series of 426 patients. [30]

A study by San Francisco et al. discovered a kappa coefficient of 0.43, under-staging in 17 percent of patients, over-staging in 9 percent of patients, and a concordance of 74% in a group of 466 patients. [31] In a group of 4789 patients, Chun et al. found a 66% association, 6% under-staging, 28 percent over-staging, and a 0.60 kappa concordance coefficient. [32] Tomioka et al. reported 61% concordance, 21 percent under-staging, 17 percent over-staging, and a kappa coefficient of 0.37 in a series of 223 patients in Japan. [33]

CONCLUSION

We found significant correlation between clinical stage, biopsy Gleason score, and PSA levels in post radical prostatectomy specimen of prostate cancer. Pre-operative evaluation should consider all the diagnostic modalities before surgery. In order to better manage prostate cancer aggressiveness, doctors and patients should be aware of the final evaluation of the biopsy Gleason score, clinical stage, and PSA levels. This is because future research is expected to enhance the techniques of currently accepted staging.

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