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Original Research Article

Correlation of Serum PSA, Gleason Score and Histopathological Grading of Adenocarcinoma of Prostate in Prostatic Biopsies at a Tertiary Care Center

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Abstract:

Objectives: Some of the key measures that are relevant to prostate cancer include serum PSA levels, Gleason score, and histopathological grading. Their relationship in the tertiary care facilities cannot be overlooked and hence constitutes this study's research focus.

Methods: The retrospective survey involved 86 samples of prostatic tissues taken between January 2022 to January 2023. These assessments included histomorphological examination and plasma levels of prostate-specific antigen (PSA). Gleason score was used to grade adenocarcinomas into five grade groups later on. PSA was categorized into 5 groups based on the type of questions they contain. Correlation analysis was performed.

Results: As for the type of cancer, it was noted that 37.2 % of the samples had adenocarcinoma. The study subjects were mainly males, and the mean age was 62.2 years. Most of the men were diagnosed with a Gleason score of 7 (12) while 7 men were diagnosed with a score of 6. The mean PSA was 37.2ng/ml in malignancy. The present observation also revealed that higher PSA levels were equated with higher Gleason scores. Out of all the cases that were given a score of 6, there was only one that had the PSA within the normal limits. The overall accuracy of PSA to detect adenocarcinoma was 96.87%, Specificit of 59.25%.

Conclusion: It was found that there is a direct relationship between a man's PSA levels, his Gleason score and his histopathological grade. These parameters are used when determining how severe the prostate cancer is and also when coming up with the treatment plan for the patient.

Keywords: Prostate cancer, Prostate-specific antigen, Gleason score, Histopathological, relationship, Therapy.

Introduction

Prostate cancer remains one of the most prevalent malignancies affecting men globally and tends to develop after the age of 50 years [1], necessitating a profound understanding of its diagnostic parameters for effective management.

Among these parameters, serum prostate-specific antigen (PSA) levels, Gleason score, and histopathological grading stand as fundamental pillars in guiding clinical decision-making. For prostate carcinoma serum PSA levels have been widely used for screening purposes and early detection can reduce patient mortality and morbidity [2].

Serum PSA level estimation is easy to perform and cost-effective so helps in screening [3]. Mostly in all prostatic diseases increased serum PSA levels are seen, but a marked increase in PSA levels is seen in carcinoma of the prostate [4]. Nowadays Gleason's grading system is most commonly used to grade prostate adenocarcinoma. Gleason's score of less than 6 is considered as low-grade cancer and they are not aggressive [4]. Gleason's score of 8 and beyond are generally advanced cancers with metastasis [4]. Higher Gleason scores signify more poorly differentiated and aggressive tumors, necessitating more aggressive treatment strategies.

Histopathological Grading in Prostate Adenocarcinoma: Histopathological examination of prostate biopsies provides crucial insights into tumor morphology and differentiation. Adenocarcinoma, the most common histological subtype of prostate cancer, is graded based on the architectural growth patterns of tumor cells, nuclear characteristics, and glandular differentiation. The Gleason score, derived from the primary and secondary patterns observed in histological sections, guides clinicians in prognostication and treatment planning.

Correlation Analysis: At tertiary care centers, where complex prostate cancer cases are managed, unraveling the correlation between serum PSA levels, Gleason score, and histopathological grading assumes paramount importance. Numerous studies have highlighted a positive association between elevated PSA levels and higher Gleason scores, indicative of aggressive disease behavior and advanced stage at diagnosis. Additionally, a strong correlation exists between the Gleason score and histopathological grading, with poorly differentiated tumors exhibiting higher Gleason scores and more aggressive clinical behavior.

This comprehensive article aims to elucidate the intricate correlation between these parameters in the context of prostate adenocarcinoma biopsies, drawing insights from a tertiary care center.

Material & Methods

A retrospective study was conducted in the Department of Pathology, SMBT IMSRC College from January 2022 to January 2023. A total of 86 prostatic tissue samples were processed and stained with routine Haematoxylin and eosin stain and histomorphological examination was done along with serum PSA levels. Based on their Gleason's score, patients with carcinoma of the prostate were divided into five grade groups.

The Gleason's Grading System is based on glandular differentiation and the growth pattern of tumour about stroma. All the Adenocarcinoma prostate cases were graded according to Gleason's Grading system.

- Grade 1: score 6 (3+3=6)
- Grade 2: score 7 (3+4=7)
- Grade 3: score 7 (4+3=7)
- Grade 4: score 8 (4+4=8,3+5=8,5+3=8)
- Grade 5: score >/=9

Patients with serum PSA levels were categorized as 0-4ng/ml, >4-10ng/ml, >10-20ng/ml, >20-50ng/ml, >50ng/ml [4].

Results

The present study was conducted on 86 patients over one year (Jan 2022 to Jan 2023). Out of 86 patients, 37.2% show malignancy (Adenocarcinoma) on microscopic examination. 62.7% were benign. The mean age of the patients was 62.2 years in Table 1.

In the present study, Gleason's score ranged from 6 to 9. The majority of the cases (n-12) were given a score of 7, followed by a score of 6 in seven cases. Score 8 was seen in eight cases and score 9 was seen in five cases. Out of 32 cases of Adenocarcinoma, 31 cases showed increased levels of serum PSA. The mean serum PSA level in malignancy was 37.2ng/ml in Table 2.

The mean PSA level in Group 1 was 10.6ng/ml, group 2 was 15.7 ng/ml, group 3 was 30.1ng/ml, group 4 was 54.6ng/ml, and Group 5 was 72.8ng/ml. Two cases of score 7 had higher levels of serum PSA (>50). Higher serum PSA level was seen in cases with Gleason's scores of 8 & 9. One case had serum PSA level within the normal limit (0-4) & was found to have adenocarcinoma with Gleason's score of 6 in Tables 3-5, Figures 1-3.

Table 1: Number/% of cases in accordance to the category of PSA (n=32)

Sr. PSA (ng/ml)	Total no of adenocarcinoma cases	Percentage
0-4	1	3.13%
>4-10	6	18.75%
>10-20	6	18.75%
>20-50	10	31.25%
>50	9	28.12%
Total	**32**	**100%**

Table 2: Distribution of Serum PSA in accordance with Gleason's score and Grade Groups (n=32)

Sr. PSA (ng/ml)	Group 1 (3+3=6)	Group 2 (3+4=7)	Group 3 (4+3=7)	Group 4 (4+1=8)	Group 5 (9-10)	Total
0-4	1	0	0	0	0	1
>4-10	7	0	0	0	0	7
>10-20	1	0	0	2	0	3
>20-50	2	0	4	4	2	10
>50	2	2	2	4	4	10
Total	**8**	**8**	**1**	**6**	**6**	**32**

Table 3: Serum PSA levels by adenocarcinoma (n=86)

Ca Prostate on Present Biopsy	Sr. PSA > 4 ng/ml	Sr. PSA ≤ 4 ng/ml	Total
Absent	22 (FP)	32 (TN)	54
Present	31 (TP)	1 (FN)	32
Total	**53**	**33**	**86**

- Sensitivity: 96.87%
- Specificity: 59.25%
- Positive predictive value(PPV): 58.4%
- Negative predictive value(NPV): 96.9%

Table 4: Serum PSA levels in benign and malignant cases

PSA Levels	Cases	Benign	Malignant
Normal PSA levels	33	32	1
Raised PSA levels	53	22	31
Total	**86**	**54**	**32**

Table 5: Mean Serum PSA levels in benign and malignant cases

Cases	Mean PSA Levels
Benign	10.2
Malignant	37.2

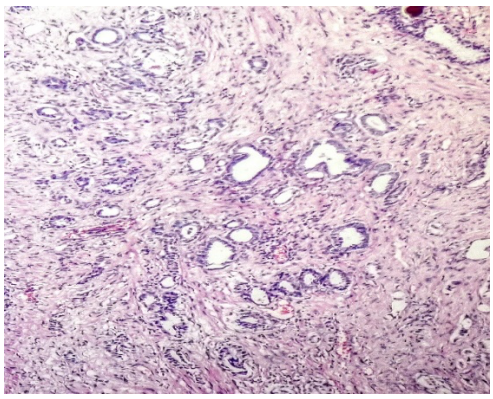

Figure 1: Adenocarcinoma prostate with Gleason's grade 3 (10x,H&E)

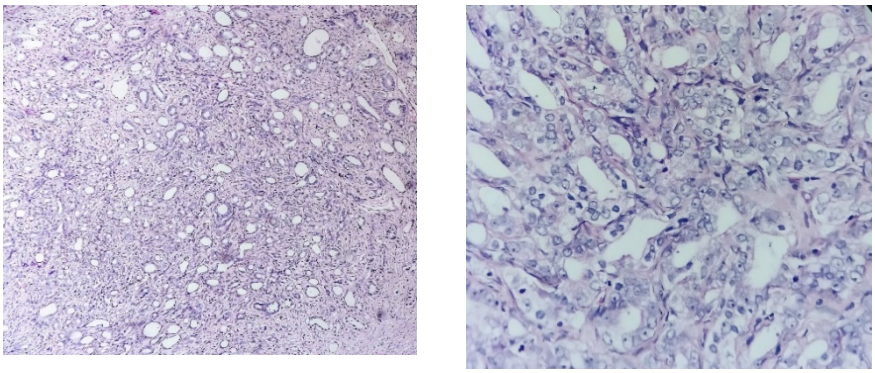

Figure 2: Adenocarcinoma prostate with Gleason's grade 4 (10x & 40x, H&E)

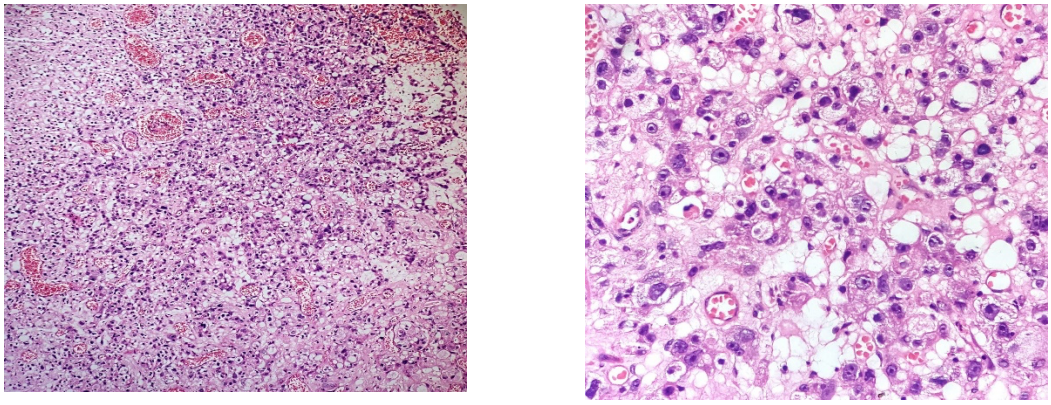

Figure 3: Adenocarcinoma prostate with Gleason's grade 5 (10x & 40x, H&E)

Discussion

The mean age of diagnosis of prostatic carcinoma in the present study was 66.2 years. This is compatible with the study Deepak et al (68.8 years) [3] and Lefkowitz GK et al (67.0 years) [6]. In our study, the majority of the cases were benign i.e 62.79% and 37.21% malignant, as seen in a study done by Ritu et al [5], but a study done by Wadgaonkar et al [7] showed a comparatively larger number of benign cases. It was 64.3% benign & 25.2% malignant in a study by Ritu et al and it was 83.8% benign & 15% malignant in a study by Wadgaonkar et al [7].

In our study, 31 out of 32 cases (96.87%) with adenocarcinoma prostate have serum PSA > 4ng/ml and 78.13% had PSA level >10ng/ml. One patient with adenocarcinoma of the prostate has normal serum PSA. This matches with the study done by Veda et al [8], Kavita et al [4](and Wadgaonkar et al [7]. PSA levels>10ng/ml were also seen in 82%, 68.75% & 92% of cases in a study conducted by Veda et al [8], Kavita et al [4], and Wadgaonkar et al [7] respectively.

In the present study, Gleason score ranged from 6 to 9 with a predominance of scores 6 & 7 which accounts for 19 cases out of 32 (59.3%). It was by the study done by Mosli et al [9] & Shiris et al [10]. The predominance of scores 6 & 7 was also seen in 57.7% & 70.5% of cases in a study done by Mosli et al [9] & Shiris et al [10] respectively. In our study sensitivity of serum PSA level is 96.87% and specificity is 59.25%, as also seen in the study done by Veda et al [8], but in the study of Deepak et al [3] the specificity was low and in a study by Shalini et al [11] sensitivity was low as compared our study.

Clinical Implications and Treatment Considerations:

Understanding the interplay between serum PSA, Gleason score, and histopathological grading has profound implications for clinical practice. In cases where elevated PSA levels coincide with high Gleason scores and poorly differentiated histology, aggressive treatment modalities such as surgery, radiation therapy, or systemic therapies may be warranted. Conversely, low-risk diseases characterized by lower PSA levels, low Gleason scores, and well-differentiated histology may be suitable for active surveillance or less aggressive treatment approaches, minimizing treatment-related morbidity and improving quality of life.

Conclusion

In our study, high serum PSA levels were correlated with high Gleason scores and grades. With the cut-off value of Sr. PSA 4ng/ml sensitivity was 96.87% and specificity was 59.25% we conclude that Serum PSA is a sensitive marker.

Though PSA is sensitive, its specificity for adenocarcinoma prostate is low. It has a high NPV which is important in ruling out the suspicion of malignancy In conclusion, the correlation between serum PSA levels, Gleason score, and histopathological grading serves as a cornerstone in the diagnosis, risk stratification, and management of prostate adenocarcinoma.

At tertiary care centers, where multidisciplinary approaches are employed, integrating these parameters enables personalized treatment strategies tailored to individual patient needs.

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