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Original Article

Role of Alcian Blue Stain in Differentiating Prostatic Adenocarcinoma from Nodular Hyperplasia of Prostate

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Abstract

Objective: Enlargement of prostate is one of the leading cause of morbidity in men. Alcian Blue stain demonstrates that the acidic mucin is present in prostatic adenocarcinoma but absent in nodular hyperplasia of prostste. So this histochemical marker can be used in distinguishing them. This study aims to determine the role of Alcian Blue stain in differentiating prostatic adenocarcinoma from the nodular hyperplasia of prostate.

Materials and Methods: This cross-sectional study was conducted in the Department of Pathology, Rajshahi Medical College, Rajshahi and in the Department of Pathology, Bangabandhu Sheikh Mujib Medical University (BSMMU) during the period of March 2018 to February 2020. Specimens were processed routinely for Haematoxilin and Eosin stain. The Alcian Blue stain was performed to demonstrate the presence of acidic mucin and the findings were categorized as positive or negative staining. Statistical analyses was carried out by using the Statistical package for Social Sciences (SPSS) version 20 for Windows. The components of accuracy test were computed by respective formulae for the tests.

Result: The study involved a total 60 specimens of prostatic tissue among which 30 were histopathologically diagnosed cases of prostatic adenocarcinoma and another 30 were histopathologically diagnosed cases of nodular hyperplasia. Among the 30 cases of prostatic adenocarcinoma the acidic mucin was positive in 25 (83.3 %) cases and negative in 5 (16.7%) cases but in nodular hyperplasia it was positive in 8 (26.6%) cases and negative in 22 (73.4%) cases. The sensitivity of Alcian Blue stain in favour of malignancy was 83.3% and specificity was 73.3%. The overall diagnostic accuracy of Alcian Blue stain was 78.3% and it showed a statistically significant difference in staining between the cases of adenocarcinoma and nodular hyperplasia, indicated by $p<0.05$.

Conclusion: Alcian Blue stain has a valuable role in differentiating prostatic adenocarcinoma from the nodular hyperplasia. So it can be used in the diagnosis of prostatic adenocarcinoma.

Key words: Alcian blue, Acidic mucin, Prostatic adenocarcinoma, Nodular hyperplasia of prostate.

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Introduction

Prostatic enlargement is one of the leading cause of male morbidity and by far the most common cause is nodular hyperplasia of the prostate.[1] Prostatic carcinoma is the most frequently diagnosed malignancy in men, and the second

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leading cause of male cancer-related mortality in the united states.[2] In our country the prevalence of prostate cancer among all cancers is 2.3% (Cancer Control in Bangladesh, 2013). The diagnosis of prostate cancer is critical and is based on a combination of architectural and cytological features. An accurate diagnosis can be very challenging due to the presence of small focus of cancer in biopsy materials.[3] Under-diagnosis of prostatic adenocarcinoma might delay treatment and cause adverse consequences for patients.[3]

Mucin stain may be an adjunctive aid in the diagnosis of adenocarcinoma of the prostate. Acidic mucin is predominently seen in malignant cases and absent in benign tumours.[4] For these characterstic features, acidic mucin have a diagnostic value in differentiating benign and malignant prostatic lesions.[1] Alcian Blue stain is used to identify acidic mucin in tissue sections.[5] Bastola and Talwar[1] performed an analytical study which showed that the Alcian Blue positivity in prostatic adenocarcinoma was statistically significant (p= 0.000003).

In Bangladesh, the diagnosis of prostatic adenocarcinoma is one of the most difficult challenges in surgical pathology. There is need of a marker which is specific, cost effective and can be used in institutions with limited resources. So, the aim of the study is to find out the role of this type of mucin histochemistry in differentiating benign and malignant tumours of prostate which will help more precisely in the diagnosis of prostate cancer.

Materials and Methods

The present study was a descriptive type of cross-sectional study and was conducted in the Department of Pathology, Rajshahi Medical College and in the Department of Pathology, BSMMU after taking permission from the Ethical Review Committee. The study was aimed at finding the diagnostic role of Alcian Blue stain in differentiating prostatic adenocarcinoma from the nodular hyperplasia of prostate. A total 60 samples of histopathologically diagnosed prostatic lesions were included in the study group among which 30 cases were prostatic adenocarcinoma and another 30 cases were nodular hyperplasia of prostate. The specimens were obtained by Trans-urethral Resection of Prostate (TURP) and needle biopsy. The tissues were fixed in 10% formaldehyde solution and embedded in paraffin block to make the histopathological slides. Routine Haematoxilin and Eosin stains were done in Department of Pathology, Rajshahi Medical College. Sections were studied under light microscope and classified into benign and malignant lesions microscopically. Associated prostatic tissue changes such as tumor invasion, prostatitis and others were also analyzed. Alcian Blue stain was done in Department of Pathology, BSMMU to demonstrate the presence or absence of acidic mucin. In most of the malignant cases the glandular acinar cells showed blue colour indicating the presence of acidic mucin. Few benign cases showed this positive result but maximum were negetive. Statistical analyses were carried out by using the Statistical package for Social Sciences (SPSS) version 20 for Windows. Chi-square tests were used to analyze categorical variables. Results having p-values <0.05 were considered statistically significant.

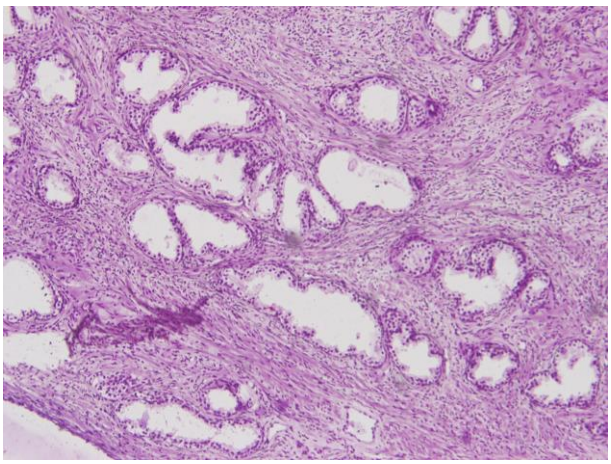

Fig 1 : Photomicrograph showing Nodular Hyperplasia of prostate (H &E X 100) (Case no. 12)

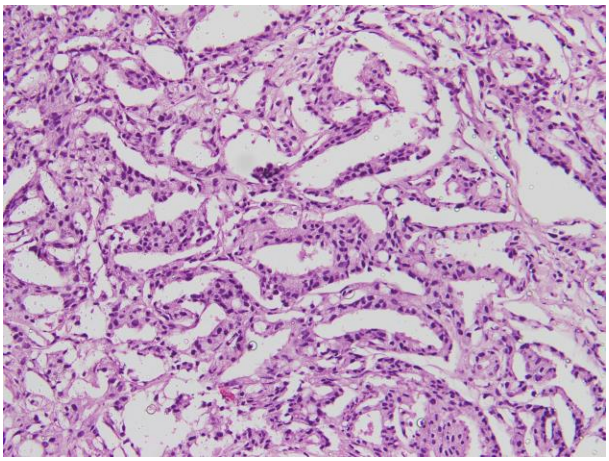

Fig 2 : Photomicrograph showing Prostatic Adenocarcinoma with Gleason score of 4+4= 8. (H & E X 400) (Case no. 54)

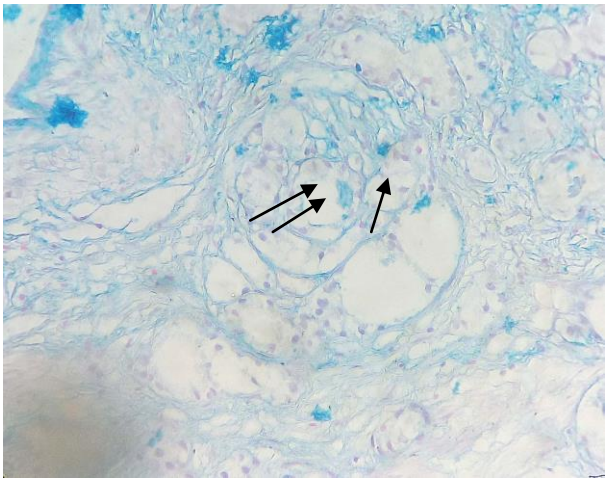

Fig 3 :Alcian Blue stain of Prostatic Adenocarcinoma (Gleason score 3+3= 6) showing blue coloured acidic mucin (double arrows) and red coloured nuclei (single arrow) of neoplastic cells (AB X 400) (Case no. 47)

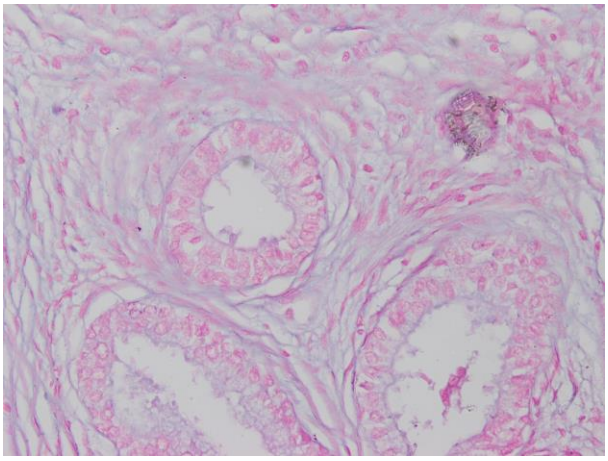

Fig 4 : Photomicrograph showing absence of Alcian Blue staining in Nodular Hyperplasia of Prostate (AB X 400) (Case no. 18)

Results

A total 60 cases of patients with prostatic lesions were studied during the period of two years. 30 patients had prostatic adenocarcinoma and another 30 patients had nodular hyperplasia of prostate which were diagnosed by histopathological examination (table-I). Among the cases of prostatic adenocarcinoma the mean age of patients were 70.76 (±4.68) with age range from 64 to 85 years. In case of nodular hyperplasia the mean age of patients were 65.83(±4.89) with age range from 55 to 77 years. In both groups the maximum number of patients were in the age group of 61-71 years. This age group distribution is depicted in table II.

Table 1: Distribution of The Patients By Their Histopathological Findings (n= 60)

Histopathological Diagnosis	Frequency	Percentage
Prostatic Adenocarcinoma)	30	50%
Nodular Hyperplasia	30	50%
Total	**60**	**100%**

Table 2 : Distribution of The Patients According to Age Group (n= 60)

Age	Nodular Hyperplasia		Adenocarcinoma	
	Frequency	%	Frequency	%
≤60 years	0	0	4	13.4
61- 70 years	18	60.0	21	70.0
71- 80 years	11	36.6	5	16.6
81- 90 years	1	3.4	0	0
Total	30	100	30	100

Adenocarcinoma : Min= 64years, Max= 85years, Mean= 70.76(±4.68)

Nodular Hyperplasia : Min= 55years, Max= 77years, Mean= 65.83(±4.89)

The predominant symptoms were difficulty in starting and stopping the urine stream followed by nocturia, dysuria, urinary hesitancy, increased frequency etc. The less common symptoms were retention of urine and overflow of urine.

25(83.4%) showed positive staining for Alcian Blue and 5(16.6%) cases showed negative staining. But in case of nodular hyperplasia only 8(26.6%) cases showed positive staining for Alcian Blue and 22(73.4%) showed negative staining. There was a statistically significant difference in Alcian Blue staining between these two study groups ($p< 0.05$).

Table IV shows the sensitivity, specificity, positive predictive value, negetive predictive value and diagnostic accuracy of Alcian Blue stain as a diagnostic test.

Table 3: Comparison of Alcian Blue Staining Between Nodular Hyperplasia and Adenocarcinoma (n= 60)

	Alcian Blue stain				Total	
	Nodular Hyperplasia		Adenocarcinoma			
	Frequency	%	Frequency	%		
Positive	25	83.4	8	26.6	33.	**p-value**
Negetive	5	16.6	22	73.4	27	
Total	30	100	30	100	60	<0.05

Data were analyzed using **Chi-square (χ^2) Test**

Table 4: Summary of The Sensitivity, Specificity, Positive Predictive Value, Negetive Predictive Value and Diagnostic accuracy of Alcian Blue Stain for Prostatic Adenocarcinoma

Alcian Blue	Case	Control	Total
Positive	25 (TP)	8 (FP)	33
Negetive	5 (FN)	22 (TN)	27
Total	30	30	60

TP= True Positive, FP= False Positive, TN= True Negetive, FN= False Negetive

Table 5: Summary of The Sensitivity, Specificity, Positive Predictive Value, Negetive Predictive Value and Diagnostic accuracy of Alcian Blue Stain for Prostatic Adenocarcinoma

Test	Sensitivity	Specificity	Positive Predictive Value	Negetive Predictive Value	Diagnostic Accuracy
Alcian Blue	83.3%	73.3%	76%	81.48%	78.3%

Discussion

The acidic mucin is predominantly seen in prostatic carcinoma because malignant prostatic glands produce acid muco-substance.[6] Alcian Blue stain was used in this study to detect the acidic mucin and the result showed a higher level of positivity in prostatic adenocarcinoma in contrast to nodular hyperplasia of prostate. Among the 30 cases of prostatic adenocarcinoma 25(83.4%) were Alcian Blue (AB) positive and 5(16.6%) were negative. On the other hand among the 30 cases of nodular hyperplasia Alcian blue was positive in 8(26.67%) cases and negative in

22(73.33%) cases. There was a statistically significant difference in the staining of Alcian Blue between these two groups, indicated by p< 0.05. This result was almost similar to the study conducted by Siroth N et al.[7] who studied on 190 cases of prostatic carcinoma and found that Alcian Blue was positive in 83% of cases. Bastola and Talwar[1] also found a result similar to this study where prostatic adenocarcinoma was Alcian Blue positive in 77.8% of cases as compared to nodular hyperplasia of prostate which was positive in only 18.5% of cases. In their study the P value for Alcian Blue positivity in malignancy was statictically significant(p=0.000003). The findings of our study were also in consistent with the study done by Hukill and Vidone [8] who reported 80% Alcian Blue positivity in malignant cases.

In our study, among the prostatic adenocarcinoma, 5 cases did not show positivity for acidic mucin which may be due to various causes such as faulty technique and section of tissue may not be representative. In this study 8 (26.6%) cases of nodular hyperplasia of prostate were also found to have the presence of acidic mucin and showed positivity for Alcian Blue stain. This unexpected finding was also observed in a study done by Gal R et al.[9] who found the presence of acidic mucin in hyperplastic prostatic glands. They explained the condition as mucinous mataplasia where the morphologically benign prostatic glands sometimes contain tall columnar cells and secrate Alcian Blue positive materials. This finding is non-specific for malignancy. Grignon DJ and O'Malley FP[10] also stated that the recognition of acidic mucin secreting cells in benign glands points to the non-specificity of this finding in the diagnosis of prostatic adenocarcinoma.

For testing the accuracy of Alcian Blue stain as a diagnostic test in differentiating the prostatic adenocarcinoma from nodular hyperplasia of prostate the standard formula of sensitivity, specificity, positive predictive value and negetive predictive value were used and the results were 83.3%, 73.3%, 76.0%, and 81.4% respectively. The overall diagnostic accuracy was 78.3%. The result is more or less similar to the study of Luna-More S et al.[11] who found a sensitivity of 80.0% and a diagnoctic accuracy of 62.75%.

So, in our study we found that Alcian Blue stain can give a satisfactory result in differentiating benign and malignant prostatic lesions and it can be used in the diagnosis of prostatic adenocarcinoma.

Conclusion

From the findings of the study it can decided that Alcian Blue stain has a beneficial role in the diagnosis of prostate cancer. So, it can be used as a diagnostic tool for early detection of prostatic adenocarcinoma in institutions where limited facilities are available.

Conflict of interest: None declared

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