

ORIGINAL ARTICLE

Analysis of Prostate-Specific Antigen-Related Indexes, Neutrophil-to-Lymphocyte Ratio in Patients with Concurrent Benign Prostatic Hyperplasia and Histologic Prostatitis

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SUMMARY

Background: This study was performed to explore the total prostate-specific antigen (tPSA) concentration, free PSA (fPSA) concentration, free-to-total PSA ratio (% fPSA), tPSA density (tPSAD), and neutrophil-to-lymphocyte ratio (NLR) in blood in patients with concurrent benign prostatic hyperplasia (BPH) and histologic prostatitis, and to provide new ideas for the diagnosis of prostatitis.

Methods: Patients who underwent transurethral bipolar plasmakinetic prostatectomy from June 2017 to June 2018 were retrospectively divided into two groups according to the degree of pathological inflammation of the resected prostate tissue: group A (BPH with histologic acute and chronic inflammation), group B (BPH with histologic chronic inflammation). The preoperative PSA-related indexes and NLR in blood were respectively compared between two groups.

Results: Groups A and B comprised 59 and 41 cases, respectively. The values of tPSA, tPSAD, and NLR were all significantly higher in group A than B, and the value of % fPSA was significantly lower in group A than B ($p < 0.05$). There was no significant difference for the value of fPSA between the two groups ($p > 0.05$).

Conclusions: Histologic acute prostatitis can cause changes of PSA-related indexes and NLR in blood, which has important clinical significance in diagnosis of prostatitis.

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KEY WORDS

histologic prostatitis, benign prostatic hyperplasia, prostate-specific antigen, neutrophil-to-lymphocyte ratio

INTRODUCTION

The prostate is located at the outlet of the bladder, and the urethra and two ejaculatory ducts run through it, therefore it plays an important role in the regulation of urination and fertilization. Because of its special anatomical location and function, the prostate is readily invaded by pathogenic microorganisms, which induce prostatic inflammation and autoimmune reactions. Patients with prostatitis, especially that involving acute in-

inflammation, often develop lower urinary tract obstruction [1]. For those elderly patients with BPH suffering from lower urinary tract symptoms (LUTS), how can it be determined whether they are combining with prostatitis? In order to improve the diagnostic level of prostatitis in elderly patients, we analyzed and compared the characteristics of preoperative PSA-related indexes and NLR in blood in patients with BPH and histologic prostatitis. This study was approved by Heze Municipal Hospital Ethics Committee.

MATERIALS AND METHODS

Clinical materials

We retrospectively evaluated the data of patients who had undergone transurethral bipolar plasmakinetic prostatectomy at the Department of Urologic Surgery of Heze Municipal Hospital from June 2017 to June 2018. All patients were required to meet the following two preoperative inclusion criteria: (1) patients who are suffering from serious lower urinary tract symptoms and (2) patients who are above 50 years old. The exclusion criteria were as follows: (1) patients who are suffering from urinary tract infections such as pyelonephritis, ureteral inflammation, or kidney inflammation; (2) patients who have suspected or are diagnosed with prostate cancer; (3) patients who are suffering from lower urinary tract diseases such as neurogenic bladder, urinary tuberculosis, urethritis, gonorrhoea, or urethrostenosis; (4) patients who have undergone urethral endoscopy, urethral catheterization, urethral dilatation, or prostate puncture within 1 month; (5) patients who have been treated with laser, microwave, radiofrequency, or other treatments; (6) patients who have been diagnosed as granulomatous inflammation, tuberculosis, or other special inflammation by postoperative pathology; (7) patients who have received antibiotics or 5-alpha-reductase inhibitors within 1 month.

In strict accordance with above inclusion and exclusion criteria, we enrolled a total of 100 patients aged 52 to 89 years. The preoperative values of tPSA, fPSA, neutrophil counts, lymphocyte counts in blood, and three diameters of prostate measured by color Doppler ultrasound were collected. Next, we performed the following calculations:

- Prostate volume (PV) = length x width x thickness x 0.52
- tPSAD = tPSA/PV
- % fPSA = fPSA/tPSA
- NLR = neutrophil counts/lymphocyte counts

Pathological diagnosis and grouping

Prostatic sections were stained with hematoxylin and eosin at 40x magnification, inflammatory cellular infiltration was assessed by the same two experienced pathologists. Histologic acute prostatitis was diagnosed by the presence of neutrophils, and histologic chronic prostatitis was diagnosed by the presence of lymphocytes,

plasmacytes, and monocytes [2-6].

The patients were divided into two groups: Group A, BPH with histologic acute and chronic inflammation; Group B, BPH with only histologic chronic inflammation.

Data comparisons

Statistical analysis was performed using the IBM SPSS 22.0 statistical software package (IBM Corp., Armonk, NY, USA). The rank sum test was used to assess significant differences of PSA-related indexes between groups, and Student's *t*-test was used to assess significant differences of NLR between groups. Values of $p < 0.05$ were considered statistically significant.

RESULTS

All BPH tissue specimens showed histological characteristics of BPH. Groups A and B comprised 59 and 41 cases, respectively.

The results of the statistical analysis were shown on Table 1. The values of tPSA, tPSAD, and NLR were all significantly higher in group A than B, and the value of % fPSA was significantly lower in group A than B ($p < 0.05$). There was no significant difference for the value of fPSA between the two groups ($p > 0.05$).

DISCUSSION

In this study, we first analyzed the histological inflammatory characteristics of prostate tissues of patients with BPH by pathological examination. Then we analyzed the influence of histologic prostatitis on PSA and NLR in blood of those patients. These results provided some theoretic guidance for the diagnosis and treatment of prostatitis.

Histopathological hyperplastic changes frequently occur in the prostate tissue of elderly men. Prostatitis can increase urination resistance and cause the progression from asymptomatic BPH to symptomatic BPH [7,8]. The location of inflammation in the prostate might be an important factor affecting the severity of LUTS, especially voiding dysfunction. Once the inflammation had resolved, the voiding symptoms would gradually disappear, and surgical treatment would be unnecessary. Hence, a diagnosis of the presence or absence of prostatitis is essential for elderly men suffering from LUTS. At present, the diagnosis of prostatitis is primarily based on history, physical examination, urine culture, and urine specimen testing [1]. In this study, prostatitis was diagnosed according to pathological examination, we found all BPH patients had histologic chronic prostatitis, and 59% of these patients meanwhile also had histologic acute prostatitis. However, some previous study indicated that more chronic inflammation was associated with BPH [4,9], acute prostatitis is rarely mentioned. PSA is mainly produced by epithelial cells of the pros-

Table 1. Comparison of tPSA, fPSA, % fPSA, PSAD, fPSAD, and NLR in groups A and B.

Item	Group A (n = 59)	Group B (n = 41)	p
tPSA (ng/mL)	7.68 (3.12, 14.63)	3.6 (1.24, 10.15)	0.027
fPSA (ng/mL)	1.09 (0.56, 2.04)	0.76 (0.25, 1.51)	0.133
% fPSA	0.16 (0.1, 0.23)	0.2 (0.15, 0.31)	0.025
tPSAD	0.13 (0.07, 0.25)	0.08 (0.04, 0.21)	0.032
NLR	3.97 ± 2.82	2.73 ± 2.21	0.021

tate gland. Under normal circumstances, PSA is directly secreted into the semen and plays an important role in human fertilization. PSA appears in serum only when the microarchitecture of the prostate tissue has been disrupted. Inflammation can destroy the epithelial cells and basement membrane of the prostate gland, resulting in the movement of PSA into the peripheral blood. Men with positive bacterial prostate tissue cultures show a tendency toward higher PSA levels [10]. In this study, histologic acute prostatitis was associated with elevated serum tPSA, tPSAD, and decreasing % fPSA. The influence of histologic chronic prostatitis on serum PSA-related index was slight, which indicated that histologic acute prostatitis was more destructive to the prostate gland than histologic chronic prostatitis.

Neutrophils are the main immune cells against pathogenic microorganisms [11,12]. NLR is a better indicator to predict inflammation or cancer [13,14]. It can reflect the ebb and flow balance changes of neutrophils and lymphocytes in tissues. This study indicated that histologic acute prostatitis can elevate NLR in peripheral blood, which has potential application value.

This study has two main limitations. First, relatively few patients were involved in this study; second, prostatitis was evaluated only by hematoxylin and eosin staining.

CONCLUSION

In summary, histologic acute prostatitis can cause changes of PSA-related indexes and NLR in blood, which has important clinical significance in the diagnosis of histologic prostatitis. For those elderly men with PSA abnormalities, the use of PSA-related indexes combined with NLR can avoid unnecessary prostate biopsy or surgery.

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Declaration of Interest:

There are no conflicts of interest (financial, employment-related, or otherwise).

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