

THE EFFECT OF INCREASING AGE ON SERUM PROSTATE SPECIFIC ANTIGEN AND PROSTATE SPECIFIC ANTIGEN DENSITY IN PATIENTS WITH BENIGN PROSTATIC HYPERPLASIA

Murat ÇAKAN, M.D., M.Özgür TAN, M.D., Zafer SINIK, M.D., Haluk TOKUÇOĞLU, M.D., Turgut ALKIBAY, M.D., Nuri DENİZ, M.D., Üstünoğlu KARAOĞLAN, M.D., İbrahim BOZKIRLI, M.D.

Gazi University, Faculty of Medicine, Department of Urology, Ankara, Turkey
Gazi Medical Journal 6 : 67-69, 1995

SUMMARY : Serum prostate specific antigen (PSA), prostate volume and prostate specific antigen density (PSAD) values were compared in 71 patients with benign prostatic hyperplasia (BPH) who were divided to four age groups. BPH was diagnosed by histopathological examination in 23 cases while rectal examination, PSA and transrectal ultrasonography (TRUS) used in 48. Statistical analysis of data revealed 0.078 ng/ml increase in PSA, 0.536 ml increase in prostate volume and 0.001 increase in PSAD for each yearly increase in age. As a conclusion, the effect of increasing age must be considered while using PSA, PSAD and TRUS for the diagnosis of BPH.

Key Words : Benign Prostatic Hyperplasia, Prostate Specific Antigen, Prostate Specific Antigen Density, Age.

INTRODUCTION

Prostate specific antigen (PSA) is a 34 kDA enzyme that is produced by both benign and malignant prostatic epithelial cells which functions for lysis of seminal coagulum (7). As incidence of BPH increases with age serum PSA values also increase and whether this increase is due to development of BPH or to other pathologies such as occult cancer is still unclear (4). Several authors have suggested using the prostate specific antigen index (PSAI) or PSA density (PSAD) which is defined as quotient of serum PSA divided by prostate volume for differing amounts of benign hyperplasia in prostate glands (2, 3). In this report the effect of age on PSA, prostate volume and PSAD was investigated in 71 patients with BPH.

MATERIALS AND METHODS

Seventy-one patients who had applied to Gazi University, Faculty of Medicine, Department of Urology with prostatism symptoms were taken into the study. Patients were divided to four age groups (50-59, 60-69, 70-79, 80-89) and mean age was calculated as 62.73 (50-85). Serum PSA was measured after 4 days from rectal examination and transrectal ultrasonography. BPH was diagnosed by histopathological examination in 23 cases (TURP in 19, transrectal needle biopsy in 2, suprapubic transvesical prostatectomy in 2) whereas 48 cases were diagnosed together with rectal examination, PSA and transrectal ultrasonography. Patients having urinary retention were excluded from the study.

Serum PSA was measured in Department of Nuclear Medicine using PSA double antibody RIA kit by DPC. Transrectal ultrasonography was done

in Department of Radiology by a Toshiba 516-S USG device. Prostate volume was calculated using the ellipsoid formula. PSAD was calculated by dividing serum PSA to prostate volume.

RESULTS

Table 1 shows PSA values in 71 patients. In 6 patients whose PSA values were greater than 10 ng/ml BPH was diagnosed histopathologically to exclude prostate cancer (4 by TURP, 2 by transrectal biopsy). Table 2 shows PSA values in different age groups. Mathematical analysis revealed a direct relation between PSA and age and 0.078 ng/ml increase in PSA per year increase in age was calculated.

| Serum PSA (ng/ml) | Number of Patients | % |
|-------------------|--------------------|--------|
| 4 > | 52 | 73.23 |
| 4 - 10 | 13 | 18.30 |
| > 10 | 6 | 8.47 |
| TOTAL | 71 | 100.00 |

Table 1 : PSA values in patients with BPH.

| Age | Group | Number | % | PSA (ng / ml) | | | |
|---------|-------|--------|-------|---------------|---------|---------|------|
| | | | | Minimum | Maximum | Average | SD |
| 50 - 59 | 1 | 19 | 26.76 | 0.24 | 14 | 3.24 | 4.12 |
| 60 - 69 | 2 | 37 | 52.11 | 0.80 | 17 | 3.84 | 3.28 |
| 70 - 79 | 3 | 8 | 11.27 | 1.80 | 15 | 4.65 | 4.27 |
| 80 - 89 | 4 | 7 | 9.86 | 1.30 | 18.67 | 5.00 | 6.10 |

Table 2 : PSA values in different age groups.

| Age | Group | Number | % | Prostate Volume (ml) | | | |
|---------|-------|--------|-------|----------------------|---------|---------|-------|
| | | | | Minimum | Maximum | Average | SD |
| 50 - 59 | 1 | 19 | 26.76 | 16 | 52 | 33.92 | 11.60 |
| 60 - 69 | 2 | 37 | 52.11 | 16 | 84 | 42.37 | 18.39 |
| 70 - 79 | 3 | 8 | 11.27 | 17 | 70 | 49.75 | 17.23 |
| 80 - 89 | 4 | 7 | 9.86 | 30 | 60 | 46.71 | 11.58 |

Table 3 : Prostate volume in different age groups.

Prostate volumes in different age groups are shown in Table 3. A direct relation between prostate volume and age was found and 0.536 ml increase in prostate volume per yearly increase in age was

calculated.

After this PSAD was calculated in each patient in all groups and 0.15 value was accepted as the limit between BPH and prostate cancer. Five patients having values greater than 0.15 were examined histopathologically to exclude prostate cancer. Table 4 shows PSAD values in different age groups. Similarly direct relation was found and 0.001 increase in PSAD per yearly increase in age was calculated.

There was a linear relationship between age and PSA, PSAD and prostate volume. Mathematical estimation of curves yielded numeric quantities of PSA, PSAD and prostate volume for each yearly increase in age.

CONCLUSION

Stamey et al were the first to quantify the contributions of BPH and prostate cancer to serum PSA in patients undergoing prostatectomy at 1987 (9). He found that serum PSA concentrations were found to be elevated (>2.5 ng/ml) by a Pros-Check assay in 86 % of patients preoperatively and prostate cancer causes approximately ten fold greater increase in serum PSA than BPH on a per gram basis (9). Alt-

though there is still debate on upper limits of normal for PSA, today 4.0 ng/ml is agreed by most urologic clinics (8). The study of transrectal ultrasonography as a screening and an early detection procedure has advanced the concept of PSAD defined as

| Age | Group | Number | % | PSAD | | | |
|---------|-------|--------|-------|---------|---------|---------|-------|
| | | | | Minimum | Maximum | Average | SD |
| 50 - 59 | 1 | 19 | 26.76 | 0.005 | 0.360 | 0.071 | 0.077 |
| 60 - 69 | 2 | 37 | 52.11 | 0.026 | 0.378 | 0.086 | 0.059 |
| 70 - 79 | 3 | 8 | 11.27 | 0.040 | 0.283 | 0.098 | 0.080 |
| 80 - 89 | 4 | 7 | 9.86 | 0.028 | 0.339 | 0.105 | 0.107 |

Table 4 : Prostate specific antigen density in different age groups.

serum PSA divided by prostate volume and 0.15 is the generally accepted limit between BPH and prostate cancer (2, 3). Carter stated no difference with advancing age whereas Bambaian found significant relation between PSA and age even when gland volume was considered (1, 5). Today age influence on PSA has not been fully analyzed but regular PSA monitoring is suggested in patients taking into consideration the increasing malignancy potential with advancing age (5).

In our study PSA, prostate volume and PSAD values compared in different age groups in patients with BPH and direct relationship between age and these parameters were found. For each yearly increase in age 0.078 ng/ml increase in PSA, 0.536 ml increase in prostate volume and 0.001 increase in PSAD was calculated. Cyntbia found 4 % increase in PSA per year (6) and no other reports could be available to compare our results. Regarding number of patients in our study group we believe further studies are necessary to enlighten the influence of age on PSA, PSAD and prostate volume.

REFERENCES

1. Babaian RJ, Myashita H, Evers RB : The distribution of PSA in men without clinical or pathological evidence of prostate cancer relationship to gland volume and age. *J Urol* 1992; 147 : 837-840.
2. Benson MC, Whang IS, Pantuck A, et al : Prostate specific antigen density : Means of distinguishing BPH and prostate cancer. *J Urol* 1992; 147 : 815-816.
3. Brawer MK, Aramburu EAG, Chen G, et al : The inability of PSA Index to enhance the predictive value of PSA in diagnosis of prostatic carcinoma. *J Urol* 1993; 150 : 369-373.
4. Brawer MK, Chetner MP, Beattie J, et al : Screening for prostatic carcinoma with prostate specific antigen. *J Urol* 1992; 147 : 841-845.
5. Carter HB, Coffey DJ : The prostate : An increasing medical problem. *Prostate* 1990; 16 : 39-41.
6. Cyntbia CJ, Harry AG : Natural history of BPH : Serum PSA concentration in age stratified, randomly sampled population-Influence of age and prostatic volume. *J Urol* 1993; 149 : 250 A, 145.
7. Ellis WJ, Brawer MK : PSA in BPH and prostatic intra epithelial neoplasia. *The Urologic Clinics of North America, Prostatic Tumor markers* 1993; 4: 621-625.
8. Partin AW, Carter HM, Chan DW, et al : PSA in the staging of localized prostatic cancer; Influence of tumor differentiation, tumor volume and benign hyperplasia. *J Urol* 1990; 143 : 747-752.
9. Stamey TA, Young N, Hay AR, et al : PSA as a serum marker for adenocarcinoma of the prostate. *New Engl J Med* 1987; 317 : 909-911.

Correspondence to : Dr. Üstünoğlu KARAOĞLAN
Gazi Üniversitesi Tıp Fakültesi
Üroloji Anabilim Dalı
Beşevler
06500 ANKARA - TÜRKİYE
Phone : 312 - 214 10 00 / 6203