Ejaculation has no impact on prostate-specific antigen levels


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Prostate-specific antigen; PSA; Ejaculation; Prostate cancer

Abstract
Background: Prostate-specific antigen (PSA) is a tumor marker used in the diagnosis of prostate cancer; it is organ-specific but it is not disease-specific. The effect of ejaculation on PSA concentration is controversial.

Aim: To evaluate the impact of PSA values after ejaculation on biopsy indication in a screened population.

Methods: Baseline PSA was measured in 100 patients that had abstained from sexual activity for at least 7 days. A second measurement was carried out 48 h after ejaculation. The numerical differences were compared using the Student’s t test. The McNemar’s test was used to analyze pre and post-ejaculation values and clinical significance was defined as a PSA value above a pre-established limit for biopsy indication.

Results: Mean age of the patients was 52.7 ± 8.6 years. The mean baseline PSA was 1.39 ± 1.43 ng/mL and after ejaculation was 1.48 ± 1.51 ng/mL (p = 0.54). Two patients had PSA values that increased sufficiently for biopsy indication, using a parameter of 4 ng/mL after ejaculation. The McNemar’s test showed no statistically significant differences (p = 0.500).

Conclusions: There was no statistically significant difference in PSA after ejaculation and this change had no clinical relevance.

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Introduction

Prostate-specific antigen (PSA) is a serine protease and its prostatic origin was demonstrated in 1979. It belongs to the kallikrein family and digests the gel that is formed in seminal fluid after ejaculation. Since its identification, it has been used in screening and in the follow-up of patients with prostate cancer (CaP). Nevertheless, it is organ-specific and not disease-specific and its role as a screening tool has recently been questioned. A PSA between 4 and 10 ng/ml has a 20% positive predictive value for CaP. The standard cut-off point for prostate biopsy indication is 4.0 ng/ml. At some centers, the level has been reduced to 2.5 ng/ml in an effort to increase its sensitivity. However, there are circumstances other than CaP that can increase PSA values, decreasing its specificity.

Some of the conditions reported in the literature that can increase PSA are digital rectal examination, cystoscopy, prostate biopsy, transurethral catheterization, urinary retention, and bicycling. Ejaculation has also been identified as a factor increasing PSA concentration. There is controversy among different studies analyzing this association, added to the fact that the differences were only observed and evaluated from a numerical, and not a clinical, point of view.

A possible explanation for the post-ejaculation increase in PSA is the augmented pressure in the prostatic ducts, which can cause basal membrane disruption and a consequent leakage of PSA into the circulatory system. The aim of our study was to evaluate the change in PSA values after ejaculation and its impact on the clinical indication for prostate biopsy in an adult sample of a population that underwent CaP screening.

Methods

The study was approved by our institutional ethics committee. Men between the ages of 40 and 75 years were invited to participate. Those presenting with prostate cancer, having taken 5α-reductase inhibitors within the last 6 months, diagnosed with prostatitis in the last 3 months, or having had prostate biopsy within the last 6 months were excluded from the study. Participants with a past history of pelvic surgery in the last year, radical prostatectomy, congenital urinary tract abnormalities, or International Prostate Symptom Score (IPSS) values above 8, and patients that had undergone urinary tract procedures involving the use of instruments in the last 3 months were also excluded.

All the participants signed statements of informed consent and were questioned in regard to ejaculatory abstinence within the last 7 days. A baseline serum PSA sample was later taken and the IPSS questionnaire was applied. All the samples were processed by the same laboratory. Total PSA was measured through a chemiluminescent bioassay (Abbott, Architect i4000). The second sample was obtained 48 h after ejaculation. External determination was proposed for the patients with PSA values above 4 ng/ml in either of the 2 determinations in order to make a decision from this result.

Baseline and post-ejaculation PSA were compared using the paired Student’s t test, establishing each individual as his own control. Clinical significance was defined as a PSA
value above the levels considered the limits for prostate biopsy, based on definitions from previous studies: 2.5 and 4 ng/ml.5,6 The difference was compared through the McNemar test.

The statistical analysis was done with the Statistical Product and Service Solutions (SPSS) version 17.0 (Chicago Illinois) software. Statistical significance was set at a p < 0.05.

Results

One hundred patients with a baseline PSA sample were recruited for the study. Six of those participants were lost during the follow-up and so were excluded from the final analysis. None of those 6 differed from the participants that completed the follow-up in relation to age range (p = 0.69), IPSS score (p = 0.54), and baseline PSA (p = 0.81).

The mean age was 52.7 ± 8.6 years and the total IPSS score was 3.8 ± 2.4. The mean baseline PSA was 1.39 ± 1.43 ng/ml and after ejaculation was 1.48 ± 1.51 (table 1).

The mean difference between the 2 measurements was not statistically significant (p = 0.054). The absolute mean and percentage of change were 0.08 ± 0.41 ng/ml and 8.7 ± 21.3%, respectively (figs. 1 and 2). The mean time from the last ejaculation to the first PSA determination was 20.49 ± 41.93 days. The mean time from ejaculation to the second serum determination was 17.36 ± 10.16 h.

Ejaculation was achieved through coitus in 68 participants (66.7%), masturbation in 24 (23.5%), and 2 (2%) patients stated through wet dreams. We compared the absolute change percentage in the PSA between coitus and masturbation and found no differences in the absolute change of PSA between the 2 groups (p = 0.11), but there were differences between them with respect to the percentage of change (p = 0.02).

No correlation was found between the time from ejaculation and the absolute change of PSA (p = 0.269) or in the percentage of change of PSA (p = 0.087).

Utilizing the cut-off value of 2.5 ng/ml for biopsy indication, 16 patients would be candidates for undergoing this procedure due to their post-ejaculation result. However, 11 of them already presented with a baseline PSA value above 2.5 ng/ml (fig. 3). The McNemar test showed no differences between patients that would have to be taken for biopsy according to their baseline and post-ejaculation PSA values (p = 0.063).

Using 4.0 ng/ml as the cut-off value, 6 of the subjects had elevated post-ejaculation PSA values. Five of these patients already had a baseline PSA above the cut-off value. In fact, an elevated PSA level in one of the patients decreased to below 4.0 ng/ml after ejaculation and the post-ejaculation PSA values reached the criteria for biopsy in only 2 subjects (fig. 3). Once more, the McNemar test showed no statistically significant difference (p = 0.500).

Discussion

The current paradigm is that ejaculation affects the absolute value of PSA and it is common practice to request that the patient abstain from having ejaculation at least 48 h prior to obtaining the sample for PSA determination.10 Through a search of the PubMed database for clinical studies dealing with this theme, we found that the majority were conducted in the 1990s and their results were inconsistent.
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Nevertheless, the present day recommendation is based on studies showing significant differences.

In 1993, Simak et al. were the first to analyze the relation between ejaculation and PSA.7 Their study included 18 young patients and found a statistically significant decrease, despite the small number of patients. They concluded that this variation could have a clinical impact and that further studies were necessary; another study supported their conclusion.8 On the other hand, some published articles found no changes, whereas others demonstrated an increase.11,13-18 Nevertheless, there were differences between the populations in each of the studies and the methods used.

Tchetgen and Oesterling11 compared PSA values at 1, 6, and 24 h after ejaculation in 64 adults (mean age of 60 years). Their results showed a statistically significant increase in both the change in absolute levels and the percentage of change, and differed from our results. However, their study utilized very strict measures of time between determinations, which we considered an approach not in accordance with clinical reality. Another important point was that their mean PSA value was below 4 ng/ml (1.8 ng/ml) with a mean change that was higher at the first hour (0.8 ng/ml). In another study by Herschman et al.16 that also measured post-ejaculation PSA at 1, 6, and 24 h, a statistically significant increase was observed in only 20 patients. However, when the cut-off point was defined at 4 ng/ml, none of the patients needed biopsy due to PSA changes, and when the cut-off point was > 2.5 ng/ml, only one of their participants underwent biopsy. Another 2 patients showed a post ejaculation PSA value > 2.5 ng/ml, one hour after ejaculation. That PSA determination (1 h post-ejaculation) is not a typical setting and therefore we consider that such a change has no clinical impact.

Other studies found no statistically significant difference13-15 and are criticized because they recruited young volunteers or because the exact time between PSA determinations was missing. We consider that knowing the precise variations at different times is important in the field of molecular biology to explain the pharmacokinetics of PSA.1,7 However, the main objective of this discussion is the clinical impact.

Stenner et al.18 conducted a study with 2 cohorts and, similar to our results, found no statistically significant differences. The first cohort consisted of 618 individuals with a self-report on the time of the last ejaculation before PSA determination. The second cohort was of 88 volunteers in whom the second sample was determined within 48 h after ejaculation. The similarity of the study design with ours supports the conclusions of both studies, as well as the reproducibility of the results.

The clinical impact of a change in PSA was analyzed in that study,18 looking for patients with values above 4 ng/ml. Five of the patients (5.7%) would have to undergo biopsy according to their post-ejaculation PSA. In our cohort only 2 patients (2.1%) would have to undergo biopsy due to the increase in PSA > 4 ng/ml, and even utilizing the cut-off point > 2.5 ng/ml, only 5 patients (5.3%) would be indicated for biopsy from their post-ejaculation PSA determination.

Despite the fact that the Tchetgen11 and Herschman16 groups had results that were distinct from ours in relation to the significant difference of the change in PSA, this was only of numerical importance. After reviewing their clinical results, we could conclude that the increase in post-ejaculation PSA values had no clinical impact and that the previous judgments were based only on absolute numerical differences.

Some studies with larger samples show differences from a numerical perspective.15,18 This can be explained by the time interval employed for taking the sample. Our study, like that of Stenner et al.,18 was developed based on the daily clinical setting and neither one confirmed a numerical difference or, more importantly, clinical impact.

Conclusions

Sexual abstinence before PSA determination should not be recommended to patients, given that it has few clinical implications. However, an increase in PSA to a value above arbitrary reference values should be complemented with a second sample and its etiology should be studied.

Ethical responsibilities

Protection of persons and animals. The authors declare that the procedures followed conformed to the ethical standards of the responsible committee on human experimentation and were in accordance with the World Medical Association and the Declaration of Helsinki.

Data confidentiality. The authors declare that they have followed the protocols of their work center in relation to the publication of patient data.
Right to privacy and informed consent. The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the corresponding author.

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Conflict of interest

The authors declare that there is no conflict of interest.

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