ABSTRACT

Objective: To investigate whether core length is a significant biopsy parameter in the detection of prostate cancer.

Material and methods: We retrospectively analyzed pathology reports of the specimens of 188 patients diagnosed with prostate cancer who had undergone initial transrectal ultrasound (TRUS) guided prostate biopsy, and compared biopsy core lengths of the patients with, and without prostate cancer. The biopsy specimens of prostate cancer patients were divided into 3 groups according to core length, and the data obtained were compared (Group 1; total core length <10 mm, Group 2; total core length 10 mm-19 mm, and Group 3; total core length >20 mm). Biopsy core lengths of the patients diagnosed as prostate cancer, and benign prostatic hyperplasia were compared, and a certain cut-off value for core length with optimal diagnostic sensitivity and specificity for prostate cancer was calculated.

Results: Mean age, PSA and total length of cores were 65.08±7.41 years, 9.82±6.34 ng/mL and 11.2±0.2 mm, respectively. Assessment of biopsy core lengths showed that cores with cancer (n=993, median length 12.5 mm) were significantly longer than benign cores (n=1185, median length=11.3 mm) (p<0.001). Core length analysis yielded 12 mm cores have an optimal sensitivity (41.9%) and specificity (62%) for detection of cancer (odds ratio: 1.08).

Conclusion: Biopsy core length is one of the most important parameter that determines the quality of biopsy and detection of prostate cancer. A median sample length of 12 mm is ideal lower limit for cancer detection, and biopsy procedures which yield shorter biopsy cores should be repeated.

Keywords: Biopsy; cancer; core length; prostate.

Introduction

According to the American Cancer Society, in 2013 approximately 240,000 patients with prostate cancer (PCA) have been diagnosed and one of every six men is under the risk of becoming PCA patient in his lifetime.\(^1\) Transrectal ultrasound (TRUS) guided prostate biopsy has become the gold standard diagnostic method after Hodge et al.\(^2\) defined this method in 1989.

The diagnostic yield of a single biopsy set is between 20-25%\(^3\) and some studies showed that increasing the number of biopsy specimens also increases the cancer detection rate.\(^4,5\) Increasing the number of cores is a method of obtaining more specimens which results in a higher cancer detection rate.\(^6,7,8\) An alternative way could be obtaining longer cores during biopsy. A number of studies have demonstrated that the frequency of prostate cancer detection correlates with biopsy length.\(^5,7,8\) In these studies, the core lengths of specimens with cancer and benign prostate hyperplasia (BPH) were compared.

In our study, we chose the patients diagnosed with PCAs and evaluated the sample core lengths in their own group. We also tried to establish a cut-off value for prostate biopsy core length that could increase the cancer detection rate.
Material and methods

We retrospectively analyzed data of 216 patients who underwent initial prostate biopsy in our clinic between January 2009-June 2013 and diagnosed with PCa. For standardization only 188 patients between 40-80 ages with PSA under 20 ng/mL who had initial biopsies were included in the study. Patients with PSA value over 20 ng/mL, aged under 40 and over 80 years were excluded from the study.

After obtaining informed consent from patients, biopsies were done while the patient was in a lateral decubitus position after rectal administration of lidocain gel with a 30 cm 18 gauge tru-cut biopsy gun in each case. A total of 10-12 cores of biopsy from peripheral zone were obtained in sagittal plane using the same ultrasound machine. The transitional zone sampling was not performed at first biopsy. The quality of cores was assessed macroscopically, and another biopsy specimen was immediately taken from the same spot if the specimen was of suboptimal quality. Each specimen was sent for histopathological evaluation in a separate tube containing 10% formol and enumerated by the biopsy site and prostate lobe.

After histopathological assessment, patients with PCa detected in one or more cores were included in the study and biopsy cores with atypical small acinar proliferation (ASAP), high grade intrap epithelial neoplasia (HGPIN) and those containing only rectal mucosa or periprostatic tissue and fragmented poor quality prostate tissues were excluded.

Biopsy specimens of PCa patients were divided into 3 groups according to their biopsy core lengths based on the gross description in the pathology report as follows; Group 1: <10 mm, Group 2: 10-19 mm and Group 3: ≥20 mm.

The study was conducted according to the principles of World Medical Association Declaration of Helsinki ‘Ethical Principles for Medical Research Involving Human Subjects’.

Statistical analysis

The continuous variables of the study were patients age, PSA, prostate volume and biopsy core length. Relationship between the biopsy core length and the number of cancer positive cores was analyzed with linear regression test. The strength of the emerging relationship and presence of positive linear relation were assessed with Pearson correlation test. Chi-square test evaluated the tumor-positive biopsy cores and assessed the relationship between core length and cancer diagnosis. Level of statistical significance was set at p<0.05 and Statistical Package for the Social Sciences (IBM SPSS Statistics, Armonk, NY, USA) version 21.0 was used for analysis.

Results

Data on 188 patients diagnosed with PCa were evaluated. Eighteen cores with ASAP or HGPIN were excluded and a total of 2,178 cores have been analyzed. Mean age (66.77±6.88 years), PSA value (11.3±7.54) and core length (11.3±0.45) were estimated. Clinical variables of 3 groups are summarized in Table 1.

When these 3 groups compared with each other, Groups 2 and 3 had a statistically significantly higher cancer detection rate relative to Group 1 (p<0.001). At the same time cancer detection rate of Group 3 was statistically significantly higher than Group 2 (p<0.002).

A cut-off value of 12 mm for cancer detection was determined as the result of comparison of these three groups and this core length has been found to have the optimal sensitivity (41.9%) and specificity (62%) in diagnosing PCa (odds ratio: 1.08).

Discussion

Although several new serum biomarkers have been identified for the diagnosis of PCa, TRUS guided biopsy is still the most important diagnostic tool. In order to analyse prostate cores correctly, appropriate sampling of prostate tissue is mandatory and for suitable sampling the regions and numbers of sampling areas should be well identified. There are a limited number of studies about biopsy core length which is one of the most important parameters in determining the quality of the biopsy. In these studies, biopsy samples of patients diagnosed with PCa were compared with the samples of patients without. However, we analyzed only the biopsy cores of patients with PCa and as far as we know our study is the first one evaluating the core samples of PCa patients.

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<th>Table 1. Clinical variables according to study groups</th>
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Nowadays there are no well-defined criteria for the adequate assessment of histopathological examination of prostate biopsy samples. In the literature the main factors used to evaluate the predictive ability of biopsy specimens are absence of extraprostatic tissues, presence of glandular prostatic tissue, fragmentation of specimen and the length of each biopsy core. There are few studies examining the predictive value of core lengths on cancer detection. In addition, considering the variable numbers and localizations of biopsy sites in biopsy protocols, it is impossible to make a generalization for the required total sample length. Iczkowski et al. also divided the acquired cores into benign, ASAP, HGPIN, PCa groups and as similar to previous findings, they found that biopsy core length was correlated with the diagnosis of ASAP. We did not evaluate the association between the length of the cores and the diagnoses of benign, ASAP or HGPIN in our study.

Van der Kwast et al. examined biopsy cores from five different centers and reported that the average sample lengths of biopsy cores differ from each other but cancer detection rate increases in direct proportion to the total sample length obtained. Ficarra et al. have evaluated the data of 7,126 cores obtained from 509 patients with transperineal approach and mean core lengths was found to be 14.1±4.4 mm in their prospective study which was longer than mean core length we have achieved. Their transperineal approach might allow better sampling. Obek et al. have retrospectively reviewed the data of 245 patients and indicated that in terms of providing a homogeneous data 12-18 cores of extended biopsy were performed by the same urologist and nurse with the same biopsy gun. The mean length of all biopsy cores was 11.4±2.5 mm and the mean length of cores containing cancer was found statistically longer compared to cancer-free cores (12.3±2.6 mm vs. 11.4±2.4 mm, respectively). Also in this study Obek et al. showed a linear increase in cancer detection rates as longer prostate biopsy cores were obtained. Similar to this study we determined an increase in cancer detection as the length of biopsy cores increased. But in our study biopsy samples were taken by different urologists and for this reason the data may not provide the expected homogenization.

Dogan et al. stated a decreased cancer detection rate in patients with aglandular biopsy core and serum PSA levels between 4-10 ng/mL. We only inspected the effect of total core length and did not evaluate the effect of aglandular biopsy cores on cancer detection rates. Berber et al. found a significant increase in cancer detection rate especially as the core length extend above 10 mm. Our findings were similar and a significant difference in cancer detection rate was found between groups with total core lengths of ≥10 mm and <10 mm. Thus, we speculated that a significant proportion of existing cancer can not be diagnosed in patients with biopsy core lengths less than 10 mm. In our study, although the core biopsy cut-off length has been identified as 12 mm (sensitivity 41.9%, specificity 62%) we have concluded that core tissue sample length of at least 10 mm has diagnostic value and below this core length limit cancer detection rate significantly decreases. Our results parallel the findings of previous studies.

Almost all of the studies examined in the literature, the impact of core length on cancer detection was determined by comparing biopsy specimens of patients with PCa and benign pathology and in almost all studies biopsy cores with cancer were longer. This condition brings to mind the possibility of missing cancer due to short core lengths in patients with benign pathology reports. To eliminate this problem we have examined biopsy specimens of patients diagnosed with cancer and suggest that cut-off values of emerging biopsy core lengths will be accepted in the literature.

Biopsy sample length is one of the most important parameter that determines cancer detection rate and directly affects it. Positive biopsy rates for Groups 3, and 1 were 65.1% and 26.6%, respectively. Therefore there is 2.44 times (65.1/26.6) increased chance of detection if the biopsy length is >20 mm compared to <10 mm. The ideal lower limit of average biopsy core length is 12 mm and we suggest that the average length of biopsy cores shorter than 12 mm need to be repeated.

**Ethics Committee Approval:** Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki “Ethical Principles for Medical Research Involving Human Subjects”, (amended in October 2013).

**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

**Peer-review:** Externally peer-reviewed.


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References