



Does length of prostate biopsy cores have an impact on diagnosis of prostate cancer?

Prostat biyopsi kor uzunluğu prostat kanseri tanısında etkili midir?

Müslüm Ergün, Ekrem İslamoğlu, Soner Yalçinkaya, Hüsni Tokgöz, Murat Savaş

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.

ÖZ

Amaç: Biz çalışmada kor uzunluğunun prostat kanseri tanısında anlamlı bir biyopsi parametresi olup olmadığını araştırdık.

Gereç ve yöntemler: Transrektal ultrason kılavuzluğunda ilk defa prostat biyopsisi uygulanan 188 hastanın patoloji raporları retrospektif olarak değerlendirildi. Prostat kanseri tespit edilen ve edilmeyen hastaların biyopsi kor uzunlukları karşılaştırıldı. Biyopsi spesmenleri kor uzunluklarına göre 3 gruba ayrıldı (grup 1; total kor uzunluğu <10 mm, grup 2; total kor uzunluğu 10 mm-19 mm ve grup 3; total kor uzunluğu >20 mm). Kor uzunlukları kanser tanısı alan ve almayan hastalarda karşılaştırılarak kanser tanısında optimal duyarlılık ve özgüllük değerleri için uygun cutoff değeri hesaplandı.

Bulgular: Yaş, PSA, prostat hacmi ve alınan total kor uzunluğu ortalamaları sırasıyla 65,08±7,41 yıl, 9,82±6,34 ng/mL, 50,3±9,6 cc ve 11,2±0,2 mm olarak bulundu. Biyopsi kor uzunluklarının değerlendirilmesinde kanser içeren korların (n=993 ortalama kor uzunluğu=12,5 mm) benign korlardan (n=1185 ortalama kor uzunluğu=11,3 mm) belirgin olarak daha uzun olduğu görüldü (p<0,001). Kor uzunluklarının analizinde 12 mm uzunluğa sahip korların kanser yakalama açısından en uygun duyarlılık (%41,9) ve özgüllüğe (%62) sahip olduğu tespit edildi (odds ratio: 1,08).

Sonuç: Biyopsi kor uzunluğu kanser yakalamada ve biyopsi kalitesini belirlemede en etkili parametrelerden birisidir. Ortalama kor uzunluğunun ideal alt sınırı 12 mm'dir ve daha kısa korlarda biyopsinin tekrarlanması gerekmektedir.

Anahtar Kelimeler: Biyopsi; kanser; kor uzunluğu; prostat.

Clinic of Urology, Antalya
Training and Research Hospital,
Antalya, Turkey

Submitted:
24.12.2014

Accepted:
10.03.2016

Correspondence:
Ekrem İslamoğlu
E-mail:
meislamoglu@gmail.com

©Copyright 2016 by Turkish
Association of Urology

Available online at
www.turkishjournalofurology.com

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.^[2,6] 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] 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 PCa 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 intraepithelial 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.

Table 1. Clinical variables according to study groups

	n	Core length (Mean ±SD) (mm)	Cancer (-) cores (n, %)	Cancer (+) cores (n, %)	p
Group 1	610	5.9±2.1	448 (73.4)	162 (26.6)	>0.05
Group 2	1422	12.6±2.4	686 (48.2)	736 (51.8)	<0.05
Group 3	146	20.9±1.5	51 (34.9)	95 (65.1)	<0.05

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.^[8] 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.^[7,8] 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.

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.^[7,9,10] There are few studies examining the predictive value of core lengths on cancer detection.^[7] 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.^[7] stated a significant relationship between cancer detection and core length in a study which evaluated 11,082 biopsy cores obtained with sextant biopsy techniques from 1,847 patients and the mean sample length was found to be 12.8 ± 3.5 mm. However, a positive relationship between cancer detection and core length has been detected only in biopsies obtained from the prostatic apex. Perhaps this is the reason why the vast majority of their short cores were obtained from the apex of the prostate. Iczkowski et al.^[7] 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.^[10] 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.^[12] have evaluated the data of 7,126 cores obtained from 509 patients with transperineal approach and mean core lengths was found to be 14.14 ± 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.^[13] 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.^[13] 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.^[9] 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.^[14] 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.^[15,16]

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 PCa 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.

Author Contributions: Concept - M.E., M.S.; Design - M.E., M.S.; Supervision - E.İ., S.Y.; Resources - M.E., H.T.; Materials - M.E.; Data Collection and/or Processing - M.E.; Analysis and/or Interpretation - M.E., E.İ., S.Y., H.T., M.S.; Literature Search - M.E., E.İ., S.Y., H.T.; Writing Manuscript - M.E., E.İ., M.S.; Critical Review - S.Y., H.T.; Other - M.E., M.S.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

Etik Komite Onayı: Yazarlar çalışmanın World Medical Association Declaration of Helsinki “Ethical Principles for Medical Research Involving Human Subjects”, (amended in October 2013) prensiplerine uygun olarak yapıldığını beyan etmişlerdir.

Hasta Onamı: Bu çalışmaya katılan hastalardan yazılı hasta onamı alınmıştır.

Hakem Değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir - M.E., M.S.; Tasarım - M.E., M.S.; Denetleme - E.İ., S.Y.; Kaynaklar - M.E., H.T.; Malzemeler - M.E.; Veri Toplanması ve/veya İşlenmesi - M.E.; Analiz ve/veya Yorum - M.E., E.İ., S.Y., H.T., M.S.; Literatür Taraması - M.E., E.İ., S.Y., H.T.; Yazıyı Yazan - M.E., E.İ., M.S.; Eleştirel İnceleme - S.Y., H.T.; Diğer - M.E., M.S.

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

References

1. American Cancer Society: Prostate Cancer. Available at <http://www.cancer.org/cancer/prostatecancer/detailedguide/prostatecancerkey-statistics> United States of America 2013. Accessed February 27, 2012.
2. Hodge KK, McNeal JE, Terris MK, Stamey TA. Random systematic versus directed ultrasound guided transrectal core biopsies of the prostate. *J Urol* 1989;142:71-4.
3. Djavan B, Ravery V, Zlotta A, Dobronski P, Dobrovits M, Fakhari M, et al. Prospective evaluation of prostate cancer detected on biopsies 1, 2, 3, and 4: When should we stop? *J Urol* 2001;166:1679-83.
4. Lane RB, Jr, Lane CG, Mangold KA, Johnson MH, Alsbrook WC Jr. Needle biopsies of the prostate: what constitutes adequate histologic sampling? *Arch Pathol Lab Med* 1998;122:833-5.
5. Rogatsch H, Mairinger T, Horninger W, Bartsch G, Mikuz G, Mairinger T. Optimized preembedding method improves the histologic yield of prostatic core needle biopsies. *Prostate* 2000;42:124-9. [\[CrossRef\]](#)
6. Eichler K, Hempel S, Wilby J, Myers L, Bachmann LM, Kleijnen J. Diagnostic value of systematic biopsy methods in the investigation of prostate cancer: A systematic review. *J Urol* 2006;175:1605-12. [\[CrossRef\]](#)
7. Iczkowski KA, Casella G, Seppala RJ, Jones GL, Mishler BA, Qian J, et al. Needle core length in sextant biopsy influences prostate cancer detection rate. *Urology* 2002;59:698-703. [\[CrossRef\]](#)
8. Fiset PO, Aprikian A, Brimo F. Length of prostate biopsy cores: does it impact cancer detection? *Can J Urol* 2013;20:6848-53.
9. Dogan HS, Aytac B, Kordan Y, Gasanov F, Yavascaoglu İ. What is the adequacy of biopsies for prostate sampling? *Urol Oncol* 2011;29:280-3.
10. Van der Kwast TH, Lopes C, Santonja C, Pihl CG, Neetens I, Martikainen P, et al. Guidelines for processing and reporting of prostatic needle biopsies. *J Clin Pathol* 2003;56:336-40. [\[CrossRef\]](#)
11. Boccon-Gibod L, Van der Kwast TH, Montironi R, Boccon-Gibod L, Bono A. Handling and pathology reporting of prostate biopsies. *Eur Urol* 2004;46:177-81. [\[CrossRef\]](#)
12. Ficarra V, Martignoni G, Novella G, Cerruto MA, Galfano A, Novara G, et al. Needle core length is a quality indicator of systematic transperineal prostate biopsy. *Eur Urol* 2006;50:266-71. [\[CrossRef\]](#)
13. Obek C, Doganca T, Erdal S, Erdogan S, Durak H. Core length in prostate biopsy: size matters. *J Urol* 2012;187:2051-5. [\[CrossRef\]](#)
14. Berber U, Haholu A, Küçükodacı Z, Yılmaz İ. 12 Kadran prostat biyopsi protokolünde toplam kor uzunluğunun kanser saptanma oranına etkisi. *Gulhane Med J* 2013;55:203-6.
15. Brooks JD. Anatomy of the lower urinary tract and male genitalia. In: Walsh PC, Retik AB, Vaughan ED, et al. *Campbell's Urology*. Philadelphia, Saunders, 2007;38-77.
16. Vaalasti A, Hernoven A. Inervation of the ventral prostate of the rat. *Am J Anat* 1979;154:231-44. [\[CrossRef\]](#)