Core Length in Prostate Biopsy: Size Matters

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Purpose: The diagnostic yield of prostate biopsy is limited. Increasing the number of cores enhances the cancer detection rate by sampling additional sites and obtaining more tissue. An alternative way to inspect more tissue would be to obtain longer cores. However, the impact of biopsy core length on cancer detection rate is an undervalued topic. We assessed the role of biopsy core length in prostate biopsy and determined the minimal tissue length to serve as quality assurance.

Materials and Methods: We retrospectively analyzed the records of 331 patients who underwent transrectal ultrasound guided initial prostate biopsy with 12 to 18 cores. The biopsy procedure and pathological evaluation were standardized. Core length was compared in patients with vs without cancer. Statistical analysis was done to determine a minimally acceptable cutoff for biopsy length.

Results: We analyzed data on 245 patients. The overall cancer detection rate was 30.2%. Mean core length in patients with vs without cancer was 12.3 ± 2.6 vs 11.4 ± 2.4 mm ($p = 0.015$). Thus, core length was significantly longer in patients with cancer. Core length greater than 11.9 mm was associated with an increased prostate cancer detection rate (OR 2.57, 95% 1.46–4.52). The cancer detection rate for cores less vs greater than 11.9 mm was 23% vs 39%.

Conclusions: Needle core length is an important morphometric parameter of transrectal prostate biopsy that directly influences the cancer detection rate. Results suggest a core length of greater than 11.9 mm as a cutoff for quality assurance.

Key Words: prostate, prostatic neoplasms, biopsy, reference standards, diagnosis

Abbreviations and Acronyms

PSA = prostate specific antigen

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PROSTATE biopsy is the mainstay for diagnosing prostate cancer. It is most commonly done using transrectal ultrasound guidance. The diagnostic yield of a single biopsy set is not more than 25% to 45 %.[1–5] The main reason underlying the low diagnostic capability of prostate biopsy is the lack of an imaging modality that can reliably show the exact cancer site(s).

Various strategies have been devised for patterned sampling of the prostate to overcome this limitation and enhance the cancer detection rate. Biopsies have moved more lateral and the number of sampled cores has increased 2 to threefold in a single biopsy set.[1–5] Increasing the number of cores has resulted in a higher cancer detection rate. This may be due not only to sampling more prostate sites but also to obtaining more tissue.

An alternative way to inspect more tissue would be to obtain longer cores. There have been suggestions of how to handle and pathologically evaluate the prostate tissue obtained.[6,7] Nevertheless, there is surprisingly sparse data in the English literature assessing the impact of needle core length on cancer diagnosis.[8,9]

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We hypothesized that a longer core may represent a higher quality core by sampling more tissue with a potential to improve the cancer detection rate. We analyzed our prostate biopsy data on sample length to explore this issue. We also sought to establish a cutoff value for biopsy core length that would increase the cancer detection rate.

MATERIALS AND METHODS

We retrospectively evaluated the prospectively maintained a database on 331 consecutive patients who underwent transrectal ultrasound guided transrectal prostate biopsy between March 2008 and September 2010. Biopsy was done with the patient in the lateral decubitus position with periprostatic nerve block, as previously described, or under procedural sedation and analgesia with midazolam and remifentanil.[10]

The same Pro-Mag™ biopsy gun with a 25 cm 18 gauge Tru-Cut® needle was used in each case. Biopsies were obtained in the sagittal plane with the same Sonoline Adara® ultrasound machine. The same nurse removed the specimen from the needle and macroscopically assessed core quality. When the specimen was considered suboptimal, eg too small, fragmented or devoid of tissue, another biopsy was immediately taken from the same spot.

Each core was gently removed from the biopsy needle, placed on filter paper and flattened. The paper was rolled and placed in a tube containing Hollande's solution. Each core was sent for pathological evaluation in a separate tube that was numbered and identified by site and prostate lobe. If a second core was obtained from the same site, it was placed in the tube allocated for that site along with the previously obtained suboptimal core.

Upon arrival at the pathology department each biopsy sample was measured and separately transferred to a cassette. Samples were fixed in Hollande's fixative for 2 to 4 hours. The fixative was washed out before placing the specimen in a tissue processor. Samples were processed with the automated Tissue-Tek® VIP® 5 Vacuum Infiltration Processor according to manufacturer instructions. Paraffin tissue sections were stained with hematoxylin and eosin before microscopic evaluation.

The pathology report described the length of each core in mm. In the presence of more than 1 piece from a single site due to fragmenting tissue or obtaining a second core after a poor quality first core, the pathologist reported the length of each piece of tissue. We recorded and analyzed the length of the longer core and disregarded the smaller fragment(s).

We routinely sample 12 to 18 cores at the first biopsy setting according to variables such as patient age, PSA and most importantly prostate volume using a slightly modified Vienna nomogram.[11] We do not sample the transition zone at the initial biopsy and we perform saturation biopsy with at least 24 cores for repeat biopsies.

For standardization purposes patients who had fewer than 12 or more than 18 cores were excluded from analysis. Thus, we evaluated the records of only men who underwent a first biopsy set with between 12 and 18 cores sampled from the peripheral zone. Patients diagnosed with atypical small acinar proliferation were excluded from study and those with high grade prostatic intraepithelial neoplasia were classified with men who had benign findings. Cores devoid of prostatic tissue, ie containing only rectal mucosa, periprostatic tissue or blood, were also excluded from analysis.

We compared core length between patients diagnosed with cancer and those with benign pathological findings. We also performed statistical analysis to determine a minimally acceptable cutoff value for biopsy core length.

Statistical Analysis

The numerical variables of the study were patient age, PSA, prostate volume, biopsy core length and cancerous tissue length in the biopsy specimen. These variables are shown as the mean ± SD. Categorical variables included prostate examination and pathological analysis, which are shown as the frequency and percent. Mean numerical variables in the 2 groups were compared with the Student t test. The relationship between the 2 numerical variables was analyzed with the Pearson correlation test. The cutoff value for core length was calculated with respect to the highest sensitivity and specificity. Thus, 2 groups below and above the cutoff were created and the OR of a prostate cancer diagnosis was calculated in these 2 groups. Significance was considered at 0.05. SPSS® version 16 was used for analysis.

RESULTS

Biopsy that sampled 12 to 18 cores was done in 255 patients. Three patients with incomplete data and 7 diagnosed with atypical small acinar proliferation were excluded from analysis. Thus, data on 245 patients were evaluated. Average age was 65.6 ± 8.4 years, average PSA was 9.5 ± 10.5 ng/ml and average prostate volume was 44.4 ± 22.5 cc. Prostate examination was abnormal in 66 men (28%), benign in 170 (72%) and unavailable in 9.

Pathological analysis revealed cancer in 74 patients and benign pathological findings in 171 with a mean age of 67.5 ± 8.6 and 64.8 ± 8.2 years, respectively. The overall cancer detection rate was 30.2%. High grade prostatic intraepithelial neoplasia was noted in 43 patients (17.5%) and classified with benign tissue. In patients with vs without cancer mean PSA was 14.2 ± 16.7 vs 7.6 ± 5.2 ng/ml and mean prostate volume was 39.8 ± 20.9 vs 46.3 ± 22.9 cc.

A mean of 12.8 ± 1.7 cores were sampled. Overall mean core length was 11.4 ± 2.5 mm. When cores without prostatic tissue were excluded from study, the mean number of cores decreased to 11.9 ± 1.9 mm and mean core length increased to 11.8 ± 2.5 mm (median 11.8, range 4.5 to 17.8). The figure shows the prostate biopsy core length in study patients.

In men with vs without cancer an average of 12.1 vs 11.8 cores were sampled. Mean core length in