Urologist's Impact on Needle Core Prostate Biopsy Histopathologic Variables Within a Single Institution

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OBJECTIVE To assess the urologist's impact on prostate needle core biopsy variables including number of containers submitted, total core length, longest core length, and individual core length threshold values, and to elucidate the relationship between these variables and cancer detection rate within a recent cohort.

METHODS A retrospective search was performed to identify patients who had an extended transrectal ultrasound-guided prostate needle core biopsy between 2008 and 2013.

RESULTS One thousand one prostate biopsies were analyzed. Total core length (mean 13.2-22.9 cm, $P < .001$) significantly varied by submitting urologist but did not impact cancer detection rate per case. Increased core length per container impacted the cancer detection per container ($P < .001$). The number of cores that met threshold values of 0.5, 1.0, and 1.5 cm as well as longest individual core length (mean 1.7-2.2 cm) significantly varied between urologist ($P < .001$), although there was no association between these variables and cancer detection. Container number differed significantly between urologists ($P < .001$) but did not correlate with cancer detection. For the single urologist with a change in his submission protocol during the study period, a nonsignificant change in cancer detection was noted when comparing 12-14 containers vs 6-9 containers.

CONCLUSION Submitting urologist significantly impacts prostate biopsy metrics. An increased amount of tissue per container was associated with higher rates of cancer per container. A nonsignificant change in cancer detection rate was observed when container number was reduced from 12-14 to 6-9. UROLOGY 92: 70–74, 2016. © 2016 Elsevier Inc.

Despite being used as the gold standard for the detection of prostate cancer, prostate needle core biopsies lack a universally agreed-upon biopsy regimen. The current protocol typically involves extracting 10-12 cores from standard sextant locations.[1-7] Controversy remains regarding the optimal core number and number of containers in which the cores are submitted. Further complicating the matter, the impact of submitting urologist on these variables has not been well assessed.

Past literature suggests that increasing the number of cores per container is associated with increased tissue fragmentation, tangling, and a reduction of the amount of sampled tissue present for histologic examination.[8,9] These observations have led to the recommendation that no more than 2 cores should be placed in a single container.[8,9] Although potentially more information can be gathered by submitting an increased number of cores and separating cores into more containers, this is associated with incurring more cost.[2,10]

Prostate cancer detection has been shown to be increased by sampling more anatomic sites as well as obtaining more cores, but its relation to individual core length, longest core length, and total core length is not clearly understood.[11,12] Previous analyses have proposed minimum core lengths as a quality metric, but the length of a sufficient core remains disputed.[13,14] The purpose of our investigation was to assess the urologist's impact on multiple prostate needle core biopsy variables including number of biopsy containers submitted, total core length, longest core length, and individual core length threshold values, and to elucidate the relationship between these variables and cancer detection rate within a recent cohort of patients undergoing prostate needle core biopsies at a single academic institution.

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METHODS

We retrospectively evaluated consecutive men from our academic tertiary care center who underwent a transrectal ultrasound-guided prostate needle core biopsy between July 1, 2008 and June 30, 2013. The study was performed with approval and in compliance with our institutional review board. Cases submitted by urologists with fewer than 100 biopsies and cases diagnosed by pathologists that had fewer than 100 cases were excluded. An 18-gauge biopsy gun was used. Urologists 1 and 2 used end-fire ultrasound probes whereas Urologists 3-5 used side-fire probes. Individual core lengths were measured and recorded at the time of gross examination. Paraffin-embedded tissue was cut into 6 levels placed on 3 slides in which levels 1-2 and 4-5 are stained with hematoxylin and eosin and levels 3 and 6 are saved for immunohistochemistry as needed. The following data were obtained: year of biopsy, patient age, overall case diagnosis, individual container diagnosis, number of biopsy containers (vials) submitted, all individual core lengths, submitting urologist, and case pathologist. Diagnosis per case was recorded (subsequent to immunohistochemical workup that was performed): (1) carcinoma if prostate adenocarcinoma was diagnosed in any container, (2) high-grade prostatic intraepithelial neoplasia (HGPIN) if only HGPIN was found, (3) atypical small acinar proliferation (ASAP) if only an atypical focus of glands was diagnosed in the final report after immunostains were performed, (4) HGPIN/ASAP if both HGPIN and ASAP were stated to be present but no cancer was found, and (5) negative if none of the above were recorded in the pathology report. Diagnosis per container was recorded as (1) carcinoma, (2) HGPIN, (3) ASAP, (4) HGPIN/ASAP, or (5) negative.

Individually measurable tissue cores, including fragments, were recorded if at gross examination they were separately identified and a measurement was documented. Total core length per case was calculated by adding the total tissue amount per container and subsequently adding the total tissue amount in all containers, including all tissue fragments. The longest core length per case and the number of cores per case that met a tissue threshold of 0.5, 1.0, and 1.5 cm were recorded. Urologist 1 submitted 1-2 cores per container, which is a similar submission scheme to that of Urologist 4 later in the time period of the study. Urologists 2, 3, and 4 early in the study submitted 1 core per container. Number of cores submitted per container was not assessed retrospectively due to possible core breakage during the procedure and gross examination. Cases without recorded measurements for every core in every submitted container were omitted from analyses involving total core length per case, longest individual core length per case, and cores meeting threshold for length. Cases submitted in greater than 14 containers and cases from patients who underwent repeat biopsy at our institution during the time of our study were excluded. Cancer detection rate was calculated for each of these parameters, as well as individually for each urologist. In cases in which missing data prevented the overall determination of a parameter, cases were excluded in their entirety. If missing data were associated with the exclusion of a core or container, only those cores or containers were excluded from the analysis.

Urologist 1 had resident involvement in nearly 100% of the cases included in this study, with residents taking all cores. Urologist 2 had resident participation in approximately 90% of cases. Urologists 3 and 4 had resident participation in 50% of cases. Urologists 2-4 routinely had residents sample one side whereas the attending physician sampled the contralateral side. The biopsy template, number of cores taken, number of containers, and the number of sites sampled were determined by the urology attending. All prostate biopsies were submitted within the time period stated, except for a small subset of biopsies that were conducted by Urologist 4 between January 1, 2008 and June 30, 2013. In comparisons between the early and late work of Urologist 4, pathologist was not used as an exclusionary criteria. During this time period, Urologist 4 decreased the number of submitted containers from 12-14 to 6-9 for the sole purpose of reducing patient expenditures, with no other changes to biopsy strategy. As Urologist 4 joined the clinical staff at our academic institution in January 2008, we were limited in the number of cases that could be included in the 12-14 container group and as such no a priori sample size analysis was done.

Statistical analyses were performed using the Kruskal-Wallis one-way analysis of variance test, Pearson's chi-squared test for independence, and logistic regression. The Kruskal-Wallis test was used for comparison of multiple groups of non-normally distributed variables such as with the determination of an overall difference among longest core and total core length among urologists. Chi-squared analysis was used for evaluation of categorical data such as with the difference between rates of cancer in cases with varying container number. Correlations with the binomial variable of cancer presence were assessed by multiple logistic regression controlling for patient age, and pathologist. The level of significance was set at .05. All data analysis was carried out using R version 3.2.2.

RESULTS

Of the 1668 prostate biopsies that were reviewed, 1001 cases met the inclusion criteria for this study (mean age 61 years) (Table 1). Of the 1001 biopsies, 51.5%, 38.9%, 4.7%, 3.4%, and 1.4% were diagnosed as carcinoma, negative, HGPIN, ASAP, and HGPIN/ASAP, respectively. One pathologist completed a genitourinary fellowship (46.1% of cases).

Core Length

The average total core length per case ranged from 13.2 cm to 22.9 cm (Table 2). There were statistically different average total core lengths among urologists ($P < .001$). However, no association was found between the total core length of the prostate biopsy and the cancer detection rate