Stereotactic Transperineal Prostate Biopsy

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This study investigates the detection rate of nonpalpable, isoechoic occult prostate malignancy using a stereotactic transperineal prostate biopsy (STPB) technique in patients with a previously negative transrectal ultrasound-guided prostate biopsy. UROLOGY 73: 386–388, 2009. © 2009 Elsevier Inc.

Occasionally, patients present with persistently rising prostate-specific antigen (PSA), despite having had prior negative transrectal-extended systematic prostate biopsies. Not only is this scenario worrisome for the physician, but it can create significant anxiety for the patient. Many investigators have reported results by using a perineal approach to obtain biopsy specimens from the prostate gland.[1–7] With the use of transrectal ultrasound guidance and a perineal prostate brachytherapy template, comprehensive tissue sampling is feasible. Furthermore, the biopsy cores can be identified as to the area of the prostate from which they were obtained.

MATERIALS AND METHODS

Stereotactic transperineal prostate biopsy (STPB) is accomplished by using a clinical setup that is the same as prostate brachytherapy, including bowel preparation instructions and preoperative medication. General anesthetic is administered via a laryngeal mask airway. With the patient in the dorsal lithotomy position, the perineum is gently washed using a betadine scrub solution, and the scrotum is secured anteriorly. With the use of a biplanar transrectal ultrasound (TRUS) probe, a Stepper Stabilizer device, and a perineal brachytherapy template, the prostate is positioned on the implant grid. While viewing the sagittal image, the physician adjusts the pitch of the TRUS probe to align the posterior aspect of the prostate parallel to the anterior rectal wall (Fig. 1A). This will avoid unnecessary puncture or laceration of the anterior rectal wall during the biopsy procedure. The axial image is positioned with row one 2-3 mm inside the posterior capsule (Fig. 1B). The prostate is then divided equally into 8 anatomic regions that we have conceptually termed "octants." The midplanes of the axial and sagittal prostate gland images for each patient determine the x, y, and z coordinates that will occupy each octant. Octants are assigned accordingly: (I) right anterior base, (II) left anterior base, (III) right posterior base, (IV) left posterior base, (V) right anterior apex, (VI) left anterior apex, (VII) right posterior apex, and (VIII) left posterior apex (Fig. 2A and B).

With the use of a biopsy gun, comprehensive tissue cores 2 cm long are initially obtained from the apical octants using 5-10 mm spacing on the template grid, followed by identical x and y coordinates of the basilar octants (Fig. 2C). The number of biopsy cores per patient approximates the prostate gland volume; the greater the volume of the gland, the more specimens are obtained. Prostates in which the anterior apical specimen adequately samples the tissue do not require a basilar specimen of the identical x and y coordinates. Therefore, these specimens should be assigned to the respective apical octant. On retrieval, all specimens, regardless of how many are obtained, are deposited into 1 of 8 formalin-filled specimen jars corresponding to the 8 octants. A pathologic review is reported according to the octant from which it was obtained.

This procedure begins with the needle placement on the x and y axis on the mid-gland axial image. Switching to the sagittal image reveals the z-axis depth of the biopsy needle and is required to ensure the biopsy needle is properly positioned before sampling the desired apical and basilar core. A note of caution is that small glands (<25 cm^3) require more reliance on both the axial and the sagittal ultrasound images before obtaining the biopsy core. Regarding larger prostate volumes, one does not absolutely need to verify x and y coordinates on every biopsy core if they are confident they are obtaining the core from the assigned octant using the z-axis sagittal image only. Biopsy specimens are obtained in a clockwise fashion from the left side of the template to the right side. As none of the patients undergoing STPB had a palpable abnormality, every effort was made to avoid the placement of the biopsy needle outside of the gland to minimize neurovascular trauma. As a rule, we identified the biopsy coordinates at the beginning of the procedure. The peripheral coordinates should all be a minimum of 2-3 mm within the prostate gland on a mid-gland axial printed paper image. The biopsy cores are marked on this to identify coordinates where the specimens have been obtained.

RESULTS

Seven hundred forty-seven previously untreated consecutive patients with continued rising total PSA underwent STPB at our institution between April 2004 and January 2008. All patients had a minimum of 1 prior benign transrectal prostate biopsy (median 3, range 1-8), with an average of 13.6 cores (median 12, range 5-22 cores) obtained on the transrectal biopsy. Median patient age, total PSA, and prostate volume and number of specimens obtained per patient were 61 years (range 44.5-81.6 years), 9.3 ng/mL (range 4-40.1 ng/mL), 46.1 cm^3 (range 12.9-123.0 cm^3), and 40 specimens (range 13-117 specimens), respectively. STPB identified adenocarcinoma in

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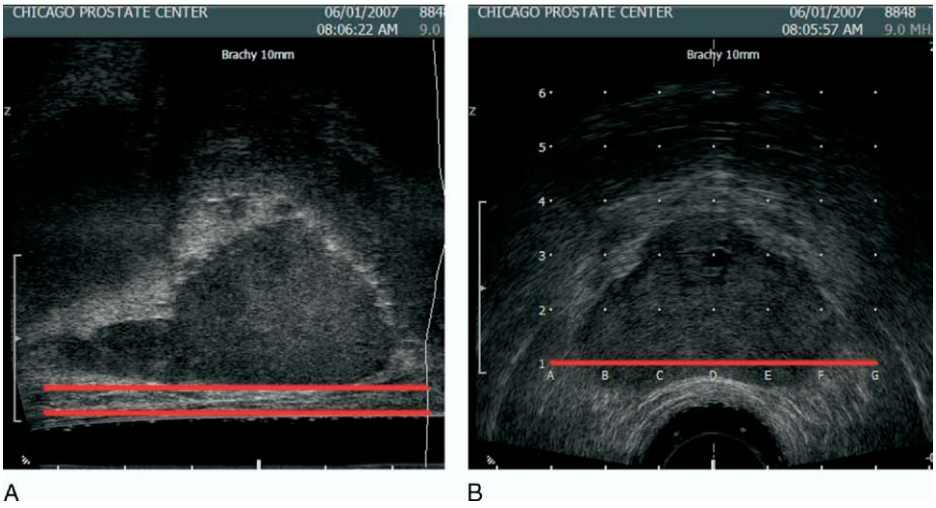

Figure 1. **(A)** Posterior prostate is parallel to the rectum. **(B)** Row 1 is 2-3 mm inside the posterior capsule.

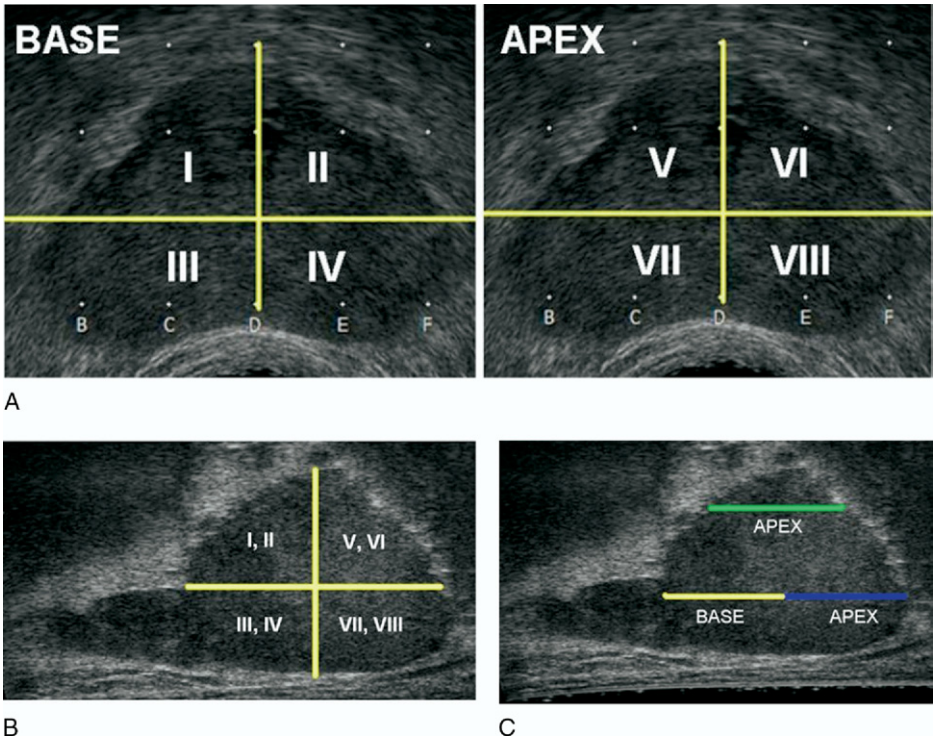

Figure 2. **(A)** Octant assignments in axial view. **(B)** Octant assignments in sagittal view. **(C)** Apical and basilar specimens.

291 of 747 (39%) patients. Gleason scores ranged from 3+3=6 to 5+5=10. Although approximately 50% of the positive biopsy specimens were in 1 or 2 octants, 20% of the patients were found to have adenocarcinoma in at least 6-8 octants. Multivariate analysis demonstrated there was a significant difference in detection rates because the apical octants had a higher incidence of malignancy than the basilar octants of the prostate gland ($P = .000$). Furthermore, the anterior apex harbored more malignant cores when compared with the posterior apex ($P = .026$). In all the patients, the estimated blood loss was less than 5 mL and the pain levels in the recovery room after the procedure were reported to be minimal. Seventy-seven of the 747 (10.3%) patients had acute urinary retention develop requiring an indwelling Foley catheter on discharge; 95% of which were removed within 3 days. This is consistent with a recent review[8] that also noted a 10% or greater rate of urinary retention after saturation biopsy. There was no recatheterization reported. Only 1 patient had infection develop within 4 weeks after the procedure.

COMMENT

Published data have clearly demonstrated a higher yield of malignant biopsy specimens when a more comprehen-

sive approach for obtaining specimens is used. Using this technique, we are able to differentiate the precise location of malignant vs benign regions of the prostate gland. A possible explanation for the significant finding in this study that occult malignancies occupy a higher percentage of apical biopsy specimens using STPB may be related to the difficulty and the limitations of apical sampling when a standard transrectal biopsy approach is used. This is also what distinguishes STPB from a transrectal saturation biopsy with 24 or 48 cores. Furthermore, the parallel orientation of the biopsy needle within the prostate gland samples more of the peripheral zone compared with a perpendicular orientation used with a transrectal biopsy technique.

Using a concept of geographic octants, we were able to identify malignant biopsy cores and assign them to 1 or more of the 8 octants within the prostate gland. STPB is well-tolerated and efficacious for diagnosis of a substantial number of prostate cancers in patients with persistent suspicion after transrectal biopsy.

CONCLUSIONS

In the future, STPB will play a significant role in the diagnosis of prostate cancer. It may also eliminate carcinoma from the differential diagnosis of patients with an elevated PSA. Because of the comprehensive nature of this procedure, a benign outcome will be welcomed as it may relieve much of the anxiety for both the patient and the physician. As a result, the clinician may be less inclined to continue repeating transrectal biopsies, and may be unlikely to prefer repeated transrectal prostate biopsy. Finally, in selected patients with minimal disease, STPB pathology, if validated, may have a monumental impact on efforts toward focal or targeted therapy directed only to the malignant prostate octants.

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