TRANSRECTAL ULTRASONOGRAPHY FOR THE EARLY DIAGNOSIS OF ADENOCARCINOMA OF THE PROSTATE: A NEW MANEUVER DESIGNED TO IMPROVE THE DIFFERENTIATION OF MALIGNANT AND BENIGN LESIONS

GIUSEPPE SPERANDEO, MARCO SPERANDEO, MICHELE MORCALDI, EUGENIO CATURELLI, LUCIA DIMITRI AND ANTONIO CAMAGNA

From the Departments of Radiology, Internal Medicine, Urology, Gastroenterology and Pathology, “Casa Sollievo della Sofferenza” Hospital, IRCCS, San Giovanni Rotondo, Foggia, Italy

ABSTRACT

Purpose: Transrectal ultrasound can reveal potentially malignant prostate lesions while they are still small. However, based on ultrasound alone they are often difficult to distinguish from benign focal lesions. We tested the reliability of a new technique for the sonographic evaluation of typical prostate lesions in differentiating adenocarcinoma from benign lesions.

Materials and Methods: During 18 months 398 consecutive male patients 45 to 76 years old underwent transrectal ultrasound for the early detection of prostate cancer. When suspicious hypoechoic lesions were noted in the peripheral regions of the prostate, moderate pressure was applied on the lesion using the ultrasound probe to evaluate consistency. Based on the response lesions were classified as deformable (the shape changed from approximately spherical to oval) or nondeformable (the original shape was retained). All lesions were then diagnosed based on fine needle biopsy.

Results: Peripheral hypoechoic prostate lesions were sonographically identified in 146 of 398 patients (36.7%). In 68 cases nondeformable lesions proved to be adenocarcinoma in 63 (92.6%), and chronic prostatitis and/or adenomatous hyperplasia in 5. In contrast, 62 of the 78 deformable nodules (79.5%) showed histological features of hyperplasia and/or chronic inflammation. The remaining 16 nodules, which showed more limited changes in shape during compression, were characterized by hyperplasia with acute inflammatory changes. In 5 cases there was also evidence of adenocarcinoma.

Conclusions: Ultrasound guided compression of suspicious prostate lesions detected on transrectal sonography is a simple, rapid and reliable maneuver that may increase the diagnostic potential of this examination.

KEY WORDS: prostate, ultrasonography, prostatic neoplasms, diagnosis
sular lesions located in the periphery of the prostate. We tested the reliability of this approach for differentiating adenocarcinomatous lesions from benign processes in a large group of males who underwent ultrasound screening for prostate cancer.11

MATERIALS AND METHODS

During the 18-month period of February 2000 through June 2001, 398 consecutive male patients between ages 45 and 76 years underwent screening studies for the early detection of prostate cancer. The screening protocol included transrectal ultrasonographic examination of the prostate, urinalysis, acid phosphatase and PSA (normal range 0 to 3 ng/ml). Ultrasound was performed with a (SSA 270 Toshiba Medical Systems, Tokyo, Japan) scanner equipped with a high frequency (7.5 MHz.) biplanar (linear array and convex) probe. The dimensions and contours of the prostate were recorded as well as any calcifications or adenomatous lesions. Special attention was focused on hypoechoic lesions in the periphery of the prostate, the contours of the overlying capsule (such as indentation, interruption and blurring) and any changes involving the seminal vesicles (such as enlargement, which may reflect tumor infiltration of the ejaculatory ducts).

When 1 or more suspicious hypoechoic lesions were noted in the peripheral regions of the prostate, ultrasound guided compression was performed in an attempt to clarify the hardness of the lesions. This maneuver, which we recently developed, consists of the application of moderate pressure on the lesion in an anteroposterior direction using the rectal ultrasound probe. Based on the response to this maneuver lesions were divided into 2 broad categories, namely deformable lesions—those with a shape that changed from approximately spherical to oval with the long axis perpendicular to the compression vector, which in our experience are unlikely to be prostate carcinomas, and nondeformable lesions—those that retained the original shape during compression, which we consider more likely to be neoplastic (figs. 1 and 2). The presence or absence of pain at compression of the lesion was also noted.

In all patients with suspicious lesions regardless of the results of the compression test ultrasound guided fine needle lesional biopsies were performed with the informed consent of the patient. Members of the urology department at our hospital obtained the biopsies via a transperineal approach. Colt (Sterylab, Rho, Milan, Italy) 18 gauge cutting needles were used with a freehand technique and at least 3 passes were made at the level of each hypoechoic lesion. Coagulation parameters were assessed in all patients before biopsy. Antibiotic coverage was provided for 6 days after the procedure.

RESULTS

In the 398 men screened urinalysis results and acid phosphatase levels were normal. Only 36 patients (9%) reported symptoms. Peripheral hypoechoic prostate lesions were sonographically identified in 146 of the 398 men (36.7%) examined. Of these 146 men 36 (24.7%) were symptomatic with mildly increased urinary frequency in 14, nocturia in 19, microhematuria in 2 and hemospermia in 1. PSA in these cases was 0.5 to 10 ng/ml.

The results of the ultrasound guided compression test revealed nondeformable lesions in 68 of the 146 patients (46.6%). Only 14 of these 68 individuals had reported symptoms and 10 (14.7%) also experienced pain during the compression maneuver. The remaining 78 men (53.4%), including 22 who had reported symptoms, had lesions that were considered deformable. This group included 62 men with lesions with a shape that clearly changed with pressure and 16 with no deformability (figs. 1 and 2). The maneuver caused pain in 69 of the 78 men (88.5%).

Ultrasound fine needle biopsies of all 146 lesions were obtained. The biopsy procedure was associated with mild self-limited complications in 7 of the 146 cases (4.8%); including microhematuria in 5, hemospermia in 1, local pain in 1 and fever in 1. Histological findings were positive for adenocarcinoma of the prostate in 63 of the 68 patients (92.6%) with nondeformable lesions (fig. 3). In the remaining 5 cases biopsy revealed signs of chronic inflammation and/or adenomatous hyperplasia. In contrast, 62 of the 78 nodules (79.5%) classified as deformable showed histological features compatible with hyperplasia and/or chronic inflammation (fig. 4). The remaining 16 lesions had been classified as deformable,
perplasia with inflammatory changes. H&E, reduced from
proved to be adenocarcinoma. H&E, reduced from
ated through the wall of the rectum. This advantage can be
lesions of this type while they are still too small to be pal-
periphery of the prostate. When the neoplasm is multifocal,
sonographically as hypoechoic lesions located in the posterior
superior to transrectal digital examination of the prostate.
more effective than the traditional transpubic study and far
PSA and free PSA levels for prostate cancer screening has
(6.4%) also contained evidence of malignancy (adenocarcino-
signs of hyperplasia with acute inflammatory changes but 5
lesions. All 16 nodules were histologically characterized by
changes in form provoked by compression were
in fact much less evident than in the other 62 deformable
lesions. All 16 nodules were histologically characterized by
signs of hyperplasia with acute inflammatory changes but 5
(6.4%) also contained evidence of malignancy (adenocarcino-

**DISCUSSION**

In recent years the importance of ultrasonography with
PSA and free PSA levels for prostate cancer screening has
been emphasized by a number of investigators. The possi-
ability of a cure depends on the stage of the tumor when it is
first detected and the ideal method of screening allows the
detection of such lesions while they are still small and local-
zied. For this purpose transrectal ultrasound is clearly
more effective than the traditional transpubic study and far
superior to transrectal digital examination of the prostate.
Approximately 75% of all prostate carcinomas present
sonographically as hypoechoic lesions located in the posterior
periphery of the prostate. When the neoplasm is multifocal,
there is often an archipelago of lesions, of which the smallest
may be isoechoic. Transrectal sonography can reveal larger
lesions of this type while they are still too small to be palpated
through the wall of the rectum. This advantage can be
highly important since autopsy findings indicate that prosta-
tate tumors less than 0.5 to 0.8 cm. can generally be consid-
ered clinically insignificant.

Transrectal ultrasound followed by fine needle lesion bi-
opsy can be considered the gold standard for the early diag-
nosis of prostate carcinoma. However, pathological eval-
uation of all suspicious lesions is expensive and stressful for
the patient. In fact, 55% to 60% of all small hypoechoic
subcapsular lesions in the posterior prostate ultimately
prove to be benign (acute or chronic inflammatory processes
or nodular hyperplasia). Therefore, refinement of the ultra-
sound criteria for identifying lesions that merit immediate
attention is necessary.

While nodular hyperplasia is due to glandular proliferation
and dilatation with fibromuscular proliferation of the
stroma, the macroscopic appearance of prostatic carcinomas
involves compact grayish tissue that strongly resembles nor-
mal adjacent tissue. For this reason small tumors are diffi-
cult to detect. With time the tumor assumes a yellowish color
that reflects an abundance of stromal connective tissue with a
serous or cystic consistency. From the microscopic point of
view distinguishing adenocarcinomas and hyperplastic nod-
ules is complicated by the relative scarcity of anaplastic cells
in the former. The presence of blood and lymphatic vessels is
often decisive. In addition to adenocarcinomas, the prostate
sometimes contains squamous cell carcinomas, which may
originate from metaplastic cells.

In the current study we evaluated the usefulness of a
diagnostic maneuver that we developed for this purpose.
Ultrasound guided compression of the lesion using the rectal
probe allows the examiner to assess its consistency and this
additional information appears to increase the accuracy of
ultrasound in terms of its ability to identify lesions with a
high risk of malignancy. The maneuver represents a more
standardized and objective refinement of the classic method
of transrectal digital exploration of the prostate, which has
been the mainstay of prostate cancer screening for years.

Of the 68 cases considered positive, that is nondeformable,
63 (92.6%) were histologically confirmed as adenocarcinoma.
The same diagnosis emerged for 5 of the 78 nodules (6.4%)
classified negative or deformable. Interestingly all 5 false-
negative diagnoses were made in the borderline subgroup of
16 men in whom lesions were classified deformable, although
changes in shape provoked by the maneuver was quite lim-
ited. In contrast, all lesions that responded to the compres-
sion maneuver with marked changes in shape proved to be
benign. Thus, the method showed 93.2% sensitivity and 78%
specificity for identifying prostatic carcinomas. Although 11
of the 16 lesions (68.8%) with limited deformability were
ultimately diagnosed as benign (negative), it is possible that
the diagnostic significance attributable to this finding may be
adjusted (that is classified as a positive rather than a nega-
tive response) to increase method specificity without causing
an unacceptable decrease in sensitivity. In any case for sus-
picious hypoechoic lesions that are within this borderline
category, even if histology reveals nothing more than an
inflammatory process, we still advise our patients to undergo
yearly followup transrectal ultrasound with PSA meas-
urement every 6 months.

Combining the pain response with lesion deformability
may also increase the accuracy of the method. Pain at com-
pression characterized the 88% of acute inflammatory lesions
and was absent in 93% of those that proved to be carcinomas.
We are currently investigating the diagnostic value of this
combined approach in a larger series of patients.

**CONCLUSIONS**

Ultrasound guided compression of suspicious prostate le-
sions detected by the transrectal sonography maneuver is a
simple and rapid technique that may increase the diagnostic
potential of this examination. Although its use is effectively limited to subcapsular (peripheral) lesions in the dorsal regions of the prostate, these characteristics apply to approximately 75% of all prostatic carcinomas, including those that are most biologically aggressive. The compression maneuver had high sensitivity and good specificity for distinguishing malignant prosthetic lesions. Biopsy remains the only reliable approach for confirming or excluding adenocarcinoma of the prostate. However, the compression maneuver could improve the selection of lesions that require histological analysis and eliminate a number of useless biopsies of benign lesions.

REFERENCES
5. Fleshner, N. E., O'Sullivan, M., Premdass, C. and Fair, W. R.: Clinical significance of small (less than 0.2 cm3) hypoechoic lesions in men with normal digital rectal examinations and prostate-specific antigen levels less than 10 ng/mL. Urology, 53: 356, 1999