A study of the hypoechoic hypertrophic lesions and hypoechoic cancer lesions in hypertrophic prostate inner glands with transrectal color doppler ultrasonography

Hui Wang, Rui Hou, Guang Yang, Wenlin Xue, Shen Lv

Department of Ultrasonography, The First Affiliated Hospital, Dalian Medical University, Da Lian 116011, China

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Abstract  Objective: To observe the sonographic and hemodynamic features of hypoechoic hypertrophic lesions and hypoechoic cancer lesions in the hypertrophic prostate inner glands, in order to raise the accuracy of early diagnosis rate for prostate cancer. Methods: 31 cases of hypoechoic hypertrophic lesions and 18 cases of hypoechoic cancer lesions in the hypertrophic prostate inner glands were observed by transrectal ultrasonography and comparatively analyze the shape, edge and the systolic peak velocity (Vs), resistance index (RI) and pulsatility index (PI) of the lesions. Results: In contrast with hypertrophic group, the cancer group presented irregular shape and unclear edge, and obviously higher Vs, RI and PI. Conclusion: The sonographic appearance and Vs, RI, PI have important value in distinguishing hypoechoic hypertrophic lesions and hypoechoic cancer lesions in the hypertrophic prostate inner glands.

Key words transrectal color doppler ultrasonography; inner gland; prostate cancer

This article is a retrospective analysis of hypoechoic hypertrophic lesions and hypoechoic cancer lesions in the hypertrophic prostate inner glands, all of which have been proven by transrectal color Doppler ultrasonography biopsy, in order to find the difference between two diseases and to raise the accuracy of early diagnostic rate for prostate cancer.

Materials and methods

Prostatic cancer group: 16 people, age from 46–79 years old (mean 65), all of them with obvious prostatic hypertrophy, including 14 people with one prostatic cancer nodule in the inner glands, 2 people with two nodules, totaling 18 nodules. The mean diameter of the nodules was 1.2 cm.

Prostatic Hypertrophy group: 25 people, age from 40–80 years old (mean 68), all of them with obvious prostatic hypertrophy, including 19 people with one hypertrophic prostatic nodule in the inner gland, 6 people with two nodules, totaling 31 nodules. The mean diameter of the nodules was 1.4 cm.

Two-dimensional transrectal ultrasound, with frequency of 7.5 MHz logic 9 multiple-used transducer, produced by GE company, was used to observe the shape and border of the nodules in each group, then using color Doppler to detect the systolic peak velocity (Vs), resistance index (RI) and pulsatility index (PI) in inner and border of the hypoechoic lesions. The sample capacity was less than 2 mm, and the angle between sonic and blood flow less than 60 degrees. The data was collected 3 times and the mean was calculated. All the data were stored on compact disk.

Statistics analysis

The SPSS 10.0 software was used for variance analyses as a statistical analysis method.

Results

Sonographic characteristic

Hypertrophic nodes were spherical or oval shaped, with regular shape and clear margin (Fig. 1). On the contrary, cancer nodes were irregular, cauliflower-shaped, with blurred margins and spiny (Fig. 2).

Hemodynamic features

All the hemodynamic parameters of the cancer nodules (Fig. 3) were increased significantly compared with...
Discussion

The majority of prostatic cancers originate from the prostate peripheral zone. Among all the nodules, about 70% originated from peripheral zones, 5%–10% from the central zones, and 10%–20% from the transition zone [1, 2]. Due to the polymorphous behavior of the prostatic cancer cells, the image of the prostatic cancer varies. In 1987, Griffiths [3] pointed out that 92% of localized prostatic cancer lesions were hypoechoic, which had been widely accepted by the scholars.

Prostatic hypertrophy mainly appeared as nodular or tumor-like enlarged inner glands (including the transition zones and glands around the urethra). The hyperplasia nodules could be hypoechoic, hyperechoic and iso-echoic. Since the prostatic cancer mainly occurred in the peripheral zones, the hyperplasia nodules in the inner glands could easily be ignored or be considered as hyperplasia nodules, especially the hypoechoic nodules in the hypertrophic inner glands.

According to Agatstein’s study [4], about 19% of benign prostatic hyperplasia (BPH) patients had found cancer lesions after biopsy. Coplen [5] had done similar researches with transrectal ultrasonography and approved that about 15% of BPH patients had been found with cancer cells in their prostate. Greene’s [6] study further approved that among hyperplasia prostates, 67% of cancer lesions were located in transfer zones.

Due to the different therapeutic strategies between prostatic hypertrophic and prostatic cancer, it is meaningful to identify the benign and malignant hypoechoic nodules in hyperplasia prostatic inner glands. Our study showed that:

There were obvious distinctions between benign and malignant lesions with sonographic appearance.

Compare to BPH, the cancer lesions appeared as blurred border, lobular or irregular shaped, according to the cancer cells’ high speed and infiltrated growth behavior.

There were obvious differences between the two kinds of lesions in hemodynamic features.

Any disease which has histology changes, must experience the abnormal hemodynamic stage in histopathology [7]. When prostate hypertrophy occurs, the oxygen consumption of the tissue increases and contributes to localize hypoxia, stimulates the blood vessel growth and blood supply increases. In this instance, the prostatic cancer will experience two phases, the phase without blood vessel formation, and the new vessel formation phase. In the former phase, the tumors were supplied mainly by dispersion to obtain nutrition and disposal metabolize productions in peripheral tissues. In the latter phase, large amount of neo blood vessel form, and blood perfusion

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Vs, RI, PI in hypertrophic nodes and cancer nodes</th>
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<tbody>
<tr>
<td>Group</td>
<td>Number of nodules</td>
</tr>
<tr>
<td>Hc</td>
<td>31</td>
</tr>
<tr>
<td>Cancer</td>
<td>18</td>
</tr>
</tbody>
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* Means $P < 0.01$ (compared with hypertrophy group and cancer group)