Histopathological features of recurrent prostate adenocarcinoma after high intensity focused ultrasound (HIFU) focal treatment: A case report

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ARTICLE INFO

Keywords:
Prostate adenocarcinoma
High-intensity focused ultrasound
Histopathology

ABSTRACT

High-intensity focused ultrasound (HIFU) is a focal therapeutic approach for localised non-metastatic prostate cancer. We report a 53-year-old man who failed active surveillance of prostatic adenocarcinoma in the right lobe and underwent HIFU focal therapy. He experienced an outfi eld recurrence in the contralateral lobe thereafter and underwent salvage radical prostatectomy. We discuss the histopathological features in the salvage radical prostatectomy post HIFU treatment, its relationship to the outfi eld recurrence and the management.

Introduction

High-intensity focused ultrasound (HIFU) is a focal therapeutic approach for localised non-metastatic prostate cancer with eff ective outcome and lower probability of side eff ects. 1 HIFU therapy causes coagulative necrosis of the tumour by raising the local temperature while sparing surrounding organs in order to preserve urinary and sexual function. 2 Here we document the histological changes in the salvage radical prostatectomy of a patient who underwent focal-HIFU treatment for localised prostate cancer.

Case report

The patient presented in February 2019, aged 53, with serum total prostate specific antigen (PSA) level of 4.13 μg/L. (The chronological timeline of the patient’s diagnostic and treatment journey is summarized in Fig. 1) The patient had no significant past medical history. Multi-parametric magnetic resonance imaging (MRI) prostate scan showed indeterminate diffuse bilateral peripheral zone lesions (Prostate Imaging Reporting and Data System, PI-RADS 3), suggestive of a mild infl ammatory process. Prostate volume was 21.9 ml. A transrectal ultrasound-guided biopsy of the prostate was performed, which showed adenocarcinoma of the prostate in tiny 1mm foci of Gleason 3 + 3 (grade group 1) in the right lobe (right apex lateral and right mid-gland medial, Fig. 2A–C). He was managed with active surveillance.

However, his total PSA increased from 4.13 μg/L (February 2019) to 4.53 μg/L (July 2019) and 6.2 μg/L (October 2019). In November 2019, he underwent focal HIFU therapy for prostate cancer, targeted on the localized lesions in the right apex and right mid-gland. Unfortunately, his follow-up was interrupted by the COVID-19 pandemic because he was working overseas outside Singapore. In Aug 2020, his total PSA increased to 10.27 μg/L. Another multi-parametric MRI scan showed contralateral left peripheral zone suspicious PI-RADS 5 lesions. Prostate-specific membrane antigen positron emission computer tomography (PSMA PET-CT) scan showed a localised lesion within the prostate gland.

Subsequent MRI-ultrasound fusion guided biopsy showed locally recurrent cT2cN0M0 Gleason 3 + 4 prostate adenocarcinoma (PI-RADS 5 lesion, grade group 2, Fig. 2, D), at the left peripheral zone and midline transitional zone at the apex anterior to the prostatic urethra (PI-RADS 3 lesion, Gleason 3 + 3 (grade group 1, Fig. 2, E). The patient decided to undergo robotic salvage radical prostatectomy with bilateral pelvic lymph node dissection, which was done in Sep 2020. The histology showed prostatic acinar adenocarcinoma (pT2N0 Gleason 3 + 4, grade group 2) in the left lobe peripheral zone posteriorly and posterolaterally, extending into right lobe (Fig. 3A and B). Focal-HIFU treatment related changes were present in the right lobe posterior region, featuring stromal edema, hyalinization, fibrosis with neovascularization, corpora amylacea rimmed by foreign body type giant cells without glandular lining, hemosiderin laden macrophages and basal cell hyperplasia in the
adjacent non-neoplastic glands are present (Fig. 3 C–F). No viable tumour cells were seen in this region with prior focal-HIFU treatment.

The patient recovered well after the operation and serum PSA level was 0.015 μg/L in January 2021.

Discussion

HIFU focal therapy for prostate cancer can be used as primary treatment for localised disease in recent multicentre prospective studies, including treating clinically significant nonmetastatic prostate cancer. HIFU is also an alternative for salvage therapy in localised relapse of
prostate cancer following previous external beam radiotherapy. In order to provide accurate pathological diagnostic and/or prognostic information in post-HIFU radical prostatectomy, pathologists require knowledge of the expected post-treatment histopathological changes, as has been established for radiation and hormonal therapy.

In our case, no viable tumour cells were identified within the treatment area which may indicate a satisfactory tumour response to focal HIFU therapy. The treatment related changes in the non-neoplastic tissue were mainly reactive and reparative in nature, such as stromal edema, hyalinization, fibrosis with neovascularization, corpora amylacea rimmed by foreign body type multinucleated giant cells (Red arrows) are frequently seen in the post-HIFU treatment area (H&E, at × 100 magnification, bar length: 100 μm). (E) Corpora amylacea without a glandular lining but instead rimmed by foreign body type multinucleated giant cells (Red arrows) are frequently seen in the post-HIFU treatment area (H&E, at × 100 magnification, bar length: 100 μm). (F) Basal cell hyperplasia with hemosiderin laden macrophages (Red arrow) and chronic inflammation are present in the vicinity of the post-HIFU treatment area (H&E, at × 100 magnification, bar length: 100 μm).

In summary, we present histopathological changes of a case of focal-HIFU prostate cancer treatment. The remaining cancer in the contralateral lobe together with increased PSA in the follow-up underscores the necessity of monitoring and surveillance following focal-HIFU prostate cancer treatment.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

Authors declare no conflicts of interest.

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