Radiofrequency ablation treatment for localised prostate cancer

Published on 10.07.2003

DOI: 10.1594/EURORAD/CASE.2083
ISSN: 1563-4086

Section: Interventional radiology
Imaging Technique: Ultrasound
Imaging Technique: MR
Imaging Technique: Ultrasound
Imaging Technique: Ultrasound-Colour Doppler
Imaging Technique: Ultrasound-Power Doppler
Imaging Technique: MR

Case Type: Clinical Cases
Authors: Minnetti M, Zarrelli G, Ginepri A, Assael F, Ruggieri V
Patient: 74 years, male

Clinical History:
Radiofrequency ablation of a localised prostatic cancer in a patient who was not a candidate for surgery.

Imaging Findings:
The findings on clinical inspection (DRE) were negative; the total PSA value was 4.65ng/ml.

The patient was not a candidate for radical prostatectomy because of previous cardiac failure.

Transrectal ultrasound performed with an "endfire" multifrequency probe delineated a subcentimetric hypoechoic nodule of the right peripheral prostate, without focal irregularity of the capsule (Fig. 1).

Biopsy performed via the transrectal route under US guidance with a 16 gauge "tru-cut" needle showed an adenocarcinoma of the right prostate lobe, with a Gleason score of 7 (3 + 4) and no invasion of perineural spaces. Only two biopsy specimens of the hypoechoic nodule were positive; the remaining prostate did not show tumoral foci on TRUS-biopsy.

MR imaging of the pelvis was performed with axial, coronal and sagittal high resolution Spin Echo and Turbo SE images, also with fat-suppression and gadolinium-DTPA enhancement. The examination showed an 11mm x 6mm nodule in the same site, with low signal intensity on TSE T2-weighted imaging and slight enhancement on T1-weighted imaging after iv gadolinium.

The protocol for the radiofrequency treatment was IRB approved. It was performed under intravenous sedation, with continuously refreshed saline bladder irrigation to cool the urethra. A straight internally-cooled 17 gauge 2cm exposed-tip electrode needle was inserted percutaneously via the perineum, under sonographic biplanar guidance to optimise hitting of the targeted nodule (Fig. 2).

Total average coagulation time was 10 minutes, RF current 1200mA, temperature 80°C, maximum generator output
45W, tissue impedance lower than 50 ohm.

Intranodular temperature measured in the cool-down post-operative phase was 58°C.

No major complications occurred and the patient was discharged in good condition without catheterisation 2 days later.

Serial measurements of PSA obtained 15, 30, 45, 60, 90, and 180 days after treatment and at 9, 12, 15, and 18 months follow-up showed low and stable values, of 0.6ng/ml.

The patient preserved his sexual potency.

Post-treatment imaging (MR of the prostate 45 days, 6 and 12 months later, and TRUS with colour Doppler and transrectal biopsy 6 and 12 months later), showed an avascular area at the site of treatment, initially hyperechoic on TRUS and slightly hyperintense on T1-weighted MR imaging (Fig. 3a).

At 6 months, MR images showed a cavitation area, hypointense on T1- and T2-weighted sequences, with no evidence of vascularity on colour Doppler TRUS (Figs 3b-d and 4a-d). Later (12-18 months post-treatment) monolobar hypoplasia of the ablation site was seen on both TRUS and MRI, with persistent avascularity and partial loss of zonal discrimination (Fig. 5).

There were no findings of residual tumoral foci on histology obtained with repeated systematic biopsies at 6 months (Fig. 6), only coagulative necrosis.

**Discussion:**

Radiofrequency thermal ablation (RF) is used for the treatment of various type of tumour, such as liver neoplasm, liver metastases, osteoid osteoma, small renal carcinomas, and recurrent head and neck tumours. For lung cancer, pancreatic mass and prostate cancer the role of RF is still in evaluation.

We are aware of few other experiences of potentially curative treatment of clinically localised prostate cancer with RF. Preliminary results show RF ablation as one of the many treatments that patients with prostatic cancer may undergo in the course of their disease. Unlike hormone therapy and radiation, there is not a maximum dose, and repeated treatments can be applied as necessary if the disease remains localised.

Unlike treatments that involve the entire gland, which often cause impotence, a "nerve sparing" percutaneous transperineal ultrasound-guided RF procedure involves approximatively only a quarter of the prostate.

The procedure takes around 20 minutes and is performed with insertion of an electrode-needle transcutaneously, directly into the gland, via the perineum.

Although further research is required, the preliminary results suggest that RF ablation is an effective treatment for one-sided prostate cancer. Close collaboration with urologists is essential in the selection of patients.

The low morbidity, minimal invasiveness (potentially office–based applicability) and efficacy of cancer control make RF ablation a valid option for the treatment of localised prostate cancer, not in conflict with other therapeutic options.

**Differential Diagnosis List:** Transperineal radiofrequency ablation of T2a prostate cancer

**Final Diagnosis:** Transperineal radiofrequency ablation of T2a prostate cancer
References:


Dupuy DE, Goldberg SN.


Goldberg SN, Gazelle GS, Mueller PR.


Zlotta AR, Djavan B, Matos C, Noel JC, Peny MO, Silverman DE, Marberger M, Schulman CC.

Description: Hypoechoic peripheral prostate nodule detected by TRUS. Origin:
Description: Tip of the 17 gauge straight electrode needle inserted into the prostatic nodule via the perineum under transrectal ultrasound biplanar guidance. Origin:
Figure 3

Description: Axial T1-weighted MR image shows a slightly hyperintense area corresponding to coagulative necrosis and granulation tissue at 45 days after radiofrequency ablation of the right lobe.

Origin:
**Description:** Axial TSE T2-weighted image with hypointense area at 6 months after radiofrequency ablation. **Origin:**

**Description:** Coronal T2-weighted MR image: cavitation area at the site of RF treatment. **Origin:**
**Description:** Sagittal T2-weighted MR image: cavitation area at the site of RF treatment. **Origin:**
Figure 4

a

Description: Slight hypoechoic ablated area at 6 months after RF.

b

Description: Hypoechoic zone in the ablated area.
**Description:** Avascularity in the treated area of the right prostatic lobe. **Origin:**

**Description:** Persistent avascular zone in the treated area at 6 months. **Origin:**
**Description:** T2-weighted axial image: hypoplasia and partial cystic transformation at the site of treatment. **Origin:**
Description: Coronal T2-weighted image: hypoplasia of the treated lobe and loss of zonal discrimination. Origin:
Figure 6

Description: Single arrow: normal prostatic tissue. Double arrows: coagulative necrosis. Origin: