

Submission Type: Scientific Papers Contact: Michael K. Stehling MD, PhD

INSTITUTION: Boston University

E-Mail: m.stehling@t-online.de

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Prostate Cancer Treatment with Irreversible Electroporation (IRE): Experience, Safety and Efficacy after 4.5 Years in 265 Patients

M K Stehling, MD, PhD, Offenbach, GERMANY; E Guenther, DIPLPHYS; N Klein, MSc; S Zapf; D Kim, MD; B Rubinsky, PhD

PURPOSE

Irreversible Electroporation (IRE) is a novel tissue ablation method .It selectively destroys cells whilst preserving tissue infrastructure and is hence an ideal method for focal prostate cancer (PCa) therapy. It preserves (or allows regeneration of) vital surrounding structures such as neurovascular bundle, inferior sphincter and rectum, thus minimizing the side-effects of PCa therapy, mainly being impotence and incontinence.

METHOD AND MATERIALS

We have employed IRE for the treatment of 265 patients with primary (stages T1-T4) and recurrent PCa after surgery (18/265), radiation therapy (4/265) and HIFU (3/265). All patients underwent mp-MRI prior to and after IRE (T2, diffusion, perfusion, in selected cases 1H spectroscopy). 44% of patients underwent additional 3D-transperineal biopsy before IRE. Treatment was carried out by rectal US-guided transperineal IRE-electrode insertion under general anesthesia and deep muscle relaxation. All patients had follow-ups with PSA and mp-MRI for documentation of local tumor control.

RESULTS

Initial tumor control was achieved in all patients. Within the follow-up period of up to 4y, the recurrence rates were 0/55 (Gleason<7), 3/117 (Gleason 7) and 10/67 (Gleason >7). There were no IRE-related complications and toxicity was extremely low: 27 patients reported a transient reduction of erectile function (EF) (recurred after 6-8m), 15 a permanent reduction and 2 a permanent loss of EF. There were no cases of IRE-related incontinence, even when the lower urinary sphincter was included in the treatment field; a partially included rectum also remained intact. Treatment was completed within 24h in all patients with a single overnight stay in the clinic. Patients had no wound pain.

CONCLUSION

IRE treatment of PCa is safe. In the short-term follow-up with MRI and PSA (maximum 4.5y) it is effective. Toxicity is significantly lower compared to other PCa treatments. Based on our data incontinence can be avoided altogether. MRI and 3D-biopsy are suitable for pre-treatment work-up and MRI for post-treatment follow-up. IRE has the potential to become an important tool for PCa therapy.

CLINICAL RELEVANCE/APPLICATION

IRE treatment is an alternative to the current treatment options for PCa, with much lower invasiveness and toxicity. It is effective in all stages of PCa and offers treatment options in advanced and recurrent PCa not amenable to other therapies.

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