17 Transurethral Microwave Thermotherapy

MARIAN DEVONEC, JEAN-PHILIPPE FENDLER, PATRICE JOUBERT, and PAUL PERRIN

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17.1 Introduction

Current therapeutic options for benign prostatic hyperplasia (BPH) include medical management, which has only a limited effect and is essentially palliative and reversible at the end of the treatment (LEPOR 1989), and endoscopic surgery, which clearly has an important effect made permanent by the removal of prostatic tissue and the creation of a cavity within the prostate (LEPOR and RIGAUD 1990; HOLTGREWE et al. 1989). In addition to these two treatment options, there is a possibility of using minimally invasive alternative therapy whose aim is essentially to induce irreversible tissue changes in order to obtain...
therapeutic effectiveness more optimal than that of medical treatment. Treatment outcome of this minimally invasive therapy should be as close as possible to that of transurethral resection of the prostate (TURP), the standard management of BPH, but at a lesser cost in terms of associated morbidity and clinical burden.

17.2 The Difference Between Hyperthermia and Thermotherapy

The application of microwave energy to tissue results in heating and, consequently, the activation of protective mechanisms against heat, i.e., thermoregulation. Only when these mechanisms become saturated beyond thermal threshold is the tissue damaged. Histologic changes resulting from this treatment can be easily observed and are dependent on the physical characteristics of the microwave emission. Microwave thermotherapy of BPH should be distinguished from microwave hyperthermia in that its goal is to cause an irreversible tissue lesion with a favorable outcome in the irritative and obstructive symptoms of BPH. Hyperthermia elevates the temperature of the target tissue to 42°–44 °C (COSSET 1989). Repeated exposures to such temperatures have been shown to affect cancerous tissue and are essentially used in combination with radiation therapy. Hyperthermia treatment of cancer is safe because temperatures of 42°–44 °C do not produce immediate tissue necrosis (see Chaps. 13, 14). Normal or benign tissue treated with transrectal hyperthermia requires much higher temperatures, well above 45 °C, before it undergoes necrosis (SERVADIO et al. 1989; LINDNER et al. 1990a; STROHMAIER et al. 1990; MONTORSI et al. 1992; ZERIBIB et al. 1992; VAN DEN BOSSCHE et al. 1991). On the other hand, repeated applications of transurethral hyperthermia produces a well-defined but superficial necrosis of the prostatic urethra (BAERT et al. 1990; SAPOZINK et al. 1990; LAUWERYNS et al. 1991).

Thermotherapy elevates the temperature of the target tissue to between 46° and 60 °C (DEVONEC et al. 1991). At such high temperatures, a single exposure of 1 h has been shown to induce thermocoagulation of benign hypertrophy of the prostate. Thermotherapy is safe if there is constant monitoring of the rectal and urethral temperatures. Above 60 °C, thermoablation of prostatic tissue can be observed with the formation of a cavity inside the prostate gland.

The treatment goals, thermokinetic characteristics, and pathology results of the two techniques are so different that the World Health Organization has drawn a distinction between thermotherapy (intraprostatic temperature between 46 ° and 60 °C) and hyperthermia (intraprostatic temperature between 42 ° and 44 °C) (SMITH et al. 1992).

17.2.1 Safety, Pain, and Efficacy Thresholds of Microwave Therapy

Three thresholds have been demonstrated during the use of microwave therapy in the treatment of BPH: a safety threshold, a pain threshold, and an efficacy