LASER THERAPY IN LOCALIZED PROSTATIC CANCER

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Localized prostatic carcinoma is defined as a malignant prostatic disease limited to the gland without evidence of lymph node involvement or distant metastases. Theoretically it should be possible to cure these patients with local procedures provided that suitable techniques were available. Radical prostatectomy, transurethral resection, radiotherapy and radioactive implants have been practiced for years, but none of these methods has gained common acceptance as routine procedures.

Combined treatment with TUR and the subsequent Neodymium-YAG laser irradiation was introduced in our department in 1981 as a method for radical treatment in patients with localized prostatic carcinoma.

This treatment is founded on the following considerations: Prostatic cancer nodes often arise and are situated near to the capsule or in the apical area of the gland. Even extended transurethral resection will frequently leave remnants of tumor tissue close to the capsule.

The Neodymium-YAG laser light is only slightly absorbed by water and hemoglobin, and penetrates the tissue to a depth of about 5 mm. The considerable forward (20–30%) and backward scattering (30–40%) of the laser energy reduces the penetration depth, but heats a larger tissue volume around the point of impact. This property makes the Neodymium-YAG laser suited for deep thermal volume coagulation. The development of heat occurs rather slowly, and it is therefore possible to perform coagulation under controlled conditions without carbonization or vaporization of the tissue. As the beam can be conducted in flexible fibers, the Neodymium-YAG laser is ideal for endoscopic coagulation in the urinary tract.

Our experiences and preliminary results have previously been presented in the literature (Sander and Beisland 1984), (Beisland and Sander 1986). The present paper gives results updated to 1990.

Treatment procedure

The treatment is carried out in two separate steps. The transurethral resection has to be done as radical as possible by an experienced urologist. If too much prostatic tissue is left after the first resection, a second TUR is to be recommended. The laser irradiation is performed 3–5 weeks after TUR because the capsule wall has to be clean and without fibrin or blood clots. With a laser power of 45–50 W the whole capsule is systematically coagulated by overlapping single pulses of 4 seconds duration.
The flexible laser light guide is introduced transurethrally for coagulation of the upper part of the cavity. The laser light guide can only be angulated to 90 degrees, and it is therefore impossible to access the apical area by this approach. Consequently, after having treated the first 10 patients we improved the procedure by additional use of a suprapubically inserted trocar cystoscope. By this access the lower part of the cavity and the apical area can be properly irradiated.

During coagulation of the posterior wall of the cavity a special care has to be taken to avoid damage to the rectum.

We have performed monitoring of the rectal temperature with a temperature sensitive probe mounted on a palpat ing finger introduced per anus, pressed against the anterior wall of the rectum at the prostatic level and kept in position during the irradiation procedure.

When irradiating posteriorly, the temperature increases with each pulse application. Interruption of irradiation and continuous saline irrigation causes decrease in temperature to original level within 2–3 minutes. Cessation of both irrigation and irradiation lowers the temperature slower and new series of pulses cause ever increasing rectal temperatures. It is advisable that when approximately 10 pulses has been applied posteriorly, the coagulation should be interrupted for one or two minutes. During coagulation anteriorly or laterally there is no risk for damage to neighboring organs.

The laser treatment is carried out under spinal anesthesia. Mean operation time is approximately 35–50 minutes. A cathether is left in the bladder to next morning and the hospital stay is one or two days after operation.

Clinical material

The material consists of 118 patients with localized prostatic carcinoma of stage T0 difT2 (A2–B2). Patients with incidental carcinoma of stage T0 foc (A1) have not been included. The histological differentiation of the tumors is given in table I. The oldest patient was 86 years, the youngest 51 years (mean age 69 years). The observation time ranges 6–98 months.

| Table I. Histological differentiation in 118 patients with localized prostatic carcinoma treated with TUR and Neodymium-YAG laser irradiation |
|-------------|-----|
| WHO I       | 62  |
| WHO II      | 49  |
| WHO III     | 7   |

For preoperative staging urethrocystoscopy, rectal palpation and transrectal ultrasonography are carried out. Transrectal ultrasonography is also important for control of sufficient resection and for follow up. Investigations for
possible distant metastases include blood analyses, chest X-ray, pelvic and lumbar bone films and in suspected cases bone scan. Staging lymphadenectomy has not been carried out routinely.

Follow up has been carried out at 3 months intervals during the first 2 years and thereafter every 6 months. Follow up investigations include palpation of the prostate, transrectal ultrasonography and blood analyses. Urethroscopy is done at the first or second control to verify proper epithelialization of the cavity. If local tumor recurrence is suspected on palpation or ultrasonographically, needle biopsies are carried out.

For evaluation of the results we distinguish between disease-free survivors and failures. Failure criterion are considered to be: development of distant metastases, persistent elevation of serum acid phosphatases (recently also PSA), tumor progression beyond the prostatic capsule or local recurrence of tumor verified by biopsy to be cancer.

Results

The results are surveyed in table II. One hundred and four patients are evaluated as disease-free survivors. Clinically they are doing well and their voiding pattern and sexual function are as seen after TUR alone. The overall actual disease-free survival rates are 98% on one year, 90% on 2 years, 89% on 3 years, and 88% in the 4–8 year period. Two patients died without cancer of the prostate 33 month (colon cancer with metastases) and 62 months (leukemia) after treatment.

Treatment failed 12 cases, in most of them the failure was diagnosed 12–24 months after treatment (table III). Six patients got a local recurrent tumor with progression beyond the prostatic capsule. Three of them, however, belonged to the first 10 patients, only laser irradiated by the transurethral approach and their recurrent tumor occurred apically. Six patients developed distant metastases, five of them had originally a poorly differentiated tumor. Probably they had lymph node involvement already at the time of treatment.

Perioperative complications did not occur. There was no bleeding and no problems due to the suprapubic insertion of the trocar cystoscope. Postoperatively, acute cystitis, acute epididymitis and spinal headache required prolonged hospital stay in one patient, respectively. During the first weeks many patients experienced minor dysuria and micturition discomfort. Late complications such as stricture or incontinence are few, but in one patient with severe incontinence an artificial sphincteric prosthesis was implanted after 33 months disease free follow up (table IV).

Table II. Results in 118 patients with localized prostatic carcinoma treated with TUR and Neodymium-YAG laser irradiation

| Disease-free survivors | 104 |
| Dead without prostatic carcinoma | 2 |
| Failures | 12 |
Conclusion
The results so far encouraging and compare satisfactorily to results obtained with external beam radiation and radioactive implants. Longer observation time is necessary for definite evaluation of the method and for comparison to the results obtained with radical prostatectomy. However, the treatment is not encumbered with serious complications or functional disturbances, and very few patients are excluded because of high age or concomitant diseases.

REFERENCES