

URODYNAMIC PATTERNS AFTER PROSTATE RADIOTHERAPY. EVALUATION AT 2, 18, 48 AND 60 MONTHS.

Hypothesis / aims of study

In localized prostate carcinoma (T1c-T2c N0 M0), external beam radiation therapy (EBRT) is recommended, offering the same long-term survival results as surgery. Among early and intermediate side effects of EBRT, changes in micturition and in bowel function are frequently observed but so far not been fully investigated. Although, since 1996, some studies have been focused on the quality of life of patients after EBRT (1-3), no prospective investigation have been developed on the basis of voiding diaries and urodynamic studies. This prospective study was designed to evaluate and quantify modifications in micturition patterns induced by EBRT on patients with prostate carcinoma (PC).

Study design, materials and methods

60 patients with PC were consecutively treated, from September 2009 to December 2010, in a single Institution, with 4-field 3D-CRT plans (76-78 Gy in 38-39 sessions). The average age of the population was 74,7 years (58,6–78,7). Median prostate volume was 39 mL (22-61). After obtaining informed consent and after a systematic basic assessment, the patients were studied 2 months before and 2 months after EBRT through: a) IPSS-questionnaire (in order to calculate voiding symptom severity); b) 3-days micturition time chart (inclusive time of voiding, frequency-volume and incontinence episodes); c) Urodynamic tests (UDS) : uroflowmetry and assessment of post-voiding residual (PVR), filling cystometry, pressure-flow study of voiding, urethral function studies. UDS were all performed in a single Laboratory and interpreted by senior Urodynamicist of the Institution. The same tests were performed again at 18, 48 and 60 months after radiation therapy.

Results

Among the 60 patients enrolled, 56 (93,3%) completed the study at 2nd month, 51 (85%) at 18th month, 46 (76,7%) at 48th month and 45 (75%) at 60th month.

2 months before EBRT (baseline data): a) IPSS: median total score proved to 7 (in the 56 evaluable pts); b) the 3-days micturition chart, before treatment, with an average of 6 micturition a day and only one patient complained about 1 episode of urge incontinence (UUI) in 24 hours; c) on UDS: the Uroflowmetry revealed (mean values) Max Flow Rate (Qmax): 14,7mL/s, Average Flow Rate (Qmean): 9,9 and PVR: 44mL; Cystometric capacity: 380mL and normal compliance in 55/56pts, (1 patient was hypocompliant at 3,83mL/cmH₂O); at Voiding pressure/flow study, in 53 pts the mean Bladder Outlet Obstruction Index (BOOI) was 15,6 and in 3 pts the BOOI was over 20 (respectively 22,1, 25,6, 26,3: "equivocal" in ICS nomogram).

2 months after EBRT: a) IPSS: median total score proved to 11 (in the 56 evaluable pts); b) the 3-days micturition chart, after the treatment, an average of 9 micturitions a day: UUI was present in three patients (1-2 episodes of urge incontinence /day) and a total of 6 patients complained of frequency-urgency syndrome; c) on UDS: the Uroflowmetry revealed (mean values) Qmax: 12,9mL/s, Qmean: 8,3 and PVR: 63 mL; Cystometric capacity: 288mL and normal compliance in 50/56pts, (6 patient were hypocompliant at [mean value] 8,15 mL/cmH₂O); at Voiding pressure/flow study, in 46 pts the mean BOOI was 17,7 and in 10 pts the BOOI was over 20 (mean value: 29,2).

18 months after EBRT: in the evaluable 51 patients; a) IPSS median total score: 10; b) 3-days micturition chart an average of 9 micturitions a day (5-11) with mean median volume per micturition of 290 mL (170-410); one patient complained for UUI (with 1-2 episodes per day) and one patient complained for urgency frequency syndrome; c) on UDS: the Uroflowmetry revealed (mean values) Qmax: 13,6 mL/s, Qmean: 8,5 and PVR: 59 mL; Cystometric capacity: 350 mL (145-430) and normal compliance in 47/51 patients; we found detrusor overactivity (DO) in 1 / 51 patients; at Voiding pressure/flow study, in 45 pts the mean BOOI was 17,9 and in 6 pts the BOOI was over 20 (mean value: 27,5).

48 months after EBRT: in the evaluable 46 patients; a) IPSS median total score: 11; b) in the 3-days micturition chart an average of 9 micturitions a day (5-12) with mean median volume per micturition of 260 mL (150-370); UUI was reported in two patients out of 46 (with 1-2 episodes per day) and one patient complained for urgency frequency syndrome; c) on UDS: the Uroflowmetry revealed (mean values) Qmax: 11,8 mL/s, Qmean: 7,3 and PVR: 77 mL; Cystometric capacity: 330 mL (140-400) and normal compliance in 39/46 patients; we found DO in 3 out of 46 patients; at Voiding pressure/flow study, in 45 pts the mean BOOI was 18,1 and in 8 pts the BOOI was over 20 (mean value: 29,5).

60 months after EBRT: in the evaluable 45 pts; a) IPSS median total score was 9; b) in the 3-days micturition chart an average of 7 micturitions a day (5-12) with mean median volume per micturition of 290 mL (160-360); UUI was reported in one patient out of 45 (with 1-2 episodes per day) and the same patient complained for urgency frequency syndrome; c) on UDS: the Uroflowmetry revealed (mean values) Qmax: 12,2 mL/s, Qmean: 7,4 and PVR: 81 mL; Cystometric capacity: 350 mL (160-420) and normal compliance in 41/45 patients (91%); DO in 1 out of 45 patients; at Voiding pressure/flow study, in 38 pts the mean BOOI was 17,7 and in 7 pts the BOOI was over 20 (mean value: 31,3).

Interpretation of results

Our study confirms the clinical evidence of micturition changes induced by prostate Radiotherapy, both in emptying and storage phase: changes are particularly relevant, especially in the period immediately following the treatment. Regarding the emptying phase, data collected from the 56 patients at 2 months after EBRT show a decrease in the Qmax (-12,24%) and in the Qmean (-16,2%), that are correlated with a increase in BOOI (+20,6%) and consequently in PVR (+43,2%), without cases of complete urinary retention. The micturition charts show an increase in the frequency (+50,0%), due to obstruction as well as to bladder

overactivity. In fact, 5 pts developed a urgency-frequency syndrome, including 2 pts with mild UUI. Regarding the filling phase, cystometry shows a reduction of bladder capacity (-24,2%) and 5 pts with 'de-novo' low bladder compliance. All these findings show evidence for an interference of EBRT on detrusor function and on urethral resistance, influencing the frequency of urination (+50%) and limiting the emptying phase (PVR +43,2%). In few cases (8,9%) we found DO at the urodynamic tests and only 2 patients developed 'de novo' UUI. The results of the IPSS questionnaire summarize all these observations with an increase of symptoms from score 7 to 11 (+57,1% change). This study shows also the significant impact of ERBT on micturition cycle in the filling phase as well as in the emptying one.

The relevant findings recorded in the second month after EBRT, characterized by a worsening of the IPSS score of + 57% related to the decrease in maximum cistometric capacity (-26,8%) and to an increase in the BOOI value (+18%), show an improvement at the 18th month after ERBT with a IPSS score of 10 (+42%) and an increment in the maximum cistometric capacity of 350 mL. In the following evaluations at 4 and 5 years from ERBT, we can observe a mild global clinical worsening characterized by an increased frequency (+ 35%) and by an outlet obstruction (+27%).

Concluding message

A urodynamic study conducted after the definitive conformal prostate EBRT, allows us to understand and quantify the patients symptoms in the immediate post-treatment period and in the following years.

Changes emerged from the Urodynamic evaluation, from IPSS-questionnaire and from Voiding diary are more pronounced than the clinical symptoms, probably because these patients are usually treated with symptomatic drugs. Even if the clinical significance of the findings presented here should not be overemphasized, results obtained can be useful in counseling patients about EBRT side-effects.

References

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Disclosures

Funding: NONE **Clinical Trial:** No **Subjects:** HUMAN **Ethics Committee:** IRB Helsinki: Yes **Informed Consent:** Yes