

Comparison of the quality of life of patients with prostate cancer who undergo radical treatment

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Abstract

Purpose: To compare the quality of life (QoL) of prostate cancer undergoing radical treatment: prostatectomy (RP), external beam radiotherapy (RT) and combined radiotherapy with high-dose rate brachytherapy (RT-BT).

Methods and Materials:

A prospective analysis of QoL after radical treatment was carried out between 2014 and 2015. Participation in the study was offered to patients treated between 2004 and 2009 without recurrence of the disease, during a follow-up visit. 189 patients agreed to participate in the study (62 underwent RP – group A, 91 received RT – group B and 36 were treated with the combined method – group C). QoL analysis was performed according to the validated European Organisation for Research and Treatment of Cancer Quality of Life Questionnaires: EORTC QLQ-C30, prostate cancer-specific module - EORTC QLQ-PR25 and International Index of Erectile Function-5 (IIEF-5).

Results:

The general health status was the best in group C compared to group A and B, but the difference was not statistically significant. Urinary-related symptoms were significantly less frequently reported in group C than group B and A (16.7 vs 27.9 vs. 24.7, respectively, $p = 0.003$). Bowel-related symptoms were significantly more frequent in the group B than in group A and C (11.5 vs 6.6 vs 7.4 respectively, $p = 0.01$). Hormone-related symptoms were more common in the RT group than in other groups. The erectile dysfunction evaluated in the IIEF-5 test was significantly milder in the group treated with the combined method ($p = 0.033$). There were more patients with favourable risk in group A compared to groups B and C, the difference was statistically significant ($p=0.006$). There were no statistically significant differences in QoL questionnaires between the treatment groups in the low-risk (LR) group. There was a statistically significant difference in emotional functioning ($p=0.03$) in favour of the RP group and in frequency of nausea and vomiting ($p=0.01$), which occurred most frequently in the the RT group in intermediate-risk (IR) group. In the high-risk group (HR), there was a statistically significant difference in the incidence of diarrhoea ($p=0.01$), which was the most common in the RT group compared to the combination therapy group, and did not occur in the RP group. Urinary symptoms were reported significantly more frequently in the RP and RT groups than in the combined treatment group (32.7 vs. 29.6 vs. 13.9, respectively, Kruskal-Wallis test $p=0.01$).

Conclusions:

The analysis of our study indicates that surgical treatment adversely affects the functioning of the urinary and sexual systems, while radiation therapy worsens the functioning of the intestines.

There is a significant difference in the percentage of patients with prostate cancer classified as low, intermediate, and high risk of recurrence in terms of therapeutic method (undergoing prostatectomy, external beam radiotherapy, or combined external-beam radiotherapy and high-dose rate brachytherapy).

Therefore, the lack of reference to risk groups can lead to unauthorised comparisons of quality of life. The analyses show that after stratification of patients into risk groups, the compared therapeutic methods in most cases do not differ significantly in terms of quality of life.

Introduction

Prostate cancer (PCa) is the second most commonly diagnosed cancer in men in Europe and the first in Poland [1,2]. Radical prostatectomy (RP) and radiotherapy are recognised as two basic methods of curative treatment for PCa [1]. Radiation treatment can be performed using external beam radiation therapy (RT) alone, interstitial brachytherapy (BT) alone, or a combination of both (RT-BT) [1,3].

Cancer has a negative impact on quality of life (QoL), both due to symptoms and stress associated with diagnosis and uncertain prognosis, as well as due to difficulties in chronic and toxic treatment. Currently, quality of life is increasingly evaluated in clinical trials and daily medical practice. This is particularly common in cancer due to its social and economic consequences. Overall survival in patients diagnosed with prostate cancer is usually long, so quality of life during and after treatment has a significant impact on the choice of therapy method. The decision is also dictated by the patient's age and expectations regarding possible complications (the preservation of potency and urinary continence).

The prospective ProtecT study (Prostate Testing for Cancer and Treatment), the Prostate Cancer Outcomes Study (PCOS), Hoffman's population-based prospective study and a systematic review of 18 studies [4–7] showed that surgical treatment adversely affects urinary and reproductive system function, while radiotherapy worsens bowel function.

Trials on the quality of life of PCa patients who underwent prostatectomy or radical radiotherapy are still relatively few, which is an important message for conducting own research in this area.

In this report, we analysed and compared the quality of patients with life of prostate cancer treated radically.

Materials and Methods

A prospective analysis of QoL after radical treatment was carried out between 2014 and 2015. Participation in the study was offered to PCa patients treated between 2004 and 2009 without recurrence of the disease, during a follow-up visit. 189 patients agreed to participate in the study (62 underwent RP – group A, 91 received RT – group B and 36 were treated with the combined method – group C). The patients signed an informed consent form to participate in the study.

The study used standardised EORTC QLQ-C30 and PR25 questionnaires developed by the European Quality of Life Research Group, obtained with the consent of the European Organisation for Research and Treatment of Cancer and an International Index of Erectile Function-5 (IIEF – 5).

The patients were examined on average 6.5 years after the end of oncological treatment. The longest time from the end of treatment to the end of the surveys was in the group treated with the combined method, and the shortest in the group treated with stand-alone teleradiotherapy; the difference was statistically significant (Kruskal-Wallis test, $p = 0.013$).

The median age of the group was 72 years (range 55–82 years). Patients treated with RP were significantly younger than patients treated with RT or with the combined scheme (69 vs 75 vs 71, respectively, Kruskal-Wallis test $p < 0.001$). All patients had biopsy-proven prostate adenocarcinoma, with a median Gleason score 6. The prostate specific antigen (PSA) prior to treatment ranged from 0.41 to 56.6 ng/ml. PSA level was significantly lower in group A compared to groups B and C (8.35 vs 13.0 vs 12.5 ng/ml, respectively, Kruskal-Wallis test, $p < 0.001$). The patients were divided into risk groups according to D'Amico [8]. There were more patients with favourable risk in group A compared to groups B and C, the difference was statistically significant (Kruskal-Wallis test, $p = 0.006$). Detailed characteristics of the 189 patients surveyed are presented in Table 1.

Comorbidities were present in 119 patients (63%), often with more than one condition occurring in one patient. In group B, comorbidities occurred significantly more often than in groups A and C (72.5% vs. 50% vs. 61.1%, respectively, Kruskal-Wallis test, $p = 0.018$). Neurological diseases were more common in groups B than in group A and C (13.2% vs 1.6% vs 5.6%, respectively, Kruskal-Wallis test, $p = 0.03$). Additional urinary tract diseases were the most common in group C (16.7% vs 3.2% vs 6.6%, respectively, Kruskal-Wallis test, $p = 0.047$). Details are presented in Table 2.

Table 2
Characteristics of comorbidities in patients with prostate cancer

Comorbidities	Group A (N = 62)	Group B (N = 91)	Group C (N = 36)	p (ANOVA Kruskal-Wallis)
	31 (50%)	66 (72.5%)	22 (61.1%)	0.018
Cardiac and vascular diseases	17 (27.4%)	42 (46.2%)	14 (38.9%)	0.07
Neurological diseases	1 (1.6%)	12 (13.2%)	2 (5.6%)	0.03
Other malignant tumors	1 (1.6%)	6 (6.6%)	2 (5.6%)	0.36
Spine disorders	4 (6.5%)	9 (9.9%)	6 (16.7%)	0.27
Digestive tract diseases	2 (3.2%)	11 (12.1%)	5 (13.9%)	0.12
Urinary system diseases (except prostate)	2 (3.2%)	6 (6.6%)	6 (16.7%)	0.047
Previous surgeries	17 (27.4%)	25 (27.4%)	7 (19.4%)	0.62
Mental diseases	1 (1.6%)	1 (1.1%)	1 (2.8%)	0.79

Short-course ADT (SCADT) was used in 3.2% of patients of the group A, 17.6% of the groups B and 22.2% in group C, long-course ADT (LCADT) was applied of the 71.4% of the group B and 72.2% in group C, there was no LCADT in group A (Kruskal-Wallis test, $p < 0.001$). The median duration of SCADT in group A was 3.25 months compared to 5.7 months in group B and 4.65 months in group C (Kruskal-Wallis test, $p = 0.005$). The median duration of LCADT in group B was 32.8 months compared to 21.4 months in group C (U-Mann-Whitney test $p = 0.06$).

RP was performed using a retropubic approach according to the technique described by Walsh and Donker in the Bare modification of Bare [1,13]

RT was performed with 6 to 20 MV photons generated by a linear accelerator. The intensity-modulated RT (IMRT) or three-dimensional conformal planning technique (3d-CRT) was based on computed tomography and magnetic resonance imaging. The patients were placed in a supine position. Precise and reproducible patient immobilisation was achieved using a thermoplastic mask system. Clinical target volume (CTV) included the prostate and the base of the seminal vesicles at low risk (LR) and intermediate-risk (IR) and also the pelvic lymph nodes in patients with high risk (HR). A planning target volume (PTV) of 7–10 mm was applied. Organs at risk include the rectum, urinary bladder, femoral heads, penile bulb, and bowel.

The median dose to the prostate was 76 Gy (range, 74–77 Gy) in group B and 54 Gy (range, 46–64 Gy) in group C. The median fractionated dose was 2 Gy. The final decision on pelvic irradiation depended on risk factors and the decision (44% in group B and 38.9% in group C). The median external beam dose to the pelvis was 44 Gy (range 44–50 Gy).

Brachytherapy was administered using intraoperative treatment planning with ultrasound guidance. The prostate gland was defined as CTV. Treatment planning was carried out with the following constraints: the maximum dose to the urethra and rectum had to be less than 120%. Needles were implanted under transrectal ultrasonography guidance. The location of each needle was visualised and the implant was reconstructed using the treatment planning system. One or two 10-10.5 Gy BT were administered before and/or after RT. It was applied using an HDR 192-Ir stepping source unit. Dosage was calculated in the prostate capsule.

Consent to conduct the study was obtained from the Bioethics Committee of the Maria Skłodowska-Curie National Research Institute of Oncology Gliwice Branch.

The EORTC QLQ-C30 and PR25 questionnaires [4,14] and the IIEF-5 test [15] were analysed. The consent to use EORTC QLQ-C30 and PR-25 was obtained from EORTC Quality of life.

The EORTC QLQ-C30 questionnaire was used to summarise the sense of health and assess functioning in the physical, emotional, and social dimensions. It contains 30 questions, grouped into five functional scales (physical functioning, functioning in life roles, emotional functioning, cognitive functioning, social functioning), three symptom scales and single questions aimed at assessing the intensity of additional symptoms (fatigue, nausea and vomiting, pain, shortness of breath, insomnia, loss of appetite, constipation, diarrhoea, financial difficulties), and a scale of general health status. The questions included in the questionnaire contain a 4-point scale from 1 to 4 (1 - not at all, 2 - a little, 3 - a lot, 4 - very much), while the questions regarding the general assessment of the quality of life and health are presented on a scale from 1 to 7, where 1 means very poor health and quality of life, and 7 is excellent. The patient selected an answer for each question.

The EORTC QLQ-PR-25 questionnaire was used to assess the quality of life associated with PCa and assess symptoms related to urinary and bowel function, as well as symptoms related to androgen deprivation therapy (symptom scales) and sexual function (functional scale) related to PCa therapy. It consists of 25 questions arranged on a 4-point scale (1 - never, 2 - sometimes, 3 - often, and 4 - very often). The patient selected an answer for each question.

The absolute numerical value (Raw score – RS) on the individual scales was calculated as the sum of the answers to the individual questions divided by the number of questions.

The calculations used the formulas recommended in the EORTC QLQ-C30 scoring manual.

The following formula was used for the functional scales:

$$\text{Score} = 1 - (\text{RS}-1) / \text{rank} \times 100$$

The following formula was used to determine symptoms and overall health status.

$$\text{Score} = (\text{RS}-1) / \text{rank} \times 100$$

The rank was defined as the difference between the maximum and minimum number of possible answers to the questions on a given scale. Most of them had a 4-point scale, so the score was 3. For functional scales, a higher calculated value indicated better functioning. For the symptoms scales, a higher value indicated a greater severity of the symptoms.

IIEF-5 is a commonly used test for assessing the severity of erectile dysfunction, based on responses to 5 questions on a 5- to 6-point scale (0 - none, 1 - very low, 2 - low, 3 - moderate, 4 - high, 5 - very high). The patient selects an answer to each question.

The sum of the points of the individual questions gives a score which is then assigned to the appropriate level of erectile dysfunction. The higher the total value, the milder the sexual dysfunction.

- • Severe erectile dysfunction is 1–7 points,
- • Moderate erectile dysfunction is 8–11 points,
- • Mild to moderate erectile dysfunction is 12–16 points,
- • Mild erectile dysfunction is 17–21 points,
- • No erectile dysfunction is 22–25 points.

The nature of the distribution of each continuous variable was checked by the Komogorov-Smirnov test with Lilliefors correction, and then their normality or lack thereof was confirmed using appropriate statistical tools. In the statistical analysis, parametric tests were used to compare variables: Student's t-test or nonparametric tests: Mann-Whitney U, Kruskal-Wallis ANOVA.

The Mann-Whitney U and Kruskal–Wallis H tests were used to test the hypothesis that the populations were the same against the alternative hypothesis. The difference was considered significant if the p-value was less than 0.05. Statistical calculations were performed in Statistica ver 10.

Results

The evaluation of general health status showed the best results in the C compared to group A and B, the difference was not statistically significant (68.9 vs. 62.1 vs. 60.2, respectively, Kruskal-Wallis test $p = 0.09$, Table 3, Fig. 1). A statistically significant difference was found in emotional functioning ($p = 0.02$) in favour of group A and in social functioning ($p = 0.045$) in favour of group C. Symptoms such as pain ($p = 0.01$), dyspnea ($p = 0.04$), loss of appetite ($p = 0.03$), and diarrhoea ($p = 0.003$) were the most severe and occurred significantly more often in group B. Not all patients completed the questionnaires in full, hence the differences in the number of patients in the groups.

Table 3
Scoring of the quality of life of 189 patients in terms of physical, emotional and social functioning according to the QLQ-C30 questionnaire, depending on the treatment method

	Group A		Group B		Group C		p (Kruskal-Wallis ANOVA test)
	N=		N=		N=		
General health status	62.1	33	60.2	72	68.9	29	0.09
physical functionings	83.4	33	78.5	76	84.4	31	0.36
functioning in life roles	88.4	33	84.9	74	87.1	31	0.77
emotional functioning	84.8	32	73.7	73	80.5	29	0.02
cognitive functioning	83.3	31	80.0	75	86.8	29	0.10
social functioning	85.4	33	80.6	73	93.5	28	0.045
fatigue	24.0	32	30.4	74	27.8	30	0.40
nausea and vomiting	3.54	33	4.76	77	1.08	31	0.08
pain	8.08	33	20.89	75	12.90	31	0.01
shortness of breath	8.08	33	20.89	75	17.20	31	0.04
insomnia	26.3	33	30.7	76	23.7	31	0.45
loss of appetite	2.0	33	9.2	76	6.5	31	0.03
constipation	17.2	33	25.7	74	16.1	29	0.17
diarrhea	2.0	33	14.4	74	9.2	29	0.003
financial difficulties	17.2	33	22.8	73	14.9	29	0.39
symptoms related to the functioning of the urinary system	24.7	61	27.9	87	16.7	36	0.003
symptoms related to the functioning of intestines	6.6	56	11.5	66	7.4	27	0.01
symptoms related to hormonal treatment	18.5	60	23.0	83	18.6	35	0.13
sexual functions	54.7	12	60.4	27	52.2	16	0.52

Symptoms related to urinary tract function were reported significantly less frequently in group C compared to group A and B (16.7 vs. 24.7 vs 27.9, respectively, Kruskal-Wallis test, $p = 0.003$, Table 4, Fig. 2). Intestinal symptoms occurred significantly more frequently in group B than in group A and C (11.5 vs 6.6 vs 7.4, respectively, Kruskal-Wallis test, $p = 0.01$). Symptoms related to hormonal treatment occurred more frequently in group B than in the other groups; the difference was not statistically significant.

Table 4
Scoring of the IIEF-5 of 189 patients depending on the treatment method.

IIEF-5	Group A (N = 24)	Group B (N = 64)	Group C (N = 30)	p (Kruskal-Wallis ANOVA test)
Severe erectile dysfunction	19 (78.2%)	48 (75%)	15 (50%)	0.033
Moderate erectile dysfunction	2 (8.3%)	3 (4.7%)	5 (16.7%)	
Mild to moderate erectile dysfunction	3 (12.5%)	9 (14.1%)	7 (23.3%)	
Mild erectile dysfunction	0	4 (6.2%)	3 (10%)	
absence of erectile dysfunction	0	0	0	

Sexual function was comparable in all groups using the PR-25 questionnaire. Erectile dysfunction evaluated by the IIEF-5 test was significantly milder in the combined treatment group ($p = 0.033$) (Table 5). Differences in the results of the PR-25 and IIEF-5 tests may be related to the number of patients who completed the surveys.

Quality of life depending on the prognostic group.

The quality of life of 189 patients in terms of physical, emotional and social functioning according to the QLQ-C30 questionnaire and in the evaluation of urinary system, bowel, sexual function, and symptoms related to hormone therapy according to the PR-25 questionnaire did not differ statistically significantly depending on the prognostic group.

The IIEF questionnaire showed a significantly increased severity of erectile dysfunction in the high-risk (HR) group (Kruskal-Wallis test, $p = 0.04$). These data are not consistent with the results of the EORTC QLQ-PR25 questionnaire, in which the highest sexual functioning was observed in the HR group then in the low- (LR) or intermediate-risk (IR) group and the difference was not statistically significant (64.8 vs 51.7 vs 55.4, Kruskal Wallis test $p = 0.26$). This may be due to the relatively small group of patients who completed the QLQ-PR-25 questionnaire compared to the group of patients who completed the IIEF questionnaire.

Detailed information is provided in the Supplementary Files (Tables 1–2).

Quality of life of patients at risk, depending on the treatment method.

In the LR group, there were no statistically significant differences in physical, emotional and social functioning according to the QLQ-C30 questionnaire, urinary symptoms, intestinal symptoms, hormone therapy, and sexual function evaluated using the EORTC QLQ-PR25 questionnaire or the IIEF-5 test depending on the treatment method.

There was a statistically significant difference in emotional functioning ($p = 0.03$) in favour of the RP group and in frequency of nausea and vomiting ($p = 0.01$), which occurred most frequently in the RT group in the IR group.

In the HR group, there was a statistically significant difference in the incidence of diarrhoea ($p = 0.01$), which was the most common in the RT group compared to the combination therapy group, and did not occur in the RP group. Urinary symptoms were reported significantly more frequently in the RP and RT groups than in the combined treatment group (32.7 vs. 29.6 vs. 13.9, respectively, Kruskal-Wallis test $p = 0.01$).

Detailed information is provided in the Supplementary Files (Tables 3–8).

Discussion

Due to the comparable effectiveness of surgery and radiation therapy and the relatively long survival of prostate cancer patients, quality of life after treatment is crucial for the patient. Available studies comparing the quality of life of patients after surgery or radiation therapy have shown impaired urinary and sexual functions after surgery and impaired intestinal function after radiation therapy [4–7, 9–13]. Complications have a significant impact on quality of life and affect both the assessment of treatment itself and the general condition. Few prospective studies are available to assess the quality of life in patients with PCa. Most studies are observational. They differ in the number and selection criteria of patients and the questionnaires used to assess quality of life (not always validated for a given population).

Knowledge of side effects and quality of life after treatment is important so that a well-informed patient can make a decision about treatment. This is particularly important in patients with prostate cancer with favourable risk factors, in whom survival outcomes are comparable regardless of the choice of treatment. These issues have been the subject of several studies [4–6].

The prospective ProtecT study (Prostate Testing for Cancer and Treatment) assessed the quality of life of 1643 men diagnosed with prostate cancer who underwent active surveillance, RP or RT combined with SCADT. There were no statistically significant differences in general health status assessed on the EORTC QLQ-C30 questionnaire within 5 years after the end of treatment in the group of patients aged 50 to 69 years, with clinical stage T1 to T2 [4]. Symptoms related to the urinary system, intestinal system, sexual function, and hormonal treatment were assessed using the Expanded Prostate Cancer Index Composite (EPIC) questionnaire. In the sixth year after the end of treatment, a deterioration in urinary system, urinary incontinence, and sexual function was observed in the RP group compared to the remaining groups. However, in the group of patients who underwent RT, compared to the group of actively observed and operated patients, a deterioration in the functioning of the gastrointestinal tract was observed. The differences between the groups were not statistically significant [4].

Similar results were found in the observational Prostate Cancer Outcomes Study (PCOS), which included 164 patients who underwent RP and 491 who underwent RT. During 5-year follow-up, urinary incontinence and erectile dysfunction were significantly more frequent in patients with RP, while intestinal dysfunction was observed in the RT-treated group. These differences were not observed at a long 15-year follow-up [5].

In the present study, patients who underwent RP, similarly to the cited studies, had a significantly more frequent occurrence of urinary-related symptoms and less frequent sexual activity. The RT group experienced symptoms related to the functioning of the urinary system comparable to the RP group. These symptoms were more severe than in the combined therapy group. In the RT group, intestinal disorders, especially diarrhoea, and loss of appetite were more common.

Hoffman's prospective population-based study compared the quality of life assessed by the EPIC questionnaire in patients undergoing active surveillance (AS), RP, RT, and LDR brachytherapy in groups of patients with favourable and unfavourable risk factors [6]. In a group of 1136 patients with favourable risk factors (cT1-cT2bNoM0, PSA $\leq$ 20 ng / ml, grade 1–2), it was shown that urinary incontinence and sexual dysfunction are more common in the RP group compared to actively observed patients. Bladder, rectal, and genital symptoms were reported more frequently in patients with BT compared to the observed group. Symptoms in patients after RT did not differ significantly from those observed in patients under surveillance after 5 years [6]. In our study, in the group of patients with favourable risk factors, there were no statistically significant differences between the treatment groups.

In Hoffman's study, in a group of 619 patients with unfavourable risk factors (cT2cN0M0, PSA 20–50 ng/ml, grade 3–5) differences in urinary incontinence and sexual dysfunction were observed in the RP group compared to the RT group in combination with ADT [6]. Comparable results were obtained in our study in the high-risk group, 5 years after the end of therapy, RP patients reported urinary incontinence significantly more frequently. Diarrhoea was most common in RT group.

A systematic review of 18 studies [7] including 13604 patients who underwent quality of life evaluations found that AS had the least impact on cancer-related quality of life over a 6-year follow-up period. RP adversely affects the function of the urinary and reproductive system compared to active surveillance and RT, while RT worsens function compared to AS and RP. The study demonstrated the impact of prostate cancer treatment on quality of life.

Studies comparing RP, RT and BT, including our own study, indicate quality of life up to 6–10 years after completion of therapy. They indicate a significantly higher incidence of urinary incontinence in patients after RP, worse intestinal function in patients with ET, and deterioration of sexual function after RT and after RP [9–13].

Due to the long-term survival of PCa patients, the quality of life at long-term follow-up is important. Jang's study analysed the quality of life of 211 patients in the second decade after prostate cancer treatment. RP, RT or BT. Urinary incontinence occurred significantly more frequently in the group of

patients undergoing RP than in the BT group ($p = 0.001$) Urinary tract irritation occurred significantly more frequently in the RT and BT groups than in the RP group ($p = 0.005$ and $p = 0.01$, respectively). No statistically significant differences were observed in the functioning of the gastrointestinal tract and sexual functions between the groups. A factor that significantly influenced the deterioration of sexual function was the older age at the time of radical treatment ($p = 0.038$) [9].

Due to the 15-year period of patient observation, the results of the PCOS study in patients with low-risk PCa are very valuable. No significant differences were observed in urinary incontinence, erectile dysfunction, or bowel function between the compared groups [5]. No statistically significant differences in QoL were observed between treatment methods in LR group in our study.

Similarly, in the Hoskin study, a 10-year follow-up did not show differences in the functioning of the digestive, urinary, and sexual systems between patients treated with EBRT and combined RT and BT [16].

In the PCOS study, the incidence of erectile dysfunction within 15 years after treatment was very high (80%), urinary and genital function deteriorated over the years in both groups [5,7].

The authors of the SPCG-4 study assessing the quality of life of patients after prostatectomy and 12 years of follow-up [17]. It is difficult to assess whether the deterioration in the urinary system and erectile dysfunction is due to treatment and/or ADT, or advanced age in which sexual dysfunction is normal and inevitable, or perhaps due to both factors.

Men without prostate cancer experience age-related erectile dysfunction and urinary problems. Litwin [18], who evaluated 598 men (mean age 73 years) without PCa using the UCLA-PCI (University of California Los Angeles Prostate Cancer Index) questionnaire, found that 50% of men were unable to maintain an erection during sexual intercourse and 23% were unable to maintain an erection during any sexual activity. 31% of men in the group described above reported urinary incontinence.

Data from the PLCO study comparing PCa patients after treatment with those without a cancer diagnosis suggest that genital and urinary dysfunction may be a consequence of treatment [7,19], although some studies indicate that pretreatment symptoms are an important predictor of posttreatment function [9,10,13,20].

In studies with a longer follow-up period, the difference in the incidence of urinary incontinence and sexual dysfunction between patients after surgery and radiation therapy decreases [5,11–12,21].

In the PCOS and Jang study with a long follow-up period, no differences in intestinal function were observed between treatment methods [5,9]. This may be due to the use of adjuvant or salvage radiotherapy after RP, the presence of gastrointestinal disorders before prostate cancer treatment, or the age of the patients [9].

Some studies [22–23] have also shown an increase in pain in patients after PCa radiotherapy. Similar results were obtained in the current analysis ($p = 0.007$).

The analysis of published studies and our ongoing study indicates that surgical treatment adversely affects the functioning of the urinary and sexual systems, while radiotherapy worsens the functioning of the intestines in the short and medium term. Over the years, after completion of treatment, differences in the functioning of the urinary, sexual, and digestive systems disappear.

In our own analysis, we did not assess the quality of life of prostate cancer patients treated with modern therapeutic methods, both urological (minimally invasive surgeries, laparoscopic, robotic) and radiotherapy (stereotactic radiation therapy, CyberKnife), which limits the results generalisation of the obtained from our research.

Conclusions

The analyses show that after stratification of patients into risk groups, the compared therapeutic methods in most cases do not differ significantly in terms of quality of life.

There is a significant difference in the percentage of patients with prostate cancer classified as low, intermediate, and high risk of recurrence in terms of therapeutic method (undergoing prostatectomy, external beam radiotherapy, or combined external-beam radiotherapy and high-dose rate brachytherapy). The analyses show that after stratification of patients into risk groups, the compared therapeutic methods in most cases do not differ significantly in terms of quality of life. Therefore, the lack of reference to risk groups can lead to unauthorised comparisons of quality of life.

Abbreviations

QoL	quality of life
RP	radical prostatectomy
RT	external beam radiotherapy
BT	combined radiotherapy with high-dose rate brachytherapy
EORTC QLQ	European Organisation for Research and Treatment of Cancer Quality of Life Questionnaires
IIEF	5-International Index of Erectile Function-5
LR	low risk
IR	intermediate risk
HR	high risk

high risk
PCa
prostate cancer
BT
brachytherapy
SCADT
short-course androgen deprivation therapy
LCADT
long-course androgen deprivation therapy
ADT
androgen deprivation therapy
CTV
clinical target volume
PTV
planning target volume
IMRT
intensity-modulated RT
3d
CRT-three-dimensional conformal planning technique
Gy
gray
HDR
high dose rate
RS
raw score

Declarations

Conflict of interest statement:

The authors declare that none of them have any conflicts on interest in relation to the present publication.

Ethics approval and consent to participate:

This study was performed in line with the principles of the Declaration of Helsinki.

Approval was granted by the Bioethics Committee of the Maria Skłodowska-Curie National Research Institute of Oncology Gliwice Branch on 14th of March, 2012. Number: KB/430-38/12. Informed consent was obtained from all individual participants included in the study.

Consent for publication: Not applicable

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Authors' contributions:

Conceptualization: RS, SC, BSC

Data Curation: BSC, SC

Formal Analysis: BSC

Investigation: BSC, SC

Methodology: BSC

Supervision: RS, PW

Writing – Original Draft: BSC, SC

Writing – Review & Editing: RS, BSC, SC, PW, KB

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Table 1

Table 1 is available in the Supplementary Files section.

Table 5

Table 5 is not available with this version

Figures

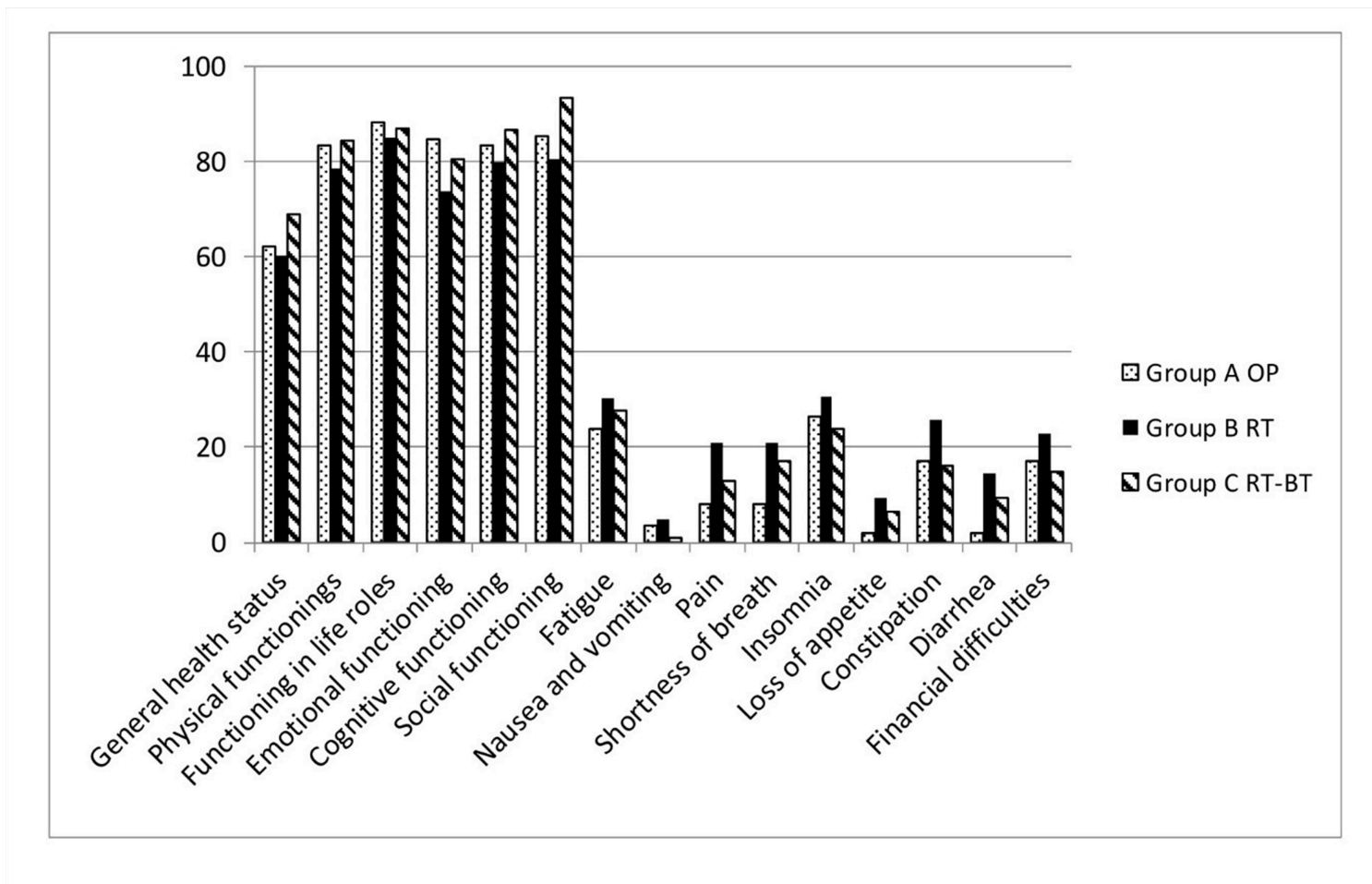


Figure 1

Graph scoring of the quality of life of 189 patients in terms of physical, emotional and social functioning according to the QLQ-C30 questionnaire, depending on the treatment method.

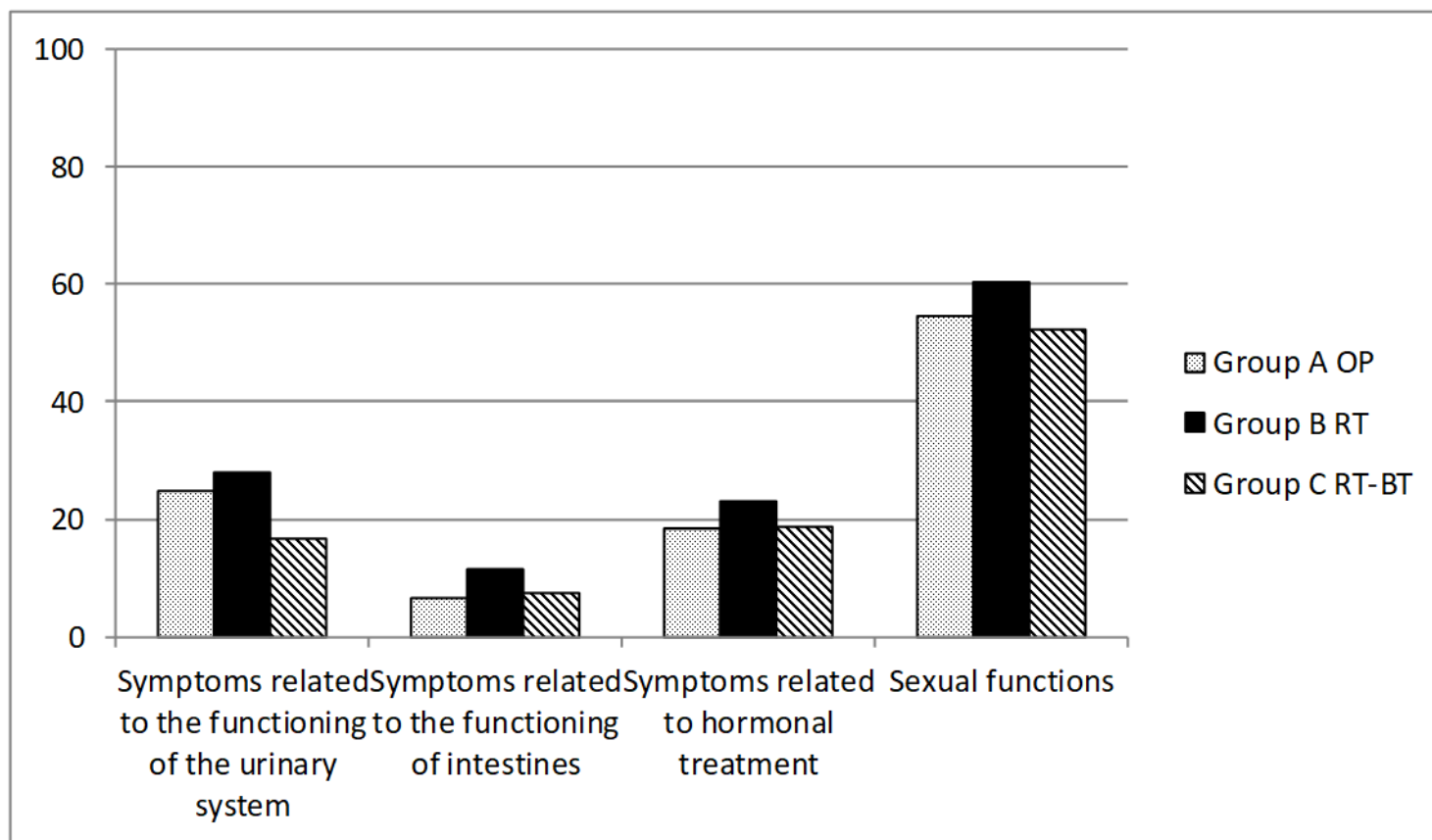


Figure 2

Graph scoring of the quality of life of 189 patients in terms of physical, emotional and social functioning according to the QLQ-PR25 questionnaire, depending on the treatment method.

Supplementary Files

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