in vivo *37*: 2173-2177 (2023)
doi:10.21873/invivo.13316

Comparison of Distress Scores Before and After Radiotherapy for Prostate Cancer

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Abstract. *Background/Aim: Prostate cancer patients undergoing radiotherapy (RT) may experience distress. This study evaluated the course of distress during RT. Patients and Methods: Four distress characteristics were analyzed for change of distress in 136 patients irradiated for prostate cancer, including age, Karnofsky performance score, intent of RT, and previous RT. Results: Mean distress scores were 4.3 (±2.9) at baseline and 4.2 (±2.7) at the end of RT. Associations with increased distress were found for KPS >80 (p<0.001) and curative intent RT (p=0.072). When evaluating increased distress as binary variable (yes vs. no), KPS >80 was significant on univariable (p<0.001) and multivariable (p=0.016) analyses. In patients with baseline scores ≤5 points, KPS >80 was associated with mean change of distress (p=0.009) and increased distress (p=0.029). Conclusion: Many patients receiving RT for prostate cancer do not experience increased distress during their treatment course. Patients at higher risk of increased distress may require early psychological assistance.*

Prostate cancer represents one of the most common cancer types worldwide, particularly in Western countries (1). Many of these patients are treated with external beam radiotherapy (EBRT) with or without a brachytherapy boost (2). The quality of life of patients assigned to radiotherapy (RT) may be impaired by psychological distress. Such distress may be a consequence of fear of treatment-related acute and late toxicities or exposure to complex technology and radiation (3-6). In a previous study, the prevalence of worry and fears was 25% and 27%, respectively (7). Uncertainty exists regarding the process of distress during the weeks of radiation treatment. On one hand, it is conceivable that the distress increases in case of acute toxicity. On the other hand, the patients may get used to the procedure and the technology of irradiation, which likely would lead to a reduction of distress. Or both aspects may be balanced, and no significant change in distress will occur. In a previous study of 200 patients irradiated for different malignancies, the mean distress score decreased in the majority of patients including those with prostate cancer (8). The present study focused particularly on patients irradiated for prostate cancer to characterize changes in distress during the course of RT and identify specific risk factors of increased distress for this patient group.

Patients and Methods

One-hundred-and-thirty-six patients irradiated for prostate cancer at two centers in Northern Germany between November 2021 and November 2022 were included in this retrospective study. The study received initial approval from the ethics committee at the University of Lubeck (2022-486). Distress was measured with the Distress Thermometer of the National Comprehensive Cancer Network (NCCN), which was completed by the patients prior to (baseline) and on the last day of their radiation therapy (9). Distress scores ranged between 0 (no distress) and 10 (maximum distress) points. Four characteristics (Table I) were analyzed for correlation with the change of distress scores during the time of the RT series. For calculation of the change of distress, baseline distress scores were subtracted from the scores indicated by the patients on the last day of RT. Characteristics included age (≤64 *vs.* 65-79 *vs.* ≥80 years, Karnofsky performance score (≤80 *vs.* >80), intent of RT (curative *vs.* palliative), and experience of prior RT (no *vs.* yes).

Mean values and standard deviations of the changes were calculated. Associations between characteristics and mean changes

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Key Words: Prostate cancer, radiotherapy course, psychological distress, risk factors.

Table I. *Entire cohort (n=136): Distribution of patient characteristics.*

Characteristic	Subgroup	Number of patients (n)	Proportion (%)
Age at RT	≤64 Years	13	10
	65-79 Years	96	71
	≥80 Years	27	20
Karnofsky performance score	≤80	49	36
	>80	87	64
Intent of treatment	Curative	83	61
	Palliative	53	39
History of previous RT	No	110	81
	Yes	26	19
All patients		136	100

RT: Radiotherapy.

of distress scores were statistically analyzed with the exact Wilcoxon two-sample test (two subgroups) and the Kruskal-Wallis test (three or more subgroups). In addition, rates of improvement (score decreased by ≥2 points), no change (difference –1 to +1 point), and deterioration (score increased by ≥2 points) of distress are given. Associations of the four characteristics with these outcomes were also performed with the exact Wilcoxon two-sample test and the Kruskal-Wallis test. For additional evaluations regarding increase of distress, the binary variable "yes *vs.* no" was used. Corresponding statistical analyses were performed with the Chi-square test (univariable analyses) and a logistic regression (multivariable analyses). Separate subgroup analyses were performed in patients with baseline distress scores ≤5.

In all analyses described above, *p*-values <0.05 were regarded significant and *p*-values <0.10 indicating a trend.

Results

In the entire series, mean distress scores were 4.3 (±2.9) at baseline and 4.2 (±2.7) at the last day of RT, and the mean change was –0.1 (±2.8) points. A significant association with increased distress was found for KPS >80 ($p<0.001$, Table II), and curative intent of treatment showed a trend ($p=0.072$). Similar results were found when all outcomes (improvement, no change, or deterioration) of distress scores were considered (Table III).

When evaluating increase of distress as a binary variable (yes *vs.* no), KPS >80 was significantly associated with increased distress in both the univariable ($p<0.001$, Table III) and the multivariable ($p=0.016$, Table IV) analyses. In addition, curative intent of treatment showed a trend on univariable analysis ($p=0.072$, Table III).

In the subgroup analyses of patients with baseline scores ≤5 points, KPS >80 was significantly associated with mean change of distress scores ($p=0.009$, Table V), when considering all outcomes (improvement, no change, or deterioration) of distress ($p=0.011$, Table VI), and increased distress during the course of RT ($p=0.029$, Table VI).

Table II. *Entire cohort (n=136): Mean changes of distress scores during the radiotherapy course. p-Values were calculated with the Wilcoxon two-sample test (2 subgroups) or Kruskal-Wallis test (≥3 subgroups).*

Characteristic	Subgroup	Mean change (points)	Standard deviation	*p*-Value
Age at RT	≤64 Years	+0.8	2.5	
	65-79 Years	–0.3	2.6	
	≥80 Years	+0.3	3.5	0.22
Karnofsky performance score	≤80	–1.1	2.9	
	>80	+0.5	2.5	**<0.001**
Intent of treatment	Curative	+0.2	2.9	0.072
	Palliative	–0.6	2.6	
Previous RT	No	±0.0	3.0	0.49
	Yes	–0.5	2.0	
All patients		–0.1	2.8	

RT: Radiotherapy. Significant *p*-values are shown in bold.

Discussion

In a previous retrospective study of 102 patients irradiated for prostate cancer, the patients were asked to rate the six emotional problems included in the Distress Thermometer of the NCCN, namely worry, fears, sadness, depression, nervousness, and loss of interest in usual activities (7, 9). The prevalence was the highest for worry (25%) and fears (27%), followed by nervousness (18%), sadness (11%), depression (11%), and loss of interest (5%) (7). Only very few other studies investigated specific emotional problems in prostate cancer patients. A retrospective study evaluated the prevalence of anxiety and depression in 861 men who received RT or radical surgery (10). Depression and anxiety were reported by 17% and 25% of the patients, respectively. However, the patients were not asked to report the emotional problems they had experienced immediately prior to their treatment but during the last seven years prior to that study. Therefore, these findings are of limited comparability with our previous study (7). In a secondary analysis of a randomized trial investigating the impact of nurse-led intervention of supportive care in patients with prostate cancer, pre-treatment (baseline) distress scores were evaluated using the NCCN Distress Thermometer (11). In that study, <20% of the patients reported distress scores of 4 or higher, which were considered indicating significant distress. These patients had a higher symptom burden, more unmet needs and concerns regarding their treatment, and a worse quality of life. The prevalence of <20% was in the range of emotional problems (5-27%) found in our previous study (7).

When summarizing the data regarding emotional distress prior to RT for prostate cancer, the prevalence at baseline was lower than that in patients undergoing RT for other

Table III. *Entire cohort (n=136): Improvement (minus ≥2 points), no change, and deterioration (plus ≥2 points) of distress scores during radiotherapy. p-Values were calculated with the Wilcoxon two-sample test (2 subgroups) or Kruskal-Wallis test (≥3 subgroups). Additional p-values were calculated for comparisons of subgroups regarding the binary variable "deterioration yes vs. no" using the Chi-square test.*

Characteristic	Subgroup	Change of distress scores			*p*-Value	*p*-Value*
		Improvement n, (%)	No change n, (%)	Deterioration n, (%)		
Age at RT	≤64 Years	2 (15)	6 (46)	5 (38)	0.38	0.56
	65-79 Years	30 (31)	42 (44)	24 (25)		
	≥80 Years	7 (26)	12 (44)	8 (30)		
Karnofsky	≤80	21 (43)	22 (45)	6 (12)	**<0.001**	**0.003**
performance score	>80	18 (21)	38 (44)	31 (36)		
Intent of treatment	Curative	20 (24)	36 (43)	27 (33)	0.057	0.081
	Palliative	19 (36)	24 (45)	10 (19)		
Previous RT	No	32 (29)	46 (42)	32 (29)	0.66	0.31
	Yes	7 (27)	14 (54)	5 (19)		
All patients		39 (29)	60 (44)	37 (27)		

RT: Radiotherapy; **p*-values for comparisons of subgroups with respect to the binary variable "deterioration yes *vs*. no". Significant *p*-values are shown in bold.

Table IV. *Entire cohort (n=136): Results of the multivariable analysis regarding the binary variable "deterioration yes vs. no".*

Characteristic	Compared subgroups	Odds ratio (point estimate)	95% Wald confidence interval	*p*-Value
Age at RT	65-79 *vs*. ≤64 years	0.706	0.201-2.483	0.64
	≥80 *vs*. ≤64 years	1.097	0.252-4.779	
Karnofsky performance score	≤80 *vs*. >80	0.282	0.101-0.786	**0.016**
Intent of treatment	Curative *vs*. palliative	1.332	0.494-3.589	0.57
Previous RT	No *vs*. yes	1.219	0.353-4.213	0.75

RT: Radiotherapy. Significant *p*-values are shown in bold.

malignant diseases (12-16). For example, the prevalence of specific emotional problems was 12-46% in patients irradiated for breast cancer, 11-47% in patients irradiated for head-and-neck cancers, 16-57% in patients irradiated for gynecological cancers, 11-47% in patients irradiated for rectal or anal cancer, and 23-63% in patients irradiated for malignant gliomas, respectively.

In contrast to these studies that evaluated the prevalence of distress, the present study investigated the course of distress during RT. The mean distress scores at baseline and at the end of RT were almost identical, suggesting that many patients irradiated for prostate cancer do not experience an increase of distress during their course of treatment. These results agree with the findings of our pilot study investigating the course of distress in 200 patients irradiated for any type of malignant disease (8). In the 22 patients with prostate cancer who were evaluable for the course of distress, the mean distress scores decreased by 0.5 (±2.3) points during RT. The pilot study found the primary tumor type to be associated with increased distress, but was not designed to identify risk factors for patients with a particular tumor type (8). This was a major goal of the present study, which has been successful in this regard. It shows that some groups of prostate cancer patients have a comparably high risk of increased distress, namely patients with a KPS >80

Table V. *Patients with a baseline distress score of ≤5 points (n=89): Mean changes of distress scores during the radiotherapy course. p-values were calculated with the Wilcoxon two-sample test (2 subgroups) or Kruskal-Wallis test (≥3 subgroups).*

Characteristic	Subgroup	Mean change (points)	Standard deviation	*p*-Value
Age at RT	≤64 Years	+1.4	2.0	0.31
	65-79 Years	+0.5	2.5	
	≥80 Years	+1.6	3.2	
Karnofsky performance score	≤80	–0.1	3.1	**0.009**
	>80	+1.3	2.3	
Intent of treatment	Curative	+1.1	2.6	0.16
	Palliative	+0.3	2.7	
Previous RT	No	+0.9	2.8	0.55
	Yes	+0.5	1.4	
All patients		+0.8	2.6	

RT: Radiotherapy. Significant *p*-values are shown in bold.

Table VI. *Patients with a baseline distress score of ≤5 points (n=89): Improvement (minus ≥2 points), no change, and deterioration (plus ≥2 points) of distress scores during radiotherapy. p-Values were calculated with the Wilcoxon two-sample test (2 subgroups) or Kruskal-Wallis test (≥3 subgroups). Additional p-values were calculated for comparisons of subgroups regarding the binary variable "deterioration yes vs. no" using the Chi-square test.*

Characteristic	Subgroup	Change of distress scores			*p*-Value	*p*-Value*
		Improvement n, (%)	No change n, (%)	Deterioration n, (%)		
Age at RT	≤64 Years	1 (10)	4 (40)	5 (50)	0.43	0.70
	65-79 Years	13 (22)	25 (42)	22 (37)		
	≥80 Years	1 (5)	10 (53)	8 (42)		
Karnofsky performance score	≤80	8 (30)	13 (48)	6 (22)	**0.011**	**0.029**
	>80	7 (11)	26 (42)	29 (47)		
Intent of treatment	Curative	7 (12)	25 (44)	25 (44)	0.98	0.24
	Palliative	8 (25)	14 (44)	10 (31)		
Previous RT	No	14 (19)	30 (41)	30 (41)	0.66	0.60
	Yes	1 (7)	9 (60)	5 (33)		
All patients		15 (17)	39 (44)	35 (39)		

RT: Radiotherapy; **p*-values for comparisons of subgroups with respect to the binary variable "deterioration yes *vs*. no". Significant *p*-values are shown in bold.

and those patients with curative intent of treatment. Moreover, in patients with a lower level of distress at baseline (≤5 points), a KPS >80 was also significantly associated with increased distress during RT. It is important to identify high-risk patients to provide early psychological assistance for them. The finding that also patients with lower baseline distress scores can experience worsening of distress during RT shows that it is important to offer psychological assistance to all patients at risk, irrespective if their baseline score. However, when following these suggestions, one should consider the retrospective design of this study including the potential risk of a hidden selection bias.

In summary, the mean distress scores at baseline and at the end of RT were almost identical. Thus, many patients irradiated for prostate cancer do not experience an increase of distress during their course of treatment. However, some groups of prostate cancer patients have a comparably higher risk of increased distress. The risk factors found in this study can help identify these patients, who should be offered early psychological assistance.

Conflicts of Interest

The Authors state that there are no conflicts of interest related to this study.

Authors' Contributions

S.J., C.D., N.Y.Y. and D.R. participated in the design of the study. The data were provided by C.D. and analyzed by a professional statistician supported by D.R. The article was written and approved by all Authors.

Acknowledgements

The study was funded by the European Regional Development Fund through the Interreg Deutschland-Danmark program (TreaT, 148-1.1-21).

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Received June 22, 2023
Revised July 17, 2023
Accepted July 18, 2023