

Mental Status Change of Patients Receiving Radiation Therapy

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ABSTRACT

Patients diagnosed with the serious disease of cancer may have anxiety and fear of closed spaces while receiving radiation therapy. This study investigated patients receiving treatment based on Linac and Tomotherapy to look into this anxiety and fear. Study method was survey. The survey was performed according to treatment duration (treatment within 5 minutes, 10 minutes, over 20 minutes, and over 30 minutes). The patients were also surveyed about any experience of changing treatment rooms or machines due to machine failure. A total of 200 survey questionnaires with full answers were researched in this study. As a result, it was found that the less the patients' experience on radiation therapy, the higher their anxiety was. The dominating reason for this result was because the patients expected possible pain during the treatment process. In terms of treatment machine, Linac showed the highest anxiety of all for the openness of its patient stand. The most stable status was found in the case of treatment between 20 minutes and 30 minutes using Tomotherapy. The reason was the coziness of Tomotherapy machine. In the case of receiving the treatment for over 30 minutes, patients felt anxious for the isolation from the outside. The study findings are expected to serve as the necessary data for quality medical service with enhanced patient satisfaction in the clinical field.

Keywords: radiation therapy, patient satisfaction, medical service, cancer

I. INTRODUCTION

The national cancer statistics released in December 2016, indicated that the survival rate of cancer patients for 5 years or over increased gradually to exceed 70% in 2014. Female cancer patients' survival rate was higher than male cancer patients' survival rate. The survival rate of patients with thyroid cancer, prostate cancer and breast cancer went above 90%. The number of cancer patients, excluding thyroid cancer cases, increased by 1,886, emphasizing the necessity for cancer care management at the national level.^[1]

To treat cancer patients, operations, chemotherapy and radiation therapy are utilized. Although there can be differences according to cancer types diagnosed, metastases status, etc., it is known that most of the cancer patients experience asthenia, loss of appetite, hypothyroidism, defecation problem, physical discomfort due to nausea, etc. Depression, in particular, discourages patients' participation in their treatment and, sometimes, becomes serious to lead to suicide. For this reason, proper treatment intervention is essential.

Practical difficulties in personal life, family and occupation work as a stress factor potentially leading to

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psychiatric diseases. Reportedly, 20~40% of the patients complain about depression and anxiety cases requiring therapeutic intervention.^[2,3]

Many cancer patients lose health, part of body, psyche, social function, self-esteem, sexual function, occupation and many others to lose their personal balanced status and suffer from extreme mental confusion.^[4] Most of the patients diagnosed with a cancer and under medical treatment, therefore, experience various emotional changes such as anxiety, fear, depression, emotional shock and frustration.^[5]

Cancer patients under radiation therapy receive medical treatment for a relative brief duration on the daily basis. They can visit their hospital as outpatients and continue daily activities as usual. As these patients meet medical staff for the long term such as doctors, nurses, and radiological technologists; they receive great

support from them. Still, it is true that they are under depression and sense of hopelessness because of the self-deprecative mental pressure that they are cancer patients.^[6] Moreover, as cancer treatment becomes more successful amid medical development, patients' life expectancy is extended and living quality improvement is demanded in terms of both the physical aspect and mental aspect.

According to the study by Ferrans, living quality is deemed emerge as a relevant indicator under the awareness that a result measurement variable is necessary, which covers a larger area beyond tumor reaction or survival rate.^[7] In this understanding, the present study researches the mental status of cancer patients during their radiation therapy with a view to help improve customer service (CS) for patients as well as their mental quality of living.

Table 1. Features of survey respondents

Division		Frequency	Division		Frequency
Gender	Male	120	Treatment time	~ 5 min	15
	Female	80		~ 10 min	23
Age	Min	23		~ 20 min	97
	Max	85		~ 30 min	39
	Avg	61.6		30 min ~	26
Diagnosis Ca	Colon Ca	52	Treatment Method	Conventional Tx	101
	Lung Ca	38		IMRT	68
	Breat Ca	33		Special Therapy	13
	Liver Ca	46		ETC	8
	Cervix Ca	25		Initial	25
	ETC	6		~ 5	36
Past RTx	Y	32	Treatment Fractions	~ 10	37
	N	168		~ 20	34
Device	Linac	126		~ 30	36
	Tomotherapy	74		30 ~	31

II. MATERIAL AND METHODS

1. Study participants

This study employed statistical analysis based on survey as the main research technique in order to investigate diverse discourses on mental effects during radiation therapy and such mental effects themselves. For this study analysis, 200 patients were surveyed with their consent, who had been diagnosed with cancer at the

U university hospital and S university hospital from May 1, 2015 to December 31, 2016 and under radiation therapy. The 200 respondents' characteristics are shown as table 1.

2. Main survey questions

For the study experiment, the survey included questions on the respondents' gender, age, diagnosed cancer name, therapeutic method, previous radiation therapy experience, name of present treatment equipment, freq

uency of present radiation therapy, etc.

Such questions were included to gain information on the respondents' mental status according to their diagnosed cancer name, differences in anxiety perceived according to therapeutic methods and duration, psychological burden depending upon different therapeutic machines.

III. RESULT

1. Basic information of respondents

The total of 200 survey respondents of this study include 120 men and 80 women, having 40 more men than the number of women. Their average age was found 61.6, ranging from 23 to 85 shown as table 2.

Colorectal cancer cases were the most frequent among the diagnosed cancer cases, followed by liver cancer, lung cancer and breast cancer. The numbers are relevant to the national cancer statistics. Concerning the previous radiation therapy experience, about 16% of them were found to have such experiences.

In terms of the therapeutic machine they used for treatment, Linac accounted for 63%, larger than Tomo therapy accounting for 37%.

With respect to the therapy duration, the largest part of the respondents answered it was about 20 ~ 30 minutes. Regarding the therapeutic methods, general therapy was most frequent followed by intensity-adjusted radiation therapy and special therapy.

To enable two-way comparison, therapy frequency in the survey was adjusted from first time to thirty times or over to examine about 30 patients.

2. Mental status change according to gender

Each question uses a 5-point scale (1=mentally stable, 5=very unstable). As a result of investigation patients' mental status change according to gender, men recorded 4.2 (N=120) and women, 4.1 (N=80), indicating little gap between men and women ($p < 0.001$). The survey

essay questions asking reasons of mental instability found that main causes were the denial of reality that they were a cancer patient and concerns about their family.

Table 2. Psychological changes according to gender

Items	Psychological state	p-value
Male	4.2	< 0.001
Female	4.1	

3. Mental status change according to age

Mental status change according to age was investigated based on the same scale of questions on gender. It was found that patients in their 20s to 80s recorded 4.0, 4.7, 4.5, 4.5, 4.3, 3.7, and 3.1, respectively, indicating that the mid-aged groups had most serious anxiousness shown as table 3. The questions asking reasons of psychological anxiety found that those in their 20s had the largest hope and positive expectation that they could recover sooner to record 4.0 in their mental status. Patients in their 80s recorded 3.1 seemingly because of their resignation about recovery.

Table 3. Psychological changes according to old

Items	Psychological state	p-value
20's age	4.0	-
30's age	4.7	-
40's age	4.5	< 0.001
50's age	4.5	< 0.001
60's age	4.3	< 0.001
70's age	3.7	-
80's age	3.1	-

4. Mental status change according to cancer type

With respect to mental status change according to cancer type; colorectal cancer cases recorded 3.5; lung cancer and liver cancer cases, 4.3 and 4.6; and breast and cervical cancer cases, 2.5 and 2.7. It is deemed that at the breast and cervical cancer cases recorded relatively positive mental status for the dominant medical and social context that they are curable diseases shown as

table 4. Essay questions also found that the main reason was respondents' understanding that these cancers are curable. On the other hand, lung and liver cancer patients recorded higher anxiety level as these cancers have high relapse rate and mortality.

Table 4. Psychological changes according to Diagnosis

Items	Psychological state	p-value
Rectal Ca	3.5	< 0.001
Lung Ca	4.3	< 0.001
Breast Ca	2.5	< 0.001
Liver Ca	4.6	< 0.001
Cervix Ca	2.7	< 0.001
etc	3.5	-

5. Mental status change according to previous radiation therapy experience

This study examined the patients' mental status change according to their previous radiation therapy experience. As a result, patients with previous radiation therapy experience recorded 4.5 and those without, recorded 4.4, representing little gap. The results indicate that the anxiety level of cancer patients who had received cancer treatment before increased as their radiation therapy might have begun to treat relapse. The patients receiving radiation therapy for the first time showed higher mental anxiety for the fact that they were diagnosed with a cancer and the vague uneasiness about radiation therapy.

Table 5. Psychological changes according to Experience

Items	Psychological state	p-value
Experience O	4.5	< 0.001
Experience X	4.4	< 0.001

6. Mental status change according to therapeutic machines used

Mental status change according to therapeutic machines utilized was investigated in this study. As a result, Linac showed 3.0 and Tomotherapy, 2.3. The mental status was more stable than other cases because the trust

on medical staff including radiological technologist worked as the largest variable. Tomotherapy showed a more stable mental status than Linac reportedly because it provides a patient supporting device called Vaclock to fix their whole body to the treatment stand, which fully embraces patients to make them feel relieved shown as Fig 1.



Fig. 1. Whole Body Vaclock

Moreover, Tomotherapy does not show the movement of equipment during the operation, helping patients feel more relaxed. On the other hand, Linac has a rotating Gantry head and rotating Collimator. The movement of Multi Leaf Collimator is showed to patients. Moreover, the patient stand moves whenever necessary, causing anxiety to patients who has to lie down all the time during the treatment shown as Fig 2 and 3.



Fig. 2. Treatment image of Linac and Tomotherapy

Table 6. Psychological changes according to Therapeutic equipment

Items	Psychological state	p-value
Linac	3.0	< 0.001
Tomotherapy	2.3	< 0.001

7. Mental status change according to therapeutic duration

The duration of radiation therapy treatment was investigated. As a result, the within-5-minute duration showed 3.5 and mental anxiety rose along the duration time between 10 minutes and 20 minutes. On the other hand, the duration between 20 minutes and 30 minutes recorded decreased level of mental anxiety. In the case of exceeding 30 minutes, mental stability increased. This result is deemed because most of the patients receiving treatment relatively longer used Tomotherapy. Most frequent therapeutic duration was between 10 minutes and 20 minutes. Most of the patients receiving

radiation therapy were found to have the mental anxiety level of 4.2.

Table 7. Psychological changes according to Treatment Time

Items	Psychological state	p-value
< 5min	3.5	-
5~10min	3.8	-
10~20min	4.2	< 0.001
20~30min	3.6	< 0.001
>30min	3.9	-

8. Mental status change according to therapeutic method

This study investigated patients' mental anxiety status according to different therapeutic methods shown as table 8. As a result, the Conformal Radiation Therapy Method recorded 3.8, the highest and IMRT, 3.6. Special therapy and other therapeutic method recorded 3.5 and 4.2. Conformal Radiation Therapy Method and IMRT Method are presently the most common treatment methods in South Korean and recorded 3.7 on average.

Table 8. Psychological changes according to Treatment Method

Items	Psychological state	p-value
Conformal Tx	3.8	< 0.001
IMRT / IGRT	3.6	< 0.001
Special	3.5	-
ETC	4.2	-

9. Mental status change according to the present therapy frequency

This study examined the effect of therapeutic frequency of the time of survey on their mental anxiety level. It was found the highest at the initial treatment shown as table 9. Those receiving therapy less than 5 times recorded 4.6; 10 times, 3.7; and over 10 times, 2.0 from 2.8, showing decrease in anxiety.

Table 9. Psychological changes according to Number of Treatments

Items	Psychological state	p-value
First	4.7	< 0.001
<5	4.6	< 0.001
5~10	3.7	< 0.001
10~20	2.8	< 0.001
20~30	2.5	< 0.001
>30	2.0	< 0.001

IV. DISCUSSION

To treat cancer patients, operative chemical therapy and radiation therapy are implemented. Of them, the radiation therapy is widely utilized to treat from primary cancers to metastatic cancers.

Patients receive radiation therapy alone at a treatment room. In order to prevent radiological technologists and other staff from being exposed to radiation, the place is sealed. Thus, patients are left alone in the room. This study examined patients' mental anxiety in this case. As a result, no difference was found according to their gender and all of them were found to feel anxiety (men, 4.2; women, 4.1). in terms of age, patients in their 30s to 60s showed 4.6 on average and those in their 70s or older had less anxiety. Such a result is deemed because they well understood the reality and tended to resign themselves. With respect to cancer types and resulting anxiety, lung and liver cancers showed higher anxiety while breast and cervical cancers had lower numbers of 2.5 and 2.7. The results are deemed to correspond to the ratio of complete recovery of breast cancer and cervical cancer. On the other hand, lung and liver cancers are known to have low survival ratios and high recurrence, thus, patients were found to feel heavier mental burden.

Regarding the previous experience of receiving radiation therapy, patients with previous cancer treatment experience showed greater mental anxiety as their cancer relapsed and first-time patients had also heavy anxiety for uneasiness about everything.

With respect to therapeutic equipment, Linac showed higher anxiety level than Many respondents answered that Tomotherapy. Tomotherapy uses Vaclock to embrace their whole body and the machine itself moved less. When it comes to the time spent for therapy treatment, patients' mental anxiety rose until 20 minutes of therapeutic duration while mental stability increased after 30 minutes. Regardless of therapeutic methods, all of the patients were found to have mental anxiety.

Therapeutic frequency and mental anxiety were investigated. As a result, the more frequent the therapeutic treatment, the lower the patients' anxiety level became. This is deemed a result that patients adapted themselves to radiation therapy.

Patients diagnosed with the severe disease of cancer also suffer from depression which discourages their engagement in therapy and could lead to a serious situation causing death. For this reason, a proper medical intervention is necessary. Multiple stresses could cause patients' depression and anxiety requiring medical intervention.

To help ease patients' psychological anxiety during radiation therapy, now many hospitals change their treatment rooms into warmer colors and show clear sky or green trees on the ceilings which patients usually lie down and watch.

According to the study by Lee, et al., aroma therapy can help relieve patients from depression or mental stresses. Therefore, such an olfactory approach seems necessary in treatment rooms in addition to the visual changes.^[8]

Another factor to ease cancer patients' depression is known to be the love and interest of their family, according to research findings. Jo & Kim, in their study, reported that the group of patients having grudge against their family-in-law, ex-husband or neighbors felt more depressed and painful.^[9-10] In this sense, radiological technologists, though they cannot be a family, would still need to show as much interest and caring as they can.

This study investigated patients' mental anxiety only. Future study will need to research the sub-dimensions of anxiety such as depression, loss, helplessness, etc. Multipole attempts should be further researched to overcome this mental anxiety.

V. CONCLUSION

The survey on the mental anxiety of cancer patients receiving radiation therapy found as follows;

Regardless of gender and age, all of the cancer patients complaint about mental anxiety during radiation therapy. Also, depending upon the prognosis of their cancer status, they feel different levels of anxiety.

Excluding patients in their 70s, the mental anxiety levels of other groups of patients were found almost similar. Also, little difference was found between the patient group with previous radiation therapy record and the group without.

With respect to the therapeutic machines, Tomotherapy showed higher mental stability and the more frequent the treatment, the more stable the patients were.

It is deemed that radiological technologists will need to create warmer atmosphere in treatment rooms for patients' mental stability and explore both visual and olfactory methods such as aroma therapy.

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방사선치료 시 환자의 심리적 상태의 변화 양상

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요 약

암(cancer)라는 중증의 질환을 가지고 있는 환자의 경우, 방사선 치료시 받을 수 있는 불안감, 폐쇄적 공포심을 알아보려 하였다. 연구의 대상은 각각 선형가속기의 치료, 토모테라피 치료를 받는 환자를 대상으로 하였으며 연구의 방법은 설문조사의 방법으로 시행을 하였다. 설문의 내용은 치료시간별로 조사하였고, (5분 이내의 치료시, 10분이내, 20분 이상, 30분 이상), 장비의 고장으로 인한 치료실 및 치료기기 변경의 경험에 대한 설문조사를 시행하였다. 설문에 성실히 응답한 200개의 설문지를 연구한 결과 방사선치료의 경험이 없을수록 불안감이 많았으며 그 이유로는 치료시 고통이 있을 것 같다는 의견이 지배적이었다. 치료기로는 선형가속기가 가장 불안감이 높았으며 이유는 환자의 테이블의 개방감 때문인 것으로 나타났다. 가장 안정적인 상태는 토모테라피 치료를 20분 이상 30분 미만 시행한 경우였으며 치료시 토모테라피 치료장비의 아늑함이 원인이었다. 30분이 초과된 경우는 외부와 분리에 대한 불안감으로 불안한 심리상태를 보였다. 본 논문을 통하여 임상에서는 환자의 만족도를 높이는 양질의 의료서비스를 제공하기 위한 제반 자료로 활용되길 기대해 본다.

중심단어: 방사선치료, 환자만족도, 의료서비스, 암