Research Article

Evaluation of Anxiety and Depression Status of Patients Before Non-Invasive Radiology

Ozlem Turkoglu,[1] Ozgur Maden[2]

[1]Department of Radiology, Sultan Abdulhamid Han Training and Research Hospital, Health Science University, Istanbul, Turkey
[2]Department of Psychiatry, Sultan Abdulhamid Han Training and Research Hospital, Health Science University, Istanbul, Turkey

Abstract

Objectives: The aim of the study was to investigate the distribution of anxiety and depression caused by non-invasive radiological methods in patients applying to the polyclinic.

In patients who applied to radiology clinics for non-invasive procedures (roentgenogram, ultrasound, computed tomography, magnetic resonance imaging a risk and incidence of anxiety and depression have not been well documented To determine the distribution of anxiety and depression caused by non-invasive radiological methods.

Methods: Three hundred three patients who applied to our Radiology Clinic enrolled in the study. Patient group who might have radiogram, ultrasonography, computed tomography or magnetic resonance imaging examinations due to any health condition were included in the study. After informing the cases about the study and obtaining their consent, they were asked to answer Spielberger State Anxiety Inventory (STAI-1), Spielberger Trait Anxiety Inventory (STAI-2) and Beck Depression Inventory (BDI) forms to determine the anxiety and depression levels of the cases. The groups compared to each other statistically.

Results: The depression levels of the cases before the procedure were compared and the individuals who underwent CT procedure had the highest mean followed by MRI and USG, the lowest mean was observed in individual who underwent RG procedure, respectively (p<0.001). According to the radiological examination methods, when the state anxiety levels of the cases before the procedure were compared, while the individuals who underwent USG procedure had the highest mean followed by CT and MRI, the lowest mean was observed in individuals who underwent RG procedure (p<0.001).

Conclusion: Our study lights the way of informing the patients by the physicians before non-invasive radiological examinations to be performed have to impact on minimizing anxiety and depression levels.

Keywords: Anxiety, computed tomography, depression, magnetic resonance imaging, Radiology, roentgenogram, ultrasound

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Magnetic resonance imaging (MRI), computed tomography (CT), ultrasound (USG) and roentgenogram (RG) are standard non-invasive radiodiagnostic methods. As being the most common method, RG is the quick and easy commented examination. RG and CT use the ionising radiation, and both procedure mostly requires exclu-sion of pregnancy. While CT and MRI scans are performed on a moving bed through a tube, MRI uses radio-waves, not ionising radiation. The duration of these procedures quite different such as MRI takes between 15-45 minutes depending on the region being scanned, but CT does not take more than a few minutes mostly. USG uses sound

waves, not ionising radiation and applied by a radiologist or medical technician. The technique requires an average time between 5 -15 minutes mostly, and the patient can be offered to change the position to better visualisation of the related organ.

The radiodiagnostic method is selected according to preliminary diagnosis such as brain MRI in case of stroke. The patients' responses for that inspection depend on their fears and concerns. There are many studies about the psychology of patients in the waiting rooms of invasive clinics, including radiology department.[1-12] However, anxiety during the non-invasive radiodiagnostic methods; MRI,[1-3] USG[4] and CT[5] was rarely mentioned in the literature. According to the psychological base of the patients, mood disorders would appear, such as anxiety or depression at the moment of waiting for radiodiagnostic method. The lack of a detailed explanation of why the procedure will be done or the effectiveness of the method can reveal a wide range of fears, claustrophobia, hypochondria etc.[1-5]

Different from the existing literature; our study design compared the mood of patients according to the applied non-invasive radiodiagnostic method. we evaluated the diagnostic methods in an order according to provocating capability to anxiety and depression.

Methods

Patient Population

Three hundred three cases who applied to our Radiology Clinic enrolled in the study. After informing the cases about the study and obtaining their consent, in waiting rooms of radiodiagnostic methods, patients were completed a self-administered questionnaire. The data were collected within one week of the period. Ethical considerations of this study were approved by the Ethics Committee of Health Science University, Istanbul Haydarpasa Numune Training and Research Hospital in 2018.

Questionnaires

The State Anxiety Scale (S-Anxiety) analyses the present state of anxiety, asking how participants feel "right now," using items that measure subjective feelings of concern, stress, nervousness, worry, and activation/triggering of the autonomic nervous system. The Trait Anxiety Scale (T-Anxiety) evaluates relatively stable side of "anxiety tendency," including general states of calmness, confidence, and security. The STAI has 40 items, 20 topics assigned to each of the S-Anxiety and T-Anxiety subscales. Responses for the S-Anxiety scale assess the intensity of current feelings "at this moment": 1) not at all, 2) somewhat, 3) moderately so, and 4) very much so. Responses for the T-Anxiety scale as-

sess the frequency of feelings "in general": 1) almost never, 2) sometimes, 3) often, and 4) almost always. There are two types of expressions as direct and reversed expressions. There are ten reversed expressions in STAI-1 and seven in STAI-2. The scores of direct and reversed expressions are summed up separately, and the resultant total score of direct expressions is subtracted from the total score of reversed expressions. A predetermined invariable value, 50 is added to this number in state anxiety inventory, and 35 are added in trait anxiety inventory. Total scores in both sections below 42 refer to normal anxiety, and total scores above 42 refer to high anxiety.[9,10]

Beck Depression Inventory (BDI)

Beck Depression Inventory (BDI) is used in order to determine the depression levels of the cases.[8] BDI consists of 21 items evaluating the symptoms that occur in depression. Each question has four answers, with severity ranging from 0 to 3. While using the Beck depression inventory, the cut-off value for our country is reported as >17. It is understood that the higher the score, the higher the severity of depression. In our study, 8-17 points were considered as mild depressive symptoms, 18-27 points as moderate depression and >27 points as severe depression.[6] Tegin has assessed the validity and reliability of Beck depression inventory for Turkish society, which is used to determine the severity of depression.[6-7] According to this scale, the cut-off score was determined as 17. Those who scored above this was considered as under risk in terms of clinical depression.[6]

Statistical Analysis

Statistical evaluation was performed using SPSS (ver. 22.0, Chicago, Il, USA) program. Data obtained were transferred to the computer environment. Data were defined using the arithmetic mean±standard deviation and ratio (%). STAI-I, STAI-II and BDI scores were reviewed through Kolmogorov Smirnov test, and through this, it was decided to review the inventory scores with parametric tests. For this purpose, the one-way analysis of variance (ANOVA) of parametric tests was used to compare group data, and Games-Howell test was used for Post Hoc analyses. In statistical interpretations, $p < 0.05$ was accepted to be significant.

Results

Three hundred three patients who applied to the University of Health Sciences Sultan Abdülhamid Han Training and Research Hospital Radiology Clinic enrolled in the study.

The demographic data is as following of 50.2% of the subjects were women (n=152), and 49.8% were men (n=151). The age of patients'varied between 18 to 65 years, and the mean age was 38.64±12.16 years. 36.0% of the subjects

(n=109) were university or higher graduates. The 56.1% (n=170) were married. 57.1% (n=173) were unemployed, and 21.1% (n=64) of those working were self-employed. Based on their income status, 54.6% of the cases (n=166) were medium-level, and 70.3% were living in the city centre. 40.9% of the subjects (n=124) were smoking, and 11.2% (n=34) were taking alcohol. The socio-demographical data of the subjects are given in Table 1.

The regions inspected by modalities are presented in Figure 1. As shown, thorax was the most common and followed by the abdomen and breast. Here we noticed another point some patients (n=16) had more than one modality at the same week such as abdomen USG and CT, extremity roentgenogram and MRI or PA (posteroanterior) chest roentgenogram and lung CT. The subgroup of the patients that was one modality applied and multiple modalities applied patients were compared; STAI-S scores were showing statistically significant difference as p<0.001. The multiple modalities following each other increase the current anxiety in the waiting room (Table 2).

The clinics requiring radiological examination are indicated in Figure 2. The most modality requesting clinic was general surgery, and the second was pulmonologists. Apart from this the prevalence was 57.8% (n=175) for surgical and 42.2% (n=128) for non-surgical branches. The inventory scores of the cases are given in Table 3. The subgroups of patients were done according to gender. There was no statistically significant difference between male and female subgroups accordingly STAI S-T and BDI scores P-value> 0.05 (Table 4). The radiological modalities which were performed in numbers were as following; 26.7% (n=85) (RG), 23.8% (n=78 (USG), 25.4% (n=79) (CT), and 24.1% (n=77) (MRI). The Anova statistical method is conducted to test whether the depression levels of the cases significantly differ, a statistically significant difference was detected between the groups (F (299) = 7.803, (p<0.001)). However, as the variances of the groups were not homogenous (Levene test, p<0.05), Games-Howell test of Post Hoc analysis tests was used to determine the source of difference. The direction of the difference was determined as (CT)-(RG) (Table 4). According to data, when the depression levels compared, the CT had the highest mean followed by MRI and USG, the lowest mean was observed in RG (Table 5). This difference may be explained by radiophobia due to multiple times of radiation exposure compared to a simple roentgenogram. The study population was having high intellectuality about the danger or risks of radiation. Besides the CT rooms are forbidden areas for pregnant woman and this black propeller on a yellow background as a sign denoting exposure to atomic radiation may cause fear and depression. In spite of the same sign, RG is leading least formation of depression may be due to duration is very short,
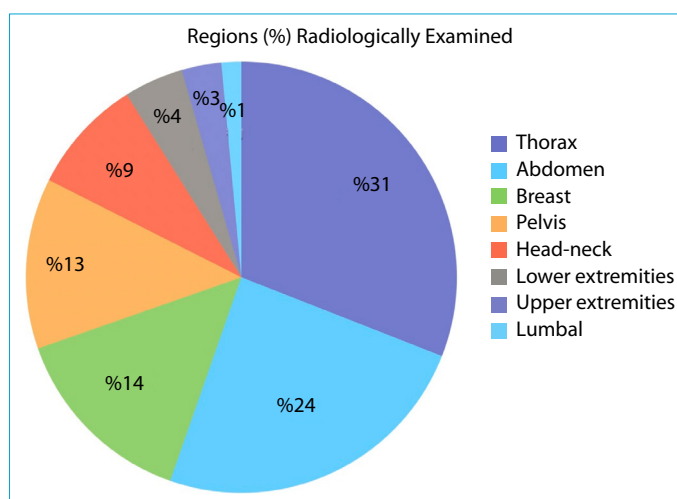

Figure 1. The regions inspected by modalities.

Table 1. Socio-Demographic Characteristics of the Cases

	Number (n)	Percentage (%)
Gender		
Female	152	50.2
Male	151	49.8
Educational status		
Illiterate	34	11.2
Primary school graduate	22	7.3
Secondary school graduate	45	14.9
High school graduate	93	30.7
University graduate or higher	109	36.0
Marital status		
Married	170	56.1
Single	133	43.9
Professional status		
Officer	38	12.5
Worker	28	9.2
Self-employed	64	21.1
Unemployed	173	57.1
Income status		
Low	97	32.0
Medium	166	54.8
High	40	13.2
Smoking		
Yes	124	40.9
No	179	59.1
Alcohol		
Yes	34	11.2
No	269	88.8
Age ($\bar{X}\pm SD$)	38.64±12.16	

$\bar{X}$: Mean; SD: Standard Deviation.

the ionising radiation dose is many times lower than CT and known as safe and last of all no gantry or tunnel-like system that captures the patient.

Table 2. Inventory scores related to number of modalities

	n=287 One modality applied patients $\overline{X}$	n=16 Multipl modalities applied patients $\overline{X}$	n=303 total $\overline{X}$	SD p≤0.01
STAI-I	37.86	38.14	38.00	6.01
STAI-II	40.22	53.61	46.83	6.01
BDI	11.24	20.12	15.68	9.50

x: Mean; SD: Standard Deviation.

According to the results of one-way analysis of variance conducted to test whether the state anxiety of the cases significantly differs, a statistically significant difference was detected between the groups (F (299) = 7.471, (p<0.001)). However, as the variances of the groups were not homogenous (Levene test, p<0.05), Games-Howell test of Post Hoc analysis tests was used to determine the source of difference. The direction of the difference was determined as (MRI- (RG) (Table 5). Based on this, it is possible to state that radiological examination methods have a significant impact on the increase of state anxiety levels of the patients. According to the radiological examination methods, when the state anxiety levels of the cases before the procedure were compared, the individuals who underwent USG pro-

Table 3. Inventory Scores of the Cases

|	$\overline{X}$	SD
Beck Depression Inventory (BDI)	15.68	9.50
State Anxiety Inventory (STAI-1)	38.00	6.01
Trait Anxiety Inventory (STAI-2)	46.83	6.01

$\overline{X}$: Mean; SD: Standard Deviation.

Table 4. Inventory scores related to genders

	Male (n=152) $\overline{X}$	Female (n=151) $\overline{X}$	Total (n=303) $\overline{X}$	SD p>0.05
STAI-I	38.25	37.75	38.00	6.01
STAI-II	47.30	48.36	46.83	6.01
BDI	15.83	15.53	15.68	9.50

$\overline{X}$: Mean; SD: Standard Deviation.

cedure had the highest mean followed by CT and MRI, the lowest mean was observed in individuals who underwent RG procedure. This may be caused by the white coat phenomenon just as in a clinical setting. The patient may feel anxious due to close contact with the radiologist/medical technician who would identify the pathology. Even the mimics of USG applicant may arouse the patient to con-
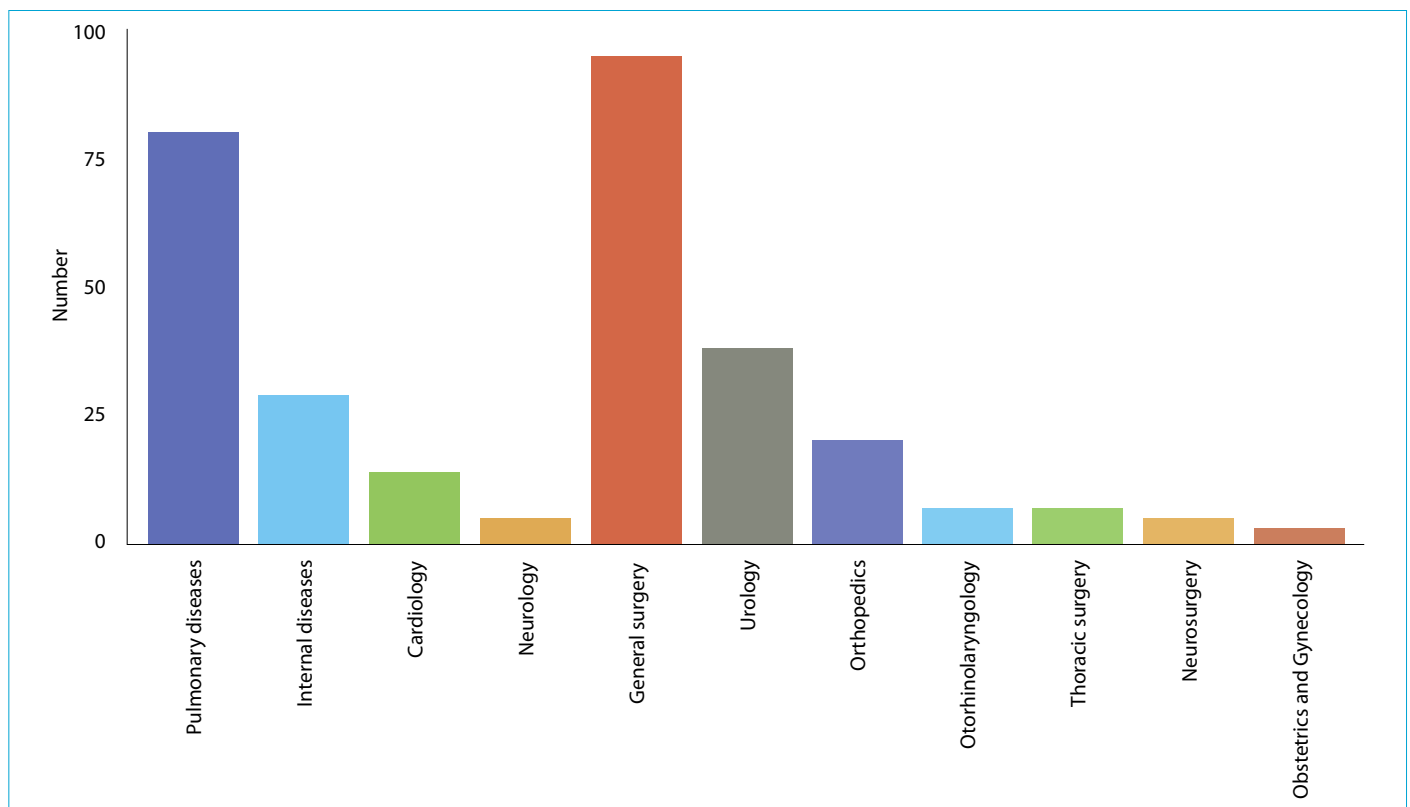
Figure 2. The regions inspected by modalities.

Table 5. Mean, Standard Deviation and Single Factor ANOVA Results of Anxiety and Depression Levels of the Cases Based on Radiological Examination Methods

	Radiological Examination Methods	N	X̄	S.D.	sd	F	P	Significant Difference
BDI	RG	81	12.30	7.25	3/299	7.803	<0.001	A-C
								A-D
	USG	72	14.68	9.71				
	CT	77	19.063	11.11				
	MRI	73	16.85	8.34				
STAI-1	RG	81	35.54	3.24	3/299	7.471	<0.001	A-C
								A-D
	USG	72	39.75	6.56				
	CT	77	38.82	6.59				
	MRI	73	38.14	6.41				
STAI-2	RG	81	45.95	7.28	3/299	1.896	>0.05	--
	USG	72	47.29	6.04				
	CT	77	46.22	4.89				
	MRI	73	47.99	5.37				

X̄: Mean; SD: Standard Deviation; A: Roentgenography; B: Ultrasonography; C: Computed Tomography; D: Magnetic Resonance Imaging.

sider the malignant or complicated situation.

According to the results of one-way analysis of variance conducted to test whether the trait anxiety of the cases significantly differs, no statistically significant difference was detected between the groups F(299)= 1.896, (p<0.05) (Table 5).

Discussion

This study aimed to compare non-invasive radiodiagnostic modalities according to the degree of anxiety and depression in the waiting room. We designed a multifactorial comparison study of all non-invasive radiodiagnostic methods together different from the literature.[1-6] Our study depression levels were recorded highest for the CT waiting patient group, followed by MRI and least seen on RG. The literature mentioned that the CT and MRI sourced anxiety would be sourced from the radiophobia, claustrophobia concerns, and the duration of the procedure would be associated with increased stress. Additional environmental factors, such as an uncomfortable room or insensitive staff may further increase patients' stress. In the literature, all these factors listed as contributors to depression scores.[1-3, 5] The USG patients are devoid of radiophobia, and they are being applied unconfined space. The RG is used to be a method of everyday use and is well known for its quick and simple application does not lead so much depression and anxiety. Our study results were correlated with this judgement. In the literature; very similar to our study results, a study of 145 women screened for the ovarian cancer risk with transvaginal ultrasonography found that 38 % of pre-

menopausal women and 27 % of postmenopausal women experienced high levels of cancer risk-related anxiety prior to their first screening test.[13] In our study, we encountered the high state anxiety levels for USG as well. Another study showed that 15 % of patients had anxiety before undergoing routine mammography according to a study of 4249 patients in Norway.[14] In another study, the presence of anxiety was related to lower educational levels of patients because of first time experience with mammography.[15] In our study, the educated people had more anxiety may be due to questioning diagnosis and considering the worst scenario at all. The difference from the existing literature may be sourced from non-homogenous distribution of the patients'. In our study, the RG and USG caused less anxiety and depression than CT and MR. The STAI-S scores of MR and CT were high comparing to RG. The patients were experiencing more intense anxiety when they asked for MRI or CT for which diagnoses would be concerned among the widespread indications, especially when the contrast agent is required.

Antwi Wk et al.[4] resulted that when the patient was received detailed explanation about the ultrasound examination, they were not anxious during waiting. However, high anxiety scores of USG in terms of state anxiety were present even though the patients were informed. Because USG provides a quick way to diagnose, it would make patients more anxious before the procedure. In our study, less anxious population was waiting for RG, which is the method used to be common, quickest and less radioactive.

In our study, most of the patient population was inspected

on thorax, abdomen and breast regions. High percent of the patients were university graduated. The questioning of probable diagnosis by an intellectual group would form high anxiety.

In literature, people with multiple diseases have higher anxiety and depression incidence than the overall population waiting or undergoing endoscopy, bronchoscopy, breast biopsy and colposcopy.[13, 16-19] Depression and anxiety were defined more frequent in female gender in overall society and in patients who undergo invasive procedures.[20] In our study, different from others, we could not found statistically significant differences in terms of gender (Table 4).

In a study conducted in our country, before the invasive radiological procedure, 50% of patients had depression, and 76.25% of patients developed anxiety.[21] Similar studies highlighted this.[1-3, 5] Cassileth et al.[22] reported that the age factor was a decisive parameter for psychological status in diseases such as chronic renal failure, skin and joint diseases, cancer, diabetes and depression. We could not found age relation to anxiety and depression. Bandyopadhyay et al.[23] determined that if the patients informed at the day of surgery, anxiety decreased.

In literature, high depression levels were reported with incompatible patients[24-26] and those who experience anxiety before MRI may develop long-term clinical anxiety disorders, particularly claustrophobia and panic attack.[27]

Conclusion

The anxiety and depression regardless of gender and age would originate even in the waiting room of non-invasive radiodiagnostic procedures. In our study, the CT was the most depressive, and the USG was the leading causes of instant anxiety. Without disturbing the existing regulations, some room changes would be driven, such as to accommodate the newest technologies that can help to reduce the dose. The waiting rooms can be relocated to a different area where the patient would feel safe from radiation. The USG would be better performed in an explanatory way where empathy prevails, and the practitioner should be able to control facial expressions and avoid overreacting. Being more descriptive to patients, whose procedures are taken in order, can reduce emotional tension as in all clinic issu.

Disclosures

Ethics Committee Approval: The ethics committee of Haydarpasa Numune Training and Research Hospital provided the ethics committee approval for this study (12.02.2018-21.2018.KK).

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – O.T., O.M.; Design – O.T.; Supervision – O.T.; Materials – O.T., O.M.; Data collection &/or processing – O.T., O.M.; Analysis and/or interpretation – O.T., O.M.; Literature search – O.T.; Writing – O.T.; Critical review – O.T.

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