

Influence of Anxiety and Claustrophobia on Blood Pressure and Heart Rate during MRI Scan

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Abstract

Aim: To assess the effect of anxiety and claustrophobia on human blood pressure and heart rate during MRI scan.

Methods: Samples of 48 patients who need MRI scan service were chose. A questionnaire and scales were used to evaluate the patients' anxiety group and claustrophobia. Blood pressure and heart rate were determined in before and after the scan in the same circumstances and methods.

Results: The majority of the patients were female. The relation between anxiety scale and gender revealed that majority of the female have the high anxiety scales (68.57%). Alternatively, the minority of male have high anxiety level (40%). The relation between anxiety and claustrophobia with the systolic pressure before and after MRI scan, approved a statically significant difference with t-test=3.007 and, P value <0.05. No significant association was found of diastolic pressure and heart rate at the same time and circumstances with anxiety levels and claustrophobia.

Conclusion: This study represents significant evidence for an association of high blood pressure with high anxious and claustrophobic patients, measured before and after the MRI scan. While diastolic blood pressure and heart rate did not change during MRI exam.

Keywords: claustrophobia, blood pressure, heart rate, diastolic

Introduction

Magnetic resonance imaging (MRI) is vital medical equipment that has been steadily used as it gives image with high quality by using non ionizing radiation. For this procedure, the patients need to be scanned by a long narrow tube for approximately several minutes without movement, because technical issues which need to provide image free artifacts^[1,2].

This period of MRI procedure which includes fear, noises, stress, nervousness, stability and unfamiliar environment could make challenge to manage the scan typically with anxious or claustrophobic patients. These are common problems which occurs with the patients during the MRI scan^[3]. Anxiety is a indistinct and still vague^[4]. It has been reported that 25% to 37% of the patients undergoing MRI scan experienced substantial anxiety^[5,6]. What is more,

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the fear of enclosed spaces is called claustrophobia. Which is a common specific phobia with a prevalence of 1.0% to 15% in the general patients [7]. The American Cardiology Association emphasize that it should be important for the physician, dentist and medical staff to deal with complications that may take place in patients who have hypertension [8]. In addition to the light-headedness, nausea, fainting, fears of actual harm, the blood pressure and heart rate increasing may present with anxious and claustrophobic patient. [9]. This leads to necessity to avoid possible adverse reaction for cardiovascular disease like hypertension which could be occur with such psychological status. Recently the Global Health Risks shows that arterial hypertension remains the primary cause of mortality and morbidity in the world [10,11].

This study aims to evaluate the influence of anxiety and claustrophobia on the blood pressure and heart rate before and after the MRI scan. For this purpose, a questionnaire based on a rating scale was designed to capture the emotions feeling before the MRI scans. Blood pressure and heart rate recorded for the patients ten minutes before and after the imaging procedure in the same conditions.

Methods:

This experiment was to assess the potential for claustrophobia, anxiety and clinical relevance with MRI. All patients who agreed in participating received information about the study procedure, with free to withdraw from trail at any time before or after the MRI scan.

Eighty four patients with an age ranged between 25 to 50 years were selected in this experiment in Baghdad hospital during the period from May to October in 2015. The patients with cardiac disease were excluded to avoid solely based on arterial hypertension changes which found with their history previously [11]. For this reason, it is noteworthy that subjects who had any of the hypertension were included for the evaluation of the HR and PB.

All patients were interviewed and evaluated face to face in the next room of the MRI scan. Then they asked to answer a general health questions by the same examiner to exclude any blood pressure disorders, previous history to the hypertension or any cardiac diseases following the instructions and any drugs which were taken by the patients through 24

hours before the scan that would affect the sensitivity of results were excluded [12].

The blood pressure and heart rate measured by a digital cardiologic stethoscope in two separate times. First measurement, when the patient in the waiting room, trying to characterize the BP and HR two minutes before the MRI scans. The second measurement is taken two minutes after the scan in the same place and techniques of the first measurement. To evaluate the patients' phobia and anxiety level, before the MRI examination, patients were informed with a description of how to rate the intensity of anxiety and claustrophobia if present by using four points numerical scale; the following values were established: A=0, B=1, C=2, D=3, E=4.

The scale was used and consists of four questions with five possible answers, which characterize the patient anxiety level in response to different situations that involve a visit to the MRI exam room, and it is applied before the scan.

The sum of the values assigned to each answer, the possible interval score may vary between 4-20 points. The level of anxiety classified in naught, mild, moderate and exacerbated groups. The collected data were firstly stored in an Excel® worksheet and, then we held a descriptive statistical analysis using the SPSS®, accompanied by a form containing issues about patient identification, harmful habits, diseases, frequency to MRI visit and cardiovascular parameters. For the claustrophobic group which was detected by using a claustrophobia questionnaire according to (CLQ) [13].

Results

Figure (1) shows 48 volunteers participated in this research, (58.3%) belonged to the female with a mean age of 38 years and incomplete high education, (41.7%) belonged to male with a mean age 39. According to the aspects related to health, most of them did not have the habit of smoking, but presented a family history of systemic diseases, such as diabetes Mellitus, hypertension, cancer, heart disease, pulmonary emphysema. During the period of the patient's follow-up no systemic change that could interfere with the results of the study was detected. The relation between anxiety scale and gender revealed that majority of the female have the high anxiety scales with Claustrophobia. On the other

hand, the majority of male have mild or no anxiety level (25%), female had mild anxiety only (10%). The data obtained from the relation between anxiety scales and the age group revealed there no significant relation could be detected.

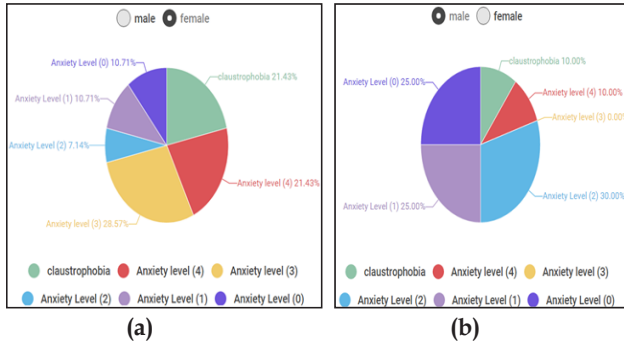


Figure (1) anxiety scale percentages and claustrophobia across sex and age groups where (a) Female patients, (b) Male patients.

It can be clearly seen that first and second anxiety scales groups show no functional relation between there systolic pressure and the experiment. While patients with higher anxiety scale with level 3 there are obvious upwards. Figure (2, a) Illustrates the statistically significant difference concerning to systolic BP with patients with high anxiety levels and claustrophobic group with (mean ± standard deviation) in the pre and post MRI scan whereas levels of anxiety and claustrophobia t-test=3.007 and, P value <0.05). Figure (2,b) shows the difference (mean ± standard deviation) of diastolic BP in accordance to the anxiety scale and claustrophobia pre and post the MRI scan, in different measures, considering the different anxiety level observed.

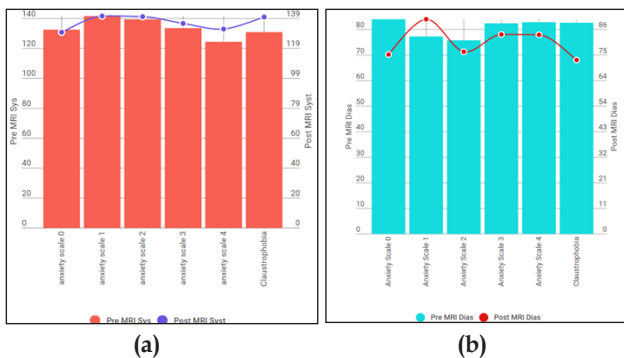


Figure (2): Association of blood pressure with anxiety levels and Claustrophobia. (a) The relationships of pre- and post MRI scans systolic BP with 5 groups (b) the relationships of pre- and post MRI scans diastolic BP with 5 groups.

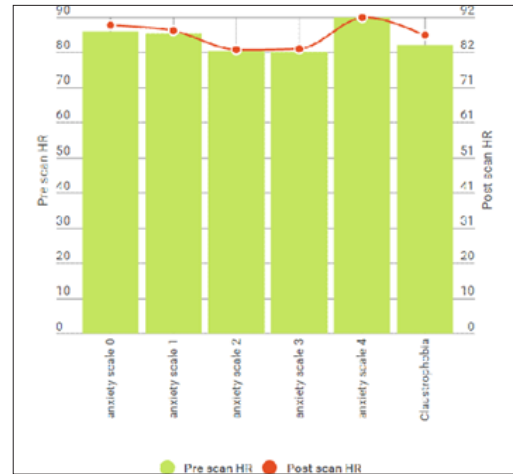


Figure (3) Association of heart rate with anxiety levels and Claustrophobia plots with pre and post MRI scan

Figure (3) shows the HR of volunteers in the two mentioned periods. We can detect that the HR virtually does not change as a function of claustrophobia or anxiety scales. There is a minor alteration after MRI scan for the non-noxious with increasing the difference till plunge in the group 3 and returning to rise again with higher anxious and claustrophobic patients. This is non-significant changes according to the difference of (mean ± and standard deviation).

Discussion

The purpose of this research was to study the relationship between the influence of anxiety and claustrophobia with the blood pressure and heart rate before and after MRI scan. This section discusses the findings that were observed with the psychophysical questionnaire and vital signs correlation. The study shows three major results about the influence of the anxiety and claustrophobia on; systolic, diastolic blood pressure and heart rate. The authors made this MRI developed anxiety scale in relay on Corah NL. to diagnose the state of anxiety in dental patients [14]. This scale was developed to our study because of the capability to be applied in count for helping as a predictor for the workers in the MRI room in compare with other anxiety scales. Patients during MRI scan are commonly undergoing negative emotions. The unfamiliar environment, unknown staff and noises can incite fear and anxiety as result they cannot complete the scan or motion artifacts will appear in the images [15].

The description provided by radiological technologist and researcher before and after MRI scan

is efficient for those patients who presented with mild and non-anxiety level, because we noticed reduction of the patients expectation in relation to the scan performed. This finding reinforces the importance of MRI questionnaire to verbalize so early and safe to the patient about the procedures to be performed in each visit, thus avoiding the fear of the unknown procedures of the scan [6,16].

Keen patients to MRI scan with no anxiety or mild level are found more with younger or educated patients. The result suggests that it is associated with the fact the patients relate the MRI scan to the feeling of fear and anxiety, perhaps to have previous negative experience [17]. Most of the previous studies on MRI associated anxiety and claustrophobia focus on psychological aspects [18]. So this pilot study as our knowledge is the first in related with main vital signs in MRI procedures. Thus, the questionnaire had been prepared to evaluate the patient reactions and to place psychological strategies to reduce the anxiety of the same. In this study, the volunteers received information about the steps and the procedures that were performed, as recommended by other authors [5,12].

The percentages in Figure (1) of this study were approved by other researchers which explained this variation in relation to different reasons for example: the age, gender, and circumstances, background and even gene defect [19]. The different individuals have different thresholds for the anxiety sensitivity [20]. Similarly, the difference claustrophobic reactions of MRI patients are affected by body part examined, gender, and positioning in the MRI tube [21].

The pie charts illustrate the primary percentages of having different anxiety scale and claustrophobia. It is clear that the main factor influencing their various percentages is the gender difference.

Female had higher anxiety levels about 21 % for claustrophobia and anxiety level scale 4; also around 28 % have anxiety scale 3. This result was also found by other study [22]. While the male have lower anxiety level but, the total percentage of less anxious and feared female are fewer than 25%.

In comparison, male percentage shows proportion of the high anxiety scale 4, 3 and claustrophobia of 10%, 0%, and 10% respectively. The reasons might

belong to anxiety and phobia occurs more often in female than in male [23]. Reckelhoff, et al have shown that BP is less in woman than in men at similar ages. After menopause period, conversely, the BP increases in female more than in male [24].

Sledge and Vinger-hoets; approved interoperation which the first phase of reaction with anxiety and specific types of phobia which leads to increase the systolic pressure and heart rate [25]. Supporting to this study, figure (2-a) illustrates the actual (mean±) values in the five levels groups. Where after the third anxiety level there were significant change between the systolic pressure and the anxiety and rising gradually with moderate, exacerbated levels and claustrophobia. In result, the systolic mean values of the groups raising influence by two factors: the increase in anxiety scales and the present of claustrophobia.

In contrary, significant changes in the diastolic and HR were not found in relation to the five groups during the MRI examination. These results were in the same line, with previous pilot study were found the phobia, anxiety, and panic attack do not associated with diastolic and heart rate [26]. In spite of the gigantic improvement in the aspects of arterial hypertension detection numerous fields of blood pressure measurement require further rigorous study, such as blood pressure measurement in distinct clinical situation and population [10].

Conclusion

The study results revealed that there was a substantial relation between systolic to anxiety and claustrophobia. On the other hand, the diastolic and heart rate did not change before and after the MRI scan in relation to the anxiety levels recorded with the patients. It is recommended that further research should be conducted in this field. Therefore, according to these results, patient with high blood pressure and/or heart diseases measures his blood pressure before the scan and calm he down should be a mandatory technical step before MRI.

Conflict of interest: none

Source of findings: self-findings.

Ethical clearance: none

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