

# Impact of extended Pre-Scan Written Information on Motion Artifacts during Head Magnetic Resonance Imaging

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## Keywords:

Pre-scan written information, Magnetic resonance imaging (MRI), Motion artifacts.

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## ABSTRACT

The objective of this study was to assess the effect of extending pre-scan written information to patients undergoing head magnetic resonance imaging (MRI) examinations on motion artifacts. A controlled study was conducted in King Fahad hospital at the department of Radiology. A total of 100 patients were involved; 50-patients received only routine oral hospital instructions (control group), and another 50-patients received pre-scan extended written beside routine oral hospital instructions (study group). The head MRI images were assessed with regard to motion artifacts. Informed consent was obtained from all the patients included in the study. The incidence percentage of motion artifacts were significantly fewer in the study (intervention group than in the control group, 10%, 58% respectively). The P value = 0.001. The motion artifacts decrease significantly in the study group than in the intervention group. Extending written information before MRI scan could significantly reduce motion artifacts and improve image quality.

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## 1. INTRODUCTION

Magnetic resonance imaging (MRI) is a radiological examination method. It is a non-invasive and safe method, which does not use ionizing radiation [1], [2]. However, some patients experience discomfort such as claustrophobia or panic associated with physical confinement and loud noises. These problems might cause a movement in some patients, during MRI examinations. Patient movement during MRI examination may impair image quality by consequence of motion artifacts [3], [4]. Approximately, up to 70% of the images have been reported to show movement artifacts [4]. Furthermore, on an average, 2.3% of patients are unable to complete their scan or obtain a diagnosis [1]. Therefore, these factors not only prevent many patients from reaping the benefits of MRI findings, but also represents an issue of socioeconomic importance in the healthcare system [5], [6].

Patient anxiety and dissatisfaction have been associated with some medical procedures in general [7]. However, these uncomfortable conditions can be reduced by giving the patients written information about the medical procedures and the details of health care they will receive [8- 10].

Although, some published data from Europe and other countries showed that motion artifacts and patient anxiety can be reduced by providing the patients with written information about MRI procedures [11- 14], to the best of our knowledge there are no published data from Saudi Arabia about effect of extending pre-scan written information on clinical MRI motion artifacts. Additionally, the differences in culture may affect patients' attitudes towards medical care and services including diagnosis and treatment of diseases [15]. The present study was aimed to assess whether extending pre-scan written information decreases motion artifacts throughout MRI procedures.

## 2. Methods

### 2.1 Study design

A control study was conducted in the radiology and medical imaging department, at a hospital in Madina using two MRI scanners; Siemens Magnetom Vision (1.5T). The duration of the study was 4 months. All patients included in the study have been scanned for head MRI.

A total of 100 adult patients were included in this study. The patients were divided into two groups; 50 patients were randomly assigned as control group without receiving any written information before MRI examination other than the regular hospital oral instructions. The remaining of the other 50 patients were randomly assigned as study (intervention) group. The intervention group were provided with extended written information about the MRI examinations before the scan, beside the regular hospital instructions. The inclusion criteria items were; (1) ability to speak, read and understand Arabic and (2) physical and mental ability to complete the questionnaire. The following were the exclusion criteria items: (1) presence of diseases that affect movement such as Parkinson's disease and (2) refusal to participate. The images were observed and assessed for motion artifacts by two qualified specialists; radiologist and MRI technologist with more than 3 years' experience. The observer was blinded to the patients' characteristics during the assessment of the images.

### 2.2 Ethics

Approval for conducting and publishing the data of this research was obtained from the department of radiology at King Fahad Hospital. In addition, informed consent was obtained from all patients.

### 2.3 Statistical analysis

The collected data were analyzed using SPSS software (version 16.00). Comparison of the parameters were interpreted using the chi-square test. Spearman correlation test was used to find an association of pre-scan written information and MRI motion artifacts. Chi-square values  $< 0.05$  were considered significant.

## 3. Results

One hundred adult patients (male = 56; female = 44; age range = 18–77 years; mean age =  $43 \pm 14.19$  years) were included in the study.

Table 1 summarizes the number and % of motion artifacts in study (intervention) group and control group. The number of patients who did not show motion artifacts were 45 (90%) and 21 (42%), respectively, whereas the numbers of patients who showed motion artifacts were 5 (10%) and 29 (58%), respectively. The table also illustrates a significant negative correlation between pre-scan written information and the occurrence of motion artifacts in both intervention and control group. ( $P$ -value = 0.001,  $R^2 = 0.507$ ).

**Table 1** shows the correlation between occurrence of motion artifacts and intervention and control group of

patients.

Motion artifact	Control group <i>n</i> =50 & (%)	Intervention group <i>n</i> =50 & (%)	R-square	<i>P</i> -value
Total number (%) of patients with motion artifacts	29/50 (58%)	5/50 (10%)	$R^2 = 0.507$	0.001

#### 4. Discussion

Motion artifacts appearance is a common problem in MRI examinations. They degrade image quality and possibly interfere with interpretation [7]. Educating patients about MRI procedures is the best method to make sure that a patient stays still to reduce anxiety and motion artifacts. The purpose of this research was to assess whether the extended pre-scan written information has impact on reducing motion artifacts in head MR images.

The results of this study revealed that the incidence of motion artifacts was decreased significantly in the intervention group than in the control group as illustrated in table (1). A significant positive association was observed between the occurrence of image motion artifacts and patients of intervention group who were given pre-scan extended written instructions. This finding is in agreement with). The first study published by [8], investigated the effect extended pre-scan written information on MRI motion artifacts. This study reported that extended pre-scan written instructions significantly decreased MRI motion artifacts [8]. (Moreover, A similar conclusion was reached by who reported that clinical MRI motion degradation could be reduced by using a pre-scan patient information pamphlet [16].

The result of study also, in line with many other studies assessed the effect of written information decreasing the anxiety and indirectly reduced motion artifacts [13], [14]. Reducing MRI motion artifact is as essential in improving image quality and providing a proper MRI image reporting. This consequently leads to adequate diagnosis and treatment [17- 19]. Patient education and effective communication with patient are become crucial element in quality of healthcare services [20]. Pre-scan written instructions play a great role in patient education. Several studies reported that patient education is positively impacted on reducing patient anxiety and allow patient to cooperate during diagnostic and treatment procedures [21- 23].

#### 5. Limitations of this study and future direction

The main limitation of the study is the small sample size and small geographical area of the study. This study is first one in its location. It will open further research paths. A study with large size sample and different geographical areas is recommended

#### 6. Conclusion

In conclusion, this study showed that extended written information can decrease the incidence of motion artifacts by helping patients to understand the importance of movement constraint during MRI examinations. Reduction of motion artifact could improve MRI image quality by enabling more adequate diagnosis.

#### 7. Competing interests

The authors declare that they have no conflicts of interest.

#### 8. Acknowledgment

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