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Original Research

Artifacts in Magnetic Resonance Imaging

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ABSTRACT:
Background: This study was conducted to assess the prevalence of artifacts in MRI. **Material and methods:** This study was conducted to assess the prevalence of artifacts in MRI.This study comprised of 100 participants who underwent MRI procedure for various reasons. The artifactswere observed and the findings were tabulated. Statistical analysis was conducted using SPSS software. **Results:** In this study, it was seen that chemical shift artifact was seen in 3 subjects. Zipper artifact was seen in 6 patients. Motion artifact and metallic foreign bodies artifacts were seen in 11 and 2 subjects, respectively. Total 22 artifacts were seen in this study. **Conclusion:** In this study, the prevalence of artifacts in MRI was 22%.
Keywords: MRI, Artifacts, Prevalence

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INTRODUCTION

Many types of artifacts may occur in magnetic resonance imaging. These artifacts may be related to extrinsic factors such as patient motion or metallic artifacts; they may be due specifically to the MR system such as power gradient drop off and chemical shift artifacts; they may occur as a consequence of general image processing techniques, as in the case of truncation artifacts and aliasing.

Change in patient position, pulse sequence, or other imaging variables may improve some artifacts. Although reduction of some artifacts may require a service engineer, the radiologist has the responsibility to recognize MR imaging problems. The radiologist's knowledge of MR imaging artifacts is important to the continued maintenance of high image quality and is essential if one is to avoid confusing artifactual appearances with pathology.[1]

Artifacts in magnetic resonance imaging (MRI) may be caused by the MR scanner hardware itself or by the interaction of the patient with the hardware.[2] Artifacts and foreign bodies within the patient's body may be confused with a pathology or just reduce the quality of examinations. The knowledge of the artifacts and their sources is extremely important in order to avoid false diagnoses and to learn how to eliminate them.[3] Radiologists are frequently not informed about the medical history of patients. When performing the examinations, they face postoperative images (without knowing the patient's history) or other images they are not familiar with – caused by foreign bodies.

This study was conducted to assess the prevalence of artifacts in MRI.

MATERIAL AND METHODS

(MRI 3Tesla Megnatom Vida Siemens)

This study was conducted to assess the prevalence of artifacts in MRI.This study comprised of 100 participants who underwent MRI procedure for various reasons. The artifactswere observed and the findings were tabulated. Statistical analysis was conducted using SPSS software.

RESULTS

Table 1: Artifacts in MRI

Type	Number of cases	Percentage
Chemical shift artifact	03	03
Zipper artifact	06	06
Motion artifact	11	11
Metallic foreign bodies	02	02
Total	22	22

In this study, it was seen that chemical shift artifact was seen in 3 subjects. Zipper artifact was seen in 6 patients. Motion artifact and metallic foreign bodies artifacts were seen in 11 and 2 subjects, respectively. Total 22 artifacts were seen in this study.

DISCUSSION

Compared to other imaging modalities, such as ultrasound or computed tomography, MRI has always been particularly sensitive to subject motion. This is primarily due to the prolonged time required for most MR imaging sequences to collect sufficient data to form an image.

This is far longer than the timescale of most types of physiological motion, including involuntary movements, cardiac and respiratory motion, gastrointestinal peristalsis, vessel pulsation, and blood and CSF flow. The effects of motion have been well known since the early days of MRI and include blurring and ghosting in the image.[4,5]

In CT imaging, Streak artifacts are a common problem. The presence of high attenuation metal objects in the field of view such as dental restorations, orthodontic bands, surgical plates and pins can cause this type of artifacts. That is because the metal materials highly attenuate the x-ray beam resulting in incorrect high attenuation values of objects behind the metal. However, in MRI, images are created using a combination of strong uniform magnetic field and radio frequency pulses. All substances when placed in a magnetic field are magnetized at various degrees depending on their magnetic susceptibility. The variations in the magnetic field strength that occur on the interface between the dental material and the adjacent tissues will cause magnetic field distortions and signal loss which will generate an artifact in the image. The artifact severity will vary depending on the shape, position, orientation and number of objects in the image, sequence type used and sequence parameters.[6-8]

This study was conducted to assess the prevalence of artifacts in MRI.

In this study, it was seen that chemical shift artifact was seen in 3 subjects. Zipper artifact was seen in 6 patients. Motion artifact and metallic foreign bodies artifacts were seen in 11 and 2 subjects, respectively. Total 22 artifacts were seen in this study.

The aim of an in-vitro study conducted by Klinke T et al[9] was to identify and evaluate the artifacts produced by different dental restoration materials in CT and MRI images.Test samples of 44 materials (Metal and Non-Metal) commonly used in dental restorations were fabricated and embedded with reference specimens in gelatin moulds. MRI imaging of 1.5T and CT scan were performed on the samples and evaluated in two dimensions. Artifact size and distortions were measured using a digital image analysis software.In MRI, 13 out of 44 materials produced artifacts, while in CT 41 out of 44 materials showed artifacts. Artifacts produced in both MRI and CT images were categorized according to the size of the artifact.Metal based restoration materials had strong influence on CT and less artifacts in MRI images. Rare earth elements such as Ytterbium trifluoride found in composites caused artifacts in both MRI and CT. Recognizing these findings would help dental materials manufacturers and developers to produce materials which can cause less artifacts in MRI and CT images.

CONCLUSION

In this study, the prevalence of artifacts in MRI was 22%.

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