

REVIEW MR Imaging

Reducing patient's psychological stress. A guide for MR technologists

Nikolaos Stogiannos

MR Technologist, Corfu General Hospital, Greece

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ABSTRACT

When performing magnetic resonance imaging (MRI) in the clinical setting, the patient experiences many psychological issues, mainly due to the nature of the examination, the structure of the magnet and the anxiety related to the final diagnosis. It is the technologist's responsibility to overcome these vital issues, ensuring the psychological well-being of the patient. Specific issues such as claustrophobia and anxiety have to be addressed, as they potentially affect the examination

process and the quality of the results. In addition, the patient's well-being must always be the main concern. Many ways of achieving this have been recommended in the literature. However, every MR practitioner must be always aware of the difficulties implicated with MRI examinations. The role of the MR technologist in providing proper care and counselling to reduce the patient's anxieties related to the examination is underlined in this article.



KEY WORDS

anxiety; claustrophobia; MRI

1. Introduction

Magnetic resonance imaging (MRI) is a very demanding imaging method and many patients worldwide cannot undergo MRI examinations for different reasons. It requires some physical capabilities from the patients in order to be carried out, as well as some psychological preparation

before, during and after the examination. The structure of the MR scanner, in conjunction with the disturbing noise and the relatively long scan times, make this imaging modality a real challenge for every patient.

Nowadays, manufacturers and scientists are making efforts to reduce the acoustic noise produced by the rap-



CORRESPONDING AUTHOR, GUARANTOR

Nikolaos Stogiannos,
MR Technologist, 6A 1st Parodos Felix Lames, Corfu, Greece
Email: nstogiannos@yahoo.com

id amplitude and polarity changes during MRI examinations. Sequence-based optimisation has already achieved significant reduction of noise, without compromising Signal to Noise Ratio and image quality [1]. In addition, a hardware-based technique called Active Noise Control has been developed to further reduce the acoustic noise. This technique is applied to dampen the noise source or to nullify the noise signal [2]. Moreover, MR vendors have already implemented specific algorithms to optimise gradient switching and software packages which reduce noise levels at approximately 50 dB (A) in operation.

Apart from noise-related discomfort, many anxieties related to the examination process and the final diagnosis have an impact on the patient's psychological condition. Furthermore, claustrophobia may be caused to many patients due to the narrow structure of the magnet. However, MR vendors have already implemented wider MR systems to help patients feel more comfortable. Specifically, a recent study showed that using a 70 cm-wide bore system reduced claustrophobia compared to the conventional 60 cm-wide scanner [3]. This supported the findings of older studies, which have already underlined the significant reduction in claustrophobia when using wider MR systems [4]. Finally, the development of open-bore MR systems during the last years has also helped to ease claustrophobia and make this examination more patient friendly.

2. Before the examination

All healthcare professionals have to understand the patient's special needs and his/hers psychological condition. According to Priest, psychology and healthcare professionals are strictly connected [5]. This connection comes from the need to understand people in order to care for them. Moreover, it is essential for every healthcare professional to understand that the body and the mind are not separate. Therefore, many illnesses are described as psychosomatic disorders and they are triggered under emotional stress. Consequently, the patient's psychology is of a great importance and this could not had been different in the case of MRI examinations. It is believed that the fundamental skill of a healthcare professional is to relieve psychological suffering by listening, communicating and empathising. During the MRI examination, many patients experience various psychological issues, related to stressful illness and a demanding examination.

Firstly, the MR practitioner has to deal with the patient's anxieties before the examination. This cannot be possible

if the causes and levels of anxieties are not known. For that reason, it is essential to investigate the reasons behind these fears and try to overcome them. Anxiety is categorised in characteristic and circumstantial, named trait and state anxiety respectively. According to Morales, state anxiety is transient and it is associated with reactions to adverse situations, while trait anxiety is not affected by external sources [6]. Ahlander et al. suggested the use of a questionnaire related to patient's anxiety. The Magnetic Resonance Imaging-Anxiety Questionnaire was designed and, after the study was finished, it clearly justified the need for establishing a questionnaire to investigate expressions of anxiety [7]. Many people arrive at the MRI department with fear of this examination. This can happen because it is the first time they experience an MRI examination, or because someone from their environment has narrated his own experience during an MRI scan. Many people use to tell every single detail about their "awful" experience during this examination to their relatives or friends. The result is that many patients are concerned when arriving at the department to undergo the examination. This is a common observation, as most of the patients have been influenced by external sources.

The important role of the MR practitioner is to relax the patients and make them feel safe before the examination. The best way of achieving this is by providing detailed information on how the examination is carried out, what is the approximate scanning time, what they are going to experience inside the magnet and what this examination requires from them. According to Grossman, the patient has to be educated before the examination, giving time to answer any possible questions and making him feel comfortable and safe [8]. Elmaoglu and Celik also agree with this strategy, suggesting that clarification of any misunderstandings is essential for a successful examination. They also state that the form of the examination should be explained directly to the patient [9]. Westbrook suggests that additional counseling may be needed after the patient has entered the magnet room [10]. This happens because additional anxiety is caused when seeing the magnet bore and the unknown environment. It is very important for the technologist to build trust in the relationship with patients and make them feel safe. This will positively affect not only the patient's psychological well-being, but also the successful progress of the examination. Another important factor related to patients' anxiety is the waiting time before the examination. Many studies have shown

that patients experience increased anxiety if they have to wait for a long time before their scan. The possible life-altering diagnosis of the MRI, in conjunction with the fear of the unknown, can make patients feel stressful. Thu et al. concluded that there is a correlation between increased anxiety and longer waiting times, especially in female patients [11]. Therefore, it is essential that all MRI departments must have an optimal examination schedule, in order to prevent patients from experiencing long waiting times and increased anxiety levels.

In addition, various interventions have been described within the literature to help patients relax prior to the examination. Although patient counseling and oral information is a well-established procedure, it must be noted that a friendly environment can be vital for reducing patient anxiety before the examination. Therefore, a survey suggested a possible multimedia DVD presentation in the waiting area to relax patients and make them more familiar with the context of the examination [12]. Similarly, a randomised control trial confirmed that pre-scan anxiety levels were reduced with the implementation of a video clip prior to the examination [13]. Furthermore, music is a well-established method of relaxation, with music therapy having many applications within the healthcare discipline. When children have to be scanned, music therapy has been proved to be very effective, as anxiety and pain are significantly reduced when music therapy is applied to medical procedures [14]. Therefore, a relaxing ambient music background will certainly play a crucial role in reducing patient anxiety and creating a friendlier and more relaxing atmosphere while waiting for the examination. Finally, colour painting and lighting of walls and ceiling within the MRI department can play an important role in improving patient psychology.

3. During the examination

During the examination, it is very important for the patient to maintain calmness and confidence. A very effective way to achieve this is by using the system's intercom on a regular basis to communicate with the patient. Before the examination, the patient must be informed about this way of communication, in order to be reassured. During the examination, the MR technologist has to communicate with the patient to check that his /hers physical and psychological condition is not stressful. Moreover, the patients have to be counselled before the examination about the emergency alarm bell and its use, and they have

to be encouraged to use it whenever they feel anything annoying. Communication with the patients during the examination is essential and it ensures not only the patients' calmness, but also their safety. As the patients are exposed to magnetic fields and RF pulses, many potential dangers are possible to cause harm. By maintaining a regular communication with them, their safety is ensured, any possible anxieties about the progression of the examination are minimised and the overall quality of the examination is guaranteed. Tazequl et al. compared the levels of cortisol and prolactin in the patients' blood before and after an MRI exam. This procedure is justified by the fact that anxiety causes hormonal response systems to be activated. This study showed that the group that was left inside the magnet without communication had higher levels of both cortisol and prolactin, meaning they had experienced more anxiety [15]. The group that was guided during the examination after each sequence experienced less anxiety. Mutschler et al. also showed that anxiety changes during fMRI are related to catechol-O-methyltransferase, which influences neurotransmission [16]. These studies justify the need for regular communication with the patients during the MRI examinations, as anxiety levels are strictly associated with brain response dynamics and the overall physical condition. Minde, Klaming and Weda used electrophysiology to detect patient's anxiety levels during the examination [17]. They concluded that anxiety levels were higher at the beginning of the scan, with a peak usually when the table was moving inside the magnet bore. During the examination, anxiety levels were decreased until the end of the scan. Moreover, they found that patients who have to be scanned with head-first supine position experience more anxiety than patients who are scanned with feet-first position. An alternative strategy which would decrease anxiety levels is trying to scan these patients at a prone position, as they will be able to see outside the magnet bore. In addition, many head coils are equipped with mirrors and they must be used to help the patient have a sight of the outside environment. Moreover, alternative strategies have been proposed, such as the use of MRI simulators for habituation of the patients before the examination, or an in-bore audiovisual system to distract the patients during the examination. However, there are some limitations, such as the time and cost intensity. The same limitation is also applied when relatives of the patient have to stay inside the MRI room, as they have to be screened, which is time consuming.

The use of ambient colour lighting inside the bore of the magnet is another important strategy to reduce patient stress during the examination. Currently, many MRI departments have already implemented this strategy, while the relaxing decoration and painting inside the magnet room is gaining popularity, especially among paediatric imaging departments. Nowadays, most vendors have already introduced in-bore entertainment systems to help patients feel more comfortable and safer during the examination, while portable LCD screens have been developed to offer an in-bore cinema experience. The future of MR systems design must surely be on this approach, as the developing technology allows to improve patients' MRI experience and reduce anxiety.

4. After the examination

Patient care after the examination is also important, as most patients are often disorientated and their anxiety is still present. Chapman, Bernier and Rusak studied MR-related anxiety levels during the examination and after the examination. Moreover, they studied anxiety levels over consecutive scans. It was found that heart rate and anxiety levels were decreased after the examination, while they were further decreased during the next scanning session, probably due to habituation [18]. However, most patients are still nervous after the examination, mainly because of the possible findings. The majority of patients will ask to speak to the doctor and they also seek information about the collection of their results. The MR technologist must always be prepared to clarify any possible questions, relax the patient and ensure that his physical condition is good enough before allowing him to leave the MRI unit. Westbrook suggests that an optimal strategy is to offer the patient a drink and give him enough time to relax before going away [10]. It is very important that the MRI examination will not be a negative experience for the patient. This will help the patients feel safer and calm in case of future MRI scans.

5. Claustrophobia

Claustrophobia is a negative aspect of MRI examinations, with a cost to the patient and the health service as well. Booth and Bell state that around four percent of the patients withdraw from the MRI examinations due to claustrophobia [19]. A negative effect of claustrophobia is the missed appointments, due to defensive avoidance. Furthermore, the diagnosis and treatment of the patient is

delayed, as well as the quality of the examination is decreased, mainly due to motion artefacts. The nature of the magnet bore, with its narrow structure, in conjunction with the noise of the scanner and the immobility of the patient usually creates a feeling of suffocation. Many strategies can be applied to reduce anxiety and claustrophobia, such as music and communication during the examination, MRI simulators for habituation of the patients, audiovisual interventions and information leaflets. These strategies have been proved beneficial in reducing anxiety; however many limitations exist, such as cost and time. Moreover, the use of sedation is still possible, as many claustrophobic patients do not manage to undergo the MRI examination without it. This results in an increased cost of the MRI examination and it also has an inherent risk for the patients. Booth and Bell suggested the use of a questionnaire for predicting claustrophobia before the attendance at the MRI unit. This was found to be a relatively effective way of minimising missed or delayed appointments, however the authors suggested further research [19]. Enders et al. compared the short-bore magnet to the open magnet in terms of claustrophobia. They concluded that, although there is an advantage of open MR systems, the difference is not significant. Therefore, they suggested a more patient-centered environment to reduce claustrophobic events and waste of time [20]. Finally, they also agreed that the claustrophobia questionnaire has a value.

6. Conclusion

MRI is a powerful diagnostic tool with many applications. However, the structure of the magnet bore, in conjunction with the nature of the examination, often cause high anxiety levels to patients. Many patients do not manage to complete the MRI examinations, while many of them experience severe anxiety and affect negatively the diagnostic accuracy of the scan. The role of the MR practitioner is extremely important on these cases, in terms of care, appropriate counselling and patient management. Furthermore, many physical issues can be present during the MRI examinations and the challenge is to successfully overcome them and produce a high-quality MRI scan. Every MR technologist should always be aware of the potential psychological and physical issues of patients undergoing MRI examinations and try to make the procedure as pleasant and painless as possible. Recent developments in both hardware and software packages will certainly help to reduce some serious limitations,

such as acoustic noise and anxiety due to the structure of the magnet. However, despite the valuable contribution of these technological improvements, a patient-centered approach must be always in the center of interest. Hence, it is the MR technologist's responsibility to take

care of the patients and ensure their physical and psychological well-being. **R**

Conflict of interest

The author declared no conflicts of interest.

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