

Clinical Issues

Treatment of Claustrophobia for Cardiovascular Magnetic Resonance: Use and Effectiveness of Mild Sedation

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ABSTRACT

Claustrophobia is associated with cardiovascular magnetic resonance (CMR) due to the nature of the technique and lengthy examination times. We report the incidence and treatment of claustrophobia in a prospective study on the use of intravenous (IV) and oral diazepam for CMR from August 1997 to June 1999 in 1754 adult patients referred for clinical (1226) and research (528) purposes. Patients under 16 yr of age and adults with learning difficulties were excluded. The initial refusal rate of clinical and research patients was 4.2% (54 clinical and 19 research). Because ethical approval to administer diazepam to research patients had not been granted at the beginning of this study, further analysis of the results excludes the 19 research patients. Of the 54 clinical patients, 31 were given IV diazepam (mean dose, 7.5 mg; range, 2.5–20 mg) with successful scanning in 30 (97%). Eight patients refused sedation, and scanning was not possible. The examination was attempted without sedation by five patients in the claustrophobic group and was terminated early; however, sufficient diagnostic information had been acquired in all cases. A further four patients took oral diazepam up to 1 hr before their appointment, with a 100% success rate. Three patients refused to attend the department due to known severe claustrophobia (2) and concerns over gradient noise (1), and three had medical contraindications to diazepam. Therefore, after the administration of diazepam to alleviate claustrophobia, the failure rate decreased to from 54 (4.4% of clinical patients) to 20 (1.6%) patients, a reduction of 63%. When it is possible to give diazepam to patients with claustrophobia at the time of CMR, it is a safe, predictable, and highly effective method of obtaining a successful result. A protocol for the use of diazepam has been developed and is now also approved by our institutional ethics committee for use in research patients.

KEY WORDS: *Cardiovascular magnetic resonance; Claustrophobia; Diazepam; Sedation.*

Editor's Note: This is the first JCMR study published from an SCMR technologist. We look forward to many additional submissions from our technologist colleagues.

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INTRODUCTION

Claustrophobia, the morbid fear of being in an enclosed space, is associated with cardiovascular magnetic resonance (CMR) due to the nature of the imaging technique and the length of the examination. The patient lies within the bore of the scanner, positioned so that the heart is at the center of the imaging field. This invariably means that the patient lies wholly within the bore of the scanner with neither their head nor feet outside, thus increasing the feeling of being confined. In addition, the patient will have their electrocardiogram monitored and may have their blood pressure measured at intervals, adding to the restrictive nature of the examination (1). Claustrophobia and anxiety result in failed examinations and wasted resources, and magnetic resonance imaging has been attributed to the development of long-term claustrophobia requiring treatment in two patients (2,3). Various methods have been described to alleviate the problem, including positioning the patient prone within the bore (4), the use of prismatic glasses enabling the patient to see outside the confines of the scanner, music played through earphones during the examination (5), communication devices (6), oral (7,8) and intranasal (9) anxiolytics, and medical hypnosis (10). In some cases, intravenous or intramuscular sedation has been used (8,9).

Many of these methods are simple and easy to carry out and can be offered to all patients to reduce anxiety levels. However, pharmaceutical and hypnotic methods require advanced preparation and may not be suitable for patients experiencing unexpected claustrophobia without rearranging the patient's appointment or delaying the daily schedule.

METHODS

We report a prospective study of the incidence and response to the offer of sedation to alleviate claustrophobia and the success of subsequent imaging in 1754 patients referred for CMR from August 1997 to June 1999. Patients under age 16 yr and adults with learning difficulties were excluded from the study.

RESULTS

The initial refusal rate of patients, both clinical and research, referred for CMR was 4.2% (54 clinical and 19 research patients). Ethical approval was not available to

give diazepam to patients undergoing CMR for research purposes, and therefore subsequent analysis of the results excludes these 19 patients. In the 54 clinical patients eligible to receive sedation, intravenous (IV) diazepam was administered to 31, with successful CMR being performed in 30 patients, giving a success rate of 97%. Eight patients refused diazepam, and scanning was not possible in these patients. Five patients in the claustrophobic group attempted the scan without sedation and the examination was terminated early, but sufficient diagnostic information had been acquired in all cases, preventing the need for a further study with anxiolysis. Four patients who were aware of existing claustrophobia or who expressed anxiety before arrival in the unit took oral diazepam up to 1 hr before their examination. All four patients successfully completed CMR, giving a 100% success rate within this group.

Three patients refused to attend the department at all due to known severe claustrophobia (2) and concerns over gradient noise (1) and therefore could not be offered sedation. A further three had medical contraindications to the administration of diazepam. Thus, after taking diazepam to alleviate claustrophobia, the failure rate fell from 54 (4.4% of clinical patients) to 20 (1.6%) patients who were unable to undergo CMR, a reduction of 63%. The dose of IV diazepam ranged from 2.5 to 20 mg, with a mean dose of 7.5 mg.

DISCUSSION

The aim of administering diazepam was to achieve anxiolysis rather than deep sedation, because patients often need to cooperate with breathhold techniques during CMR. This has the added benefit of providing a focus and method of control for the patient and of reducing the examination time. Image quality in all sedated patients was very good. After the success of the technique, a protocol was drawn up for the use of sedation to alleviate claustrophobia in patients undergoing CMR (Table 1).

This technique has a high level of patient acceptability. Six patients within the claustrophobic group have had one or more follow-up studies during and since completion of the study. All these patients were happy to undergo further studies with the use of diazepam despite initial concerns over claustrophobia. A further patient who was initially sedated returned for follow-up and successfully completed CMR without sedation. After the introduction of this protocol, ethical approval has been granted at our institution for the administration of IV di-

Table 1*Sedation Protocol for the Safe Administration of Diazepam
Claustrophobic to Patients Undergoing CMR*

- Establish IV access.
- Give 2–20 mg diazepam slowly until the desired level of anxiolysis is achieved.
- Pulse oximetry should be used throughout. Resting PO₂ should be >90%.
- Electrocardiogram should be monitored.
- Patient must not drive home and should be accompanied on public transport.
- Two staff members should be present when sedation is given, and at least one should be a medical doctor.
- Relevant antidote (flumazenil) should be readily available.

azepam to patients giving informed written consent for CMR research studies.

There have been previous reports of the use of benzodiazepine sedation for improvement of the problems associated with CMR. In three reports, oral sedation has been given. Klein (7) reported 100 patients letter using alprazolam to good effect, and this was followed by reports from Moss et al. (9) using intranasal midazolam in 1023 patients and from Murphy and Brunberg (8) using valium, atavan, or xanax in 939 patients. In these reports, however, all patients were undergoing general MR studies. This is the first report of the use of sedation in cardiovascular patients who have problems particular to their diagnosis and the imaging techniques used, notably that sedation must be sufficient to achieve anxiolysis without hindering cooperation with breathholding, which is standard in all patients in our center, or navigator imaging, which can be detrimentally affected by changes in breathing patterns (11) and that patients with impaired ventricular function (approximately 25% of our claustrophobic group) who may be orthopneic must be able to tolerate the medication. In none of our cases was benzodiazepine reversal with flumazenil required, and in no case was a significant change seen in hemodynamic parameters and pulse oximetry. Our results therefore show that light sedation is satisfactory for cardiovascular patients.

CONCLUSION

When it is possible to give diazepam to patients with claustrophobia at the time of CMR, it is a safe, predictable, and highly effective method of obtaining a successful result. It has a high degree of patient acceptability and increases efficiency of patient throughput.

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