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to our attention in this survey, in which case, we will follow up on this issue in a future letter to *AJNR*.

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Technique for RF Isolation of a Pulse Oximeter in a 1.5-T MR Unit

Monitoring sedated or unstable patients during radiographic procedures is a time-consuming but obligatory part of a radiologist's activity. During MR studies, patients are effectively out of sight, and a means of continuous monitoring becomes necessary. Digital oxygen transducers or pulse oximeters can be used to monitor arterial hemoglobin saturation and pulse rate noninvasively. These portable machines frequently are used during surgical procedures, but their operation in a 1.5-T MR unit is limited by their emission of RF radiation, which interferes with the formation of MR images. I have designed a simple technique for RF isolation of a standard pulse oximeter for use in a 1.5-T MR unit.

In standard pulse oximeters, two light-emitting diodes (LEDs), red and infrared, are used to generate dual light beams that are recorded by a photodetector. The relative amount of each color absorbed by the pulsing arterial blood indicates the amount of arterial hemoglobin saturation (Nellcor Inc., Product Information Division, Haywood, CA). A disposable LED sensor is attached to the patient's finger or toe, and its short electrical line is connected to a second electrical line that leads directly to a preamplifier. The final electrical connection is between the preamplifier and the oximeter. My colleagues and I have found it most convenient to place the preamplifier and the oximeter outside the magnet room and to run the electrical line from the LED through a copper pipe in the wall of the magnet room into the main console room. With the LED attached, the patient's hand or foot is wrapped completely in aluminum foil as is the entire electrical line leading to the copper pipe. The part of the copper pipe exposed in the magnet room is also completely wrapped with aluminum foil. The preamplifier and the oximeter are outside the RF-shielded magnet room and need not be wrapped.

A 1.5-T unit will not interfere with the operation of a standard pulse oximeter, but the RF energy emitted from the LED, electrical wire, preamplifier, and oximeter will interfere with the formation of an MR image. I underwent several trials with a pulse oximeter attached to my finger but without the aluminum-foil RF shielding. During these trials, oxygen saturation and heart rate remained accurate during routine MR examinations. No discernible image could be obtained during these studies ("salt and pepper" images) as long as the unshielded oximeter was used. Once the aluminum foil was applied, the images were free of artifact. At our institution, we routinely use a Nellcor N-200 pulse oximeter, which emits a broad spectrum of RF radiation but which has two peaks at 6 and 96 MHz (personal communication, S. Souza, C. Dumoulin, General Electric Corporate Research & Development Center, Schenectady, NY). The wire from the LED is passed directly through a copper pipe in the wall of the magnet room into the control room because we have been unsuccessful with the use of electrical filters in the penetration panel.

In more than 35 clinical studies, we have seen no complications with the use of aluminum foil, and the image quality has been indistinguishable from studies in which the oximeter was not used. Tolerance by the patients has been excellent.

Pulse oximetry is a simple, noninvasive, and reliable method of detecting arterial oxygen saturation, and it rapidly has become an essential tool in monitoring sedated and anesthetized patients. A simple method of RF shielding by using aluminum foil will allow the routine use of a pulse oximeter in a 1.5-T MR unit.

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