

Tissue Expanders and Magnetic Resonance Imaging: The "Hot" Breast Implant

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Magnetic resonance imaging (MRI) utilizes three electromagnetic fields to create images. Despite these electromagnetic fields and concern for patients with metallic implants, studies and clinical experience have demonstrated the safety of this modality in the presence of nonferromagnetic implants. However, little has been written about the use of MRI scans in patients with tissue expanders. We present a case of a woman who developed a burning sensation at the site of her tissue expander during an MRI scan. The sensation resolved rapidly once the scan was discontinued. The potential for metallic heating or motion within the electromagnetic field is discussed. Patients with tissue expanders who require MRI scans should be carefully questioned about localized symptoms in the region of their expander during the scan. However, the actual implications of the symptoms for this group of patients are unclear.

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Magnetic resonance imaging (MRI) is being used with increased frequency in women who have had prior breast implants or expanders placed, usually for subsequent oncological monitoring or for detection of implant rupture [1]. Numerous studies have documented the safety of MRI in the clinical setting following placement of an implant with small metallic components [2, 3]. There has been documentation of temperature changes in the tissues surrounding metallic implants in prior studies, though these changes have not been deemed clinically important [4]. We present a patient who developed localized burning symptoms during an MRI scan in the region of a previously placed metal-containing tissue expander. To our knowledge, this is the first published report of this phenomenon.

Patient Report

A 51-year-old woman with a sarcomatoid breast carcinoma of the right breast underwent a modified radical mastectomy and immediate placement of a tissue expander in the submuscular position. The breast expander was designed to be percutaneously insufflated with saline and was made of medical grade silicone with a metal-backed injection portal. An 800-ml McGhan textured expander (McGhan Medical Corp., Santa Barbara, CA) was used. The procedure and the postoperative recovery were uncomplicated. Her pathology demonstrated two positive nodes and she subsequently underwent multiple cycles of chemotherapy. The chemotherapy was administered through a venous access disk inserted via the left subclavian vein. The disk was made of silicone rubber with a metal-backed portal.

The patient elected to delay placement of a permanent breast implant. She subsequently developed symptoms suggestive of possible central nervous system metastatic disease, and an MRI scan of the brain was ordered approximately 1 year after the original procedure. Soon after the study began, the patient complained of a burning sensation over the area of the expander injection port in the region of the right chest, which was thought to be related to heating of the metal in the expander. The burning swiftly subsided after the scan was aborted. The patient had never experienced any symptoms of burning prior to her MRI scan.

Following the scan the patient had no subsequent symptoms or physical findings in the area involved. She later elected to have the expander removed. The expander was examined and the silicone covering over the metal-backed port was intact. At the patient's request, no attempt at further reconstruction was pursued.

Discussion

At present nearly 2 million American women have breast implants or expanders. MRI scanning

continues to increase in popularity, most likely because of its noninvasive nature and accuracy. The technique has been used with increasing frequency in patients with breast implants to detect implant rupture [1]. It has also been used to facilitate oncological surveillance and to assist in the diagnosis of other postoperative complications such as hematoma [5]. It seems probable that many of these women will seek further diagnostic or imaging evaluations if there is any question regarding implant integrity.

Extensive work has been done to insure the safety of MRI scanning, in general, and in the particular clinical setting involving metallic implants [2, 3, 6]. Given the number of patients with metallic clips from prior surgery, prosthetic orthopedic implants, heart valves, vascular access ports, and numerous other miscellaneous metallic implants and objects, MRI would likely cease to be a useful imaging modality if it were not safe in this very large patient population. The potential risks of performing MRI on patients with metallic implants include conduction of electrical currents, heating of the implant, misinterpretation of an artifact as an abnormality, and the possibility of movement or dislodgement of the metallic implant. These complications are more likely to occur when metals that have ferromagnetic properties are involved [7]. The vast majority of metallic implants used today have nonferromagnetic properties, including the needle stop in the injector port of the expander used in this study. The etiology of the woman's symptoms in the case presented is unclear, although there are a number of possibilities worthy of further discussion.

The potential heating effects of metallic implants by MRI examinations has been studied. Most studies document no temperature rise [8] or very little temperature rise that most authors believe is not clinically important [9]. However, it is theoretically possible for a large heating effect to be induced if there are two implants creating a large conducting path [10]. A conducting path between the needle stop in the injector port of the expander and the metallic casing of the venous access disk in the case presented here might have led to enough local heating for the patient to perceive a burning sensation, although the patient did not complain of any burning at the

site of the subclavian access disk. A similar mechanism would explain another case reported in the literature of an oximeter causing a severe burn on the finger of a patient who had undergone an MRI [11]. This hypothesis is worthy of further investigation.

It is also theoretically possible that the implant may have moved or been deflected by the magnetic field, which may have been perceived as a burning sensation. No studies to date have documented significant deflection forces that would result in movement of nonferromagnetic implants [12]. The situation presented in this case report is somewhat unique, however, due to the presence of a small magnet built into the injection port of the expander that is designed to allow the reconstructive surgeon easier access to the filling port using a small hand-held magnetic pointer. Despite its small size, the potential for movement in the strong magnetic fields created by magnetic resonance scanners would be great, and this localized movement could lead to related symptoms [13, 14].

Numerous patients with a wide variety of metallic implants have had MRI scans with no apparent symptoms referable to the implant. The case presented may be an isolated anomaly or may truly represent a small subset of patients that have discomfort at the site of their implant or expander during scanning. This case suggests that patients with expanders or implants with metallic components may be subject to localized symptomatology during MRI scans, and they should therefore be questioned carefully concerning burning or pain in the vicinity of their implant before, during, and after the scan. The implications of these symptoms for the patients are unknown.

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