MR Evaluation of Breast Implants

Michael S. Middleton, MD, PhD

KEYWORDS

• Breast • MR • Implant • Silicone • Saline • Prosthesis • Rupture • Deflation

KEY POINTS

- Addition of breast implant–related magnetic resonance (MR) imaging to breast cancer–related MR imaging examinations is helpful.
- T2-weighted, fat-nulled, water-suppressed MR imaging is useful to evaluate breast implants and soft tissue silicone.
- Intracapsular rupture can be categorized on MR imaging as being uncollapsed, minimally collapsed, partially collapsed, or fully collapsed.

INTRODUCTION

Breast implant magnetic resonance (MR) imaging is useful to evaluate the integrity of breast implants and to determine the relationship of breast implants to any breast lesions that may be present. Additional uses are to evaluate the amount and distribution of soft-tissue silicone, to estimate implant volume, and to determine breast implant type and manufacturer. Soft-tissue silicone may be present as either a result of silicone gel–filled implant rupture or a direct injection of silicone fluid. Plastic surgeons occasionally need to know the volume of implants currently in place so that the correct size can be ordered for replacement. Knowing the implant type, style, and manufacturer can in some cases help evaluate implant integrity and occasionally can provide device failure information to manufacturers or regulatory agencies, and evidence for class action, personal injury, or patent lawsuits.

Evaluation of Implant Integrity

There is an ongoing need to evaluate breast implant integrity. About 10 times as many implants are placed annually now in the United States as were placed in 1992, when the Food and Drug Administration (FDA) breast implant moratorium was instituted (more than 300,000 sets of implants are currently placed annually in the United States, compared with about 32,000 sets/year in 1992 before the FDA moratorium).[1,2] That moratorium was lifted in 2006, and silicone gel–filled breast implants have been available with FDA approval in the United States since then.[3] Recent investigations of implant integrity have shown that implants placed since 1992 have considerably longer lifetimes than earlier implants.[4–10] However, any device can fail, including currently available breast implants. It has been said that breast implants do not last a lifetime; they have a lifetime, but that expected lifetime is now longer than it used to be.[11] Some women will have implants that remain soft and symptom-free forever, but there is a risk for problems such as pain, change of breast size or shape, capsular contracture, implant rupture, extrusion of soft-tissue silicone from a ruptured implant into breast and possibly surrounding soft tissue, and development of silicone granuloma. Patients now considering breast implants are informed that implant rupture can occur, that implants are not considered lifetime devices, and that reoperation may be necessary.[12,13] Furthermore, women with implants are advised to have

Disclosure: Consultant to Allergan.
Department of Radiology, UCSD School of Medicine, 410 West Dickinson Street, San Diego, CA 92103-8749, USA
E-mail address: msm@ucsd.edu

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an MR imaging examination to check for implant rupture 3 years after placement and then every 2 years thereafter, even if they are not having symptoms, as well as to check whether any new symptoms might be due to rupture, whenever that may be needed.[12,13] It is the author's opinion that checking asymptomatic breast implants with MR imaging every 2 years is too frequent, and that the above-noted advice for biennial MR imaging is based, at least in part, on published high-rupture prevalences of older, less durable implants.[10] Putting aside the question of how frequently MR imaging to check for silent implant rupture is necessary, current FDA-approved manufacturer recommendations support the use of MR imaging to check breast implants for rupture.

There is no definitive proof that silicone implants cause other disease (including cancer), or that implant rupture (in addition to just implant presence) is a factor in that process, despite claims (and lawsuits) since the 1970s to that effect. Studies have not shown a strong association of breast implants with cancer or severe autoimmune disease.[14–16] Patients considering breast implants are informed that current infection, existing cancer or precancer that has not been adequately treated, current pregnancy, and nursing are contraindications to breast implants, and also that safety and effectiveness have not been established in patients with autoimmune disease such as lupus or scleroderma, conditions or medications that interfere with wound healing or blood clotting, reduced blood supply to breast or overlying tissue, ongoing radiation therapy, and certain mental health problems.[12,13]

Relationship to Breast Lesions

In addition to evaluating breast implant integrity, there is also an ongoing need to evaluate the relationship of breast implants and their complications to any breast lesions that may be present.

For patients who are having a contrast-enhanced MR imaging examination for any breast cancer–related reason, addition of breast implant–related imaging should be considered for two reasons. First, breast implant–related complications can mimic breast cancer, just as breast cancer can mimic breast implant–related complications. Second, on a breast cancer–related MR imaging examination, breast surgeons want to be aware of implant-related problems to help avoid complications at surgery and also to have the option to take care of both problems at the same time. Examples of problems that could complicate surgery are capsular contracture, old hematoma, implant rupture, soft-tissue silicone gel or silicone granuloma, proximity of a lesion to be biopsied or removed surgically to a breast implant, and actual cancer involvement of the fibrous capsule.

For patients who are having a noncontrast breast implant–related MR imaging examination, the possible addition of contrast-enhanced MR imaging sequences to look for breast cancer should be considered. Miglioretti and colleagues[17] found that the presence of breast implants increases the likelihood that breast cancer will not be evident on mammography and therefore the presence of breast implants should be taken into account in decisions of whether to add contrast-enhanced sequences to look for breast cancer, because the presence of implants makes it more likely that breast cancer, if present, will not be detected in mammography.

Soft-Tissue (Extracapsular) Silicone

When silicone gel–filled breast implants rupture, silicone gel can extrude outside the implant fibrous capsule into surrounding soft tissues; when that happens, it is often referred to as "extracapsular" silicone. (The term "intracapsular silicone" refers to silicone gel that is contained within the implant fibrous capsule.)

Silicone fluid was injected directly into breast tissues before and for several years after breast implants became commercially available in the United States in 1964.[18] Occasionally this procedure is still performed in other countries and also rarely in the United States by nonphysician practitioners. These patients' breasts harden over time, and many have undergone subcutaneous mastectomy with implant replacement. Infiltrated silicone (which is not firm and is usually undetectable to palpation) is virtually always present in these cases, even though operation reports often will state that all of it has been removed. The only way to remove all infiltrated silicone fluid would be to remove the tissues in which it resides, which would often require extensive surgery that in practice is not done; only the portion that has become firm or hard (ie, silicone granuloma) is removed. Hence, when these patients present for MR imaging evaluation, infiltrated silicone fluid remaining from prior injections is seen in the breast and often also in other nearby soft tissues including the pectoralis muscles, along with any implants that have been placed. Typically, silicone in soft tissues completely blocks ultrasound transmission and results in extensive overlying density on mammography, which interferes with lesion detection. Although injected silicone is not thought to cause breast cancer, it can prevent early detection, and so sometimes these patients' only hope of early