Is it safe to have a screening MRI because of the gadolinium injection?

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Mammograms are an important part of my yearly check-up. Mammography is the most widely used tool for screening for breast cancer. Screening exams are important tests to find disease before a woman develops symptoms of the breast cancer. Many scientific studies showed that mammography reduced the number of women who die from breast cancer by 30%. However, other tests, in addition to a mammogram are recommended in women who are at high risk; defined as greater than 20% chance of developing breast cancer in their lifetime. In these women, a mammogram and an MRI are recommended as a part of their annual check-up of their breasts. A MRI scanner uses magnetic fields and radio waves to make 3D images of the breast. Often, MRI exams also use a contrast dye (gadolinium) that is injected into a vein. This contrast dye is sometimes called a contrast medium or a contrast agent. This dye gets preferentially picked up by breast cancers because there are more blood vessels feeding the tumor. The dye enhances the detail and clarity of the MRI pictures. The cancers will appear as white spots, standing out, in contrast to the normal breast tissue. Gadolinium allows a radiologist, a doctor trained to look at these images, to more accurately report whether there is any disease within the breasts. Although MRI is the most sensitive exam, concerns have been raised about whether this contrast dye is safe.

What is gadolinium?

The gadolinium based contrast agent is a complex molecule formed by a metal ion and a carrier molecule. A molecule is a chemical substance that contains a bunch of atoms arranged in a particular order and held together by chemical bonds. Gadolinium is a chemical element that moves within a magnetic field. It is this movement that makes certain tissues or diseases more clearly visible in the MR pictures. Gadolinium can be toxic, so it is bonded with a carrier molecule to make it safe for use during an MRI scan. In the gadolinium contrast media, chemical bonds are formed between a gadolinium ion and a carrier molecule called a chelating agent. Chelating originates from the Greek word

"claw," meaning "to trap," and that's what chelating agents do. They form a ringed structure that binds to gadolinium and prevent it from interacting with other molecules within our body. This contrast dye is injected into a vein as part of an MRI scan, and eliminated from the body through the kidneys. Different brands of gadolinium contrast agents use different chelating molecules.

Will I feel anything when I have a gadolinium contrast injection?
The injection of the contrast dye takes between 10 and 30 seconds. The MRI technologists will inform the patient when they are about to inject the contrast medium. Most patients do not notice any symptoms. A few patients will report a transient cold sensation at the injection site, which is of no significance. Rare symptoms, occurring less than 1 in 100 injections, include mild nausea, vomiting, dizziness or a headache. These reactions are brief, apparent within a few minutes after the contrast injection. The MRI technologists are trained to take care of these symptoms. They resolve without treatment, or with an analgesic for the headache.

What are the risks of gadolinium contrast medium injections?
Gadolinium based contrast agents are generally considered very safe. Aside from the brief symptoms discussed above, even more uncommon side effects include allergy-like reactions and nephrogenic systemic fibrosis. A skin rash may develop a few minutes after the injection of the dye, in approximately 1 in 1000 patients. This rash is a mild allergy that resolves on its own, or with allergy medicine. Severe allergic reactions to the gadolinium contrast agent are extremely rare, occur in approximately 1 in every 10,000 people. They may develop difficulty breathing and swelling of the lips and mouth. Fortunately, these symptoms generally respond very well to standard emergency drug treatment, similar to those given to treat other severe allergic reactions. Nephrogenic systemic fibrosis (NSF) is a rare disease that occurs mainly in people with pre-existing advanced kidney disease. The symptoms include swelling and tightening of the skin and internal organ damage. It occurs in a minority of patients with severe kidney disease. The gadolinium contrast medium has been identified as a trigger for developing this disease. This increased risk may be related to the reduced ability of the kidneys to remove the contrast dye from the bloodstream if a patient has pre-existing kidney disease.

For this reason, patients will be asked questions about possible kidney disease as part of the safety screening questionnaire before the MRI scan.

Deposits of gadolinium in the brain

New research has found residual gadolinium in the brains of patients who have had many contrast-enhanced MRI exams. Patients with these deposits have no symptoms, so we don't know what the clinical significance, if any, of this finding is. The gadolinium may remain in the brain for years and the long-term effects are unknown. This is an active area of research.

What are the benefits of gadolinium contrast medium injections?

MRI exams enhanced by gadolinium contrast agents have been used to diagnose disease and to guide treatment in more than 100 million patients worldwide over the past 25 years. The gadolinium contrast medium improves the quality of MR images by altering the magnetic properties of nearby water molecules in the body. This improves the diagnostic accuracy of the MRI scan and allows your doctor to see the internal structures in your body. For example, it improves the clarity of inflammation, infections, tumors, and provides critical information about the blood supply for some organs.

Bottom line – is gadolinium safe to use?

Gadolinium based contrast agents were approved by the FDA in 1988. After more than 400 million doses of gadolinium, there has been no evidence of problems resulting from gadolinium injections. In fact, there is a lot of evidence that shows that gadolinium is safe to use. Breast MRI is the most powerful tool and provides life-saving medical information. A contrast-enhanced breast MRI exam is the most sensitive tool we have to detect breast cancer. Talk to your doctor to learn more about your risk for breast cancer and see if the benefits outweigh the risks for you to have a screening breast MRI exam.

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