



## **Use of MRI as an Alternative to Fluoroscopy**

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Of the primary imaging modalities (radiography, ultrasound, computed tomography, nuclear medicine, magnetic resonance), magnetic resonance imaging (MRI) is the most novel of the five used today. Despite the longer time and higher costs, which limit its use, the lack of ionizing radiation makes MRI attractive. For this reason, many research initiatives are aimed at expanding the role MRI has in modern medicine.

MRI has found success in replacing at least some fluoroscopic diagnostic studies. Although it is unlikely that MRI will soon replace fluoroscopic guidance for most invasive procedures, recent work is highlighted below.

### **MRI ALTERNATIVES FOR DIAGNOSTIC FLUOROSCOPY**

Most diagnostic procedures performed using fluoroscopic imaging are unlikely to be replaced by MRI, but MRI is beginning to replace certain procedures (e.g., conventional angiograms, defocography). Other procedures are primarily in the research phase (e.g., swallowing studies, cystourethrogram), although human studies offer promise for their utilization in the not-too-distant future.

#### **Diagnostic Angiography**

Just as computed tomography (CT) angiography has supplanted purely diagnostic fluoroscopic angiography, both contrast- and non-contrast-enhanced MR angiography (MRA) now play an active role in assessment of vasculature patency and pathologies. MRA is seeing use throughout the body, with modern day use and research spanning neurologic, cardiac, thoracoabdominal and extremity vascular evaluation. Furthermore, novel processing algorithms are being refined to provide additional clinically relevant metrics (e.g., perfusion time, flow turbulence, etc.).

## REFERENCES/FURTHER READING

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### **Other**

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### **Defecography**

Primarily used to evaluate for prolapse and pelvic musculature, defecography has historically been a primarily fluoroscopic study. Today, in centers with equipment capable of conducting the study, MR defecography can be substituted, providing much more information that fluoroscopic evaluation cannot provide.

### **References/Further Reading**

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### **Swallow Evaluation**

With the expansion of speech-language pathology as a field, the video-fluoroscopic swallowing study (VFSS) is a relatively common procedure. Although in its infancy, real-time MR swallow evaluation is a promising field, improving VFSS by removing ionizing radiation and providing axial plane evaluation. The latter may obviate the need for flexible endoscopic evaluation. Interestingly, pineapple juice, with its inherently high manganese content, provides an optimal (and more palatable) oral contrast agent.

## References/Further Reading

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## Voiding Cystourethrogram

Between nuclear radionuclide cystography and fluoroscopic voiding cystourethrogram, evaluation of the genitourinary system for reflux involves some form of radiation. As most of these studies are conducted in children, MR cystourethrograms are a novel technique, primarily in the research stages, that may help reduced fluoroscopic studies.

## References/Further Reading

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## MRI alternatives for interventional procedures

Primarily in the research stages, both non-vascular and vascular interventions using MRI exist.

### *Body/Non-catheter-directed procedures*

With the possible exception of breast mass biopsy/localization in a handful of centers, routine use of MR-guidance for non-catheter interventions is not routine. Exciting human studies, primarily in biopsy localization, offer future promise.

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## Catheter-directed procedures

Catheter-based cardiac interventions (e.g., congenital abnormalities, ablative procedures) are the most well-documented examples of an MR-based, catheter-directed procedure. Human studies primarily exist in cardiac applications.

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