Beware of artifacts in orbital magnetic resonance imaging

Dandu R Varma, Sandeep Ponnaganti1, Rithika V Dandu2

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Orbital magnetic resonance imaging (MRI) is plagued by many artifacts, that sometimes closely mimic pathology.1 We review the most common artifacts in clinical practice.2

Motion artifacts
Optic neuritis is characterized by T2 hyperintensity of the optic nerves [Fig. 1a]. Similar changes can also be produced by motion artifacts [Fig. 1b], which are recognizable by the associated blurring of nerve outlines and ghosting [Fig. 1b and c]. Repeating the scan with the patient fixing the gaze removes these artifacts [Fig. 1d].

Partial volume artifacts
Signal changes similar to optic neuritis [Fig. 2a] can occasionally be seen in normal optic nerves [Fig. 2b]. This occurs when the nerves are tortuous and the MR section includes adjacent fat, which artifactually increases signal in the nerve [Fig. 2c]. Fat suppressed sequences [Fig. 2d] are immune to this artifact.

Similar phenomena can affect the extraocular muscles. Extraocular muscles are enlarged and show T2 hyperintensity.

Consultant Neuroradiologist, Citi Neuro Centre, 1Fellow in Neuroradiology, Citi Neuro Centre, Hyderabad, Telangana, 2Department of Electronics and Communications Engineering, RV College of Engineering, Bangalore, Karnataka, India

Correspondence to: Dr. Dandu R Varma, Department of Neuroradiology, Citi Neuro Centre, MLA Colony, Road No 12, Banjara Hills, Hyderabad - 500 034, Telangana, India
E-mail: varmaji@rediffmail.com

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Susceptibility artifact

Signal changes produced by disorders affecting the inferior rectus muscle, such as myositis [Fig. 4a] can occasionally be seen on fat saturated sequences, in individuals with metallic dental implants [Fig. 4b]. Disturbance of the magnetic field along the floor of the orbit by dental implants or air in the maxillary sinus interferes with fat saturation and creates a false appearance of edematous changes [Fig. 4c]. The artefact is recognizable as it extends beyond the muscle boundaries and is worst inferiorly. A similar artefact can be seen when the patient uses eye makeup (mascara) containing metallic iron particles.

Chemical shift artifact

The appearance of tumor deposits along the optic nerve [Fig. 5a] can be seen even in normal individuals [Fig. 5b] as the so-called “Chemical shift artifact.” This artifact is typically seen at the interface between fluid and fat containing structures (such as optic nerve and retroorbital fat) as a band of dark signal intensity on one side (along the frequency encoding direction). This is caused by “mis-mapping” (shift) of the signal from retroorbital fat, in relation to the perioptic fluid [Fig. 5c]. Fat suppressed sequences [Fig. 5d] are immune to this artifact.

This artifact is also seen at the margin of fat containing structures surrounded by fluid (e.g., silicone oil in the globe or intracranial lipomas) and fluid containing structures surrounded by fat (e.g., cysts or hemangiomas within the retroorbital fat). Presence of this artifact gives vital clues in the diagnosis of these conditions.
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References
1. Brown BA, Swallow CE, Eiseman AS. MRI artifact masquerading as orbital disease. Int Ophthalmol 2001;24:343-7.
2. Herrick RC, Hayman LA, Taber KH, Diaz-Marchan P, Kuo MD. Artifacts and pitfalls in MR imaging of the orbit: A clinical review. Radiographics 1997;17:707-24.