

MRI Artefacts

Like all medical imaging methods, MRI is prone to artefacts; it is important that these are understood so that their impact can be minimised. MRI artefacts can be discussed under distinct categories:

(a) Physics. These include magnetic susceptibility artefacts, often around tissue/air interfaces, and chemical-shift artefacts, at fat/water boundaries. They can be mitigated by manipulation of gradient strengths and directions, and sampling bandwidths.

(b) Hardware. These include RF or gradient miscalibration or instability, leading to image shading and ghosting; RF interference, causing zipper artefacts; and gradient nonlinearity, causing geometric distortion. Artefacts can be addressed by careful calibration and quality control procedures, and by post-processing.

(c) Pulse sequences. This includes aliasing and slice-overlap shading (slice cross-talk); these can be reduced by careful setting of gradient directions and acquisition parameters. Other artefacts are related to signal sampling and Fourier transformation, including Gibbs ringing artefacts at boundaries.

(d) Physiological. Artefacts can arise due to motion of the heart, or of abdominal organs during breathing. Mitigation is by gating, breath-holding and the use of rapid pulse sequences. Involuntary motion such as peristalsis in the gut can also lead to ghosting artefacts, which can be reduced by pre-scan medication and by ultra-rapid pulse sequences.