

# Neuro Zti implant – designed for MRI

*Magnetic Resonance Imaging (MRI) is a well-established technique used in clinical settings around the world to provide professionals with valuable diagnostic and prognostic information about a patient's health. Users of the Oticon Medical Neuro Zti can be reassured that their implant will not stop them undergoing this type of scan.*



## MRI and CI patients

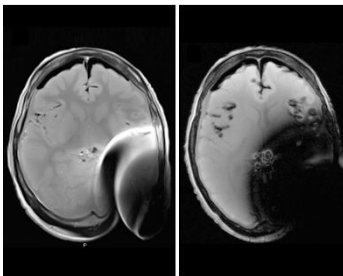
MRI scans are an established diagnostic tool used for body, as well as brain scans, ranging in strength from 0.2 Tesla to 7 Tesla. Recent estimates show that around 79% of MRI scanners in use around the world are 1.5 Tesla, making this the most common type by far<sup>1</sup>.

The Neuro Zti implant is fully compatible with 1.5 Tesla scans with the magnet in place for both body and head scans. The implant has been designed to ensure this type of scan is safe and painless and does not produce 'magnet flip' as the magnet is held firmly in place by the rigid implant structure<sup>2</sup>. This means it can't dislodge and remains locked in even after multiple MRI exams, while the implant itself remains stable throughout the MRI scan thanks to a unique screw fixation system that securely attaches it to the bone. This has been confirmed by an independent study from Berlin<sup>3</sup>. Furthermore, if needed, the implant structure of the Neuro Zti is designed for easy magnet removal.

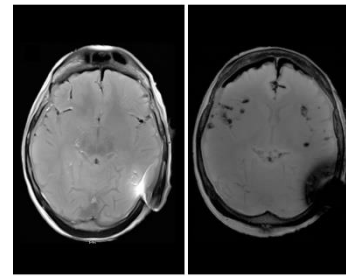
## Why radiologists often want the magnet removed regardless of Tesla strength

Brain scans account for 20-25% of MRI scans among people worldwide<sup>1,4,5</sup>. For CI patients, this figure increases to 49%<sup>6</sup>, making brain scans the most common MRI exams they are likely to undergo. For this reason, it's important to understand how an MRI scan affects a cochlear implant – and also how the images are affected by the magnet.

Leaving the implant magnets in place during head scans of either 1.5 Tesla or 3 Tesla can usually influence the image quality. The magnet may create artefacts that distort the result and prevent reliable diagnosis. This is even more common in scans of 3 Tesla because of the additional magnetic strength. See figure 1.



*Figure 1*  
Example of MR image of head at 1.5T (left) and at 3T (right) with magnet in situ<sup>7</sup>.



*Figure 2*  
Example of MR image of head at 1.5T (left) and 3T (right) after magnet removal with non-magnetic spacer in situ<sup>7</sup>.

In fact, when asked radiologists stated that they could not make an accurate diagnosis from images scanned with 3 Tesla with the magnets in place because of the interference created by the magnets<sup>7</sup> (see table below). This can be clearly seen on figure 1 of the MRI head scan, where the magnet creates artefacts. When this happens, the magnet has to be removed. For this reason, its ease of removal is an important factor when considering an implant.

**Summary of the visibility of the rated anatomical structures at the side of the cochlea implant; with and without magnet at 1.5T and 3T.**

| Anatomical structure implanted side | 1.5T MR magnet in situ | 1.5T MR without magnet | 3T MR magnet in situ | 3T MR without magnet |
|-------------------------------------|------------------------|------------------------|----------------------|----------------------|
| temporal lobe                       | limited assessable     | assessable             | not assessable       | assessable           |
| parietal lobe                       | limited assessable     | assessable             | not assessable       | limited assessable   |
| occipital lobe                      | limited assessable     | assessable             | not assessable       | limited assessable   |
| vermis cerebellaris                 | not assessable         | assessable             | not assessable       | assessable           |
| lobus cranialis cerebelli           | not assessable         | assessable             | not assessable       | limited assessable   |
| pedunculus cerebellaris medius      | not assessable         | assessable             | not assessable       | assessable           |
| cerebellopontine angle              | not assessable         | assessable             | not assessable       | assessable           |
| internal auditory canal             | not assessable         | assessable             | not assessable       | assessable           |
| cochlea                             | not assessable         | assessable             | not assessable       | assessable           |
| vestibulum                          | not assessable         | assessable             | not assessable       | assessable           |
| semicircular canals                 | not assessable         | assessable             | not assessable       | assessable           |
| brain stem                          | limited assessable     | assessable             | not assessable       | assessable           |

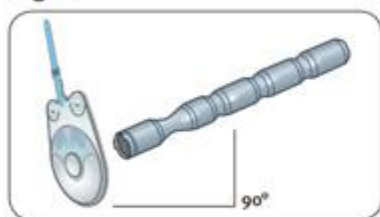
Ref: Wagner, F., Wimmer, W., Leidolt, L., Vischer, M., Weder, S., Wiest, R., Mantokoudis, G. and Caversaccio, M.D., 2015. Significant artifact reduction at 1.5 T and 3T MRI by the use of a cochlear implant with removable magnet: an experimental human cadaver study. *PloS one*, 10(7), p.e0132483.

**Neuro Zti – direct, easy and quick magnet removal**

The Neuro Zti is 3 Tesla compatible without magnet and is designed for easy magnet removal under local anesthesia with only a small skin incision. The implant is attached using screws and not drilled into the skull. With the dedicated Oticon Medical surgical tool, the magnet is removed in a few steps and can then be replaced again after the scan.

*The dedicated surgical tool simplifies magnet removal*

**Figure 1**



**Figure 2**



**Figure 3**



**Hold with fingers,  
lock the extractor tool and pull**

Furthermore, the Neuro Zti implant magnet can be removed multiple times without damaging the body of the implant. This can be an issue for CI magnets cased in silicone that can loosen over time causing the magnet to flip and migrate<sup>8</sup>. For younger cochlear implant patients who are likely to undergo several MRI scans during their lifetime, ease of removal should be part of the decision making process when choosing an implant system.

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7. Wagner, F., Wimmer, W., Leidolt, L., Vischer, M., Weder, S., Wiest, R., Mantokoudis, G. and Caversaccio, M.D., 2015. Significant artifact reduction at 1.5 T and 3T MRI by the use of a cochlear implant with removable magnet: an experimental human cadaver study. *PloS one*, 10(7), p. e0132483.
8. F. Hassepass<sup>1</sup>, V. Stabenau<sup>1</sup>, S. Arndt<sup>1</sup>, R. Beck<sup>1</sup>, S. Bulla<sup>2</sup>, T. Grauvogel<sup>1</sup>, A. Aschendorff: Magnet Dislocation: An Increasing and Serious Complication Following MRI in Patients with Cochlear Implant