Magnet displacement following MRI scans in Cochlear implant recipients : Potential for major harm

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Introduction

UK NICE guidelines recommend Cochlear Implants for severe to profound deafness not helped by acoustic hearing aids¹. 80% of Implants used at University Hospitals Birmingham are from Cochlear. Following a serious of safety incidences in which patients were found to have displaced magnets from implants following routine MRI scan at our centre as well as other national centres we decided to audit outcomes of patients with all types of Cochlear implant undergoing MRI scans.

Aim

To assess the incidence of cochlear implant magnet displacement during routine MRI scans and its associated morbidity.

Methods

Study Design: Retrospective Audit

Setting: University Teaching Hospital

Inclusion: All patients with Cochlear implants undergoing any routine MRI scans

Exclusion: Preoperative planning MRI scans

Time period: October 2007 to November 2017

Data points:

- 1) Type of implant
- 2) MRI scan – Type, Model, Strength
- 3) Application of Protocol for protecting implant

Outcome:

- 1) Incidence of magnet displacement – determined by symptoms of pain and XRAY
- 2) Need for Revision Surgery

Ethical approval: Not required

Results

Total number of MRIs	485
Scans with implants insitu:	32
• Cochlear	14
• ABI	2
• BAHA	16
Female:Male	20:12

Table 1: 485 scans were analysed over the 10 year time-period. 14 MRI scans performed Post-Cochlear implants (10 Cochlear™, 4 Med-EL™).

Figure 1: Increasing number of MRI scans performed in patients with Auditory implants over 10-year time period.

Total number of scans in Post-Cochlear Implant patients	14
• Cochlear™ Ltd	10
• Med-EL™	4
Number of patients with displaced Cochlear™ implants	5 out of 10 (2010-2017)
Male : Female	4:1
Mean Age at time of MRI scan	55 years
Right : Left	3:2
Pain reported:	
• At time of scan	0 of 5
• Post-scan	2 of 5
• XRAY performed to check magnet position	5 of 5

Table 2: MRI scans post-Cochlear™ Implant causing displacement between 2010-2017. 5 of 10 patients had magnet displacement. No patients reported pain during the scan but two reported pain post-scan. All patients had an XRAY to check for magnet position. A further 4 patients with implants from other companies including Med-EL™ did not experience displacement. All scans were 1.5 Tesla.

Outcomes following MRI scans in Cochlear Implant Patients

Figure 2: 40% (4/10) of patients required revision surgery to correct the displaced magnet over the 10-year time period. One patient had displacement identified which settled with conservative measures.

Figure 3: Variation in the application of the splint protocol from Cochlear™ Limited². Indications for MRI scans varied from MRI head, abdomen, pelvis, IAM, or spine.

Conclusion

- There is a moderate risk of harm during MRI scans in patients with Cochlear™ implants.
- A significant number required revision surgery.
- Pain is not a reliable indicator of displacement.
- The angle/type of scan does not affect outcome.
- The cause may be an inadequate splint protocol:
  - Loose bandages/Lack of tension
  - Inadeqaute splints
- These findings are consistent with national (CBIG UK communication) and published reports of magnets in Cochlear™ implants being displaced³.

Future

- Risk vs Benefit awareness when requesting scans and counselling patients.
- Application of new splint protocol released by Cochlear™ using tension markers as guide.
- Re-audit. All centres should monitor and share findings for ongoing quality improvement.

Figure 4: New Splint protocol from Cochlear™ Ltd with tension markers to guide splint & bandage application released December 2017.

References

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3. Carlson ML, Neff BA, Link MJ, Lane JI, Watson RE, McGee KP, Bernstein MA, Driscoll CL. Magnetic resonance imaging with cochlear implant magnet in place: safety and imaging quality. Otolology & Neurotology. 2015 Jul 1;36(6):965-71.

Conflicts of Interest: None