Dentomaxillofacial Radiology (2016) 45, 20150187

birpublications.org/dmfr

LETTER TO THE EDITOR

Effect of magnetic resonance imaging on microleakage of amalgam restorations: an *in vitro* study

Dentomaxillofacial Radiology (2016) **45**, 20150187. doi: 10.1259/dmfr.20150187

Cite this article as: Mortazavi SMJ, Paknahad M. Effect of magnetic resonance imaging on microleakage of amalgam restorations: an *in vitro* study. *Dentomaxillofac Radiol* 2016; **45**: 20150187.

To the Editor

With great interest, we have read the article by Shahidi et al[1] entitled "Effect of magnetic resonance imaging on microleakage of amalgam restorations: an *in vitro* study" that is published in *Dentomaxillofacial Radiology*. The first report on the role of exposure to MRI or microwave radiation emitted by mobile phones in enhancing the release of mercury from dental amalgam restoration was published in 2008.[2] Furthermore, Mortazavi et al[3] have recently studied the effects of stronger magnetic fields and provided further support for the adverse effect of MRI in increasing the release of mercury from dental amalgam fillings. It is worth mentioning that results obtained in studies[1,4] performed on the role of exposure to electromagnetic fields (EMFs) in MRI on the microleakage of amalgam, including the study conducted by Shahidi et al[1] are strongly in line with these findings.[1,4] Shahidi et al[1] in their article evaluated the effects of magnetic fields of MRI on microleakage of amalgam restorations. They found higher microleakage scores in amalgam restorated teeth which were exposed to MRI procedures. Interestingly, these authors clearly stated that the increase in microleakage following MRI might be attributed to the thermoelectromagnetic convection induced by exposure to EMFs that was supposed to be responsible for the enhancement of the diffusion process, grain boundary migration and vacancy formation resulting in microleakage. However, some researchers[5–7] believe that no conclusive evidence exists to prove such temperature changes following common MRIs. Görgülü et al[5] evaluated the heating and magnetic field interactions of fixed orthodontic appliances with different wires and ligaments in a MRI environment. The temperature changes of the specimens were considered to be within acceptable ranges. None of the groups exhibited excessive heating (the highest temperature change was 3.04 °C).[5] Similarly, Ayyıldız et al[6] evaluated the heating and magnetic field interactions of fixed partial dentures in a 3.0-T MRI environment. The study findings indicated that patients with fixed partial dentures (single crown or bridge) fabricated from Co–Cr, Ni–Cr and zirconia substructures may safely undergo MRI at up to 3.0-T magnetic field strengths. In their study, none of the groups exhibited excessive heating (mean temperature change of <1.4 °C).[6] Regier et al[7] stated that the radiofrequency-induced heating of orthodontic brackets for all orthodontic appliances during high-field MRI at 3.0 T can be categorized as negligibly low and temperature elevations ranged from -0.3 °C to 0.2 °C. Therefore, it seems that the magnitude of temperature increase was not high enough to justify this theory. Hence, finding alternative mechanisms such as accelerated corrosion due to galvanic effect for explaining the increased microleakage of amalgam will be critical for better understanding of phenomena such as microleakage and increased mercury release from dental amalgam fillings after exposure to EMFs.

S M J Mortazavi[1,2], Maryam Paknahad[3]

[1]*Non-Ionizing Radiation Department, Ionizing and Non-ionizing Radiation Protection Research Center (INIRPRC), Shiraz University of Medical Sciences, Shiraz, Iran*

[2]*Medical Physics and Medical Engineering Department, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran*

[3]*Department of Radiology, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran*

Correspondence to: Dr Maryam Paknahad. E-mail: paknahadmaryam@yahoo.com

(The Editors do not hold themselves responsible for opinions expressed by correspondents)

Received 4 June 2015; accepted 28 July 2015

References

1. Shahidi SH, Bronoosh P, Alavi AA, Zamiri B, Sadeghi AR, Bagheri MH, et al. Effect of magnetic resonance imaging on microleakage of amalgam restorations: an *in vitro* study. *Dentomaxillofac Radiol* 2009; **38**: 470–4. doi: 10.1259/dmfr/30077669
2. Mortazavi SMJ, Daiee E, Yazdi A, Khiabani K, Kavousi A, Vazirinejad R, et al. Mercury release from dental amalgam restorations after magnetic resonance imaging and following mobile phone use. *Pak J Biol Sci* 2008; **11**: 1142–6. doi: 10.3923/pjbs.2008.1142.1146
3. Mortazavi SM, Neghab M, Anoosheh SM, Bahaeddini N, Mortazavi G, Neghab P, et al. High-field MRI and mercury release from dental amalgam fillings. *Int J Occup Environ Med* 2014; **5**: 101–5.
4. Yilmaz S, Misirlioglu M. The effect of 3 T MRI on microleakage of amalgam restorations. *Dentomaxillofac Radiol* 2013; **42**: 20130072. doi: 10.1259/dmfr.20130072
5. Görgülü S, Ayyildiz S, Kamburoğlu K, Gökçe S, Ozen T. Effect of orthodontic brackets and different wires on radiofrequency heating and magnetic field interactions during 3-T MRI. *Dentomaxillofac Radiol* 2014; **43**: 20130356. doi: 10.1259/dmfr.20130356
6. Ayyıldız S, Kamburoğlu K, Sipahi C, Murat S, Görgülü S, Pişkin B. Radiofrequency heating and magnetic field interactions of fixed partial dentures during 3-tesla magnetic resonance imaging. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2013; **116**: 640–7. doi: 10.1016/j.oooo.2013.06.035
7. Regier M, Kemper J, Kaul MG, Feddersen M, Adam G, Kahl-Nieke B, et al. Radiofrequency-induced heating near fixed orthodontic appliances in high field MRI systems at 3.0 Tesla. [In German]. *J Orofac Orthop* 2009; **70**: 485–94. doi: 10.1007/s00056-009-9923-0