LETTER TO THE EDITOR

Effect of orthodontic brackets and different wires on radiofrequency heating and magnetic field interactions during 3.0-T MRI

Dentomaxillofacial Radiology (2016) **45**, 20150266. doi: 10.1259/dmfr.20150266

Cite this article as: Mortazavi SMJ, Paknahad M. Effect of orthodontic brackets and different wires on radiofrequency heating and magnetic field interactions during 3.0-T MRI. *Dentomaxillofac Radiol* 2016; **45**: 20150266.

To the Editor,

We have read the article by Görgülü et al¹ entitled “Effect of orthodontic brackets and different wires on radiofrequency heating and magnetic field interactions during 3-T MRI” that is published in *Dentomaxillofac Radiol* 2014; 43: 20130356. Görgülü et al¹ in their article evaluated the heating and magnetic field interactions of fixed orthodontic appliances with different wires and ligaments in a 3.0-T MRI environment and estimated the safety of these orthodontic materials. They found maximal temperature elevation of 3.20 °C in their experiment. Interestingly, these authors clearly stated that the temperature changes of the specimens were considered to be within acceptable ranges. It is worth mentioning that the maximum temperature rise produced during a MRI session with a given specific absorption rate can be calculated from:

$$T = (\text{SAR} \times t) / C_H$$

where T is the temperature rise in degree Celsius, SAR is the specific absorption rate (in W kg^{-1}), t is the duration of exposure (in seconds) and C_H is the heat capacity of the sample (in $\text{J kg}^{-1} \text{°C}$). Considering this equation and the data provided by the authors in table 1, T can be calculated as follows:

$$T = (1.8 \times 148) / 3470 = 0.025 \text{°C}$$

It should be noted that the typical value for the heat capacity of human soft tissue is $3470 \text{ J kg}^{-1} \text{°C}$.

Therefore, the authors should explain why they found a maximum temperature rise of 3.20 °C. They declared that brackets can be considered “MR safe”.¹ However, other researchers^{2–4} found lower temperature changes following common MRIs. Yassi et al⁴ evaluated the thermal effects induced by MRI on certain metallic devices used in orthodontics. They showed a very moderate increase in temperature of the materials during MRI exposure, *i.e.* <1 °C. Similarly, Ayyıldız et al² evaluated the heating and magnetic field interactions of fixed partial dentures in a 3.0-T MRI environment. In their study, none of the groups exhibited excessive heating (mean temperature change of 1.4 °C).² Regier et al³ stated that the radiofrequency-induced temperature elevations for all imaging sequences of orthodontic brackets for all orthodontic appliances during high-field MRI at 3.0 T can be categorized as negligibly low with maximal temperature elevation of 0.2 °C. Therefore, it seems that the magnitude of temperature increase reported by Görgülü et al¹ is not rational. However, as most proteins denature at elevated temperatures, a maximum temperature rise of 3.20 °C can induce detrimental effects in adjacent tissues in the oral cavity.

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

Received 10 August 2015; accepted 23 September 2015

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