Radiology Case Reports 15 (2020) 2569–2571

Available online at www.sciencedirect.com

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journal homepage: www.elsevier.com/locate/radcr

Case Report

Thigh burn – A magnetic resonance imaging (MRI) related adverse event ☆

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ARTICLE INFO

Article history:
Received 23 August 2020
Revised 22 September 2020
Accepted 25 September 2020

Keywords:
Magnetic resonance imaging
Second-degree burns
Thigh burn

ABSTRACT

Burns are an unexpected adverse event of magnetic resonance imaging (MRI). We present an interesting case of a patient who underwent an MRI and suffered a second degree burn to their inner thighs thought to be caused by the creation of a "tissue-loop." It is important that clinicians and technicians are aware of this adverse event to help prevent further occurrences in this commonly used imaging modality.

Introduction

It has been documented that burns can occur in patients undergoing magnetic resonance imaging (MRI) studies. These cases are mostly related to a patient's skin being in contact with metallic or metal-containing objects. However, the case we present today was due to skin-to-skin contact and highlights the importance of appropriate positioning for a patient undergoing an MRI. We also suggest that more research into the pathogenesis of such an unusual cause of injury is warranted.

Case Report

A 72-year-old patient with refractory acute myeloid leukemia was admitted to a regional New South Wales hospital for management of recurrent small bowel diverticulitis and severe perianal pain. The patient underwent a MRI scan to rule out a perianal abscess. At the time the patient was severely edematous and hypoalbuminaemic.

During the procedure, the patient experienced a painful burning sensation between his thighs where they were in contact. He had been advised by the MRI technician to press the alert bell if he had any concerns, however, as this was his first MRI, he was not aware that this was not normal. Upon return

☆ Acknowledgments: All authors provided clinical expertise and participated in creating this report and approved the final version. The authors declare they receive no financial grants or funding for this publication or have any conflicts of interest.

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https://doi.org/10.1016/j.radcr.2020.09.046

Fig. 1 – A bullous lesion on the patient's right medial thigh (1 cm) with some mild surrounding erythema on the day of magnetic resonance imaging.

Fig. 2 – Bilateral medial thigh lesions (2 cm total) which developed after magnetic resonance imaging of the perianal region, photo taken 2 days after imaging.

to the ward, his wife noticed that he had blisters on both inner thighs.

On examination, bilateral medial thigh bullous lesions were seen. They were confirmed to be at the point at which the thighs touch when the feet are bought close together and were of a consistent appearance with second-degree burns (Figs. 1 and 2). These lesions were not present prior to the MRI. The patient did not have any monitoring devices or cables on his person at the time of the MRI scan. He was wearing underwear and a hospital gown, and a spacer was placed between his lower legs, these were not touching the site of the burn. The MRI used during this imaging scan was a Philips Intera 1.5 Tesla with Torso coil. The scan went for 33 minutes and there were seven sequences.

Discussion

This case is almost identical to another case report by Mandel et al, where a 48-year-old man suffered second degree burns during an MRI to investigate cellulitis of his right thigh [1]. In that case, the patient's lower limbs were also touching at the thighs and resulted in burns on both sides at the contact point [1].

The literature on MRI burns is limited. Most MRI burns that have been reported involve simple direct electromagnetic induction caused by the contact of monitoring devices, such as ECG electrodes, pulse oximetry probes, monitoring equipment cables on the patient or, in 1 case, a patient's permanent metal-containing eye make-up [2–5]. In the Mandel et al case, there was no clear explanation for the burns other than a possible "tissue-loop" created at points of skin-to-skin contact, in which the closed loop heats due to "high-power electromagnetic radiofrequency pulses" that travel through the conducting circuit [1,6]. A study conducted in 2010 aimed to recreate this type of MRI burn injury [6], where porcine legs were used to recreate the "tissue-loop," however, in that study only slight erythema resulted at the point of contact [6].

The more common scenarios of MRI burns mentioned above are possibly due to the result of electromagnetic induction heating of a circuit often made by wires in monitoring equipment, for example, which can heat significantly, leading to thermal burns of the skin if in contact [7]. Other burns have occurred when a patient's body is touching the radiofrequency transmission coils of the MRI machine itself, and is due to the capacity for greater current induction and heating at the body's periphery [8–10]. In our case, however, the patient's body was not touching the radiofrequency coils of the machine.

This case raises the importance of patient positioning and avoidance of skin to skin contact in areas of high intensity in the MRI machine. Technicians and clinicians should be made aware of the potential for adverse events and patients should be encouraged to notify staff if burning sensations occur during imaging.

Despite thorough screening of patients undergoing MRI, the incidence of nonmetallic causes of skin-to-skin burns are on the rise [9]. As burns are the most common MR related adverse event, referrers to MRI and MRI technicians need to be increasingly aware of the possibility of tissue-loops forming and providing measures to avoid burns [11,12].

At the time of MRI, our patient was also suffering from peripheral edema caused by hypoalbuminemia. Our team hypothesized whether this may have increased the intensity of the heat generated by the MRI and may be the predominant contributing factor to this MRI burn. It is possible that this was also a contributing factor in the case of thigh cellulitis seen in the Mandel et al paper. We found no reports demonstrating similar circumstances and there would be benefit for further investigation in this area.

Conclusion

MRI burns are an atypical complication of a very commonly used investigation tool. This case demonstrates the possibility of this adverse event occurring despite a thorough screening procedure. Further research into the pathogenesis would be valuable so that these injuries can be avoided entirely in the future.

Patient Consent

Informed verbal consent was obtained from the patient for publication of this case report and for use of the accompanying images.

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