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Case Report

Unexpected magnetic resonance imaging burn injuries from jogging pants

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ARTICLE INFO

Article history:

Received 21 July 2019

Revised 12 August 2019

Accepted 16 August 2019

Available online 5 September 2019

Keywords:

Magnetic resonance imaging

Thermal burns

Jogging pants

ABSTRACT

During magnetic resonance imaging, thermal burns are a potential cause of injury. We experienced a rare case of magnetic resonance imaging burn injury caused by jogging pants. The list of materials of the jogging pants did not indicate any metal. However, light, thin metal fibers were used. Changing to suitable magnetic resonance imaging-compatible clothing is important before undergoing magnetic resonance imaging. To minimize the risk of magnetic resonance imaging burns, it is necessary to increase staff awareness and communicate and comply with pretreatment safety checks.

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Introduction

During magnetic resonance imaging (MRI), thermal burns are a potential cause of injury. Before MRI examination, a metal detector wand is usually used to check whether the patient is wearing metal. Especially, patients connected to external metal-containing monitoring devices such as electrocardiography leads and pulse oximeters must be carefully observed. However, we experienced a rare case of MRI burn injury caused by jogging pants.

Case report

A 40-year-old woman underwent an MRI examination for dermatomyositis to evaluate her thigh muscles. She did not have a clinical history of previous surgical operation or severe trauma. Before the MRI examination, we used a metal detector wand and checked her verbally and visually. We confirmed that she was not wearing metal. She was wearing a white tee shirt and black jogging pants during the MRI examination. When we started examination using a wide-bore

Declaration of Competing Interests: The authors declare that they have no competing interests.

Funding: The authors received no financial support for the research, authorship and/or publication of this article.

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<https://doi.org/10.1016/j.radcr.2019.08.015>

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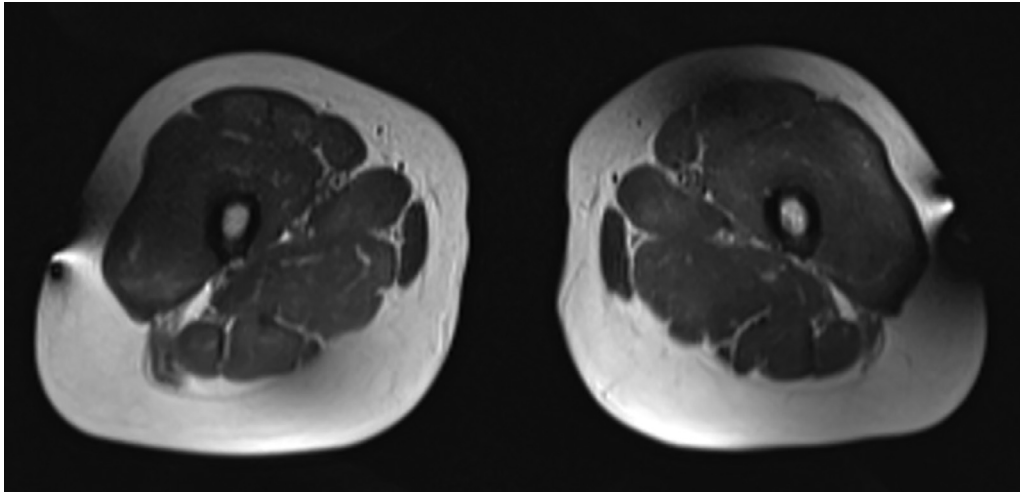


Fig. 1 – A 40-year-old woman underwent magnetic resonance imaging for dermatomyositis to evaluate the thigh muscles. The T2-weighted fast spin-echo axial image showed artifacts on the outside of her bilateral thighs.

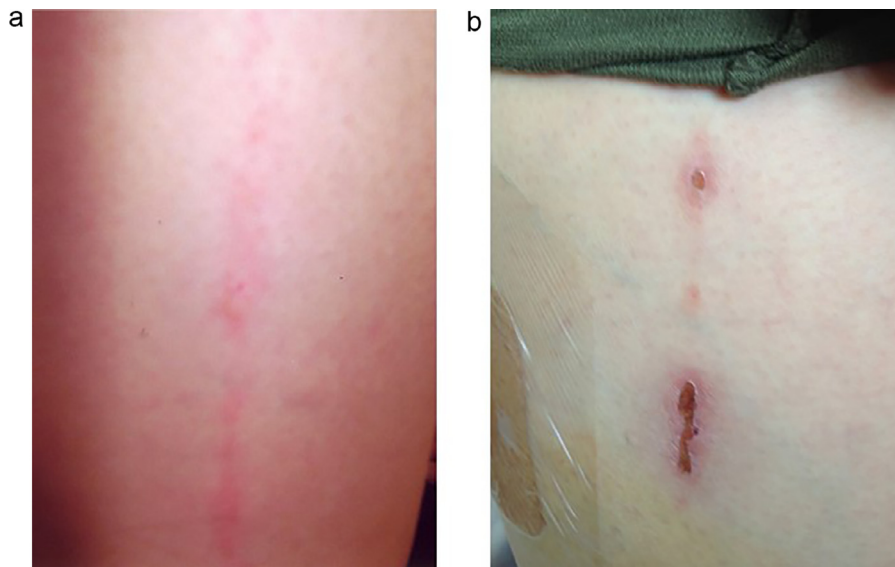


Fig. 2 – (a) Linear redness and swelling on her bilateral thighs after magnetic resonance imaging. (b) After a week, the redness gradually became blistering eruptions.

3.0-T MRI (Magnetom Trio, Siemens, Erlangen, Germany) with a body-phased array coil (Siemens), artifacts were observed on the outside of her bilateral thighs (Fig. 1). However, she did not complain, and we continued the examination. The imaging parameters were as follows: T1-weighted fast spin-echo axial image, TR/TE of 700/10 msec; T2-weighted fast spin-echo axial image, TR/TE of 4500/92 msec; and short tau inversion recovery fast spin-echo axial and coronal image, TR/TE/TI of 4500/92/230 msec. The total imaging time was 15 minutes.

After the examination, a linear redness and swelling were observed on her bilateral thighs (Fig. 2a). After a week, the redness gradually became blistering eruptions (Fig. 2b). The

reddened area corresponded to the vertical lines on the jogging pants (Fig. 3a). Therefore, we suspected that the jogging pants contained metal that caused the thermal burns. However, the list of materials of the jogging pants did not indicate any metal (100% polyester). We imaged the jogging pants using high-resolution digital radiography; however, no obvious metallic material was found (Fig. 3b). We contacted the customer service of the manufacturer about the possibility of MRI burns. As a result of the conversation with customer service, we found that light, thin metal fibers may have been used in the vertical lines of the jogging pants (Fig. 3b). The patient was diagnosed as having second-degree burn injuries by a dermatologist. It improved gradually with a steroid ointment.

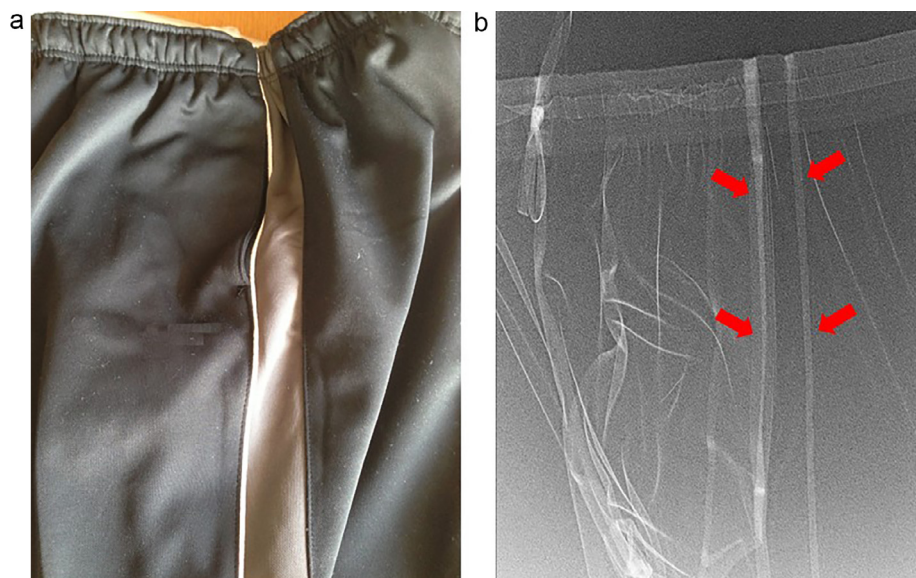


Fig. 3 – (a) The reddened area corresponded to the vertical lines on the jogging pants. (b) The jogging pants did not show any obvious metallic material on high-resolution digital radiography. Light, thin metal fibers were used in the vertical lines (arrows).

Discussion

Many MRI examinations are performed every day worldwide. Although MRI examinations are considered safe, they are not without significant risk of injury to the patient. More than 70% of MRI complications are related to thermal burns [1]. In addition, previous reports showed several thermal injuries associated with MRI [2–4].

The primary cause of MRI burn injury in patients who are not wearing conductive devices is excessive power deposition. As MRI is often considered one of the safest imaging modalities owing to its lack of ionizing radiation, hot regions are often times created deep inside the patient's body, like a microwave oven, which makes it more difficult for the patient to feel and for the technologists and clinicians to detect before it is too late.

MRI burn injuries, whether from heat conduction or direct skin contact, can be extremely serious. Numerous cases of painful first- and second-degree burn injuries have been reported [2–4]. The risk of MRI burns is not new knowledge; however, more research is needed on their causes and how to prevent them.

The advancement of MRI as a diagnostic tool, coupled with the stronger MRI technology, suggests that the risks of accident and injury may increase.

MRI burn injuries may be preventable by proper patient screening for the presence of ferrous magnetic materials. However, in our case, the burns occurred because the patient did not complain during the MRI examination and no abnormality was found during the check with a metal detector.

A previous report showed invisible metallic microfibers, which is found in popular athletic clothing, and presented an

unrecognized MRI risk for cutaneous burns [4]. It showed a case of a second-degree burn in an 11-year-old girl who presented for a scoliosis evaluation with MRI. The patient wore a gray undershirt under a long-sleeved white t-shirt and gray sweatpants. Prior to entering the MRI room, she was screened verbally, visually, and with a wand metal detector. Once she awoke from sedation, she complained of a burning discomfort on her right side. We discovered that she had sustained linear erythematous blistering eruptions along her right flank and ipsilateral volar wrist that were in contact with her undershirt. This is similar to our case; however, our case is the first report of MRI burns by jogging pants.

Recently, many clothing companies are using metallic fibers in exercise, spandex, and stretch clothing. And, the metallic fibers found in some hi-tech yoga pants can actually give you burns during an MRI scan. These tiny metal threads keep odor and bacteria from building up in clothes as people do their downward dog pose. If we see “anti-microbial” or “anti-bacterial” in the label, clothing may use metallic fibers (There was no mention in our case.) [5]. The metallic fibers in the clothing are invisible, especially as technology has improved, so it is difficult to detect by standard MRI screening methods. As clothing may contain unexpected metallic materials, patients must change to site-supplied MRI-compatible clothing before undergoing MRI. If an unexpected artifact is found during MRI examination, the patient must be checked again even if the patient does not complain.

In conclusion, we report a rare case of MRI burn injuries. Patients, clinicians, and technicians must all be familiar with the potential for thermal injuries related to MRI examination. MRI burn injuries can be prevented with proper patient screening for the presence of metallic materials. Patients must change to suitable MRI-compatible clothing during MRI. To minimize the risk of MRI burns, it is necessary to increase staff aware-

ness and communicate and comply with pretreatment safety checks.

Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Authors' contributions

All authors provided clinical expertise and participated in drafting the manuscript. All authors read and approved the final manuscript.

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