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Case report

MRI artefact in the rectum caused by ingested orthodontic brackets

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ABSTRACT

Magnetic susceptibility artefacts, caused by metallic objects, present a challenge in magnetic resonance imaging (MRI). In this case, MRI showed metal-induced artefact in the rectum of a 14-year-old girl who presented with pain in the coccyx after a snowboarding accident. Previous radiographs showed no evidence of metal in the area. After the identification of the artefact and upon discussion with the patient, she disclosed that two orthodontic brackets had been swallowed two days prior to the MRI examination, likely the source of artefact. Following the passage of the brackets, subsequent MRI was artefact-free. A similar artefact was recreated by scanning a potato with and without an orthodontic bracket, highlighting the impact of the resulting artefact on MRI.

Introduction

In magnetic resonance imaging (MRI), the presence of metal within the area of interest can cause local magnetic field inhomogeneity, which may lead to significant signal change and geometric distortion.[1] Magnetic susceptibility artefact is a common artefact associated with routine MRI, however, determining the origin and ameliorating its effect can pose significant challenges in some cases. This work presents an incidental, metal-induced artefact caused by stainless steel orthodontic brackets in the rectum of the patient.

Case presentation

A 14-year-old girl presented with persistent pain in the coccyx five months after a snowboarding accident and was referred for MRI. The patient had no history of previous surgery. On the initial MRI scan, performed on a 1.5 T system, an unexpected artefact in the rectum was observed (Fig. 1A). Our initial assessment suggested a metal-induced susceptibility artefact. Previous radiographs (anterior–posterior view of the coccyx and lateral view of the sacrum) performed to rule out fracture or alignment abnormalities two weeks prior showed no evidence of metal in the area (Fig. 2).

Following a second patient safety screening and a higher quality scan (a spin echo pulse sequence and a finer image matrix were used to minimise the artefact effect), with the patient also wearing a hospital gown (as opposed to wearing her own metal free clothes in the initial scan), the artefact remained (Fig. 1B). After discussion, the parents and patient reported that two of the patient's orthodontic brackets had been dislodged and swallowed approximately two days prior to the MRI scan; brackets were the suspected source of the artefact.[2] The patient received a follow-up MRI session eight days after the initial MRI, after passage of the brackets, which was artefact free (Fig. 1C).

Discussion

Metal-induced artefacts are commonplace in MRI and generally appear as signal loss, abnormal signal increase, or geometric distortion.[3,4] However, identification and minimisation of such artefacts can pose challenges. In many cases, no intervention is required, as the area of interest is unaffected. When the artefact corrupts the image around the area under examination, the MR radiographer must decide how best to manage the situation; this may include removal of the metal object (if possible), applying metal reduction techniques,[5] or in some cases, terminating the MRI examination.

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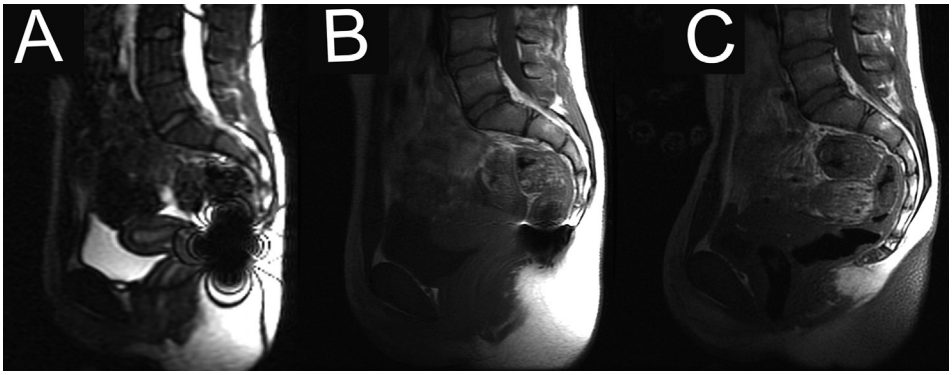

Figure 1. Sagittal MRI images. [A] The initial scan showing the metal-induced artefact in the rectum area. The artefact appears as a combination of signal loss and abnormal signal increase "or pile-up" with geometric distortion. [B] A better quality T1-weighted spin echo image confirming the origin of the artefact. [C] The artefact-free image after the passage of the metal bracket.

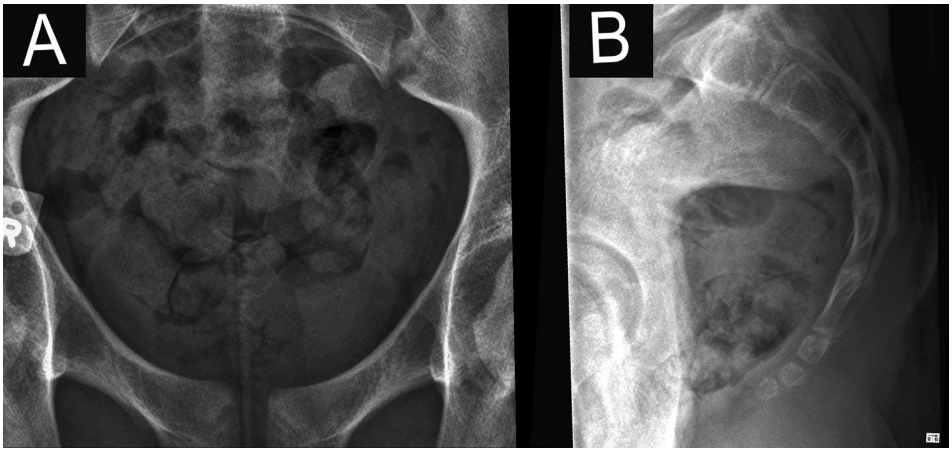

Figure 2. Two, [A] AP and [B] lateral radiographs acquired 2 weeks before the initial MRI session, demonstrating the lack of metal present at the time.

In the current case, metal artefact significantly degraded image quality, which complicated image interpretation, and could have been the origin of the persistent pain.

The steps taken by the MR radiographer to identify the origin of the artefact are not only practical, but eventually led to a successful examination without compromising safety standards. Upon the appearance of the artefact on the initial images, the radiographer stopped the scanning process and communicated with the patient to rule out the presence of any metallic objects in her clothes or medication patches; physically inspected the imaging table/coil; and repeated the exam in a hospital gown. The artefact was still present, even on an image that is less sensitive to metal artefacts (spin echo).[6] Conversation with both patient and parents ensured the patient had not undergone any previous intervention and revealed that two days prior, the patient had swallowed two dislodged orthodontic brackets. Subsequently, the patient's orthodontist was contacted and a bracket (stainless steel) was obtained. To demonstrate the effect of the stainless steel brackets, a potato was scanned with (Fig. 3A) and without (Fig. 3B) the bracket present. Fig. 3A exhibits a similar artefact to the current case.

While it is easy to identify metal artefacts, it might be challenging to pinpoint their origins. Adhering to safety guidelines,

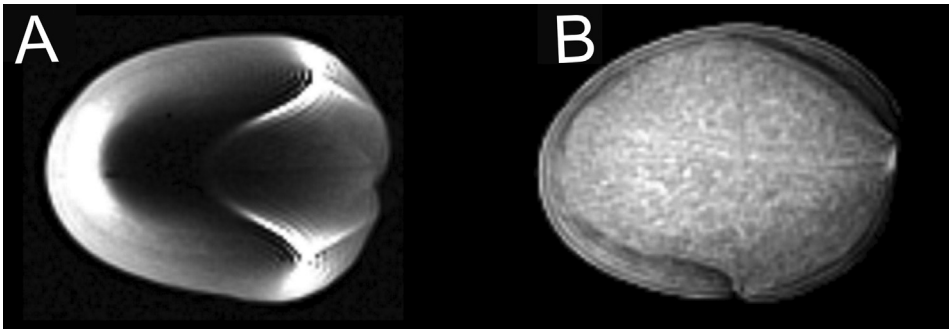

Figure 3. Two images of the potato. [A] With the stainless steel orthodontic bracket inserted inside the potato, exhibiting similar artefact to that identified in the patient's pelvis region. [B] Artefact-free image of the potato before inserting the bracket.

applying the proper imaging techniques, and focused conversations with patients help to identify potential causes of these artefacts and therefore their remedies. An additional screening question, such as "Have you swallowed any metallic object in the last week?" could easily be added to the pre-scan safety questionnaire. However, given that this situation is uncommon, this type of question may be more appropriately asked after an artefact has been identified by the MR radiographer. In summary, this case highlights another potential cause of artefact to consider on MRI.

Conflict of interest statement

Authors declare that there is no conflict of interest regarding the publication of this article.

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