

A runny nose

An unexpected ferromagnetic foreign body in an unexpected place

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Abstract. – A case report about a small child scheduled to undergo brain Magnetic Resonance (MR) imaging first and Computed Tomography (CT) scan next in the same session for coeliachia and possible associate malformative diseases is described.

Only by chance the MR procedure has not been carried out, and the CT scan scout view revealed unexpectedly a metallic paper clip deeply embedded in a nasal fossa.

The potential of unwelcome side effects and effective safety degree of MR imaging are discussed.

Key Words:

MR imaging, Metallic foreign bodies, Childhood.

Introduction

There are multiple possible health concerns about what seem to be the never ending developments in the field of Magnetic Resonance (MR) Imaging.

Both patients and medical staff are involved.

Most of safety considerations pertain to the mechanical attractive forces exerted by magnetic fields on ferromagnetic objects, implants, or medical devices.

The case we present herein did not have, by chance, health consequences for the patient, but there was surely the potential to cause him a severe injury.

Case Report

S.E., a Caucasian three years old male, had been admitted to our MR Imaging and

Computed Tomography (CT) Scan Dpt from Paediatrics, Day Hospital Dpt. Because of frequently repeated imaging procedures most children undergo throughout months or years, we regularly record in a database, as a safety anaesthesia routine, every small patient coming under our observation, and some adults as well¹: registered data include date of birth, initial diagnosis, kind of imaging the child has undergone, details on sedative or anaesthetic procedures, and every problem encountered, from difficult I.V. cannula insertion to poor airway control. In this case the small patient was unknown to us.

Diagnosis reported on clinical card was: "Coeliachia, delayed growth, and impaired psychomotory development". Both CT Scan and MR Imaging of the head were requested: the former to check if brain intraparenchymal calcifications did exist, the latter to exclude a polimalformative disease.

The mother, asked on her son's anamnestic data, referred about an undefined disreactive syndrome against drugs, but no documentation on it was available. The mother was fearing for drug and/or contrast media intolerance and on her request, with the agreement of physicians having in charge the small patient, the medical staff decided to limit radiological examination to a CT scan without contrast, a fast procedure not necessarily needing any pharmacologic sedative intervention.

Clinical conditions of the small boy where in the whole good and laboratory tests were okay; only an abundant infected nasal discharge, more from a nostril than the other, was present, but without fever.

CT scan was performed without any sedation, thanks to the presence of the child's mother in the area, but the CT scan scout

view revealed unexpectedly the presence of a metallic paper clip deeply inserted in a nasal fossa (see Figure 1).

CT scan was completed without any problem and the clip was later removed in an Ear, Nose, Throat (ENT) context.

Discussion

Safety in MR Imaging is a primary concern, in which all staff are involved. Anaesthesiologists as well, maybe more than others, besides their resuscitative, sedative, and anaesthesiological duties, should be aware of what is going on in their competence area.

Accidents are uncommon, but most are potentially severe. Equipments, consumables and objects that are safe 99% of the time, may become unsafe in an MR Imaging area. Projectile incidents are far from very rare; e.g., a metal oxygen canister may be pulled inside by the powerful machine magnet, and kill the patient, as reported by The

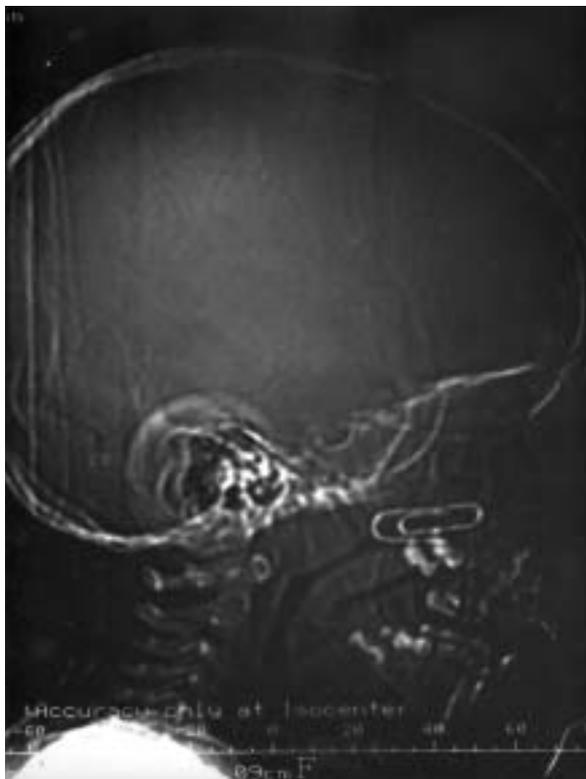


Figure 1. The CT scan view. See the text for details.

Associated Press, July 20, 2001 (Chaljub et al.² reported five similar cases in the same Institution); an infusion pump may fly and hit the MR machine, fortunately missing the child inside, as reported by The Health Care Research & Quality (Morbidity & mortality rounds on the Web. Archived cases and commentaries: Pediatrics. February 03).

Moreover, ferromagnetic implants or foreign objects, particularly if located in potentially dangerous areas of the body such as near a neural, vascular or soft tissue structure could injure the patient by movement or dislodgement, since they tend to align with the magnetic field.

Many factors may influence this kind of risk: the strength of static and gradient magnetic fields, the degree of ferromagnetism of the object, its mass, its geometry, its location and orientation in situ, and even the length of time the object has been in place³. The movement of an intracerebral aneurysm clip with a fatal outcome has been first reported by Klucznik et al.⁴ in 1993; even a small metallic foreign body located in a subcutaneous site may cause pain by movement in patients exposed to the magnetic field of an MR system⁵.

What to do with a child with a runny nose? Is this the beginning of an upper respiratory tract infection or is this allergic rhinitis? Or other?

It is easy to be wise after an event. Maybe the presence of an infected nasal discharge, more abundant from one nostril than the other, could have deserved more attention from physicians, but a child with a runny nose, even with an infected secretion, is not certainly an exception during cold seasons. On the other hand, it is well known that younger children are prone to insert foreign bodies, usually objects found at home, in the external auditory canal and the nostrils, causing pain and/or secretion; a paper by Balbani et al.⁶ dated 1998, is one of the largest reports on foreign bodies removal in children, both from the ear and the nose.

Many paediatric cases we daily deal with in our MR Imaging and CT scan Dpt are imaging check-ups, first for oncologic diseases, on a day-hospital base. Our Institution is a primary medical reference point for Middle and Southern Italy. Very often people (small ill patients and relatives) travel hundreds of

km by train or by car, sometimes all night long. It is very hard to reject a boy with a runny nose, if routine clinical and laboratory examinations allow the small patient to undergo a sedation or an anaesthetic procedure.

In reality, in our case report, nothing happened, nevertheless we have been in a risky situation.

The MR apparatus to be used was near to be obsolete (actually it was dismissed two months later), with a static magnetic field strength of 0.8 T: most modern MR systems have static magnetic field strengths often exceeding 3.0 T. An object exhibiting mild ferromagnetism in association with lower static magnetic fields may be attracted with such a force to be very hazardous to a patient undergoing an MR procedure with higher static magnetic fields.

For an extensive list of metallic foreign bodies being potential risk for patients see Shellock⁷.

We go back to consider the potential risks for our patient. What would have been happened if the scheduled investigation had been carried out under patient's sedation or light general anaesthesia, even with the low power MR apparatus we used as far as some months ago? To be honest, we do not know for sure the degree of ferromagnetism of the paper clip, since it has been lost after removal.

Surely, since the beginning imaging artifacts should have warned that something was going wrong and a head X-ray would have been taken, as always in case of doubt: the patient's history may help to rule out such foreign bodies; however, many patients, even well oriented adults, often do not remember accidents.

By chance, taking a head X-ray actually happened during CT scan imaging, without exposing the small patient to the MR system magnetic field.

As we said before, most of MR systems currently used develop much stronger magnetic fields. Nasal fossae are maybe not as biologically sensitive as other body areas, but a severe damage should be likely to be expected.

In our Institution, mainly because of logistics, MR procedures come first CT scan imaging when both are requested. As a conclusion we would like to suggest that making an effort to do the contrary could be better, maybe deserving more attention to a runny nose.

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