



Are Epidural Catheters MRI Safe? Lesson Learnt in Patient Safety from a Near Miss Event

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Introduction

Perioperative epidural catheters offer effective pain relief and reduce opioid use and related side effects.

Postoperative patients occasionally require immediate imaging and medical personnel may lack awareness regarding the safety of epidural catheters during MRI imaging.

The case presented involves a thoracic surgical patient who was subjected to an MRI procedure with an unsafe epidural catheter.

Methods

As the case report is devoid of patient identifiable information, it is exempt from IRB review requirements as per institutional policy. Informed consent was obtained from the patient.

Results

Patient: 66-year-old woman with metastatic lung adenocarcinoma and chondrosarcoma

Procedure: Right thoracotomy and upper lobe wedge/rib resection

Pain Management: Preoperative thoracic epidural with 0.0625% Bupivacaine and 10mcg Hydromorphone continuous infusion.

Immediately post-op the patient had excellent analgesia with pain rated at 3/10. On post-op day 3 the patient was scheduled to undergo an MRI of the chest to assess for potential thoracic vertebrae infiltration.

- The patient reported worse pain with laying flat and our service was notified as the patient was transported to the MRI suite..
- It was at this point there was an uncertainty regarding the safety of the epidural inside an MRI.
- further examination revealed that the epidural catheter brand/model was indeed MRI unsafe. (Figure 1)

Swift action was taken to contact the MRI suite and halt the procedure.

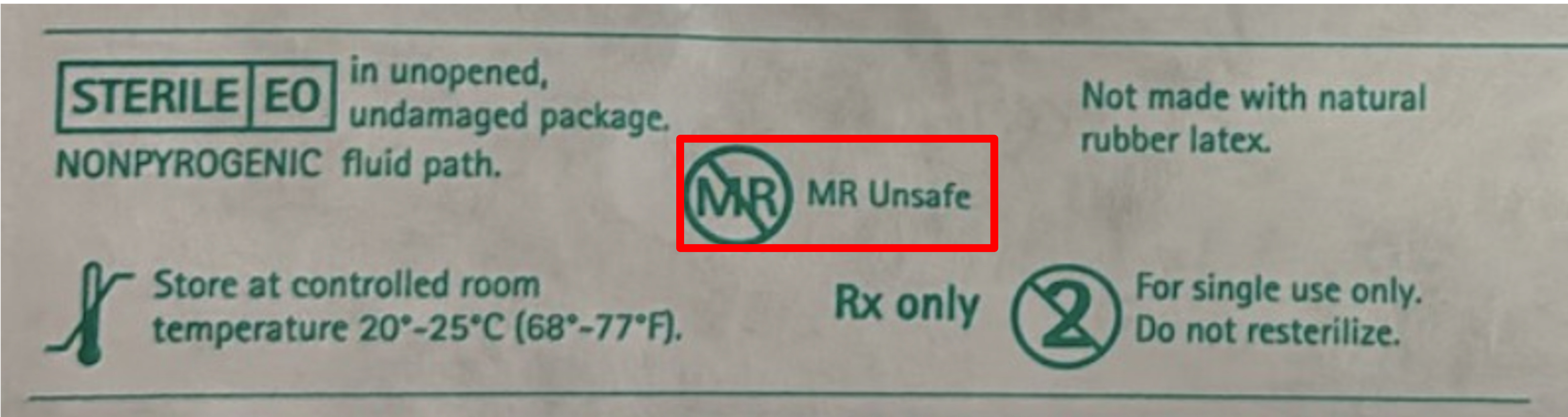


Figure 1: Packaging for the epidural catheter used in our patient with labeling stating its MRI incompatibility.

Discussion

There have been multiple instances reported of patients with metal implants accidentally undergoing MRI with outcomes ranging from minor to catastrophic. Metal wire reinforcement is often built into the epidural catheter to aid in maneuverability. Examination of the brands available at our institution (Brand A, Brand B, and Brand C) found that only brand C was MRI safe.

Our patient was placed in a potentially dangerous situation when they started her MRI. Inspection of the patient's catheter revealed a Brand A catheter, confirming that a potentially disastrous outcome was narrowly avoided.

Conductive metal components within the epidural can shift or heat up via the antenna effect and result in injury to proximal structures such as the connective tissue, the spinal cord, or nerve roots. (Figure 2)

- The heating of conductive materials in an MRI is directly proportional to the duration of the procedure.
- Temperatures may increase as much as 6°C over 15 minutes.
- Typical thoracic MRI duration is 15-30 minutes. plenty of time for potential damage to ensue.

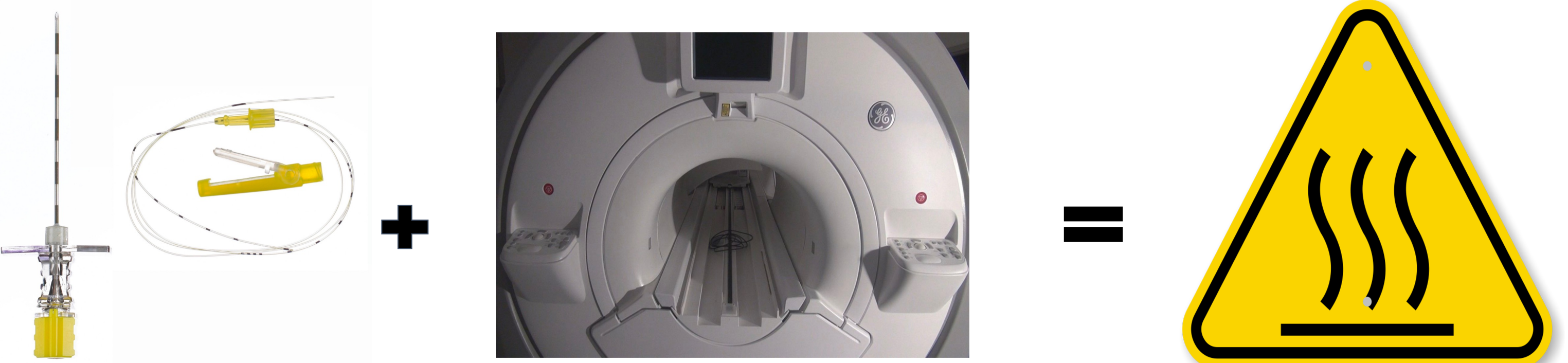


Figure 2: The antenna effect is a phenomenon where conductive metal objects absorb radiofrequency energy and become heated

Discussion cont.

Swiss cheese model of accident causation was constricted from this near miss incident and included below. (Figure 3)

- Primary surgical team who ordered the MRI
- Regional block service who placed the epidural
- ICU team
- Acute pain service on consultation
- Radiology suite performing the scan.

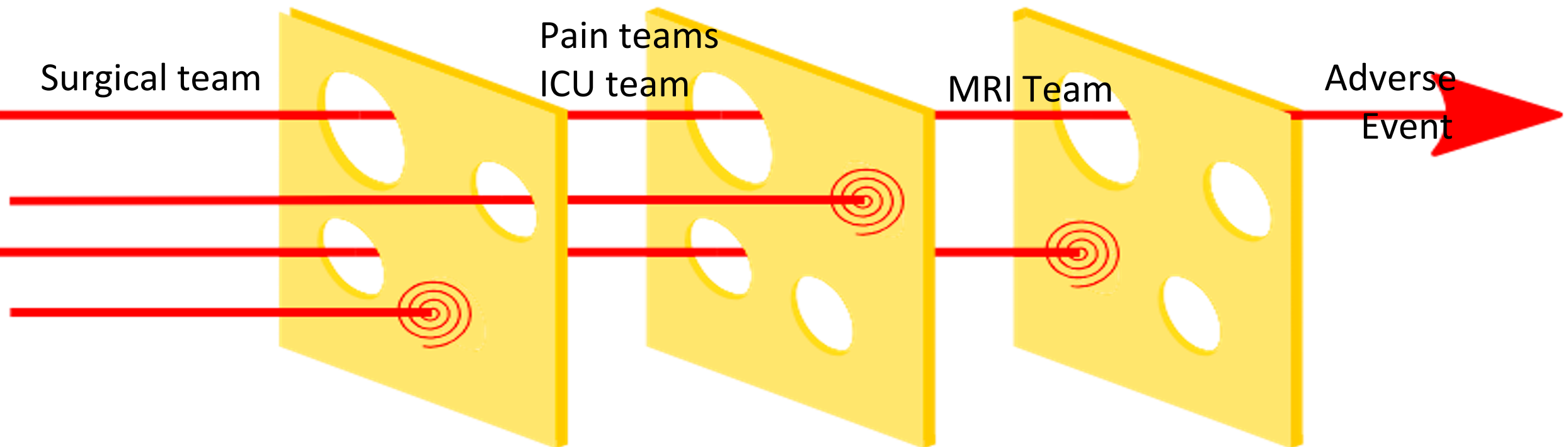


Figure 3: Swiss cheese model demonstrating gaps in safety.

Conclusion

Examination of this case revealed multiple opportunities for improvement. The ordering provider and approving radiologist should be aware of the epidural in place and investigate the MR safety status of indwelling catheters before scheduling the MRI. The epidural catheter being placed by the regional team should be properly labeled and the procedure note should include the specific type for quick reference. Lastly, if a patient has a high pre-op likelihood of needing a postoperative MRI, communication with the anesthesia team prior to surgery would preemptively guide the decision to place an MR safe epidural catheter.

References

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