CSF mimic in the post-operative spine: A pitfall for the unwary

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Learning objectives

A synthetic dural sealant polymer named "DuraSeal" is used in our institution following dural breach at spinal surgery. It has a high water content, therefore follows CSF signal on all sequences. It can easily be mistaken for CSF pseudomeningocele on postoperative MRI.

The learning objectives are therefore:

1. To raise awareness of potential diagnostic confusion with this product;
2. To aid patient safety by sharing our experience in our institution with this product.

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Background

In our institution, spinal surgery is performed by both neurosurgeons and orthopaedic surgeons. Spinal MRI is reported by MSK radiologists, neuroradiologists, and the general radiology workforce. Thus, many disparate groups contribute to the patient imaging pathway, and they do not all come into contact with each other at learning events, formalised discrepancy meetings or informally in conversation. This means that information which is common to one group may not be easily disseminated to the other groups.

Imaging findings OR Procedure Details

The Product

The use of dural sealants to obtain watertight closure after intradural procedures has been standard practice for many years. In addition to primary closure (which is the gold standard, although not 100% successful) the use of an adjunct to aid the seal and reduce the incidence of post operative CSF leak is increasingly seen as good practice (Haque, 2013).

With autografts (pericranium or small bowel submucosa) the increased morbidity of these superadded operative procedures makes the use of a synthetic substance attractive (Rosen, 2011).

In our institution, we use a polyethylene glycol hydrogel (PEGH) compound called DuraSeal, produced by Coviden. This conforms to irregular surfaces without affecting underlying tissue viability and is effective at producing a watertight seal (Kim, 2011; Osbun, 2012). This substance has FDA approval in the United States (Kim, Osbun).

The Findings

As described by Tarapore et al in 2011, the PEGH compound ("DuraSeal") has a high water content, and follows CSF signal on MRI. After analysis of the signal intensities of DuraSeal compared with CSF, they concluded that " with T1 and T2 weighted techniques…PEGH…may not be differentiated from CSF" (Tarapore, 2011) or indeed seroma. In addition, given the site of application, in the clinical setting these imaging findings may be misinterpreted as post surgical CSF leak. This potential hazard was reported in 2011, but only in the neurosurgical literature. To our knowledge, this phenomina has not been reported in the orthopaedic or MSK radiology literature.

What Happened

In our institution, we have indentified 6 post-operative spinal cases in which the early (<6 weeks) imaging of the DuraSeal in the surgical bed mimics CSF. In each case, **the radiology report incorrectly interpreted the case as CSF leak.**

In the first case, the patient was taken back to theatre. Fortunately, in the other cases, the potential for error had been disseminated to the departmental surgical team (although not to any radiologists) and any action based on incorrect imaging intepretation was prevented.

Images for this section:

Fig. 1: Figure 1. Axial 1.5 Tesla T2 weighted image of "DuraSeal" product in surgical bed, potentially mimicking CSF leak.

Fig. 2: Figure 2. Axial 1.5 Tesla T1 weighted image of "DuraSeal" product in surgical bed, potentially mimicking CSF leak (different patient).

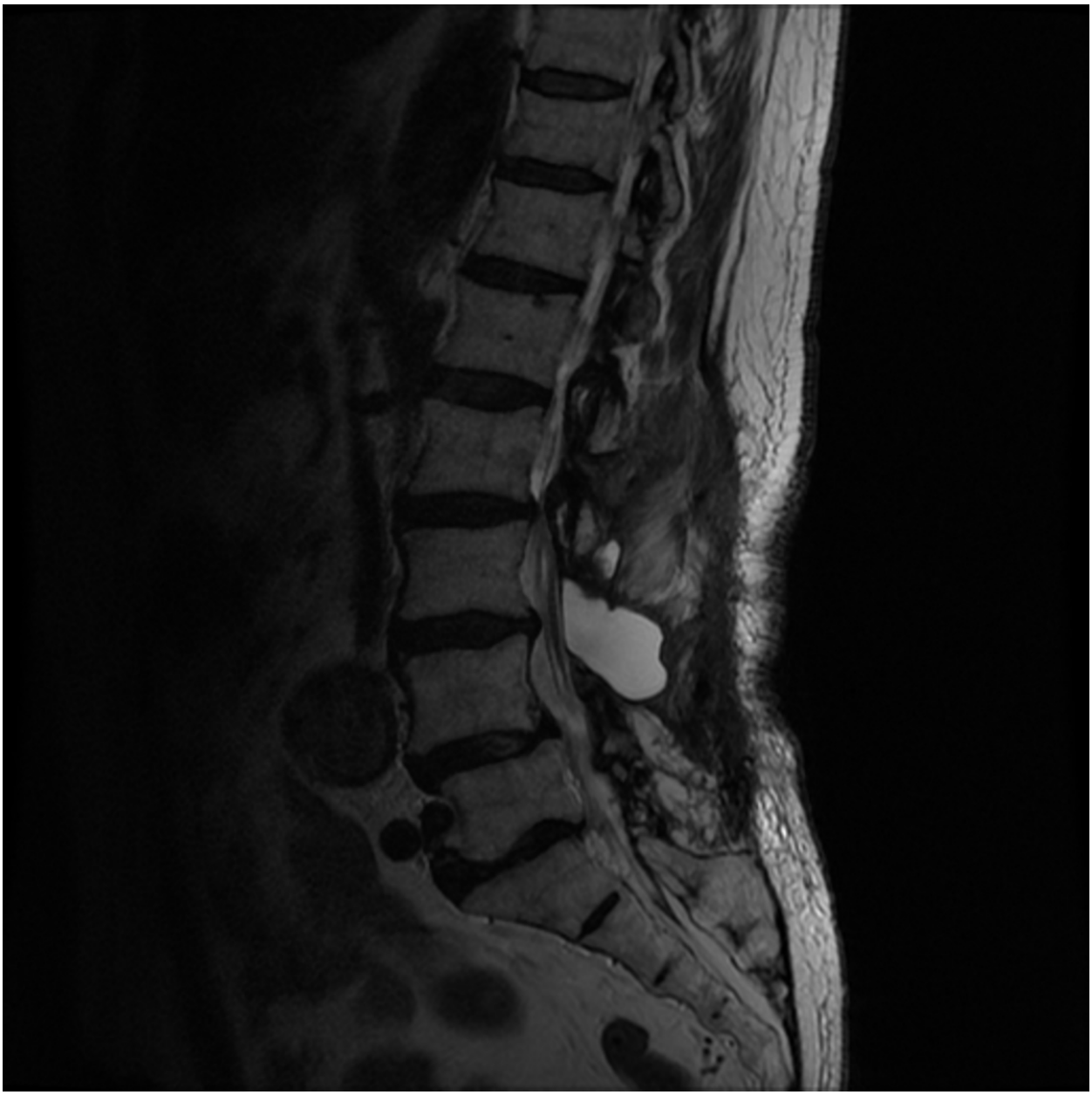

Fig. 3: Figure 3. Sagittal 1.5 Tesla T2 weighted image of "DuraSeal" product in surgical bed as previously. Again, this is a different patient.

Conclusion

The potential for misinterpretation of this postoperative imaging phenomena is high. This may lead to unnecessary repeat surgery or at the very least, misplaced concern regarding procedure success.

Particularly in institutions where MRI spines are reported by MSK and neuroradiologists, and operations are performed by both orthopaedic and neurosurgeons, the potential for miscommunication is clear.

All surgeons who use the product should be aware of the potential for postoperative imaging confusion. They should clearly document when the product has been used both in the patient's operative notes and in imaging request forms. Any radiologist who reports post operative MRI spines should be aware of this potential pitfall, and word their reports accordingly.

Ultimately, as in all areas of medicine, there is no substitute for ongoing learning and effective interdepartmental communication. By raising awareness in the radiological literature of this potential for misinterpretation, we aim to promote patient safety within the field of spinal surgery.

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