

Causation Analysis

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The Significance of Medical Imaging Technology

“It ain’t what you don’t know that gets you into trouble. It’s what you know for sure that just ain’t so.” Although Mark Twain likely didn’t realize it at the time that he first spoke this famous quote, his words ring true when it comes to

the interpretation of advanced spinal imaging techniques.

Throughout the years, medical imaging technology has come a long way—from X-rays, to CT scans, to MRIs. As the technology has improved, clearer anatomical pictures have been produced. Although the improvement in image quality is not disputable, the relevance of the detailed findings is not as certain.

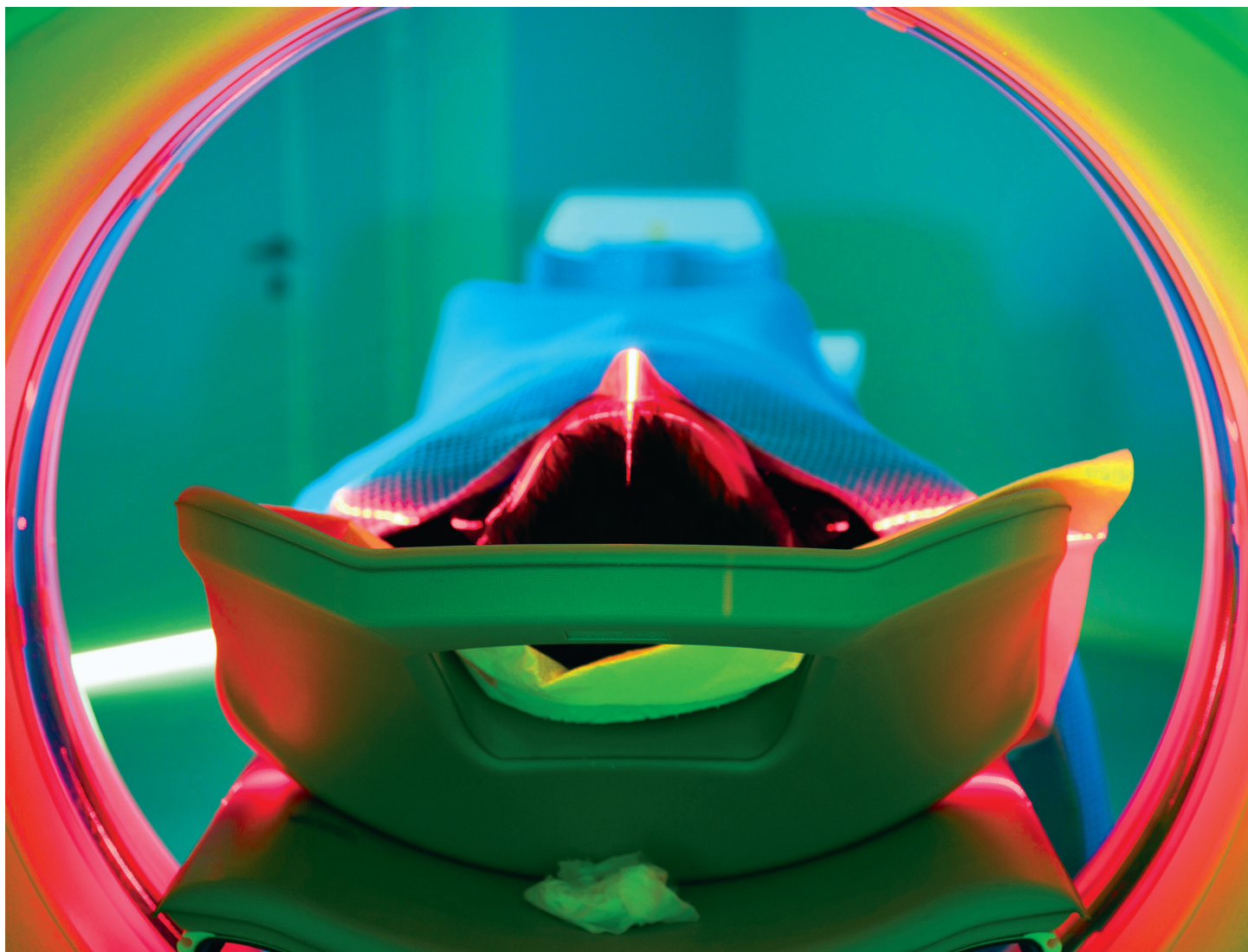
The same is true in relation to the courtroom. Gone are the days when lawyers presented their cases without electronic gadgets or presentations designed to captivate and entertain a jury. The prevalence of television and the popularity of crime drama and science fiction have led the average juror to believe wholeheartedly in anything claiming to

be based in science. So when medical imaging technology is used in the courtroom, a dangerous situation can occur when the significance of the science being presented is distorted.

Take, for instance, the case of the low-impact rear-end collision. While liability may not be in dispute, causation and the extent of damages may be questionable, at best. This is particularly true when the optics of an accident (*e.g.*, passenger vehicle versus tractor-trailer) are major contributing factors to the amount of damages being claimed. Plaintiffs will rely heavily on any radiological images that allegedly support their damages. To provide the best defense, a rebuttal expert will need to educate a jury on the true significance, or lack thereof, of any studies performed.



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Imaging Findings Are Ubiquitous, but Those Findings May Not Be Clinically Relevant

When it comes to the spine, imaging findings without clinical relevance are ubiquitous. Therefore, it is crucial to understand that anatomic details seen on a picture are not necessarily clinically relevant or explanatory of a person's medical symptoms. Unfortunately, in both the medical and medicolegal worlds, this concept is often not well understood. This can lead to the dangers of assigning clinical relevance to incidental imaging findings (*i.e.*, "abnormalities" on an imaging test that are not causing symptoms or related to an accident).

In the evaluation of spinal imaging findings, there are a few important questions to address. Is imaging in asymptomatic individuals normal? If a patient has new symp-

toms, do the findings on an imaging test explain those symptoms? Does imaging alter outcomes (in a good way)?

Several studies have evaluated the question of spinal imaging in asymptomatic individuals. In an X-ray study of people over 65 years old, 162 with, and 158 without chronic low back pain, over 95 percent in each group were found to have some level of degeneration. Additionally, the severity of the X-ray findings was not associated with whether the person was in the symptomatic or the asymptomatic group. (Hicks G.E., Morone N., and Weiner, D.K. Degenerative lumbar disc and facet disease in older adults: prevalence and clinical correlates. *Spine*. 2009 May 20;34(12):1301–6) A different study performed on people without symptoms with an average age of 52, showed CT scan evidence of spinal arthri-

tis in 65 percent and spinal disc disease in 64 percent. (Kalichman, L. *et al.* Computed tomography-evaluated features of spinal degeneration: prevalence, intercorrelation, and association with self-reported low back pain. *Spine J.* 2010 Mar.;10(3):200–8) An MRI study of younger people, ages 20–50, also without symptoms, showed evidence of *advanced* spinal disc degeneration in 72 percent of subjects. Additionally, this study found a 65 percent rate of bulging discs or disc protrusions, 18 percent disc extrusions (large disc herniations), 33 percent torn spinal discs, and 18 percent spinal arthritis. (Weishaupt, D. *et al.* MR imaging of the lumbar spine: prevalence of intervertebral disk extrusion and sequestration, nerve root compression, end plate abnormalities, and osteoarthritis of the facet joints in asymptomatic volunteers. *Radi-*

ology. 1998 Dec.;209(3):661–6) Given the fact that these individuals were in their 20s, 30s, and 40s and had no spine symptoms, these findings are quite remarkable. Lastly, a recent study was performed in over 1,200 individuals without neck pain. MRIs of the cervical spine showed bulging discs in 88 percent, including 75 percent of subjects in their 20s. (Nakashima

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H. *et al.* Cervical disc protrusion correlates with the severity of cervical disc degeneration: a cross-sectional study of 1211 relatively healthy volunteers. *Spine*. 2015 Jul. 1;40(13):E774–9) Another way of looking at whether spinal imaging findings are important is to investigate whether these findings are associated with new symptoms. To address this question, Carragee *et al.* obtained baseline lumbar spine MRIs on 200 asymptomatic individuals. (Carragee, E. *et al.* Are first-time episodes of serious LBP associated with new MRI findings? *Spine J.* 2006 Nov.-Dec.;6(6):624–35. Epub 2006 Oct. 11) They followed these subjects for several years, and if they developed an episode of severe new lumbar spine symptoms, a new MRI was obtained. Of the 200 people, 51 experienced a new episode and received a new MRI. Of the 51 new MRIs, 86 percent were unchanged or improved

compared to the initial MRI. The danger in this study was that 76 percent of the initial MRIs—before the onset of symptoms—showed degenerative disc disease. If these patients had not been involved in a research study, this initial spine MRI would not have been done. Therefore, the degenerative disc disease that was present prior to the onset of the patient’s symptoms could have been erroneously attributed to the new symptoms. As Dr. Carragee said, “Most common findings on MRI taken after acute, serious low back pain... should not be considered explanatory of either the new event or the severity of the symptoms.” (Carragee *et al.* 2006) To elaborate, “Findings on MRI within 12 weeks of new and serious low back pain development are highly unlikely to represent any new structural change.” *Id.* Lastly, the only relevant associations that were found in this study were that those patients who got a new MRI were more likely to have baseline chronic pain, psychological distress, and previously disputed compensation claims, and they were more likely to be smokers.

Does Lumbar Spine Imaging Improve Clinical Outcomes?

The fact that spinal imaging is filled with false positive results raises the important question about whether lumbar spine imaging improves clinical outcomes. In 2005, Modic *et al.* studied patients with acute low back pain, with or without sciatica. All of the patients received an MRI, but the patients were randomized to one group in which the patient and doctor received the MRI results, or to another group in which neither the patient nor the doctor received the results. At the end of the study, there were no differences in outcomes between the two groups, other than that the patients in the group that received the MRI results had a lesser sense of well-being. Dr. Modic stated that “the act of imaging may have a deleterious effect in terms of unnecessary patient therapy or unnecessary worry and concern on the part of patients relative to misconceptions regarding the seriousness of degenerative change.” (Modic, M.T. *et al.* Acute low back pain and radiculopathy: MR imaging findings and their prognostic role and effect on outcome. *Radiology*. 2005 Nov.;237(2):597–604) Another study randomized patients with low back

pain to one group that received an X-ray or another group that did not receive an X-ray. The study found a 26 percent higher rate of low back pain, a lower overall health status score, and a higher rate of doctor visits within three months in the group that received an X-ray. Surprisingly, despite having a higher level of pain, the patients in the X-ray group did report higher patient satisfaction at nine months (although not at three months). Of those patients who had abnormal imaging findings on their X-rays, there were no differences in outcomes compared to the other patients. According to the authors of this study, “Radiography encourages or reinforces the patient’s belief that they are unwell and may lead to greater reporting of pain and greater limitation of activities.” (Kendrick, D. *et al.* Radiography of the lumbar spine in primary care patients with low back pain: randomized controlled trial. *BMJ*. 2001 Feb. 17;322(7283):400–5) These two studies demonstrate that spinal imaging can affect clinical outcomes in a negative way.

Summary

In summary, spinal images are “abnormal” in the large majority of individuals who are asymptomatic. In fact, it is quite rare to have a normal imaging study of the spine. New episodes of low back pain are typically not associated with relevant lumbar spine MRI findings, and it is unlikely that findings seen on an MRI taken after the onset of low back pain have clinical relevance. Lastly, spinal imaging tests can alter clinical outcomes in a negative way.

Having a medical expert educate a jury on these issues as they relate to a specific case will certainly affect the damages portion of any case. Conventional wisdom teaches us that the more detailed a study is, the better it is. In fact, many patients, doctors, and plaintiff attorneys “know” this to be true. But as Mark Twain warned us, it’s what we “know for sure that just ain’t so” that gets us into trouble. Accepting this misleading information can cause harm to patients and lead to inappropriate medical and legal conclusions. As a general rule, we recommend ignoring the traditional definition of an MRI as “magnetic resonance imaging” and instead considering the following definition: “most results [are] irrelevant!”