Dynamic Chiropractic

WHIPLASH / NECK PAIN

How Do You Rate as a Forensic Expert?

Arthur Croft, DC, MS, MPH, FACO

Most of modern health care hovers in a perpetual flux. This is never more true than in the fields that merge with forensic science or medicine. New research brings with it new understanding. And as our knowledge grows, provisional theories may fall by the wayside to make room for new models of these complex problems. Simultaneously, new strategies are forged in the medicolegal crucible. It has become increasingly difficult for practitioners to testify effectively without a good foundation in these evolving areas. Conversely, those who are well-versed in these complex and frequently controversial topics can quickly level the playing field and offer a refreshing breath of truth and reality to the legal proceedings. Here is a small sample of some common forensic challenges. A brief explanation of each is offered in the Answer section (see below).

1. *Daubert* [*Daubert v. Merrell Dow Pharmaceuticals, Inc*. 509 U.S. 579 (1993)] is the test of evidence judges can use to decide whether an expert should be allowed to testify at trial. Judges, who were empowered by the U.S. Supreme Court to act as gatekeepers of scientific testimony, are now encouraged to consider evidence more independently, using relevance to the facts at hand and reliability as their guide. Which of the following questions is not a consideration in *Daubert*?
    1. Whether the scientific theory or technique has been tested.
    2. Whether the opinion has been published or reviewed by peers.
    3. What the known or potential rate of error is.
    4. Whether it has been generally accepted in the relevant scientific community.
    5. Whether the expert has been qualified in court as an expert.

2. One of the enduring forensic legends we hear so often goes something like this: "Approximately 50 percent of all asymptomatic adults have a herniated disc." Which of the following is a true statement?
    1. The number is actually closer to 67 percent.
    2. No person has an asymptomatic herniation.
    3. The true numbers have been found to be 8 percent in the cervical spine and 19 percent in the lumbar spine.
    4. Believe it or not, the number actually is about 50 percent.

3. Many experts and attorneys believe research has now shown that the magnitude of vehicle property damage can be roughly equated to the risk for occupant injury in motor vehicle crashes (MVC); and that separate research has demonstrated that the magnitude of vehicle property damage is related to long-term outcome. Which answer is most correct?
    1. There is a strong correlation between property damage and risk for acute injury, but there is no good correlation between property damage and long-term outcome.
    2. The opposite of choice a is true.
    3. It's true: There is a strong correlation between property damage and acute risk and long-term outcome.
    4. Both beliefs are more false than they are true.

4. Based on a number of crash test studies, the growing evidence is establishing a threshold of soft-tissue injury in rear-impact crashes of about 5 mph (delta V, or change of velocity).

Which of the following statements is most true concerning this?

1. This statement is reasonably true, but really applies only to healthy male crash test volunteers.
2. This statement is generally true for the population at large.
3. The threshold has actually been lowered to 2.5 mph by research conducted in the late 1990s.
4. The newest data suggest the threshold is closer to 1 mph.

5. Mild traumatic brain injuries (MTBI) are defined as those in which there may be a loss of consciousness (but it does not exceed 15 minutes) and the Glasgow Coma Scale (GCS) falls between 13 and 15. These are the most common form of TBI and also the most contested and misunderstood. Which of the following statements are not true?
    1. Most Americans have a fairly accurate understanding of MTBI and its residuals, such as the postconcussion syndrome (PCS).
    2. MVC are the leading source of MTBI in the U.S.
    3. Most cases of MTBI resolve completely within the first 3-6 months.
    4. The S-100 protein is frequently elevated and serves as a useful laboratory marker in TBI.

6. What is a grade III concussion?
    1. One in which coma lasts more than 12 hours.
    2. One in which the GCS is less than 9.
    3. One in which there is any loss of consciousness.
    4. One that is accompanied by demonstrable lesions as viewed on CT.

7. Of the many factors that are considered to be important in terms of whiplash injury risk in a rear-impact MVC, which is the most important of the vehicle parameters?
    1. The type of bumpers the target and bullet vehicle is equipped with.
    2. The backset component of the head restraint geometry.
    3. The relative masses of the colliding vehicles.
    4. Whether or not the brakes are applied in the target vehicle.

8. In a typical whiplash injury, the two primary injury sites in the neck are:
    1. Upper cervical and mid cervical.
    2. Mid cervical and lower cervical.
    3. There is only one primary injury site: lower cervical.
    4. Upper cervical and lower cervical.

9. For typical modern passenger vehicles, what is the average threshold speed at which property damage (crush) begins to occur? Assume that the following are closing velocities (not delta V) in a crash between similar sized vehicles in a straight, 180-degree rear-end vector with good bumper contact and no offset.
    1. For cars with 2.5 mph-rated bumpers, it is about 2.5 mph. For cars with 5 mph-rated bumpers, it is about 5 mph.
    2. 15-20 mph.
    3. 0-3 mph.
    4. 8-12 mph.

10. The single most effective diagnostic tool for the evaluation of ongoing PCS is:
    1. QEEG.
    2. SPECT.
    3. PET.
    4. S-100 protein.

5. Comprehensive neuropsychological testing.

Answers

Question #1: The correct answer is e. While it is customary to be qualified as an expert prior to your testimony, this routine task is not a part of *Daubert*. Also, some states use the Frye rule rather than the newer *Daubert*. It serves the same purpose and is similar. Knowledge of these rules is critical for experts, because opposing counsel will generally attempt to limit or disallow your testimony altogether using a *Frye* or *Daubert* challenge. Thus, you should be ready to address these issues as they relate to your intended testimony. Moreover, you may also be asked by attorneys to assist them in preparing such a challenge for opposing experts.

Question #2: The correct answer is c. This 50 percent legend has its roots in a report appearing in *Spine* in the 1980s and has been generally misinterpreted ever since. (Importantly, however, probably more than 90 percent of attorneys subscribe to this myth.) The authors reported that 50 percent of adults over the age of 40 had "abnormalities," only some of which were actually herniations. This has become transmogrified into the current myth.

Several subsequent studies, however, have confirmed that the true incidence of protrusion or herniation in the asymptomatic population is only about 19 percent. This figure is relevant only to the lumbar spine, despite incorrect extrapolation by experts. In fact, it has been found that in the asymptomatic population, the prevalence of HNP in the cervical spine is a scant 8 percent. The myth is usually directed in such a way as to cast doubt on the very relevance of a herniation as a source of pain, as well as on the issue of causation from a liability standpoint.

A more relevant question might be: What is the prevalence of herniation in the cervical spine of individuals with chronic neck pain? A recent study reported prevalence as high as 67 percent at C5-C6 (the most commonly affected level) in a group with chronic pain but no radicular symptoms (Arana E, Marti-Bonmati L, Molla E, Costa S. Upper thoracic-spine disc degeneration in patients with cervical pain. *Skeletal Radiol* 2004;33(1):29-33).

Question #3: The correct answer is d. To answer this question, we must put it in proper context. If the statement that there is a correlation between crash severity and risk for injury and outcome can include the entire spectrum of crash energies, from a 1 mph bump to a 70 mph near-side impact, then it is true. However, it is almost universally applied to a range of crashes, colloquially referred to as low-speed collisions, ranging from about 2 mph up to perhaps 15 mph or so. The overwhelming balance of the literature makes it quite clear that within this range, property damage does not correlate well with either the risk for injury in the first place, or the risk of developing long-term symptoms if acutely injured. The myriad other variables (which fortunately for the reader are beyond the scope of this article) are collectively more important determinants. Moreover, simple Newtonian physics can demonstrate why, within a certain crash range, higher speed crashes are associated with a lower frequency and/or severity of injury. Knowledge of these relationships and this literature is crucial, because this very issue provides the strongest plausible defense in personal injury trials. Intuitively, jurors can't understand why someone might sustain an injury in no-damage or low-damage crashes, particularly because they might not be injured in high-property-damage crashes. In my experience, most plaintiff attorneys around the country accept this property damage fallacy.

This is an issue worth familiarizing yourself with, for reasons other than forensics. Take note of the fact that physicians in California are now facing criminal investigation for fraud based entirely on the (incorrect) presumption that injuries can't occur in the absence of structural damage. (I have

no doubt that this insurance industry-sponsored mischief will be resolved.)

Question #4: The correct answer is a, although even that has not been scientifically established. Crash test studies are not designed to address the question of thresholds for injury. If they were, they would be in direct violation of the Helsinki Doctrine and established ethical practices in science. Institutional Review Board approval would never be granted and the research would be unpublishable without it. I and others have "observed" some injuries of volunteers in that speed range that do not appear to occur at lower crash speeds. However, these tests simply can't be considered representative of all real-world crashes, nor can the test subjects be considered representative of all real-world crash victims. There probably is no crash speed below which no living person could be injured. I could develop this into a virtual dissertation, but in the interest of parsimony, I will offer just one recent piece of research. In Sweden, a number of rear-impact crashes were investigated. Because the cars were equipped with crash pulse recorders (CPR), the crash metrics (delta V and acceleration) were known and didn't need to be estimated. The reported average crash severity in injury crashes was 5.1 mph (Krafft M, Kullgren A, Ydenius A, et al. Rear impact neck protection by reducing occupant forward acceleration - a study of cars on Swedish roads equipped with crash recorders and a new anti-whiplash device. Proceedings of the International IRCOBI Conference, Graz, Australia, Sept. 22-24, 2004:221-231). These authors agreed that a threshold or lower boundary of safety probably could not be defined. Clearly then, 5 mph cannot be an average threshold for injury.

This is a critical issue because it has become *de rigueur* for the defense in MVC cases to establish this fact first, and then, after reconstructing the crash, to report the crash speed as falling below this threshold. From this, the conclusions are self-evident: There was no injury; therefore, there is fraud.

Question #5: The correct answer is a. In studies conducted in New York, Canada and rural Louisiana, people were surveyed on their general knowledge of MTBI. The groups included some individuals who knew someone who had suffered such an injury. The general level of understanding for this condition was quite poor, with many endorsing such apparently cartoon-inspired notions as recovery of memory loss with a second blow to the head, or the belief that recovery of cognitive and behavioral function is largely a function of effort and motivation. This has important medicolegal ramifications, considering that these people are representative of those filling jury positions. It emphasizes why it is so important for a jury to hear an honest and understandable, yet science-based explanation of the facts about such a condition. Obviously, whiplash is another condition that is poorly understood by many, including many health care workers.

Question #6: The correct answer is c. When there is any LOC associated with a concussion, it is grade III. This is independent of the GCS. The question is likely to be missed by physicians who were trained more than a decade ago. For many years, the standard diagnostic criteria for concussion included a requisite loss of consciousness. As a paramedic in the 1970s, I quickly saw the folly of inquiring about LOC and its duration from someone experiencing it. It is the logical equivalent of asking someone to recite the things they have forgotten. Moreover, not all individuals who suffer a concussion lose consciousness. More recently, the Mild Traumatic Brain Injury Committee of the Head Injury Interdisciplinary Special Interest Group to the American Congress of Rehabilitation Medicine, as well as the American Academy of Neurology, have more sensibly redefined the condition of cerebral concussion. It need not be accompanied by a LOC.

Today, the grades of concussion are defined as follows:

Grade I: transient confusion; no loss of consciousness; concussion symptoms clear in less than 15

minutes.

Grade II: transient confusion; no loss of consciousness; concussion symptoms or mental status abnormalities last longer than 15 minutes.

Grade III: any loss of consciousness, either brief (seconds) or prolonged (minutes).

Question #7: The correct answer is b. The distance between the head and the head restraint at the point of collision, the backset, is the single most important determinant of injury risk in a rear-impact collision. There are, of course, many other important risk factors that should be considered in an overall risk assessment, including the relative vehicle masses, angle of impact, degree of overlap, types of bumpers, amount of crush, etc. There are many additional human factors to consider as well. An important piece of the forensic puzzle can be provided with backset information, in spite of the fact that many so-called experts ignore it for practical reasons: They simply do not have the opportunity to observe it. In contrast, treating health care providers frequently have the opportunity to make this simple investigation. Apart from the forensic value, it has bearing on injury mechanisms and, in turn, on diagnostics and treatment.

The Insurance Institute for Highway Safety (www.iihs.org) actually rates head restraint geometry, in an effort to inculcate manufacturers into improving their vehicles' safety. This can be an importance resource for forensic experts.

Question #8: The correct answer is d. From a biomechanical standpoint, as the head moves rearward in relation to the torso - a phase also termed the retraction phase, and one directly relating to backset - the cervical spine assumes an S-shaped configuration, with the upper cervical spine flexing and the lower cervical spine hyperextending. Both the capsular ligaments and discs experience the brunt of the trauma. In addition, when the head is turned somewhat, the alar ligaments are also subjected to very high loading and can be damaged, as recent MRI studies have demonstrated.

Question #9: The correct answer is d. A crash speed of 20 mph, although it sounds fairly benign, generally results in fairly substantial property damage and often results in complete seat back collapse. Most people will look at the resulting damage and overestimate the crash speed that caused it. Although this 8-12 mph answer provides only a crude range, it is based on my experience with crash testing and the reports of dozens of other researchers. It has significance in the forensic world because many accident reconstructionists claim to be capable of reconstructing a crash with very high precision and reliability by examining the crashed vehicle, even when there is little or no resulting crash damage. I can state with some authority, both as a crash test researcher and as 0an accident reconstructionist, that this practice is questionable at best. This relates to question #4. It is the prelude to the conclusion that injuries are not likely in a given crash.

Both large and small epidemiological studies provide compelling evidence that a significant number of real-world crash victims are injured in crashes in which there is little or no resultant damage. In a recent study conducted in New York, for example, it was reported that the single largest category of injury was in the no-damage group (Chapline JF, Ferguson SA, Lillis RP, et al. Neck pain and head restraint position relative to the driver's head in rear-end collisions. *Accid Anal Prev* 2000;32:287-297).

Question #10: The best answer is probably e. Quantitative EEG is probably the least reliable of the group. SPECT, which can disclose blood flow abnormalities, and PET, which can reveal metabolic abnormalities, can be useful tools, particularly when the resolving power of CT and MRI fails to pinpoint cerebral lesions in MTBI. A thorough and comprehensive neuropsychological battery is

generally effective in correctly identifying anatomical sites of abnormality and does not rely on technology.

How Did You Fare?

9-10 correct: You are indeed a forensic superstar. Congratulations.

7-8 correct: Not bad. You are obviously involved in this area now and keep fairly current.

5-6 correct: You definitely should be more current if you are treating injured patients, and especially if you are doing IMEs. Time to get yourself into a self-study program or other form of training.

3-4 correct: You should probably stick to family practice. In a personal injury case, you are likely to be more of a liability than an asset.

1-2 correct: You are obviously a practicing personal-injury plaintiff's lawyer. This is a test for physicians only.

Arthur Croft, DC, MS, MPH, FACO,
Director, Spine Research Institute of San Diego
San Diego, California
info@srisd.com

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