

Human Intervertebral Disc Herniation: the 50% Solution.

Arthur C. Croft, D.C., M.Sc., M.P.H., F.A.C.O.

The Journal of the Texas Chiropractic Association

April 9, 2007

## **Introduction**

Partial truths, it was once said, are often useful in the service of lies. Urban legends usually spring forth from the creative imaginations of clever folk. But they just as often emanate from careless or faulty interpretation of facts. In the medicolegal arena, the three most prevalent myths of the past decades are (1) that 50% of all people (including, of course, those who have no back pain) have herniated lumbar (and many would include cervical) discs, (2) that the majority of soft tissue injuries associated with whiplash trauma resolve within 6-12 weeks, and (3) that in low velocity collisions, when property damage in a motor vehicle collision is negligible, injury to its occupants is unlikely. This editorial deals with the first of these popular canards.

## **The Genesis of the 50% Solution**

If goal number one for a defense lawyer is to introduce doubt into the minds of the triers of fact—a jury, say—the notion that 50% of the American population is walking around in ignorant bliss with a benignly asymptomatic disc herniation (or perhaps more than one) will greatly marginalize a plaintiff's complaint of disc herniation. It essentially implies two important things: (1) that it is quite likely that the herniation revealed on the CT or MRI preexisted the claimed injury and/or (2) that it is not likely producing any real pain or disability, even if it was the result of the injury. It is easy to see how a successful foisting of this myth can provide a real “solution” to a disc herniation claim from the perspective of the defense. So where did this urban legend have its start?

## **The Real Numbers**

As near as I can tell, the 50% disc herniation myth began with a paper by Weisel et al. in 1984<sup>7</sup>. This was a CT-based study in which radiologists were asked simply to identify abnormalities they saw on CT scans. They were blinded as to the subjects' status. The subjects were grouped according to age and in the over-40 category the radiologists found abnormalities in about 50% of the subjects. However, these abnormalities included osteophytes, eburnation, and other *lusus naturae* and findings that are often of questionable clinical significance. Included in this class of abnormalities was disc herniation. In other words, disc herniation was not seen in 50% of the asymptomatic population: this was a misinterpretation of the original data. But the word spread quickly, no doubt owing to the usefulness of the (mis)interpretation, and within a few years it had achieved urban legend status. If you have any doubt, just ask any PI lawyer you know

what percentage of all persons have disc herniations and they will immediately parrot the 50% figure.

In the Wiesel et al. study, disc herniation was seen in only 19% in the under-40 age group. This is in line with other reports of asymptomatic disc bulge/herniation; these range from 4-28% and are more common among the elderly 6. Interestingly, the relative proportions of “major abnormal findings” in the 20-39 yr group and 40-59 yr groups were later shown to be very similar at about 20%; the 60-80 yr group had markedly more abnormal findings, at 57%, as one might expect 2. Thus, the rate of true positives are likely to be higher among younger aged individuals.

Most importantly, however, these studies are somewhat contrived and artificial, lacking by their very design, a fundamental component of the diagnostic equation—namely that of clinical interpretation. Radiologists blinded in such studies are generally obliged to report all of the pathology they see, as opposed to the pathology they would usually report as being probably significant, given the clinical history provided to them by clinicians. And, of course, knowing the prevalence of disc herniations in the healthy population, while of academic interest, tells us little about the prevalence or the significance of disc herniations in the patient population. One of the first lessons epidemiologists learn is that one must extrapolate from one population to another with great caution. And what about extrapolating from one body part to another?

Another important question is this: if we know that as many as 28% of lumbar discs are herniated, can these statistics be extrapolated to the cervical spine? It’s been my experience after 25 years in the medicolegal field that most lawyers and expert witnesses assume that the facts are interchangeable across spinal levels. But in another study by Boden et al. 3 the incidence of disc herniation in the normal cervical spine was found to be only 8%; with bulging discs at 2%; foraminal stenosis at 9%. Overall, the findings of “major abnormalities” in this group of subjects was only 19%. Yet degeneration was found in 37% of cervical spines (55% of the lumbar spines in their other study). The most common level to be classified as abnormal was C5-6, consistent with many other reports. And most recently, the incidence of cervical disc herniation among a group of 100 uninjured persons making up a whiplash control group was found to be only 4% 5. So clearly, the statistics of herniation are distinctly different in the lumbar and cervical spines. We have attempted to summarize this cervical disc herniation literature elsewhere 4.

These are important statistics to be familiar with because another common medicolegal misconception is that the presence of degeneration is generally always: (1) abnormal, (2) likely to be painful, and (3) the likely source of a patient's pain (i.e., as opposed to a claimed injury). The truth is that degeneration is such a common finding that it is generally considered a normal part of the aging process and, as clinicians are well aware, it correlates very poorly with pain or disability.

Having answered the question concerning the prevalence of disc herniation among the atraumatic and asymptomatic, we might also ask this question of the symptomatic. What

proportion of neck pain sufferers have these lesions? In a recent selected study of persons with neck pain, it was reported that only 17.3% of the C5-6 levels were deemed normal 1. This compared to 93.6% of the C2-3 spaces which were deemed normal in this series. "Protrusions/bulges" were found in 66.7% of cases with neck pain, and "extrusion" in 16% at the lower levels. Thus, persons with neck pain are 2-8 times more likely to have clinically important cervical disc abnormalities than persons without neck pain.

Finally, we cannot leave the subject without asking similar questions of the thoracic spine. This question was addressed in 1995 8. This was a blinded review by two neuroradiologists and two orthopaedic surgeons. In this group of 90 asymptomatic subjects (of which 30 had a history of lumbar pain), disc herniation was found in 37%. This is remarkably higher than the 19% reported in the lumbar spine 2 or the 8% reported in the cervical spine 3.

Disc herniations were found at all levels, but the majority were seen below T5. Persons with Scheuermann disease were twice as likely to have disc herniations. The overall prevalence of abnormal findings in another group of 31 thoracic pain sufferers was not significantly different from the asymptomatic group. In the whole group of normals, males tended to have more abnormalities, and age did not seem to play a large role, although the stratification used by the authors was unclear.

### **In Summary**

In asymptomatic persons we can expect to see from 4-8% with cervical disc herniation. For the lumbar spine this figure will be about 20%, and in the thoracic spine, the figure jumps to 37%, at least according to one study. Clinicians are cautioned to consider subject age when considering the correlation between pain and the findings of herniation. In older persons, the false positive rate is higher and in younger persons the true positive rate is higher. The relative rarity in the cervical spine make a finding here less likely to be benign than in the lumbar spine. Finally, good clinical acumen, honed diagnostic skills, and perspicacious judgment should allow the astute clinician to correlate anatomical and physiological findings adequately, making the final determination markedly more reliable and authoritative than a simple matter of probability. Jurors should never be forced to decide a case on probability alone.

### **References**

1. Arana E, Marti-Bonmati L, Molla E, et al. Upper thoracic-spine disc degeneration in patients with cervical pain. *Skeletal Radiol* 2004;33:29-33.
2. Boden SD, Davis DO, Dina TS, et al. Abnormal magnetic-resonance scans of the lumbar spine in asymptomatic subjects. *J Bone Joint Surgery* 1990;72-A:403-8.
3. Boden SD, McCown PR, Davis DO, et al. Abnormal magnetic-resonance scans of the cervical spine in asymptomatic subjects. *J Bone Joint Surgery* 1990;72-A:1178-84.

4. D'Antoni A, Croft AC. Prevalence of herniated intervertebral discs of the cervical spine in asymptomatic subjects using MRI scans: a qualitative systematic review. *Journal of Whiplash and Related Disorders* 2005;5:5-13.
5. Giuliano V, Giuliano C, Pinto F, et al. The use of flexion and extension MR in the evaluation of cervical spine trauma: initial experience in 100 trauma patients compared with 100 normal subjects. *Emerg Radiol* 2002;9:249-53.
6. Kent DL, Haynor DR, Larson EB. Diagnosis of lumbar spinal stenosis in adults-a meta-analysis of the accuracy of CT, MR and myelography-review. *Am J Roentgenol Radium Ther Nucl Med* 1992;158:1135-44.
7. Wiesel SW, Tsourmas N, Feffer HL, et al. A study of computer assisted tomography: I. the incidence of positive CAT scans in an asymptomatic group of patients. *Spine* 1984;9:549-51.
8. Wood KB, Garvey TA, Gundry C, et al. Magnetic resonance imaging of the thoracic spine. Evaluation of asymptomatic individuals. *J Bone Joint Surg Am* 1995;77:1631-8.