Dynamic Chiropractic – February 8, 1999, Vol. 17, Issue 04

Problems in Auto Crash Reconstruction

By Arthur Croft, DC, MS, MPH, FACO

This editorial is stimulated by a spate of e-mail queries I've received lately on an accident reconstruction program being taught around the country. It's been said that for every letter to the editor, phone call or e-mail question, there are a few hundred other similar questions unasked. So let me start by qualifying myself and the purpose of this piece. I am a certified accident reconstructionist (Northwestern University Traffic Institute --NUTI), so I know something about this business. I do not practice accident reconstruction, although I do teach it and have done lots of medicolegal cases where it comes into play. I try to attend most of the related seminars available and read all of that literature (what little of it there is).

For the last two years, I've even been laboring over a book on low speed rear impact crashes (LOSRIC), which I keep threatening to finish. Much of it involves reconstruction principles specific to low speed rear impact reconstructions, which are unequivocally the most difficult kind for reasons I'll get into shortly. I generally encourage clinicians to get some training in this area if they plan on doing any personal injury work.

Let me tell you my new name for this business: auto crash reconstruction (ACR). That comes from the recent decree from NHTSA that we should no longer refer to crashes as "accidents" because it implies that they are unavoidable. In truth, over 90% of the fault for accidents is attributable to human error.

Finding the right training has been, for most clinicians, difficult and confusing. Here's why. To go through a thorough, full bells-and-whistles type of program, you'll spend a good sum of money and about six weeks of full-time classroom work (which can be broken up into one or two-week sessions) and then take some rather challenging exams. You'll need to be fairly well acquainted with basic algebra, trigonometry and geometry; a knowledge of physics is also helpful.

As a compromise, there are three-day to eight-day courses (sometimes taught on weekends) that will provide just the amount of introduction to ACR principles that a clinician needs. You won't be prepared to do full scale reconstructions, but you will be allowed to testify, at least tangentially, on the subject.

On the extreme side, there is no law against calling yourself an ACR, even with no formal training. Many today have had only spotty training or on-the-job training as police officers. Others, of course, are engineers or physicists with lots of good training and experience. Either way, it's fine to discuss whatever training you've had, but I would strongly discourage calling yourself an ACR without proper credentials. A weekend course is not going to be enough to credibly pull it off in a medicolegal arena.

Surprisingly, it's often hard to tell who's who from reading the reports, since many highly trained engineers and physicists seem to have become mired in the romanticism of science while seemingly unacquainted with current literature. In jest, I refer to them as accident reductionists. As in any science, the ability to reduce everything to simple fundamental laws (i.e., reductionism) does not imply the ability to start from those laws and reconstruct the universe. Can you imagine a particle physicist creating an elephant from atoms? The same applies to ACR in LOSRIC. Knowledge of ACR principles and physics dynamics is no guarantee that your theories will be correct.

In ACR, we principally use Newton's laws of motion and equations that have been handed down to us from Galileo Galilei before him (i.e., law of inertia; law of falling bodies). These laws are precise and true to be sure, but to use them and get meaningful results we must be certain, to some reasonable degree of accuracy, of the variables to use in our calculation. This is where, in ACR, the trouble begins and ends; where some reputable scientists and well trained ACRs practice their dubious physics of bank shots, applying the fait accompli, facing their employers and the courts with the results preordained. It's all very simple, and I'll give it to you with the smallest splash of cynicism I can manage.

Let's start with what the ACR is trying to do. If one is working for the defense, the idea is to trivialize the crash and portray it as a no-possible-injury event. (Yes, those of you who are astute will argue correctly that the threshold for injury for all persons is not known, making the notion of a no-possible-injury event specious at best).

If working for the plaintiff, the idea is to find some way of providing data to place the event within known injury corridors. Now we know from several real world crash studies (as opposed to the reel world variety which are rampant[1])that occupants can be injured in crashes in which no property damage to cars results.

McConnell et al.[2] found the threshold to be a 5 mph delta V, but remember: these were healthy adult male volunteers, suggesting the threshold for those at greater risk would be lower. In the most recent work, the authors reported 29% and 38% injuries when crash pulses were only 2.5 mph and 5 mph delta V, respectively.[3] In neither case were the cars damaged, even with repeated crashes.

Many more studies have been conducted and show clearly that a well- aligned low speed crash can occur at impact speeds of up to 15 mph with little resulting deformation.

This creates a tremendous problem for the typical LOSRIC with little or no residual crush of either car because, while there are ways of estimating crash speeds such as measuring bumper isolator travel (if it's visible and if the car has isolators), they can never be terribly accurate. We are left with such a broad range of uncertainty that it questions the relevance of ACR in these kinds of crashes, because that broad range spans the continuum of no-injury types to crashes. It falls on the clinician to ultimately determine whether injury occurred and, if so, what treatment to render. Post hoc, dubiously accurate guesses as to whether a thing that has already occurred is likely to have occurred are outside the scope of modern logic.[4] My prediction is that the irrelevance of ACRs in LOSRIC will auger their doom and in fact has already done so in courtrooms from Arizona to Indiana.

To be a successful defense ACR, it seems you have to feign ignorance of the literature I mentioned (among others) or else criticize it and hope your opponents won't be prepared to joust. Fortunately most ACRs, in my experience, don't read much of it; some would actually have to have these papers to read them. (Don't worry, I'm not referring to the ones who teach these courses.) But a well-informed DC needs not possess ACR credentials to provide extremely important assistant to attorneys in their preparation of cross-examination strategies for these experts. For the DCs with credentials, all the better, particularly because many DCs are being gagged in testifying about issues related to the crash, occupant kinematics and biomechanics on the grounds that they are not engineers, ACRs or biomechanists. So, as the cliche goes, knowledge is power.

References

1. Freeman MD, Croft AC, Rossignol AM, Weaver DS, Reiser M. A review and methodologic critique of the literature refuting whiplash syndrome. *Spine;* scheduled for January 1999 publication.
2. McConnell We, Howard RP, Poppel JV, et al. Human head and neck kinematic after low velocity rear-end impacts: understanding "whiplash." *39th Stapp Car Crash Conference Proceedings*

952724;1995:215-238.

3. Brault JR, Wheeler JB, Siegmund GP, Brault EJ. Clinical response of human subjects to rear-end automobile collisions. *Archives of Physical Medicine & Rehabilitation* 1998;79:72-80.
4. Croft AC. Whiplash injuries and low speed collisions: confessions of an accident reconstructionist. *Forum* 1997;27(6):10-15.

Click here for more information about Arthur Croft, DC, MS, MPH, FACO.

[IMAGE]