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REVIEW OF THE SCIENTIFIC LITERATURE – A SUMMARY OF RECENT STUDIES

In 2005 an article appeared in the peer reviewed MEDLINE indexed medical journal *Pain Research Management*: “A review of the literature refuting the concept of minor impact soft tissue injury.” The article notes: “Minor impact soft tissue (MIST) is an insurance industry concept that seeks to identify late whiplash as a psychosocial phenomenon. However, the medical literature in this area has not been systematically reviewed since the Quebec Task Force’s review in 1995.” The article’s objective was “To review the medical literature which claims that late whiplash is an organic phenomenon causing significant disability.” The conclusion: “A review of the literature did not support the validity of MIST.” Sixty-three medical journal articles were reviewed.

The authors note that one study examined “the relationship between real-world Delta V, as measured by ‘black boxes’ installed inside vehicles, and chronic injuries. While one would expect a linear relationship, none was found. For instance, chronic injury rates at Delta Vs of 5-10 km/h were twice that of 10-15 km/h! In addition, chronic injury rates at 15-20 km/h were twice the rates seen at 20-25 km/h. These rates likely relate to the stiffness and elasticity of the vehicle and the complex interplay between seat design, occupant mass, occupant position and vehicle dynamics.” In other words, a low Delta V does not automatically mean that the risk or severity of injury was low.

The authors then noted: “If late whiplash is a short-term, mild muscle pull that should always resolve on its own with only supportive care, then the MIST policy would seem reasonable. However, if there were data showing this injury is more serious, then MIST would be called into question.” The authors then list the literature which documents injury to the dorsal root ganglia, facet joints and ligaments.

The presence of a neurological injury is supported by the fact that “numerous researchers (found) that late-whiplash patients have different sensory thresholds than normal controls (42-47) . . . This means that they feel things differently than someone with a normal sensory system . . . the prevailing opinion is that this is due to sensitization of the CNS.”

What about long-term prognosis for late-whiplash injury? The authors reviewed a study which found that “Seven years after the crash, there was a 160% to 370% increased risk for headache, thoracic and low back pain, fatigue, sleep disturbances and ill health for those who were in a rear-end crash.” Another researcher studied a group that was followed for 15.5 years. Over 70% of the patients continued to report symptoms related to the original crash at the end of the study. Between years 10 and 15.5, 18% had improved, while 28% had worsened and 54% had stayed the same. A third study found that “when patients who sought specialty care for

injuries reported in an emergency room were compared with patients also seen in the emergency room but with no motor vehicle crash-related complaints, the disability rate in the injury group was 30-35%, while the non injury group reported an injury rate of only 6%.”

The conclusion: “Is MIST still scientifically valid? While many authors have published studies that would seem to support the MIST hypotheses, the vast majority of work published in the past 10 years would not support MIST.” (Christopher J. Centeno MD, Michael Freeman, PhD MPH DC, Whitney L. Elkins MPH: “A review of the literature refuting the concept of minor impact soft tissue injury,” *Pain Res Manage* 2005;10(2):71-74.)

An editorial in the peer reviewed medical literature was entitled **“SEEING THROUGH THE ‘MIST’ (minor impact soft tissue injury)?”** and was published in the Summer 2005 issue of *Pain Research Management* by Eldon Tunks, M.D., F.R.C.P.C. Key comments include the following:

“The authors (referring to the Centano, Freeman and Elkins article cited above) noted that the hypothesis that the severity of the crash should determine the severity of injury has not been supported by crash studies. They point out that studies dealing with simulated crash data and real-world crash data from ‘black boxes’ installed in vehicles have found that Delta V, or the change in velocity during crashes, does not bear a consistent or expected relationship to injuries, and low-damage accidents can be accompanied by occupant injury. The relationship between accident severity and occupant injury is determined by interactions between the overall energy of the accident, the stiffness and elasticity of the vehicles, seat design, head restraint, occupant mass and position, vehicle design with crumple zones, and other factors such as the addition of a tow hitch and whether the occupant is male or female.”

“There are various lines of evidence that call the assumption of trivial soft tissue injury into question. In their extensive narrative review, Barnsley et al (1) compiled evidence that whiplash accidents are associated in some cases with damage to the zygapophyseal joints, intervertebral disk avulsion, tear of the anterior annulus fibrosus and anterior longitudinal ligament, and accelerated onset of degenerative changes in the cervical spine.”

“There is reasonable doubt about the validity of equating ‘whiplash-associated disorder’ with ‘MIST’. For the sake of our patients and the integrity of our science, we as clinicians, independent medical consultants and clinical investigators must take account of the emerging evidence in this field.”

Another recent medical literature review found the following: “In the mid-1990s, a set of guidelines was published by a leading U.S. auto insurer for claims adjustors concerning the handling of certain types of crash-related injury claims (1)” . . . “Claims adjustors were instructed that, as a general precept, crashes with minimal damage are unlikely to-or cannot-cause significant or permanent injury. Thus, any claim for injury in the presence of minimal vehicle property damage was to be handled as a type of fraudulent claim and claims adjustors were instructed that, regardless of medical evidence of injury, the injury should not or could not have occurred because of the nature of the crash, and the claim goal was to close without payment.”

“The purpose of the present study is to synthesize the published literature for evidence that allows for validation of a system that can accurately predict injury presence, severity, or duration based solely on vehicle property damage levels” . . . “We conducted a comprehensive best evidence synthesis of the existing medical and engineering literature to investigate the relationship between vehicular structural damage and occupant injury in motor vehicle crashes.”

Conclusions: “Our best evidence synthesis demonstrates that while there appears to be some relationship between property damage and injury risk or severity, this may only be true when considering a wider property damage range (e.g., minor vs. severe or moderate vs. severe) but this metric does not hold for males nor does it correlate significantly with long-term symptoms for persons of either sex. A substantial number of injuries are reported in crashes of severities that are unlikely to result in significant property damage. Thus, property damage is neither a valid predictor of acute injury risk nor of symptom duration. Other factors, such as head restraint geometry, awareness of the impending crash, sex, and prior injury are likely to impose competitive or stronger outcome effects, particularly as regards long-term outcome. *Based upon our best evidence synthesis, the level of vehicle property damage appears to be an invalid construct for injury presence, severity or duration. The MIST (Minor Impact Soft Tissue) protocol for prediction of injury does not appear to be valid.*” (Emphasis added.)(Freeman M, Croft A: “Correlating crash severity with injury risk, injury severity, and long-term symptoms in low velocity motor vehicle collisions.” *Med Sci Monit* 2005;11(10): RA316-321.)

Another new article regarding low speed impacts was recently published in the literature: “Significant Spinal Injury Resulting From Low-Level Accelerations: A Case Series of Roller Coaster Injuries.” Freeman MD, Croft AC, Nicodemus CN, Centeno CJ, Elkins WL. *Archives of Physical Medicine and Rehabilitation*, Volume 86, November 2005, p. 2126-2130.

The objective of the study was to describe a group of significantly injured roller coaster riders and the likely levels of acceleration at which the injuries occurred, and to compare these data with contemporary efforts to define a lower limit of acceleration below which no significant spinal injury is likely to occur. Injury incident records and emergency medical service records were evaluated for 932,000 riders of a San Antonio, Texas roller coaster.

The study found a total of 656 neck and back injuries during the study period, and 39 were considered significant by the study inclusion criteria. Injuries included cervical and lumbar disc bulges and herniations which in some cases required surgery.

The conclusion of the study: “The results of this study suggest that there is no established minimum threshold of significant spine injury. The greatest explanation for injury from traumatic loading of the spine is individual susceptibility to injury, an unpredictable variable.”

In addition: “Experimental rear-impact no-damage collisions have been shown to produce more than 15g peak head acceleration, more than 3 times the amount of the peak head acceleration measured on the roller coaster. (22) Based on the results of this study, it is apparent that in a susceptible subset of the relatively healthy general population, significant spinal injury can result from low-level accelerations.”

CONCLUSIONS

1. Late whiplash is an organic phenomenon causing significant disability.
2. The hypothesis that the severity of the crash should determine the severity of injury has not been supported by crash studies.
3. The level of vehicle property damage appears to be an invalid construct for injury presence, severity or duration.
4. There is no established minimum threshold of significant spine injury. The greatest explanation for injury from traumatic loading of the spine is individual susceptibility to injury, an unpredictable variable.