Dynamic Chiropractic

WOMEN'S HEALTH

MVC, Pregnancy and Infant Torticollis

THEORIZING ON THE MECHANISM OF INJURY

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Do theories hold any place in scientific literature? Sure they do; just consider the theory of relativity, widely quoted and taught in physics classes around the world. There are numerous "theory" textbooks in many of our prestigious universities. So, does a theory have a place in the realm of certainty?

Let's look at an interesting scenario that calls for a theory. Can crash-testing be done to test for injury risk with a pregnant female? Ethically, no human volunteer testing can ever take place. This leaves us with simulations resulting from computational models, biomechanical modeling, or crash-test dummies that accurately simulate a pregnant female.[1-4]

A recent study by Duma, et al.,[4] stated that automobile crashes are "the leading cause of traumatic fetal injury mortality." The authors wanted to know if a fetus could be injured and were able to demonstrate that in simulated biomechanical modeling, "fetal injury risk" was possible at speeds of over 15 mph, with risk ranging between 37 percent to 61 percent. This is consistent with other studies that have looked at "local uterine compression on the risk of fetal injury"[3] or "uterine strain."[1]

There are several independent facts that we are certain exist. We know that motor vehicle collisions (MVC) occur and that people are injured; some more or less than others. We also know that during pregnancy, the female body produces a hormone called relaxin in increasing amounts in preparation for delivery. Relaxin, as the name suggests, "relaxes" ligaments for birth. Additionally, we know that hormones are readily shared between mother and fetus during pregnancy; therefore, the hormones that affect mother will affect child in utero.

We also know infants can have torticollis from unknown etiology. What happens when we consider all three of the above factors at the same time, including the consideration that MVC mechanics can be responsible for infantile torticollis if a crash occurs during pregnancy? Consider the following: During pregnancy, the most common position for the unborn baby is in a head-down position. Particularly during the last few months of gestation, pregnancy is obvious and seat belt positioning becomes an issue, particularly for reasons of comfort.

Often the seat belt is placed well below the bulging abdomen, across the lower abdomen. This position places the belt near or at the head level of the baby in utero. Although there is "protection" from the tissues between the baby's head and the seat belt, the mechanical forces imposed during a crash transcend all tissue regardless of the amount of "cushion" between each.[1-4]

If the occupant is projected forward into the seat belt, which is designed to suddenly stop forward motion, will that motion transfer to the baby and impose forces onto the baby's head and neck in utero? In fact, Biederman[5] has talked about kinematic imbalances due to suboccipital strain (KISS), one of the main symptoms of which is torticollis. A risk factor for this condition seems to be

"intrauterine misalignment."[5] Trauma is well-understood to create sufficient forces to cause misalignment.

According to the *Merck Manual,* "Congenital torticollis is head tilt present at birth. The most common cause is traumatic neck injury during (but sometimes before) delivery."[6] This condition is defined as a spasm of neck muscles (myospasms) creating a bend to one side (laterocollis) or rotation of the head and neck (torticollis). This can often be painful and limits ROM.6 Although birth trauma is cited as the most common cause of head tilt, there is room for consideration of trauma prior to delivery as a cause.[7]

Once the child is born, the "pathogenetic importance of asymmetric posture and motion [may be] played down if recognized at all."[5] The clinician should ask about trauma (collision trauma) to the mother during the pregnancy, and if present, should not be dismissed as a potential for causal relationship.

If the connection is dismissed or the condition is not treated, it may spontaneously subside, if mild, but later in life (around age 5-6 years old), the child may develop headaches, postural problems and a variety of other symptoms.[5] Long forgotten will be the trauma sustained by the mother during pregnancy.

Computational and biomechanical models have demonstrated that there is sufficient force generated during a collision to create "uterine strain," causing injury or death to the fetus. Current medical definitions of torticollis leave room for prebirth cause, but quickly dismiss it as a minor cause. It is the contention of this author that MVC may in fact be a leading cause of torticollis noted in infant and pediatric patients.

Many doctors, attorneys and third-party payers will eagerly and quickly dismiss any connection between trauma from a car collision during pregnancy and an infant's torticollis. This paper attempts to draw connections to the fact that this bridge can exist and be causally related. Clinicians should be aware of trauma history, which includes trauma from birth and motor vehicle accidents, when infants or young children present for treatment.

References

1. Moorcroft DM, Stitzel JD, Duma GG, Duma SM. Computational model of the pregnant occupant: predicting the risk of injury in automobile crashes. *Am J Obstet Gynecol*, August 2003;189(2):540-4.
2. Moorcroft DM, Jernigan MV, Duma SM, Duma GG. A finite element model of the pregnant female occupant: analysis of injury mechanisms and restraint systems. *Annu Proc Assoc Adv Automot Med*, 2002;46:347-51.
3. Duma SM, Moorcroft DM, Stitzel JD, Duma GG. Evaluating pregnant occupant restraints: the effect of local uterine compression on the risk of fetal injury. *Annu Proc Assoc Adv Automot Med*, 2004;48:103-14.
4. Duma SM, Moorcroft DM, Stitzel JD, Duma GG. Biomechanical modeling of pregnant occupants in far-side vehicle crashes. *Biomed Sci Instrum*, 2006;42;154-9.
5. Biederman H. Kinematic imbalances due to suboccipital strain in newborns. *Journal of Manual Medicine*, 1992;6:151-156.
6. *The Merck Manual of Diagnosis and Therapy, 18th Edition*. Section 19, Pediatrics, Chapter 261: Congenital Anomalies, Musculoskeletal Anomalies.
7. Burkus JK, Deponte RJ. Chronic atlantoaxial rotary fixation correction by cervical traction, manipulation and bracing. *J Pediatr Orthop,* 1986;6:631-5.