Persistant Spine Pain After Soft Tissue Healing Has Occurred

Following cervical whiplash and ligamentous injuries in other areas of the spine, these soft tissue injuries usually recover in two to three months. This statement is well supported by numerous scientific studies. However pain and disability may continue long after soft tissue healing has occurred. Numerous studies note persistent pain after many years. According to Punjabi,\textsuperscript{1} approximately 50\% of whiplash patients reported chronic neck pain after 15 years\textsuperscript{2,3}. Tomlinson et al noted in a 7.5-year prospective study that 29\% continued to report neck pain.\textsuperscript{4} They related much of the severity of symptoms to anxiety and depression.

The possibility that physical disruption of cervical ligaments is a significant cause of persistent pain and pain related depression cannot be ignored. Ligaments and muscles that have been injured heal differently from bone and differently from each other. Muscles, due to pain-related relative immobilization, may heal in a shortened position. Proper length is necessary to eliminate pain on stretch, with over-active stretch responses. Normalization requires passive stretching slightly beyond the point of pain, sometimes assisted by ancillary procedures such as massage, heat, even botox injections.

Ligaments heal quickly but may heal in a lengthened position, or not heal at all if their ends are not brought together. The best example is a tear of the knee’s anterior cruciate ligament (ACL). Instability here is clinically demonstrable and repair or replacement of the damaged structure is necessary. Unfortunately in the spine, such physical tests as used for assessment of knee ligament stability are not feasible. While history may raise a suspicion of its presence, radiographic studies are necessary to demonstrate loss of motion segment instability (LMSI) in the spine. According to the \textit{AMA Guides to the Assessment of Physical Impairment}, 4\textsuperscript{th} Edition, spinal impairment should be assessed using the diagnosis-related estimates (DRE) method. Four tools are available for assessing the presence of and degree of LMSI.

- Plain x-rays comparing flexion extension will detect gross abnormalities, especially at the atlas/axis level. Lesser degrees of slippage of one vertebra upon another may not be sufficiently great to be discernible with this technique. \textit{The Guides Casebook} states on page 183 regarding the cervical spine: “it might be difficult to measure the translation on flexion/extension x-rays within the degree of accuracy required to differentiate between 3.4 and 3.6 mm.” Note that the difference between 5\% and 25 \% whole body impairment is based on whether or not translation is less than or more than 3.5 mm. in the cervical spine, or 5.0 mm. in the thoracic or lumbar spine.

Magnetic Resonance Imaging (MRI) has lower resolution than x-ray, and while it may be better than a single view x-ray at showing gross slippage in the neutral position, the data necessary for finding loss of motion segment integrity cannot be obtained from a recumbent MRI. Since flexion and extension views are not possible it does not meet the criteria expressed in the AMA Guidelines for detecting LMSI. MRI images are generally taken without spine loading as the client is lying down and this is a further disadvantage when assessing function.

Functional Magnetic Resonance Imaging (fMRI) does involve flexion and extension. This is quite effective in detecting small and significant movement abnormalities, but it is very time consuming (hence expensive) and not available in Canada. Such MRI studies have been done in Sweden, and Dr. Bengt Johansson states:

“An fMRI examination is performed by positioning the cervical spine in approximately 40 different positions such that the pathological movement patterns and injuries to the ligaments and joint capsules can be detected.”

Digital Motion X-ray is available in Ontario and British Columbia. This is a dynamic study that, like fMRI, utilizes a series of images captured in sequence while the client is in the upright posture and hence the spine, loaded as in a real-life situation, is visualized in motion. The X-ray machine works with a video camera taking 30 individual x-ray frames per second to create a motion x-ray that lasts approximately 90 seconds. The result is about 3,000 individual x-ray images that can be viewed on a computer monitor, freeze-framed, zoomed in or out, or viewed in slow motion. Even though it does not show the cervical ligaments, the technician can see the results of ligamentous injuries by abnormal movements of the vertebral bodies. These abnormalities are easily seen by anyone trained in musculoskeletal radiography. Computerized analysis of the movement of selected points generates measurements of translation in millimeters and angular movement in degrees with a measurement precision that is superior to hand measurement. Such an assessment can be obtained in Markham, Ontario by contacting Dr. John Baird (DC) at 1 905 294 6000.

For more information on neck pain, back pain, anatomy of pain, and pain in general, visit www.ahs.uwaterloo.ca/~ranney/pain.html.

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5 Johansson, B: Whiplash injuries can be visible by functional magnetic resonance imaging. *Pain Research and Management* 2006; 11(3): 197-199.