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Subluxation and the Nervous System

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Dr. David Seaman joins *Dynamic Chiropractic* as a columnist for 2004. The author of *Clinical Nutrition for Pain, Inflammation, and Tissue Healing*, Dr. Seaman has been a regular contributor to DC in the past, addressing such topics as the diet-induced pro-inflammatory state and the neurological component of the subluxation.

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Subluxation remains a topic of heated contention, as does its relationship to the nervous system. Some still view the subluxation as a "bone out of place" that is returned to its proper position with an adjustment. That this view persists is somewhat surprising when we consider that back in 1967, Len Faye first introduced the dynamic subluxation complex to his students at the Anglo-European College of Chiropractic, in Bournemouth, England, and then to us here in the United States in the late 1970s and early 1980s. Faye described the subluxation complex as a joint that hypomobility, myopathological changes in spinal musculature, histopathology of spinal structures, inflammation, and related neurological dysfunction termed "neuropathophysiology."

Joint Complex Innervation

To understand the neuropathophysiology of subluxation, we need to be aware of the innervation of the spinal joint complex. Nociceptors and mechanoreceptors are the primary sensory receptors that innervate joint structures, including synovia, joint capsules, bone, ligaments, tendons, muscles, and blood vessels. The predominant receptor is the nociceptor. More than 90 percent of joint innervation is nociceptive, originally determined by animal studies,¹ then confirmed in studies with human spinal joint capsules.² In short, there is a paucity of mechanoreceptor innervation of the joint capsule, and an abundance of nociceptive innervation, which should seemingly lead our profession to dig deeply into the nature of nociception. There

seems to be less nociceptive innervation of muscles; we have about an equal balance of nociceptive and mechanoreceptive receptors,³ which means that nociceptive innervation of muscles is still significant.

Clearly, the afferent innervation of the spinal joint complex favors nociceptive receptors. At this point, readers should appreciate that nociceptors are not pain receptors and that nociception does not equate with pain. This misinterpretation is common throughout the extent of health care professions, as texts such as *Guyton's Physiology* use "pain receptor" and "nociceptor" interchangeably.

Different nerve fiber types are associated with nociceptors and mechanoreceptors, and nerve fibers are classified in two fashions. There is an alphabetical classification, which includes A, B, and C fibers that correspond to both afferent and efferent fibers. There is also a Roman numeral classification system, reserved exclusively for afferent fibers, designated as group I, II, III, and IV fibers, afferents, or units. These classification systems tend to make comprehending the nature of nerve fibers more difficult than it should be.

The best way to view this is from the perspective of fiber size. Generally speaking, there are A-alpha, A-beta, A-gamma, A-delta, B and C fibers, differentiated by their size, with A-alpha the largest and the C fibers being the smallest. Depending on their place of origin, A, B and C fibers can be afferent or efferent.

Nociceptive afferents, for example, are either A-delta or C fibers; when these fibers leave peripheral tissues with which to travel to the spinal cord, we know that they are nociceptive. So far, so good, right?

The confusion often begins when the overlap between the alphabetical and numerical system is presented. All we need to know at this point is that A-delta afferents equate to group III units, and C fibers equate to group IV units. Practically speaking, this means that joints are predominately innervated by A-delta/group I fibers and C/group IV fibers. Actually, C-fibers/group IV units are the predominant afferent fibers that leave joints.

When we consider joint innervation for the purpose of understanding the neurology of subluxation, we need to know that C-fibers or group IV afferents are the primary nerve fibers that innervate spinal joints. Stated again, joints are innervated predominantly by C-fibers/group IV afferents.

Compared with nociceptors, significantly fewer mechanoreceptive afferents leave our joints. A-alpha fibers equate with Group Ia and Ib afferents, while A-beta fibers equate to group II units. Significantly more group I and group II units innervate muscle compared to joints.

This heavy concentration of nociceptive fibers in joints suggests that we are basically built to experience joint pain, which bears itself clinically when we consider that most people experience back or neck pain during their lives. Whenever asked why back pain is so common, we should state the simple truth: our spinal joints are densely populated with nerve receptors that sense tissue injury and inflammation, i.e., nociceptors.

Subluxation Neurology

The above description of fiber types can be found in most anatomy, neurology and physiology texts. What we don't read in such texts is that spinal dysfunction/subluxation will influence the activity of the various fiber types. Nociceptors are activated by tissue injury and the chemical mediators that cause inflammation, while mechanoreceptors are stimulated by normal movements. Accordingly, spinal injury is likely to increase the firing of nociceptors however, the activity of mechanoreceptors is likely to be reduced because with injury, inflammation, nociception and pain, there will be less movement afforded to the injured joint and therefore, less mechanoreceptor activation. The outcome of this pattern of receptor activity associated with the subluxation complex will be discussed in future columns. Suffice it to say that increased nociception and reduced mechanoreception can cause pain, visceral symptoms, problems with motor control and proprioception, or no symptoms at all.⁴

The important point to appreciate now is that the subluxation complex will alter the firing of spinal tissue nociceptors and mechanoreceptors, and this will lead to various symptoms that we often encounter in the clinical setting that respond to chiropractic care. So, when we think about subluxation, the subluxation complex, or joint dysfunction, we need to think about receptors and afferent fibers.

Although the spinal nerve travels through the intervertebral foramen, it is rare for a bone-on-nerve subluxation to occur. There has to be significant facet hypertrophy or disc collapse, not a common encounter in clinical practice; perhaps 1 percent of the population with back pain suffer with this problem.⁵ When such neurocompression does exist, surgery and/or heavy medication is often the choice of care.

What makes the bone-on-nerve subluxation popular is that we can visualize the spinal nerve in books and cadaver specimens; however, we cannot see nociceptors or mechanoreceptors. For us humans, it is far easier to believe something that we see, compared with something that is invisible to the naked eye. Despite this tendency, we must understand that spinal joints and muscles have a massive nociceptive and mechanoreceptive innervation pattern that is profoundly influenced by the subluxation complex. While not

visible, they are the reason patients come to our offices.

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