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### ***Spinal Manipulation***

Various forms of spinal manipulation have been used by numerous cultures throughout history. Hippocrates used manipulative procedures to treat spinal displacements, and is credited with the phrase “Look to the spine for disease.” Similar procedures were performed by several American Indian tribes, and appear in the records of ancient Asian and Egyptian cultures. Treatment by “bonesetters” became popular in England and America during the 19<sup>th</sup> century, but manipulation techniques weren’t systematized until the development of chiropractic and osteopathy in the late 1800s.

Chiropractic (literally “hand practice”) was developed by Daniel Palmer (1845-1913) who used his hands to palpate misaligned vertebrae, and then deliver a forceful thrust to reduce them back into place using their bony prominences as levers for repositioning. (This would eventually be termed a short-lever adjustment; long-lever techniques use contact points distant from the vertebral joint in question, thereby manipulating a series of vertebrae.) Palmer believed that vertebral displacements cause disease by pinching nerves as they exit the spinal cord, thus impeding normal nerve flow to tissues and organs. However, in the absence of disc herniation or bony remodeling, direct anatomic compression of nerve roots by misaligned bones has not been confirmed as the key factor in subluxation-induced disease. Nor is it known whether stress to local blood vessels, either by bony displacement or altered joint mobility, is sufficient to cause significant nerve damage. This anatomic model, called the non-impulse-based model, has been challenged in recent years by a functional impulse-based model. In this model, nerve impulses carrying information to and from the spinal cord play the central role.

Research suggests that information from nociceptive afferents is toned down in the spinal cord by information from the faster-signaling mechanoreceptive afferents. Normal joint mobility thus allows regulatory inhibition of pain signals. In joint hypomobility (due to muscle tension, connective tissue fibrosis, cartilage damage, or bony remodeling) appropriate mechanoreceptor stimulation is missing because the joint isn’t moving normally. Aberrant neural patterns created by joint fixation and repetition of the same afferent signals results in long-lasting alterations in how the spinal cord responds to all future signals (reflex entrainment). This process does not rely on actual bony displacement, and the modern chiropractic definition of a subluxation includes any joint dysfunction, including anatomic, dynamic, or physiologic abnormalities. The therapeutic adjustment – defined as any High-Velocity Low-Amplitude (HVLA) thrust delivered with controlled force, direction, and depth – is thought to restore normal neural processing by stimulating the appropriate mechanoreceptors whose afferent signals interrupt abnormal reflex patterns. Thrusts that cause joint separation and stretching (either along or at right angles to the articular plane) provide better stimulation than thrusts that cause joint compression. The result is reflex inhibition of pain, reflex muscle relaxation, and the correction of abnormal movement patterns. Simple joint mobilization involving non-thrust motion does not provide equal effects.

Since functional disturbances are not obvious on radiographs, chiropractors have traditionally relied on primarily subjective means to identify subluxations and evaluate response to treatment. (Techniques are available to measure indicators like skin temperature and electrical conductivity, but their validity in identifying subluxations needs more research.) A technique developed for humans called Activator Methods Chiropractic Technique (AMCT), relies on a phenomenon called facilitation to locate subluxations. Facilitation refers to the heightened excitability of neural pathways caused by repeated stimulation (likely involving an increased probability of neurotransmitter vesicle release from the presynaptic pool), which results in hyperactive efferent

responses to any further stimulus whether mechanoreceptive or nociceptive. The manifestation of this process used in AMCT to locate subluxations is muscle spasm and shortening along the spine in response to mechanical stimulation (via direct pressure to or movement of the affected joint); this is measured as functional leg length inequality. The practitioner then uses a hand-held spring-activated device (Activator Adjusting Instrument) to deliver the appropriate HVLA thrust; therapeutic effect is measured as restoration of leg length equality. This technique is not practical in dogs and cats (having much shorter legs and little patience for the required positions), but a similar method using facilitation was developed for quadrupeds called Veterinary Orthopedic Manipulation (VOM). In this technique the Activator thrust itself is used as the mechanical stimulus to trigger a reflex muscle twitch. Between T3 and L4/5 this is observed as twitching of the cutaneous trunci muscle; above T3 and below L4/5 it is common to see twitching of the neck/forelimb and pelvic/hindlimb muscles respectively. Every spinal joint is tested by positioning the Activator (or similar device) strategically on each vertebra; reflex muscle twitches are recorded as “reads” in the patient’s chart (location and severity). At the same time the thrust is locating subluxations, it is also providing the therapeutic adjustment. Two to three passes down the spine are traditionally performed by the VOM practitioner at each visit; this allows interpretation of shifting read patterns between passes to determine areas of primary subluxation versus areas of secondary compensation, and to locate hidden subluxations whose reads may be initially suppressed by more severe subluxations elsewhere. The appendicular joints are also addressed. Recorded reads decline in extent and severity as the patient improves clinically, and may persist beyond resolution of symptoms if the patient’s condition or activities promote repeated dynamic stress.

AMCT and VOM both deliver the HVLA thrust with the joint in its resting, neutral position. Strictly manual chiropractors who refuse to use a spring-activated device argue that the therapeutic effects of adjustment require the traditional hand-delivered thrust which begins with the joint in a stressed position (at the end of its passive range of motion) and takes it beyond its elastic barrier of joint resistance (which generally requires movement sufficient to overcome the fluid tension between joint surfaces, resulting in cavitation and the characteristic cracking sound); this provides an added degree of stretch to surrounding connective tissues believed necessary to break up fibrous adhesions. Proponents of instrument adjusting argue that their higher-speed lower-force specific thrusts are sufficient to restore the joint’s normal neuromuscular homeostatic mechanisms, and subsequent self-healing of tissues, without stressing the joint to such a degree. Early studies in humans do suggest that the Activator achieves about the same amount of immediate joint movement during the actual thrust as manual techniques using less force and more speed\*. Overall movement is of course greater using manual technique, but it remains to be seen whether one technique is superior to the other. Both have seen positive clinical results. As with most things in medicine, it is likely that some patients respond better to one and some to the other. The fact that VOM does not force the joint beyond its elastic barrier gives it an added measure of safety in small animals, and ensures that the spine will not be over-adjusted with repeated passes along the vertebrae. Methods like massage and acupuncture can be added to provide additional gentle benefit in areas where adhesions may be present.

VOM has helped pets with a wide range of ailments, including IVDD, Wobbler’s (normalizing neural responses in cases of hypermobility as well as hypomobility without stressing the joint), sciatica, arthritis, partial cruciate tears, lick granulomas, feline hyperesthesia syndrome, and even certain internal disorders (caused by reflex stimulation of the sympathetic nervous system). A thorough veterinary exam and proper diagnostic tests are necessary to identify the nature of the problem and to determine if orthopedic manipulation is appropriate. (You may wish to save this article as reference for next month’s case report.)

*\*Comparing forces and speeds in the human cervical spine<sup>1,2</sup>, manual thrusts average around 100 Newtons of peak force with thrust duration times ranging from 80-100 milliseconds; Activator cervical thrusts average around 40 Newtons of peak force with a thrust duration time of about 30 milliseconds. Comparing movements in the lumbar spine<sup>1,3</sup>, manual and Activator thrusts both generate roughly 0.5-1mm translation and 0.5-1° rotation. (Studies need to be conducted that simultaneously compare forces, speeds, and movements all in the same spinal region.)*

1. Chiropractic Technique, D. Peterson & T. Bergmann, Mosby 2002, Ch.4 Pg.125-6

2. Biomechanical Characterization of Five Novel Methods of Cervical Spine Manipulation, J Manipulative Physiol Ther 1993; 16(9):573-7.

3. Measurement and Analysis of the In Vivo Posteroanterior Impulse Response of the Human Thoracolumbar Spine: A Feasibility Study, J Manipulative Physiol Ther 1994; 17(7):431-41.