



Dynamic Chiropractic – April 26, 1991, Vol. 09, Issue 09

The Art of the Chiropractic Adjustment: Part IV

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The aim of this series is to define certain general principles that underlie almost all chiropractic adjustive techniques. Parts I and II of this series reviewed depth of drive, the articular snap, segmental distraction, timing, the advantages of placing the patient's spine in an oval posture, correct table height, and patient positioning objectives. Part III summarized the factor of time in the clinical approach and its underlying biomechanical principles of tissue viscoelasticity, fatigue, creep, and relaxation. This column reviews the need to visualize the loading effects on articular cartilage, joint lubrication, action of the intra-articular synovial tabs, and the articular planes to deliver a corrective thrust most effectively.

Loading Effects on Articular Cartilage

When articular cartilage is subjected to weight bearing, deformation develops instantaneously according to the tissue's stiffness property. This initial stage of rapid deformation has a negligible matrix fluid flow, and the contour of the tissue changes but not its volume. This stage is followed by a slower time dependent creep (see previous column) related to the flow of water through the matrix according to the magnitude of the load, the fiber elasticity, the quantity of surface area loaded, the uniformity of force distribution, the matrix permeability (which is low even when unloaded), the osmotic pressure of the matrix colloid, and the length of the flow path.

When articular load is decreased during rest, stressed cartilages begin to return to their original thickness -- quickly at first (90 percent) because of the elastic recoil of the collagen fibers, and then slowly after that from the absorption of water governed by the Donnan osmotic pressure of the proteoglycans in the matrix gel. This recovery by absorption is enhanced by oscillation of the unloaded joint and limited by the collagen fiber's stiffness and strength that are subjected to increasing tensile forces as the swelling develops.

Again we see the important factor of time. Because fluid flow within a connective tissue's matrix is time dependent, cartilage response to compression depends on the magnitude of the load, the length of time the load is applied, and if the load is applied statically or cyclically. A small amount of fluid is expressed through the matrix even during a briefly applied load and its absorption is time-dependent. If a second load is applied before the matrix is fully reimbibed, as during cyclic loading, the result is incomplete recovery that summates as the cyclic loading continues.

Joint Lubrication

Joint lubrication is another factor to consider and visualize during adjustive therapy. The complex lubrication system of human joints far exceeds that of similarly designed manmade bearings. Much of this is due to: 1. the renewable coating of glycoprotein molecules that blanket the surface of articular cartilage, 2. the ingress and egress of fluid from the cartilage's matrix, 3. the porosity and elasticity of cartilage that also allows fluid imbibition and discharge during load compression and relief, and 4. the unique folding and sliding action of interarticular synovial folds during movement.

The Intra-articular Synovial Tabs

The faces of the posterior articular facets of the spine are covered by tough hyaline cartilage and separated by meniscus-like tabs of synovium that originate from the synovial lining of each joint. They allow a degree of extra shock-absorbing and pressure-absorbing protection for the articular cartilage. The tabs normally glide in and out of the joint during motion but are sometimes nipped during joint jamming (e.g., in extension). The resulting swelling and hypertrophy from chronic inflammation of the tabs will disrupt normal articular glide and establish a state of chronic apophysitis leading to spondylosis. An acutely "locked" joint due to tab dislocation can easily mimic the features of intravertebral disc (IVD) protrusion.

Articular Planes

It is almost certain that every DC has seen another chiropractor delivering a thoracic adjustment with the line of drive directed toward the floor. Such a line of drive is contrary to all biomechanical and anatomical factors involved. Besides being inefficient, it is highly painful to the patient. The fault lies in failure to visualize the design and position of the structures beneath the contact hand. Knowledge and vision are the keys for mastering any art.

A line of drive directed exactly parallel to the plane of articulation is the most mechanically efficient and induces the least amount of articular injury (and related patient discomfort). Because the midthoracic facets face almost straight toward the anterior when the patient's spine is in an oval posture, the adjustive impulse must be directed as parallel to the spine as is possible, i.e., headward, minimally downward. Granted, this is an awkward position, but the more downward impulse, the more articular jamming will be induced -- encouraging articular bruise and the subsequent development of an inflammatory reaction leading to adhesion development in the weeks or months ahead. Keep in mind that the superior articular processes of the subjacent segment extend somewhat upward like rabbit ears. They could be easily fractured by a sharp force directed anteriorly if not for the stability provided by the rib cage.

It is of questionable clinical value to the patient to release a fixation only to set the stage for another in the future. When it is necessary to stretch the anterior longitudinal ligament and widen the IVD space anteriorly, it is recommended that this be done by patient positioning and to release the fixed facets with a force that is parallel to their plane of articulation. In this era of increasing malpractice claims, it is wise to give patient safety and comfort an extraordinary priority over a loss of a few ounces of mechanical efficiency.

The planes of articulation of an individual patient's particularly involved motion unit must be considered. Textbook descriptions are based on population averages and do not consider the factors of individual genetic design or the affects of unique trauma and osseous erosion from long-term postural imbalance. Adapt to the situation at hand, not a textbook illustration.

This series of articles has been adapted from a brief summary of Chapter 15 of the new book, *Clinical Chiropractic: Upper Body Complaints*.

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Editor's Note:

You can take advantage of the special pre-publication price of Dr. Schafer's latest textbook, *Clinical Chiropractic: The Management of Pain and Disability Upper Body Complaints*. Please see the Preferred Reading and Viewing list on page XX to order your copy in advance (part #T125).



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