Dynamic Chiropractic

CHIROPRACTIC (GENERAL)

The Art of the Chiropractic Adjustment: Part III

Richard C. Schafer, DC, FICC

As described in the previous two columns, all adjunctive procedures stand in the shadow of the basis for and the proper administration of the chiropractic adjustment. The goal of this series is to define briefly certain general principles that underlie almost all chiropractic adjustive technics. Some may be new to the reader, yet their basis is as old as chiropractic itself.

Parts I and II of this series reviewed depth of drive, the articular snap, segmental distraction, timing the thrust, the disadvantage of some drop-support tables, the advantages of placing the patient's spine in an oval posture, correct table height, and patient positioning objectives. This column very briefly describes the factor of time in the clinical approach and its underlying biomechanical principles: viz, tissue viscoelasticity, fatigue, creep, and relaxation.

The Factor of Time in the Clinical Approach

To produce an effective articular adjustment, it is first necessary to evaluate the degree of joint motions and end plays present. Whatever corrective procedure is used, Hooke's law should be remembered: The stress applied to stretch or compress a tissue is proportional to the strain, or change in length thus produced, if the limit of elasticity of the tissue is not exceeded. Adjustive ojectives are generally achieved by dynamic manual articular mobilization unless such a technic is contraindicated in a specific situation. Obviously, one would not apply a dynamic force over extremely porotic bone, a fracture, an abscess, a tubercular cyst, or a malignancy, for example; nor would it be applied over acutely inflamed tissue or splinted muscles if the doctor expects the patient to return.

The author approaches the subject of chiropractic articular correction as a nonincisive surgical procedure, a "chiurgical" art. Correct application takes time. It takes time to assure proper patient positioning, assure that the intended line of drive is exactly parallel to a particular patient's facet design, assure that the safest and most efficient and painless point of contact is selected, and assure that the proper impulse velocity and depth have been predetermined according to the circumstances at hand (e.g., patient age, size, development, individual pain threshold, underlying pathophysiologic status, etc.).

There is no doubt that sufficient time must be taken to assure that adequate examination is made and preadjustive therapy is applied to render the tissues involved to be more receptive to the adjustment, (e.g., tissue plasticity, elasticity, and flexibility) and that adequate postadjustive therapy is applied to enhance the healing process (e.g., neurocirculatory processes and pain control). In addition, traumatized and pathologic tissues characteristically have low endurance and high biomechanical fatigue properties. These form a substantial part of the scientific foundation of our art.

Neuromusculoskeletal tissues are organic viscoelastic substances. The critical factor in viscoelastic stability involves both load and a time element; i.e., a viscoelastic substance can resist a certain load for a period and then fail without the load being altered. All musculoskeletal structures, thus, have a time-dependent stability factor, which is usually structurally adapted to in living tissue if the time element is prolonged. We witness this in bone with the trabecular redesign from chronic stress according to Wolff's law. What is true for bone is true in all viscoelastic substance to a variable degree.

Biomechanical Fatigue and Endurance

The combined components of viscosity and elasticity allow relaxation and creep, and both are a function of time. The viscoelastic nature of IVDs and other joint connective tissue therefore offers time-dependent properties such as fatigue and hysteresis. These properties vary in reaction whether a load is applied quickly with high amplitude (e.g., a jerk) or slowly with a low magnitude (e.g., pressure fatigue failure). As the repair and regeneration capabilities of discs and cartilages are low, their fatigue life is comparatively short when subjected to repetitive loading. On failure, the result is tissue tearing.

The limit of tissue endurance is the least load that produces a failure from structural fatigue. If healing processes are inhibited or impaired, if the body's reserves are depleted, or if the healing processes do not have adequate time to repair structural cracks in bone or cartilage, for example, small fatigue fractures commonly occur in articular cartilage.

Biomechanical Creep and Relaxation

The viscoelastic properties of a fibrocartilage such as an IVD and somewhat of articular cartilage allow creep and relaxation behavior. The greater the load, the greater the deformation and the faster the rate of creep. A degenerated disc, for example, exhibits less viscoelasticity, less creep, and less capability of attenuating shocks and vibrations uniformly over the full surfaces of the end plates. Thus, stress relaxation is the viscoelastic property of a tissue to retain a constant deformation after a load is removed. Relaxation, popularly called "give," is a steady deformation occurring with less force over time. It is demonstrated in a tissue being stressed at a constant magnitude where the force necessary to maintain the deformation decreases with time.

Creep is the viscoelastic property of slowly increasing deformation under a constant load. That is, there is an initial deformation followed by a slowly increasing degree of deformation. Unlike plastic behavior, creep begins even with a minimal force and the recovery is slow. Creep is exhibited in the decrease of an individual's height from many hours in the upright position owing to the phenomenon occurring in the IVDs where a constant weigh has been borne for a sustained period. When a constant force is applied to visoelastic substances such as bone muscles, tendons, cartilage, and ligaments, the property of creep becomes apparent. When a deformation is fixed, stress relaxation becomes apparent.

Some Practical Applications

The biomechanical properties of tissue relaxation, creep, and fatigue are important considerations whenever articular correction, traction, lifts, or braces are used. For example, soft tissues involved in spinal distortion retain some residual effects for a time after adverse forces have been removed. Thus, some means of rest and support are often necessary to allow the deformed tissues to adapt to changed conditions. This means that when certain adjustive forces, a pressure brace, or a shoe lift are applied, they should be done slowly, in increments, so that the degree of creep reversal obtained and the residual relaxation present can be evaluated.

It is important that the patient be allowed to rest undisturbed in a comfortable position (and draped with a sheet and light blanket to avoid chilling) for 20 to 30 minutes or more following an adjustment, because the encouragement of physiologic normalization within vicoelastic substances takes time. Logic dictates that a period of postadjustive rest be allowed before the physiologic and structural demands of weightbearing and cyclic loading are applied, if optimal benefits are to be expected. Thus, facilities for postadjustment rest offer an excellent means of providing the time factor for soft tissue fibers to adapt without fighting gravity and for some corrective disc imbibition.

In most circumstances contributing to abnormal soft tissue stiffness where true ankylosis has not occurred, a large degree of functional shortening is superimposed to encourage structural changes. When adjusting a vertebral or extraspinal motion unit that is obviously fibrotic, mild traction and a broad contact with mild transverse pressure held in the direction of correction for 30 to 60 seconds just before the corrective adjustment, helps to "reverse" the established creep and elastic fiber shortening produced by gravity, hypertonicity, etc. This is usually on the side of disc or cartilage thinning or musculotendinous shortening. When the adjustment is delivered, it is with further palpable movement and far less discomfort to the patient than would otherwise be produced. The same mild contact following a specific adjustment appears to enhance "holding" of the correction achieved.

Richard C. Schafer, D.C., F.I.C.C.
Oklahoma City, Oklahoma

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.

MARCH 1991