GROSS POSTURAL BALANCE AND ARTICULAR BALANCE

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A popular axiom within the field of physical therapy, especially undergraduate clinical theory, deals with the importance of normal alignment of the axial skeleton (Kendall 1952, Sahrmann, 1982). Rarely is this vital concept integrated with other core concepts to be explored by students or faculty. The assessment of gross postural alignment in the frontal and sagittal planes seems to be the basis for acceptable analysis. Even transverse plane dysfunction is at times considered tertiary to frontal and sagittal deviations from neutral. The body is addressed in the frontal plane as hopefully, equal right and left halves, or as the variation of a product of a plumb line that does or doesn't fall in line with predetermined landmarks in a sagittal plane. It is often taught that the relative position of head, shoulders, trunk, hips, knees, or feet forward or backwards exist at an equal, or parallel distance in relation to any part of the spine. Discrepancies from these balance points offer the physical therapist a base reference for consideration of intervention. It does not facilitate differential diagnosis to locate the dysfunction, nor does normalization of these balance points indicate complete resolution of pathology.

When an individual attains a closer to normal aligned posture (or perfect posture), we assume from our knowledge of basic biomechanics that body mass is more evenly distributed around the center of gravity. This assumption recognizes that muscular activity is minimal while ligamentous tension is balanced in regard to both compressive and tensile forces. Examination should demonstrate minimal energy expenditure. (Kappler 1982) The pattern of efficiency is altered in any plane. When there exists a shift in the center of gravity in reaction to the body mass; additional energy is needed to offset the malalignment. The human mechanism has a certain amount of available potential energy at any given time. Under optimal conditions, a person will have enough “energy” to complete all daily chore requirements (work) plus have enough “energy” to partake in extracurricular activity without collapsing from exhaustion. Typically, acute and chronic pain patients report barely enough energy to get out of bed and go to work, let alone go to a movie, play a game of tennis, or go for a bike ride after work. Their lives consist of getting the basics done for themselves or families, and becoming couch potatoes until it is time to repeat the process of getting through the day. The weekends serve as further recharging days to get them to the following Friday!

Energy depletion is not the only side effect of postural malalignment. Secondary to the loss of this balance, further deterioration of structure is possible within the dysfunctional area and far distal to the area.

Articulations are historically considered “areas” for postural dysfunction or malalignment. The delicate balance of surface congruency is often subjected to abnormal mechanical stresses due to postural malalignment. This will be explored more from both a macro-view and micro-view of joint interfaces and joint balance. The ability to compensate for localized abnormal changes in our system, both acute and chronic in nature, determines, in part, our capacity to function on a whole. For example, a patient with lateral deviation of the patella secondary to quadriceps atrophy may experience retropatellar pain due to friction and irritation of the cartilage along one of the facets of the patella. The patient, via compensation of slight external rotation of the hip, may actually pseudo-treat the problem for quite some time. This compensation pattern may be transmitted to the hip, foot, sacrum, or even another part of the knee for optimal function. These compensatory patterns are often involuntary and subconscious. In essence, we are demonstrating an efficient organism, while functioning totally inefficiently. Our system will react to compensate for, or to tolerate, a joint dysfunction, even at the cost of energy depletion (energy waste is the inefficient part of the mechanism; compensatory pain-free function is the efficient part of the mechanism). Another example may add clarification. If a patient lacks the full scapulohumeral abduction necessary for a proper tennis serve, the motion may be artificially recovered by side bending and hip hiking further down the kinetic chain of motion. This inefficient compensation cannot continue indefinitely for the average person before symptoms appear. Postural malalignment can result in system-wide effects, including: loss of gross and fine coordinated movements; alteration of neuron excitability; accentuation of segmental facilitation: general fatigue; limitations of motion due to fascial adaptation; changes in the integrative function of the brain, both neural and endocrine; neural and endocrine control due to the loss of movement in the sacrum; direct interference with blood and lymph circulation; direct disturbances of cranial function, as well as visceral support and function. (Bailey 1977, Cathie 1945, Cathie 1949). This is not an entire, inclusive list of potential sequelae, but it serves to illustrate the far-reaching effects of something as apparently simple as postural malalignment.

Gross postural structural alignment and balance are required for efficient function. Traditional physical therapy and allopathic medicine approaches to treatment seem to address only the large-scale postural deviations without regard to individual joint balance. Osteopathic philosophy takes a different approach. The entire framework is recognized as component parts which are interconnected and interrelated.

"The proper relative arrangement and relation of parts, together with the minimal amount of stress, strain, and abnormal forces, are essential for good health to be maintained through the proper interrelationship of functions of the various systems of the body." (Cathie 1950)

The relative balance of articular surfaces is founded upon proper development of the skeletal structures. Any deviation from this balance can lead to degeneration. Wolff's law states simply, "That a bone becomes adapted during its growth to the functional forces acting upon it." (Enlow 1968, Scott 1957, Chamay 1972) Further analysis of the concept of tissue adaptation requires addressing the effects of these forces on trabecular bone. Trabeculae, the infrastructure of bone, are organized to provide maximum strength with a minimum of material. (LeVeau 1984). A change in compressive loads on bone leads to changes in its internal architecture. An example will illustrate. Because of greater compressive and repeated loads on the humerus of a professional tennis player, marked humeral hypertrophy will occur in that very same bone. (Jones, et. al. 1977) Consequently, if repeated stresses and compressive loads can cause humeral hypertrophy, that same loss and repeated compressive force on a bone can also cause a lessening of the trabecular infrastructure; i.e., osteoporosis. The trabecular patterns of every bone in the body seem to be very specific in relation to the compressive sheer torsion bending forces placed upon them. What is not demonstrated in most two-dimensional pictures is the three-dimensional nature of the trabecular formation. Examination reveals that comparison between the glenohumeral trabecular pattern and the talocalcaneal articulation, reveals a greater amount of density of trabeculae on the foot. (Hall, 1960) Possibly the density of the trabeculae is related to the inherent articular balance and position of any two surfaces. Evident in previous research, dysfunction is eminent when postural malalignment is present on a gross scale. The authors feel this process is initiated on a much smaller scale: at the joint surfaces. If, due to chronic protraction of the shoulder girdle, the humeral head is maintained in an anterior displaced position in the glenoid fossa, the soft tissues as well as bone start to deteriorate. The soft tissues seemingly have a tendency to deteriorate much faster than the bone. Tissues will begin a remodeling process: some will lengthen; some will shorten; vectors of muscle pull with change due to relative functional displacement of origins and insertions; compensation somewhere else in the kinetic chain will result. Soft tissue, when exposed to chronic abnormal stress, typically resists as long as bone, but both meet the same fate—degeneration. Whether articular balance is lost in a non-weight bearing joint, such as the elbow, shoulder or wrist, or in a weight bearing joint, such as the intervertebral joint, hip or knee, the results of the maintenance of these malalignments lead only to further compensations, greater dysfunctions and eventually, deterioration. Appreciation of this concept could prompt the practitioner to evaluate children and adolescents, if not infants, for signs of any loss of articular balance and postural alignment.

Utilization of exercise programs for the treatment of malalignment has not been productive for our profession. Functional exercise programs focused on strengthening and stretching are inadequate to correct articular balance and change postural deviations. Combinations of osteopathic structural manual therapy techniques, and traditional and functional approaches have resulted in many dramatic and immediate changes in articular balance. The indirect technique of strain/counterstrain, developed by Dr. Lawrence Jones, is a keystone to facilitate restoration of postural balance via normalization of articular balance. The key concept with this treatment approach involves addressing the neural component of a facilitated segment at its core; hence, the problem is treated at the source, i.e., the neuromuscular spinal reflex, rather than treating the sign—a protracted shoulder girdle. Strain/counterstrain is mentioned as an effective and efficient measure to correct articular imbalance. Myofascial release and muscle energy techniques are also effective in restoring articular balance. These constitute a large but NOT total portion of a structural rehabilitation approach that can restore articular balance. Adjunct functional approaches include Shirley Sarmon's exercise protocols, zero balance, functional orthopedics as outlined by Gregg Johnson, Feldenkrais techniques, Trager Mentastics, etc.

Dr. A.T. Still, 1897, stated that "Perverted structure was related to perverted function." This concept forms a solid foundation in dealing with both gross anatomical balance in all planes, as well as the fine articular balance in those same planes that is needed to promote smooth friction-free motion at each of the joints. The joint configuration, articular balance, and laws and rules of motion are the same throughout the body. Even the cranial sutures and the sacroiliac articulations need proper articular balance within their limited ranges of mobility. An articulation that exists anywhere in the systems; i.e., bone on bone, bone on tissue, or tissue on tissue, requires the capability to move through its entire restriction-free range of motion. For this, articular balance is essential.

References

Hall, M. "The trabecular patterns of the normal foot." *Clinical Ortho*., Vol. 16, 1960, pp. 15-20.

Jones, H., Priest, J., et al. "Humeral hypertrophy in response to exercise." *J. of Bone and Joint Surgery,* Vol. 59. (A), March 1977, pp. 204-208.

Kappler, R. "Postural balance and motion patterns." *Postural Balance and Imbalance*. pp. 6-12.

Kendall, H., Kendall, F.P., Boynton, D.A. *Posture and Pain.* Williams and Wilkins. MD, 1952.

Kon, I.M. "Proprioceptors and somatic dysfunction." *Journal of the American Osteopathic Association*, 74:638-50, March 1975.

LeVeau, B., Bernhardt, D., "Developmental biomechanics." *Physical Therapy.* 64: Dec. 1984, pp. 1874-1882.

Nelson, C. "Postural analysis and its relation to systemic disease." *Postural Balance and Imbalance, pp. 16-19.*

Sahrman, S. "Posture and muscle imbalance." *Postgraduate Advances in Physical Therapy*, 1987.

Scott, J.H. “The Mechanical Basis of Bone Formation.” *The Journal of Bone and Joint Surgery*, Vol. 39, (B), Feb. 1957, pp. 134-144.

Steindler, A. *Kinesiology of human body under normal and abnormal pathological conditions.* Charles C. Thomas, Springfield, 1955.

Still, A.T. *Autobiography*. Published by the author, Kirksville, MO, 1897.

Tipton, C., Mathews, R., Maynard, J., Carey, R. “The influence of physical activity on ligaments and tendons.” *Medicine and Science of Sports.* Vol. 7, No. 3, pp. 165-175, 1975.

Course notes, Johnson, Capellaro, Gillam, Saliba, etc.

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