JOINT FUNCTION

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Skeletal flexibility is necessary for any movement. Joints are made to move. This is their primary function. Muscles are made to move the joints. Hence we should consider the two major types of spinal joints, the freely movable diarthroses and the semimovable amphiarthroses. The posterior diarthroses have gliding surfaces and need a constant lubrication. This means a capsular ligament with secretory cells to maintain optimum lubrication. Motion is limited by strong check ligaments and by antagonistic muscle action. The muscles have sheaths of fibrous tissue which like the ligaments are in a continual state of shrinkage to remove unneeded slack. Thus if a joint is moved daily thru its entire range of motion the fibrous tissue is stretched to its optimum length. Immobilization induces continual shrinkage and loss of motion. In addition muscle action promotes trophic reflexes which maintain bulk and strength. Immobilization reduces proprioceptive input which is the sensory arm of the trophic reflex and promotes atrophy of muscle as well as shrinkage (contracture) of ligaments and fascia.

A joint and its activating muscle form a functional unit which is maintained by use. Gradual increase in action and loading will induce hypertrophy of both the muscle and the bone. Disuse induces atrophy. Therefore it is imperative to maintain joint action. Otherwise adaptability diminishes and leaves that area more vulnerable to many types of injury. There are sensory nerve endings in and around joints specifically designed to report on loading and position. They are called proprioceptors. Each of the thousands of proprioceptors at each joint is reporting information at least once per second during sleep and up to 1,500 per second during action. This vast barrage of LOCAL SENSORIAL CONVERSATIONAL TONE is processed by the supercomputer in each segment of the cord and is correlated in the brain stem, cerebellum and cerebral cortex to maintain all skilled activities. Any distortion of this information input disturbs the total function and will be discussed later.

The second general type of joint, the amphiarthrosis is typified by the intervertebral disc. This also allows motion but not gliding. Hence it is bending and twisting that occurs thanks to the strong fibrous ring as a band with the jelly center as a fluid cushion shock absorber. These joints also have check ligaments, activating muscles and abundant proprioceptive endings. The vertebral joints from C2 to L5 have both discs and diarthroses to efficiently handle the needed functions and loads. Now let us consider normal and abnormal loading.

Normal loading and use of every joint is vital to joint maintenance. After three weeks of zero gravity the space folk showed up to 60% loss of calcium in the calcaneus. Loading induces a piezo-electric effect within the bone which is a part of Wolf's Law on bone remodeling. Still this has a neural component usually overlooked. Where the sensory pathway is cut or distorted there is the same piezoelectric phenomenon BUT NO remodeling and repair. The result is neurotropic arthropathy typical in Charcot's joint, diabetes and leprosy. Hence the cybernetic mechanism known as the trophic reflex with its proprioceptive sensory component is a major factor in slow healing of wounds and in many arthritis cases.

Normal loading of bone is needed to maintain bone mass, i.e. disuse atrophy follows no load. Normal strain on the activating muscles is needed to maintain muscle bulk and muscle strength. Hypertrophy and atrophy are the function of use & disuse. Joint excursion is needed to stretch the ligaments, the muscle sheaths and the fascia to prevent shrinkage and contracture. Again the neural component is overlooked, but critical.

Overload of any joint takes several forms. Overload of stress in the neutral position if minimal will induce quite even hypertrophy of the bone and cartilage. If the overload exceeds structural limits the cartilage plate which is the weakest spot in the intervertebral joints will show impaction end plate fracture. If the joint is near maximum flexion with sudden heavy overload there is usually vertebral body compression fracture with AP wedging. The intervertebral disc is much stronger than the body and never ruptures unless it has been weakened for a long time. Hence disc rupture implies chronic subluxation with recurrent meningeal nerve dysfunction for many months or years.

Sudden heavy overload of the cervical spine in extension can crush an articular process but they are normally very strong. More often there will be pedicle fracture. Another heavy sudden overload, not of compression but of severe hyperextension has torn anterior ligaments produced avulsion fracture and even split a vertebral body. A seat belt buckle fulcrum during severe hyperflexion has split the entire neural arch and torn the top half from the bottom. Such injuries are rare. Much more common injury is the pinching of capsular ligament and other joint structures when the joint buckles. This buckling is usually a surprise stress with long muscles contracting before the intrinsic muscles are “set.” The pain causes a reactive muscle “splinting” to prevent further injury. This prevention of getting worse can also prevent normal improvement. If the sensory proprioceptive input is distorted the post traumatic subluxation may persist with the muscles and ligaments undergoing contracture (shrinkage) and hence become pathogenic.

Moderate joint overload over a short time has minimal effects. Prolonged overload but with adequate resting intervals and sleep time for repair of injury induces hypertrophy of bone, muscle and ligaments. If this overload is continued with “double shift” work and minimal rest the joints will show cartilage thinning and the broadening of the joint to carry the overload. This is the classic osteoarthrosis in extremities and spines. It is a distorted repair process to meet the need.

In children with normal epiphyseal plates the sudden heavy overload or the continued moderate overload will cause epiphyseal fracture or an epiphysitis. This is the “little league” elbow, the knee & ankle plate separations of sports injuries. The most neglected problem of athletic injuries is the “double” injury. A slide that jams an ankle usually will subluxate a low lumbar joint, delay the healing and prolong recovery. Then too there are osteochondroses with no history of direct joint injury. Perthes disease has epiphyseal fragmentation due to proprioceptive input distortion which has continued for months following a lumbosacral subluxation, minimal but long forgotten. So it is clear that the infinite variation of joint overload at the spine in the sensory and trophic pathway as well as peripheral joint overload can explain much of the varied pathology of injury. Add this to hereditary weakness to make for an infinite complexity.

Use it or lose it applies to the joints and their activating muscles. Loading must be within the range of adaptability. Beyond that range the overloading can start arthritis, athroses, fractures, tears, epiphysitis, osteochondrosis, osteochondromatosis, bursitis and others. All these are from distortions of the neural mechanism at the segment of the cord supplying the joint.

After realizing some generalities of peripheral and spinal joint function we can better consider a special joint problem known as a subluxation. Spinal joint problems are much like other joint problems plus additional neurological insults. A sprained thumb or ankle will be favored during healing without causing other major problems. Any spinal joint sprain can likewise heal quite rapidly without complications. Most minor spinal sprains do heal uneventfully but there is an exception. That is the time when there is

a distortion of the sensory nerve input at the level of the injured joint. If a person sees a slight step down he can manage very well. However if he unexpectedly steps off a curb the body reacts to the emergency. If the body is well trained and in fine condition this jolt is absorbed easily. If tired or weak the spine may buckle with the long muscles jerking into action before the short intrinsic muscles have the spinal joints stabilized and ready for the sudden move. This may pinch the articular capsule and shoot a barrage of emergency warnings into that segment of the spinal cord in a very distorted manner. If the nerve system recognizes the actual positioning of the joint it can be recovered quickly but if the message is badly garbled there is inappropriate response. Short muscles contract quickly to stabilize the joint and prevent further damage but with the distorted messages the contractions persist much too long and prevent normal recovery. Even this is not devastating except for the fact that in this same spinal segment are the reflex pathways and the controls of skin temperature and of visceral function. People with a severe whiplash injury at the brain stem level often have hot and cold flashes for weeks after the injury. Others have serious vertigo or visual disturbances. If there is double injury with upper cervical and mid-thoracic subluxations peptic ulcers often develop. Correction of these two subluxations induces rapid healing of the ulcers.

What Is a subluxation? It is the spinal sprain which is distorting the sensory input in turn causing altered efferent function. The total integrative function of that segment is distorted. Signs and symptoms of a subluxation include altered motion, altered sensations (usually pain or paresthesias) and aberration of some or all functions served by that cord level. If this is prolonged there can be slow disintegration or chronic malfunction of the entire periphery. The cybernetic mechanism known as the trophic reflex with its proprioceptive sensory component is a major factor in most pathologies, whether ulcers, pneumonia, arthritis or slow healing of wounds. Therefore subluxation recognition and correction is really an ultra-specialty. Intervertebral subluxations have a very wide range of side effects. This is truly the core of chiropractic science and art.

Joint function is the basis of body motion and flexibility. Increased flexibility means increased adaptability. Conversely loss of flexibility is loss of adaptability directly related to physical health. Exercise to promote flexibility is a critical part of any health program but if carried to extremes will inflict several types of joint injury. Joints are to be loaded and worked but not to be dangerously overloaded. One excellent indicator is comfort tolerance. Any joints can and should be worked until tired and almost sore to attain most rapid build-up. Any overload should be carefully monitored. Build up of body flexibility and adaptability promotes health. It is much more logical than fighting disease. Shoveling darkness from a room is not as effective as turning on the light. Build up adaptability and the incoordinations called disease will disappear. Yes, joint function is important. Exercise to maintain flexibility is very important but overloading is hazardous in many ways. Maintain flexibility & with it health.