

Spine - Health and Disease

Immobilization Degeneration

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Every tissue of the spine remodels and adapts to the stresses placed upon them. This involves both chemical and structural changes. Most of these changes are adverse and characterized by degeneration and weakening of the tissues rendering them more susceptible to injury. The adverse effects of immobilization involves spinal joint (facet) cartilage, the joint lining (synovium), the spinal joint (articular) capsule), spinal ligaments, bone under the cartilage (subchondral bone), the intervertebral disc as well as the lining around the spinal cord and spinal nerves (meninges). Some of the tissue changes develop within hours to days of immobilization.

Each spinal tissue undergoes a unique pattern of degeneration when exposed to limited or absent movement. Spinal segment immobilization can lead to abnormal movement and stiffness of the segment. Research has demonstrated that many of the changes initially observed after immobilization in extremity joints are reversible upon remobilization of joint if performed early enough. This likely occurs in the spine as well.

The basis for immobilization degeneration is well known and extensively documented. When a joint is immobilized, a very predictable pattern of degeneration ensues. The changes involve every structural component of the joint.

One of the earliest and most significant consequences of immobilization degeneration is the softening and thinning of cartilage. This is associated with biochemical changes in the cartilage. More severely compromised cartilage is less likely to repair. Limited movement also results in biochemical and structural changes within ligaments which causes supportive ligaments to become shortened and less flexible.

Bone is metabolically active and is constantly remodeling in response to the stresses placed upon it. The negative effects of immobilization and disuse on bone structure are very well documented. Immobilization leads to demineralization or thinning of bone, a disorder commonly referred to as osteoporosis or osteopenia. The intervertebral disc requires movement in order to receive water and nutrients through passive process of diffusion. The lack of adequate spinal segment movement results in accelerated degeneration and stiffening of the associated intervertebral disc. This intervertebral disc segment also loses volume due to biochemical and structural changes within the disc. The loss of disc height places additional mechanical stress upon the corresponding pair of spinal (facet) joints which lie posterior to the disc. This sets the stage for injury and for disruption of supportive annular fibers, process that can lead to disc herniation.

Spinal segments and spinal regions can become immobilized through a variety of different causes. It may occur secondary to muscle spasm, a sedentary lifestyle, splinting, bracing, limited activity due to a degenerative and painful condition, ankylosis, and trauma.