

# Spine - Health and Disease

## Spinal Dysfunction

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The term spinal dysfunction refers to an abnormal increase or decrease in spinal movement (mobility). The term may be used to describe a spinal segment, a spinal region or the whole spine. The presence of spinal dysfunction at one level (segment) of the spine will affect the movement pattern of the segments above and below it. Spinal dysfunction can occur in the absence of disease or as the result of disease. Spinal dysfunction may cause adjacent spinal levels (motion segments) to move too little and/or too much. Chronic spinal dysfunction may lead to tissue compromise over time. When soft tissue compromise occurs this can lead to further alteration of spinal segment movement patterns. The most common causes of spinal dysfunction are degenerative disc disease, strains/sprains, muscle weakening (deconditioning), muscle spasm, and osteoarthritis. Spinal dysfunction may be precipitated by injury. Joint dysfunction may remain long after pain goes away.

#### The Spinal Motion Segment

A motion segment is defined as a functional unit comprised of two adjacent articulating surfaces (joint surfaces) and the connecting tissues which hold them together. The definition of a spinal motion segment is two adjacent vertebrae and the connecting tissues which bind them together. The spinal motion segment is essentially a three-joint complex comprised of two facet joints and the intervertebral disc. The spinal motion segment is where all movement takes place. All the tissues of the segment are influenced by movement including the vertebra, the intervertebral disc, nerves, spinal cord, blood vessels, facet joints, muscles and ligaments.

#### Dysfunction of the Spinal Segment

There are different terms that are used to describe abnormal function or structural relationships at the level of an individual spinal segment. One of these terms used by the chiropractic profession that describes an abnormal or altered relationship between adjacent vertebrae and their joints is the term subluxation. The term also describes abnormal intervertebral movement or abnormal physiological function from the vertebral segmental level. The root words for the term subluxation come from a combination of the Greek sub and lux which together means "less than a dislocation". There are numerous synonyms for the term subluxation. Some of the more common ones are joint dysfunction, segmental dysfunction, vertebral subluxation complex, dysfunctional joint, and facet syndrome. There are also terms used to more specifically characterize the pattern or type of abnormal movement at a spinal segment. Commonly used terms in this category include, fixation, hypomobility, and hypermobility and paradoxical motion.

The term hypomobility is used to describe a spinal segment which is associated with reduced intersegmental movement which may or may not be associated with pain, reactive muscle spasms and or degenerative changes (spondylosis). The term

hypermobility refers to segment where there is excessive motion between spinal segments (intersegmental movement). Pathological hypermobility is when there is excessive intersegmental motion in the tissue damaging range. Parakinetic or paradoxical movement refers to intersegmental motion which occurs in a direction or pattern other than that which is expected or normal. This may result in tissue deformation or damage. Evaluation of spinal segment motion is performed with manual methods such as palpation and through diagnostic imaging. Positional X-rays provide an accurate method for documenting abnormal movement and a method to quantify/grade the degree of abnormal movement in different planes. The term fixation refers to a total loss of spinal joint movement. This can occur as the result of severe degenerative change with bone spurs which bridge across adjacent vertebrae. Spinal fixation is also the desired goal of surgical fusion using a bone graft and/or instrumentation.

### **Causes of Spinal Dysfunction**

There are many causes of spinal segment dysfunction. The causes can generally be classified by their structural location. More common causes include changes associated with spinal segment degeneration involving the intervertebral disc, the facet joints and the ligaments. The development of muscle atrophy or scar tissue will alter spinal joint function. The presence of persistent or recurrent muscle spasms around a painful spinal segment will alter spinal segment movement at that level. Abnormal skeletal development of adjacent bony surfaces of the vertebral body will predispose the spinal segment to abnormal movement. Other common causes of spinal dysfunction are muscular deconditioning and poor posture.

### **Functional Radiography and Spinal Dysfunction**

Many researchers in the medical and chiropractic fields have addressed the issue of functional X-ray assessment. This refers to taking X-rays of the spine in different positions to evaluate the movement patterns of individual spinal segments. Decreased spinal segment movement (segmental hypomobility), increased spinal joint movement (segmental hypermobility), and excessive spinal segment movement (spinal instability), can be documented by positional x-rays. Functional radiography of an individual's spine is beneficial for documenting spinal instability and the need for fusion.

### **Spinal Hypermobility Versus Instability**

Segmental (spinal) hypermobility is defined as a spinal motion segment with excessive movement which may be associated with pain but is not so extreme to be life threatening or to require surgical stabilization. The term clinical instability is defined as the loss of the ability of the spine under normal loads to maintain normal relationships between vertebrae in such a way that there is neither damage nor subsequent compromise of the spinal cord or spinal nerve roots, and in addition, there is no development of incapacitating deformities or pain secondary to structural changes.

### **The Development of Spinal Dysfunction**

Each spinal segment influences the spinal segments around it. The individual spinal segment can influence the posture and dynamics of the spinal region as well as the entire spine. For example, a painful spinal segment may be associated with persistent spasm of large spinal muscles, which will alter the mobility of the entire spine. It may also result in antalgia, a term that describes a sustained posture that reduces one's back pain. Compensatory motion occurs in adjacent segments of the spine in order the

preserve mobility to as close to normal as possible. This can create a domino-like effect throughout a region of the spine. This occurs frequently in spinal fusion. The fused spinal segment can no longer move or absorb normal impact pressures or shock. The adjacent spinal segments and the discs will be placed under additional strain in order to compensate for lost movement during everyday activities.

### **Do the Bones of My Spine Go “Out of Place”?**

Not unless there is severe trauma or destructive disease. Vertebrae may go out of place if there is a fracture or dislocation, both representing serious injury to the spine. Vertebrae may “go out of place” if there is severe destructive disease, which has compromised the bone or supporting elements of the spinal segment. An example would be an aggressive tumor. Some spine specialists may occasionally refer to a bone being out of place during the course of therapy as a way of describing a malposition between two vertebrae or to oversimplify a vertebral relationship in the absence of more serious compromise such as dislocation or fracture. Quite often the term may be used to describe a spinal segment which has lost normal mobility or which has an abnormal pattern of movement.

### **Definition of a Joint:**

A joint is defined as the approximation of two bones supported by specialized tissues such as ligaments, tendons, and membranous joint capsules. Some joints contain fluid in the joint space referred to as the synovial fluid, which has both nutrient value and shock absorbing capacity. Some joints are connected together by relatively inflexible fibrocartilage. There are many specialized nerve endings referred to as receptors within the supportive and connecting tissues of the joint. The spine contains uniquely shaped joints that are planar in function where the surfaces slide on each other, with only a small degree of pivoting.