

Intervertebral Disc

Inflammation and Disc Pain

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Inflammation is a response to injury that is characterized by redness, pain, increased blood flow, swelling, mobilization of specialized cells and the release of chemicals. The inflammatory response is the body's way to deal with infection or injury. The inflammatory process facilitates the release of chemicals that influence pain, kill bacteria and begin the tissue healing process. The inflammatory process can lead to pain and sometimes dysfunction of tissues. The presence of excessive inflammation for too long can result in the development of excessive scar tissue. Research has revealed that there are sensory nerve fibers in the outer portion of the disc in the low back of humans. The nerve penetration of a normal disc is only about 2 to 3.5 mm. The presence of certain chemicals and nerve fibers suggests that the disc can be a source of inflammation and pain.

Disorders of the intervertebral disc can cause inflammation through a variety of different mechanisms. A disc herniation can cause inflammation directly by physically compressing and damaging neighboring tissue or indirectly through the release of chemicals which induce inflammation and sensitize nerves. If a disc compresses a spinal nerve or other spinal tissues it will reduce blood flow in and out of the tissue causing inflammation.

A physical tear of the fibers which surround the intervertebral disc can lead to the leakage of chemicals from the intervertebral disc into the spinal canal (epidural space). This is the space which surrounds the spinal nerve and the spinal cord. Some of the chemicals which leak from a compromised disc may cause inflammation of surrounding tissues. This can cause local back pain and contribute to the development of extremity pain. Many of the pro-inflammatory chemicals arise from the center portion of the disc called the nucleus pulposus.

Chemicals that cause inflammation are often referred to as pro-inflammatory chemicals. Inflammatory chemicals associated with disc disease include bradykinin, histamine and prostaglandins. Other pro-inflammatory chemicals which may be released from a diseased disc include lactic acid, phospholipase A2 (PLA2), chondroitin sulfate, a component of glycosaminoglycans.

Pro-inflammatory chemicals are not only found in degenerative discs but may also arise from a spinal (facet) joint. A diseased joint at the same level of disc disease may contribute to the development of inflammation. These chemicals normally found in a healthy disc accumulate within the intervertebral disc secondary to age and disease related degenerative changes. For example a degenerative, herniated intervertebral disc contains a higher level of the chemical PLA2 than a normal disc. PLA 2 is a highly inflammatory chemical, which promotes the release and activation of other inflammatory chemicals such as prostaglandins and leukotrienes. If the outer fibers of a disc become torn, chemicals like PLA 2 inside the disc leak out into the spinal canal and cause inflammation of neighboring tissues.

Nerve endings along the outside of the disc tend to be silent unless exposed to inflammatory chemicals like substance P and PLA2. These chemicals occur in higher concentrations in injured and degenerative discs. A zone of inflammation can develop between a disc herniation and an adjacent spinal nerve. Within the zone of inflammation other factors can promote the

inflammatory process such as the presence of rising concentrations of inflammatory chemicals, reduced blood supply, scar tissue, and abnormal friction between different tissues.

Diagnostic imaging tests like MRI and CT scans are good at detecting structural abnormalities such as a disc herniation, nerve compression and even the presence of large amounts of scar tissue. These studies are incapable of detecting small amounts of scar tissue, the presence of inflammation or inflammatory chemicals. Spinal X-rays do not reveal scar tissue or the presence of inflammation. X-rays also do not reveal the actual integrity of the spinal cord or the spinal nerves.

When the outer supportive (annular) fibers of the disc tear, it creates a gap between the ends of the normal tissues. Scar tissue forms within the area of the tear and sets the stage for nerve fibers to migrate or grow into this portion of the disc. This healing process can make the intervertebral disc more pain sensitive. The development of scar tissue also promotes the formation of chemicals, which can sensitize or stimulate the nerve endings causing pain. However it is known, but poorly understood why some patients with disc degeneration or herniation never develop chronic disc-related back pain.