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Goel's Facet Distraction Surgery and an Alternative Hypothesis for Degenerative Spinal Disease

Degenerative spinal diseases are common cause of disability in the elderly. Pain in the neck, radicular symptoms of paresthesiae and limb weakness and symptoms of myelopathy may restrict the activities of an individual. Old age related retired and sedentary life style, lack of physical exercises, musculoskeletal weakness and similar such features are predisposing factors in most cases. Reduction of water content of the intervertebral disc has been uniformly incriminated as the genesis point of process of degeneration. The general definition of spondylotic changes of spine is the secondary effects on the spine that are related to the primary event of disc degeneration. Reduction in the disc space height, osteophyte formation, ligamentous hypertrophy, listhesis of the facets and similar such features result in reduction in the dimensions of the spinal and root canal and accordingly produce symptoms of myelopathy and radiculopathy. Decompression by widening of the spinal cord or root canal dimensions of canal by removal of the compressive effect of the ligaments, bones and osteophytes has been the standard form of treatment for over a century. Movement preserving or restoration surgical procedures have recently become popular.

Recently, an alternative hypothesis of pathogenesis of degenerative spinal spondylosis has been proposed by Goel that has the potential for revolutionizing the treatment paradigm.[1-3] The hypothesis stresses on the importance of instability in the entire process. Standing human posture lays stress on the muscles of the back of the neck and rest of the spine. Over time, due to disuse or abuse, these muscles weaken and result in vertical instability of the spinal segments. This manifests by facetal overriding as an initial pathogenetic feature. Due to the spinal lordosis and varying alignment of facets at different spinal levels the nature of facetal listhesis varies. In the craniovertebral region the facetal overriding manifests as listhesis of facet of atlas over the facet of axis, in the cervical and dorsal spine there is retrolisthesis of the facets while in the lumbar spine there is a vertical override of the facets. Facetal listhesis is the initial event in the entire process of spinal degeneration. Reduction of the disc space and secondary formation of osteophytes and buckling of the intervertebral ligaments manifesting as hypertrophy result in reduction in the spinal and root canal dimensions. Essentially it means that the disc changes, osteophyte formation and the ligamentous hypertrophy are secondary events to primary facetal listhesis. It also suggests that the treatment of degenerative arthritis can be aimed at treatment of the facetal listhesis and the secondary events in the process have the potential of getting rectified as a result. The radiological features that are generally observed in cases with degenerative spinal disease of reduction in the disc space height, bulge of the disc into the spinal canal, osteophyte formation, ligamentous hypertrophy, reduction in the spinal canal and root canal size and compression of the spinal cord and spinal root essentially depict the effect of the instability of the facets that is not clearly shown by imaging. Till recently, the imaging for the facets was not satisfactory and the entire focus of investigations was on the disc space and on the intrusions into the canal and on issues causing compromise of canal dimensions. Contemporary treatment appears to be focused on radiological interpretation rather than philosophical understanding of the pathogenetic process.

The treatment is based on what is seen on imaging and trying to correct them. Essentially, the treatment attempts to produce a radiological cure.

Distraction and fixation of the facets not only stabilizes the spinal segments but also has the potential to reverse the entire pathology of spinal degeneration. It increases the spinal and root canal dimensions, increases the disc space height, stretches back or unbuckles the ligaments and has the potential to regress the osteophytes. The disc fluid can reform and such disc reformation can be demonstrated by imaging. Distraction arthrodesis of the facets is a relatively small and simple operation and avoids removal of any part of the bone, ligaments or the disc. It avoids retraction of oropharyngeal pathways and major blood vessels of the neck. There is a possibility of real-time observation of the instability of joint and distraction fixation can be done. Such reliance on direct observations rather than radiological interpretations can be effective. Distraction arthrodesis of the spinal segment can be done even when there is no abnormality demonstrated radiologically.

Facet distraction surgery essentially reverses the entire pathologic process in degenerative spinal disease.[4,5] It restores the alignment of the facets and the vertebral elements. It also reverses the trends of circumferential buckling of ligaments and of formation of osteophytes. The hypothesis that disc is not the primary issue in the process of spinal degeneration and muscle weakness related vertical instability forms the basis of the entire phenomenon has significant impact on the understanding of treatment that may be optimum. The concept emphasizes the role of muscular exercises in the treatment protocol and of conservative non-surgical treatment options. It also validates the therapeutic efficacy of traction. The theory conceptualizes that disc removal as a part of surgical process may not be a mandatory step in the treatment. It suggests that removal of osteophytes should not be of primary concern and osteophytes can regress over time. The theory puts forth the concept that ligamentous hypertrophy is not the primary issue in the process and removal of the ligaments during surgery may not be pursued. The fact that symptoms of lumbar canal stenosis do not occur at rest but start after activity or after walking for a distance suggests that the canal is not stenosed inherently or primarily but the stenosis occurs after the muscles supporting the spinal column weaken after a period of indulgence. The symptoms of stenosis do not occur at rest and are initiated only after the activity stresses out the muscles. Essentially, after a period of activity vertical instability ensues that leads to the symptoms. Vertical spinal instability is a dynamic process that may not be appreciated on imaging that is done when the person is at rest. Investigations should be done after a period of activity that initiates symptoms.

Presence of osteophytes in general and particularly in the region of craniovertebral junction suggests a secondary response to primary instability of the region.[6,7] In general, presence of osteophytes signifies the need for stabilization surgery. Stabilization of the spinal segments forms the primary issue in the treatment of degenerative spine. The fact the spinal stabilization alone forms the basis of treatment for degenerative canal stenosis was first hypothesized by Goel.[1-7] The satisfactory clinical outcome following such an approach to patients validates the concept.

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