Editorial

International Journal of Neurology and Neurosurgery
Vol.15, No.4 October-December 2023
DOI: http://dx.doi.org/10.21088/ijnns.0975.0223.15423.1

Is Resection of Disc Necessary in Surgery for Spinal Degeneration?

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How to cite this article:

Atul *et al.* Is Resection of Disc Necessary in Surgery for Spinal Degeneration? International Journal of Neurology and Neurosurgery 2023;15(4): 114-116

INTRODUCTION

The structure of the intervertebral disc with nucleus pulposus in the center and annulus fibrosus in the periphery simulates a car tire with the outer rubber rim and central air. Like the car tire, intervertebral disc forms the seat of strength of the vertebral column and of entire body in general. Fluids, that include disc, in general provides the basis of 'weightlessness' of the human form.[1] Intervertebral disc is the center of movements, of strength and of shape of the spinal column. Our articles mention that disc is the brain of all movements.[2] Even when no significant muscles focus their activity on the intervertebral disc, the disc regulates all spinal movements. Disc is like opera conductor who manages the entire orchestra without holding any musical instrument in his hands. In the embryologic parlance, intervertebral disc comes first, and vertebral body comes much later. Accordingly, it may be only correct to use the term interdiscal body than intervertebral disc.[1,2]

Reduction in the 'water content' of the disc and old-age related disc space reduction have been incriminated to be the cause of spinal degeneration for decades. Disc 'degeneration' has been primarily incriminated to be the nodal point that eventually leads to a cascade of subsequent events that culminate into the so-called 'spinal degeneration'. The genesis of osteophyte formation and ligamentous bulging that result in neural canal and spinal canal stenosis has been singularly blamed on primary disc related issues. Majority of spine surgery for spinal degeneration is focused primarily on the disc and resection of the disc forms a principle surgical step. Disc resection is done for decompression, for facilitating bone fusion and for providing template for artificial disc placement. Even though disc related issues like disc herniation, disc bulges and disc compression have commonly been incriminated to be the cause of a variety of neural symptoms, our studies identify disc to be 'divine' and that disc alterations work in obvious or 'unseen' favor and can never be the cause of any problem to the human body.[1,2]

Like no other animal, humans are unique in that they stand on two legs. The major focus of the muscles of the spine is to keep the body erect to facilitate the acts of sitting, standing, walking, and running. Whilst the extension movement of the spine is an active movement, flexion is essentially a passive activity. Accordingly, the major muscle bulk is in the back or in the extensor compartment of the spine. Facets and facetal articulation form the fulcrum of activity of all these muscles. Only relatively thin strands of muscles are in the vicinity of the intervertebral disc or the vertebral bodies. Whilst the disc is the brain, facets and facetal articulation forms the brawn or power focus of all spinal movements.

Weakness of the muscles of the spine can be related to disuse, misuse, or injury. The primary impact of such muscle weakness is on the facets and on facetal articulation. The net effect is 'vertical' spinal instability

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or telescoping of the facets because of listhesis of the rostral facets over the caudal facets.[3] Such listhesis can be potential, subtle, or manifest and might not be identifiable on dynamic radiographic imaging. Our view is that such spinal instability forms the primary point of origin that initiates and propels the process of spinal 'degenerative' alterations.[3-5] Chronic instability of the spine because of gradual, longstanding, and progressive weakness of muscle provides an opportunity for natural protective processes to develop and mature.[6] Vertical instability leads to a variety of secondary spinal 'alterations' like buckling of the intervertebral ligaments that include posterior longitudinal ligament and ligamentum flavum, osteophyte formation anterior or posterior to the vertebral bodies and in proximity of the facets, cyst formation in and around the facetal articulation, unusual bone formation and fusion and reduction in the intervertebral disc space.[6] All these alterations are radiologically observed to lead to reduction in the neural and spinal canal dimensions. Lateral location of the facets, oblique profile and location away from neural structures make identification of instability even on modern imaging difficult. Our observation is that the primary issue in spinal degenerative 'alterations' is spinal vertical instability and all the secondary changes observed on imaging that seem to be neural compressive are secondary, naturally protective, or adaptive, indicate segmental spinal instability and are manifestly or potentially reversible following spinal stabilization. Our view is that reduction in disc height and disc bulges into the spinal canal is by itself not 'pathological' but is secondary to vertical spinal instability and is an adaptive process.[7-11]

Atlantoaxial joint is the most mobile joint of the spine. A large bulk of strong muscles of the nape of the neck is dedicated for activities of the atlantoaxial joint. Atlantoaxial joint is flat and round. Whilst subaxial spinal instability results in vertical spinal instability, instability at the atlantoaxial articulation is circumferential. Atlantoaxial joint space reduction, basilar invagination, erosion of the articular cartilage, parafacetal cyst formation, retro-odontoid pseudotumor formation, osteophytes around the odontoid process, abnormal bone formations and fusions are some of the several evidences that are suggestive of instability or 'degeneration' at the atlantoaxial joint.[12,13] Whilst degeneration of the spine is generally related essentially to lower cervical spine, our observation is that degeneration of the atlantoaxial joint is frequent and is probably under evaluated, under diagnosed and under treated clinical entity. More mobile the joint is, more is the possibility of it developing instability. Atlantoaxial instability related spinal degeneration can be a discrete process or can be associated with single or multi-segmental subaxial spinal instability.[14-16] Atlantoaxial instability is more often 'central' or 'axial' in nature and there may not be any evidence of neural or dural compression on dynamic imaging of the craniovertebral junction.[17-19] There are remarkable similarities in the function of odontoid process and of intervertebral disc. Both intervertebral disc and the odontoid process have naturally protective role and our studies suggest that both the disc and the odontoid process 'can never go wrong'.

Whilst generalized muscle weakness that is frequently 'old' age related leads to multi-segmental spinal instability, injury to the muscles/ligament is an acute process and is associated with more focal single level spinal instability. Multisegmental spinal instability that is usually related to generalized muscle weakness is more often observed in relatively 'old' people. On the other hand, injury to the muscles, leads to focal segmental instability and is more often seen in younger people. Whilst focal spinal instability more often leads to radiculopathy, multisegmental spinal instability is associated with symptoms related to myelopathy. Multisegmental subaxial spinal instability is frequently associated with instability of the atlantoaxial joint, particularly when the myelopathy is severe in nature.[20]

Prolapsed disc is an acute phenomenon and is related to sudden lifting of heavy weights or some kind of injury. In acute disc prolapse, surgical attack is universally focused on the 'tumor-like' mass that obviously deforms the neural structures. Our understanding is that disc herniation is a result of instability or the disc herniation by itself causes spinal instability.[7-9,11] Our articles mention that disc herniation and related pain is a natural protective measure, results in avoidance or restriction of spinal movements and provides for an opportunity for healing of the injured muscle/tendon.

Essentially, for both multisegmental spinal degeneration that result in disc bulges into the spinal canal and a single segmental disc herniation or prolapse, instability is the cause of problems and stabilization is the treatment. Focusing the surgical attack on resection of the disc is unnecessary. Surgical strategy should deal with the cause of the problem and not with the effect of the problem. All the effects of instability that include disc herniation and disc bulges are secondary, are protective, are indicative of spinal instability and

are manifestly or potentially reversible following spinal stabilization.

Ossification of the posterior longitudinal ligament is also an outcome of spinal instability.[21] Identification of the levels of spinal instability and stabilization of those segments should form the mode of surgical treatment.

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