

Chronic muscle pain and spasm hallmarks of spinal instability

While pain and muscle spasms are relatively severe in cases with acute spinal instability like that following trauma, both these symptoms are constant, relentlessly nagging, progressively worsening, and frequently disabling in patients with chronic or longstanding spinal instability. Chronic neck pain and muscle spasms are a common clinical symptom complex related to craniovertebral junction and subaxial spinal instability. Neck pain and muscle spasms have diagnostic implications and can be present even in the absence of any other tell-tale evidence of instability.


Unique standing human posture lays lifelong stress on the muscles of the spine. While extension of the spine is an active movement, flexion of the spine is a passive activity. A large majority of muscles of the spine have their activity that is focused on the facet articulation that forms the fulcrum of all major spinal movements in general, particularly those movements that affect standing/sitting posture and walking, running, and dancing. Weakness of these muscles due to their misuse, abuse, or injury leads to subtle, potential, or manifest spinal instability.^[1] Essentially, weakness of the powerhouse of the human body, namely the muscles, forms the nodal point of the pathogenesis of spinal “degenerative” disease. Our articles use the term “degeneration” synonymously with “instability.”^[1]

Acute instability is usually related to injury of the muscle pulley and is more often focal or segmental and leads to symptoms of radiculopathy and is generally associated with single-level disc herniation.^[2] On the other hand, chronic or longstanding muscle weakness, as is generally observed in “old” population, is associated with multisegmental spinal instability and manifests as cervical or lumbar canal “stenosis” and related symptoms.^[3-5] We observed that weakness of the muscles of the spine leads to telescoping of the spinal

segments related to listhesis of the facets and labeled it as “vertical spinal instability”.^[6] Such instability can be subtle and is more often not identifiable on dynamic imaging. However, in chronic situations, apart from symptoms of pain and muscle spasms, several tell-tale evidence of instability guide the clinician in the identification of the presence of spinal instability and treatment accordingly.

Chronic and nagging neck/back pain is an initial and persistent symptom of spinal instability and related spinal degeneration. Apart from pain, spasm of the muscles is a constant association. Both these symptoms are aimed to prevent and restrict excessive and potentially harmful spinal movements in an unstable spine. The presence of both or one of these two symptoms indicates the presence of potential, subtle, or established spinal instability.

Both pain and spasm reduce spinal movements and in a chronic situation lead to several secondary spinal alterations. Muscle spasm limits the spinal movements and reduces the vertical dimension of the spine by bringing the spinal segments closer to each other. Spinal alterations that result following chronic or longstanding neck muscle spasms include reduction in the joint space, erosion of the articular cartilage, reduction in the intervertebral disc space height, and buckling of the intervertebral ligaments that include posterior longitudinal ligament and ligamentum flavum.^[7] In more chronic situations, secondary alterations include osteophyte formation around the facets and vertebral bodies. Vertical reduction in the spinal column height ultimately results in a reduction in the neural foraminal and spinal canal dimensions. Other chronic changes in the spinal column include vertical reduction and transverse increase in the vertebral body height. The vertebral column in general and vertebral bodies and disc in particular become vertically and

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circumferentially compressed and transversely flattened to an extent. Such compression manifests as indentation in the middle of the body and widening or flattening of the paradiscal part of the vertebral body. Alterations lead to abnormal or new bone or osteophyte formation in the vicinity of disc space and facet articulation and in the long term can eventually lead to bone fusion.^[8] Ossification of the posterior longitudinal ligaments is secondary spinal alteration and is related to the primary issue of spinal instability.^[9] Alteration of the spinal curvature that includes reduction in spinal lordosis and kyphotic alteration is probably aimed to reduce the burden of spinal movements on the facets and is another important natural musculoskeletal alteration. The site and nature of spinal instability will determine the type of spinal curve alteration. Essentially, all the spinal alterations begin with muscle weakness. All the symptoms and secondary spinal alterations or manifestations are naturally protective or adaptive in their function and indicate spinal instability even in the absence of parallel radiographic demonstration of instability.

Chronic pain in the nape and muscle spasms related to atlantoaxial instability has several clinical implications. As in the rest of the spine, chronic neck pain and muscle spasms are natural events aimed to reduce or limit the neck movements in an unstable spine that could have dangerous consequences to the neural structures and to life.

The atlantoaxial joint is the most mobile joint of the spine. The smooth and round architecture of the articulation that facilitates circumferential movements, also makes it potentially the most unstable joint. The muscle bulk of the nape is large and strong and initiates, propels, and conducts circumferential neck movements. The activity of the muscles is focused on the large spinous process of the axis and large transverse process of the atlas. The fulcrum of all muscle activity is the atlantoaxial facet articulation. Symptoms of pain and neck spasms can indicate the presence of atlantoaxial instability much before its radiological demonstration. Longstanding spasms of the nape muscles that is aimed to reduce or limit neck movements in an unstable atlantoaxial articulation lead to a vertical reduction in the height of the spinal column and in its transverse widening.

Long-standing pain in the nape that increases on neck movements and nape muscle spasms are constant symptoms related to basilar invagination, Chiari formation, syringomyelia, Klippel–Feil alteration, bone fusions, platybasia, and several other conditions related to the craniovertebral junction.^[10]

Chronic muscle spasms of the nape lead to shortening of the neck and when the instability is more pronounced unilaterally, it leads to torticollis. Bone fusions such as assimilation of the atlas, C2-3 fusion, and Klippel-Feil alteration are a direct consequence of longstanding muscle spasms. Muscle spasm leads to vertical shortening and transverse increase of the dimensions of the spine in general and craniovertebral junction in particular.^[8]

We observed earlier that the effect of longstanding instability is not only limited to the neck but also to the dorsal and lumbar spine and to the head in general and the posterior fossa in particular. A short neck is frequently associated with short head and short spine height.^[11] While short neck results in torticollis, kyphoscoliosis is a consequence of a short spine.^[12] Both head and spine are vertically short and transversely larger than normal. Vertical decrease in the head dimension results in herniation of tonsils from the foramen magnum or Chiari formation. The increase in transverse neck and posterior cranial fossa dimension results in the occupation of cerebrospinal fluid (CSF) in extra space created or in syringomyelia, syringobulbia and external syringomyelia, and external syringobulbia.^[13] Syringomyelia could be a natural phenomenon of self-neural destruction that participates in neutralizing the pressure mechanics of the spine aimed at reducing the overall potential negative effects of instability.^[14]

Bifid arches of atlas and axis, os-odontoideum, platybasia, and several such so-called pathological clinical entities are in fact a result of natural adaptive or protective response to atlantoaxial instability.

Our observation is that instability of the spine related to muscle weakness and the consequent nature of protective pain and muscle spasm form the basis of several issues that are currently considered to be pathological and related to embryological dysgenesis. It appears that all the symptoms and spinal alterations are naturally protective, indicate spinal instability, and are potentially or manifestly reversible following spinal stabilization.

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REFERENCES

1. Goel A, Dandpat S, Shah A, Rai S, Vutha R. Muscle weakness-related spinal instability is the cause of cervical spinal degeneration and spinal stabilization is the treatment: An experience with 215 cases surgically treated over 7 years. *World Neurosurg* 2020;140:614-21.
2. Goel A. Is disc herniation “secondary” to spinal instability? Is it a protective natural response? *J Craniovertebr Junction Spine* 2021;12:213-5.
3. Goel A, Vutha R, Shah A, Patil A, Dhar A, Prasad A. Cervical spondylosis in patients presenting with “severe” myelopathy: Analysis of treatment by multisegmental spinal fixation – A case series. *J Craniovertebr Junction Spine* 2019;10:144-51.
4. Goel A, Ranjan S, Shah A, Patil A, Vutha R. Lumbar canal stenosis: Analyzing the role of stabilization and the futility of decompression as treatment. *Neurosurg Focus* 2019;46:E7.
5. Goel A, Vutha R, Shah A, Prasad A, Shukla AK, Maheshwari S. Defining role of atlantoaxial and subaxial spinal instability in the pathogenesis of cervical spinal degeneration: Experience with “only-fixation” without any decompression as treatment in 374 cases over 10 years. *J Craniovertebr Junction Spine* 2024;15:74-82.
6. Goel A. Vertical facet instability: Is it the point of genesis of spinal spondylotic disease? *J Craniovertebr Junction Spine* 2015;6:47-8.
7. Goel A, Shah A. Facetal distraction as treatment for single- and multilevel cervical spondylotic radiculopathy and myelopathy: A preliminary report. *J Neurosurg Spine* 2011;14:689-96.
8. Goel A. Cervical fusion as a protective response to craniocervical junction instability: A novel concept. *Neurospine* 2018;15:323-8.
9. Goel A, Grasso G, Shah A, Rai S, Dandpat S, Vaja T, *et al.* “Only spinal fixation” as surgical treatment of cervical myelopathy related to ossified posterior longitudinal ligament: Review of 52 cases. *World Neurosurg* 2020;140:556-63.
10. Shah A, Vutha R, Prasad A, Goel A. Central or axial atlantoaxial dislocation and craniocervical junction alterations: A review of 393 patients treated over 12 years. *Neurosurg Focus* 2023;54:E13.
11. Goel A. Short neck, short head, short spine, and short body height – Hallmarks of basilar invagination. *J Craniovertebr Junction Spine* 2017;8:165-7.
12. Goel A. Is central atlantoaxial instability the nodal point of pathogenesis of “idiopathic” dorsal spinal kyphoscoliosis? *J Craniovertebr Junction Spine* 2019;10:1-2.
13. Goel A, Nadkarni T, Shah A, Sathe P, Patil M. Radiologic evaluation of basilar invagination without obvious atlantoaxial instability (Group B basilar invagination): Analysis based on a study of 75 patients. *World Neurosurg* 2016;95:375-82.
14. Goel A. Is syringomyelia pathology or a natural protective phenomenon? *J Postgrad Med* 2001;47:87-8.