

Kyphosis One Level Above the Cervical Disc Disease: Is the Kyphosis Cause or Effect?

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FROM ABSTRACT

If present, kyphotic angulation is generally at the level of the cervical disc disease (CDD) in the neck, but sometimes occurs at one level above the CDD. We name this situation as kyphosis one level above (KOLA).

KOLA CDD has not been studied previously. In this study, we present 18 patients who had KOLA among 147 patients operated on for CDD over a 5-year period. Seven of these 18 patients also received surgery for their KOLA.

Surgical clinical outcomes and kyphotic corrections of KOLA patients receiving and not receiving surgery for their kyphosis were compared.

The 7 KOLA patients having surgery to correct the kyphosis had a mean 20.14 ± 3.13 degrees correction in their kyphosis, whereas the 11 patients undergoing surgery only for CDD showed only a mean 3.00 ± 2.52 degrees correction. When kyphotic corrections were compared, statistically significant differences were found between the 2 groups. Clinical outcome scores showed a trend towards improvement in the patients operated upon for kyphosis correction.

KOLA may be a factor in the development of cervical disc herniation and spondylosis, and should be treated if more than 11 degrees.

In cervical region, upper adjacent level disease may be an extension of KOLA.

THESE AUTHORS ALSO NOTE:

The normal cervical spine has a gentle sloping, lordotic curve from C1 to C7.

"Hypolordosis refers to any degree of flattening of the normal cervical lordosis. Cervical kyphosis refers to any degree of reversal of the normal cervical lordosis."

"Loss of lordosis or straightening of the cervical spine is often seen after acute cervical injury secondary to paraspinal muscle spasm."

Reversal of the cervical lordotic curve into a cervical kyphosis is much less common than cervical hypolordosis, and “can be due to degenerative, inflammatory, traumatic or neoplastic conditions of the cervical spine.”

“In the case of cervical disc disease (CDD), kyphosis results from the collapse of disc spaces and subsequent vertebral subluxation.”

“Kyphosis one level above (KOLA) [cervical disc disease] may be a factor in the development of cervical disc disease rather than its effect.”

For this study, the authors evaluated 147 patients with symptomatic cervical disc disease. “The cervical alignment was assessed by lateral x-rays and the angle of local kyphosis or lordosis was measured on lateral x-rays by using tangential lines passing on posterior borders of adjacent vertebrae of apex kyphotic level.”

The kyphotic angulation and cervical disc disease was surgically treated if the kyphotic angulation exceeded 11-degree. One patient with an 8-degree kyphotic angulation was also treated because of associated subluxation.

DISCUSSION

“The normal sagittal weight-bearing axis lies posterior to the vertebral bodies of C2-C7, maintaining the normal sagittal contour and thus minimizing the demands on the posterior cervical musculature to maintain the balance of weight-bearing forces. With a loss of the normal sagittal alignment in kyphosis, the weight-bearing axis shifts anteriorly, and constant muscular contraction is required to maintain upright head posture. Eventually fatigue and pain occur, and the kyphosis progresses. The anterior shift of weight onto the vertebral bodies and degenerated discs results in a vicious cycle of disc degeneration and the formation of vertebral osteophytes. Thus, kyphotic sagittal alignment may provoke further degeneration at the adjacent segment. The increase in weight born by discs at lower level(s) may also cause the nucleus pulposus to herniate or degenerate. In the case of CDD associated with KOLA, instability and kyphosis may perhaps be the initiating event, which later may act as a factor in the development of disc herniation and degeneration one level below.”

These authors “believe that structural instability is present in even mild [cervical spine] kyphosis.”

Uncorrected cervical spine kyphosis, especially if greater than 11-degrees, can be associated with the following:

- 1) Cervical disc disease
- 2) Progression of the kyphotic angulation
- 3) The spinal cord becomes draped and flattened over the posterior aspect of the vertebral bodies, diminishing the microvascular supply to the spinal cord
- 4) Adverse stretching or tethering of dentate ligaments and cervical roots

5) "Direct neuronal injury and myelopathy with progressive deformity may result from both spinal ischemia and increased spinal cord tension."

Even mild cervical kyphosis may put the spinal cord at risk for histopathologic and vascular changes. "Maintaining normal cervical anatomy with its lordosis in this region of prominent movement may optimize the cord function."

In kyphosis, "radicular symptoms and findings may develop secondary to foraminal narrowing from uncovertebral and/or facet joint hypertrophy."

Kyphotic angulation one level above the level of cervical disc disease "may be a factor in the development of cervical disc herniation and spondylosis, rather than its result."

Segmental degeneration at the level above the kyphotic angulation may be an extension of the kyphotic angulation as well.

KEY POINTS FROM DAN MURPHY

1) The normal cervical spine has a gentle sloping, lordotic curve from C1 to C7.

2) "Hypolordosis refers to any degree of flattening of the normal cervical lordosis. Cervical kyphosis refers to any degree of reversal of the normal cervical lordosis."

3) "Loss of lordosis or straightening of the cervical spine is often seen after acute cervical injury secondary to paraspinal muscle spasm."

4) Reversal of the cervical lordotic curve into a cervical kyphosis is much less common than cervical hypolordosis, and "can be due to degenerative, inflammatory, traumatic or neoplastic conditions of the cervical spine."

5) Cervical spine kyphosis may be a factor in the development of cervical disc herniation and spondylosis, and should be treated if more than 11 degrees.

6) In this study, "cervical alignment was assessed by lateral x-rays and the angle of local kyphosis or lordosis was measured on lateral x-rays by using tangential lines passing on posterior borders of adjacent vertebrae of apex kyphotic level." This is similar to the traditional Ruth Jackson stress lines drawn on the back of the vertebral bodies of the lateral cervical radiograph, and then measuring the angle that forms between the lines.

- 7) "With a loss of the normal sagittal alignment in kyphosis, the weight-bearing axis shifts anteriorly, and constant muscular contraction is required to maintain upright head posture. Eventually fatigue and pain occur, and the kyphosis progresses. The anterior shift of weight onto the vertebral bodies and degenerated discs results in a vicious cycle of disc degeneration and the formation of vertebral osteophytes. Thus, kyphotic sagittal alignment may provoke further degeneration at the adjacent segment. The increase in weight born by discs at lower level(s) may also cause the nucleus pulposus to herniate or degenerate. In the case of CDD associated with KOLA, instability and kyphosis may perhaps be the initiating event, which later may act as a factor in the development of disc herniation and degeneration one level below."
- 8) Structural instability may be present in even mild cervical spine kyphosis.
- 9) Uncorrected cervical spine kyphosis, especially if greater than 11-degrees, can be associated with the following:
- A)) Cervical disc disease
 - B)) Progression of the kyphotic angulation
 - C)) The spinal cord becomes draped and flattened over the posterior aspect of the vertebral bodies, diminishing the microvascular supply to the spinal cord
 - D)) Adverse stretching or tethering of dentate ligaments and cervical roots
 - E)) "Direct neuronal injury and myelopathy with progressive deformity may result from both spinal ischemia and increased spinal cord tension"
- 10) Even mild cervical kyphosis may put the spinal cord at risk for histopathologic and vascular changes. "Maintaining normal cervical anatomy with its lordosis in this region of prominent movement may optimize the cord function."
- 11) In kyphosis, "radicular symptoms and findings may develop secondary to foraminal narrowing from uncovertebral and/or facet joint hypertrophy."
- 12) Kyphotic angulation one level above the level of cervical disc disease "may be a factor in the development of cervical disc herniation and spondylosis, rather than its result."
- 13) Segmental degeneration at the level above the kyphotic angulation may be an extension of the kyphotic angulation as well.

Comments from Dan Murphy:

This article emphasizes the adverseness of cervical spine kyphosis: accelerated spondylosis, spinal cord tethering, spinal cord ischemia, radiculopathy and myelopathy. Although the corrections of the kyphotic deformity in this study were surgical, there are several studies in the PubMed Database indicating that chiropractic can improve and even reverse cervical kyphosis. The procedures usually involve combinations of certain adjustments and extension traction.