

## **Pain Generation in Lumbar and Cervical Facet Joints**

**The Journal of Bone and Joint Surgery (American)**

**April 2006;88:63-67.**

John M. Cavanaugh, MD, Ying Lu, MS, Chaoyang Chen, MD and Srinivasu Kallakuri

FROM ABSTRACT:

Facet joints are implicated as a major source of neck and low-back pain.

Biomechanical studies have shown that lumbar and cervical facet-joint capsules can undergo high strains during spine-loading.

Neuro-anatomic studies have demonstrated free and encapsulated nerve endings in facet joints as well as nerves containing substance P and calcitonin gene-related peptide.

Neuro-physiologic studies have shown that facet-joint capsules contain low-threshold mechanoreceptors, mechanically sensitive nociceptors, and silent nociceptors.

Inflammation leads to decreased thresholds of nerve endings in facet capsules as well as elevated baseline discharge rates.

Recent biomechanical studies suggest that rear-end motor-vehicle impacts give rise to excessive deformation of the capsules of lower cervical facet joints.

Still unresolved is whether this stretch is sufficient to activate nociceptors in the joint capsule.

To answer this question, recent studies indicate that low stretch levels activate proprioceptors in the facet-joint capsule.

Excessive capsule stretch activates nociceptors, leads to prolonged neural after discharges, and can cause damage to the capsule and to axons in the capsule.

In instances in which a whiplash event is severe enough to injure the joint capsule, facet capsule overstretch is a possible cause of persistent neck pain.

THESE AUTHORS ALSO NOTE:

LUMBAR FACET PAIN:

Paradoxically, studies have shown that degenerative lumbar facet joints can be asymptomatic while normal appearing joints can be painful.

Lumbar facet joint anaesthetic injections on patients who had nonspecific low-back pain and no definitive radiologic findings, found the facet joints to be the source of pain in 15% and partially responsible for the pain in 50%.

Biomechanical studies confirm that the lumbar facets can become overloaded.

During extension, the lumbar facet superior articular process bottoms out on the lamina below causing high strains to the facet-joint capsule.

Neurophysiologic studies support the concept that lumbar facet pain is of capsular origin.

## CERVICAL FACET PAIN

“Whiplash-associated disorders are among the most common injuries associated with motor-vehicle accidents.”

In the United States, more than 59% of insurance claimants for motor-vehicle injury reported neck injuries.

“Studies of the natural history of whiplash-associated disorders have suggested that chronic pain with continued symptoms develops in 6% to 33% of acutely injured victims.”

“Several regions of the cervical spine are postulated to be a source of whiplash injury and pain generation, including facet joints, intervertebral discs, ligaments and muscles, and spinal nerve roots.”

“The incidence of cervical facet pain appears to be greater than that of lumbar facet pain.”

The prevalence of cervical facet pain is at least 54% in one study on chronic whiplash pain patients, and 55% of patients with chronic, nonspecific cervical spinal pain.

“A chronic pain condition (late whiplash syndrome) without detectable lesions was reported to occur in subjects with a whiplash injury of the neck. The facet joint is a potential source of pain in these cases.”

“Several facet-joint injury mechanisms have been proposed, including facet-joint impingement, synovial fold pinching, and facet-joint capsule strain injury.”

Facet-joint capsule deformation in whiplash events may result in capsular injury and persistent pain. **[IMPORTANT]**

## RESULTS

The present study shows a quantitative relationship between facet capsule pain and applied facet capsule stretch from cervical facet joints. Cervical facet capsular strains that correspond to the onset of pain indicate strain ranges that are injurious or painful in whiplash.

This study also shows that pain producing capsular strains are "comparable with the strains that lower cervical facet-joint capsules experienced during whiplash loading" and fall within the range of partial failure strains.

"Thus, this study supports a capsule-strain-injury mechanism of whiplash and further provides a neurophysiologic basis for it."

Persistent pain after capsular strains "may be related to nerve injury or capsular injury with the release of inflammatory mediators into the surrounding tissue."

"This peripheral sensitization may lead to central sensitization of pain pathways in the spinal cord" and may "eventually evolve to chronic whiplash pain."

"Several studies have observed central hypersensitivity to neck stimulation in whiplash patients."

## CONCLUSIONS

"Clinical studies indicate that the facet joint is the origin of a good percentage of lumbar and cervical spinal pain."

The incidence of cervical facet pain is higher than that of lumbar facet pain.

Many patients with facet pain "have no obvious radiographic abnormalities," suggesting the pain is of capsular origin.

"Biomechanical studies support overstretch of cervical facet-joint capsules as a possible source of whiplash injury."

"The neurophysiologic studies reported here support injured facet-joint capsules as a source of the facet syndrome."

Inflammation of the facet joints leads to decreased thresholds of capsule receptors and increased pain.

"High capsular strain may also lead to damaged axons in the capsular tissue, which may then lead to persistent pain."

## KEY POINTS FROM DAN MURPHY

- 1) Facet joints are implicated as a major source of neck and low-back pain.
- 2) Inflammation leads to decreased thresholds of nerve endings in facet capsules as well as elevated baseline discharge rates.
- 3) Rear-end motor-vehicle impacts give rise to excessive deformation of the capsules of the lower cervical facet joints.
- 4) Excessive capsule stretch activates nociceptors, leads to prolonged neural after discharges, and can cause damage to the capsule and to axons in the capsule.
- 5) In instances in which a whiplash event is severe enough to injure the joint capsule, facet capsule overstretch is a possible cause of persistent neck pain.
- 6) Paradoxically, studies have shown that degenerative lumbar facet joints can be asymptomatic while normal-appearing joints can be painful.
- 7) The lumbar facet joints are wholly responsible for about 15% of low back pain and partially responsible for about 50% of low back pain.
- 8) Extension strains damage the facet-joint capsule.
- 9) 6% to 33% of whiplash-injured victims develop chronic pain.
- 10) The incidence of cervical facet pain is greater than that of lumbar facet pain.
- 11) The prevalence of cervical facets causing chronic neck pain is about 55%.
- 12) Facet-joint capsule deformation in whiplash events results in capsular injury and persistent pain. **[IMPORTANT]**
- 13) "This study supports a capsule-strain-injury mechanism of whiplash and further provides a neurophysiologic basis for it."
- 14) Persistent pain after capsular strains "may be related to nerve injury or capsular injury with the release of inflammatory mediators into the surrounding tissue." **[Like Prostaglandin E2 (PGE2)]**
- 15) Many patients with facet pain "have no obvious radiographic abnormalities," suggesting the pain is of capsular origin.
- 16) Inflammation of the facet joints leads to decreased thresholds of capsule receptors and increased pain.