

Synovial folds – A pain in the neck?

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FROM ABSTRACT

The synovial folds of the cervical spine are regarded as a potential source of neck pain and headache, especially following whiplash injury.

Damage to the synovial folds following motor vehicle trauma has been well documented in post-mortem studies.

However, methods of identifying injury to the synovial folds in the survivors of motor vehicle trauma have proven elusive to date. Recently, it has been made possible to image the synovial folds in vivo using magnetic resonance imaging. This now makes it feasible to investigate the potential involvement of synovial folds in the generation of neck pain and headache and its relief using spinal manipulation.

This paper reviews critically the morphology of the synovial folds of the cervical spine that underpins the hypotheses proposed to explain their functional and clinical significance and a new system of naming and classifying the synovial folds is presented.

These findings have implications for understanding the anatomical basis of neck pain and headache and the rationale for the use of spinal manipulation in their management

KEY POINTS FROM THIS ARTICLE:

- 1) "Intra-articular synovial folds are formed by folds of synovial membrane (synovium) that project into the joint cavity and are found in synovial articulations throughout the vertebral column."
- 2) The earliest description of synovial folds in the vertebral column occurred in 1855.
- 3) The published literature uses a number of names to identify these synovial folds, including:
 - "Synovial fold is the most accurate name to apply to these structures."
 - Meniscus / Menisci
 - Meniscoid
 - Intra-articular inclusions
 - Intra-articular discs

- 4) Cervical synovial folds extend 1–5 mm between the articular surfaces.
- 5) Synovial folds have been identified in all synovial articulations of the cervical spine.
- 6) Synovial folds are most commonly found in adult lateral atlanto-axial and cervical zygapophysial joints.
- 7) “Synovial folds contain an abundant vascular network.”
- 8) With repeated mechanical impingement between the articular surfaces, “the synovial fold may differentiate into fibrous tissue to varying degrees.” Collagen-producing, activated fibroblasts have been observed within synovial folds. Consequently, the “process of fibrous change may involve inflammation and repair.”
- 9) The presence of nerve fibers and endings has been demonstrated in synovial folds. These nerve fibers have been identified both alongside and independent of blood vessels in the cervical synovial folds. The function of these nerves may be nociceptive, proprioceptive and/or vasomotor. There are a number of studies supporting the nociceptive function in particular for these joint structures.
- 10) “The synovial folds are believed to adapt themselves intimately to the contour of the joint space in all positions of the joint and act as ‘passive space-fillers’ that fill peripheral non-congruent parts of the joint in its neutral position but displace when the joint moves.”
- 11) “The synovial folds may protect and/or lubricate the articular surfaces, enhance joint congruity and stability, assist weight-bearing or dissipate stress.”
- 12) The synovial folds may have a mechanosensory role. The synovial fold tissues are fibro-fatty in composition, and “innervated adipose tissue is thought to be important in giving proprioceptive feedback for sensorimotor control which would be especially important in the upper cervical spine which has direct neurophysiological connections via cervical proprioceptors to the vestibular and visual systems.”
- 13) “Disturbances in balance and vision have been reported to accompany upper cervical pain and dysfunction and are areas of increasing interest particularly in relation to whiplash.”
- 14) The entrapment hypotheses, is usually proposed to explain the clinical presentations of the synovial fold syndrome.
- 15) Intra-articular adhesions and synovial fold impingement following whiplash may cause deformation and/or inflammation within the synovial folds, irritating the sensory nerves. Consequently, spinal manipulation and mobilization may effectively treat the associated spinal pain and disability. **[Important]**

16) "An abnormal joint movement may cause a synovial fold to move from its normal position at the articular margins to become imprisoned between the articular cartilage surfaces causing pain and articular hypomobility accompanied by reflex muscle spasm."

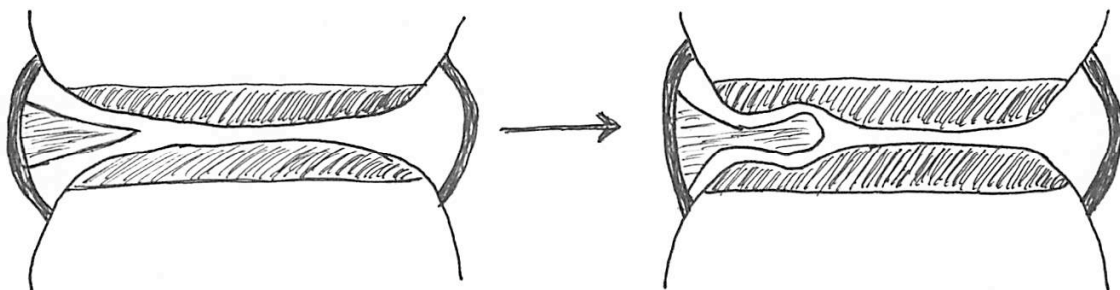
17) "Synovial fold entrapment has been used to explain the pathophysiology of torticollis and the relief of pain and disability following spinal manipulation." The traction forces generated during manipulation would cause rupture of a trapped fibro-adipose synovial fold from the fibrous capsule causing intra-articular haemarthrosis and loose body formation."

18) In habitually immobilised or under-used joints, the "synovial folds may act as a nidus for fibrous tissue proliferation resulting in the formation of adhesions that reduce joint motion." **[Reduced motion resulting in fibrosis]**

19) "The majority of evidence regarding the possible role of synovial folds in the generation of neck pain relates to their potential to become injured during whiplash associated with motor vehicle trauma."

20) "Contusions, rupture and displacement of the synovial folds have been reported at autopsy following fatal motor vehicle trauma in addition to joint haemarthrosis caused by synovial fold disruption. Such injuries are not visible at post-mortem using conventional X-ray, CT or MRI."

21) "Discolouration of the dorsal synovial folds has been observed months after the initial injury in post-mortem studies of motor vehicle trauma survivors who died later from other causes. Therefore injury to the synovial folds following whiplash may be a potential source of both acute and chronic neck pain."



COMMENTS FROM DAN MURPHY:

My orthopedic training (from the late, great Richard Stonebrink, DC) advises that the best adjustment approach for the synovial fold entrapment syndrome is to adjust on the "low side of the rainbow," i.e. to make the antalgic lean worse. This approach is most likely to gap the contralateral facet joint, freeing the entrapped synovial fold. The result is immediate improvement of antalgic lean and improvement in the range of motion. Dr. Stonebrink referred to the synovial fold entrapment syndrome as a "meniscoid block."