

Role of the sinu-vertebral nerve in low back pain and anatomical basis of therapeutic implications

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FROM ABSTRACT

Low back pain is frequent and results in major disability for patients.

This anatomical study was done to understand mechanisms involved in that pain.

Two kinds of innervation are present in the lumbar spine: one depends on the somatic nervous system and the other on the sympathetic nervous system.

The sympathetic nerves are the sinu-vertebral nerves and the rami communicantes which innervate the intervertebral disc, the ventral surface of the dura mater, the longitudinal dorsal ligament and the longitudinal ventral ligament.

The sinu-vertebral nerve was described first by Luschka in 1850.

This nerve is implicated in diffuse low back pain because of its pathway and its sympathetic component.

This nerve cannot directly reach a somatic element at each level of the lumbar spine, so it must first reach the L2 spinal ganglion.

Thus, there is a "hole" in the somatic innervation between L3 and L5 because the dorsal nerves do not reach the skin at these levels. The pain therefore takes another route through the sympathetic system.

Discogenic pain is mediated by the sinu-vertebral nerves, and through the rami communicantes it reaches the L2 spinal ganglion.

THESE AUTHORS ALSO NOTE:

"Many structures are implicated in low back pain including the ventral and the dorsal longitudinal ligaments, the ventral face of the dura mater and the intervertebral disc."

"Anatomical structures implicated in low back pain are innervated by the sinu-vertebral nerve. This nerve was described first by H. von Luschka in 1850. It looks like a recurrent branch in the intervertebral foramen, connected to the sympathetic system through rami communicantes. This nerve extends to epidural vessels and the vertebral body."

Some studies indicate that the sinu-vertebral nerve is mostly sympathetic.

These authors present information on the sinu-vertebral nerves obtained by performing dissection on 6 human cadavers and immunohistochemical staining.

RESULTS

"The sinu-vertebral nerve was composed of two branches: a more substantial contribution from the subjacent intervertebral level and a smaller one from two levels below."

The sinu-vertebral nerve innervates the posterior longitudinal ligament, the anterior aspect of the dura mater, the vessels of the vertebral canal and the intervertebral disc.

Immunohistochemistry staining of the sinu-vertebral nerve showed that this nerve has a sympathetic component.

DISCUSSION

"The sinu-vertebral nerve comes from the dorsal longitudinal ligament, from the ventral part of the dura mater and the intervertebral disc. The origin consists of an ascending and a descending branch."

"We studied six fresh cadavers and found in all cases that the sinu-vertebral nerve had more branches at the L2 level than at the L3, L4 or L5 levels."

The sinu-vertebral nerve at the L3, L4 and L5 levels has a sympathetic component.

"The sinu-vertebral nerve carries pain impulses through the [sympathetic] rami communicantes and finally joins the sympathetic trunk."

The pathway of the afferent nociceptive impulses is unclear, "because they must join the somatic system to produce a topographic component of the pain."

"It is reasonable to assume that pain impulses coming from the intervertebral disc, dorsal longitudinal ligament and the ventral part of dura join the L2 spinal ganglion (somatic system) via the rami communicantes and the sympathetic trunk."

Treatment at the L2 spinal ganglion has been performed in 33 patients with chronic, discogenic low back pain, and 79% experienced improvement in their symptoms at the 3-month follow-up, 72% had no low back pain at 1 year follow-up.

CONCLUSIONS

"The sinu-vertebral nerve is implicated in diffuse, chronic low back pain."

The sinu-vertebral nerve innervates the dorsal longitudinal ligament, the intervertebral disc and the ventral part of the dura mater.

The sinu-vertebral nerve has a sympathetic component and transmits pain impulses from the sympathetic trunk to the L2 spinal ganglia (site of convergence).

Successful treatment of chronic low back pain is often possible by appropriate treatment that affects the L2 spinal ganglia. **[Important]**

KEY POINTS FROM DAN MURPHY

- 1) "Low back pain is frequent and results in major disability for patients."
- 2) Many structures are implicated in low back pain including the anterior and posterior longitudinal ligaments, the anterior face of the dura mater and the intervertebral disc.
- 3) The anatomical structures implicated in low back pain are innervated by the sinu-vertebral nerve.
- 4) The sinu-vertebral nerve is composed of a primary branch from the subjacent intervertebral level and smaller branches from the level below and above.
- 5) The sinu-vertebral nerve is implicated in diffuse low back pain because of its three levels of origin and its sympathetic component.
- 6) The sinu-vertebral nerve was described first by H. von Luschka in 1850.
- 7) The sinu-vertebral nerve is a recurrent branch in the intervertebral foramen that is connected to the sympathetic nervous system.
- 8) The sympathetic fibers in the sinu-vertebral nerves innervate the intervertebral disc, the anterior surface of the dura mater, the posterior longitudinal and the anterior longitudinal ligaments.
- 9) "The sinu-vertebral nerve comes from the dorsal longitudinal ligament, from the ventral part of the dura mater and the intervertebral disc. The origin consists of an ascending and a descending branch."
- 10) Discogenic low back pain from levels L3, L4, and L5, are mediated by the sinu-vertebral nerves, which enter the central nervous system at the L2 spinal ganglion.
- 11) Therefore, low back disc pain uses the sympathetic nervous system.
- 12) "The sinu-vertebral nerve carries pain impulses through the [sympathetic] rami communicantes and finally joins the sympathetic trunk [at L2]."

- 13) The pathway of the afferent nociceptive impulses from the disc is unclear, "because they must join the somatic system to produce a topographic component of the pain."
- 14) "It is reasonable to assume that pain impulses coming from the intervertebral disc, dorsal longitudinal ligament and the ventral part of dura join the L2 spinal ganglion (somatic system) via the rami communicantes and the sympathetic trunk."
- 15) "The sinu-vertebral nerve is implicated in diffuse, chronic low back pain."
- 16) The sinu-vertebral nerve has a sympathetic component and transmits pain impulses from the sympathetic trunk to the L2 spinal ganglia (site of convergence).
- 17) Successful treatment of chronic low back pain is often possible by appropriate treatment that affects the L2 spinal ganglia. **[Important]**

COMMENTS FROM DAN MURPHY

We have reviewed a number of studies that indicate the primary source for chronic low back pain is the annulus of the disc. This study indicates that the annulus of the disc is innervated by the sinu-vertebral nerve. This study indicates that the sinu-vertebral nerve innervating a single low back disc originates from three adjacent nerve root levels, giving each disc a unique diffuse innervation. Low back disc pain is conveyed into the central nervous system through the sympathetic nervous system at the L2 ganglion level. Successful treatment of low back discogenic pain may require treatment at the L2 ganglion level.