The Tissue Origin of Low Back Pain and Sciatica: A Report of Pain Response to Tissue Stimulation During Operations on the Lumbar Spine Using Local Anesthesia

Orthopedic Clinics of North America, Vol. 22, No. 2, April 1991, pp.181-7

Stephen Kuslich, Cynthia Ulstrom, and Cami Michael
THESE AUTHORS NOTE:

These authors performed 700 lumbar spine operations using only local anesthesia to determine the tissue origin of low back and leg pain. This paper is based primarily on 193 consecutive patients studied prospectively.

"Sciatica could only be produced by stimulation of a swollen, stretched, or compressed nerve root."

"Back pain could be produced by several lumbar tissues, but by far, the most common tissue or origin was the outer layer of the annulus fibrosis."

"The facet joint capsule very rarely generated low back pain."

These authors note that the opinion of British Neurologist Wyke (1980), "the disc is not an important source of low back pain because nerve endings are not present," is mistaken, wrong.

These authors disagree that weak or strained muscles are a common source of low back pain because:
1) Many patients with back pain have strong muscles.
2) Back pain lasts much longer than pain caused by strained or overused muscles in other regions.

These authors found "no published accounts of muscle tears and hematomas in patients operated on for low back pain."

These authors reference six other studies that conclude that "the annulus fibrosus is the most common site of low back pain," and that the compressed nerve root alone causes sciatica, and that normal nerve roots cause no pain at all.

In this study, these authors consecutively anesthetized successive tissues of the low back. Prior to anesthesia, each tissue was mechanically stimulated with mechanical force from blunt surgical instruments or by an electrical current.

"The patients were fully awake or only lightly sedated. During the course of the operation we stimulated each tissue and asked the patient to report any painful sensation."

The assessed tissues were skin, fat, fascia, supraspinous ligament, interspinous ligament, spinous process, muscle, lamina, facet capsule, facet synovium, nerve root,

dura, compressed nerve root, normal nerve root, annulus fibrosus of the disc, nucleus of the disc, and vertebral end plate.

The lumbar fascia could be "touched or even cut without anesthesia."

Any pain derived from muscle pressure was "derived from local vessels and nerves, rather than the muscle bundles themselves."

"The normal, uncompressed, or unstretched nerve root was completely insensitive to pain."

Stimulation of the compressed or stretched nerve root consistently produced the patient's sciatic pain.

"In spite of all that has been written about other tissues in the spine causing leg pain, we were never able to reproduce the patient's sciatica except by finding and stimulating a stretched, compressed, or swollen nerve root."

In patients who had prior back surgery, "there was always some degree of perineural fibrosis. The scar tissue itself was never tender. The nerve root, however, was frequently very sensitive. We concluded that the presence of scar tissue compounded the nerve pain by fixing the nerve in one position and thus increasing the susceptibility of the nerve root to tension or compression."

About two thirds of patients responded with their pre-operative back pain to irritation of the annulus fibrosis. **[Important: the annulus was by far the most common reproducer of the patient's back pain.]**

"The annulus was exquisitely tender in about one third of cases, moderately tender in one third, and insensitive in the remaining one third." "Perhaps certain individuals are more richly innervated than others **[important]**. Or, alternatively, perhaps there exists some chemical **[like prostaglandin E2]** or mechanical irritant **[like the chiropractic subluxation complex that opens the pain gate]** that sensitizes certain discs to become painful." **[I like this paragraph.]**

The posterior longitudinal ligament is intimately connected with the posterior central portion of the annulus; when it was tender, the posterior annulus was also tender, and they produced central low back pain.

Pressure on the vertebral end plate frequently resulted in deep, severe low back pain. **[The end plates are, of course, anatomically attached to the disk; I believe that this has implications for the postural distortions {deviations from the vertical axis in sagittal or coronal planes} that chiropractors frequently manage.]**

"The nucleus is never tender."

"In spite or all that has been written about muscles, fascia, and bone as a source of pain, these tissues are really quite insensitive." **[Important]**

KEY POINTS FROM DAN MURPHY

1) Irritation of a normal or inflamed nerve root never produced low back pain.

2) The inflamed, stretched, or compressed nerve root is the cause of buttock, leg pain and sciatica.

3) The outer annulus is "the site" of a patient's back pain.

4) Studies that suggest the disc is not an important source of low back pain because nerve endings are not present are mistaken, wrong.

5) The facet joint capsule very rarely generated low back pain. When it did, the pain was sharp and localized, and did not match the preoperatively perceived deep, dull back pain. Facet capsule pain, when rarely present, is probably due to its ability to compress or irritate other sensitive local tissues like the outer annulus.

6) Back muscles themselves are not a source of back pain. **[This does not mean that muscle problems are unrelated to back pain because they can create altered biomechanical function that put inappropriate stresses on the pain sensitive annulus.]**

7) The lumbar fascia is completely insensitive.

8) The normal, uncompressed, or unstretched nerve root was completely insensitive to pain.

9) Back surgery always causes perineural fibrosis and scarring, which compounds the nerve pain by fixing the nerve in one position, increasing the susceptibility of the nerve root to tension or compression. **[The Fibrosis Of Repair]**

10) Some patients have disc pain because their disc is more extensively innervated.

11) Some patients have disc pain because they have some chemical irritant. **[Like prostaglandin E2.]**

12) Some patients have disc pain because they have some mechanical irritant. **[Like the chiropractic subluxation complex that opens the pain gate.]**

13) Some patients have disc pain because of abnormal pressure on the vertebral end plate, **[which are anatomically attached to the disk and would increase their gravitational loads subsequent to postural distortions affecting the first class lever of upright posture.]**

14) The muscles, fascia, and bone are really quite insensitive. **[Important]**