SUBJECTIVE NATURE OF LOWER LIMB RADICULAR PAIN

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ABSTRACT

Background: Lumbar pathologies may cause the perception of leg pain, but the character of this pain has not been described. Diagnosis is often based on dermatomal charts, but observations reveal that the pain is not typically perceived on the skin.

Objective: To document the incidence of superficial versus deep pain localization among patients with lumbar radicular pain.

Methods: Twenty-five patients with lower limb radicular pain were questioned to determine the specific localization of their pain. The investigator categorized the pain location into general areas (eg, posterior thigh or anterior leg). Patients were asked if their pain was perceived as being on the skin or deep, as a forced choice question. These data were gathered in 2 conditions: at rest (spontaneous pain) and during a straight leg raise test (mechanically evoked pain). Data were recorded using a standardized form for later analysis.

Results: In all cases, symptoms were reported to be in deep structures. Pain was typically reported at sites correlated with multiple spinal levels.

Conclusion: Because radicular pain symptoms are perceived in deep structures rather than on the skin, the diagnostic value of dermatomal charts is questioned. Clinicians are advised to be specific when questioning patients with radicular pain symptoms and to refer to myotomal and sclerotomal charts when making diagnoses. (J Manipulative Physiol Ther 2005;28:12-14)

Key Indexing Terms: Pain; Sciatic Neuropathy; Straight Leg Raise

A fundamental characteristic of radiating pain is that it is perceived in a different location than the causative lesion. The best-known example of radiating pain is the lower extremity pain associated with lumbar disk disease and known as “sciatica,” which affects up to 40% of the adult population.1 Despite the prevalence of such painful conditions, the localization of pain has rarely been described, especially in terms of “deep” versus “superficial.” Because the myotomal and sclerotomal (deep) and dermatomal (superficial) innervation patterns are dissimilar, the clinical interpretation of symptoms may be dependent on this sort of localization. The primary goal of this study was to determine whether lower limb radicular pain is perceived by patients to be deep or superficial. To this end, we questioned patients presenting to our pain clinic with diagnoses of lumbar radiculopathy about the localization of their spontaneous and mechanically evoked leg pain.

METHODS

The Beth Israel Deaconess Medical Center Committee on Clinical Investigation approved this protocol. All data collection was performed by one of the authors (AZ), who was unaware of the main hypothesis of the study. The records of scheduled patients aged 25 to 65 years were checked for diagnoses of lumbar radiculopathy. Before their scheduled examination, such patients were invited and gave verbal consent to participate.

While lying supine on the examination table, the investigator asked the patients about the pain they were currently perceiving (spontaneous pain), using a standardized script. Patients were not asked to provide pain descriptors, nor were such descriptors recorded. They were asked to localize their symptoms as specifically as possible. The investigator categorized the location of symptoms as anterior, posterior, medial, and/or lateral for the buttocks, thigh, knee, leg, and/or foot. For each region where pain was reported, patients were also asked if the pain was perceived “on the skin” or “deep,” using these standard terms. All data were recorded on a standardized form.

A straight leg raise (SLR) test was then performed, and the approximate angle at which symptoms appeared was
recorded. The subjective reports of the patients to the same
questions about pain localization during this test were
recorded. Ankle dorsiflexion was then performed, and
patients were asked if this worsened their pain. The
responses were summarized in chart format.

RESULTS

Subjective pain perceptions from 19 right and 10 left legs
of 25 patients were recorded (Table 1) from the 25
sequential patients who were asked to participate. All 29
legs were reported to generate spontaneous pain. In all
cases, the pain was reported to be deep, not superficial.
Straight leg raising evoked pain in 24 (83%) legs, at a mean
level of 58° (SD 16.7). Evoked pain was also reported to be
depth in all cases. Ankle dorsiflexion aggravated the
symptoms in 20 (83%) of these legs. The 95% exact
binomial confidence interval for both spontaneous and
evoked superficial pain being reported in 0 of 29 cases is
0 to 0.12; in other words, the prevalence of superficial pain
probably lies, in either case, between 0% and 12%.

The regions of spontaneous pain were compared with
myotomal charts of the lower limb,2 and the corresponding
root levels were recorded. In all but 1 case, multiple roots
seemed affected. In only 1 case did symptoms in the
distribution of multiple roots “skip” any level. In the majority
of cases, the regions and spinal levels of evoked pain were
either the same or were a subset of the areas of spontaneous
pain (Table 1). In 2 cases, the evoked symptoms were
more widespread than the spontaneous symptoms. Eleven
patients reported spontaneous anterior thigh and/or knee
pain, and in 2 different cases, evoked pain was reported in
these areas, indicating L2 and/or L3 involvement.

DISCUSSION

The most striking finding in this study was that in all
cases, the spontaneous and evoked pains were reported as
deep rather than superficial. This contrasts to previous
reports that 22% of patients with radicular symptoms had
superficially perceived spontaneous leg pain.3,4 The principal
difference may be that the cited reports examined cases
in which surgery had been or would be performed, whereas our patients were mainly referred to the pain clinic as nonsurgical candidates. In addition, the cited authors attributed superficial symptoms to more severe nerve involvement, which is a distinct possibility.

The difference between deep versus superficial pain has clinical and biologic implications. Clinically, spontaneous pain and the SLR test are used to help diagnose which nerve roots are involved in a radiculopathy. The symptoms are often compared with dermatomal charts. However, in the absence of reports of spontaneous or SLR-evoked cutaneous pain, dermatomal charts are clearly not the ideal diagnostic reference. These data suggest that myotomal and sclerotomal charts\(^2\) have more diagnostic potential.

On the other hand, the data may indicate that pain symptoms have limited diagnostic utility, especially considering that pain was reported correlating to multiple levels in almost all cases. Biologically, these data imply fundamental differences within primary afferent nociceptive neurons. The neurons innervating musculoskeletal structures may respond differently to pathologic lesions that cause radicular symptoms from the neurons innervating cutaneous structures. These ideas are consistent with recent reports that intact afferent neurons innervating muscle develop spontaneous activity after nerve injury,\(^5\) whereas cutaneous neurons do not. This could explain deep spontaneous pain after nerve injury. Also, the axons of deep but not cutaneous afferent neurons develop spontaneous activity and more importantly mechanical sensitivity during neuritis.\(^6\) This provides a potential mechanism for both spontaneous and mechanically evoked pain perceived as “deep.”

There was a distinct difference between the number of spinal levels involved in spontaneous pain compared with evoked pain. We hypothesize that this reflects different mechanisms for spontaneous versus evoked pain and that both could be explained by changes affecting primary afferent nociceptors. Although little data exist to support such hypotheses, our previous report showed that when axons are inflamed, some nociceptive neurons spontaneously generate action potentials (could lead to spontaneous pain), whereas others become mechanically sensitive (could lead to evoked pain).\(^6\) The present observations could be caused by such basic neurophysiological differences.

The apparently multiple spinal level involvement of the symptoms and the different distributions of spontaneous and evoked pain are not consistent with commonly held concepts of focal pathologies (eg, discal herniation). However, autologous nucleus pulposus from a compromised intervertebral disk is known to cause intrathecal inflammation\(^7,8\) that would not be expected to be restricted by nerve root levels, but rather by the spread of the intradiscal material. The extent of radicular symptoms, assessed by the number of spinal levels involved, may be related to the extent of inflammation and may be a measure of severity. However, there is a confounder in the concept of nonspecific extension of inflammation to other spinal levels as a cause of the symptoms reported: there were no reports of contralateral symptoms. We have no hypothesis to offer as explanation for this.

**CONCLUSION**

This project indicates that questions regarding “volume,” in addition to area of pain, give qualitatively different diagnostic information. Future comparisons of symptoms, physical findings, and imaging will be necessary to clarify the significance of such symptoms and whether they impact clinical decision making.

**REFERENCES**