Lumbar and Cervical Nerve Root Entrapment of Discal Origin– A Consecutive Case Series Investigation

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Fifth International McKenzie Conference, Wyndham Franklin Plaza, Philadelphia, Sept 14, 1997.

Introduction: The clinical management of sciatica and brachial neuralgia can be a complicated process. There are numerous causes of nerve root tension, compression and irritation. However, pathologies involving the intervertebral disc are the most common. The system of clinical assessment described by McKenzie enables the trained practitioner to accurately determine the presence or absence of relevant discal pathology.

The appropriate and effective use of any clinical intervention strategy for patient's with nerve root signs and symptoms is dependent upon the establishment of patient selection criteria. The McKenzie system of clinical assessment has identified three separate mechanical causes of sciatica and brachial neuralgia. These are; 1) disc bulge, 2) adherence of the nerve root, and 3) entrapment of the nerve root. This consecutive case series investigation looks at the clinical outcomes of patients presenting with mechanical entrapment of the nerve root examined and treated by a group of skilled and experienced McKenzie practitioners.

Background: Recent studies have demonstrated the ability of a qualified McKenzie practitioner to accurately predict the presence or absence of relevant intervertebral disc pathology in patients with referred or radiating pain into the limb. The presence of disc involvement was dependent upon identification of the centralization phenomenon described by McKenzie. When the centralization phenomenon was present, intradiscal pathology was predictable using a dynamic model of nuclear displacement through patterns of annular fissuring and disruption. In McKenzie terms, this is called a derangement syndrome. The ability to rapidly (minutes/hours) increase and/or decrease the discal displacement represents the derangement phase of these disorders. In the case of sciatica or brachial neuralgia, the derangement would have to be posterior to involve the nerve root complex (McKenzie derangement # 5 or # 6).

However, with the passage of time, repair always follows injury. This is regardless of whether the injury is a result of external or internally generated forces. In the case of an intradiscal derangement, this repair process can eventually arrest the active disc displacement. Subsequently, when this occurs, if the patient continues to have symptoms and loss of function the character of their disorder will change. This will mark the end of the active derangement stage of the disorder. The centralization phenomenon is no longer found, although the patient's history suggests that it once was present.

McKenzie has used end range flexion testing as a means of recognizing this change in the patient's clinical condition. When the patient is still in the active (posterior) derangement stage, repeated and/or sustained end range flexion will worsen the patient's condition (described as peripheralization). Provided the patient has a contained disc displacement, repeated passive end range extension (with or without shift correction) will demonstrate the centralization phenomenon.

When the active derangement is over, flexion may affect the patient's symptoms, but the condition will no longer worsen as a result. There will be no adverse effect on the patient's ability to perform passive end range extension movements afterwards, and there will be no evidence of the centralization phenomenon. Once it is clear that the active derangement stage is over, the McKenzie practitioner must attempt to differentiate the cause of the persistent leg or arm symptoms (general rule = leg/arm symptoms present for 10 weeks or longer). The possibilities include nerve root adherence and/or nerve root entrapment.

Materials & Methods: Using a customized data base program ('Patient Records Program') and a standardized outcome assessment system ('Duffy/Rath Outcome Manager'), patient data was collected on a ongoing basis in a outpatient physical therapy clinic. Every patient since the opening date of the clinic was assessed using the data base program and outcome assessment system. Categorical groupings of clinical outcomes were determined for all

patients according to specified criteria. Five groups were identified, as follows: 1) Excellent, 2) Good, 3) Fair, 4) Poor, or 5) Unknown (see table 1). There were operational definitions and guidelines used for all patient groupings, particularly for the mechanical conclusion a nerve root entrapment (see table 2).

Table 1: Criteria for Determination of Clinical Outcome.

Excellent: 1. Complete relief of pain and full return to function (work and recreational activities). 2. Pain analog scales may be a 1 or 2. 3. Functional scales may have a cumulative total of 10 points (no single category > 2), and must be lower than original totals. 4. Full restoration of motion, negative mechanical exam. Fits all secondary criteria.	Good: 1. Partial relief of pain and full return to function: Return to work and resumed all recreational activities or satisfied with the ones resumed, or Ready to RTW = True, or Retraining = True. 2. Pain analog scales not > 5, less than original. 3. Functional scales may have a cumulative total of 25-30 points (no single category > 4) and must be lower cumulative total than original. 4. Full restoration of motion, significantly improved mechanical exam, improvement in all secondary criteria.
Fair: 1. Partial relief of pain and only partial or no improvement in secondary criteria. 2. Pain analog scales less than original. 3. Functional scales cumulative total < 75 and must be a lower cumulative total than original. 4. Any rating of improvement by the patient, especially when coupled with improvements in mechanical examination, should be a fair (since poor means no relief and no improvement). The status of patients with a fair outcome could therefore have a wide range	Poor: 1. No relief of pain and no improvement in function. 2. No improvement in pain or functional VAS ratings, or in secondary criteria. No patient rating of improvement, or the patient expresses dissatisfaction with care. Secondary Criteria: 1. Work/activity status 2. Patient satisfaction 3. Objective & mechanical measurement 4. Guidelines for 'outriggers'

Table 2: Operational definition for mechanical diagnosis of nerve root entrapment (Key clinical factors).

1. Must have limb pain. Has a positive extension sign (does not have to have obstruction) that can not be eliminated with repetitions. Can be varying degrees of severity, example: leg pain worse after repeated extension, increased with every rep. but not worse as a result. Occasionally leg pain NE with extension.
2. Does not worsen with repeated or sustained flexion (usually leg pain decreases and/or abolishes with repeated flexion but does not remain better as a result, usually flexion range of motion increases with repetitions, but also does not remain increased), therefore can not be derangement.
3. Pain does not centralize/reduce with repeated/sustained extension or lateral compartment techniques, nor does the obstruction to extension (if present) improve and remain better as a result of the application of flexion procedures.

A data and outcome verification process was established, which allowed the treating clinician to assign an outcome group at the termination of physical therapy care. However, the data and outcome group had to be verified by an independent, non-treating physical therapist before inclusion for analysis.

Patients completed pain drawings, VAS ratings of pain and a functional disability questionnaire at the initial and each subsequent treatment session. At the second, and all subsequent, treatment session the patient was asked to rate their recovery on a 0 (no improvement since the initiation of treatment) to 100 % (complete recovery, 'cured', symptom free and fully functional) scale. A standardized initial assessment and reassessment form was utilized in the patient's clinical chart.

There were 6,350 patients evaluated and treated between December 1992 and March 1996. Of these patients, 4,756 were listed as having verified outcomes and eligible to be included in the study. Upon further investigation, 145 of these patients were identified as presenting with a mechanical diagnosis of nerve root entrapment (3 % of patient population). There were 125 of these with a disorder affecting the lumbar spine (86. 2 %), and 20 affecting the cervical spine (13.8 %). Further investigation of this group of 145 patients identified that 25 had not completed the final data verification process and another 13 did not have a known clinical outcome. Both of these groups were removed, leaving 107 patients in the study population (lumber = 94, and cervical = 13).

The study population consisted of 61 male and 46 female patients. The mean age was 47.9 years, with a range of 24 to 89 years. The insurance coverage for these patients was 70 private, 31 workers compensation and 6 motor vehicle accident. Litigation was analyzed by a patient in-take form, with the following response: 83 = no litigation,

7 = yes, case is involved in litigation, 17 = unknown. The duration of the patient's episode of back or neck pain ranged from 1 week to 574 weeks, with an average of 68 weeks. Most of the patients, 72 (67. 3 %) were working and active at the time of the initial evaluation. The location of symptoms were found to extend below the knee or elbow in 100 of the patients (19 had a neurologic deficit) and 7 had symptoms that only extended into the upper arm or thigh. There were 8 McKenzie trained therapists involved in the patient treatment, with 6 diploma holders (103 patients) and 2 credentialled practitioners (4 patients).

Results: Clinical outcomes for all patients was found to be excellent = 18 (16.8 %), good = 40 (37.4 %), fair = 23 (21.5 %), and poor = 26 (24.3 %). The mean number of treatment session (visits) was 8.9 with a range of 1 to 38 visits. The mean number of weeks on program was 7.6, with a range of 1 to 41weeks (see table 3).

Outcome findings in the lumbar patients were as follows: excellent = 15 (16.0 %), good = 38 (40.4 %), fair = 20 (21.3 %) and poor = 21 (22.3 %). Outcome findings in the cervical patients were as follows: excellent = 3 (23.1 %), good = 2 (15.4 %), fair = 3 (23.1 %) and poor = 5 (38.4 %).

Table 3: Clinical outcomes in the treatment of nerve root entrapment:

	Range	Av. Visits	Range	Av. Weeks
Excellent	3 – 15	5.9	2 – 40	8.0
Good	3 – 38	10.5	2 – 34	8.6
Fair	3 – 33	9.8	2 – 28	10.2
Poor	1 - 10	5.3	1 - 9	3.4

The average number of visits varied with clinical outcome, as follows: excellent = 5.9 (3 – 15), good = 10.5 (3 – 38), fair = 9.8 (3-33), poor = 5.3 (1-10). The average number of weeks on program varied with clinical outcomes, as follows: excellent = 8.0 (2-40), good = 8.6 (2-34), fair = 10.2 (2 – 28), and poor = 3.4 (1-9).

Discussion: The results of this study suggest that it is more difficult to achieve a good to excellent clinical outcome with patients with a mechanical diagnosis of nerve root entrapment than in the general population of patients with mechanical disorders of the spine. This would be expected considering the nature of the pathological mechanism in a nerve root entrapment of discal origin.

However, a fair outcome does represents some improvement in both the patient's symptom and/or function status. In more difficult clinical cases, this may be the best outcome that can be expected. When all patients that demonstrated at least some improvement are included, then 81 (75.7 %) out of the 107 patients demonstrated some response to treatment.

One factor which appears to influence clinical outcome and the utilization of service (visits and weeks) is the activity status of the patient at the time of initial evaluation. Active (working) patients had a combined good/excellent outcome of 61.1 % in an average of 6.5 visits and 6.9 weeks. Inactive (not working/idle) patients had a 40.0 % good/excellent outcome in an average of 13.6 visits and 9.0 weeks. Fair outcomes were 20.8 % for the active group and 22.9 % for the inactive group. Poor outcomes were 18.1 % of the active and 37.1 % of the inactive group (see table 4).

Table 4: Clinical outcomes in patients inactive/idle verses active/working with nerve root entrapment:

	Idle (N = 35)	Working (N = 72)
Excellent	2 = 5.7 %	16 = 22.2 %
Good	12 = 34.3 %	28 = 38.9 %
Fair	8 = 22.9 %	15 = 20.8 %
Poor	13 = 37.1 %	13 = 18.1 %
Visits	13.6 (1 - 38)	6.5 (2 - 25)
Weeks	9.0 (1 – 33)	6.9 (1 – 40)

Considering that the poor outcome group had the least number of visits and weeks on program, this suggests greater utilization of service required to achieve a good to excellent outcome in the inactive group. This has been a

consistent finding in previous studies. It appears that the importance of keeping spinal pain patients as active as possible during the course of recovery is paramount to clinical success.

Clinical efficiency is demonstrated by a moderate number of visits (8.9) and weeks on program (7.6) in a difficult group of patients. The ability of the McKenzie system to rapidly and appropriately sort-out those patients who will not respond (5.3 visits, and 3.4 weeks) remains consistent, as with previous studies.

Summary: A consecutive case series investigation has identified that the mechanical diagnosis of nerve root entrapment is infrequent, but when encountered can be a difficult clinical condition to achieve a good or excellent outcome with the McKenzie approach. However, most of the patients demonstrated at least a partial improvement in both symptoms and function.

Patients who are active at the time of the initial evaluation appear more likely to respond well to mechanical therapy than those who are not active. There is significantly less visits and weeks required to manage the active group, then that required for the inactive group. This is further evidence of the importance of keeping spinal pain patients active during their course of recovery.

The findings of this consecutive case series provides further evidence of the usefulness of the McKenzie approach as a 'triage agent 'in the management of spinal pain disorders. In this case, as a means of sorting-out an intervention strategy for chronic sciatica and/or brachial neuralgia. Those patients who will not respond are identified quickly, and a more appropriate intervention strategy can be pursued. However, many of the patients will respond and will do so at a reasonable cost (visits) and in a reasonable amount of time (weeks). Caution should be exercised regarding conclusions drawn from these findings due to constraints in the design of this study.

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