Mechanical Low Back Pain in Pregnancy – Preliminary Findings In A Consecutive Case Series Investigation

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Introduction: Low back pain during the course of pregnancy is a common experience for many women. There are three prevalent groups of theories regarding the etiology of this occurrence; 1) hormonal, 2) vascular and 3) mechanical. The hormonal and vascular theories insinuate that the back symptoms are a normal and expected occurrence, which will spontaneously resolve after completion of term. This assumes that the problem developed during the course of pregnancy, which often leads to palliative remedies, and a 'wait and see' approach. A mechanical approach investigates if the cause is secondary to strain on the connective tissues in the lumbosacral region, and implies the possibility of an active physical remedy. It also suggests the possibility that the condition existed prior to becoming pregnant, as well as a potential for chronicity and/or recurrence after delivery.

This study is concerned with the recognition and clinical management of mechanical pain disorders during pregnancy. A modification of the McKenzie method of spinal assessment and treatment is utilized to differentiate mechanical disorders from non-mechanical disorders. Clinical outcomes for a consecutive case series of patients with low back pain disorders during pregnancy is presented and discussed. The study provides preliminary evidence that low back pain disorders in pregnancy are frequently mechanical, and can be successfully managed throughout the pregnancy with a mechanically based system of patient education and exercise. It also suggests that low back pain during pregnancy may have similar mechanisms of onset as the general population of low back pain sufferers. Particularly poor sitting posture and a frequency of flexion in the lifestyle, which require extension based intervention strategies. This presents a need for consideration to the long term health and abilities of women after delivery.

Background: An attempt to understand the mechanism(s) of nociception in any pain disorder is a fundamental prerequisite to establishing a rational system of intervention. In the case of mechanical stimulation of the nociceptive system, the pain mechanism involves sufficient strain or tension in the connective tissues of the moving parts of the body. The McKenzie method provides a disciplined system for assessing the effect of end range positions, movements and postures on the patient's pain and function. This provides a means for the identification of mechanical verses non-mechanical pain disorders. Recent studies have demonstrated this system of assessment as being superior to MRI in the identification of painful verses non-painful disc pathology in low back pain patients.

Secondary to the interference of the growing abdomen, mechanical function changes during the course of the pregnancy. This prompts a modification of the normal assessment and treatment procedures utilized in the McKenzie system. The most notable of these is the inability to perform the McKenzie 'press-up' (passive end range extension) in the prone position. End range extension can be achieved starting from the quadruped position, by leaning against a table/counter/or desk with straight elbows and allowing the hips to 'sag' forwards, through backward bending in standing with firm hand support, lying supine over a large roll and/or utilizing the REPEX table supine. These procedures are used only when indicated by

determination of the patient's response, and barring any contraindication determined by the medical physician and/or midwife. Otherwise, the patient is placed through the McKenzie assessment process as with any other back pain patient.

Materials and 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. 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.

Table 1: Criteria for the 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'

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, 109 of these patients were identified as being pregnant at the time of initial evaluation and presenting with a low back pain disorder. Further investigation of this group of 109 patients identified that 23 had not completed the final data verification process and another 14 did not have a known clinical outcome. Both of these groups were removed, leaving 72 patients in the study population.

The mean age was 31.6 years, with a range of 20 to 46 years. The insurance coverage for these patients was 52 private, 17 workers compensation and 3 motor vehicle accident. Involvement of the case in litigation was determined by a patient in-take form, with the following response: 37 = no litigation, 5 = yes, 30 = unknown.

The duration of the patient's episode of back pain ranged from 1 week to 755 weeks, with an average of 42.3 weeks. More of the patients were working/active at the time of the initial evaluation 44 (61. 1 %) than out of work or inactive because of their back pain, 28 (38.9 %). The location of symptoms were grouped according to the first 4 classes of the Quebec Task Force classification system: class 1 (back +/- buttock) = 15 (20.8 %), class 2 (back + thigh) = 22 (30.6 %), class 3 (back + symptoms extending below the knee) = 34 (47.2 %), and class 4 (back + limb with neurologic deficit) = 1 (1.4 %).

The McKenzie diagnosis was established in 59 (81.9 %) of the patients. In the 13 (18.1 %) patients where a McKenzie diagnosis was not established, 1 was identified as a S-I disorder, and 11 were mechanically inconclusive, and 1 classified as other. Of the 59 patients with an established McKenzie diagnosis, 57 were identified as having a posterior derangement syndrome (96.6 %), 1 anterior derangement (1.7 %) and 1 nerve root entrapment (1.7 %). There were 10 McKenzie trained therapists involved in the patient treatment, with 6 diploma holders (56 patients) and 4 credentialled practitioners (16 patients).

Results: The clinical outcomes were found as follows: excellent = 16 (22.2 %), good = 31 (43.1 %), fair = 17 (23.6 %), and poor = 8 (11.1 %). The average number of visits was 5.7 (range 1 – 41), and the average number of weeks on program was 4.0 (range = 1 – 42).

The number of visits varied with the different outcome groups: excellent = 3.3 (range 1 – 7), good = 7.2 (range 2 – 41), fair = 6.2 (range 2 – 13), and poor = 3.8 (2 - 10). The number of weeks on program also varied with the different outcome groups: excellent = 2 (range 1 – 6), good = 6 (range 1 – 42), fair = 4 (range 1 – 10), and poor = 2 (1 - 7).

Table 2: Overall outcomes in the treatment of LBP in pregancy.

	%	Range	Av. Visits	Range	Av. Weeks
Excellent	16 (22.2 %)	1 – 7	3.3	1 - 6	2
Good	31 (43.1 %)	2 - 41	7.2	1 - 42	6
Fair	17 (23.6 %)	2 - 13	6.2	1 - 10	4
Poor	8 (11.1 %)	2 - 10	3.8	1 – 7	2

Outcomes varied according to activity status. Patients that reported to be working/active at the time of the initial evaluation had a 34.1 % excellent (n = 15), 43.2 good (n=19), 18.2 % fair (n=8), and only 4.5 % poor (n=2) outcomes. The average number of visits was 5.0 (range 1 – 27), and average number of weeks 4.0 (range 1 – 42). In comparison, the idle/inactive group had 3.6 % excellent (n=1), 42.9 % good (n=12), 32.1 % fair (n=9) and 21.4 % poor (n=6) outcomes. The average number of visits was 6.7 (range 2 – 41), and the average number of weeks was 3.7 (range 1 – 25).

Table 3: Clinical outcomes in inactive/idle verses active/working patients:

	Idle (N = 28)	Working (N = 44)

Excellent	1 (3.6 %)	15 (34.1 %)
Good	12 (42.9 %)	19 (43.2 %)
Fair	9 (32.1 %)	8 (18.2 %)
Poor	6 (21.4 %)	2 (4. 5 %)
Visits	6.7 (2 – 41)	5.0 (1 - 27)
Weeks	3.7 (1 – 25)	4.0 (1 – 42)

Outcomes also varied according to the McKenzie diagnosis. Combining the groups of McKenzie derangement 1 – 4, 27.3 % were excellent (n=9), 54.6 % good (n=18), 12.1 % fair (n=4), and 6.0 % poor (n=2) outcomes. The average number of visits were 4.7 (range 1 - 14), and the average number of weeks was 2.9 (range 1 – 13). The derangement 5 group had a 31.4 % excellent (n=5), 43.6 % good (n=7), 25.0 % fair (n=4) and 0 % poor. The average number of visits was 5.3 (n = 1 – 10), and the average number of weeks was 3.7 (range 1 – 14). The derangement 6 group had a 12.5 % excellent (n=1), 37.5 % good (n=3), 37.5 % fair (n=3), and 12.5 % poor (n=1). The average number of visits was 12.8 (range 2 – 41), and the average number of weeks 11.3 (range 2 – 42).

The mechanically inconclusive group did not respond nearly as well to the modified McKenzie approach. The inconclusive group had 9.1 % excellent (n=1), 18.1 % good (n=2), 36.4 % fair (n=4) and 36.4 % poor (n=4) outcomes. The average number of visits was 4.1 (range 2 - 10), and the average number of weeks was 2.5 (range 1 – 8).

Table 4: Clinical outcomes per mechanical diagnosis.

Mechanical Dx	**Outcome**				**Visits**		**Weeks**	
	Excellent	***Good***	***Fair***	***Poor***	***Mean***	***Range***	***Mean***	***Range***
D1 – 4 (33)	9 (27.3%)	18 (54.6 %)	4 (12.1 %)	2 (6.0 %)	4.7	1 - 14	2.9	1 – 13
D5 (16)	5 (31.4 %)	7 (43.6 %)	4 (25.0 %)	0	5.3	1 - 10	3.7	1 – 14
D6 (8)	1 (12.5 %)	3 (37.5 %)	3 (37.5 %)	1 (12.5 %)	12.8	2 - 41	11.3	2 – 42
Inconclusive(11)	1 (9.1 %)	2 (18.1 %)	4 (36.4 %)	4 (36.4 %)	4.1	2 - 10	2.5	1 – 8
SI (1)	0	0	1	0	3	na	1	na
D7 (1)	0	1	0	0	3	na	1	na
NRE (1)	0	0	0	1	5	na	2	na
Other (1)	0	0	1	0	13	na	10	na

Discussion: The findings in this study suggest that the cause of pain in pregnancy is frequently mechanical, and that a modification of the McKenzie approach can be effectively used for treatment. Almost all of the patients in the study who faired well were diagnosed as having a posterior derangement syndrome, and responded to an extension principle of treatment. This involved training the patient in the avoidance of sustained or repeated end range lumbar flexion, frequent use of passive end range extension exercises, and instruction in the use of support for the lumbar lordosis in sitting. Patients with unilateral pain, which failed to initially respond to extension procedures, were given lateral compartment procedures. Those patients who could not be categorized mechanically did not respond well to treatment. This is probably due to a non-mechanical source to the patient's problem. This conclusion was arrived at quickly, and the inconclusive group had the lowest average number of visits and the fewest average weeks on program.

These results suggest that the tension in the posterior ligamentous system, particularly the posterior aspects of the annulus fibrosus is a common cause of back pain in pregnancy. This

appears contrary to the popular opinion that pregnancy leads to increased anterior tension secondary to an accentuation of the lumbar lordosis. Only 1 of the patients in this study was classified as having a McKenzie derangement 7 (anterior derangement) syndrome. Even if the lordosis is accentuated, the pregnant women still has a significant amount of flexion stresses and strains in her lifestyle (especially if there are other small children). And, the additional weight in front of the axis of flexion and extension increases mechanical stress on the posterior ligamentous system, and consequently the intervertebral disc.

It is the opinion of the authors that during the second and third trimester of pregnancy the lumbosacral angle is progressively reduced, placing greater stress on the posterior aspects of the L4-5 and L5-S1 discs. However, in order to compensate for the forward shifting of the center of mass the woman leans her upper body backwards, creating greater stress on the anterior structures in the upper regions of the lumbar spine. The increased activity of the erector spinae to counter the forward displacement of weight, and the postural compensation of the upper trunk provide the allusion that the entire lumbar region is held in extension. Anecdotally this is confirmed by analyzing movement loss in women post-partum. We frequently observe a moderate to major loss of lumbar extension at the L4-5 and L5-S1 levels. This loss usually requires weeks to months of regular end range extension exercise to be regained. This finding would not be expected if the lower lumbar levels were held at a progressively greater degree of end range extension during the course pregnancy. Certainly, the biomechanics of the spine during pregnancy needs further investigation and consideration.

Summary: The findings of this study suggest that there is a mechanical origin to many women's back pain during pregnancy, and that a modification of the McKenzie approach can be an effective and efficient method of treatment. The majority of patients in this study were identified as having a McKenzie posterior derangement syndrome. This suggests that there is an imbalance of sustained and repeated end range stresses and strains causing these patient's problems. In other words, the causes of the back pain disorders are essentially the same as found in non-pregnant populations. If this is so, more patients will find relief for their problem with a McKenzie extension or lateral principle of treatment than with a McKenzie flexion principle of treatment. It should be stressed that the need for either is possible, and the patient needs to be individually assessed and treated according to their appropriate responses. One should not overlook the possibility of the sacro-iliac joint as a source of the problem as well. Particularly when there is unilateral buttock pain, with or without radiation into the thigh or lower leg.

The authors put forth a hypothesis that the lower lumbar levels are placed under progressively greater mechanical load in flexion throughout the course of pregnancy. This conjecture is based upon deductive reasoning from both clinical experience and the findings of this study. However, this requires formal attention with proper biomechanical and clinical investigation before any conclusions can be drawn.

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