Lumbar Spine Manipulation and Water Diffusion in the Intervertebral Disc (Pt. 2)

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Editor’s Note: Part 1 of this article appeared in the Dec. 15, 2015 issue. References for both parts appear at the end of this installment.

A new study published in Spine\textsuperscript{1, 5} provides more information on lumbar disc diffusion after spinal manipulation. This nonrandomized study used a control group and included more subjects than the previous study.\textsuperscript{12} Eighty-nine subjects (57 asymptomatic controls and 32 participants with LBP, ages 18-60 years) were recruited for the study.

All LBP subjects had to have pain rated at least 2/10 on the NPRS and a modified Oswestry Disability Index (mODI) score of at least 20 percent. Exclusion criteria included nerve root compression, osteoporosis, joint hypermobility syndrome, previous lumbar spine surgery, and spinal manipulation / exercise treatment within the previous four weeks. Lumbar spine manipulation clinical prediction rules (CPR) were used to determine if LBP subjects received spinal manipulation or were excluded:

- Symptoms less than 16 days
- Symptoms not distal to the knee
- Low fear-avoidance score for LBP
- Lumbar spine hypomobility of at least one level
- At least one hip with internal rotation motion greater than 35 degrees

Subjects who met at least 4/5 of the CPR (predicted responders) and those who met two or less of the CPR (predicted nonresponders) received spinal manipulation. Subjects who met 3/5 of the CPR were excluded from the study. Control subjects in the study did not have any current LBP and had experienced no LBP that required sick leave in the previous year.

Thirty-two participants had lumbar diffusion-weighted MRI performed before and after their first manipulation and a mean ADC [apparent diffusion coefficient, as introduced in part 1] was calculated.
Additionally, subjects with LBP who did not receive spinal manipulation had diffusion-weighted MRI with a mean ADC calculated. The ADC measurements were not performed in the asymptomatic control group.

Spinal manipulation consisted of a maximum of two thrusts applied in a posterior-inferior direction with a contact point at the anterior-superior iliac spine on both sides in a supine position. Three to four days after the initial manipulation, a second manipulation was performed. Seven days after the initial spinal manipulation the modified ODI was completed. Participants who had a 30 percent or greater reduction in baseline mODI were classified as spinal manipulation responders, while those with less than a 30 percent decrease in mODI were classified as nonresponders.

Of the 32 subjects who received spinal manipulation, 15 were classified as responders and 17 were classified as nonresponders according to the mODI. Results of this study showed that spinal manipulation responders had a significant increase in lumbar disc diffusion at the L3-4 (4.91 percent), L4-L5 (6.5 percent) and L5-S1 discs (8.15 percent) while there was no significant change in the nonresponders or in the LBP group that did not receive spinal manipulation. The authors hypothesize that a decrease in lumbar stiffness after spinal manipulation may be what causes an increase in disc diffusion in responders.

Take-Home Points

To summarize these three research studies [the first two of which were discussed in part 1 of this article], in their first study, Beattie, et al., treated subjects with LBP with lumbar spine mobilizations followed by prone press-ups. Subjects whose low back pain decreased after treatment had an increase in water diffusion of the L5-S1 disc. Subjects with longer durations of low back pain did not respond as well as those who had low back pain for less than two months.

In a subsequent study, Beattie, et al., showed that subjects who experienced an immediate decrease in low back pain after side-posture lumbar spine manipulation had an increase in water diffusion of the upper and lower lumbar intervertebral discs. Subjects with a smaller BMI and fewer levels of lumbar degeneration responded better (increased water diffusion) to the manipulation.

The newest study performed by Wong, et al., [discussed here in part 2], relying on more subjects and an LBP control group, showed that subjects with LBP who demonstrated an improvement in the modified Oswestry Disability Index one week after two sessions of spinal manipulation had an increase in water diffusion of their lower lumbar discs after their first manipulation. This further reinforces and expands upon
the previous work of Beattie, et al.

This research suggests lumbar manipulation can, in some patients, immediately decrease back pain intensity and simultaneously increase the diffusion of water through the upper and lower lumbar intervertebral discs. The long-term benefits of spinal manipulation / mobilization or therapeutic exercise on disc diffusion are not known; however, an increase in the diffusion of water and nutrients is thought to be beneficial for cell health, while decreased diffusion has been linked with lumbar spine degeneration.

References


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