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Spinal Manipulation & Disc Herniation: A Rational Approach

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The clinical decision process surrounding the use of high-velocity, low-amplitude (HVLA) spinal manipulation (SMT) in patients with suspected (or confirmed) cervical (CDH) or lumbar disc herniation (LDH) has traditionally been difficult. Clinicians naturally wish to help their patients, yet medicolegal concerns about iatrogenesis or worsening of the patient's condition while under care are particularly prevalent for these patients. Similar to most spinal conditions, a variety of interventions are commonly employed in the treatment of CDH/LDH. The most effective treatment for CDH and LDH remains largely unknown to date, although it is generally agreed that a course of conservative treatment should be undertaken before surgery is considered. Regarding SMT specifically, the existing clinical evidence has been unable to provide a consistent level of guidance[1,2]. In the real world, there have certainly been successes and failures.

One cohort and a prospective, observational study, both conducted by the same researchers from the University of Zurich in Switzerland, have recently been published on the use of SMT in patients with confirmed CDH and LDH[3,4]. It is important that we evaluate and interpret these studies responsibly as we apply their results to patient care (for those interested in additional details, both cohort studies have been reviewed for Research Review Service and will appear on the APM website).

Study #1 (Cohort) – SMT in Patients with Confirmed Cervical Disc Herniation[3]

Fifty patients with MRI-confirmed CDH at a level correlating to the patients' clinical neurological findings (sensory, reflex and motor changes) were enrolled in this study (34 males, average age ~44). Patients underwent a standard treatment procedure of a single, HVLA cervical manipulation with rotation to the opposite side and lateral flexion to the same side of the affected arm (treatment was performed on both sides if symptoms were bilateral). Treatment was administered 3-5 times per week for the first 2-4 weeks then 1-3 times per week thereafter until the patient was asymptomatic. Follow-up was conducted over a period of 3 months, but no follow-up imaging was conducted.

Results:

- Two weeks after the first treatment, 55.3% of all patients reported that they had significantly improved. At this point, no one reported worsening of their symptoms.
- At 1 month, 68.9% of individuals were significantly improved, with only one patient reporting being slightly worse (one patient in the subacute/chronic group).

- By 3 months, this figure rose to 85.7% of patients noting significant improvement.
- In general, acute patients reported faster improvement compared to those who were included in the subacute or chronic group. However, 3 months after the first treatment, 76.2% of the subacute/chronic patients reported clinically relevant improvement, with none of these patients reporting they were worse.

Study limitations include:
No control group;
Favourable natural history of the condition within 3 months without treatment;
No post treatment imaging...what happened to the disc herniation?

Study #2 (Prospective, Observational) – SMT vs. Imaging-Guided Lumbar Nerve Root Injections in LDH Patients [4]

This study compared the effectiveness of two treatments – SMT and imaging-guided nerve root injections – in a group of 102 patients (64 males, average age ~47) with MRI-confirmed and clinically correlated LDH. Data was obtained from two separate databases, one for each treatment group respectively. From each group, 51 age and gender matched patients were selected for analysis by a blinded researcher (for a total of 102 patients). Nerve root injection patients had not received SMT and vice-versa. Diversified style lumbar SMT was employed, but the type of adjustment utilized depended on the location of the LDH: patients with intraforaminal LDHs (as noted on MRI) received a modified push adjustment with a kick, whereas patients with paramedian LDHs receive a pull adjustment with a kick. The nerve root injection group received contrast fluoroscopy- or CT-fluoroscopy guided injections of Kenacort and Ropivacaine.

Results

- The injection group had a significantly higher average initial Numerical Rating Scale (NRS) score when compared with the SMT group.
- The average number of SMT treatments was 11.2 (ranging from 5 to 20).
- Only 1 SMT patient reported being worse after treatment compared with 3 injection patients.
- No SMT patients required surgery during the study period, while 3 injection patients received a second injection and 3 had surgery.
- In the SMT group, 76.5% of patients were "improved" (Odds Ratio = 1.93, 95% Confidence Interval of 0.82-4.56), while 62.7% of the injection patients were "improved" (OR = 0.52, 95% CI: 0.22-1.23).
- There was no statistically significant difference between groups in terms of the proportion reporting clinically important improvements. The SMT and injection groups each had significant decreases in NRS scores at one month, with an average pain reduction of 60% in the SMT group and 53% (NRS score) in the injection group.
- Between groups at one month there were no significant differences in NRS scores, Patient Global Impression of Change (PGIC, a 7 point scale) scores or NRS change scores.
- The average cost in the SMT group was 533.8 Swiss Francs, while the average cost in the injection group was a total of 697 Swiss Francs.

On the surface, the results of these two studies are promising, but we must remember that cohort and observational prospective studies do not represent the highest level of evidence and have many inherent design limitations. A very important distinction from clinical practice in both studies is that patients had confirmed disc herniations before undergoing treatment – more on this below. In clinical practice, we often do not possess this level of knowledge in advance!

Practice Considerations:

The herniated nucleus pulposus (HNP) may develop spontaneously secondary to accumulated degenerative change with no specific cause[8,9], or acutely following trauma. There are also genetic determinants that may mediate one's susceptibility to developing a HNP, possibly creating subsets of patients[5,6]. Taken together, the genesis of the HNP is a multifactorial process and the clinician ought to bare these differences in mind when faced with a patient suffering from a HNP. Degenerative changes affecting the intervertebral disc (IVD) include loss of extracellular matrix integrity with the nucleus of the IVD as well as the progressive cell death of NP cells. Tears and fissures also occur throughout the annulus that likely lead to changes in tolerance of applied loads. However, one wonders what the ramifications of these changes are, particularly with respect to the choice of manual therapies.

One of the recent Peterson et al. studies[3] examined the use of SMT in patients with known cervical spine HNP. However, the study had no control group, nor was there any indication of the MRI appearance of the HNP in the patients treated at the conclusion of the study. If the hypothesis is that SMT is beneficial to some patients with HNP, what is the mechanism? What does SMT accomplish in the presence of a torn annulus and herniated nucleus pulposus?

Or, does this study actually suggest that the SMT accomplishes anything with respect to the HNP as opposed to manual therapy for 'mechanical neck pain' in general (which is reasonable, as many patients did improve under care)? Is any benefit of SMT superior to a placebo? Radiculopathy caused by a herniated NP involves an inflammatory cytokine-induced neuropathy as well as a host of other biochemical and cellular events with the process requiring hours, days, weeks, months or even years to occur.

Therefore, we cannot know how long the HNP was present prior to treatment commencing? What might occur through the provision of SMT that could resolve this pathology? These are important questions concerning possible therapeutic efficacy of SMT. Additionally, the authors state, "serious adverse events such as dissection of the vertebral artery or serious neurologic deficits are so rare that accurate estimations of the frequency cannot be calculated but are estimated at 1 of 200 000 to 1 of several million treatments". These statements regarding serious deficits should be interpreted with caution since other publications (such as a single site retrospective case series) have suggested that the incidence is much higher[7].

Legal actions have commenced against chiropractors treating patients presenting with neck and low back pain (with or without radiculopathy) with claims that SMT caused the HNP. These cases are always complex, with very grey areas amidst the patient's treatment history and evolution of the ultimate result. Most of the time there are no pre-treatment MRI or CT images available, often making it impossible to determine exactly when the HNP occurred.

Further, and many of these cases include a patient with a lengthy history of off and on neck or back +/- radicular pain. Such a history is consistent with the gradual evolution of the HNP and radiculopathy, further muddying the waters of causation. It is not to say that SMT may not be helpful with certain cases of HNP, however it is important for the clinician to be aware of the unpredictable nature of this

ailment. Even when SMT is delivered with the greatest of care, there is the possibility that the patient's condition could be exacerbated.

Therefore, and one must ask one's self what the potential 'downside' may be in such a condition. It is very likely that in many of these cases the HNP was already present or in process due to the biology of disc degeneration. However, the reader must reconcile how a treatment thought by some to potentially cause a HNP could at the same time effectively treat the same condition.

It is important to learn if there were any particular, unique patient characteristics shared by the responders in both trials reported by Peterson et al. that may set them apart from others (if there was any particular therapeutic benefit)? It should be emphasized that treatment performed on a patient with a known HNP with well-defined parameters is a different thing from the usual clinical setting where such information is rarely available; therefore, the clinician ought to exercise good judgment extrapolating the results of this study to the clinic. On the other hand, when the clinician encounters a patient with neck and or low back pain with or without radiculopathy, what is one to do? The studies by Peterson et al. suggest that SMT may be an effective treatment for patients suffering from known and quantified disc herniation. It would be interesting to obtain post-treatment data concerning objective evidence for changes in the herniated disc (MRI) or neurological status of the patients post treatment such as EMG. Current guidelines maintain that an acutely herniated disc with progressive neurological compromise is an absolute contraindication to SMT treatment and the over-riding concern of 'first, do no harm' must be paramount[10].

As discussed earlier, the evolution of radiculopathy or neurological embarrassment usually occurs gradually over days, weeks or even months. Therefore, until we understand these pathologies better, perhaps the best approach with these patients should begin with a thorough, meticulous history and examination and patient education. If the patient presents within the developmental phase of a HNP that may progress to radiculopathy (or even myelopathy), conservative treatments such as traction, soft tissue therapy and perhaps acupuncture will pose the least potential for harm, but at the same time provide the clinician with valuable feedback over the course of a few clinic visits.

Also, education about the potential for the condition to change over time will fully inform the patient with respect to potential important changes in their symptoms. The HNP may, left to its own devices, progress towards overt spinal cord compromise (in the cervical or lumbar spine) due simply to natural history or trivial trauma.

SMT is arguably the most formidable treatment option available to the chiropractor; thoughtful, reasonable and informed consideration ought to dictate its use. It may be that SMT is an effective and safe therapy for some cases of HNP as detailed within the Peterson et al. studies and there is a need for much for research in this area. However, it is imperative that the clinician be aware that the natural history of some patients suffering from a HNP is to develop frank neurological embarrassment simply due to natural history. The chiropractor needs to manage these cases very carefully for the benefit of all since neither the patient nor the clinician wants to be on the wrong side of Mother Nature or the legal system.

References:

1. Leininger B, Bronfort G, Evans R, Reiter T. Spinal manipulation or mobilization for radiculopathy: A systematic review. Phys Med Rehabil Clin N Am 2011; 22: 105–125.

2. Rodine R, Vernon H. Cervical radiculopathy: a systematic review on treatment by spinal

manipulation and measurement with the Neck Disability Index. J Can Chiro Assoc 2012; 56(1): 18–28.

3. Peterson CK, Schmid C, Leemann S et al. Outcomes from Magnetic Resonance Imaging-confirmed symptomatic cervical disk herniation patients treated with high-velocity, low-amplitude spinal manipulative therapy: a prospective cohort study with 3-month follow-up. J Manipulative Physiol Ther 2013; 36: 461-467.

4. Peterson CK, Leeman S, Lechmann M, et al. Symptomatic magnetic resonance imaging-confirmed lumbar disk herniation patients: a comparative effectiveness prospective observational study of 2 age- and sex-matched cohorts treated with either high-velocity, low-amplitude spinal manipulative therapy or imaging-guided lumbar nerve root injections. J Manipulative Physiol Ther 2013; 36(4): 218-225.

5. Erwin WM, Fehlings MG. Intervertebral disc degeneration-genes hold the key. World Neurosurgery 2013; 80(5): e131-3.

6. Kalb S et al. Genetics of the Intervertebral Disc. World Neurosurgery 2012; 77(3-4): 491-501.

7. Malone DG et al. Complications of cervical spine manipulation therapy-5-year retrospective study in a single-group practice. Neurosurg Focus 2002; Dec 15 (13): 6.

8. Yoon ST, Patel NM. Molecular therapy of the intervertebral disc. Eur Spine J 2006; 15(Suppl 3): S379-S388.

9. Suri P et al. Inciting events associated with lumbar disc herniation. Spine J 2010; 10(5): 388-95.

10. World Health Organization. WHO guidelines on basic training and saftey in chiropractic. 2005, WHO: Geneva, Switzerland. P. 19-27.

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