Research Paper Review

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Review of methods used by chiropractors to determine the site for applying manipulation

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Triano JJ, Budgell B, Bagnulo A et al

Reviewed by Dr. Shawn Thistle DC (Research Review Service)

ABSTRACT

Background

With the development of increasing evidence for the use of manipulation in the management of musculoskeletal conditions, there is growing interest in identifying the appropriate indications for care. Recently, attempts have been made to develop clinical prediction rules, however the validity of these clinical prediction rules remains unclear and their impact on care delivery has yet to be established. The current study was designed to evaluate the literature on the validity and reliability of the more common methods used by doctors of chiropractic to inform the choice of the site at which to apply spinal manipulation.

Methods

Structured searches were conducted in Medline, PubMed, CINAHL and ICL, supported by hand searches of archives, to identify studies of the diagnostic reliability and validity of common methods used to identify the site of treatment application. To be included, studies were to present original data from studies of human subjects and be designed to address the region or location of care delivery. Only English language manuscripts from peer-reviewed journals were included. The quality of evidence was ranked using QUADAS for validity and QAREL for reliability, as appropriate. Data were extracted and synthesized, and were evaluated in terms of strength of evidence and the degree to which the evidence was favourable for clinical use of the method under investigation.

Results

A total of 2594 titles were screened from which 201 articles met all inclusion criteria. The spectrum of manuscript quality was quite broad, as was the degree to which the evidence favoured clinical application of the diagnostic methods reviewed. The most convincing favourable evidence was for methods which confirmed or provoked pain at a specific spinal segmental level or region. There was also high quality evidence supporting the use, with limitations, of static and motion palpation, and measures of leg length inequality. Evidence of mixed quality supported the use, with limitations, of postural evaluation. The evidence was

unclear on the applicability of measures of stiffness and the use of spinal x-rays. The evidence was of mixed quality, but unfavourable for the use of manual muscle testing, skin conductance, surface electromyography and skin temperature measurement.

Conclusions
A considerable range of methods is in use for determining where in the spine to administer spinal manipulation. The currently published evidence falls across a spectrum ranging from strongly favourable to strongly unfavourable in regard to using these methods. In general, the stronger and more favourable evidence is for those procedures which take a direct measure of the presumptive site of care- methods involving pain provocation upon palpation or localized tissue examination. Procedures which involve some indirect assessment for identifying the manipulable lesion of the spine-such as skin conductance or thermography-tend not to be supported by the available evidence.

ANALYSIS

Author's Affiliations
Canadian Memorial Chiropractic College, Toronto, Ontario, Canada; Northwestern Health Sciences University, Bloomington, MN, USA; Palmer College of Chiropractic, San Jose, CA, USA; University of Bridgeport College of Chiropractic, Bridgeport, CT, USA; Logan College of Chiropractic, Chesterfield, MO, USA.

Background Information
In general, there is increasing evidence supporting the use of manipulation in the management of musculoskeletal conditions. Similar to interventions for any condition, musculoskeletal or otherwise, a key aspect of the clinical utility of manipulation is identifying the appropriate indications for care. For which patients is manipulation most appropriate? Where do we apply it? These are obviously important questions.

Recently, attempts have been made to develop clinical prediction rules, which are essentially algorithms or step-wise processes that guide clinical decision making based on patient presentation and history as well as physical examination findings (including, in some cases, response to treatment). Most of this research has been conducted on low back pain (see the Lumbar Spine – Clinical Prediction Rule section of the RRS database – linked below). However, the overall validity of existing clinical prediction rules remains unclear and their impact on care delivery has yet to be established.

Despite wide variability, most clinicians utilize one or more of the following collection of pathophysiological consequences of the presence of a 'manipulable lesion'. Given the acronym P.A.R.T.S. (1), these factors are commonly viewed a requisite for manipulation application and likely represent the most common method utilized in the field to justify a treatment application site (2). They can be summarized as follows:

1. *Pain*: from patient self-report or reproduction during clinical procedures (assumed to be spatially related to the local presence of pathology or dysfunction).
2. *Asymmetry*: by observing anatomical landmarks for symmetry or location, motion or compliance/stiffness in response to challenge.
3. *Relative ROM*: Joints, within a linkage system, contribute a predictable proportion and path to the

regional movement expressed by the linkage system as a function of task.

4. *Tissue temperature, texture or tone changes*: muscle responds to pathology that is spatially related with hypertonicity, hypotonicity, hypertrophy or atrophy as a function of the primary tissue disease process present, suggesting that in the presence of pathology/dysfunction, a spatially consistent change in the relative ratio of fluid (edema) to cellular and acellular components is observable.
5. *Special test findings*: In the presence of pathology/dysfunction, there is a spatially consistent neurogenic activity that demonstrates a muscular, kinematic, vascular, or secretory response that is observable.

When a clinician decides to utilize manipulation, a clinical judgement is made which often involves one (or more) of the constructs just described. This study was designed to evaluate the scientific literature on the validity and reliability of the more common methods used by chiropractors to inform the choice regarding treatment localization (the 'site of care' at which spinal manipulation is to be applied). To clarify, this study was not evaluating the bases for a judgement to apply manipulation, rather, once the decision has been made, how a clinician decides where the treatment is directed.

PERTINENT RESULTS

A total of 2577 titles were screened, with 201 articles meeting all inclusion criteria. The spectrum of study quality was quite broad, as was the degree to which the evidence favoured clinical application of the various diagnostic methods reviewed.

Pain & Pain History

- The most convincing favourable evidence was for methods which confirmed or provoked pain at a specific spinal segmental level or region. Examples include localized tenderness to palpation, or provocation of pain with a particular movement or orthopedic maneuver.
- Regarding pain provocation, the recommendation was favourable, based on moderate quality evidence, for use of pain history to increase reliability of symptom provoking findings during the assessment of site to apply treatment.

Pain Provocation Via Orthopedic Maneuvers

The authors provided a favourable recommendation, with high quality evidence for both validity and reliability in use of the following to narrow the region of interest for applying treatment:

- Seated forced extension;
- pain on lumbar motion (side-bending > flexion side-bending rotation > side-bend rotation > extension side-bend-rotation > rotation);
- three or more sacroiliac maneuvers (iliac distraction, thigh thrust, lateral recumbent iliac compression and prone sacral thrust);
- cervical compression and traction tests;
- McKenzie maneuvers including lateral shift, relevance of lateral shift, relevance of lateral component, and deformity in the sagittal plane; and
- a painful arc in flexion and/or on return to upright posture and the prone instability test, which may suggest local instability.

Asymmetry & Postural Assessment

Clinicians often assume bilateral symmetry and that some sort of structural and physiological axial

pattern(s) exist. It follows that absence of symmetry (e.g. scoliosis) may be sufficient to result in a distinct diagnosis or clinical syndrome. In the majority of cases, however, it is the comparison from side-to-side or axially that is considered meaningful. In terms of assessment for localizing treatment to a specific site, the forms of examination involving symmetry include postural evaluation, palpation for stiffness of spinal tissues/segments, static palpation of landmarks, segmental motion palpation, bilateral leg length measurement and range of motion.

- High quality evidence is favorable with limitations to the specificity of antalgia and reliability of postural assessment for kyphosis, lordosis and scoliosis.
- Postural assessment is not as useful, however, for determining site of care.
- Unclear–high quality evidence suggests moderate validity for the concept of intersegmental restrictions (identified via motion palpation). There is a mix of studies reporting low to substantial reliability for manually locating a site within one segment.
- Based on high quality evidence, the validity of palpation for localizing the site of care is unclear.
- A recommendation of favorable with limitations, depending on the target structure, is made for reliability in localizing common anatomical landmarks.
- Regarding motion palpation, the authors propose a recommendation of favorable with limitations (region of the spine, direction of movement and method employed), based on high quality evidence for both validity and reliability for use in localizing the site of care.
- Regarding leg length inequality (LLI), the authors offer a recommendation of favorable with limitations for assessing the pelvis, based on high quality studies. However, the validity for the relationship of LLI to symptoms has not been demonstrated, and the reliability of LLI assessment appears to be method-dependent.
- Regarding ROM, the authors offer a recommendation of favourable for use to localize the site of treatment within a spinal region, based on high quality evidence for validity and reliability.

Additional Testing Methods

- The evidence was unclear on the applicability of measures of stiffness (e.g. passive physiologic/accessory motion, joint springing, overpressure testing) and the use of spinal x-rays.
- The evidence was of mixed quality, but unfavourable for the use of manual muscle testing, skin conductance, surface electromyography and skin temperature (thermography) measurement.
- There is high quality evidence of validity and reliability, however, for the use of thermography to confirm overt sciatica in the lower limb.
- Evidence of moderate quality is favorable for the use of skin rolling and palpatory assessment of tissue texture, although the relationship of skin rolling to tissue texture is uncertain.

CLINICAL APPLICATION & CONCLUSIONS

Clinicians in practice employ a considerable range of methods for determining where in the spine to administer spinal manipulation. Perhaps not surprisingly then, current published evidence also varies greatly across a spectrum, ranging from strongly favourable to strongly unfavourable in regard to using these methods. Important take home messages from this body of evidence can be summarized as follows:

- In general, the body of existing evidence supports more direct, mechanical methods of assessing and identifying the site of care.
- Less support exists for indirect methods such as manual muscle testing for nonpathological states,

thermography, surface electromyography and measures of electrodermal activity.
- Maneuvers that replicate the patient's familiar pain may be the most consistent sources for diagnostic information.
- Additional assessment methods were deemed to be useful for patient screening, or narrowing the topographical focus of examination. These included postural assessment, orthopedic testing in general, and range of motion testing, as well as assessment of leg length inequality.
- Even though there is favourable evidence for a number of palpation methods, there are significant limitations. The inability to consistently locate anatomical landmarks likely is a common underlying concern.

Special Guest Commentary from study lead author Dr. Jay Triano

Spinal manipulation continues to gain acceptance as a viable option for treating non-pathological spine related pain. Recently, the National Institutes of Health, National Center for Complementary and Alternative Medicine released its current summary of scientific evidence supporting use of these procedures (http://nccam.nih.gov/health/providers/digest/chronic-low-back-pain?nav=upd – as of posting date). While various theoretical foundations continue to vie for dominance as to how manipulation may benefit patients, there is a single commonality to all clinical encounters where it is used. That is, the decision as to where to apply these procedures in a given patient's circumstance. This paper provides the most comprehensive review to date of the evidence as to what methods of patient evaluation have been shown to be valid and reliable to achieve this.

There are many complexities that make this type of review difficult. However, the wealth of evidence – of all levels of quality and generally representative of the current state of research in this area – does provide strong take-home messages. As noted by Brady and Haldeman (3) in their accompanying commentary to our paper, Doctors of Chiropractic can be reassured that there is reasonable consistency between observers for several approaches. They include; history on the localization of pain, tissue palpation, provocative testing, range of motion testing and the demonstration by the patient of the locus and description of pain.

As important is the additional message that can be taken from this work. It is time to shift the scientific dialogue from debates about what may be valid or reliable to one more meaningful in patient-centred care. There is need for more and better research into the underlying functional and/or pathological states that respond to manipulation, and the capacity of diagnostic tests/maneuvers to help change health outcomes.

STUDY METHODS

The authors conducted structured literature searches in Medline, PubMed, CINAHL and ICL, in addition to hand searches of archives, to identify studies investigating the diagnostic reliability and validity of common methods used to identify the site of treatment application. To be included, studies had to present original data from studies of human subjects and be designed to address the region or location of care delivery. Only English language studies from peer-reviewed journals were included.

The quality of evidence was ranked using QUADAS for validity and QAREL for reliability, as appropriate. Data were extracted and synthesized, then evaluated in terms of strength of evidence as well as the degree to which the evidence was favourable for clinical use of the method under investigation.

Recommendations for assessment methods were then proposed as follows, based on the quality of supporting evidence:

- *Favourable*: favourable for general use by clinicians to determine site of care.
- *Favourable with limitations*: favourable for determining site of care, although limits exist such as number and quality of studies, limited generalizability, etc.
- *Unclear*: based on the evidence available, it is unclear whether or not this procedure should be recommended for use.
- *Unfavourable with exceptions*: Procedure is not recommended for general use but may be used in limited circumstances (e.g. if other techniques are unavailable.)
- *Unfavourable*: the procedure is not recommended for use (limited number of studies, significant flaws in methods, not generalizable, high quality evidence against validity and/or reliability).

STUDY STRENGTHS / WEAKNESSES

This study was very comprehensive and well done, but some limitations are worth noting (as outlined by the authors themselves):

- Although every effort was made to perform a complete literature search, some literature may have been missed.
- A number of studies used examiners of doubtful ability (mainly students), which may be incongruous when investigating complex psychomotor skills.
- Rules that are used to rate the strength of evidence are by definition arbitrary and thus subject to discussion.
- A number of authors utilized suboptimal methods of data analysis (e.g. correlation analysis), particularly for addressing inter-rater reliability.
- This review, having examined the evidence on the reliability and validity of research on the site of care, did not address the larger question as to the clinical value of identifying an appropriate site of care. We cannot rule out the possibility that the clinical consequences of the manipulation treatment are to some extent site-independent.
- Systematic use of QUADAS and QAREL independently address only metrics of validity and reliability within the context of each study. It is important to remember that neither characteristic necessarily implies the other. That is, an assessment may be valid but unreliable and vice versa. The implication of either alone, or both together, is insufficient to define clinical utility.

Additional References

1. Bergman T, Courtis G. Joint assessment – P.A.R.T.S. Top Clin Chiropract 2000, 7: 1–10.
2. Christensen MG. Practice analysis of chiropractic 2010. Greeley, Colorado: National Board of Chiropractic Examiners; 2010.
3. Brady O & Haldeman S. Commentary: we can tell where it hurts, but can we tell where the pain is coming from or where we should manipulate? Chiro Man Ther 2013, 21: 35.