

# VALIDATION OF PALPATORY METHODS FOR EVALUATING ANATOMICAL BONE LANDMARKS OF THE CERVICAL SPINE: A SYSTEMATIC REVIEW

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## ABSTRACT

**Objective:** The aim of this study was to systematically review the literature for validity of palpatory procedures for evaluating anatomical bone landmarks in the cervical spine.

**Methods:** A systematic search of electronic databases identified observational studies assessing validity and/or accuracy regarding evaluation of anatomical bone landmarks of cervical spine palpatory procedures. The databases used in the search included the US National Library of Medicine of the National Institutes of Health (MEDLINE/PubMed), the Regional Library of Medicine (Bireme), the Scientific Electronic Library Online (SciELO), the Physiotherapy Evidence Database (PEDro), the Latin American and Caribbean Health Sciences Literature database (LILACS), the Cochrane Library, and Coordination of Personnel Improvement of Higher Education (CAPES/Brazil). Data were extracted by a primary reviewer, and 2 independent reviewers used a critical appraisal tool to estimate the quality of the retrieved studies. The results were synthesized qualitatively within the Quality Assessment of Diagnostic Accuracy Studies criteria. After completing the synthesis and scoring, the reviewers applied classifications such as “low,” “fair,” and “good.”

**Results:** The initial search yielded 69 860 articles. After selection criteria were applied, 5 studies satisfied the eligibility criteria. Three studies verified the validity of the manual palpatory procedure, and 2 studies correlated the findings of the palpatory procedures with other measured results. According to Quality Assessment of Diagnostic Accuracy Studies criteria, 3 studies presented good methodological quality, and 2 presented fair methodological quality. Studies demonstrated an accuracy range from 51% to 87.8%.

**Conclusion:** There are few studies that evaluate the validity of manual palpatory procedures for examining bony landmarks of the cervical spine. The 5 that were found showed fair to good methodological quality. However, we note that there may be poor external validity due to the sampling heterogeneity of these studies. (*J Manipulative Physiol Ther* 2015;xx:1-9)

**Key Indexing Terms:** *Reproducibility of Results; Dimensional Measurement Accuracy; Cervical Vertebrae; Palpation*

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Cervical pain is a major personal and social burden,<sup>1</sup> affecting approximately 10% to 15% of the adult population at some point in their lives.<sup>2-5</sup> Despite the high prevalence of pain in this region, there have been few published studies of physical examination of the cervical spine.<sup>6,7</sup> The diagnosis of various musculoskeletal diseases of the spine is based on a combination of laboratory examinations, imaging, and physical examinations, which culminate in a treatment proposal based on the pathology and professional modality involved.<sup>8</sup> Thus, in the context of physical examination, palpatory procedures are essential to those in relevant health care specialties, including anesthesiologists,<sup>9-12</sup> physiotherapists,<sup>13</sup> osteopaths,<sup>14</sup> orthopedic surgeons, and neurologists.<sup>15-17</sup> From a segmental viewpoint, the spine presents peculiarities in its palpatory exploration, and the variety of postural patterns and somatotypes makes the accuracy of spinal palpation an interesting subject of investigation, especially in the area of palpatory anatomy.

We can define diagnosis as a process for identifying an etiology of the disease or as a condition through which a history of the patient, physical examination, and laboratory and imaging results are evaluated. An accurate diagnosis is essential for effective problem management. An incorrect diagnosis can lead to unnecessary costs, delays in identifying an appropriate treatment, and negative consequences to the health of the patient.<sup>18</sup> Manual therapists typically use a combination of palpation and other actions, based on evidence, to enhance both diagnosis and patient care.<sup>19</sup> Palpation is the process of exploring or examining anatomical structures through touch that provides information to the examiner about the locations of bone reference points, tissue temperature, texture, and elasticity of soft tissues.<sup>20,21</sup> Static spinal palpation, which is commonly used as a component of the diagnostic process, can be used to determine the position of bone structures, sites of pain sensitivity, or vertebral levels.<sup>7,22</sup>

In general, manual examination tests are used to detect and address mechanical disorders of the cervical spine, and the test results are used as indicators for clinical application of manual therapy.<sup>23</sup> Despite the wide use of palpation, there have been few scientific evaluations of the diagnostic value of palpation and its effectiveness in manual therapy. Therefore, there is a lack of evidence pertaining to the reliability and validity of palpatory tests.<sup>14,24</sup> The existing systematic reviews point to the fragility of the comparisons between investigations of palpatory anatomy.<sup>2,7,8,13,25,26</sup> The inadequate comparison data may be due to the absence of a “gold standard” for objectively evaluating the vertebral level palpated and/or to the variability of the tests, terminology, study design, and methodology.<sup>27</sup> However, there is a need for investigation of palpatory methods, especially concerning the validity of the procedures for palpating the cervical spine.<sup>13</sup> The aim of this study was to perform a systematic review of the validity of palpatory procedures for evaluation of anatomical bone landmarks of the cervical spine.

## METHODS

The systematic review method followed an a priori protocol and encompassed research aspects such as eligibility criteria; search method; selection of studies; and degree of methodological quality, data extraction, and synthesis.

### Inclusion Criteria

For this review, the database search included original reports of studies that investigated the validity or accuracy of palpatory manual procedures to assess the cervical spine, published between January 1, 2004, and August 8, 2014, in English, Portuguese, French, and Spanish.

### Exclusion Criteria

In this study, review articles, editorials, meta-analysis, conference proceedings, letters to the editor, abstracts, and

reliability studies of interexaminers and intraexaminers of cervical region palpatory procedures were excluded.

The search was conducted between July 8, 2014, and August 8, 2014, in the databases of the US National Library of Medicine of the National Institutes of Health (MEDLINE/PubMed), the Regional Library of Medicine (Bireme), the Scientific Electronic Library Online (SciELO), the Physiotherapy Evidence Database (PEDro), the Latin American and Caribbean Health Sciences Literature database (LILACS), the Cochrane Library, and Coordination of Personnel Improvement of Higher Education (CAPES/Brazil). The studies included in the search were published between January 1, 2004, and August 8, 2014. The following search terms were used “cervical vertebrae,” “cervical spine,” “palpation,” “validity of tests,” “anatomical landmarks,” “dimensional measurements accuracy,” and all the possible combinations.

### Selection Strategy

The selection strategy was divided into 4 parts. First, 1 researcher identified in the article title one of the search terms. The abstract was then evaluated according to the inclusion and exclusion criteria by another researcher. Next, the articles selected were read and evaluated in full according to the inclusion and exclusion criteria by the same researcher. Finally, the articles selected were analyzed by researchers that classified them by the criteria of Quality Assessment of Diagnostic Accuracy Studies (QUADAS). The search strategy was saved in databases so that the authors would be notified about any new articles that fit our criteria.

### Quality Evaluation

The studies included in this review were analyzed by 2 unrelated observers who applied the quality criteria of QUADAS,<sup>28,29</sup> which is composed of 14 criteria. Each item must be answered with one of the following responses: “yes,” “no,” or “unclear.”

The QUADAS instrument does not determine a priori scores for defining quality; it is up to the researcher to decide which cutoff point to use. Therefore, criteria 1 to 4 (“yes” answers) were considered as “low” quality, criteria 5 to 9 (“yes” answers) were considered as “fair,” and criteria 10 to 14 were considered as the definition of a “good”-quality study.

## RESULTS

The first selection phase yielded 69 860 articles with 1 term and 8882 with combined terms. Sixty-eight articles were selected, but 40 of them were duplicates. In the second phase, after having read the abstract, 6 articles were included. Upon completion of the third phase, during which the articles were read in full, 5 were selected to undergo to quality evaluation (Fig 1).

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