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Agreement of clinical examination for low back pain with facet joint origin

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Background: Low back pain (LBP) with facet joint origin is a common diagnosis of patients referred to physical therapy clinic. An expert consensus of diagnostic criteria has been proposed. However, the reliability of the assessment has not been proved.
Objective: To test the degrees of agreement between two physical therapists for nine physical examination items and the diagnosis of facet joint origin.
Methods: The examination according to diagnostic criteria was performed independently by two physical therapists in 45 patients with chronic LBP. The percent agreements and Kappa coefficients of each examination item and diagnostic conclusion were calculated.
Results: The percent agreements of nine examined items ranged from 73.3–91.1%. The Kappa coefficients, widely ranged from 0.250–0.690 ($p = 0.48$ to < 0.001), showed statistically significant agreements for all examination items. The low level of agreements was partly due to improper distributions of test results. The agreement of conclusion was 86.7% and Kappa coefficient was 0.492 ($p = 0.001$) which reflected good agreement of facet diagnosis.
Conclusion: There were adequate agreements for clinical examination of LBP with facet joint origin. The low level of agreement suggested the clinicians to have operational definition and rigorous training sessions although the examinations seemed to be routinely performed.

Keywords: Low back pain; facet joint; assessment; reliability; agreement.

Introduction

Among musculoskeletal complaints, low back pain (LBP) is the symptom most frequently leading to physician and physical therapy visits.[1] Several anatomical sites in low back were considered the source of pain including facet joint, intervertebral

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disc, ligaments, nerve root and dura, muscles, and fascia.[2] A number of factors such as neurological, mental stress, and social status are also reportedly contributing to LBP.[3,4]

Facet or zygapophyseal joint was indicated to be the cause in 42% of persons with LBP using controlled comparative local anesthetic diagnostic blocks for diagnostic confirmation,[5] especially in the chronic cases.[6] A community-based survey in older adults showed evident facet degeneration on CT imaging associated with LBP.[7]

A study reported that when physical therapists use the combination of McKenzie lumbar spine assessment algorithms with a series of pathoanatomical diagnostic tests in patients with chronic LBP, the most frequent diagnosis (49%) was facet joint.[8] To diagnose the facet joint pain in clinic, the literatures suggested the uses of symptoms,[9] symptom changes with movement and activities,[10] local symptoms without nerve root pain,[11,12] and unilateral pain without referred pain lower than knee, and no symptom along dermatome or myotome.[13,14] The movements activating pain by increasing pressure on the joint and stretching the capsule are extension, rotation, and lateral flexion.[10,11] In rotation and extension, the pain mechanics is supposed as the inferior articular process slips on superior articular process which could activate nociceptors in the capsule.[15,16]

A study in 2007 presented the consensus of experts about the clinical features of facet joint pain.[17] The three round Delphi survey resulted in 12 indicators relevant to pathoanatomical mechanism of pain. The criteria included "(1) unilateral local pain, (2) activate pain with unilateral pressure on the joint or transverse process, (3) no nerve root pain, (4) less pain in flexion, (5) referred pain not beyond knee, (6) pressure on the joint found decreased range or increased resistance on the painful side, (7) muscle spasm same side to the facet, (8) pain in extension, (9) pain in extension with lateral flexion and rotation to the same side of facet, (10) the injection into the joint relief pain, (11) pain improves with fluoroscopically guided double-anesthetic blocks into the medial branch of the dorsal ramus which innervated the joints, and (12) could not diagnosed from X-ray".

Clinically, the physical therapists could evaluate the criteria 1 to 9 to determine whether the pain is caused by facet joint. Some studies attempted to validate clinical features of pain from facet joint origin showed controversial results.[18,19] However, these criteria are valuable in clinical reasoning and support the biomechanic evidences of pathology of the facet joints.[17] Use of these criteria for evaluating the patients would result in more homogenous of subjects and the manual therapy specifically on facet joints would be more effective. However, the reliability of using these criteria in clinic has not been reported. Therefore, this study aimed to test the agreement of physical therapists in using the criteria to examine and diagnose patients with facet joint problem causing LBP.

Methods

This study was a single-group, repeated-measures reliability study. The testing was conducted in a university physical therapy center. The study protocol was approved by the Ethic Committee of Mahidol University (MU-CIRB); protocol No. MU-IRB, COA. No. 2014. 033.2103, and Protocol No. MU-IRB 2014/006.0901. The data collection was undertaken from January to December 2015. The examination according to the criteria reported in the study of Wilde[17] included the interview of symptom behaviors (unilateral local pain, referred pain not beyond knee, and no nerve root pain); pain response in movement tests (less pain in flexion, pain in extension, and pain in extension with lateral flexion and rotation to the same side of facet); and manual tests (activate pain with unilateral pressure on the joint or transverse process, pressure on the joint found decreased range or increased resistance on the painful side, and muscle spasm same side to the facet).

The participants were consecutive patients aged 18–60 years old with LBP longer than three months. On the day of examination, the patient had pain measured by VAS 21–79 from 100 mm. Subjects were excluded if they presented with history of suspected spinal fracture or severe trauma; cauda equine syndrome with sensory impairment, leg weakness and incontinence; medical diagnosis of spondylolisthesis, foraminal or central stenosis, scoliosis or other spinal deformities; extended period of steroid use; taking pain medication within 24 h; pregnancy or menstruation.

The examiners were two physical therapists with clinical experiences in the musculoskeletal area of 20 and 9 years. They reviewed and practiced the testing procedure together before

beginning of subject recruitment. After history taking, the first examiner assessed the participants. After a brief rest, the second examiner, who did not see the examination process or knew the results, performed the assessment again. Both examiners also gave their impressions that the LBP was from facet joint origin or not. The subjects were asked to conceal the information of the first testing session. Each session took about 10 min. The examination order was randomized. The results of examination were analyzed for the agreements of each criteria and conclusion of facet joint diagnosis.

The sample size of subjects was estimated to minimize the standard error associated with the percent agreement between two arbitrary raters.[20] Setting the error margin at 15%, at least 44 patients were needed in the study. The percentage of agreement and generalized Kappa statistics were used to determine the agreement between therapists for each of the dichotomous scale items of the examination. The levels of Kappa statistics agreement were as follows: $0.00 < K < 0.20$ poor or slight agreement; $0.21 < K < 0.40$ fair; $0.41 < K < 0.60$ moderate; $0.61 < K < 0.80$ substantial or good; $0.81 < K < 1.00$ very good or almost perfect.[21]

Results

There were 45 patients with LBP, 32 females and 13 males, participating in this study. The average age of subjects was 33.64 ± 10.12 years. All subjects had chronic LBP with duration of symptom ranged from 3 months to 10 years. The pain intensity on the day of assessment was 4.47 ± 1.57.

The results of examination are presented in Table 1. The numbers of yes and no determined by each examiner were different for all items. However, the number of cases concluded to have or not to have facet lesion determined by two examiners was the same.

Table 2 shows the agreement levels of each examination item and the conclusion. All items had percent agreement greater than 70%. The highest level of percent agreement was the referred pain not beyond knee. The lowest percent agreements were reporting of pain location as unilateral and the palpation of muscle spasm on the same side of facet.

The Kappa coefficients showed statistically significant agreements between examiners for all examination items. There were different levels of agreement. Three items had fair agreement level, four had moderate agreement, and two had substantial agreement. The agreement of diagnosis if the patients had facet joint lesion was fair.

Discussion

To date, there are no specific clinical and radiographic indications of pain originated from facet joint.[22] A systematic review showed that the controlled anesthetic block of the facet or its nerve supply, the medial branch had good psychometric properties for diagnosis of LBP.[22] However, the test is invasive and not specific, therefore it is not

Table 1. Results of the examination of each criterion.

Examination items	Examiner 1		Examiner 2	
	Yes (%)	No (%)	Yes (%)	No (%)
(1) Unilateral local pain	23 (51.1)	22 (48.9)	29 (64.4)	16 (35.6)
(2) Referred pain not beyond knee	37 (82.2)	8 (17.81)	41 (91.1)	4 (8.9)
(3) No nerve root pain	36 (80.0)	9 (20.0)	39 (86.7)	6 (13.3)
(4) Less pain in flexion	20 (44.4)	25 (55.6)	23 (51.1)	22 (48.9)
(5) Pain in extension	34 (75.6)	11 (24.4)	38 (84.4)	7 (15.6)
(6) Pain in extension with lateral flexion and rotation to the same side of facet	33 (73.3)	12 (26.7)	36 (86.7)	6 (13.3)
(7) Muscle spasm same side to the facet	30 (66.7)	15 (33.3)	42 (93.3)	3 (6.7)
(8) Activated pain with unilateral pressure on the joint or transverse process	37 (82.2)	8 (17.8)	41 (91.1)	4 (8.9)
(9) Pressure on the joint found decreased range or increased resistance on the painful side	40 (88.9)	5 (11.1)	39 (86.7)	6 (13.3)
Conclusion of facet joint origin	38 (84.4)	7 (15.6)	38 (84.4)	7 (15.6)

Table 2. Percentage of agreement and Kappa Coefficient of criteria and diagnosis.

Examination items	% Agreement	Kappa coefficient	p-value[a]
(1) Unilateral local pain	73.3	0.436	0.001**
(2) Referred pain not beyond knee	91.1	0.622	< 0.001**
(3) No nerve root pain	80.0	0.286	0.048*
(4) Less pain in flexion	84.4	0.690	< 0.001**
(5) Pain in extension	86.7	0.588	< 0.001**
(6) Pain in extension with lateral flexion and rotation to the same side of facet	77.8	0.324	0.017*
(7) Muscle spasm same side to the facet	73.3	0.250	0.011*
(8) Activated pain with unilateral pressure on the joint or transverse process	86.7	0.433	0.002**
(9) Pressure on the joint found decreased range or increased resistance on the painful side	88.9	0.483	0.001**
Conclusion of facet joint origin	86.7	0.492	0.001**

[a]p-values for Kappa Statistics; *statistical significance at $p < 0.05$; **statistical significance at $p < 0.01$.

commonly performed even in orthopedics clinic. The criteria for diagnosing by symptom response and physical examination still needed for clinical use had face validity from the expert consensus in a Delphi study.[17]

For the clinical examination tested in this study, three criteria of symptom behaviors, including unilateral local pain, referred pain not beyond knee, and no nerve root pain, had various levels of agreements with Kappa coefficients ranged from 0.286 to 0.622 (% agreement from 73.3–91.1). There were three tests determining pain responses to movements, including less pain in flexion, pain in extension, and pain in extension with lateral flexion and rotation to the same side of facet. This examination domain also showed the same trend as the symptom behaviors with Kappa coefficients from 0.324 to 0.690 (% agreement from 77.8–86.7). The evidences of reliability of pain response to repeated movements were reportedly controversial in a systematic review.[23] However, based on the movement impairment classification system examined, Van Dillen *et al.* reported the very good level of agreements ($K > 0.75$) of physical examination items of symptom behaviors in patients with LBP.[24] In their study, the researchers established and defined the wording of questions and response choices before testing. However in our study, the interview and movement tests were performed in the same manner as routinely done in the physical therapy clinic which did not control the way to ask or test patients. With this manner, the answers and responses from each patient might result in different interpretations by different examiners. The interview and movement tests might be lacking of definition and training consideration, since they are usually supposed as basic clinical skill of therapists.

There were three examination items which needed tactile determination in this study including muscle spasm same side to the facet, activated pain with unilateral pressure on the joint or transverse process, and pressure on the joint found decreased range or increased resistance on the painful side. These items had low to fair agreements with Kappa coefficients of 0.250 to 0.483 (% agreement from 73.3–88.9). Systematic reviews reported generally low reliability of palpation-based assessment.[25–27] There were conflicting evidences about the reliability of evaluating muscle tension or spasm as well as the intersegmental stiffness of vertebral disc.[24,27–29] Strong evidence indicating low reliability pain on palpation and trigger points was also reported. Consistent results showed that the judgments based on visual and tactile information were usually difficult to perform reliably.[25–29]

The agreement for the pressure on the joint found decreased range or increased resistance on the painful side was moderate in this study. However, multiple reviews have suggested low agreement of this manual assessment.[27–29] The better agreement shown in this study might be due to both the subject and examiner characteristics. The patients recruited in this study had chronic symptom duration longer than three months with

moderate pain scale which might be related to the changes of spinal resistance. The examiners might have similar manual technique and interpretation of pressure on joint since they graduated from the same physical therapy school, have been working in the same clinical setting, and have several chances to discuss and practice in terms of manual therapeutic procedure together. They also reviewed and practiced the testing procedure together before beginning of subject recruitment in this study. The three-point grading (hypomobility, normal, and hypermobility) which used in this study was also recommended in review by Wong *et al.*[27]

The agreement level of conclusion was moderate in this study. The review of agreement levels of different diagnosis systems used in physical therapy clinics reported variability of agreements depended on the methodology and definitions used in the study.[24] Since the physical examination in physical therapy clinic depends largely on communication, manual skills and judgments of examiners, the explicitly defined techniques, operational definition, and consistent training would be necessary for improving reliability.[25]

The major limitation of result interpretation of this study is due to the statistics used. The results of low Kappa coefficient values in this study were partly due to the small number of some response category results from characteristics of the study sample. This would result in skewed response distribution and effect on Kappa statistics.[30] More studies which used greater variety of symptom and examination responses would be needed to confirm the agreement of therapists.

In addition, the study to test validity of the criteria set is warrant. The construct validity examination using factor analysis would result in the known redundant items which guide to more concrete set of examination instrument.

Conclusion

There was adequate reliability between two examiners showed by the percent agreements greater than 70% for all items used for confirming facet joint lesion. The test protocol of all assessment items was reviewed and practiced together by both examiners. However, the words of questions in history taking part and the manual techniques used were assumed to be routine practice in clinic, therefore these issues were not standardized which might be the source of disagreement in patient responses. However, due to skewness of symptom response, the Kappa coefficients were only low to moderate in this study. The items of "muscle spasm same side to the facet", "no nerve root pain", and "pain in extension with lateral flexion and rotation to the same side of facet" which had Kappa coefficients less than 0.40 (fair level of agreement) might need special cautions when performed and interpreted for facet diagnosis. Further study with variety of sign and symptoms of LBP would be beneficial to confirm the reliability of physical examination of facet joint in physical therapy clinic. The validity study compared with standard tests, i.e., nerve block and intra-articular injection would also verify these criteria of diagnosis. The reliability study assessing therapists with different clinical experiences would be valuable to prove clinical practicality of the testing protocol. Also, the study using reliable instrumental spinal stiffness measurements[27,31] might add clinical insight to this specific lesion condition.

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Conflict of Interest

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Author Contributions

Vongsirinavarat M took part in study conception and design, data collection and analysis, as well as writing and revision of the manuscript. Wahyuddin W was involved in study design and manuscript revision. Adisaiphaopun R performed subject screening and data collection. All authors have given final approval of the version to be published.

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