Facet Joint Pain in Chronic Spinal Pain: An Evaluation of Prevalence and False-positive Rate of Diagnostic Blocks

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Study Design: A retrospective review.

Objectives: Evaluation of the prevalence of facet or zygapophysial joint pain in chronic spinal pain of cervical, thoracic, and lumbar origin by using controlled, comparative local anesthetic blocks and evaluation of false-positive rates of single blocks in the diagnosis of chronic spinal pain of facet joint origin.

Summary of Background Data: Facet or zygapophysial joints are clinically important sources of chronic cervical, thoracic, and lumbar spine pain. The previous studies have demonstrated the value and validity of controlled, comparative local anesthetic blocks in the diagnosis of facet joint pain, with a prevalence of 15% to 67% variable in lumbar, thoracic, and cervical regions. False-positive rates of single diagnostic blocks also varied from 17% to 63%.

Methods: Five hundred consecutive patients receiving controlled, comparative local anesthetic blocks of medial branches for the diagnosis of facet or zygapophysial joint pain were included. Patients were investigated with diagnostic blocks using 0.5 mL of 1% lidocaine per nerve. Patients with lidocaine-positive results were further studied using 0.5 mL of 0.25% bupivacaine per nerve on a separate occasion. Medial branch blocks were performed with intermittent fluoroscopic visualization, at 2 levels to block a single joint. A positive response was considered as one with at least 80% pain relief from a block of at least 2 hours duration when lidocaine was used, and at least 3 hours or longer than the duration of relief with lidocaine when bupivacaine was used, and also the ability to perform prior painful movements.

Results: A total of 438 patients met inclusion criteria. The prevalence of facet joint pain was 39% in the cervical spine [95% confidence interval (CI), 32%-45%]; 34% (95% CI, 22%-47%) in the thoracic pain; and 27% (95% CI, 22%-33%) in the lumbar spine. The false-positive rate with a single block in the cervical region was 45%, in the thoracic region was 42%, and in the lumbar region 45%.

Conclusions: This retrospective review once again confirmed the significant prevalence of facet joint pain in chronic spinal pain.

Key Words: facet joints, zygapophysial joints, medial branch blocks, controlled comparative local anesthetic blocks, cervical pain, thoracic pain, lumbar pain

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The lifetime prevalence of spinal pain has been reported as 54% to 80%.[1–9] It is conventionally believed that most episodes of low back pain will be short-lived, with 80% to 90% of attacks resolving in about 6 weeks, irrespective of the administration or type of treatment, and with only 5% to 10% of patients developing persistent back pain. However, this belief is flawed as the condition tends to relapse and most patients will experience recurrent episodes. Modern evidence has shown that chronic persistent low back pain and neck pain are seen in up to 25% to 75% of patients, 1 year or longer after the initial episode.[1,10–18] In addition, chronic pain with the involvement of multiple regions is a common occurrence in more than 60% of patients.[19–22] Yet, even with its high prevalence and scientific advances, it has been suggested that a specific etiology of back pain can be diagnosed with certainty in only about 15% of patients based on clinical examination, radiologic evaluation, and nerve conduction studies in the absence of disc herniation and radicular symptomatology.[1,23,24] However, on the basis of precision diagnostic blocks, the diagnosis of the cause of spinal pain may be made in approximately 85% of the patients.[1,24,25]

Intervertebral discs, facet joints, ligaments, fascia, muscles, and nerve root dura have been identified as tissues capable of transmitting pain in the low back.[26] Facet joint pain, discogenic pain, and sacroiliac joint pain also have been proven to be common causes of pain with proven diagnostic techniques.[1,24,25] The facet or zygapophysial joints are paired diarthrodial articulations between posterior elements of adjacent vertebrae. Spinal facet joints have been shown in normal volunteers to be a source of pain in the neck and referred pain in the head and upper extremities,[27–30] upper back, mid back, and referred pain in the chest wall,[31,32] and the low back and referred pain in the lower extremity.[33–37] Facet joints are well innervated by the medial branches of the dorsal rami.[38–40]

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Biomechanical studies have shown that lumbar and cervical facet joint capsules can undergo high strains during spine-loading.[41] Neuroanatomic studies have demonstrated free and encapsulated nerve endings in facet joints, and also nerves containing substance P and calcitonin gene-related peptide.[41] Neurophysiologic studies have shown that facet joint capsules contain low-threshold mechanoreceptors, mechanically sensitive nociceptors, and silent nociceptors.[41]

On the basis of controlled diagnostic blocks of facet joints, in accordance with the criteria established by the International Association for the Study of Pain,[42] facet joints have been implicated as responsible for spinal pain in 15% to 45% of the patients with chronic low back pain,[21,25,43–46] 42% to 48% of patients with chronic thoracic pain,[21,47] and 54% to 67% of patients with chronic neck pain.[21,48–50]

Multiple authors[25,43–50] in the past have studied individual regions and presented the results in various types of practices. Manchikanti et al[21] evaluated 500 patients in an interventional pain management practice setting with comparative local anesthetic blocks in a prospective study and reported the prevalence of facet joint pain in patients with chronic cervical spine pain as 55%, chronic thoracic spine pain as 42%, and lumbar spine as 31%. They also reported false-positive rates with single blocks with lidocaine of 63% in the cervical spine, 55% in the thoracic spine, and 27% in the lumbar spine. Systematic reviews[51,52] also have established the prevalence, false-positive rates, and the value and validity of diagnostic facet or zygapophysial joint blocks. Even then, all these studies were performed by 2 investigators of heterogenous settings and populations.

Generalizability is a measure of the extent to which others can achieve the same outcomes as those of original authors. Consequently, it is an important feature of any intervention, either therapeutic or diagnostic. In practical terms, generalizability may be reflected by the extent to which practitioners in a conventional practice can reproduce results obtained in academic research studies, or reproduce the results in a large population base.[53] Generalizability is also achieved by multiple prospective or randomized trials. Consequently, in the case of prevalence of spinal facet joint pain, all the prospective studies have been produced by only the 2 groups. Thus, further trials by different groups are required. However, another approach is to conduct a retrospective review in a substantial series of patients. Such an evaluation would demonstrate whether the same or similar outcomes can be achieved in practical settings as have been reported in research studies.

Yet another method of confirming the results of a previous study and solving the problem of reproducibility is to conduct a clinical audit on the basis of available data to ensure this knowledge is being used to the best effect.

Outcomes for a large series of patients, formerly initiated in 1993 at the United Kingdom's National Health Service (NHS), clinical audit was defined as, "a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of the change."[54] A recently published clinical audit of results of radiofrequency neurotomy for chronic neck pain provided evidence of efficacy and generalizability of the procedure in routine clinical practice.[53]

In this study, we sought to evaluate the prevalence of facet joint pain by spinal region in patients with chronic spinal pain presenting to an interventional pain management practice for diagnosis and treatment. We used the same protocol[21] as was previously published to determine the presence of facet joint pain using responses to controlled comparative local anesthetic facet joint nerve blocks, performed in accordance with International Association for the Study of Pain criteria.[42]

MATERIALS AND METHODS

In this retrospective evaluation, 500 consecutive patients receiving controlled comparative local anesthetic blocks were included. The patients presented with chronic neck, thoracic, or low back pain or a combination thereof. Patients were managed by one physician in a nonuniversity, private practice setting in the United States. The procedures were performed in an interventional pain management ambulatory surgery center. The practice provides comprehensive, interventional pain management services.

The chart review was performed by 3 investigators who were not involved in performing the procedures.

Inclusion criteria at the institution included: consecutive patients undergoing controlled comparative local anesthetic blocks, of ages 18 to 90 years, who had pain for at least 6 months, which was nonspecific rather than radicular in nature. The treating physician excluded disc-related pain with radicular symptoms in all patients based on radiologic or neurologic testing, lack of a neurologic deficit, and radicular symptoms or pain that involved predominantly the upper or lower extremity or chest wall. All patients selected had failed conservative management including physical therapy, chiropractic manipulation, exercises, drug therapy, and bedrest.

Each of the patients had a work-up, which included comprehensive history, physical examination, and evaluation of the results of prior procedures and investigations. Of the 500 patients who had undergone controlled comparative local anesthetic blocks, 438 patients were eligible to be included in the retrospective review. The study period lasted from January 2004 to March 2006.

Facet joint pain was investigated in all patients starting with diagnostic blocks using 1% lidocaine. Patients with lidocaine-positive results were further studied using 0.25% bupivacaine on a separate occasion, usually 3 to 4 weeks after the first injection. The blocks were performed on the ipsilateral side in patients with unilateral pain or bilaterally in patients with bilateral or axial pain. Blocks were performed at a minimum of 2 levels to block a single joint. Target joints were identified by the pain pattern, local or paramedian tenderness over the area of the facet joints, and reproduction of pain with deep pressure. Blocks were performed with intermittent fluoroscopic visualization using a 22-gauge, 2-inch spinal needle at each of the indicated medial branches in the cervical and thoracic spine, and with a 22-gauge, 3.5-inch spinal needle at each of the indicated medial branches at the L1-L4 levels and the L5 dorsal ramus at the L5 level of the lumbar spine.

Intravenous access was established and light sedation with midazolam was offered to all patients. Each facet nerve was infiltrated with 0.5 mL of 1% lidocaine or 0.25% bupivacaine. Following each block, the patient was examined and asked to perform previously painful movements. A positive response was defined as at least an 80% reduction of pain with ability to perform previously painful movements, as assessed using a verbal numeric pain rating scale. To be considered positive, pain relief from a block had to last at least 2 hours when lidocaine was used, and at least 3 hours, or longer than the duration of relief with lidocaine, when bupivacaine was used. Any other response was considered as a negative outcome.

All patients judged to have a positive response with lidocaine blocks underwent subsequent bupivacaine blocks. Patients who were determined not to have facet joint pain were offered other diagnostic or therapeutic interventions, including discography, epidural injections, or sacroiliac joint injections.

Data were recorded on a Microsoft Access 97 database. The SPSS version 9.0 Statistical Package was used to generate frequency tables. The prevalence and 95% confidence intervals (CI) were calculated. Differences in proportions were tested using the χ^2 test. Fischer exact test was used whenever the expected value was less than 5. Results were considered statistically significant if the P value was < 0.05.

RESULTS

Five hundred consecutive patients undergoing controlled comparative local anesthetic blocks for the evaluation of facet joint pain were reviewed. Of these, 438 patients met the inclusion criteria. Sixty-two patients were excluded from the review. Patient flow is illustrated in Figure 1.

Patient Evaluation Flow Pattern

All the patients were included in the analysis. As shown in Figure 1, follow-up was not available after the first block in 4 patients in lumbar, 8 patients in cervical, and 3 patients in thoracic regions, whereas follow-ups were not available after the second block in 10 patients in lumbar, 12 patients in cervical, and 2 patients in thoracic groups. The results were considered negative or false-positive for all the patients with lack of follow-up.

Demographic Characteristics

Demographic characteristics are illustrated in Table 1. Significant differences were identified in patients with involvement of 1 region and 2 regions with a greater proportion of female patients compared with male. An additional variable in the demographic characteristics was height, which was greater in patients with involvement of 1 region compared with 2 regions or 2 to 3 regions.

Salient features based on regional involvement of the spine are illustrated in Table 2. There were no significant differences noted in any of the variables.

Results of Comparative Local Anesthetic Blocks

Table 3 illustrates the results of diagnostic blocks evaluating facet joint pain in all 3 regions. In the cervical spine, lidocaine blocks were performed in 251 patients, in 65 patients in the thoracic spine, and 303 patients in the lumbar spine. Of these, 175 of 251 patients in the cervical spine reported a definite response with a positive result to initial lidocaine blocks, whereas 38 of the 65 patients in the thoracic spine reported a positive result, and 150 of 303 patients with lumbar spinal pain reported positive results with a single lidocaine block.

Of the 175 patients positive for single blocks with lidocaine, 97 patients reported positive response to bupivacaine blocks in the cervical spine, whereas 22 of 38 patients in the thoracic spine positive for single lidocaine blocks were also positive with bupivacaine blocks. Eighty-three patients in the lumbar spine showed positive results with bupivacaine from 150 of the lidocaine positive patients.

The controlled comparative local anesthetic blocks with positive results using double local anesthetic blocks provided a prevalence rate of facet joint pain in patients with chronic neck pain of 39% (95% CI, 32%-45%); 34% (95% CI, 22%-47%) in patients with chronic thoracic pain; and 27% (95% CI, 22%-33%) in patients with chronic low back pain.

Table 3 also illustrates false-positive rates. False-positive rates were calculated by assuming all patients with no response to lidocaine to be true negative, and all patients with a positive response to lidocaine and a negative response to bupivacaine or positive response to both lidocaine and bupivacaine as false-positives. The false-positive rates for cervical facet joints with a single block were 45% (95% CI, 37%-52%), for thoracic facet joints with a single lidocaine block were 42% (95% CI, 26%-59%), and for lumbar spine 45% (95% CI, 36%-53%).

Characteristics of Regional Involvement

Table 4 illustrates facet joint involvement by region on the basis of controlled comparative local anesthetic blocks. Overall, at least one region was judged to be positive in 156 patients or 36% of the 438 patients. However, in 25% of the 181 patients were positive among patients with involvement of 2 and 3 regions.

Adverse Effects

No major adverse effects were noted in this study.

DISCUSSION

This retrospective evaluation of patients with chronic nonspecific spinal pain involving the cervical,

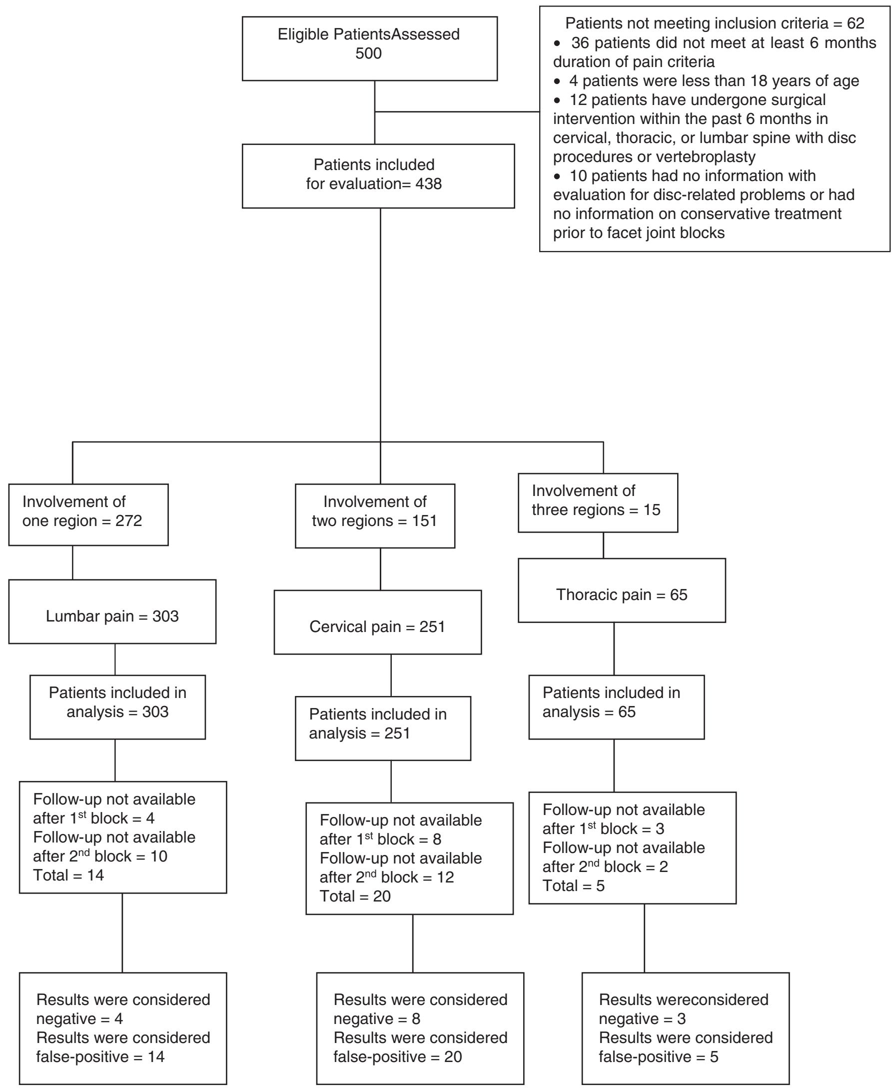

FIGURE 1. Schematic representation of the review and patient flow.

TABLE 1. Demographic Characteristics

	One Region (272)	Two Regions (151)	Three Regions (15)	Total (438)
Sex				
Male	45% (122)	26% (39)	33% (5)	38% (166)
Female	55%*(150)	74%*(112)	67% (10)	62% (272)
Age (y)				
Range	18-92	17-84	25-57	17-92
Mean ± SEM	48 ± 1.0	46 ± 1.2	42 ± 2.4	47 ± 0.7
Weight (lbs)				
Range	97-390	99-427	123-220	97-427
Mean ± SEM	187 ± 2.9	180 ± 4.1	173 ± 7.2	184 ± 2.3
Height (in)				
Range	57-76	58-76	60-72	57-76
Mean ± SEM	67.3† ± 0.2	65.9 ± 0.3	65.1 ± 1.0	66.8 ± 0.2

*Significant difference compared to the male with involvement of 1 or 2 regions ($P < 0.01$).

†Significant difference compared to the group with involvement of 2 or 3 regions ($P < 0.05$).

thoracic, and lumbar regions, alone or in combination, demonstrated by spinal region that the prevalence of cervical facet or zygapophysial joint pain in patients with neck pain is 39%, thoracic facet joint pain in patients with mid back or upper back pain is 34%, and involvement of lumbar facet joints in patients with chronic low back pain is 27%. The prevalence will be reduced if it is calculated on the basis of the total number of patients evaluated for the entire spine rather than regional. Thus, these numbers show regional involvement and evaluation of the patients for that particular region. These results are in overall agreement with the previous studies, although somewhat less than the ones published by the same group.[21]

The false-positive rates were quite high with single blocks: 45% for the cervical spine, 42% for the thoracic spine, and 45% for the lumbar spine. Once again, the results are similar to previous findings, even though there are some differences with the same group of authors with the results published in a prospective evaluation.[21,25,43–52]

TABLE 2. Baseline Salient Features Based on Regional Involvement of the Spine

	Cervical (251)	Thoracic (65)	Lumbar (303)
Sex			
Male	31% (79)	29% (19)	39% (117)
Female	69% (172)	71% (46)	61% (186)
Age (y)			
Range	17-78	20-92	17-89
Mean ± SEM	45.4 ± 0.9	45.4 ± 2.1	47.7 ± 0.9
Height (in)			
Range	58-76	59-76	57-76
Mean ± SEM	66.4 ± 0.2	66.1-0.5	66.7 ± 0.2
Weight (lbs)			
Range	99-427	113-287	97-427
Mean ± SEM	180.3 ± 2.9	168.3 ± 4.2	187.4 ± 3.0
Duration of Pain (mo)			
Range	6-338	6-330	6-430
Mean ± SEM	85.6 ± 5.3	75.8 ± 9.6	107.5 ± 6.2
Mode of onset of pain			
Gradual	55% (138)	60% (39)	54% (164)
Following an incident	45% (9113)	40% (26)	46% (139)
Distribution of pain			
Left	15% (38)	5% (3)	9% (26)
Right	13% (33)	15% (10)	12% (38)
Bilateral	72% (180)	80% (52)	79% (239)
No. joints involved			
2	50% (127)	19% (12)	63% (191)
3	49% (122)	29% (19)	36% (109)
≥ 4	1% (2)	52% (34)	1% (3)

The study also demonstrated bilateral involvement in 72% of patients in the cervical spine, 80% in the thoracic spine, and 79% in the lumbar spine. Overall 77% of the patients presented with bilateral involvement. In addition, this study also showed involvement of multiple regions with 38% of the patients with involvement of more than one region.

This study once again reaffirms the evidence that involvement of facet joints, as a cause of chronic spinal pain is real as proven overwhelmingly by numerous studies. Facet joints have been shown to be a source of chronic spinal pain by means of diagnostic techniques of known reliability and validity.[21,25,43–52,55–59] Blocks of facet joints are performed to test the hypothesis that the target joint is a source of the patient's pain.[55] Once a facet joint is anesthetized by the medial branches of the dorsal rami that innervate the target joint, if pain is relieved, the joint is considered to be the source of pain.[55] However, true-positive responses are determined by performing controlled blocks, either in the form of placebo injection of normal saline or more commonly in the form of comparative local anesthetic blocks on 2 separate occasions, when the same joint is anesthetized using local anesthetics with different durations of action. The value and validity of medial branch blocks and comparative local anesthetic blocks in the diagnosis of facet joint pain has been demonstrated.[21,25,43–52,55–67] In addition, because there are no clinical features or diagnostic imaging studies that can determine whether a facet joint is painful or not, controlled blocks seem to be a reliable tool in the diagnosis of chronic spinal pain.

The results noted in this study confirm the previous results, lending external validity to the primary findings. The study was performed in the setting of an interventional specialty practice in a private practice setting in the United States. Yet, it may be criticized that the authors performing the procedures in the retrospective review also was involved in the primary study. On the one hand, this may provide uniformity. On the other hand, it provides basis for the criticism that the results are the same. This criticism may be invalidated by the fact that the present retrospective study shows lesser prevalence of facet joint pain. Prevalence of facet joint pain was 55% in the cervical spine, 42% in the thoracic spine, and 31% in the lumbar spine compared with 39% in the present study in the cervical region, 34% in the thoracic region, and 27% in the lumbar region. This study also reinforces that the results of a retrospective review can provide valuable information similar to a prospective evaluation.

Even though the existence of facet joint pain is not universally accepted and the diagnostic methodology is not endorsed, it is the best available method to diagnose facet joint pain in chronic spinal pain. By confirming the results of the original research studies of diagnostic facet joint blocks, the results of the present study might encourage others to use appropriate diagnostic techniques in managing chronic spinal pain.

TABLE 3. Results of Single and Double Facet Joint Nerve Blocks (Single Blocks With Lidocaine and Double Blocks With Lidocaine and Bupivacaine)

	Cervical (251) Double Blocks*		Thoracic (65) Double Blocks*		Lumbar (303) Double Blocks*	
Single Blocks†	Positive	Negative	Positive	Negative	Positive	Negative
Positive	97	78	22	16	83	67
Negative	—	76	—	27	—	153
Prevalence	39% (95% CI, 32%-45%)		34% (95% CI, 22%-47%)		27% (95% CI, 22%-33%)	
False-positive rate	45% (95% CI, 37%-52%)		42% (95% CI, 26%-59%)		45% (95% CI, 36%-53%)	

*With double blocks, 97 patients with neck pain, 22 with thoracic pain, and 83 with lumbar pain had positive responses.

†With single blocks in the cervical spine, 175 patients (ie, 97 + 78) had positive responses with lidocaine blocks, 38 (22 + 16) patients with thoracic pain had positive responses, and 150 (83 + 67) patients with lumbar pain had positive responses.

TABLE 4. Facet Joint Involvement by Region on the Basis of Double Facet Joint Blocks

Double Blocks	Number	% of Positive
At least 1 region positive	438	36% (156)
At least 2 regions positive	166	26% (43)
All 3 regions positive	15	20% (3)

CONCLUSIONS

This evaluation showed that patients with chronic, nonspecific spinal pain involving cervical, thoracic, and lumbar spine may be evaluated for the prevalence of facet joint pain. However, this should be performed with controlled, comparative local anesthetic blocks owing to the significant rate of false-positive response. Painful cervical facet joints were identified in 39% of the patients in the cervical spine, 34% of the patients in the thoracic spine, and 27% of the patients in the lumbar spine.

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