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The Nature of Neck Pain in a Private Pain Clinic in the United States

Way Yin, MD,*† and Nikolai Bogduk, MD, PhD, DSc‡

*Interventional Medical Associates of Bellingham, Bellingham, Washington; †Department of Anesthesiology, University of Washington, Seattle, Washington, USA; ‡Department of Clinical Research, Royal Newcastle Centre, University of Newcastle, Newcastle, Australia

ABSTRACT

Objective. To determine the prevalence of different causes of neck pain in a private practice clinic.

Design. A retrospective audit of records.

Setting. A private spine pain clinic in the state of Washington, USA.

Patients. All consecutive patients, seen between January 2003 and January 2005, in whom a diagnosis of neck pain was made.

Interventions. The records of all patients were examined to determine the prevalence of various diagnostic entities determined by history, examination, and invasive test such as controlled diagnostic blocks and provocation discography.

Outcome Measures. Using different denominators, the prevalence of various conditions was determined in all patients who presented with neck pain, in patients in whom investigations were undertaken, and in patients who completed investigations.

Results. A large proportion of patients (36%) did not pursue investigations, which diluted the crude prevalence of various conditions. A further 17% deferred completing investigations. Among the 46% of patients who completed investigations, the prevalence of zygapophysial joint pain was 55%, discogenic pain was 16%, and lateral atlanto-axial joint pain was 9%. A diagnosis remained elusive in only 32% of those patients who completed investigations.

Conclusions. In a private practice setting, a patho-anatomic diagnosis for chronic neck pain can be established in over 80% of patients, provided that appropriate investigations are undertaken. The prevalence of cervical zygapophysial joint pain encountered in the present study corroborates the prevalence rates established in academic studies. Cervical discogenic pain does not appear to be common among patients with chronic neck pain.

Key Words. Neck Pain; Causes; Zygapophysial Joint; Intervertebral Disc; Diagnostic Block

Introduction

Little is known about the causes of neck pain. Epidemiologic studies have reported that chronic neck pain is common; it affects some 14% of the general population; and its prevalence increases with age [1–6]. But these studies do not reveal either the source or the cause of the pain.

Reprint requests to: Nikolai Bogduk, MD, PhD, DSc, Department of Clinical Research, Royal Newcastle Hospital, Newcastle, NSW 2300, Australia. Tel: 61-2-49223505; Fax: 61-2-49223559; E-mail: michelle.gillam@newcastle.edu.au.

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Some studies have explicitly focused on the prevalence of zygapophysial joint pain. In patients with chronic neck pain after whiplash, the source of pain could be traced to one or more cervical zygapophysial joints in 54% (95% CI: 40–68%) [7] and 60% (95% CI: 46–73%) [8] of patients. Among patients with neck pain, not restricted to those with whiplash, the prevalence of cervical zygapophysial joint pain has been reported as at least 36% (27–45%) in one study [9], and 60% in another [10]. These studies, however, gave no indication of how common other causes of pain were.

Understanding the possible causes of neck pain is pertinent to clinical practice in several ways. The prevalence of different causes determines their pretest probability. In turn, that indicates which conditions should be investigated first, in order most efficiently to rule in or rule out the more common causes. As well, in the absence of a single screening test capable of diagnosing all causes of neck pain, knowing the possible causes serves to inform practitioners about the types of investigations to which they should have access, if they are to make a diagnosis. Knowing the cause of chronic neck pain can also have prognostic implications, as the efficacy of treatment for certain structural causes has been established [11–13].

The present study was undertaken in order to provide a first approximation of the possible sources and causes of neck pain. It was conducted in a private practice in order to avoid the possible selection bias that can affect studies conducted in academic units.

Methods

The study was conducted in a private spine pain clinic located in the state of Washington, USA. The clinic sees patients on referral from various spine specialists (neurosurgeons, spine surgeons, physiatrists) and nonspine specialists (internists, cardiologists, oncologists, family practitioners, general practitioners). It sees approximately 500 new patients per year, with a variety of pain problems, encompassing headache, facial pain, neck pain, thoracic and lumbar back pain, radicular pain, neuropathic pain, and complex regional pain syndromes.

In order to find all patients who were seen for neck pain, between January 2003 and January 2005, the electronic records of the clinic were searched using the terms: neck pain, cervicalgia, headache, cervicogenic headache, cervical disc disease, and cervical disc degeneration. The records of patients so found were examined to determine whether the patients did have neck pain as their presenting complaint, and subsequently what diagnosis had been established, if any.

The clinic followed a systematic approach for the assessment of patients. Each patient underwent a comprehensive multisystem review and physical examination; all available imaging studies were personally reviewed by one of the authors (W.Y.). For some patients, a clear diagnosis could be established from the history and physical examination alone. When the diagnosis was not clinically evident, patients underwent investigation using structure-specific diagnostic blocks and discography.

Radicular pain was diagnosed if the patient's primary complaints were lancinating pain referred beyond the elbow, with or without associated objective neurological signs of radiculopathy, and if medical imaging demonstrated a disc herniation, protrusion, or foraminal stenosis at a segmental level concordant with the symptoms or neurological signs.

For patients with no clinical features of radiculopathy, medical imaging was not used to pursue or to formulate a diagnosis, for there are no features on plain radiographs, computed tomography, or magnetic resonance imaging (MRI), that have been shown to correlate with a valid source of pain [14–16]. These investigations typically show a normal cervical spine or no more than age changes.

For patients with no signs of radiculopathy, the source of their pain was pursued using cervical medial branch blocks to test for zygapophysial joint pain [17], intra-articular blocks to test for lateral atlanto-axial joint pain [18], and discography to test for discogenic pain [19]. These investigations were undertaken in accordance with the guidelines prescribed by the International Spine Intervention Society [17–19]. They were performed in a Medicare and Washington State-approved Ambulatory Surgery Center, without sedation, and under local anesthesia only.

The protocol that was followed required that patients first underwent diagnostic blocks of the synovial joints of the cervical spine, on the grounds that synovial joint pain has a high, pretest probability. If the patient's dominant symptom was headache, third occipital nerve blocks or lateral atlanto-axial joint blocks were undertaken, on the grounds that the C2–3 zygapophysial joints or the lateral atlanto-axial joints are the most common,

known source of cervicogenic headache [20,21]. The operator was free to choose which of these blocks he used first. If the first block was negative, the other block was used on a subsequent occasion. For patients whose dominant symptom was neck pain, cervical medial branch blocks were performed because the prevalence of cervical zygapophysial joint pain has been shown to exceed that of any other known cause of neck pain [7,8,10]. Cervical discography was reserved for patients in whom synovial joint blocks first proved negative, on the grounds that cervical discography has been shown to be false-positive in one-third of cases if zygapophysial joint pain has not been previously excluded [22]. Both for synovial joint blocks and for discography, investigations were initiated at segmental levels suggested by correlating maps of the patient's pain with those reported in normal volunteers when particular segments have been experimentally stimulated [23,24], and in patients when particular joints or discs have been stimulated [25,26].

Positive responses to synovial joint blocks were checked, using comparative local anesthetic blocks [17]. Patients were required to have long-lasting relief when 0.75% bupivacaine was administered, and short-lasting relief when 4% lignocaine was administered. If patients exhibited a discordant response (i.e., response to lignocaine was longer in duration than the response to bupivacaine), they also underwent a placebo block with normal saline.

Patients were deemed to have zygapophysial joint pain if their pain was completely relieved upon each occasion that one or more joints were anesthetized, provided that their responses were concordant with the duration of action of the agents used [17]. Zygapophysial joint pain was excluded if, at any time, anesthetizing the medial branch nerves failed to provide relief of pain, or if the patient responded to placebo.

Patients were deemed to have lateral atlanto-axial joint pain if an intra-articular injection of local anesthetic completely relieved their pain on each of two occasions that the joint was anesthetized [18]. Lateral atlanto-axial joint pain was excluded as the source of pain if, at any time, anesthetizing it failed to provide relief of pain, or if the patient responded to placebo.

Patients were deemed to have discogenic pain if discography reproduced their normal area and character of pain to a severity of 7 on a 10-point numerical pain rating scale, provided that provocation of adjacent discs was not painful [19]. Discogenic pain was excluded if disc stimulation did not reproduce the patient's pain. Any other response to discography was deemed indeterminate, and not counted as positive.

If patients were found not to be positive to atlanto-axial joint blocks, cervical medial branch blocks, or discography, additional blocks were undertaken in some cases. These included C2 nerve root blocks and atlanto-occipital joint blocks.

For various diagnostic entities, the crude prevalence was calculated as the number of patients with a particular condition divided by the total number of presenting patients. An adjusted prevalence was calculated using as the denominator the number of patients who completed investigations, i.e., the total number of patients less the number who were not investigated and the number of those whose investigations were still incomplete. The diagnostic yield of various investigations was calculated as the proportion of positive responses among those patients in whom the investigation was performed.

Results

The audit identified 167 patients: 92 female and 75 male individuals, whose records met the search criteria for neck pain. Of these patients, 24 did not have neck pain as their primary complaint. Fourteen of these patients had low back pain, and neck pain was only an incidental complaint. Four had thoracic spinal pain, and one each had carpal tunnel syndrome, complex regional pain syndrome, and facial pain. One patient had diffuse pain of a rheumatological nature, with neck pain as only one of several components. Two patients had postherpetic neuralgia affecting a cervical dermatome. All of these patients were excluded from the sample for subsequent study.

The study sample consisted of 76 female and 67 male patients. Virtually all patients had chronic neck pain (Table 1). Only three had a history of neck pain for less than 3 months. The pain varied with respect to etiology. Proportionately fewer male patients had no history of trauma; fewer male patients were injured in a motor vehicle accident; most attributed the onset of their pain to a fall, to having been struck, or to a lifting or pulling incident (Table 2). Approximately equal proportions of the female patients had no history of trauma or attributed their neck pain to a motor vehicle accident or some other incident (a fall, lifting, or having been struck) (Table 2). Most were insured in some way. Proportionately more of the female individuals carried private health insurance than

Table 1 Demographic and clinical data on 143 patients with neck pain

		Investigations		
	All Patients	Not Indicated	Not Undertaken	Undertaken
Male				
N	67	4	18	41
Age (years)				
Median	49	60	47	49
Interquartile range	41–58	50–74	38–57	42–60
Duration of pain (months)				
Median	31	36	43	31
Interquartile range	13–77	8–73	7–144	18–68
Female				
N	76	5	23	47
Age (years)				
Median	46	67	49	44
Interquartile range	40–56	46–79	40–60	40–50
Duration of pain (months)				
Median	31	300	48	26
Interquartile range	14–94	6–570	21–96	13–60

The group—All Patients—includes five patients with radicular pain who were not subject to investigations.

the male patients, and reciprocally, proportionately more of the male patients were covered by workers' compensation claims (Table 2).

On the basis of history and clinical examination, five patients had cervical radicular pain. The remainder had idiopathic neck pain, for which investigations were offered (Figure 1). Of the eligible 138 patients, 50 did not undergo investigations, for a variety of reasons (Table 3). With respect to age, gender, and insurance cover, these patients did not differ significantly from those who did undergo investigations (Table 1). Those patients with minimal symptoms tended to be older, and have no history of trauma, but differences in these respects did not reach statistical significance because of the small size of this subgroup. All patients who underwent investigations had had neck pain for a minimum of 3 months.

Four patients underwent lateral atlanto-axial joint blocks because headache was a prominent feature of their complaint. Two were found positive, but two had placebo responses to controlled blocks (Figure 1).

Table 2 Etiology and insurance status of 143 patients with neck pain

		Investigations		
	All Patients	Not Indicated	Not Undertaken	Undertaken
Male	67	4	18	41
No trauma	8	2	3	2
Trauma				
MVA	15	0	4	11
Other	44	2	11	28
Self-pay	1	0	0	1
Private insurance	12	0	5	6
Medicare	9	2	1	6
Motor vehicle insurance	8	0	4	4
Workers' compensation	37	2	8	24
Female	76	5	23	47
No trauma	22	3	7	11
Trauma				
MVA	28	0	11	17
Other	27	2	5	19
Self-pay	4	0	2	2
Private insurance	28	2	10	16
Medicare	11	3	2	5
Motor vehicle insurance	16	0	7	8
Workers' compensation	18	0	2	16

MVA = motor vehicle accident.
The group—All Patients—includes five patients with radicular pain who were not subject to investigations.

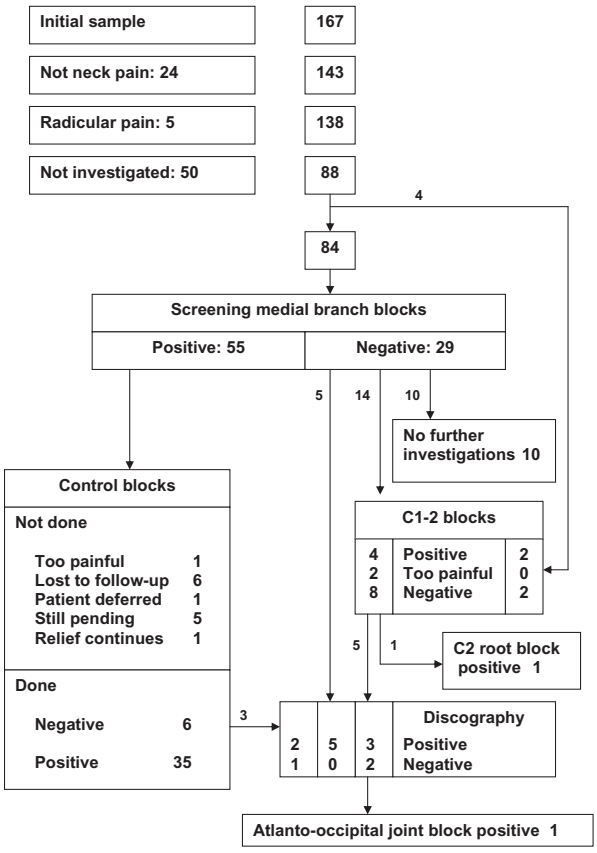

Figure 1 Diagnostic outcomes of history, diagnostic blocks, and discography, for a sample of patients presenting with neck pain.

The remaining 84 patients underwent screening medial branch blocks (Figure 1). These blocks were positive in 55 cases and negative in 29 cases. In 14 cases, control blocks were not completed for a variety of reasons (Figure 1). Control blocks were completed in 41 cases. Three patients had complete relief of pain following the control block, but their responses were discordant. Two of these patients were later demonstrated placebo responses to normal saline. For the purposes of the present study, these three patients were not considered positive. Three other patients with negative responses to controlled blocks underwent discography, and all proved positive. The remaining 35 patients had positive responses to controlled medial branch blocks (Figure 1).

Of the 29 patients in whom screening medial branch blocks were negative, 10 had no further investigations. In five patients, discography was the next diagnostic intervention performed, and was positive in each case. In 14 patients, lateral atlanto-axial joint blocks were performed. Four proved positive (Figure 1). In two patients, lateral atlanto-axial joint blocks were not completed because the procedure proved to be too painful for the patients. Eight patients had negative responses to atlanto-axial joint blocks. In one of these, an atlanto-occipital block was positive. Five proceeded to cervical discography, which was positive in three and negative in two. One of the latter patients subsequently proved positive to C2 spinal nerve block. For the other, a planned C3 nerve root block remains pending.

With respect to prevalence, a large proportion of patients (35%) did not undergo investigations, and a further proportion (17%) had initiated but had not yet completed investigations. As a result of these proportions, the crude prevalence of particular diagnostic entities appears low (Table 4). However, if those patients who did not undergo or did not complete investigations are censored, the adjusted prevalences become more informative (Table 4).

Among the patients who completed controlled blocks or more than one invasive test, a pathoanatomic diagnosis remained elusive in only 17%. In the remainder, a diagnosis was forthcoming. Fifty-five percent of patients had zygapophysial joint pain, and 9% had lateral atlanto-axial joint pain. A further 16% had discogenic pain. In those patients in whom medial branch blocks were undertaken and completed, a positive diagnosis emerged in 50%. For lateral atlanto-axial joint blocks, the yield was 22%, and for discography it was 77%, but the 95% confidence intervals of these latter two yields are large, because of the small number of patients tested.

In the sample who completed investigations, compound diagnoses were uncommon. Among the 35 patients with positive responses to controlled medial branch blocks, 5 had concurrent sources of pain. One had neck pain that was relieved by medial branch blocks, but also had lower cervical radicular pain. Four patients had headache that was relieved by blocks, but one

Table 3 Reasons for patients with neck pain not undergoing investigations with diagnostic blocks or discography

Investigations not indicated	
Psychiatric history and seeking drugs	1
Could not tolerate position	1
Minimal symptoms	8
Investigations not undertaken	
Insurance permission denied	3
Insurer approved, but patient deferred	8
Patient declined	
No reason given or recorded	16
Could not afford fees	13

Table 4 The crude prevalence of different diagnoses of neck pain encountered in 143 patients, and the diagnostic yield of selected investigations

		Prevalence (%)		Investigations (%)	
Diagnosis	N	Crude	Adjusted	Yield	95% CI
Radicular pain	5	3			
C2 segmental pain	1	1	1.5		
Atlanto-occipital joint pain	1	1	1.5		
Lateral atlanto-axial joint pain	6	4	9	22	3–41
Zygapophysial joint pain	35	24	55	50	38–62
Discogenic pain	10	7	16	77	54–100
Negative or unknown	11	8	17		
Investigations incomplete	24	17			
Not investigated	50	35			

For the crude prevalence, the denominator is the total number of patients who presented with neck pain (143), including five with radicular pain. For the adjusted prevalence, the denominator is the total number of patients in whom investigations were complete (64). The yield of investigations is the proportion of positive responses in patients in whom the investigation was undertaken and completed.

had lower cervical radicular pain, one had complex regional pain syndrome affecting the upper limb, and two had lower neck pain that was positive to discography. Their responses to discography are not included in Figure 1.

Discussion

An initially disturbing result of the present study was the large proportion of patients (35%) who did not undergo investigations. Concern about that proportion diminishes, however, once the reasons are reviewed. In 10 cases (7%), investigations were not indicated. In three cases (2%) the insurer denied payment. A further 13 insured patients (9%) were prepared to be investigated but could not afford the gap fees. Thus, financial limitations accounted for one-third of the patients who did not pursue investigations. The remaining 24 patients (17%) sought to defer investigations or declined without offering a reason. The data available from their records did not indicate whether these patients might be afraid of needles, or were reluctant to have their complaint of neck pain challenged by an objective test, or felt that their pain was not sufficiently severe to warrant invasive tests. Nevertheless, this latter group constituted a distinct minority (17%) of the presenting cases.

The patients who did undergo investigations provided results that are salutary and encouraging. A patho-anatomic diagnosis could not be established in only 25% of the sample who presented with neck pain. This contradicts the unpublished, but widely held, view that it is difficult, if not impossible, to make a patho-anatomic diagnosis of neck pain.

In the sample studied, radicular pain was uncommon, having a prevalence of 3%. This may reflect a referral bias, in that patients with radicular pain are sent from primary care to neurosurgeons, neurologists, or orthopaedic surgeons, instead of to the pain clinic under study. However, there are no published figures on the prevalence of cervical radicular pain, with which to compare this 3% prevalence. Cervical radicular pain may well be uncommon.

A study conducted in a neck pain clinic within a rheumatology department in Britain provides some comparative figures [27]. In that study, a small proportion of patients presenting with neck pain were found to have extraneous conditions, such as ear disorders and shoulder problems, which were not encountered in the present study (Table 5). The British study found a similar proportion of patients with thoracic spinal pain, somewhat fewer patients with principally low back pain, and a slightly higher, but nonetheless small proportion of patients with radicular pain. Common to both studies was a large proportion of patients with neck pain for which no diagnosis was evident on history and examination. This similarity confers some degree of external validity to the present study.

In the British study, however, a diagnosis was not pursued using invasive procedures. Doing so in the present study allowed a further diagnosis to be refined in over 60% of those patients who pursued investigations, and in over 80% of those who completed investigations (Tables 4 and 5).

The singular most common diagnosis in the present study was zygapophysial joint pain. It occurred in 55% of patients in whom investigations were undertaken and completed. This prevalence constitutes a worst-case estimate, because not all patients were investigated and not all patients completed investigation. In that regard,

Table 5 Diagnoses and their prevalence established in patients presenting with neck pain in a British study [27] and the present study

	British Study		Present Study (US)	
	N	%	N	%
Spasmodic torticollis	1	0.6		
Fracture	1	0.6		
Lymphoma	1	0.6		
Ear disorders	4	2.3		
Shoulder problem	6	3.5		
Miscellaneous	4	2.3	4	2.4
Carpal tunnel syndrome	5	2.9	1	0.6
Rheumatoid arthritis	1	0.6	1	0.6
Low back pain	6	3.5	14	8.4
Thoracic spinal pain	3	1.7	4	2.4
Radicular pain	19	11.0	5	3.0
Idiopathic neck pain	122	71	138	83
Investigations not done			50	36
Investigations incomplete			24	17
Investigations completed			64	46
Zygapophysial joint pain			35	55
Discogenic pain			10	16
Lateral atlanto-axial joint pain			6	9
Atlanto-occipital joint pain			1	1
C2 nerve root			1	1
Diagnosis elusive			11	17

The prevalence of specific entities has been calculated as the proportion of the number of patients (64) in whom investigations were undertaken and completed.

the prevalence is greater than that encountered in one other study that was conducted in a private practice, and in which many patients did not complete investigations [9]. Otherwise, the observed prevalence matches the prevalence (50–60%) reported in studies from academic centers [7,8], in which all patients completed investigations.

Lateral atlanto-axial joint blocks were undertaken judiciously in the present study. They were reserved only for patients with occipital headache, either before or after medial branch blocks. Among the few patients with headache who did not complete investigations or who were still under investigation, there might be some who would be positive to lateral atlanto-axial joint blocks. These patients might increase the observed prevalence of lateral atlanto-axial joint pain, although perhaps not substantially. The yield from lateral atlanto-axial joint blocks (22%) in 18 patients is less than that (60%) found in 34 patients in the only other study to have reported the yield from lateral atlanto-axial joint blocks [21]. This difference raises the question of just how common lateral atlanto-axial joint pain is. No studies have yet addressed that question in a concerted manner.

The prevalence of discogenic pain observed in the present study (16%) is low, and probably underestimates the prevalence of cervical discogenic pain both in the general community and in pain clinical samples. Discography was performed in only three of the 30 patients for whom a diagnosis of zygapophysial joint pain was not established. In the remainder, investigations were concluded after medial branch blocks, atlanto-axial joint blocks, or both, proved negative. Among these 27 patients could have been a proportion that might have proved positive to discography. The present data therefore allow the prevalence of cervical discogenic pain possibly to be up to 45%.

Some surgeons who see and treat patients with neck pain do not use discography to establish a diagnosis of discogenic pain. They rely instead on imaging abnormalities, and do not refer patients for invasive tests. Notionally, therefore, it might seem possible that a nonreferral bias might have reduced the number of patients with discogenic pain in the present study. However, morphological changes on MRI do not correlate with discography and are thus not diagnostic of cervical discogenic pain [28,29]. Therefore, those patients who might have been retained by spine surgeons, with a presumptive diagnosis of discogenic pain, might not actually have discogenic pain. Their absence may not significantly affect the prevalence estimates of the present study.

However, the present study was not designed to establish the prevalence of various causes of neck pain in the general community, or even a particular sample of that community. That prevalence is affected by the nature of the population studied and by referral patterns. Rather, the objective of the present study was to demonstrate the extent to which an anatomical diagnosis could be established if minimally invasive diagnostic tests are used in accordance with validated standards. In that regard, it succeeded. It shows that a diagnosis can be established in over 80% of cases if invasive tests are used. That figure might have been higher if all patients had pursued investigations to completion.

This study provides, for the first time, evidence stemming from a nonacademic practice on the relative prevalence of different sources of neck pain. Having used controlled, diagnostic blocks, it reaffirms that the cervical zygapophysial joints are a common source of chronic neck pain. These results invite confirmation or refutation, by similar studies. In the meantime, the present study provides a prima facie basis for practitioners to pursue an anatomical basis for chronic neck pain, instead of believing it to be an undiagnosable disorder.

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