



Atypical presentation and outcome of cervicogenic headache in patients with cervical degenerative disease: A single-center experience



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ABSTRACT

Objective: Cervicogenic headache affects a significant portion of the entire population. This type of headache especially with atypical presentation is often hard to diagnose and manage since its etiopathophysiology is not been yet well understood. We have investigated the prevalence of cervicogenic headache with atypical presentation and discussed the etiology of it, and the outcome of surgical intervention on this type of headache in patients with cervical degenerative disease.

Patients and methods: Radiological and clinical data of 160 patients (from 2001 through 2016) were retrospectively reviewed. Significant differences between the groups were determined by chi-square test. Logistic regression analysis was performed to identify the predictors of unfavorable outcome.

Results: In this study, 10% of the patients had atypical presentation of cervicogenic headache. In overall cohort, after surgical intervention, there was significant improvement in symptoms and pain control, whether the presentation is typical or atypical. Sixty-one percent of the patients had no complaints, and 90% of the patients were headache-free ($p < 0.0001$). Sixty-nine percent of the patients were free of neck, shoulder and extremity pain, and visual analogue scale pain score was reduced by 7 points (pre-op, 8.4 vs. last follow-up, 1.5, $p < 0.0001$). However, number of patients with reduced headache was significantly higher in the group with typical presentation of headache (90.1%) compared to group with atypical (80%) presentation, $p = 0.04$. In this study, female gender, smoking, obesity and depression were identified as predictors of overall unfavourable outcome. In addition, in a separate analysis, smoking and depression were revealed as risk factors for persistent headache.

Conclusions: A notable portion of patients with cervicogenic headache can have an atypical presentation mimicking a primary type headache. However, cervicogenic headaches with atypical presentation can be difficult to diagnose and manage at the initial visit of the patients. Etiopathophysiology of this type of headache could be explained by the theories including discogenic, convergence and sensitization-desensitization theories. When cervicogenic headache is accompanied with CDD, performing ACDF or laminectomy would be the treatment of choice. Surgical intervention can also relieve the accompanying neck, shoulder and extremity pain with minimal complications. Lastly, outcomes of surgical intervention depend on the patients' morbidities including obesity, smoking and depression.

1. Introduction

Headache is a major health concern and the most prevalent (66%) pain disorder in the worldwide population [1]. It interferes with quality of life, reduces work productivity and increases health care costs [2]. The International Headache Society has classified and sub-classified headaches based on their characteristics and sources. Thirty-eight percent of all headaches are tension headaches, the most common

type. Ten percent of headaches are migraines; three percent are chronic daily headaches; and 2.5–4.1% are CGH [3]. Cervicogenic headache (CGH) is a syndrome characterized by chronic pain that originates from bony structures or soft tissues of the neck and is referred to the head [4]. Cervicogenic headache is considerably less common than other types of headache and has not received as much attention, it can disrupt quality of life and work productivity like a migraine or tension headache [5]. Although there are some established criteria for CGH,

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it can occasionally present with symptoms of primary headache. Therefore, it is a diagnostic challenge to differentiate CGH from other forms of headache, and it has been reported that incorrect headache diagnosis may occur in more than 50% of cases of complicated headache [6,7]. Furthermore, there is no general consensus for the treatment of CGH. This study retrospectively reviews the atypical presentation of CGH in patients with cervical degenerative disease (CDD) and the outcome of the headache after treatment of CDD.

2. Method and materials

The present study was performed after approval by the Institutional Review Board. Information related to clinical history, neuroimaging, surgical procedure (laminectomy and anterior cervical discectomy and fusion, ACDF) and outcomes of patients with CDD from January 2001 through June 2016 was collected retrospectively by review of each patient's case notes, follow-up chart and radiology reports. Data was from multiple surgeons' cases of a single institution.

3. Patients' selection

We have followed the International Headache Society criteria to diagnose and include patients with CGH.

3.1. Inclusion criteria

3.1.1. Evidence of causation of headache demonstrated by the following criteria

3.1.1.1. Definition of typical cervicogenic headache.

- A Any headache fulfilling criterion C
- B Clinical, laboratory and/or imaging evidence of a disorder or lesion within the cervical spine or soft tissues of the neck, known to be able to cause headache.
- C Evidence of causation demonstrated by at least two of the following:
 - 1) Headache has developed in temporal relation to the onset of the cervical disorder or appearance of the lesion.
 - 2) Headache has significantly improved or resolved in parallel with improvement in or resolution of the cervical disorder or lesion.
 - 3) Cervical range of motion is reduced and headache is made significantly worse by provocative manoeuvres.
- D Not better accounted for by another International Classification of Headache Disorders-3 (ICHD-3) diagnosis.

3.1.2. Atypical cervicogenic headache

1. Headache which is mimicking primary type headache presentation (migraine, tension and cluster) in addition to typical cervicogenic criteria as per International Headache Society (third edition).
2. Not meeting any criterion of primary or secondary headache.

A total of 2676 cases with CDD underwent either laminectomy or ACDF between 2001 and 2016. Of the 2676 patients with CDD, only 160 (6%) patients presented with CGH. Among those 160 patients, 144 (90%) patients had typical clinical presentation of CGH. Sixteen (10%) patients had atypical presentation of headache, mimicking either migraine or tension headache. (Table 1, Fig. 1)

The treatment protocol in these patients was based on the MRI findings. Surgical intervention was offered only after failed conservative treatment. The decision between ACDF or laminectomy was based on the standard recommended criteria e.g, ACDF for single level or double level disc protrusion, and laminectomy for multiple level in elderly or canal stenosis etc. The surgical procedure performed was mostly individualized to every patient based on MRI findings and performance status.

Table 1
Patients' demographics in cervicogenic headache.

Variables	Value	Cervicogenic Headache		P value
		Atypical presentation	Typical presentation	
Total patients	160	16 (10%)	144 (90%)	
Age				
Median	57			
Range	29–81			
Gender				
Male	61 (38%)	7 (11.5%)	54 (88.5%)	NS
Female	99 (62%)	9 (9%)	90 (91%)	
Ethnicity				
Caucasians	129 (80.6%)	13 (10%)	116 (90%)	NS
African Americans	31 (19.4%)	3 (10%)	28 (90%)	
Diagnosis				NS
Stenosis	72 (45%)	9 (13%)	63 (87%)	
Disc prolapse	88 (55%)	7 (8%)	81 (92%)	
Level				
Single	86 (54%)	7 (8%)	79 (92%)	
Multiple	74 (46%)	9 (12%)	65 (88%)	
Upper	14 (8.8%)	1 (7%)	13 (93%)	
Lower	120 (75%)	11 (9%)	109 (91%)	
Both	26 (16.2%)	4 (15.5%)	22 (84.5%)	
Pre-headache score (mean, range)	8.4 (7–10)			

3.2. Follow-up

Neuroimaging studies were done at 6-month intervals in the first year of treatment and annually thereafter. Detailed neurological examination to demonstrate the improvement or worsening of pre-existing signs and symptoms, development of any new signs and symptoms, and any change in MRI images. The median duration of follow-up was 45 months (3–194 months).

3.3. Statistical analysis

The analysis was performed using Statistical Package for Social Sciences (SPSS) software, version 24.0 (IBM Corp., Armonk, NY). A chi-square test was used to determine the significance between the two groups. A univariate and multivariate regression analysis was performed to identify individual risk factors of unfavorable outcome after treatment. A p value of < 0.05 was considered significant.

4. Results

4.1. Patients' demographics

In this series, among the 160 patients with cervicogenic headache, 61(38%) were males, and 99 (62%) were females. One hundred and twenty-nine (80.6%) patients were Caucasians, and 31 (19.4%) were African Americans. The median age of the patients was 57 years (range, 29–81years). In this study, the cause of each intractable headache was either cervical stenosis or herniation of disc. Seventy-four (46%) patients had multiple levels of cervical lesion, and the other cases had a single level of disorder. Lesions in upper, lower and both cervical levels were 8.8%, 75% and 16.2% of the cases, respectively. Based on the level of cervical vertebrae involved, we have investigated distribution of headache. In this series, atypical presentation of headache was significantly more prevalent among patients was significantly higher in the patients with longer segment of cervical spine disorder (both upper and lower, C2-C7) compared to either upper (C1-3) or lower (C4-7) segmental lesion, $p = 0.03$, Fig. 2. The mean preoperative headache pain score was 8.4 (range 7–10), Table 1.

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