Original Article

The effectiveness of corticosteroid injection into cervical facet joint for managing whiplash-related neck pain

Seoyon Yang[1], Min Cheol Chang[2]^

[1]Department of Rehabilitation Medicine, Ewha Woman's University Seoul Hospital, Ewha Woman's University School of Medicine, Seoul, Republic of Korea; [2]Department of Rehabilitation Medicine, College of Medicine, Yeungnam University, Daegu, Republic of Korea

Contributions: (I) Conception and design: Both authors; (II) Administrative support: Both authors; (III) Provision of study materials or patients: Both authors; (IV) Collection and assembly of data: Both authors; (V) Data analysis and interpretation: Both authors; (VI) Manuscript writing: Both authors; (VII) Final approval of manuscript: Both authors.

Correspondence to: Min Cheol Chang. Department of Physical Medicine and Rehabilitation, College of Medicine, Yeungnam University 317-1, Daemyungdong, Namku, Taegu 705-717, Republic of Korea. Email: wheel633@ynu.ac.kr.

Background: Cervical facet joint (CFJ) pain is commonly seen after whiplash trauma, and is frequently refractory to physical therapy and oral medication. Previous studies have shown positive pain-reducing outcomes after intra-articular (IA) corticosteroid injection in patients with CFJ pain unrelated to injury. We evaluated the effectiveness of IA corticosteroid injection for managing whiplash-related CFJ pain.

Methods: We prospectively recruited 32 patients with chronic and persistent CFJ pain after whiplash trauma [≥3 on the Numeric Rating Scale (NRS)] despite physical therapy and oral medication. Under fluoroscopy guidance, we injected 10 mg (0.25 mL) of triamcinolone acetonide, mixed with 0.25 mL of 0.125% bupivacaine and 0.5 mL of normal saline. At 1 and 2 months after the injection, pain intensity was reassessed using the NRS.

Results: Thirty patients completed the study. The mean pretreatment NRS score was 5.4±1.7, while the mean NRS scores at 1 and 2 months after treatment were 3.9±1.7 and 4.0±1.6, respectively. The NRS scores at both follow-ups were significantly decreased compared to pretreatment scores (pretreatment *vs.* 1 month, P=0.002; pretreatment *vs.* 2 months, P=0.004). Furthermore, 8 patients (26.7%) reported pain relief of ≥50% 2 months after the treatment.

Conclusions: In clinical practice, whiplash-induced CFJ pain is often refractory to physical therapy and oral medication, and clinicians have limited options to alleviate pain. We think that IA corticosteroid injection may serve as a management option for whiplash-related CFJ pain.

Keywords: Cervical facet joint (CFJ); neck pain; whiplash trauma; chronic pain; corticosteroid injection

Submitted Feb 17, 2022. Accepted for publication Apr 14, 2022.
doi: 10.21037/apm-22-224
View this article at: https://dx.doi.org/10.21037/apm-22-224

Introduction

Neck pain after traffic collisions is frequently observed in clinical practice (1,2), attributing to more than 300 emergency department visits per 100,000 population every year. Whiplash is an injury associated with the forceful, rapid back-and-forth movement of the neck during traffic accidents (3). Whiplash-associated disorders (WADs) represent the sequelae of whiplash trauma, and include neck pain, along with other symptoms, such as headache, neck stiffness, and dizziness (4).

Neck pain is a major symptom of WADs (4). The degree of whiplash-related neck pain often ranges from moderate

^ ORCID: 0000-0002-7629-7213.

to very severe (5). The cervical facet joints (CFJs) are paired synovial joints located on the posterior aspect of the cervical vertebrae, with each joint containing synovial fluid and lined by hyaline cartilage (6). CFJs are one of the common sources of chronic whiplash-related neck pain (7,8). During a whiplash trauma, overloading of the facet joints by forceful movement can result in tearing of the joint capsule (7,8). Incomplete recovery of the injured facet joint thereby leads to chronic neck pain (7). In the management of CFJ pain, several studies have shown positive pain-reducing outcomes after intra-articular (IA) corticosteroid injection in patients with CFJ pain unrelated to injury (9-13). However, little is known about its effectiveness on whiplash-related CFJ pain. We proposed that corticosteroid injection into CFJ would be helpful for alleviating whiplash trauma-related CFJ pain.

In the current study, we evaluated the effectiveness of IA corticosteroid injection in the management of CFJ pain after whiplash trauma. We present the following article in accordance with the STROBE reporting checklist (available at https://apm.amegroups.com/article/view/10.21037/apm-22-224/rc).

Methods

Study participants

This was a prospective study conducted in Yeungnam university hospital between February 2017 and October 2020. We recruited 32 consecutive patients with chronic neck pain following a whiplash trauma according to the following criteria: (I) age between 20 and 79 years; (II) history of a traffic accident; (III) having axial cervical pain without radicular symptoms persisted for ≥3-month after the accident (the presence of radicular symptoms was determined by pain drawing and physical examination); (IV) WAD severity of Grade II (i.e., neck complaint, decreased range of motion of neck, and point tenderness) at first visit to the hospital; (V) failure to respond to oral medication and physical therapy (axial cervical pain with the severity of ≥3 on the numeric rating scale (NRS with a range from 0 to10; 0 was defined as "no pain"; 10 was defined as "worst pain imaginable"); (VI) ≥80% temporary pain relief, determined based on subjective patient-reported assessment of pain relief, following a diagnostic block with an IA injection of 0.3 mL of 2% lidocaine. This diagnostic block was performed only once for each patient. Each patient underwent cervical spine magnetic resonance imaging. Exclusion criteria included rheumatic disorders, coagulopathy, iodinated contrast allergy, cervical spine fracture, and any uncontrolled medical or psychiatric conditions.

Sample size was calculated based on a previous study (12), in which the reduction in NRS score after corticosteroid injection into the CFJ was 3.4±6.5. With a type I error of 0.05 and a power of 80%, 29 subjects were found to be necessary for our study. By considering a dropout rate of 10%, 32 subjects were recruited. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by Institutional Review Board of Yeungnam University Hospital (No. 2017-02-011) and informed consent was taken from all the patients. A putatively painful CFJ was selected on the basis of the distribution of pain (14,15).

Procedures

The procedure was conducted with the patient in prone position under the guidance of C-arm fluoroscopy scanner (Siemens), with the anterior thorax rested on 2 pillows, the neck maximally flexed, and the head turned 60–90° away from the side of injection. The C-arm tube was angled cephalad, until it was at a tangent to the CFJ space. A 26-gauge, 90 mm spinal needle was inserted parallel to the C-arm beam. To confirm appropriate placement of the needle tip, an arthrogram of the CFJ was performed by injecting 0.3 mL of contrast. After confirmation, we injected mixed solution of 10 mg (0.25 mL) of triamcinolone acetonide, 0.25 mL of 0.125% bupivacaine, and 0.5 mL of normal saline.

Outcome measures

All pretreatment and follow-up assessments were performed by an independent investigator, who is a nurse trained in the field of pain and did not participate in any of the treatment processes. Pain intensity was assessed using the NRS at in-person clinic visits. NRS scores were measured before treatment, and at 1 and 2 months after corticosteroid injection into the CFJ. We also evaluated the rate of >50% pain reduction from baseline at 2 months after the treatment.

Statistical analysis

All data were analyzed using the Statistical Package for Social Science software (SPSS, v. 22.0, IBM Corporation, Armonk, NY, USA). To assess normality of data distribution,

Table 1 The treated cervical facet joint level of each patient

Patient	Level
1	Both C2-3
2	Rt. C2-3
3	Both C2-3
4	Both C3-4
5	Lt. C6-7
6	Lt. C3-4, C4-5
7	Both C5-6, C6-7
8	Lt. C4-5, C5-6, C6-7
9	Both C2-3
10	Rt. C2-3
11	Both C3-4
12	Both C2-3
13	Both C2-3, C3-4
14	Both C3-4
15	Lt. C2-3
16	Both C5-6, C6-7
17	Both C6-7
18	Both C2-3
19	Lt. C2-3
20	Both C2-3, C3-4
21	Rt. C3-4
22	Both C2-3
23	Both C5-6, C6-7
24	Rt. C4-5, C5-6, C6-7
25	Rt. C4-5
26	Both C5-6, C6-7
27	Both C2-3
28	Lt. C2-3, C3-4
29	Lt. C2-3
30	Rt. C3-4, C4-5, C5-6

the Kolmogorov-Smirnov test was performed before the statistical analyses. All data were normally distributed. The one-factor repeated-measures analysis of variance was used to evaluate the change in NRS scores during the 1- and 2-month follow-ups. P values were adjusted using the Bonferroni multiple testing correction method. The level of statistical significance was set at $P<0.05$.

Results

Two patients were lost to follow-up for unknown reasons; therefore, 30 patients (mean age =48.6±11.2 years; M:F =13:17; mean duration from accident to corticosteroid injection =5.6±3.2 months) completed the study (*Table 1*). No adverse effects were observed after the procedure.

The mean pretreatment NRS score was 5.4±1.7, while the mean NRS scores at 1 and 2 months after treatment were 3.9±1.7 and 4.0±1.6, respectively. At both follow-ups, the NRS scores were significantly decreased compared to pretreatment scores (pretreatment *vs.* 1 month, P=0.002; pretreatment *vs.* 2 months, P=0.004; 1 *vs.* 2 months, P=1.000).

Two months after corticosteroid injection treatment, 8 patients (26.7%) reported pain relief of ≥50%.

Discussion

In this study, we found that whiplash-related chronic CFJ pain was significantly reduced at 1 and 2 months after corticosteroid injection into the CFJ, with 26.7% of the included patients demonstrating ≥50% pain reduction at 2 months after treatment.

Injury of the CFJ is one of most common source of neck pain after a whiplash trauma (7,8). Whiplash-related neck pain is frequently associated with incomplete recovery (16-18). About 50% of patients were reported to still complain of neck pain 1 year after a traffic accident (17). Additionally, chronic pain has been found to be associated with poor prognosis (19). So far, there is lack of specific interventions to effectively manage whiplash-related CFJ pain, which is often refractory to physical therapy and oral medication (20). Therefore, many patients with chronic whiplash-induced CFJ pain suffer from uncontrolled neck pain, which can affect both their activities of daily living and occupational performance (20).

Nociceptive C-fibers extensively innervate the synovial lining and capsule of the facet joint (21). Inflammation of the facet joint and the subsequent irritation of the surrounding nerve fibers are hence responsible for the occurrence of CFJ pain after a whiplash trauma (21). The anti-inflammatory properties of corticosteroids inhibit the production and release of inflammatory mediators (12). In our patients, IA corticosteroid injection could reduce such inflammation, attenuate the irritation of nociceptive

nerve fibers, and contribute to reduction in CFJ pain. However, during CFJ injection, various complications, such as hematoma, spinal cord irritation, and infection, can be occurred (22). Clinicians should pay attention to the occurrence of these adverse effects when performing corticosteroid injection into CFJ. So far, many studies have reported the effectiveness of IA corticosteroid injection for the control of CFJ pain (9-13). However, these studies did not include patients with CFJ pain secondary to whiplash trauma. Only one study by Barnsley *et al.* (23) evaluated the effectiveness of intra-facet corticosteroid injection on whiplash-related CFJ pain. In contrast to previous studies (9-13), Barnsley *et al.* (23) reported that corticosteroid injection into the CFJ could not effectively manage whiplash-related CFJ pain. In their study, less than 20% of patients reported relief of whiplash-related neck pain for a duration of >1 month. The major difference between this study and ours was the pain duration at baseline. While median duration of neck pain in their study was 52 months, the average duration of neck pain in our patients was 5.6 months. Therefore, it is more likely that the study by Barnsley *et al.* included patients with more severe CFJ injuries. In addition, by statistical analysis, we evaluated the change in NRS scores of CFJ pain following treatment at two time points (1 and 2 months after treatment), while Barnsley *et al.* only evaluated the time taken to return to 50% of the pre-treatment degree of pain. Therefore, the measured treatment outcomes of their study and ours are vastly different.

Our study has several limitations to be considered. First, this study was conducted without a control group. Second, the number of included patients was relatively small. Third, the follow-up period was relatively short. Fourth, we did not evaluate functional improvement after the treatment. Lastly, the injected corticosteroid can potentially leak out of the CFJ, which could have prevented us from evaluating the effect of IA corticosteroid injection accurately. In the future, further studies compensating our limitations are required.

Conclusions

In the current study, although only 26.7% of patients showed ≥50% pain reduction at 2 months after IA corticosteroid injection, CFJ pain was significantly reduced for at least 3 months after the procedure. In clinical practice, whiplash-induced CFJ pain is often refractory to physical therapy and oral medication, and clinicians have limited options to alleviate pain. Therefore, we think that IA corticosteroid injection would be worth considering as a management option for whiplash-related CFJ pain.

Acknowledgments

Funding: This work was supported by a National Research Foundation of Korea grand funded by the Korean government (grant No. NRF-2019M3E5D1A02068106).

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://apm.amegroups.com/article/view/10.21037/apm-22-224/rc

Data Sharing Statement: Available at https://apm.amegroups.com/article/view/10.21037/apm-22-224/dss

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at https://apm.amegroups.com/article/view/10.21037/apm-22-224/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by Institutional Review Board of Yeungnam University Hospital (No. 2017-02-011) and informed consent was taken from all the patients.

References

1. Alalawi A, Evans DW, Liew B, et al. Does Pain Extent Predict Ongoing Pain and Disability in Patients with Chronic Whiplash-Associated Disorders? J Clin Med

2022;11:555.
2. Anarte-Lazo E, Bernal-Utrera C, Montaño-Ocaña J, et al. Higher Neck Pain Intensity and the Presence of Psychosocial Factors are More Likely when Headache is Present After Whiplash Associated Disorders: A Case-Control Study. Pain Med 2022. [Epub ahead of print]. doi: 10.1093/pm/pnac038.
3. Lee SH, Park HJ, Kim HT, et al. Efficacy of acupuncture for whiplash injury: A protocol for systematic review and meta-analysis. Medicine (Baltimore) 2021;100:e27767.
4. Alalawi A, Mazaheri M, Gallina A, et al. Are Measures of Physical Function of the Neck Region Associated With Poor Prognosis Following a Whiplash Trauma?: A Systematic Review. Clin J Pain 2021;38:208-21.
5. Elliott JM, Noteboom JT, Flynn TW, et al. Characterization of acute and chronic whiplash-associated disorders. J Orthop Sports Phys Ther 2009;39:312-23.
6. Kirpalani D, Mitra R. Cervical facet joint dysfunction: a review. Arch Phys Med Rehabil 2008;89:770-4.
7. Pearson AM, Ivancic PC, Ito S, et al. Facet joint kinematics and injury mechanisms during simulated whiplash. Spine (Phila Pa 1976) 2004;29:390-7.
8. Quinn KP, Dong L, Golder FJ, et al. Neuronal hyperexcitability in the dorsal horn after painful facet joint injury. Pain 2010;151:414-21.
9. Dory MA. Arthrography of the cervical facet joints. Radiology 1983;148:379-82.
10. Dussault RG, Nicolet VM. Cervical facet joint arthrography. J Can Assoc Radiol 1985;36:79-80.
11. Hove B, Gyldensted C. Cervical analgesic facet joint arthrography. Neuroradiology 1990;32:456-9.
12. Lim JW, Cho YW, Lee DG, et al. Comparison of Intraarticular Pulsed Radiofrequency and Intraarticular Corticosteroid Injection for Management of Cervical Facet Joint Pain. Pain Physician 2017;20:E961-7.
13. Roy DF, Fleury J, Fontaine SB, et al. Clinical evaluation of cervical facet joint infiltration. Can Assoc Radiol J 1988;39:118-20.
14. Aprill C, Dwyer A, Bogduk N. Cervical zygapophyseal joint pain patterns. II: A clinical evaluation. Spine (Phila Pa 1976) 1990;15:458-61.
15. Dwyer A, Aprill C, Bogduk N. Cervical zygapophyseal joint pain patterns. I: A study in normal volunteers. Spine (Phila Pa 1976) 1990;15:453-7.
16. Côté P, Cassidy JD, Carroll L, et al. A systematic review of the prognosis of acute whiplash and a new conceptual framework to synthesize the literature. Spine (Phila Pa 1976) 2001;26:E445-58.
17. Kamper SJ, Rebbeck TJ, Maher CG, et al. Course and prognostic factors of whiplash: a systematic review and meta-analysis. Pain 2008;138:617-29.
18. Ritchie C, Sterling M. Recovery Pathways and Prognosis After Whiplash Injury. J Orthop Sports Phys Ther 2016;46:851-61.
19. Tunks ER, Crook J, Weir R. Epidemiology of chronic pain with psychological comorbidity: prevalence, risk, course, and prognosis. Can J Psychiatry 2008;53:224-34.
20. Bono G, Antonaci F, Ghirmai S, et al. Whiplash injuries: clinical picture and diagnostic work-up. Clin Exp Rheumatol 2000;18:S23-8.
21. Chen C, Lu Y, Kallakuri S, et al. Distribution of A-delta and C-fiber receptors in the cervical facet joint capsule and their response to stretch. J Bone Joint Surg Am 2006;88:1807-16.
22. Manchikanti L, Malla Y, Wargo BW, et al. Complications of fluoroscopically directed facet joint nerve blocks: a prospective evaluation of 7,500 episodes with 43,000 nerve blocks. Pain Physician 2012;15:E143-50.
23. Barnsley L, Lord SM, Wallis BJ, et al. Lack of effect of intraarticular corticosteroids for chronic pain in the cervical zygapophyseal joints. N Engl J Med 1994;330:1047-50.

Cite this article as: Yang S, Chang MC. The effectiveness of corticosteroid injection into cervical facet joint for managing whiplash-related neck pain. Ann Palliat Med 2022;11(8):2569-2573. doi: 10.21037/apm-22-224

