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Systematic Review

A Systematic Review of Anesthetic, Saline and Dry Needling Injections for Headache Patients

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ABSTRACT

Objectives
Earlier literature provided evidence of neck pain relief *via* cervical trigger point injections with anesthetic agents. However, recent evidence suggests that intramuscular or paraspinal cervical injections with local anesthetic may provide relief for various types of headaches and orofacial pain as well. The primary purpose of this systematic review was to determine whether a cohort of retrospective case studies and randomized controlled trials using paraspinal cervical or intramuscular anesthetic injections were associated with a decrease in headache and orofacial pain.

Methods
A systematic review of the literature was performed to observe the association between headache or orofacial pain relief and paraspinal cervical injections with various pain-relieving agents. Literature searches using the key terms "*headaches*", "*paraspinous cervical injections*", "*neck/intramuscular injections*" and "*orofacial pain*" were performed in PubMed, Google Scholar, and Scopus. We implemented the preferred reporting items for systematic reviews and meta-analyses (PRISMA) format for the systematic review.

Results
Initially, four hundred forty articles were located during the systematic review. Five total articles were selected for review and 435 were excluded because they did not meet search criteria. Another two relevant articles were found during manual searches within references of the systematic review. The seven studies included were retrospective case studies involving patients with headaches or orofacial pain who received paraspinal cervical or other intramuscular injections. A total of 841 patients' data were tallied from the 7 articles and 683 of those patients received anesthetic injections. Significant pain relief due to intramuscular or paraspinal cervical injections was observed in 83.7% of the patients.

Conclusion
Our systematic review of association between headache or orofacial pain relief and paraspinal cervical injections with various pain-relieving agents demonstrated a frequency of headache and orofacial pain relief of 83.7%. Such a large percentage compared to a robust placebo study provides promising evidence that this treatment may have a therapeutic role in the management of headache and orofacial pain. Despite limitations faced in performing our systematic review, it seems quite clear that pain relief for these headache patients can be attributed to intramuscular anesthetic or dry needling injections. While larger prospective studies should be performed regarding specific location and anesthetic, our systematic review provides additional evidence that anesthetic intramuscular and dry needling injections provide pain relief intension-type headaches (TTH), migraine headaches, cervicogenic headache pain, and orofacial pain.

Keywords
Headache; Cervical injections; Orofacial pain; Dry needling; Saline injections; Paraspinous injections.

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INTRODUCTION

Headaches are one of the most common patient complaints in medicine and on their basis of origin and character occur in a variety of categories. The International Classification of Headache Disorders (IDCH) has 14 different classes of headaches, with 4 being categorized as primary conditions and 10 falling under secondary headaches.[1] Specifically, a high prevalence of migraine, cervicogenic, and tension-type headaches (TTH) have been attributed to tightening of specific myofascial areas known as trigger points.[2,3] Due to their high prevalence and clinical importance, it is important to determine effective and efficient therapeutic interventions to reduce trigger point associated headaches. In recent years, clinical trials and case studies have suggested paraspinal and intramuscular injection with a variety of anesthetics may reduce a spectrum of headache pains.[2,4] However, no extensive systematic review has been performed to compare the various myofascial injection procedures and medications used as treatment for the varying headache classes and myofascial disorders of the head. We performed a systematic review of the literature to determine the frequency of reported pain relief after pericranial intramuscular or paraspinal cervical injections, and to decipher if the specific procedure performed (i.e., dry needle, saline or anesthetic injection), and specific anesthetic drugs used for treatment demonstrated any difference in effectiveness.

METHODS

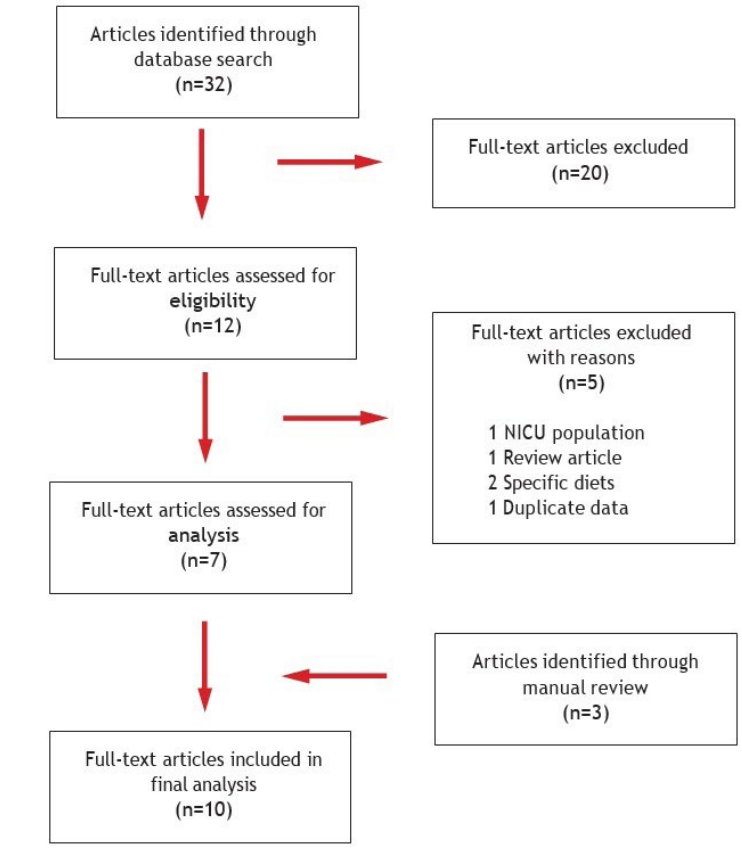
Literature Search

Literature searches using the key terms "*headaches*", "*paraspinous/cervical injections*", "*neck/intramuscular injections*", "*myofascial injections*", "*pericranial injections*", "*trigger point injections*", "*lidocaine*", "*bupivacaine*", "*myofascial pain syndrome*", "*anesthetic injections*" and "*oral/facial pain*" were performed in PubMed, Google Scholar, and Scopus. We implemented the preferred reporting items for systematic reviews and meta-analyses (PRISMA) format for the systematic review. We screened articles for final review using the Rayyan Systematic Review Software. In addition, we also reviewed any relating articles within the references of those we included to maximize search efforts (Figure 1).

Exclusion/Inclusion Criteria

Inclusion criteria were English language case series of patients over 18-years of age presenting to the clinic with a primary headache or myofascial orofacial pain who were administered local anesthetic paraspinal, intramuscular, pericranial, or myofascial injections for treatment. Exclusion criteria were studies that included pediatrics, administered nerve blocks, intravenous (IV)/catheter anesthetics, or any other form of administration besides injections for treatment of headache or orofacial pain. In addition, articles were ex-

Figure 1. *Search Strategy to Identify and Select Articles for Systematic Review about Parenteral Diarrhea and Urinary Tract Infection*



cluded if the drug used was not local anesthesia (e.g., monoclonal antibody), if other therapy was used in addition to injection, or if the population was suffering from pain besides headache. The articles were reviewed independently by one junior author and two senior authors.

Study Selections

The systematic review originally located four hundred forty articles based on our search terms. Sixteen articles were selected for review of which eleven were excluded due to a variety of reasons including patient age, injection site, and medication administered. Two additional articles were found in a manual review of paper references. A total of 7 articles matched our search criteria for the systematic review.

RESULTS

The articles located in the review were retrospective cohort or prospective case control studies that compared self-reported pain relief with a variety of anesthetic injections in patients with migraine, TTH, or generalized cervicogenic headache pain.[4-10] A total of 841 patients with headache pain were reported in the 7 studies with 683 receiving anesthetic injections. Other patients either received dry needling therapy or saline injections in the same trigger point locations.[4-10]

Results of the studies reporting pain relief in the included headache patients are shown in Table 1. Overall, 61.3% (419/683) of patients who received a trigger point or cervical intramuscular injection of lidocaine, bupivacaine, or ropivacaine noticed full pain relief shortly after injection.[4-10] In addition, another 22.4% of patients experienced partial relief with anesthetic injections in the same location; thus, 83.7% of patients who received anesthetic injections for TTH, migraine, or cervicogenic headaches reported relief shortly after treatment. In comparison, only 37% of patients with the exact same symptoms who received saline injections in the same intramuscular locations saw relief after treatment, showing significantly less pain relief than those who received anesthetics (p=0.0061). Additionally, 93% of the 44 patients who received dry needling in the studies for similar symptoms saw relief. There was no association between the number of injection points and relief reports for patients. While lidocaine was the most common choice of anesthetic in our included studies (4 of 7 studies), ropivacaine and bupivacaine were used in the larger studies with the greatest numbers of patients (85%). Nevertheless, reported pain relief was similar and there were no statistically significant differences between anesthetic type and pain relief when calculated with analysis of variance (ANOVA) analysis (p=0.129).

DISCUSSION

The goal of our systematic review was to determine the frequency of reported TTH, migraine, and cervicogenic headache relief after administration of intramuscular cervical or myofascial trigger point anesthetic injections. In the study by de Craen et al[11] the reported placebo effect of injections on migraine relief was 32.4%. In our systematic review complete or partial headache and orofacial pain relief was 83.7% for those receiving anesthetic injections. Additionally, the comparison between placebo groups receiving saline trigger point injections with those receiving anesthetic injections also reveals the effectiveness of such methods in reported relief of headache patients.

Even though lidocaine was used most often, there did not seem to be a distinguishable difference in effectiveness between anesthetic type. This result, combined with the lower relief reported with placebo saline trials, suggests that such intramuscular injections with anesthetics provide relief due to their common effect in sodium channels of neurons to prevent depolarization.[5,12] In all studies, no other form of pain relief was administered during trial which appears to further strengthen evidence of an association between anesthetic intramuscular injections and headache relief. The specific mechanism regarding bupivacaine in headache relief is yet to be determined, but evidence suggests an antinociceptive effect on the trigeminocervical complex may be part of the pathway in addition to reduction of the second order neuron cell activity.[13-15] Both the cervical and trigeminal afferents are known to converge at the brainstem, and the periaqueductal gray (PAG), nucleus raphe magnus, and the rostroventral medulla also synapse the trigeminocervical complex, providing a strong antinociceptive effect. This complex may serve as the drug target.[16-19] However, further investigations are needed to to determine the exact mechanism of action in such pain relief.

LIMITATIONS

The most prevalent limitation in the studies found in our systematic review was the lack of follow-up after the trial to determine how long anesthetic treatment was truly effective. In addition, these were retrospective studies and relied upon patient reporting which can be subjective and vulnerable to variability as it is challenging to create a standard basis of relief. Most studies reported using lidocaine as the anesthetic of choice, while the largest retrospective studies used bupivacaine. This did not provide as wide a variety of differences between anesthetics and relief as we had hoped to compare initially in our review.

The retrospective reviews included in this systematic review did not all report a placebo group. Thus, an effective placebo effect could not be reported in our study. However, a 22 trial meta-analysis regarding placebo effect in headache treatment published in 2000 showed that after two-hours 25.7% of the oral placebo patients self-reported no or mild headache severity compared to 32.4% of those receiving subcutaneous placebo.[11]

Lastly, there was also some variability between studies regarding injection point sites. While all studies either implemented pericranial trigger point or paraspinous cervical intramuscular injections, the number of injections and exact location changed depending on the study and headache location. This study assumes that regardless of the muscle groups injected on the head or neck the pain relief mechanism is the same, and it is likely that the same central nervous system pain relief mechanisms are occurring in both pericranial and paraspinous muscular injections.

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Table 1. *Results of the Studies Reporting Pain Relief in the Included Headache Patients*

Authors	Patient Total	Patients with Anesthetic	Patients with Anesthetic (Full Relief)	Patients with Anesthetic (Partial Relief)	Patients with Anesthetic (No Relief)	Patients with Dry Needling/ Other	Patients with Dry Needling/ Other (Full Relief)	Patients with Dry Needling/ Other (Partial Relief)	Patients with Dry Needling/ Other (No Relief)	Patients with Control	Patients with Control (Full Relief)	Patients with Control (Partial Relief)	Patients with Control (No Relief)	Medication Type	Injection Point	L	B	R
Venâncio Rde et al[6]	45	30 (with and w/o vasoconstrictor)	13	2	0	15	12	3	0	0	N/A	N/A	N/A	Lidocaine	3 trigger points variable per patient	0.28	0.64	0.17
García-Leiva et al[7]	52	52	9	19	22 <10 % relief	0	0	0	0	0	N/A	N/A	N/A	Ropivicaine	4 trigger points (temporal most common)	0.36	0.65	
Mellick et al[4]	417	417	271	85	61	0	0	0	0	0	0	0	0	0.5% Bupivicaine	lower cervical paraspinous	0.17		
Sabatke et al[8]	47	17	17	0	0	14	0	14	0	16	0	16	0	Lidcocaine	Temporal trigger points	0.25		
Mellick et al[9]	114	114	75	32	7	0	0	0	0	0	0	0	0	Bupivicaine	lower cervical paraspinous	0.27	0.65	0.17
Karadaş et al[5]	108	27	19	4	4	0	0	0	0	27	10	4	13	Lidocaine	6 trigger points	0.65		
Hong[10]	58	26	15	11	0	15	0	15	0	0	0	0	0	Lidocaine	1 trigger point	0.17		

CONCLUSION

Despite such limitations, our systematic review demonstrated a reported frequency of headache and orofacial pain relief of 83.7%. Such a large percentage compared to a robust placebo study provides promising evidence that this treatment may have a therapeutic role in the management of headache pain. While more studies should be performed regarding specific location and anesthetic, our systematic review provides additional evidence that anesthetic intramuscular and dry needling injections provide pain relief in TTH, migraines, cervicogenic headache pain, and orofacial pain.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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