

Office Injections for Headaches

Dr Yasmine Hoydonckx MD, FIPP

Assistant Professor

Staff Anesthesiologist and Pain Physician

Department of Anesthesia and Pain Medicine

Toronto Western Hospital

University of Toronto

Conflict of Interest

- None

Objectives

- Briefly categorize headache disorders
- Discuss office-based interventions for headaches
- Provide evidence supporting office-based headache injections and interventional options
- Discuss appropriate patient selection and procedural details

Headache by numbers

- Headache is widely prevalent in the general population
- Lifelong prevalence of any headache is **96%**, with women predominating
- Global prevalence of tension-type headache is **40%** and migraine **10%**
- Cluster headache is less common but affects still 0.1% of population
- Worldwide prevalence of chronic daily headache is **3% - 5%**, with migraine the most common type
- Despite pharmacological revolution ... Intractable headaches continue to exist → Need for Interventional treatment

ICHD-3



- International Classification of Headache Disorders, edition 3
- Proposed by International Headache Society
- Most current knowledge in headache clinical presentation, etiology and pathogenesis

Headache Classification Committee of the International Headache Society (IHS)
The International Classification of Headache Disorders, 3rd edition. Cephalalgia. 2018 Jan;38(1):1-211.

The Classification of headaches

- Part I: The primary headaches
- Part II: The secondary headaches
- Part III: Neuropathies & Facial Pains and other headaches
- Part IV: Appendix

Headache Classification Committee of the International Headache Society (IHS)
The International Classification of Headache Disorders, 3rd edition. Cephalalgia. 2018 Jan;38(1):1-211.

The Classification of Primary headaches

1. Migraine
 - a. Migraine with or without aura
 - b. Chronic migraine
2. Tension-type headache: episodic vs chronic
3. Trigeminal autonomic cephalalgias (TACs)
 - a. Cluster headache: episodic vs chronic
 - b. Paroxysmal hemicrania continua: episodic vs chronic
 - c. Short-lasting unilateral neuralgiform attacks:
 - * SUNA: episodic vs chronic
 - * SUNCT: episodic vs chronic
 - d. Hemicrania continua
 - remitting vs unremitting
4. Other primary headache disorders

Headache Classification Committee of the International Headache Society (IHS)

The International Classification of Headache Disorders, 3rd edition. Cephalalgia. 2018 Jan;38(1):1-211.

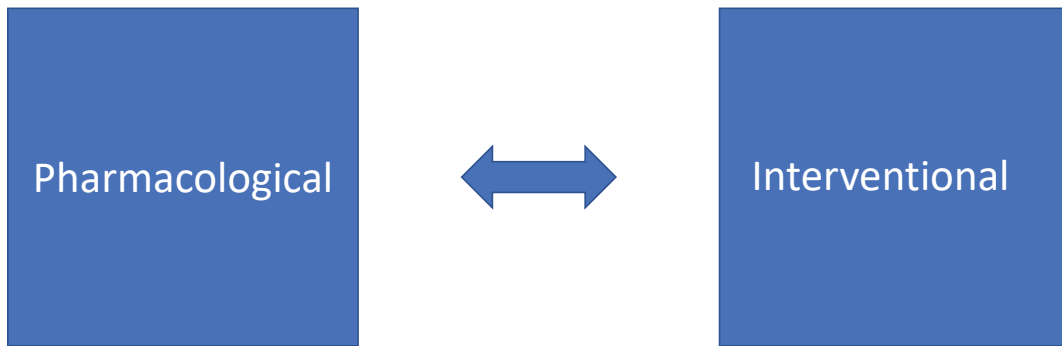
The Classification of Primary headaches

1. Migraine
 - a. Migraine with or without aura
 - b. Chronic migraine
2. Tension-type headache: episodic vs chronic
3. Trigeminal autonomic cephalalgias (TACs)
 - a. Cluster headache: episodic vs chronic
 - b. Paroxysmal hemicrania continua: episodic vs chronic
 - c. Short-lasting unilateral neuralgiform attacks:
 - * SUNA: episodic vs chronic
 - * SUNCT: episodic vs chronic
 - d. Hemicrania continua
 - remitting vs unremitting
4. Other primary headache disorders

Headache Classification Committee of the International Headache Society (IHS)

The International Classification of Headache Disorders, 3rd edition. Cephalalgia. 2018 Jan;38(1):1-211.

Treatment



Challenge

- Despite significant pharmacological improvement, there is ongoing suffering due to:
 - Ineffective treatments
 - Intolerable side—effects
- These are called: **Refractory headaches**
- Different approach is needed → **Interventional treatment**

Office-based interventions

- Why
 - Waiting list and patient need quick relief
 - Lack of personnel
 - Lack of resources
- Solutions
 - Ultrasound-guided blocks in the office
 - Infusion therapy in the office
- Advantages
 - Favorable safety profile (no radiation, real-time visualization)
 - Quick and efficient
 - Self-sufficient
 - Cost-efficient

Interventional treatment: which HA patients?

- No officially recognized criteria
- But ... Agreement amongst investigators that these techniques should be primarily offered to those who failed acute/prophylactic treatment
- aka 'Refractory headaches'

What office-based interventions?

- Nerve/ganglion injections
 1. Greater occipital nerve block
 2. Sphenopalatine ganglion block
- Muscle injections
 3. Onabotulinum toxin injection
 4. Triggerpoint injections
- Infusion therapy
- Focus on ultrasound guidance

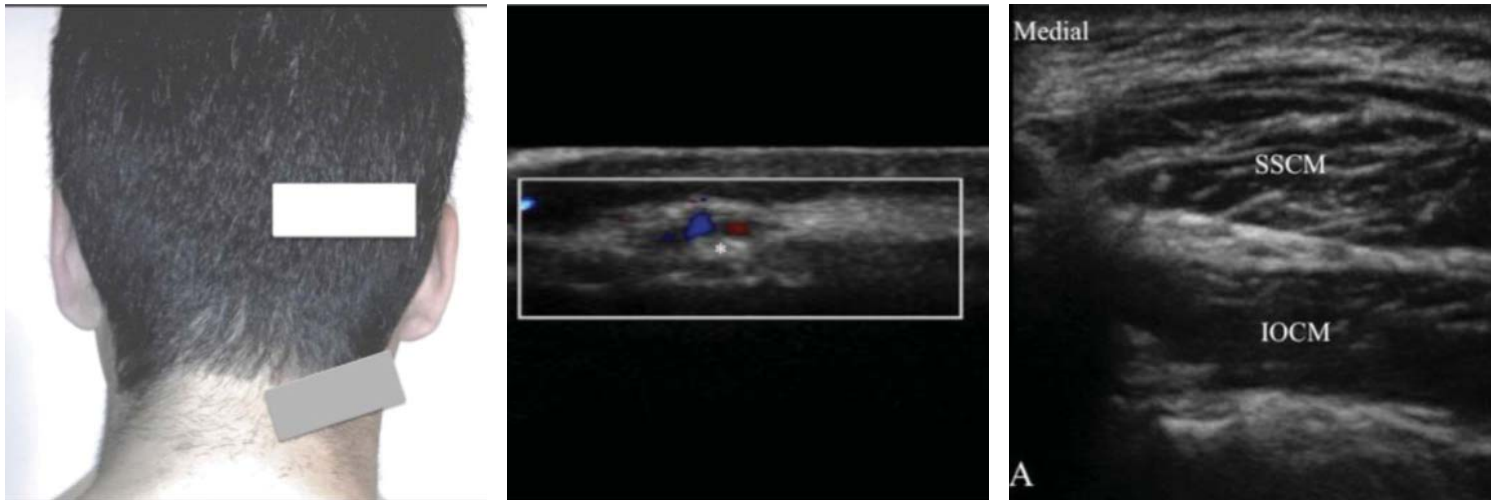
1. Greater Occipital Nerve block

Indications	Goal	Mechanism of Action
<ul style="list-style-type: none">• Migraine• Cervicogenic headache• Occipital neuralgia• Cluster headache• Tension-type headache• Chronic daily headache• Hemicrania continua• New Daily persistent headache• Posttraumatic headache• Trigeminal neuralgia	<ul style="list-style-type: none">• Acute pain relief• Terminating intractable cycle• Transitional therapy to assist weaning of medications	<ul style="list-style-type: none">• Blockade of nociceptive afferent fibers supplying the posterior head and C1-C3 area that join trigeminal fibers• “trigeminocervical complex”• Effect can last weeks to months

GONB: Technique

- Ultrasound (or landmark) guided
- 25-30 gauge 1-1 ½ in needle, injectate 2-5ml bilaterally
- Steroid: most robust evidence in treatment of Cluster headache
- Numbness on scalp
- Repeat procedure: no clear practice guidelines
- Comparison of distal vs proximal approach
 - Two studies (cadaver and CM)
 - Both techniques effective, proximal more sustained benefit

Greher M et al. Br J Anaesth. 2010 May;104(5):637-42.
Ambrosini A, et al. Pain. 2005 Nov;118(1-2):92-6.
Ashkenazi A, et al. Neurol Neurosurg Psychiatry. 2008 Apr;79(4):415-7.
Flamer D, et al. Reg Anesth Pain Med. 2019 May;44(5):595-603.



US-guided GON proximal vs distal approach

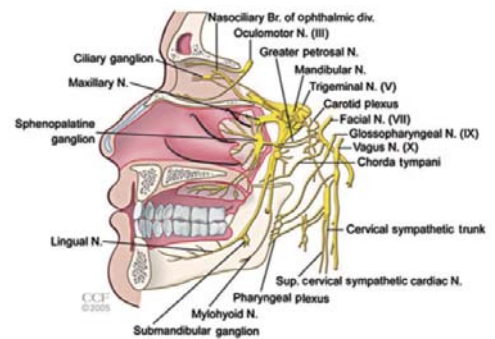
Side-effects

- Well tolerated
- Vasovagal reaction: prone position
- Discomfort due to local swelling/muscle spasm
- Hematoma
- Steroid: local hair loss, hyperpigmentation, cutaneous atrophy
- Look for symptoms of LA toxicity: Dizziness, blurred vision, tinnitus
- No epinephrine! Risk of scalp necrosis

Greher M et al. Br J Anaesth. 2010 May;104(5):637-42.
Ambrosini A, et al. Pain. 2005 Nov;118(1-2):92-6.
Ashkenazi A, et al. Neurol Neurosurg Psychiatry. 2008 Apr;79(4):415-7.
Flamer D, et al. Reg Anesth Pain Med. 2019 May;44(5):595-603.

2. Sphenopalatine ganglion block

- Large extracranial ganglion in pterygopalatine fossa
- Few mm deep to nasal mucosa
- Sympathetic and parasympathetic network
- Role in trigemino-autonomical reflex: vasoactive peptides release
- Connections with
 - Maxillary nerve
 - Vidian nerve
 - Palatine nerves
 - Trigeminal nerve
 - Superior cervical ganglion
 - Vagus nerve



Rationale for use of SPG in craniofacial pain!

Mojica J, et al. Curr Pain Headache Rep. 2017 Jun;21(6):27.
Robbins MS, et al. Headache. 2016 Feb;56(2):240-58
Van Kleef M et al. Pain Pract. 2009;9(6):435-42

Which patients would benefit from SPG block?

- Indications for SPG block
 - Refractory Cluster headaches
 - Refractory Migraine
 - TAC: Hemicrania continua, SUNCT, SUNA
 - Persistent idiopathic facial pain
- Indications for SPG RFA
 - Cluster headache

Mojica J, Mo B, Ng A. Curr Pain Headache Rep. 2017 Jun;21(6):27.
Robbins MS, et al. Headache. 2016 Feb;56(2):240-58
Piagkou M et al. Pain Practice. 2012;12(5):399–412.

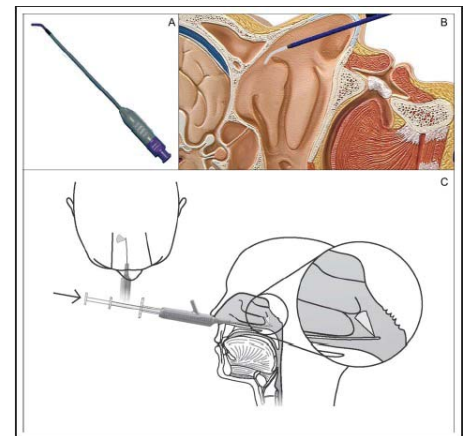
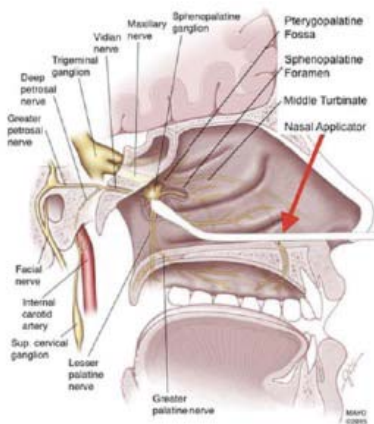
What is the evidence for SPG in HA treatment?

- Scarse and quality is limited due to significant heterogeneity
 - Cluster headache
 - SPG block
 - 5 studies (1 RCT)
 - Alcohol/lidocaine/cocaine
 - 151/181 patients reported relief
 - (p)RFA SPG
 - 7 studies (no RCT)
 - 69/115 reported long lasting pain relief
 - Migraine
 - 5 studies (2 RCT) on SPG block
 - Lidocaine/bupivacaine/botox
 - Intranasal vs infrazygomatic approach
 - 115/285 patients had immediate to short term relief

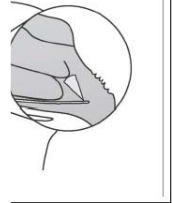
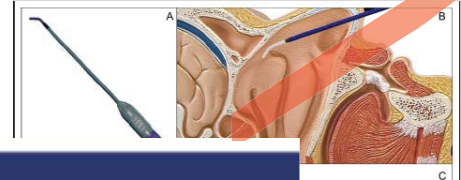
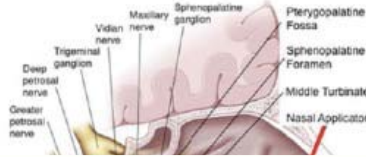
Mojica J, et al. Curr Pain Headache Rep. 2017 Jun;21(6):27.
Robbins MS, et al. Headache. 2016 Feb;56(2):240-58
Piagkou M et al. Pain Practice. 2012;12(5):399–412.

Approaches for SPGB

- Transnasal (topical): cotton-swab vs intranasal device
- US-guided infra/supra-zygomatic
- Infrazygomatic approach (X-ray)



Topical application



Daring discourse

Topical intranasal lidocaine is not a sphenopalatine ganglion block

Samer Narouze 

Narouze S. Topical intranasal lidocaine is not a sphenopalatine ganglion block. Reg Anesth Pain Med. 2021 Mar;46(3):276-279.

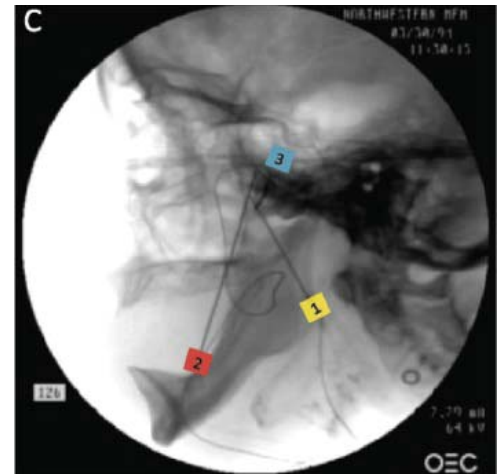
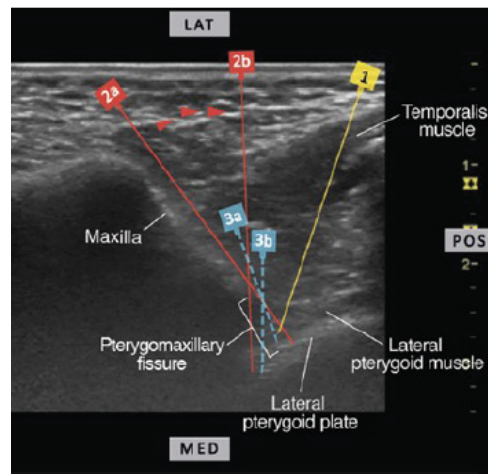
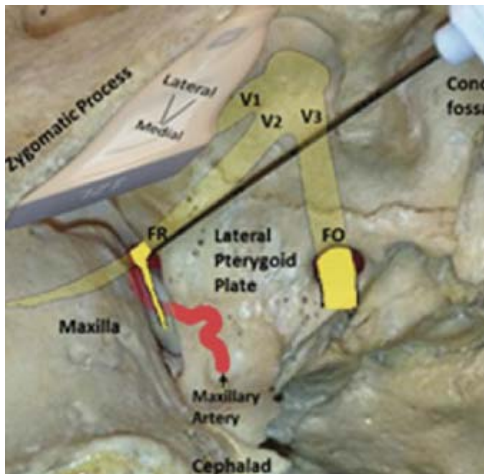
US-guided SPG block

	Strength	Weakness
US-guided	<ul style="list-style-type: none"> *Ability to plan needle trajectory *Visualization of soft tissues *Ability to identify pterygopalatine fossa and lateral pterygoid plate which are important landmarks for successful block *No radiation exposure 	<ul style="list-style-type: none"> *Inability to see needle and LA spread inside the fossa CAVE intravascular injection *Technically challenging
Fluoroscopy-guided	<ul style="list-style-type: none"> *Rule out intravascular contrast spread 	<ul style="list-style-type: none"> *No real-time visualization of needle tip or injectate *radiation exposure

US SPG block: evidence for HA

- SR describing evidence for 3 different approaches of US-SPG (Nader)
 - Infrazygomatic, posterior to anterior, in plane
 - Infrazygomatic, anterior to posterior, in plane
 - Suprazygomatic, out of plane (pediatric population)
- Six trials (n=116)
 - 2 case reports, 2 prospective trials
 - 1 cadaver study
 - 1 RCT
- 3-5 mls of LA
- Successful immediate relief (even V1-V2-V3), no long-term data

Anugerah A, Nguyen K, Nader A. Technical considerations for approaches to the ultrasound-guided maxillary nerve block via the pterygopalatine fossa: a literature review. *Reg Anesth Pain Med.* 2020 Apr;45(4):301-305.



The 3 approaches

Complications

- Epistaxis
- Cheek hematoma
- Infection
- Dryness eye (temporarily)
- Diplopia (temporarily)

3. Onabotulinumtoxin A injection

- Reduction of trigeminal nerve sensitization
- FDA approved for prophylactic treatment for Chronic migraine
- PREEMPT RCT
 - 1384 adults
 - Onabotulinum toxin A vs placebo
 - Up to week 24: significant decrease in HA frequency days (-8.4 vs -6.6)
- PREEMPT protocol
 - Fixed-dose (155U), fixed-site (31 locations in head and neck)
- Contra-indications: hypersensitivity to ingredient, neuromuscular disorders

Botox for other HA indications

- Tension-type headache
 - 22 studies (8 randomized)
 - Mixed results due to heterogeneity of studies
 - Overall sounds promising but further research is warranted
- Cluster-headache
 - 3 prospective non-randomized studies, n< 60
 - Injection in PPF or according to PREEMPT protocol
 - All showed significant improvement in headache-frequency, starting less than a week following treatment
 - Off-label use

Freund B, Rao A. Pain Pract. 2019 Jun;19(5):541-551
Lampf C, et al. J Headache Pain. 2018 Jun 19;19(1):45
Bratbak DF, et al. Cephalalgia. 2016 May;36(6):503-9
Freund B, et al. Oral Facial Pain Headache. 2020 Spring;34(2):129-134

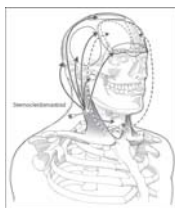
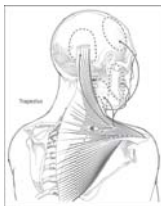
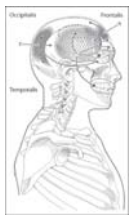
4. Trigger point injections

- *“hyperirritable spot in skeletal muscle that is associated with a hypersensitive palpable nodule in a taut band”*
- Popular for headache treatment: CM and CTTH
- 2014 Review and Guidelines from AHS about methodology and indication of TPI for headache
- Quality of data: low due to heterogeneity (injectate, volume, indication)
- Overall positive outcome but need for rigorous studies

For which patients are TPI indicated?

- Physical exam: Identification of TP in head and neck that reproduce patients' headache pain
- Areas of focus for HA treatment:
 - **trapezius** muscle: referred pain to temporal, jaw, occipital, upper neck
 - **SCM**: vertex, frontal, temporal, occipital, anterior neck, TMJ
 - **Temporalis**: teeth, supraorbital
- trochlear, masseter, splenius, semispinalis capitis and cervicis

1. Ashkenazi A, et al. Peripheral nerve blocks and trigger point injections in headache management a systematic review. Headache. 2010 Jun;50(6):943-52.
2. Robbins MS, et al. Trigger point injections for headache disorders: expert consensus methodology and narrative review. Headache. 2014 Oct;54(9):1441-59.



TPI for headache

- Trapezius, SCM, temporalis
- 22-27 G needle
- Stabilize TP
- Insertion of needle in 30° angle
- After negative aspiration, 0.1-0.3 cc of bupi 0.5%
- Frequency: no clear guidelines
- Avoid toxicity!
- Complications cfr nerve injections, reversible myonecrosis

1. Ashkenazi A, et al. Headache. 2010 Jun;50(6):943-52.
2. Robbins MS, et al. Headache. 2014 Oct;54(9):1441-59.

5. Intravenous Therapy

- For intractable primary headaches
- Central sensitization phenomenon
- Rationale of infusion therapy: Manipulation of pathways involving central neurotransmitters: Glutamate, Dopamine, Magnesium

Infusion therapy for intractable headaches

Drug	Mechanism	Indication	Evidence	Protocol	Result	Side-effects
Valproate	GABA increase	1° HA	Shahien 2011	Loading dose 900-1200 mg /20 min Evaluation at 50 min	75% of patients significant pain decrease	None
Magnesium	Subst P decrease	Acute migraine	Demirkaya 2001	1 mg iv	86.6% were pain free	Diarrhea, flushing
Lidocaine	Na+ channel	CM MOH SUNCT	Narouze 2014	1 mg/kg over 5 min bolus, followed by 4 mg/kg over 30 min	Pain reduction in 90% of patients	Nausea, vomiting, hallucinations, tachycardia
Ketamine	NMDA	1° HA	Schwedt 2010	0.3 mg/kg over 30-60 min	> 50% pain reduction in >90% of patients	Hallucination, hypertension

Shahien R, et al. Acta Neurol Scand. 2011 Apr;123(4):257-65.

Demirkaya. Headache. 2001;41:171-7

Narouze. Interventional Management of Head and Face Pain

Schwedt. Headache: the Journal of Head and Face Pain. 2010;50(3);509-19

Conclusion: Interventional HA treatment

- For refractory patients
- GON: Proven efficacy for Migraine, CH, Cervicogenic Headaches and Occipital neuralgia
- SPG: Promising for CH and migraine but need for rigorous trials
- Botox: Proven efficacy for migraine. Mixed for TTH. Promising for CH.
- TPI: Clinically popular for CM and CTTH. Need for standardized approach and rigorous trials
- Infusion therapy: Valuable add-on. More studies needed.

References (1)

- Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. Cephalalgia. 2018 Jan;38(1):1-211.
- Rizzoli P, Mullally WJ. Headache. Am J Med. 2018 Jan;131(1):17-24
- Blumenfeld A, et al. Expert consensus recommendations for the performance of peripheral nerve blocks for headaches – a narrative review. Headache. 2013;53(3):437-46
- Ashkenazi A, Blumenfeld A, Napchan U, Narouze S, Grosberg B, Nett R, DePalma T, Rosenthal B, Tepper S, Lipton RB; Interventional Procedures Special Interest Section of the American. Peripheral nerve blocks and trigger point injections in headache management - a systematic review and suggestions for future research. Headache. 2010 Jun;50(6):943-52.
- Gupta R, Fisher K, Pyati S. Chronic Headache: a Review of Interventional Treatment Strategies in Headache Management. Curr Pain Headache Rep. 2019 Jul 29;23(9):68. doi: 10.1007/s11916-019-0806-9. PMID: 31359257
- Hascalovici JR, Robbins MS. Peripheral Nerve Blocks for the Treatment of Headache in Older Adults: A Retrospective Study. Headache. 2017 Jan;57(1):80-86. doi: 10.1111/head.12992. Epub 2016 Nov 30. PMID: 27901275.
- Robertson BA, Morris ME. The role of cervical dysfunction in migraine: a systematic review. Cephalalgia. 2008 May;28(5):474-83. doi: 10.1111/j.1468-2982.2008.01545.x. Epub 2008 Mar 3. PMID: 18318747.
- Greher M, Moriggl B, Curatolo M, Kirchmair L, Eichenberger U. Sonographic visualization and ultrasound-guided blockade of the greater occipital nerve: a comparison of two selective techniques confirmed by anatomical dissection. Br J Anaesth. 2010 May;104(5):637-42.
- Ambrosini A, Vandenheede M, Rossi P, Aloj F, Sauli E, Pierelli F, Schoenen J. Suboccipital injection with a mixture of rapid- and long-acting steroids in cluster headache: a double-blind placebo-controlled study. Pain. 2005 Nov;118(1-2):92-6.

References (2)

- Ashkenazi A, Matro R, Shaw JW, Abbas MA, Silberstein SD. Greater occipital nerve block using local anaesthetics alone or with triamcinolone for transformed migraine: a randomised comparative study. *J Neurol Neurosurg Psychiatry*. 2008 Apr;79(4):415-7.
- Anugerah A, Nguyen K, Nader A. Technical considerations for approaches to the ultrasound-guided maxillary nerve block via the pterygopalatine fossa: a literature review. *Reg Anesth Pain Med*. 2020 Apr;45(4):301-305.
- Mojica J, Mo B, Ng A. Sphenopalatine Ganglion Block in the Management of Chronic Headaches. *Curr Pain Headache Rep*. 2017 Jun;21(6):27. doi: 10.1007/s11916-017-0626-8. Erratum in: *Curr Pain Headache Rep*. 2017 Nov 20;21(12):53
- Robbins MS, Robertson CE, Kaplan E, Ailani J, Charleston L 4th, Kuruvilla D, Blumenfeld A, Berliner R, Rosen NL, Duarte R, Vidwan J, Halker RB, Gill N, Ashkenazi A. The Sphenopalatine Ganglion: Anatomy, Pathophysiology, and Therapeutic Targeting in Headache. *Headache*. 2016 Feb;56(2):240-58
- Piagkou M, Demesticha T, Troupis T, Vlasis K, Skandalakis P, Makri A, Mazarakis A, Lappas D, Piagkos G, Johnson EO. The pterygopalatine ganglion and its role in various pain syndromes: from anatomy to clinical practice. *Pain Practice*. 2012;12(5):399-412.
- Freund B, Rao A. Efficacy of Botulinum Toxin in Tension-Type Headaches: A Systematic Review of the Literature. *Pain Pract*. 2019 Jun;19(5):541-551
- Freund B, Kotchetkov IS, Rao A. The Efficacy of Botulinum Toxin in Cluster Headache: A Systematic Review. *J Oral Facial Pain Headache*. 2020 Spring;34(2):129-134.
- Herd CP, Tomlinson CL, Rick C, Scotton WJ, Edwards J, Ives NJ, Clarke CE, Sinclair AJ. Cochrane systematic review and meta-analysis of botulinum toxin for the prevention of migraine. *BMJ Open*. 2019 Jul 16;9(7):e027953

References (3)

- Shahien R, Saleh SA, Bowirrat A. Intravenous sodium valproate aborts migraine headaches rapidly. *Acta Neurol Scand*. 2011 Apr;123(4):257-65.
- Demirkaya. Efficacy of intravenous magnesium sulfate in the treatment of acute migraine attacks. *Headache*. 2001;41:171-7
- Narouze. Interventional Management of Head and Face Pain. Intravenous Therapies for intractable headaches. DOI 10.1007/978-1-4614-8951-1_14
- Schwedt. International headache congress: clinical highlights. *Headache: the Journal of Head and Face Pain*. 2010;50(3):509-19
- Flamer D, Alakkad H, Soneji N, Tumber P, Peng P, Kara J, Hoydonckx Y, Bhatia A. Comparison of two ultrasound-guided techniques for greater occipital nerve injections in chronic migraine: a double-blind, randomized, controlled trial. *Reg Anesth Pain Med*. 2019 May;44(5):595-603.
- Robbins MS, Kuruvilla D, Blumenfeld A, Charleston L 4th, Sorrell M, Robertson CE, Grosberg BM, Bender SD, Napchan U, Ashkenazi A; Peripheral Nerve Blocks and Other Interventional Procedures Special Interest Section of the American Headache Society. Trigger point injections for headache disorders: expert consensus methodology and narrative review. *Headache*. 2014 Oct;54(9):1441-59.
- Diener HC, Dodick DW, Aurora SK, Turkel CC, DeGryse RE, Lipton RB, Silberstein SD, Brin MF; PREEMPT 2 Chronic Migraine Study Group. OnabotulinumtoxinA for treatment of chronic migraine: results from the double-blind, randomized, placebo-controlled phase of the PREEMPT 2 trial. *Cephalalgia*. 2010 Jul;30(7):804-14. doi: 10.1177/0333102410364677. Epub 2010 Mar 17. PMID: 20647171.