

Cervical Spine and Headache

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History

- 1860 Hilton Pain in the anterior and lateral part of the head may come from the great or small occipital nerve
- 1926 Barre Cervical spine could cause headache and vertigo
- 1948 Raney Headache may be a common symptom of cervical disk lesions
- 1949 Hunter and Mayfield occipital neuralgia - pain radiated from the occiput to periorbital and jaw areas (blocks)

History

- 1949 Bartschi- Rochaix Cervical Migraine
- 1955 Kovacs Motion caused muscle spasm, compromised vessels and nerves causing headache (chiropractics)
- 1973 Bogduk 3rd occipital headache
- 1983 Sjaastad Cervicogenic headache
- 1988 I H S Headache - Disorders of the neck

History

- 1990 Sjaastad Diagnostic criteria CGH
- 1998 Sjaastad Revised criteria CGH
- 2002 Bartsh and Goadsby Relationship between c spine afferents and trigeminal nucleus

Cervicogenic Headache Classification

- Starts in the neck – refers to forehead temple, whole head
- Unilateral or bilateral
- Aggravated by neck movement
- Palpation of neck – tender
- Response to block
- Radiological – not required
- Neck trauma – not necessary

1. IHS Classification Cephalalgia 1988;(Suppl 7):1-96
2. Sjaastad O, Fredrikson TA, Pfaffenrath V. Headache 1990;30:725-726
3. Meloche J et al. for Quebec Headache Study Group Headache 1993;33:328-334
4. Merskey H, Bogduk N, eds Classification of Chronic Pain IASP 1994
5. WCHS. www.cervicogenic.com/default.htm 1994

Cervicogenic Headache Clinical Profile

- Unilaterality (Sjaastad)^{1,2}
- Moderate non throbbing pain
- Intermittent or continuous
- Provoked by neck movement or sustained awkward postures
- Reduced range of motion
- History of trauma
- Transient relief with nerve block
- Radiologic findings (I H S)³

1. Sjaastad O, Saunte C, Hovdahl H. Cephalalgia 1983;3:249-256
2. Sjaastad O, Fredrikson TA, Pfaffenrath V. Headache 1990;30:725-726
3. IHS Classification Cephalalgia 1988;(Suppl 7):1-96

MRI in Migraine, Whiplash, Cervicogenic headache

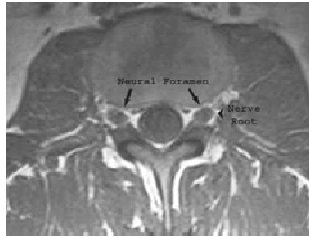
Methods blinded evaluation of images

- Cervicogenic n=46
- Whiplash n=22
- Migraine n=19

MRI Craniovertebral junction, alar and transverse ligaments

Results

- No differences



1. Knackstedt H et al J Headache Pain 2012;13:39-44

Cervicogenic Headache Epidemiology

Prevalence

- General Population¹ 0.4% -2.5%
- Chronic Headache² 15% -20%

Gender

- Females > Males 4:1

Age 40-50 yrs

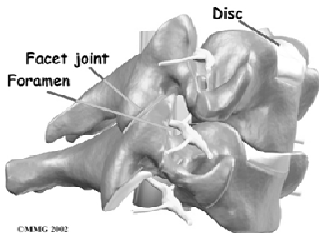
Common in migraine patients³

1. Sjaastad O, Fredriksen TA. Clin Exp Rheumatol 2000;18(2 Suppl 19):S3-6
 2. Nilsson N. Spine 1995;20:1884-1888
 3. Bono G, Antonaci F, Ghirmal S, et al. Funct Neurol 1998;13:75-77.

Cervicogenic Headache Pathogenesis

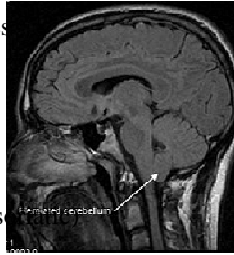
Pain Sensitive Structures of the C spine

- Facet Joints
- Periostium
- Ligaments
- Muscles
- Nerve Roots
- Vessels



Cervicogenic Headache Pathogenesis

- Developmental anomalies
- Tumors
- Paget's disease
- Osteomyelitis
- Arthritis
 - (rheumatoid, osteo, ps)
- Ankylosing spondylitis
- Dystonias
- Arnold Chiari Malformation



Cervicogenic Headache Pathogenesis

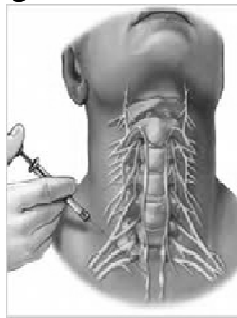
- Disk Disease (C1-C3)
- Whiplash
 - 80% report headache 25% persists at 2 yrs¹
 - Usually self-limiting²
 - Due to injury to ligaments and muscle
 - Possible shearing of long axons³
 - Possibly MOH⁴



1. Batta J. Aust NZ J Surg 1990;59:610-614
2. Hawkins GW. Clin Orthop 1962;24:22-33
3. Weiss RD, Stern BJ, Goldberg J. Headache 1991;31:451-456
4. Haldeman S, Dagenais S. The Spine Journal 2001;11:31-46

Nerve / Muscle Block for Headache Management

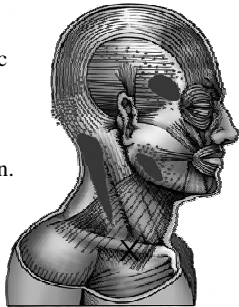
- Trigger point injection
- Occipital nerve block
- Cervical nerve root block
- Cervical facet block
- Medial Branch block
 - / neurolysis



Trigger Point Injections

What is Myofascial Pain ?

- Pain and/or autonomic phenomena referred from active trigger points (TPs), with associated dysfunction.



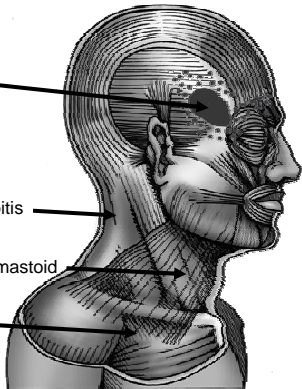
Travell and Simons. Williams and Wilkins. 1988.

Temporalis

Splenius Capitis

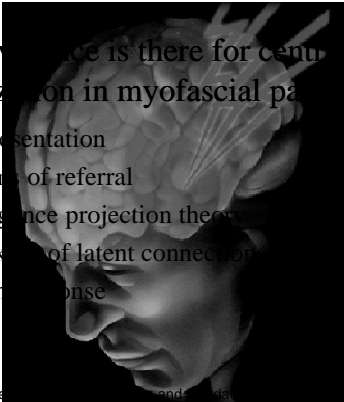
Sternocleidomastoid

Trapezius



What evidence is there for central sensitization in myofascial pain?

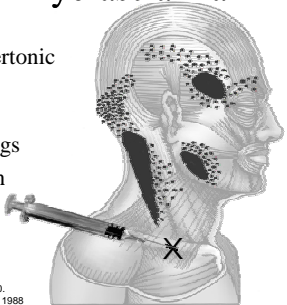
- Clinical presentation
- Mechanisms of referral
 - Convergence projection theory
 - Unmasking of latent connections
- Medication response



Graff-Radford SB, Rasmussen and ...
Current Pain and Headache Reports 2001,5:376-381

Clinical Myofascial Pain


- Injection of hypertonic saline
- No peripheral laboratory findings
- No neural pattern (dermatome)



Kellgren Clinical Science 1938, 3:175-190.
Travell and Simons, Williams and Wilkins 1988
Jensen 1986 Pain

Mechanisms of Muscle pain referral

- Convergence Projection Theory
- Unmasking of latent connections



Mense. Pain 1993, 54:241-289

Convergence Projection Theory

Referral takes place if afferent fibers from two different sources have synaptic contacts with the same dorsal horn neuron

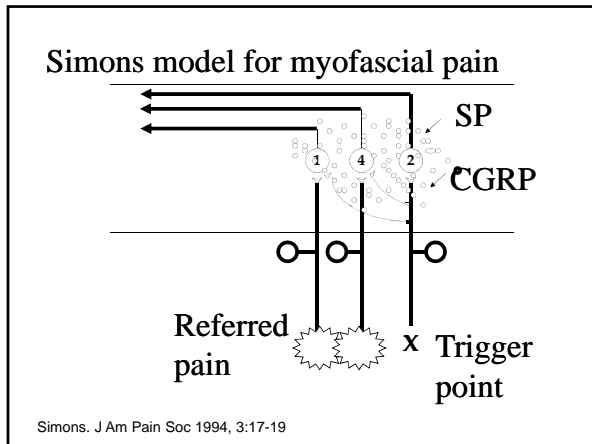
© 2004 Primary Care Network

Receptor Field Changes After Noxious Stimulus

Mense, Pain 1993, 54:241-289.

Unmasking of Latent Connections

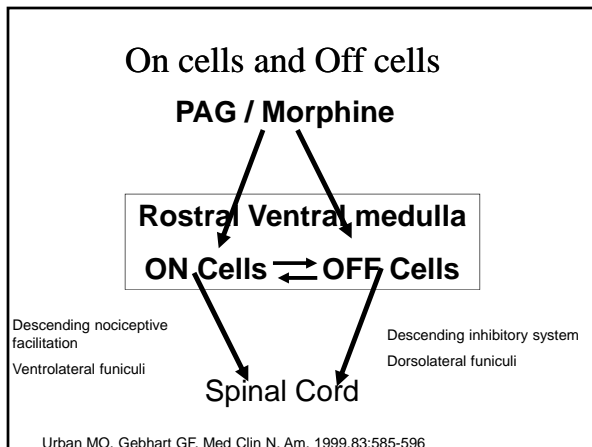
Mense, Pain 1993, 54:241-289.



Evidence for central generation

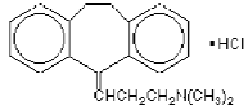
- Migraine generator
- Cluster generator
- On Cells v. Off cells

An axial brain scan image showing the central structures of the brain, likely the brainstem and midbrain, which are relevant to the central generation of pain.



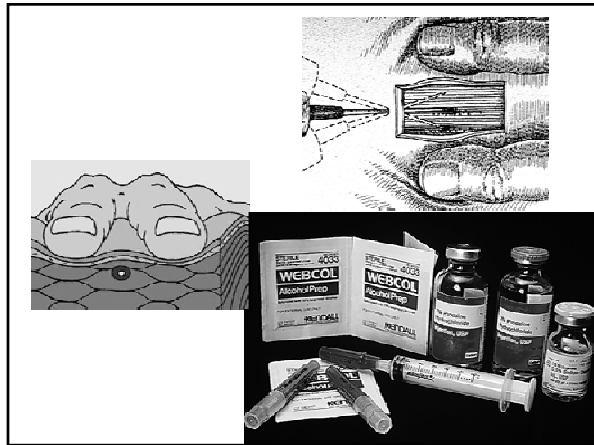
Medication Response

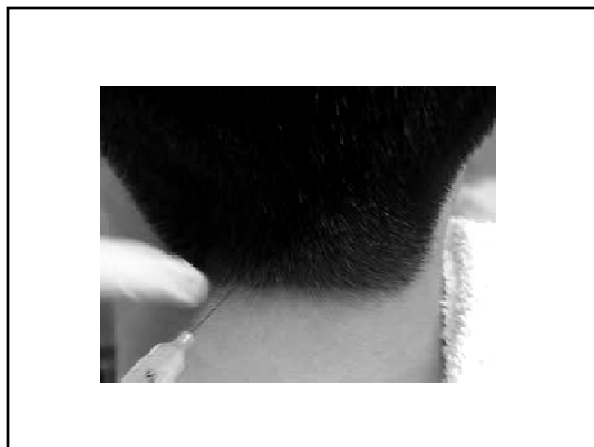
- Tricyclics
 - Amitriptyline decreased myofascial pain in a placebo controlled trial without any physical intervention



Sharav, Singer. Pain 1987 31:199-203

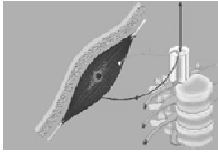
$C_{20}H_{27}N \cdot HCl$



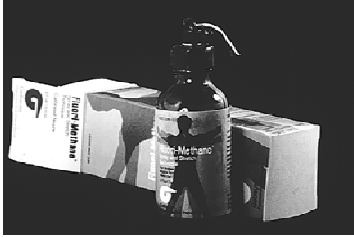


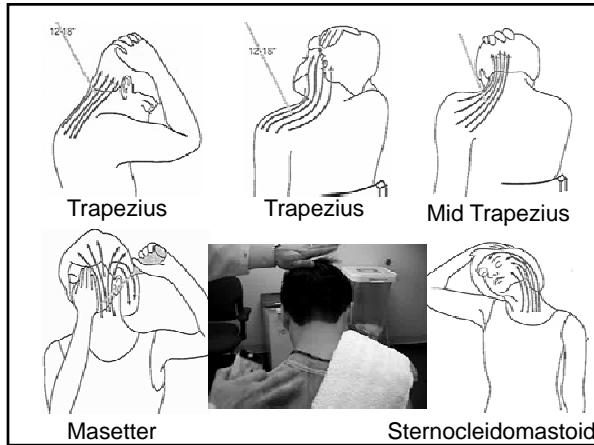
Spray and Stretch

The spray is the distraction the stretch is the action.



Jaeger B, Reeves JL. Pain 1986;27:203-210.

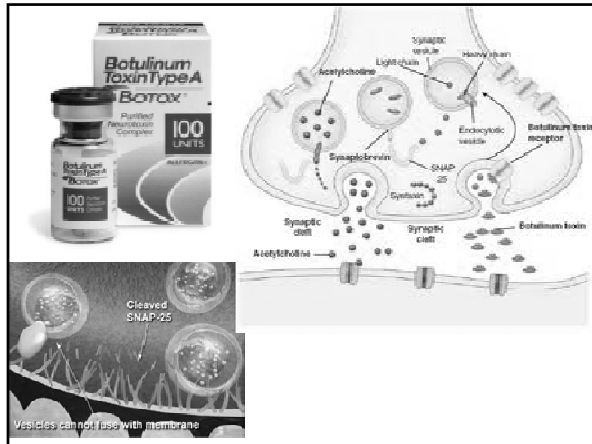


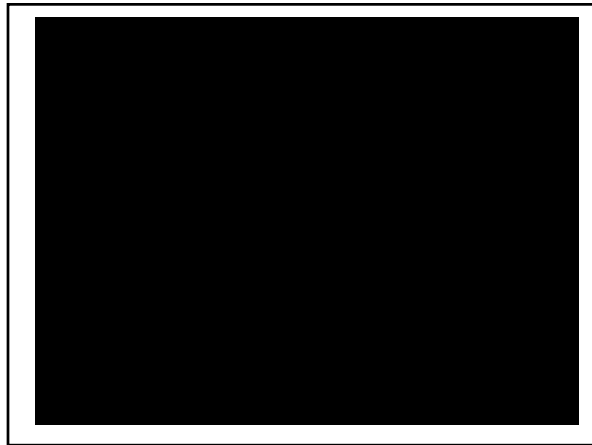


Spasm

- Sustained involuntary contraction of muscle
- EMG – sustained contraction







Botulinum Toxin and Myofascial Pain

Methods.

- RBCTs compared trigger point pain treated with BoNT/A versus saline.
- N=132 cervical and/or shoulder myofascial pain
 - visual analog scale (VAS) pain reports
 - pressure algometry
 - Medication usage
- No significant differences between the saline-injected and the BoNT/A-injected groups.

De Andres J, Cerda-Olmedo G, Valls JC, Monsalve V, Lopez-Alarcon, Minguetz A. Use of botulinum toxin in the treatment of chronic myofascial pain. Clin J Pain 2003;19(4):269-75

Botulinum Toxin and Myofascial Pain

- Randomized, double-blind, cross-over study compared BoNT/A with bupivacaine
- N=18 patients
- Trigger point injections using BoNT/A v. bupivacaine combined with a home-based rehabilitation program.
- Followed until pain returned to at least 75% of baseline
- 2-week wash-out period – then other treatment
- Both treatments were effective in reducing pain when compared to baseline (P=0.0067).
- No significant difference between groups

Graboski CL, Shaun Gray D, Burnham RS. Botulinum toxin A versus bupivacaine trigger point injections for the treatment of myofascial pain syndrome: A randomised double blind crossover study. Pain. 2005 Nov;118(1-2):170-5. Epub 2005 Oct 3

Botulinum Toxin and Myofascial Pain

- N=29
- Randomized, single-blind treatment comparison study evaluating BoNT/A with dry needling and lidocaine injections
- Cervical myofascial trigger points
- Pain pressure thresholds and pain scores significantly improved in all three groups, with a slightly greater response in the lidocaine and BoNT/A groups.

Kamanli A, Kaya A, Ardıçoğlu O, Özgöçmen S, Zengin FO, Bayrak Y. Comparison of lidocaine injection, botulinum toxin injection, and dry needling to trigger points in myofascial pain syndrome. Rheumatol Int. 2005 Oct;25(8):604-11. Epub 2004 Sep 15.

Botulinum Toxin and Myofascial Pain

- Overall these RBCT studies suggest that BoNT is no better or longer lasting than the other standard trigger point-based therapies.
- Note: Botulinum toxin is not FDA approved for myofascial pain

Onobotulinum toxin A in Cervicogenic Headache

Methods : RDBPCT n=28

- Site: Neck muscles on the affected side
- Dose: 100 U 7 sites (occipital, trapezius, splenius, sternocleidomastoid, levator scapulae)
- Frequency: Start and 8 weeks P/A or A/P

Results:

- No difference in reduction of days of headache

Linde M, et al. Cephalalgia 2011;31:797-807

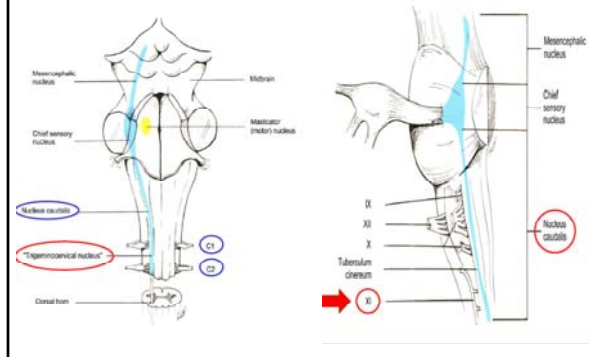
Occipital nerve block

- Occipital Neuralgia
- Cervicogenic Headache
- Migraine^{1,2}
- Cluster headache³
- Hemicrania Continua⁴



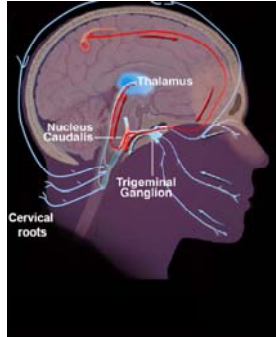
1. Ashkenazi A, Young WB. Headache 2005;45:350-354
2. Cook BL, et al. Neurology (Abstract) 2006;66:A42
3. Ambrosetti A et al. Pain 2005;118:92-96
4. Rozen T. Headache 2007;47:917-919

Trigemino-cervical Convergence



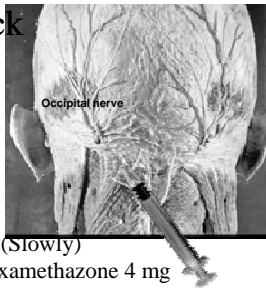
Trigemincervical Convergence

- In the presence of neurogenic meningeal inflammation there is opening of silent connections between the upper cervical and trigeminal nucleus.



Occipital Nerve Block

- Lay Patient Supine
- Prepare clean field
 - Swab X 3
- Palpate for vessel
- Place needle, aspirate
- Inject total volume of 5 cc (Slowly)
 - Marcaine 0.25% and dexamethazone 4 mg
 - 22 gauge 1.5 cc needle
- Massage gently to disperse fluid with gauze swab



Occipital Nerve block in migraine

Acute migraine¹

- 17/19 Relief in headache
- 19/19 Relief in allodynia

Acute migraine²

- 60% relief within 5 minutes

1. Ashkenazi A, Young WB. Headache 2005;45:350-354
2. Cook BL, et al. Neurology (Abstract) 2006;66:A42

Pulsed RF v GON block in cervicogenic headache

- Methods n=30
- Group A n=15 GON
 - 3ml 0.25% bupivacaine + 10 mg methylprednisolone
- Group B n=15 Pulsed RF
 - 2 cycles 45V for 120s
- Results: Pre Post 3 Post 9
- A 5.5 2.3 4.3
- B 5.9 2.6 3.1

Gabrhelik T, Michalek P, Adamus M. Prague Medical Report 2011;112:279-287

Peripheral nerve block – Hemicrania Continua

Methods n=22
 Examination for tenderness in GON and SON
 14/22 Tender in one or both points
 9/14 Received block with steroid
 4/9 Both areas blocked
 All received partial or total relief

Guerrero AL et al. Cephalalgia 2012;March Epub ahead of print.

Peripheral nerve block in CPH and Hemicrania Continua

Methods n=6 CPH; n=7 HC

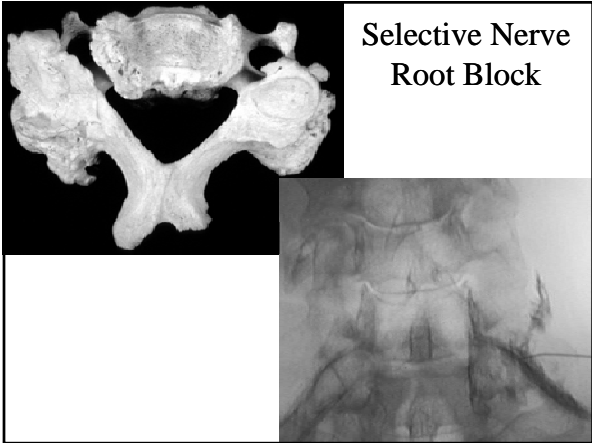
- Injected with lidocaine

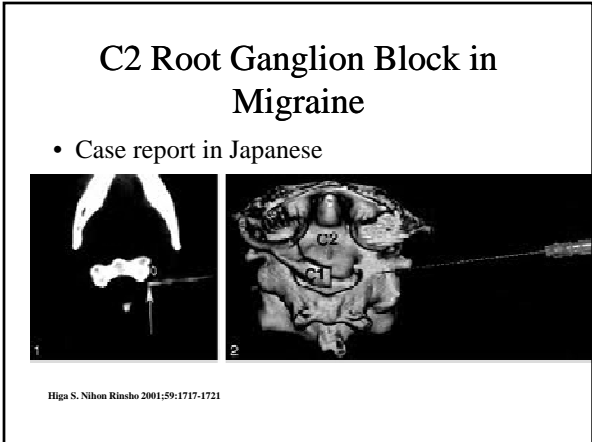
Results

- CPH No change
- HC Some change in 4/7
 - VAS Pre 7.3 Post 4.6 p<0.05

Antonace F, Pareja JA, Caminero AB, Sjaastad O. Funct Neurol 1997;12:11-15

Cervical nerve root block





Pulsed RF of C₂ ganglion in cervicogenic headache

- Methods n=2
- Positive response to occipital nerve block.
- Pulsed RF to C2 ganglion 42° for 4 min
- VAS 5/10 – 0/10 6 months

Zhang J, Shi DS, Wang R. J Headache Pain 2011;12:569-571.

Cervical Plexus Block of Cervicogenic Headache

Methods n=39

- Unilateral block, repeat
- lateral side 1 week later

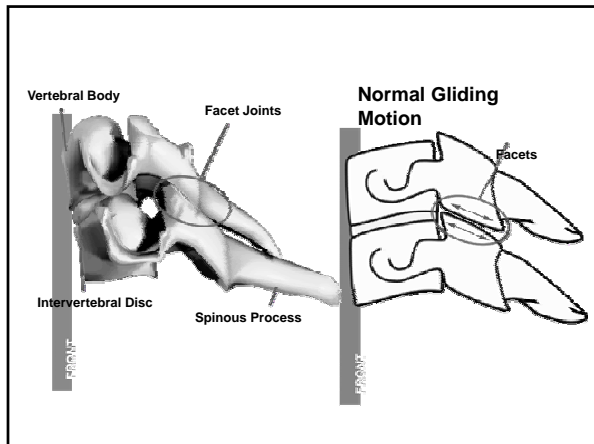
Results:

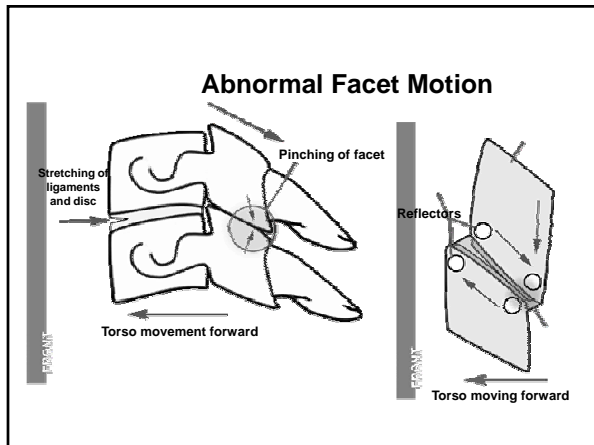
- Pre 9.54±1.53
- Post 6.75 ±3.23 p<0.00
- 33% <4/10
- Return to baseline 6.62

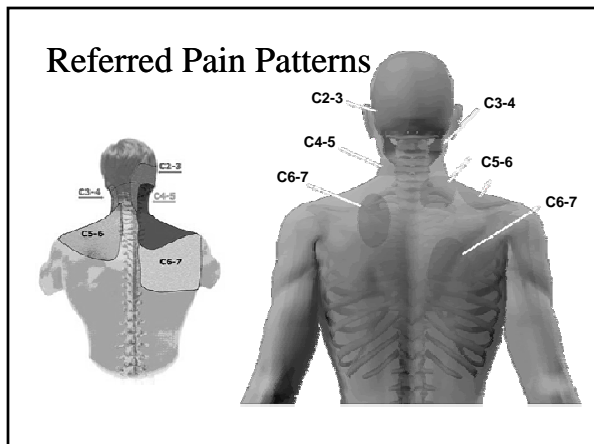


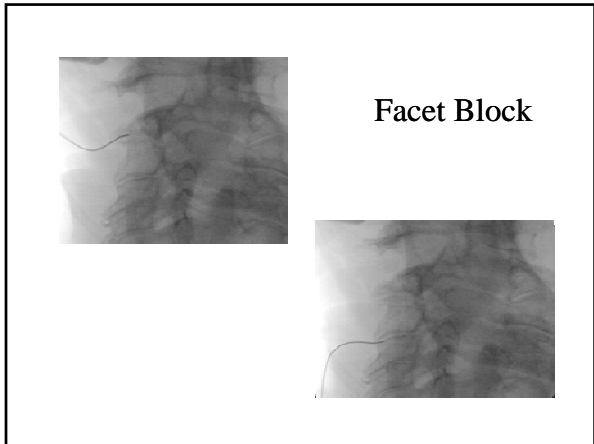
Goldberg ME, et al. Pain Physician 2008;11:849-854

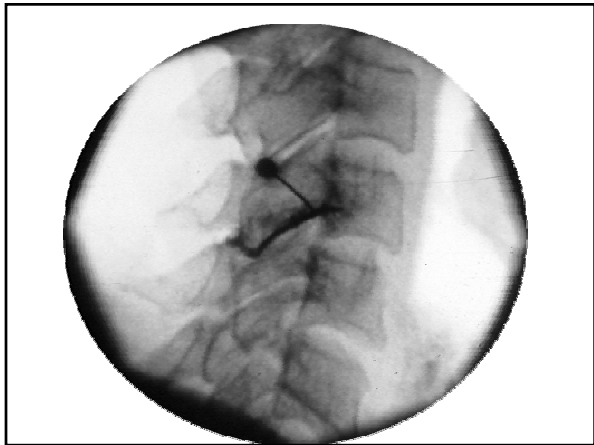
Cervical facet block











**Systematic Review of
Therapeutic Effectiveness of
Cervical Facet Joint Interventions**

Data base review 1966-2008

- Diagnosis Level I or II a
- Therapy
 - Medial Branch Blocks Level II
 - Radiofrequency Level II
 - Intraarticular Injeciton Lacking

Falco F, et al Pain Physician 2009;12:323-344

Facet Blocks and Spinal Rami Blocks for Cervicogenic Headache

Methods

- Retrospective n=31
- C₁₋₂, C₂₋₃ facet injections
- C₂, C₃ spinal rami blocks
- 0.25% bupivacaine + 3 mg betamethasone

Zhou, L, Hud-Shakoor Z, Hennessey C, Ashkenazi A. Headache 2010;50:657-663

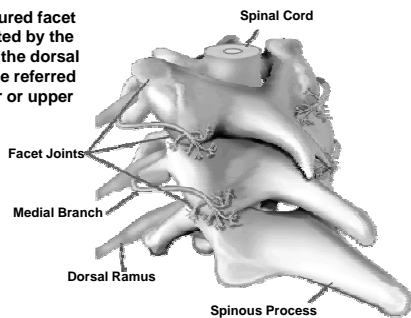
Facet Blocks and Spinal Rami Blocks for Cervicogenic Headache

Results:

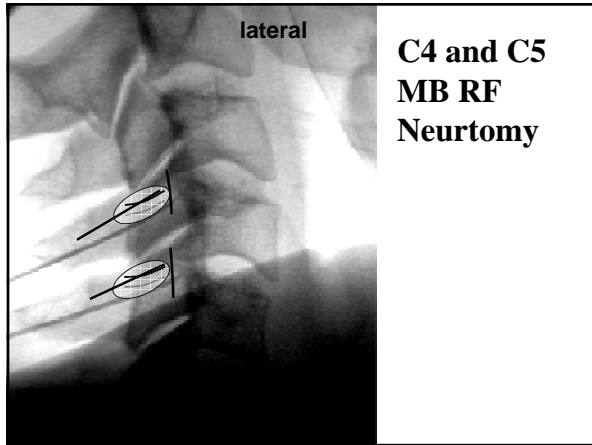
- >50% headache relief 90.3% 21.7days
- Pain relief 7.5±1.3 2.7±1.9

Zhou, L, Hud-Shakoor Z, Hennessey C, Ashkenazi A. Headache 2010;50:657-663

The pain from injured facet joints is transmitted by the medial branch of the dorsal ramus and may be referred to head, shoulder or upper back



Medial Branch block / neurolysis



Radiofrequency Neurotomy in Cervicogenic headache

- Methods n=11
 - All unilateral
 - Local block effect >90% relief >3 hours
 - C₄₋₇

	Pre	Post
• VAS	8.1+1.1	2.7+1.3
• VASi		63.8+17.1%

Park SW, Park YS, Nam TK, Cho TG. J Korean Neurosurg Soc 2011;50:507-511

**Percutaneous Radio-Frequency Neurotomy
for Chronic Cervical Zygapophyseal Joint
Pain**

- Randomized Double Blind
- 24 patients with chronic post traumatic neck pain
- Facet pain defined by triple blocks
- followed until pain returned to 50% of pre-treatment level

Susan M. Lord, et al. NEJM 1996;335:1721-6

**Percutaneous Radio-Frequency Neurotomy
for Chronic Cervical Zygapophyseal Joint
Pain**

- median time until 50% recovery 263 days
- at 27 weeks 7/12 patients in the active treatment group were pain-free

Susan M. Lord, et al. NEJM 1996;335:1721-6

Complications of Facet Blocks

Methods:

- 7500 episodes - 430000 blocks
- 3370 episodes cervical
- 3162 episodes lumbar
- 950 episodes thoracic

Manchikanti L, et al. Pain Physician 2012;15:143-150

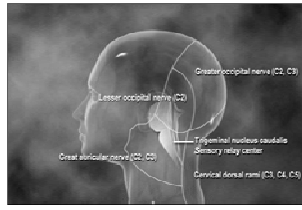
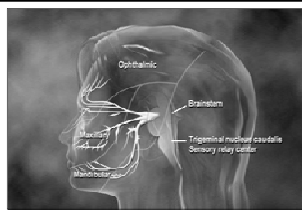
Complications of Facet Blocks

Results	% of episodes
• No major complications	
• Intravascular penetration	11.4%
– Cervical	20%
– Lumbar	4%
– Thoracic	6%
• Local bleeding	76.3%
• Local hematoma	1.2%

Manchikanti L, et al. Pain Physician 2012;15:143-150

Treatment Overview Musculoskeletal Pain

- Education/ Explanation
- Physical Medicine
- Pharmacologic intervention
- Behavioral therapy



Medications

- Antidepressants
- Anti-inflammatories
 - ANSAIDS
 - Cox 2 inhibitors
- Muscle Relaxants
 - Tizanidine - Zanaflex
 - Cyclobenzaprine - Flexaril
- Antiepileptic drugs
 - Gabapentin, topiramate, levetiracetam



