VA/DVBIC TBI Clinical Grand Rounds

Orofacial Pain Disorders and the TBI Patient - Think About the Brain

June 22, 2015, 12:00-1:15 p.m. (ET)

Presenter: John Johnson, DDS, MS
Director of Orofacial Pain Residency, Naval Postgraduate Dental School
Walter Reed National Military Medical Center
Bethesda, Md.

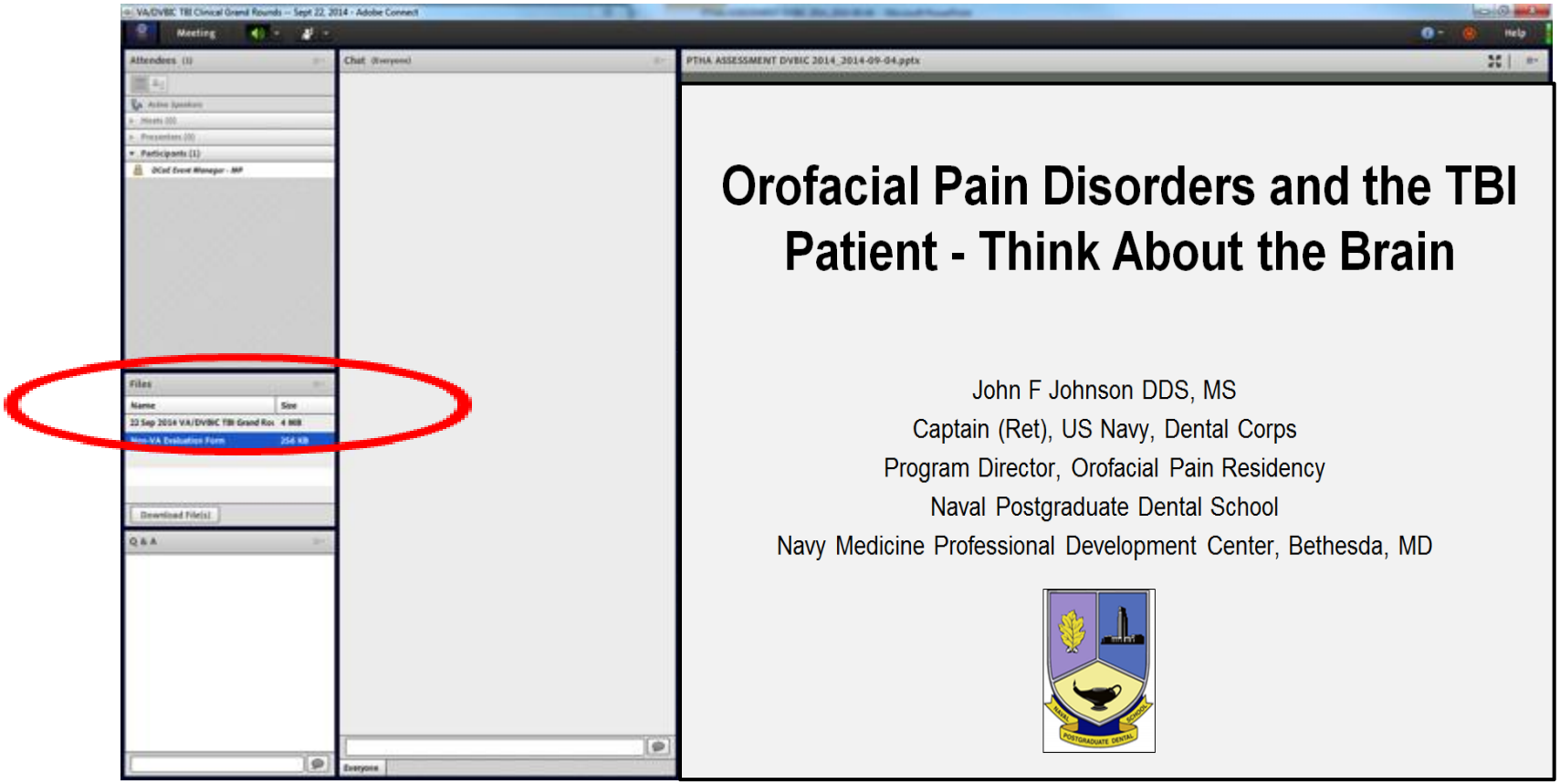
Moderator: Lt. Cmdr. Cathleen Davies
Chief, Clinical Training and Education
Defense and Veterans Brain Injury Center
Silver Spring, MD

Webinar Details

- Audio for this webinar is **not** provided via Adobe Connect
  - Dial: VANTS **1-800-767-1750**
  - Use participant pass code: **49114#**
- This webinar session is being recorded
- Question-and-answer (Q&A) session
  - Submit questions via the Q&A box

Resources Available for Download

Today's presentation and Non-VA Evaluation Form will be available for download at the end of the program in the "Files" box on the screen



Continuing Education Details

- All attendees are eligible for 1.0 CEU hours of ACCME, ACCME-NP, ANCC and APA for 100% attendance.
- In order to qualify for CEUs, the program evaluation and post test must be completed by **July 22, 2015** with a passing score of 80%.

VHA Attendee Instructions:

- **VHA** participants **must be preregistered** to complete the evaluation and post test in TMS.
- **VHA** staff should email Christopher.white3@va.gov if you were unable to register before the webinar started.
- Certificate of completion may be printed through TMS upon successful completion.

Non-VA Participant Instructions

- All Non-VA participants seeking CEUs will need to complete and email the program's fillable PDF **Non-VA Evaluation Form** by **July 22, 2015.**
- Please save and email a copy of your completed Non-VA Eval/Post-Test Form to **EESEPC@va.gov**
- Your certificate will be sent to you using the email address provided on your evaluation form.
- Questions or concerns should be sent to EPC by email at **EESEPC@va.gov**, or the EES Customer Service by phone at **1.877.EES.1331 opt 5**.
- Finally, the **Non-VA Evaluation Form** will be available for download right here on Adobe Connect at the end of today's program.

Webinar Overview

- This educational presentation will cover the assessment and management of orofacial pain-temporomandibular disorders (TMDs) in patients with a history of mild traumatic brain injury (TBI) and/or posttraumatic stress disorders (PTSD). When patients present with painful TMDs, healthcare providers have traditionally focused care solely towards peripheral anatomic structures, such as masticatory muscles and the temporomandibular joint (TMJ).

- Often providers have not been trained to consider the management of TMDs in the context of TBI or PTSD, or how the aforementioned might affect brain activity that can modulate trigeminal nerve motor responses.

Webinar Overview

- By the conclusion of this educational presentation, learners will gain knowledge to:
  - distinguish the difference between a site versus a source of pain;
  - describe four brain regions that can influence non-voluntary jaw muscle activity; and
  - identify three key patient characteristics that affect the outcome of orofacial pain-TMD therapy.

Presenter: John F. Johnson, DDS, MS

John F. Johnson, DDS, MS

- Graduated from the University of Missouri - Kansas City School of Dentistry
- Performed a general practice residency at the Naval Regional Medical Center, Camp Pendleton, California, and completed residencies in oral medicine at the Naval Postgraduate Dental School and in orofacial pain at the University of Kentucky
- Diplomate of the American Board of Oral Medicine and the American Board of Orofacial Pain
- Retired in 2010 after 30 years of active duty service in the Navy Dental Corps. During his Navy career, Dr. Johnson served as the orofacial pain specialty advisor to the Navy Surgeon General from 2002 to 2009
- Oral board examiner for the American Board of Orofacial Pain and a site visitor for the Commission on Dental Accreditation
- Program director of the orofacial pain residency at the Naval Postgraduate Dental School in Bethesda, Md.

Orofacial Pain Disorders and the TBI Patient - Think About the Brain

John F Johnson DDS, MS
Captain (Ret), US Navy, Dental Corps
Program Director, Orofacial Pain Residency
Naval Postgraduate Dental School
Navy Medicine Professional Development Center, Bethesda, MD

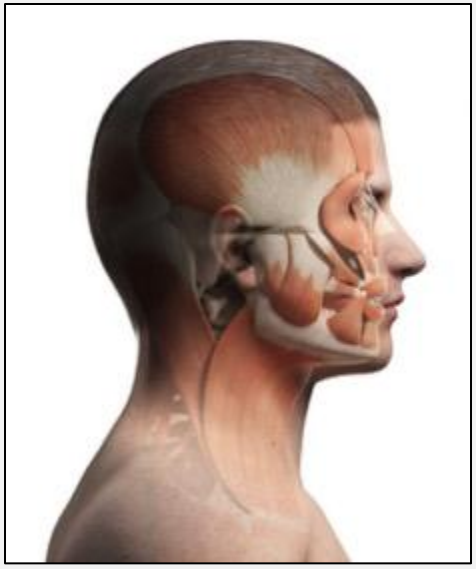
Disclosure

- The views expressed in this presentation are those of the presenter and do not reflect the official policy of the Department of Defense or the U.S. Government.
- Dr. Johnson has no relevant financial relationships to disclose.
- Dr. Johnson does not intend to discuss off-label/investigative use of commercial products or devices.

Introduction

"It is much more important to know what sort of patient has a disease than what sort of disease the patient has."

Sir William Osler



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Objectives

1. distinguish site vs. source of pain

2. describe brain regions that can influence non-voluntary jaw muscle activity

3. identify key patient characteristics that affect the outcome of therapy

What?
Why?
What else?

Orofacial Pain

The Challenge

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What is orofacial pain?

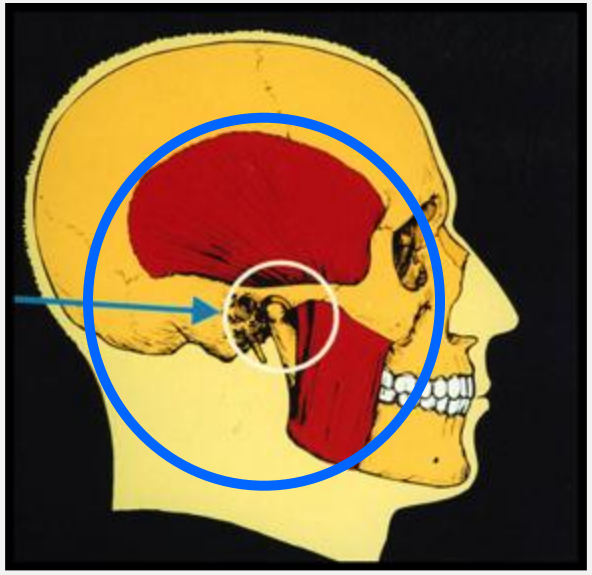
- collection of pain disorders affecting associated with the head, face and neck (de Leeuw & Klasser, 2013)
  - dental
  - autoimmune
  - infectious
  - malignant
  - musculoskeletal *
  - neurologic
  - neurovascular

* most common non-dental

Photo Source: © Can Stock Photo

Temporomandibular Disorders
(TMD, TMJ, TMJD, MPDS)

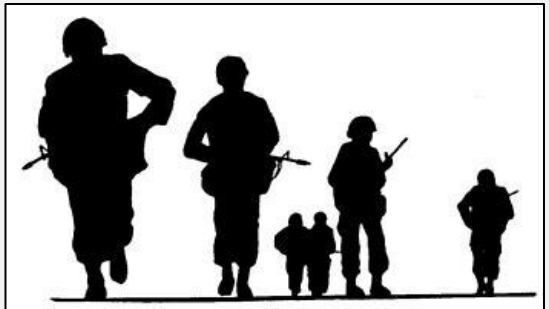
- disorders involving the muscles of mastication and adjacent structures (Greene, 2010)
- ICD-10, M26.62, arthralgia of temporomandibular joint
- *non-specific diagnosis* (…what?...why?...what else?)



Graphic Courtesy of: Dr. J Okeson

Temporomandibular Disorders
Traumatic Brain Injury
Post-traumatic Stress Disorder

- TMD's after TBI - no studies
- US veterans with TBI → 3x > likelihood of PTSD
  (Carlson, Nelson, Orazem, Nugent, Cifu & Sayer 2010)
- Croatian war veterans with PTSD
  - 48% masticatory muscle pain
  - 22% TMJ arthralgia
  (Muhvic-Urek, Uhac, Vuksic-Mihaljevic, Leovic, Blecic & Kozac, 2007)
- possible inference → TMD symptoms might not be unusual in veterans with TBI and/or PTSD



Clinical Case

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Our Patient

- 45+ yo male with c/o bilateral mid-face & preauricular pain
- 3 years ago…blast injury in Afghanistan
  - loss of consciousness
  - multiple shrapnel injuries
  - bilateral above the knee traumatic amputations

Photo Source: © Can Stock Photo

Our Patient

Problem List /Medications

- anxiety disorder - NOS
- carpal tunnel syndrome
- chronic pain
- coronary artery disease
- herniated intervertebral discs
- history of TBI
- insomnia
- lower back pain
- limb pain
- traumatic amputations

- acetaminophen, 2600 mg/d
- atorvastatin, 40 mg/d
- docusate, 200 mg/d
- eszopiclone, 3 mg/d
- nitroglycerin spray, prn
- prazosin, 3 mg hs
- tramadol, 200 mg/d

Our Patient

Previous Orofacial Pain Treatment

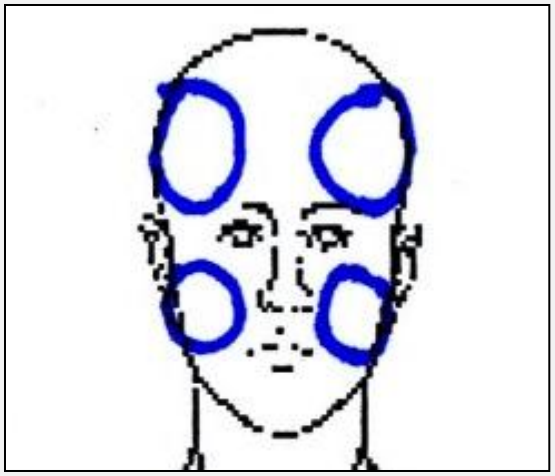
- non-steroidal analgesics
- muscle relaxants
- dental splint (mouthpiece)
- bilateral TMJ arthrocentesis
- no improvement

Our Patient

Where to Begin?

Our Patient

- 45+ yo male with c/o bilateral mid-face & preauricular pain
  - onset = 2 yrs ago, gradual
  - daily, constant, dull ache
  - today = 5/10
  - average = 5/10
  - worst = 8-9/10
  - aggravating = chewy foods
  - alleviating = resting jaw
  - associated sxs = jaw always tight, teeth very frequently clenched



Our Patient

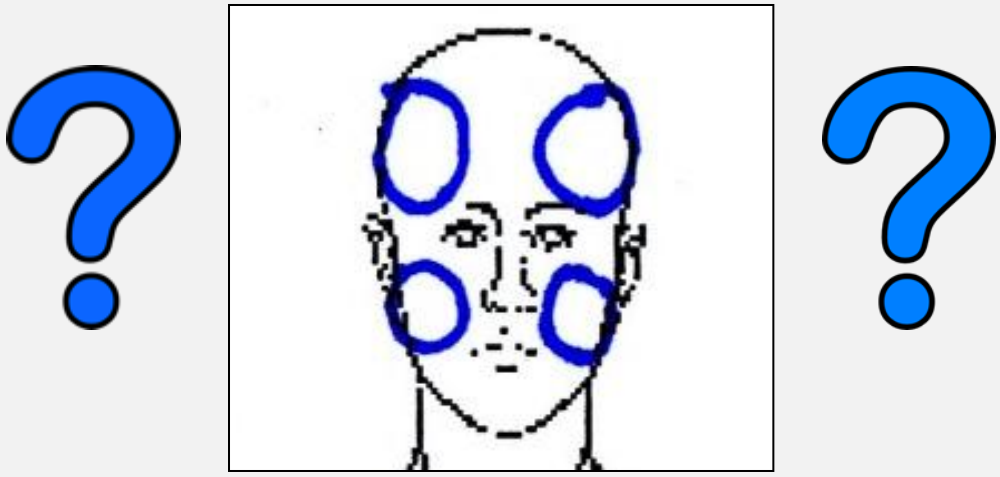
Graphic Courtesy of: Dr. J Johnson

- alert, oriented, slight distress, CN II-XII grossly intact
- cervical ROM: unrestricted, all movements painful
- mandibular ROM: unrestricted, all movements painful*
- TMJs: not tender
- masticatory* & cervical muscles: all tender or painful
- dental: no contributory findings

* reproduce chief complaint

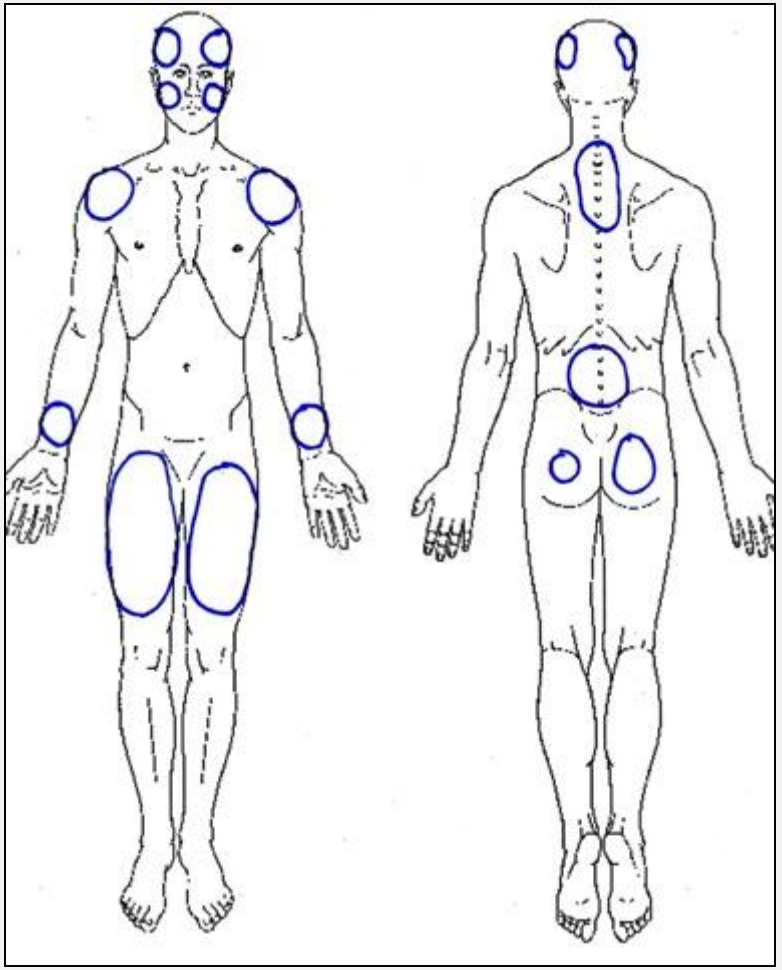
Our Patient

Enough Information?



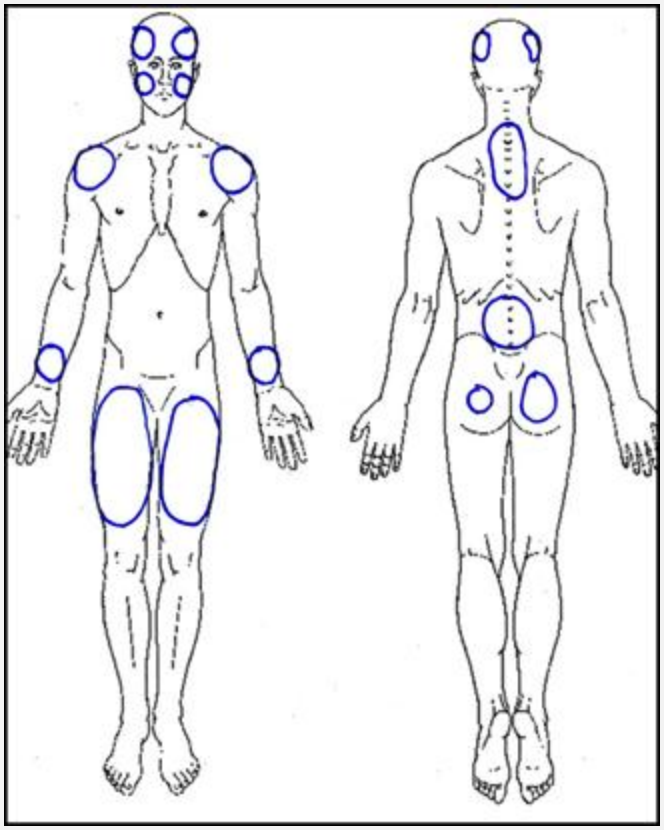
Our Patient

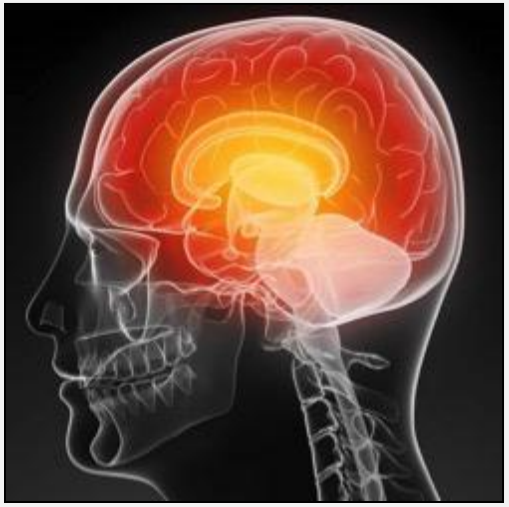
- total body pain = 8/10
- stress = 8/10
- anxiety = 5/10
- depression = 5/10
- anger = 6/10
- sleep = poor
  - (+) latency
  - (+) disruption
  - (+) nightmares
  - (-) restorative



Our Patient

Think Beyond Peripheral Anatomy…
Think About the Patient in Context…
Think About the Brain





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What?
Why?
What else?

How Do We Conceptualize Patients, Pain?

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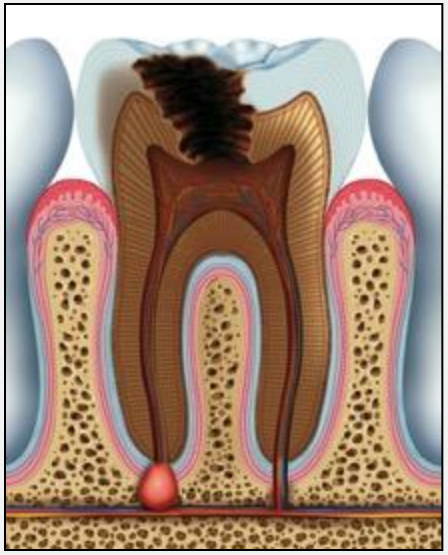
Traditional Pain Paradigm

- linear process
  - direct cause and effect relationships
  - find “it”
  - good for acute pain



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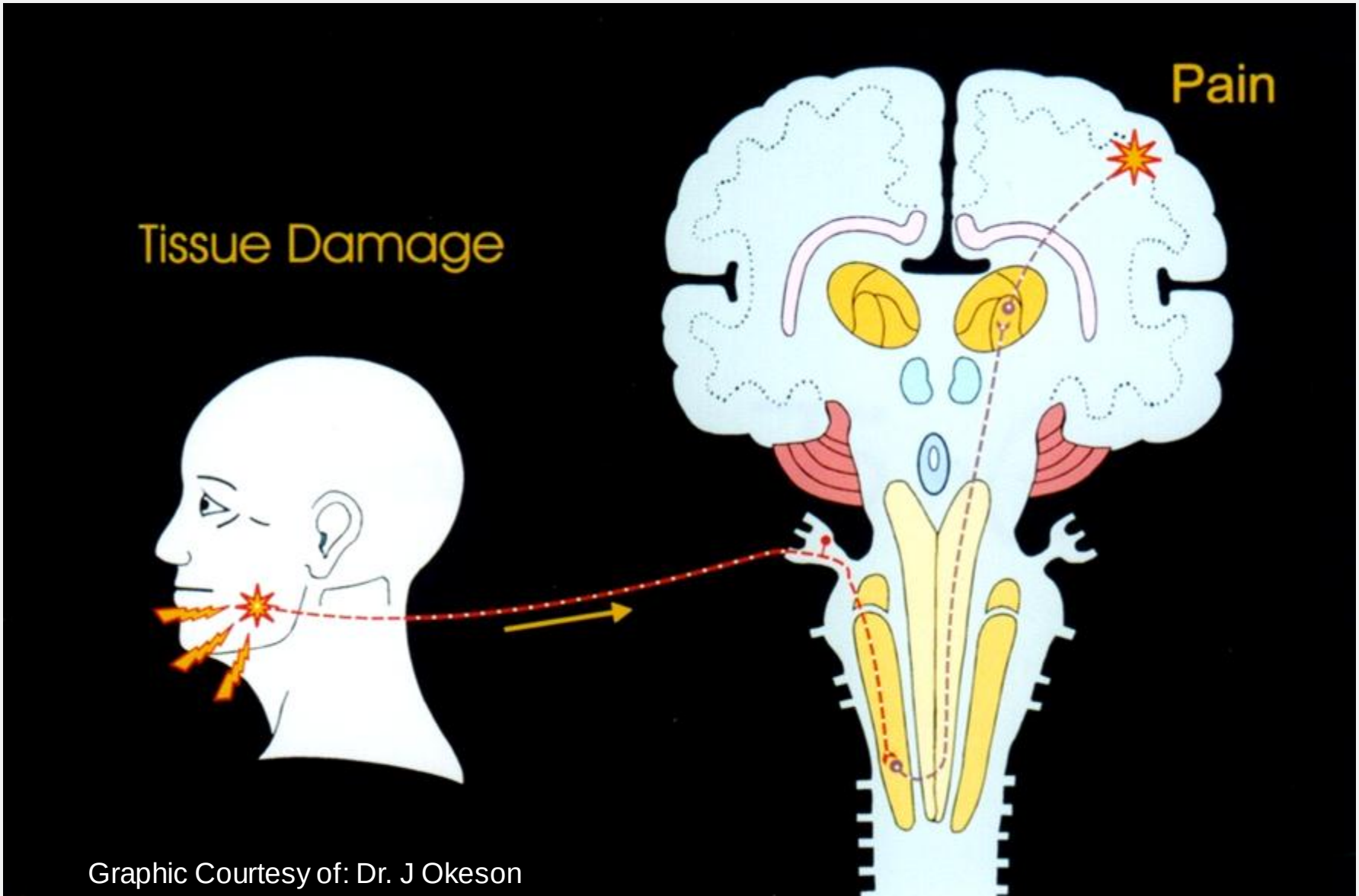
Peripheral Pain Model



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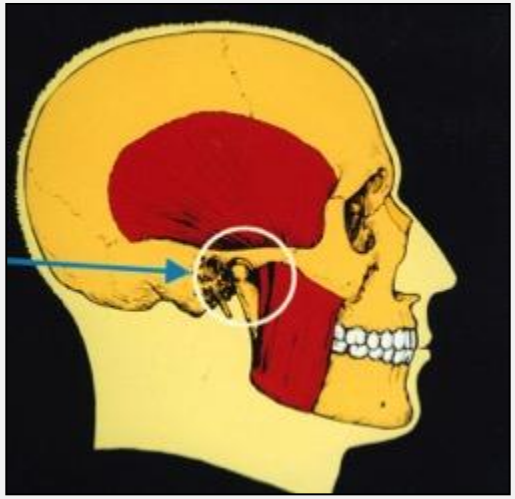
Randomized Effectiveness Study of Four Therapeutic Strategies for TMJ Closed Lock

Schiffman, Look, Hodges, Swift, Decker, Hathaway, Templeton & Fricton, 2007



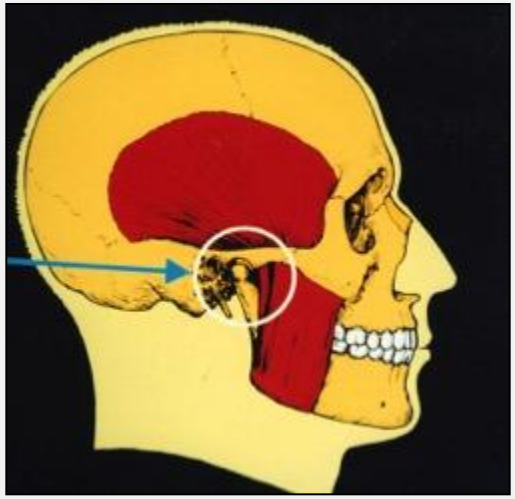
1. medication
2. medication plus splint
3. arthroscopy with lavage
4. arthrotomy

What was the best therapy?

Graphic Courtesy of: Dr. J Okeson

Randomized Effectiveness Study of Four Therapeutic Strategies for TMJ Closed Lock

Schiffman, Look, Hodges, Swift, Decker, Hathaway, Templeton & Fricton, 2007



1. medication
2. medication plus splint
3. arthroscopy with lavage
4. arthrotomy

No difference between groups!

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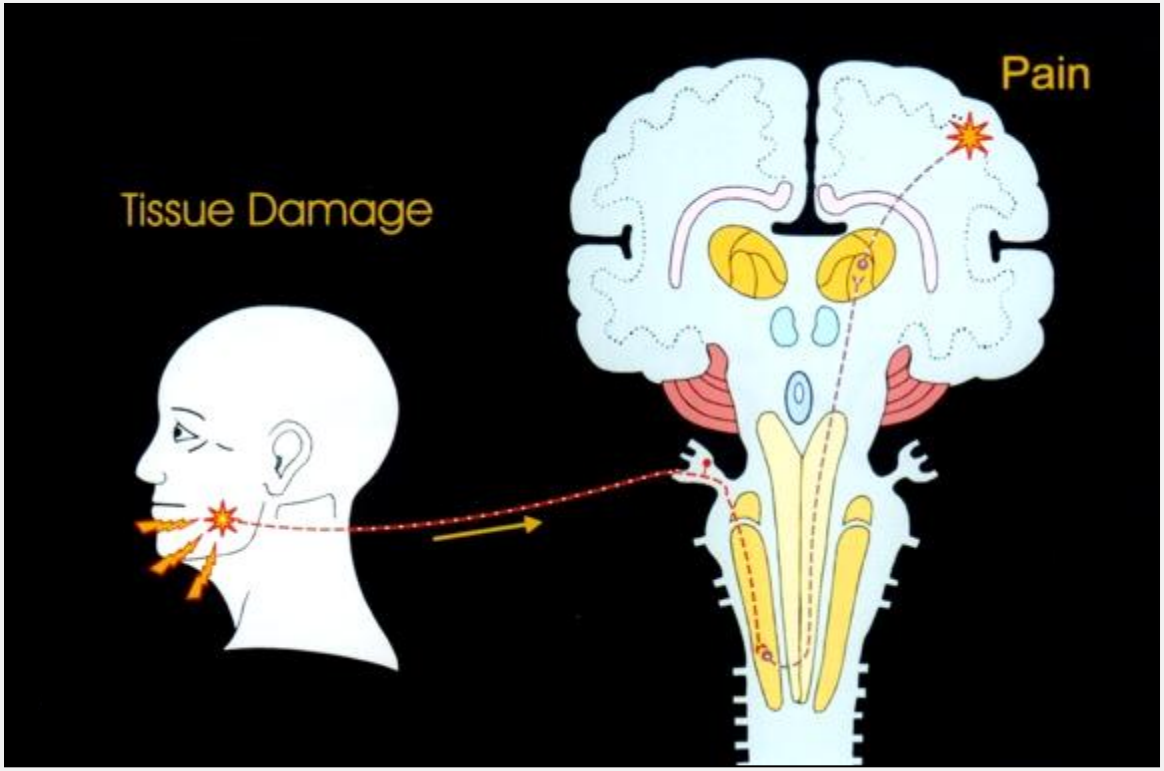
Peripheral Pain Model

Limitations - Especially With Chronic Pain



- over emphasis on peripheral anatomic changes
- increased risk of iatrogenic or no treatment

Graphic Courtesy of: Dr. J Okeson

How Do We Conceptualize Patients, Pain?

Photo Source: © Can Stock Photo

peripherally focused, biomedical models of pain are often insufficient for patients with chronic, multi-site pain and/or high affective distress…such as TBI, PTSD, polytrauma patients

Objectives

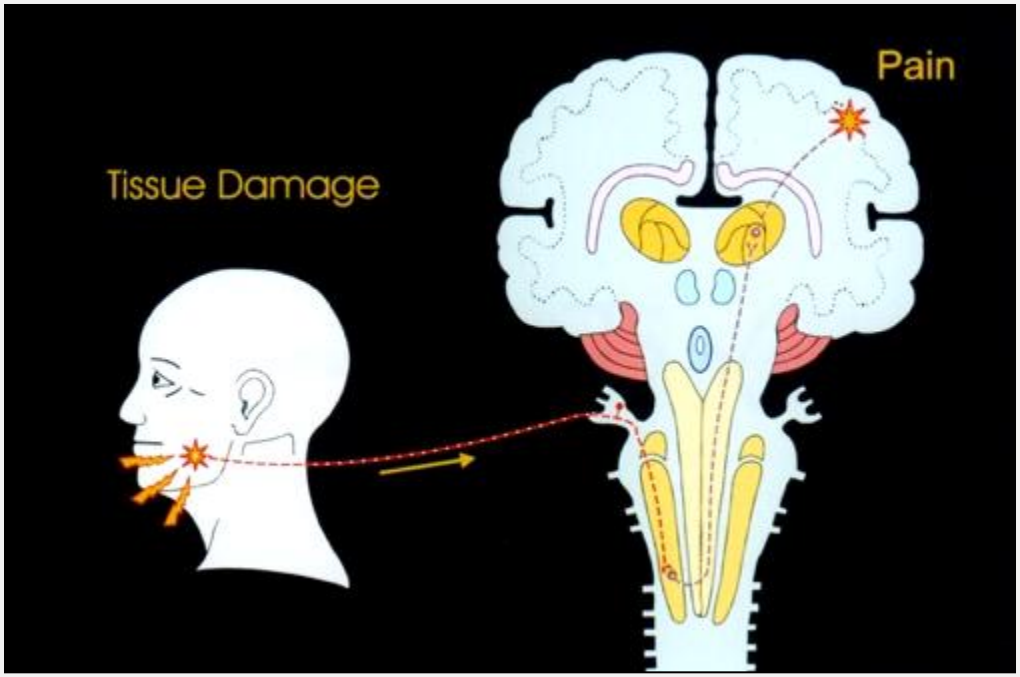
1. **distinguish site vs. source of pain**

2. describe brain regions that can influence non-voluntary jaw muscle activity

3. identify key patient characteristics that affect the outcome of therapy

What?
Why?
What else?

Site vs. Source of Pain



- site = where the pain is “felt”
- source = origin of nociception (noxious event)
- site and source are not always the same

Graphic Courtesy of: Dr. J Okeson

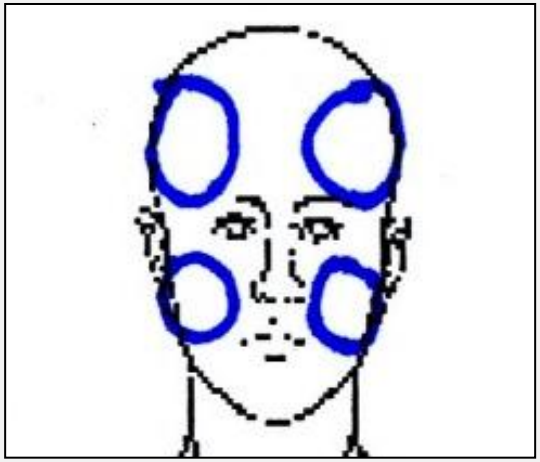
Site vs. Source

What?

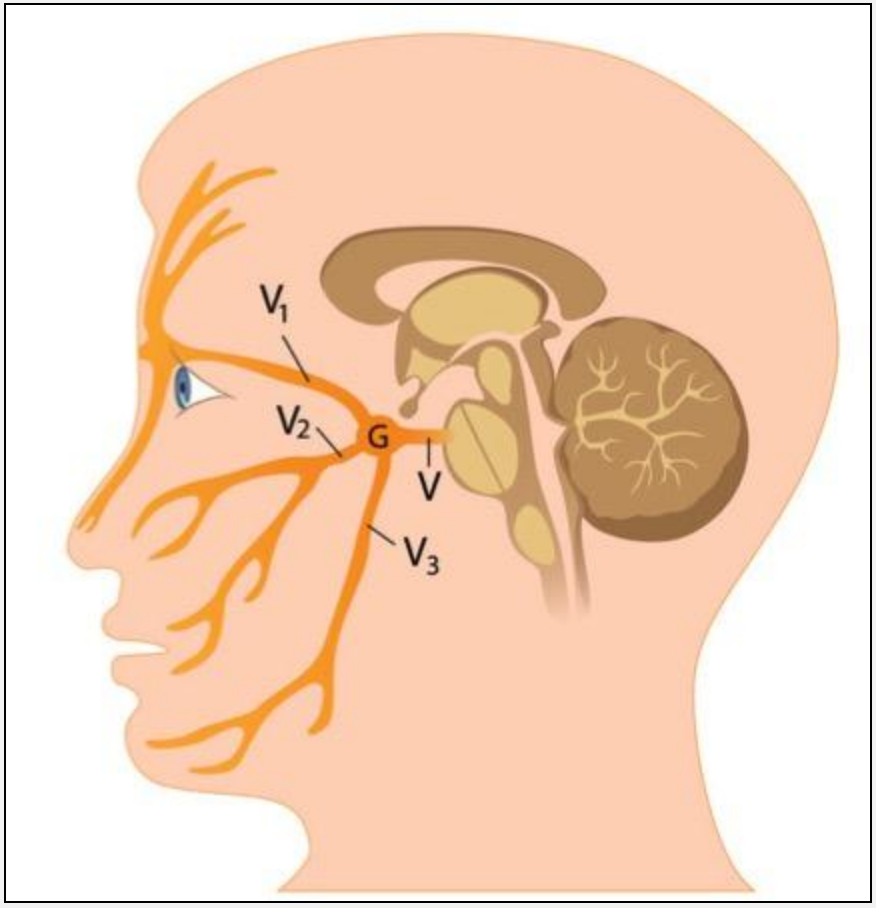
- muscle?
- joint?
- both?

Photo Source: © Can Stock Photo

- local?
- referred pain?
- both?



CN V- Trigeminal Nerve



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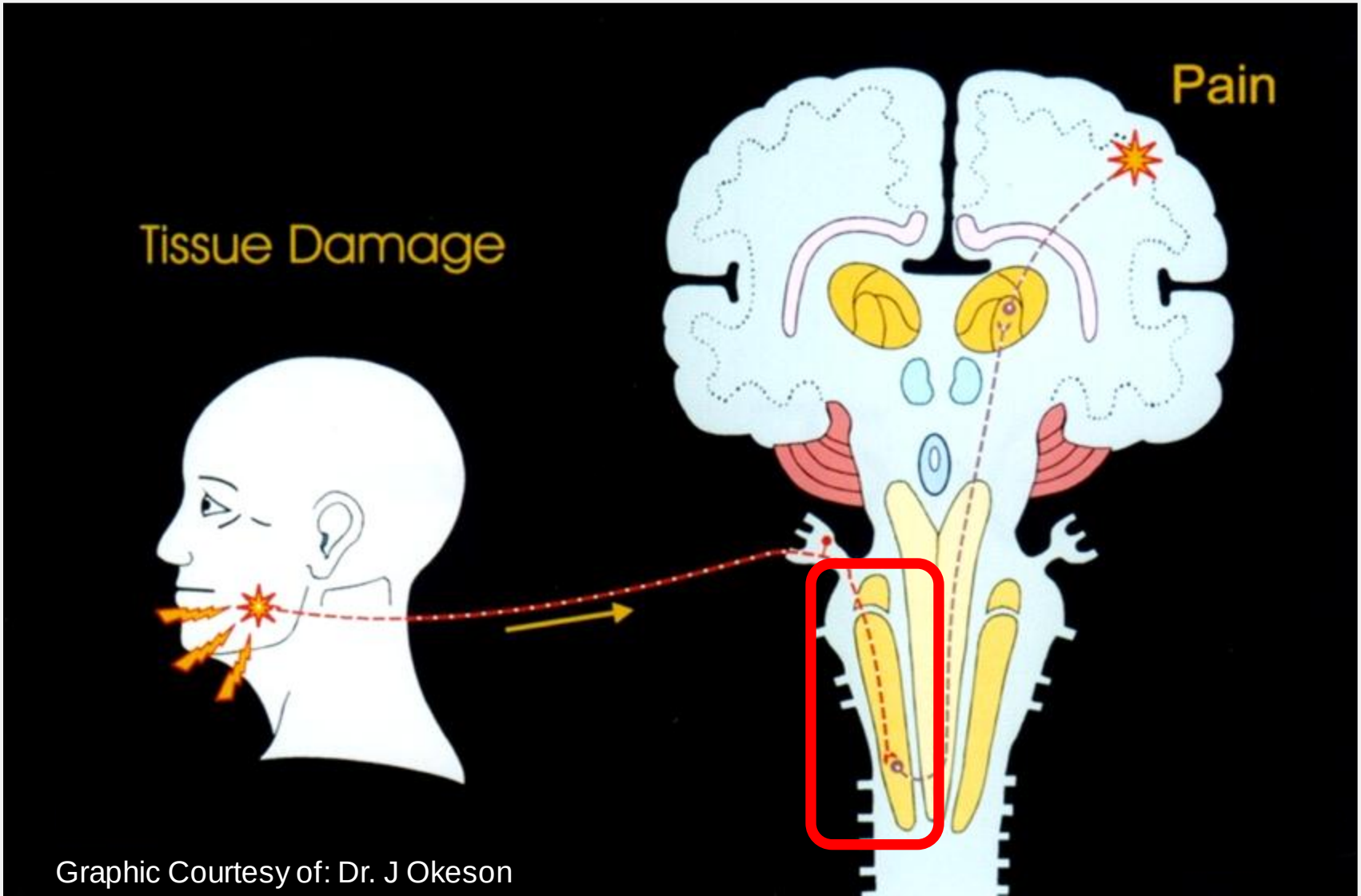
Trigeminal Nerve

A Complex Neural System



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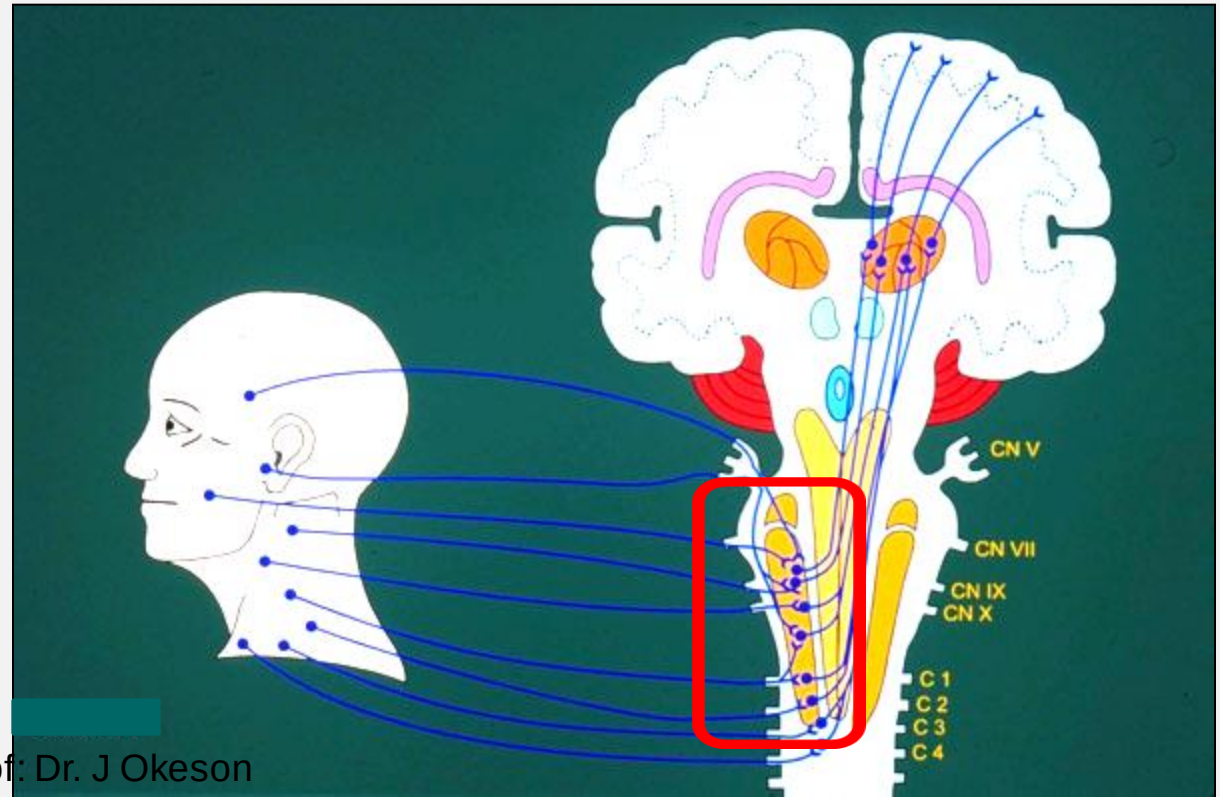
Trigeminal Convergence

- direct input = CN VII, IX, X and at least C $_{1\text{-}4}$ (Terman & Bonica, 2001)
- explains why site of pain and source of pain might differ
- referred pain is common in CN V



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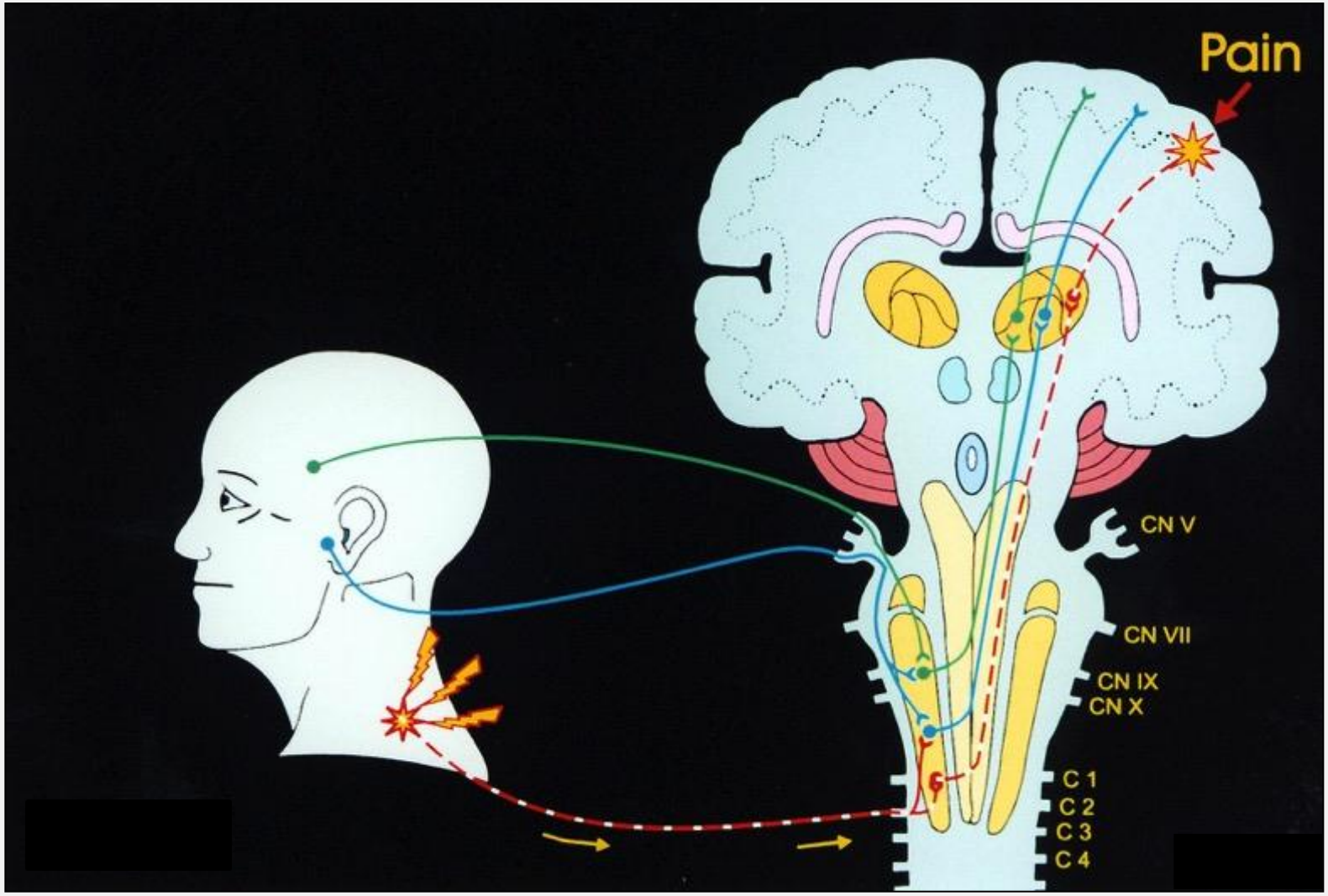
Site vs. Source of Pain

The Problem of Trigeminal Convergence



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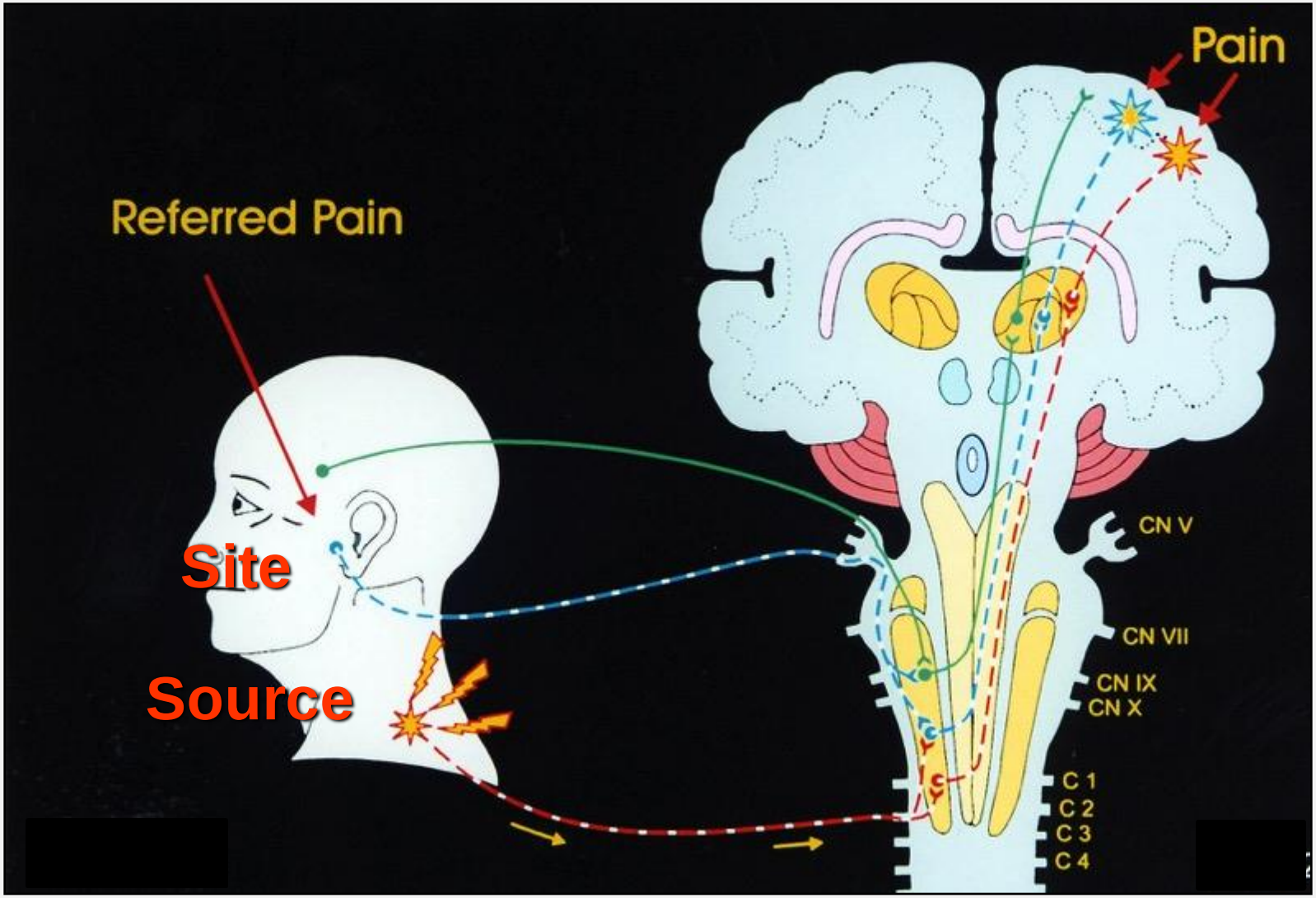
Site vs. Source of Pain

The Problem of Trigeminal Convergence



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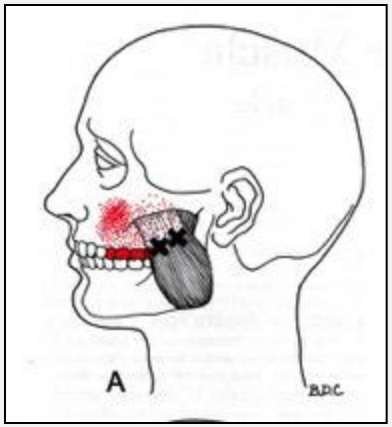
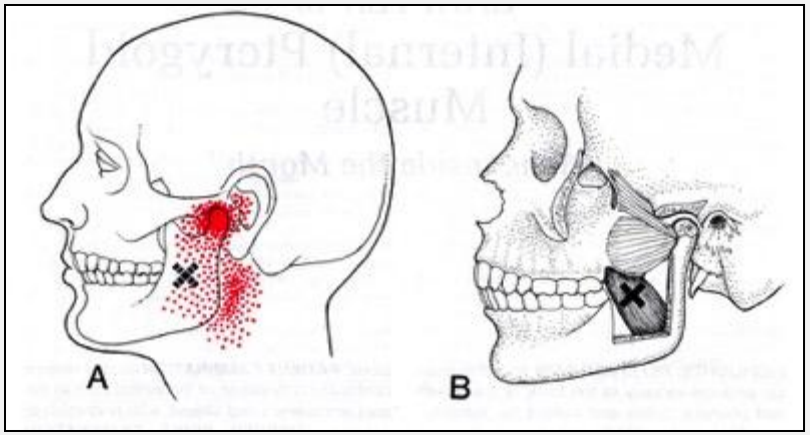
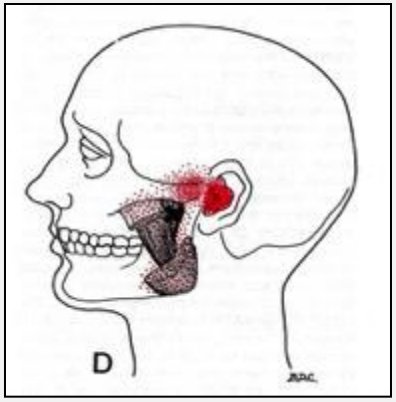
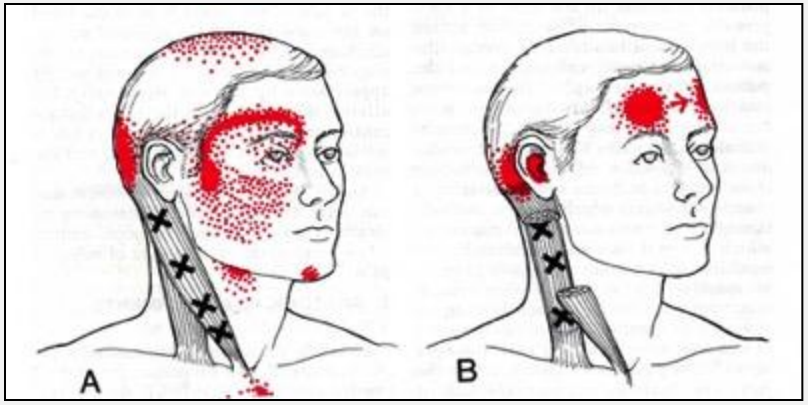
Trigeminal Convergence

Referred Muscle Pain





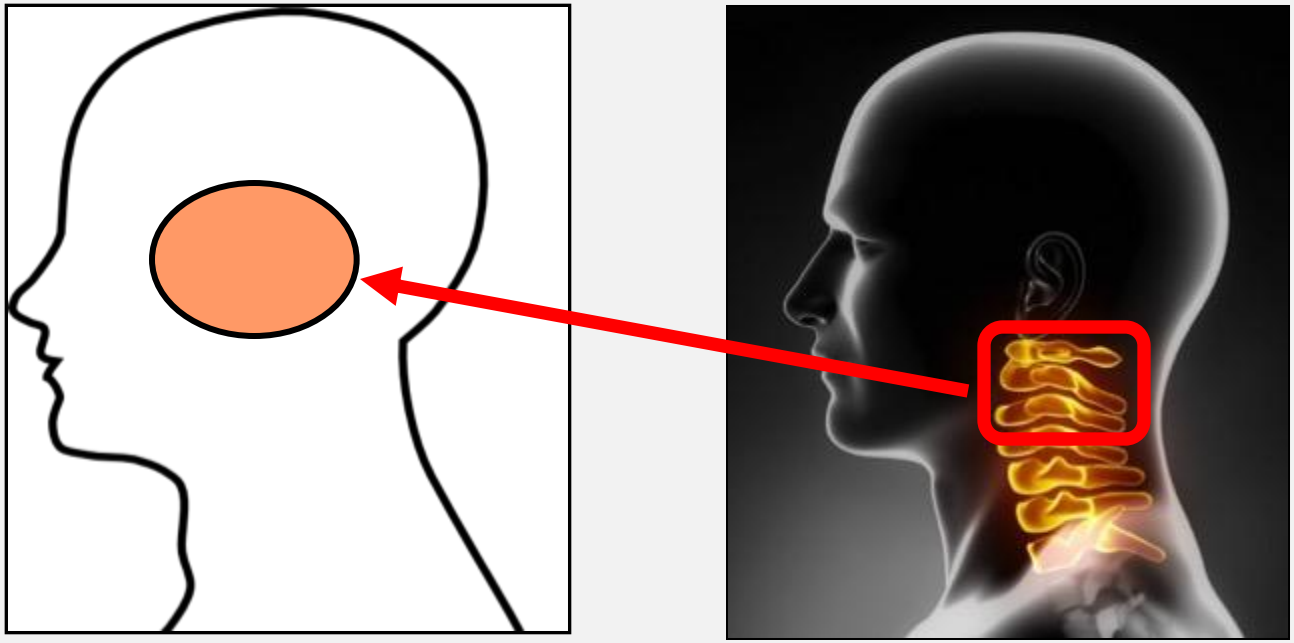




Graphics Courtesy of: Travell and Simons, 1983

Trigeminal Convergence

Cervicogenic Referral - C 1-3



60-80% reported referral

Bogduk & Govind, 2009

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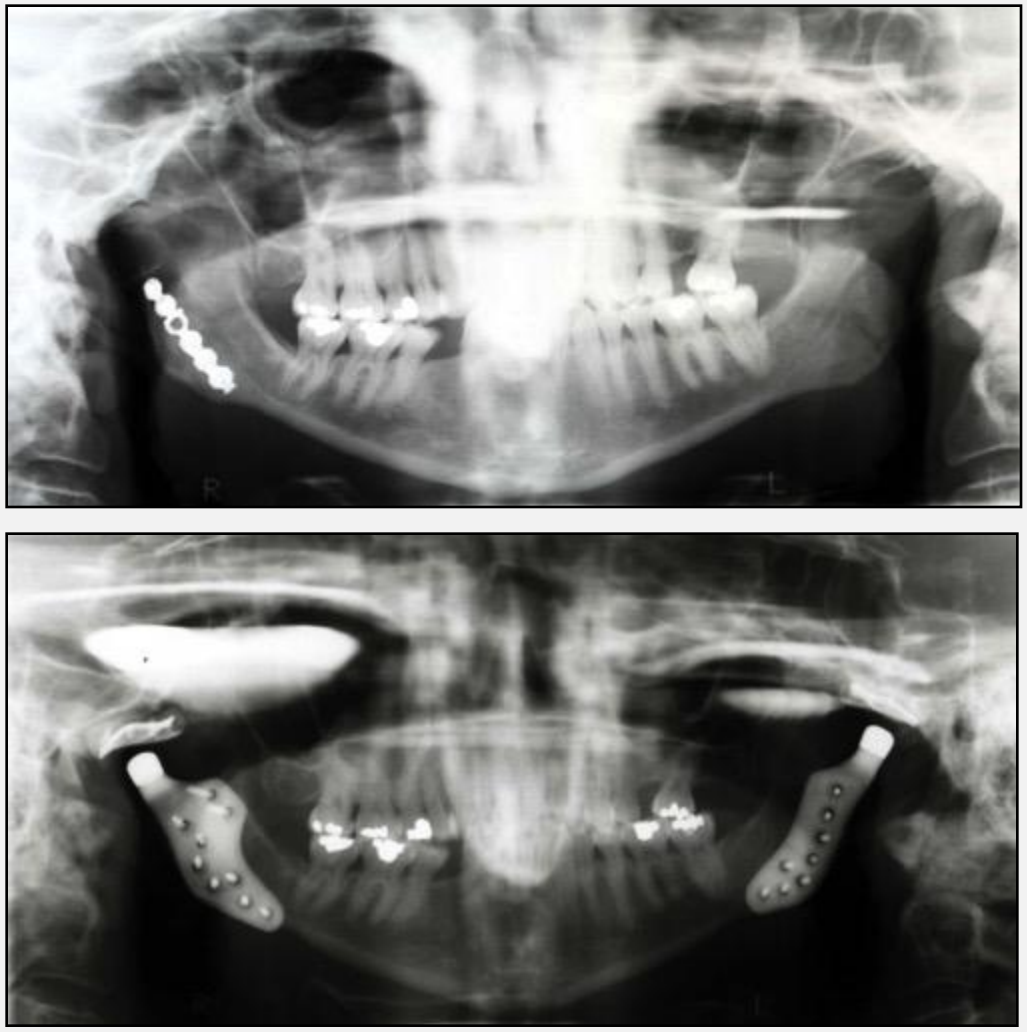
Implications of CN V Convergence

Patient s/p 7 TMJ Surgeries



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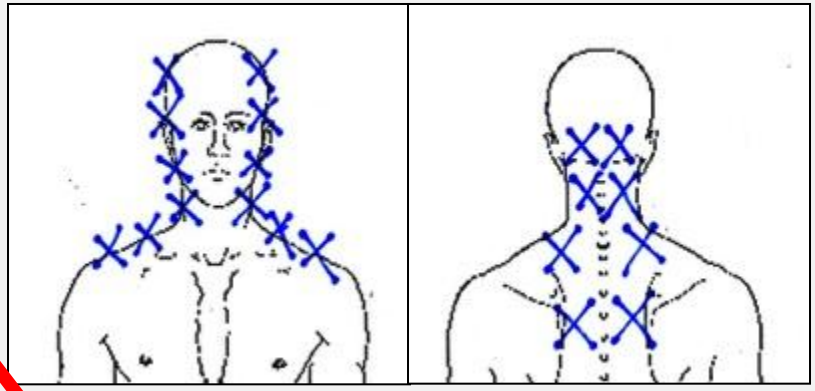
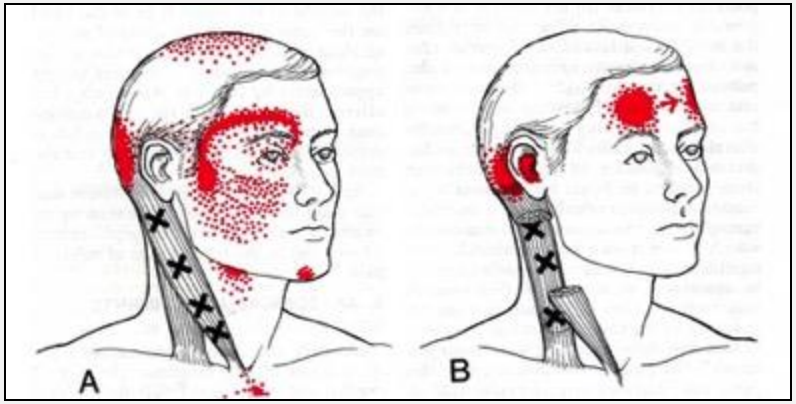
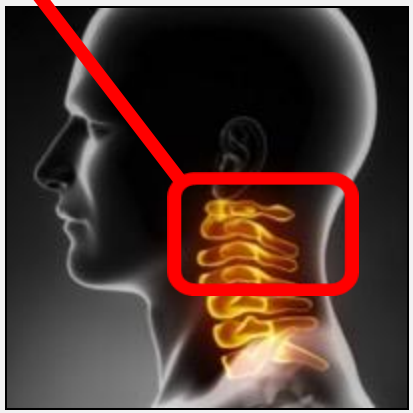
Implications of CN V Convergence

Patient s/p 7 TMJ Surgeries



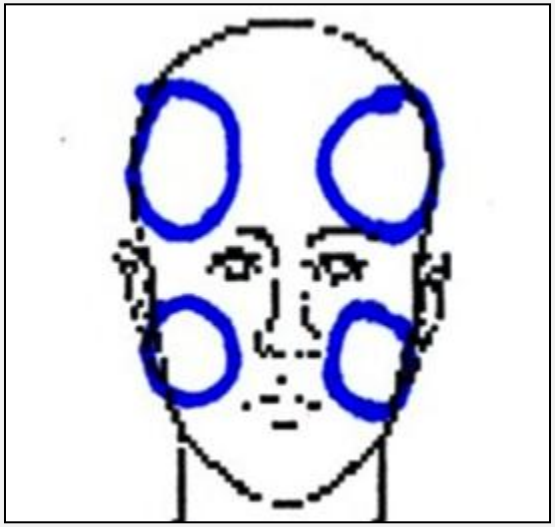


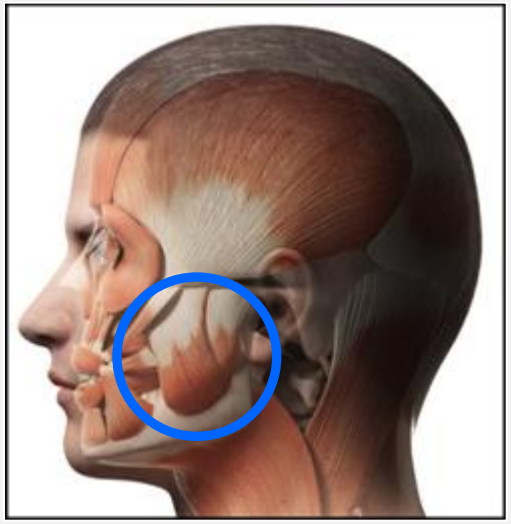


Site vs. Source

Graphics Courtesy of: Simons and Travell, Dr. J Johnson, © Can Stock Photo

Our Patient…What?





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site = mid-face & preauricular
source = masticatory muscles
What ? = masticatory myalgia

Objectives

1. distinguish site vs. source of pain

2. **describe brain regions that can influence non-voluntary jaw muscle activity**

3. identify key patient characteristics that affect the outcome of therapy

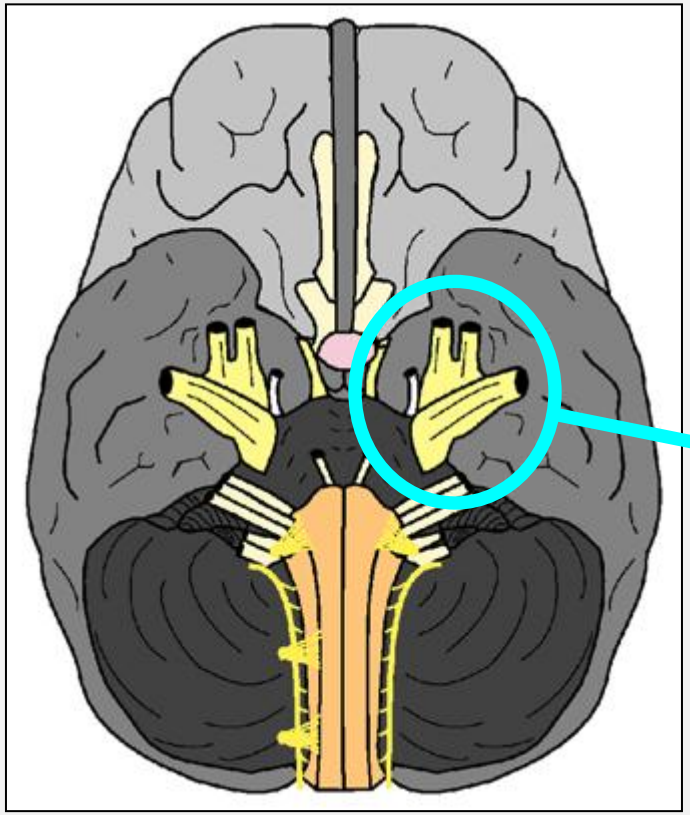
What?

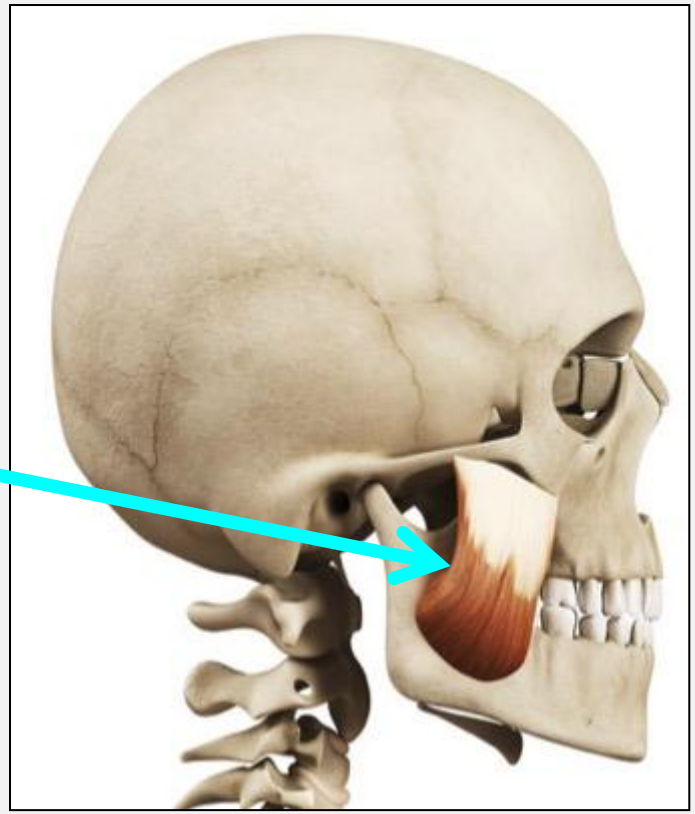
Why?

What else?

Masticatory Muscle Activity

Trigeminal Nerve (CN V) – Sensory & Motor





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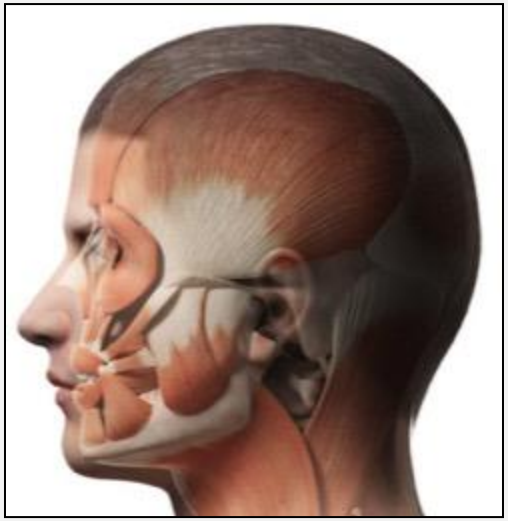
Significance of CN V Motor Activity

Who Cares?



Photos Source: © Can Stock Photo

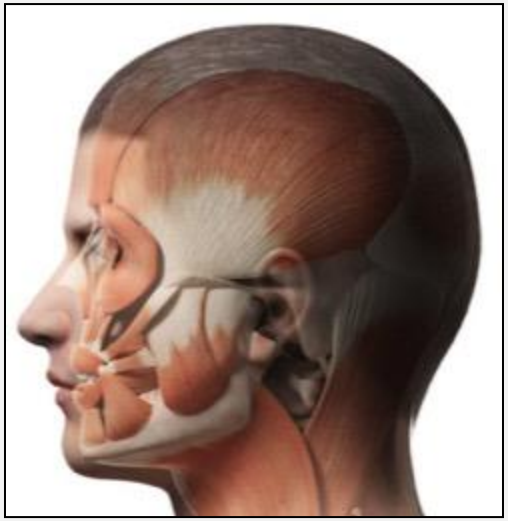
- protracted muscle response
  - metaboreceptors (H^+, lactate, ATP)
  - fatigue
  - pain (Light, Vierck & Light, 2010)
- joint over-loading (Nitzan, 2001)
  - condylar remodeling
  - osteoarthritis
  - disc disorders

"…excessive loading on articular tissues is one of the causative factors that must be identified and addressed by all clinicians…"

Israel, Diamond, Saed-Nejad & Ratcliffe, 1999

Significance of CN V Motor Activity

Who Cares?



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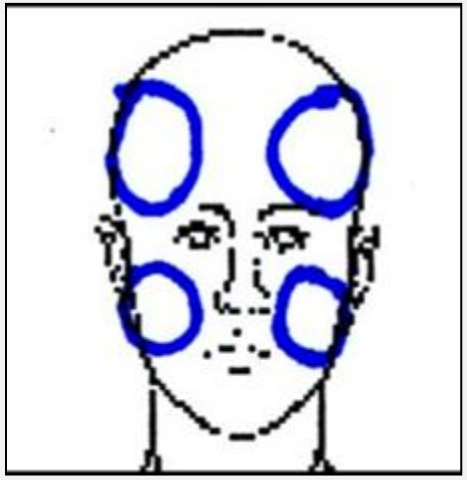
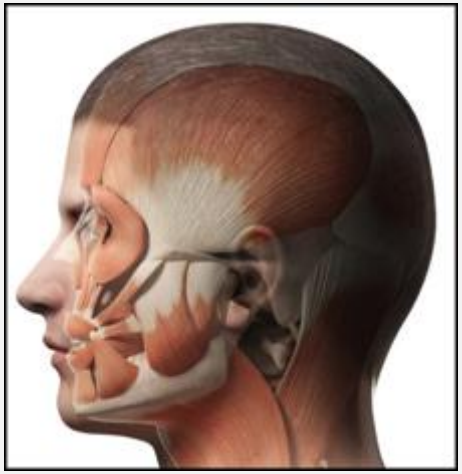
- protracted muscle response
  - metaboreceptors (H^+, lactate, ATP)
  - fatigue
  - pain (Light, Vierck & Light, 2010)
- joint over-loading (Nitzan, 2001)
  - condylar remodeling
  - osteoarthritis
  - disc disorders

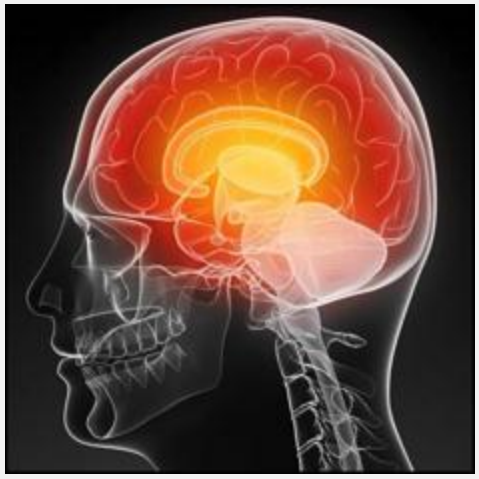
Can muscle or joint symptoms be effectively managed without addressing central neural drive? Neural drive helps to answer… "**Why?**".

Our Patient

Masticatory Muscle Pain
Is the "Why" Important?





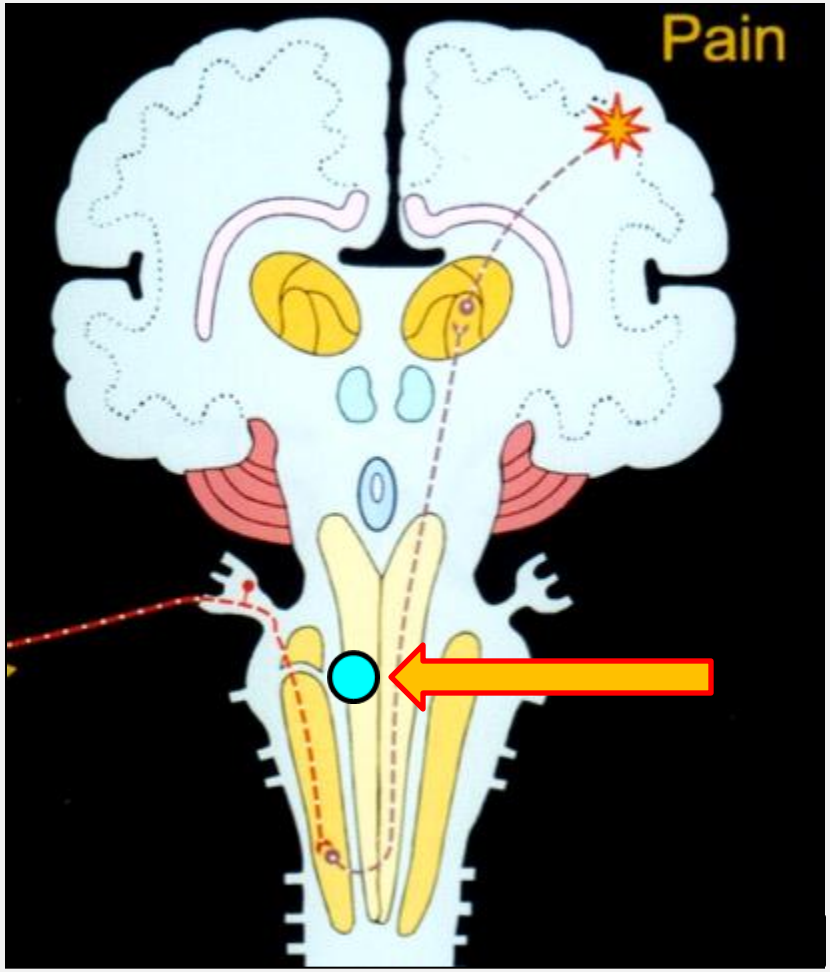


Can his muscle symptoms be effectively managed without addressing central neural drive?

Photos Source: © Can Stock Photo

Trigeminal Motor Nucleus

Unique Location & Connections

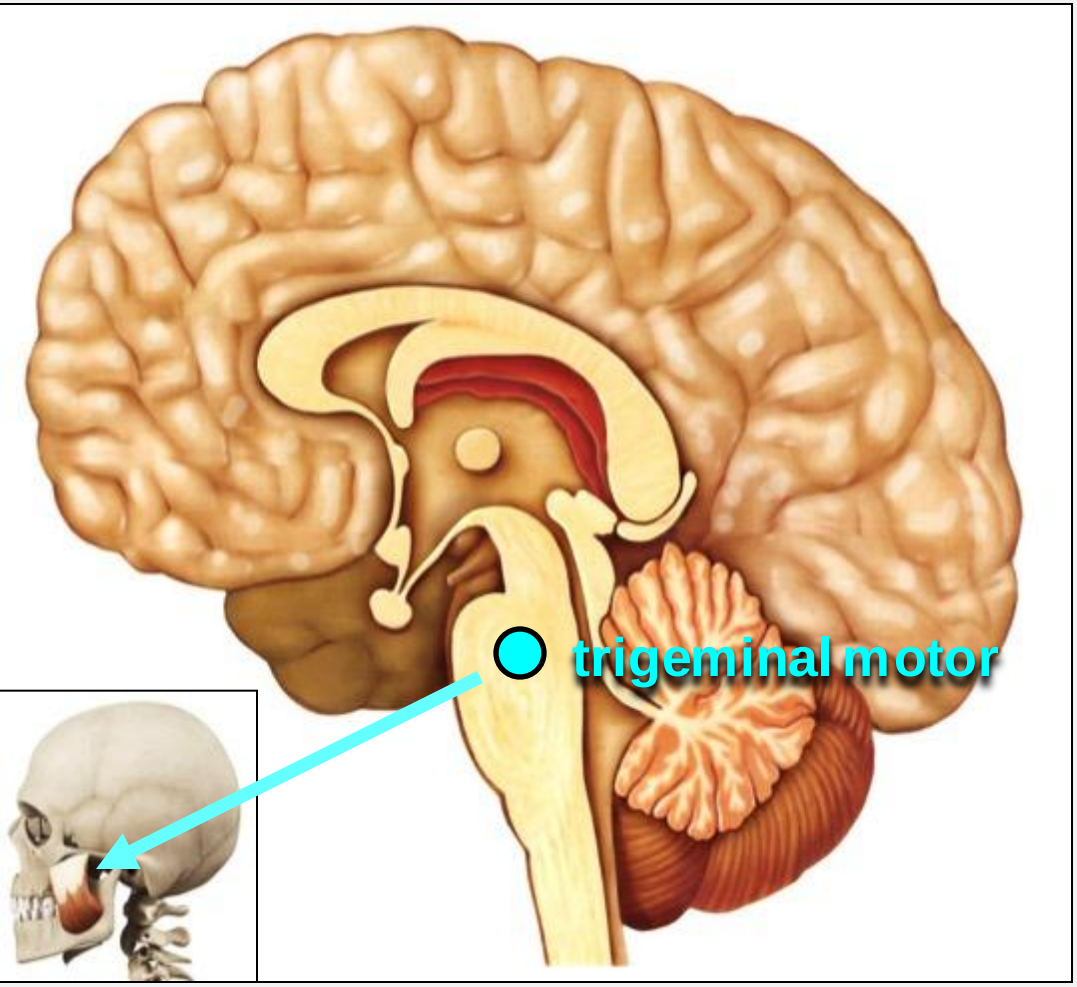


CN V_M is surrounded by premotor neurons connected to numerous integrative and autonomic brain stem nuclei (Lazarov, 2007)

Graphic Courtesy of: Dr. J Okeson

Trigeminal Motor Nucleus

Neural Circuits



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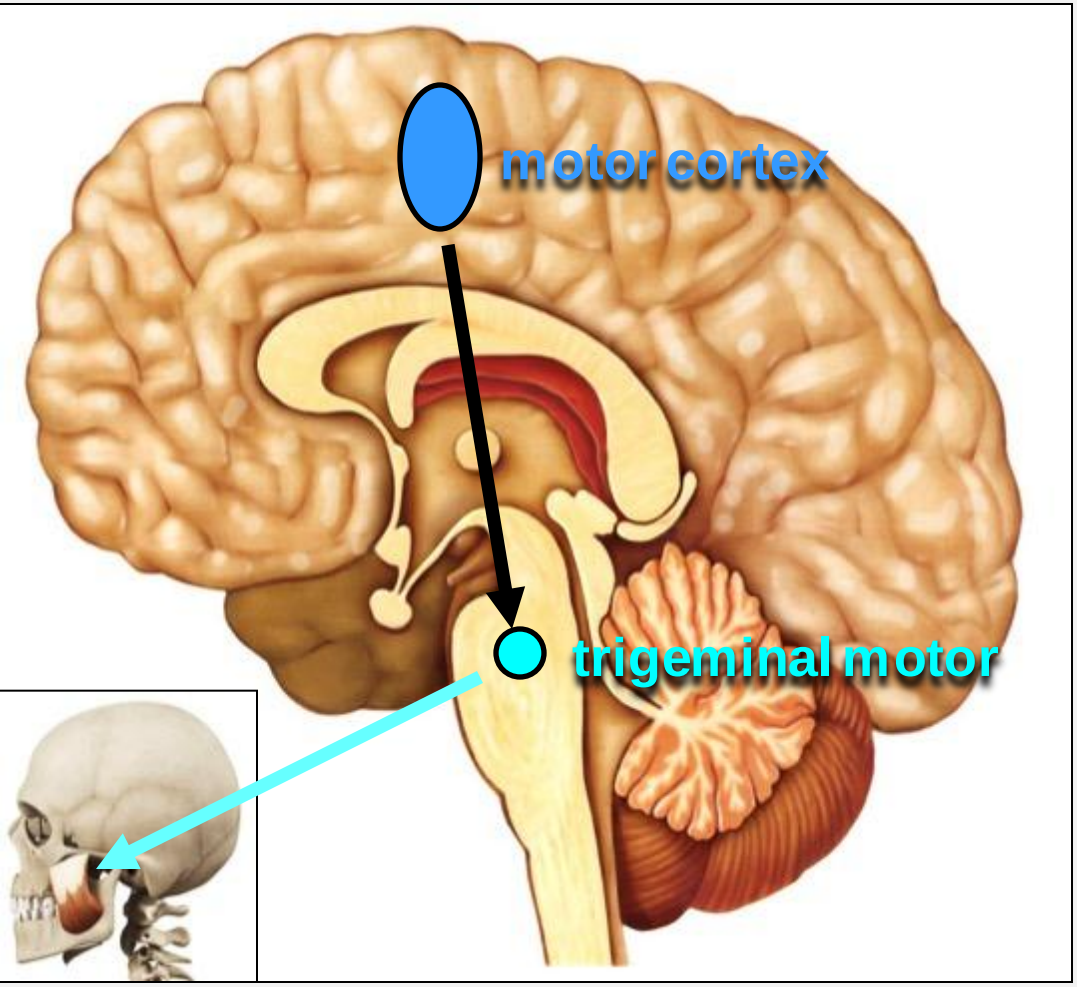
Trigeminal Motor Nucleus

Neural Circuits



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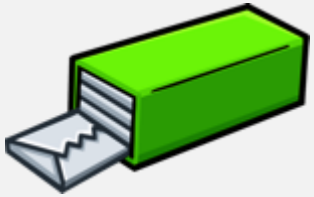
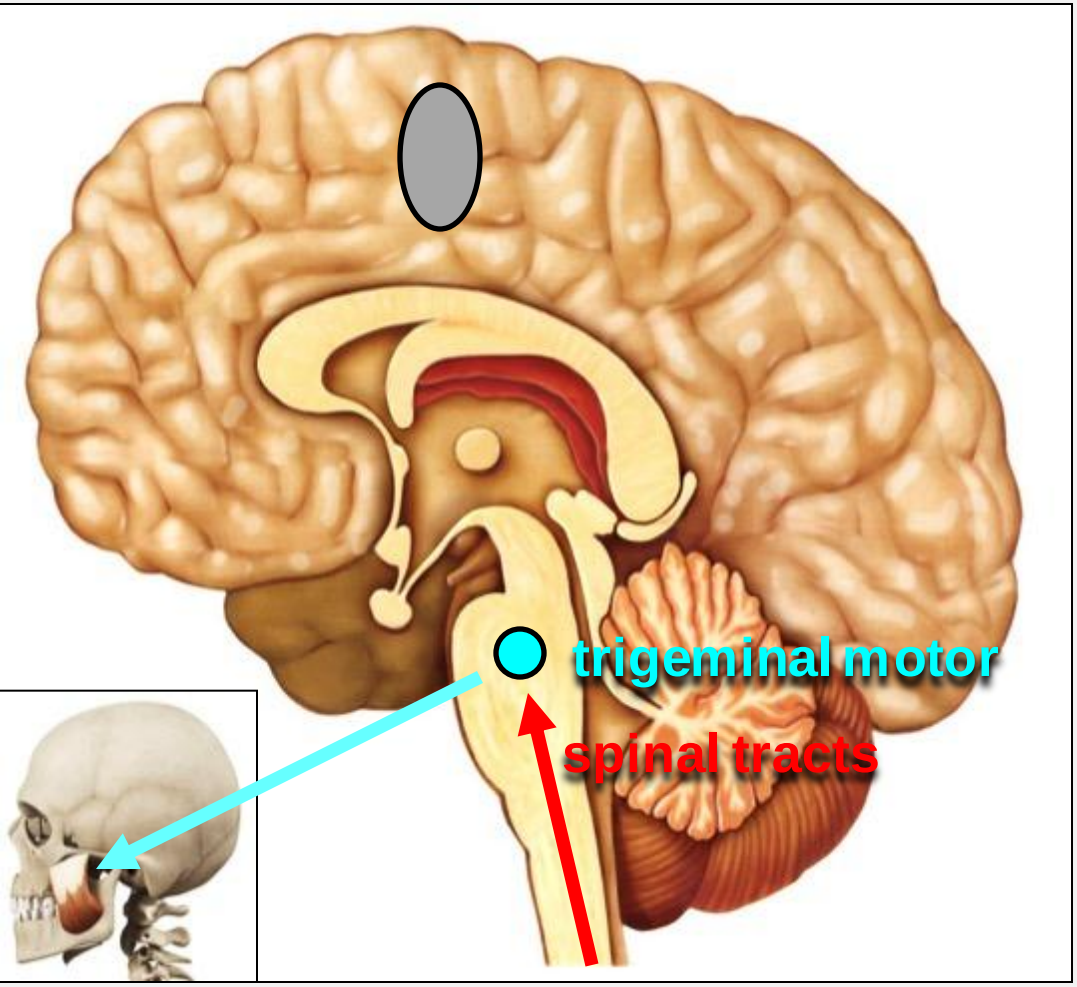
- **primary motor cortex** (volitional)



Trigeminal Motor Nucleus

Non-Voluntary Neural Circuits



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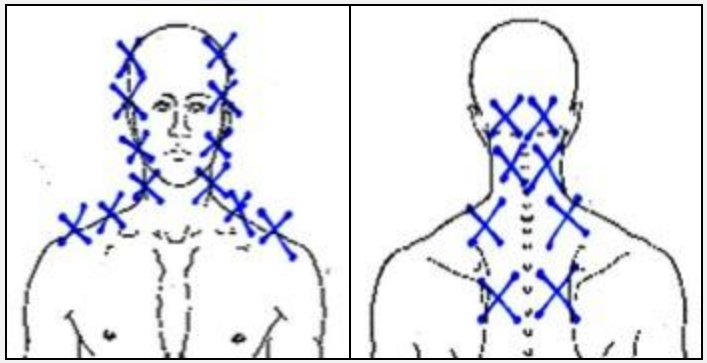
- primary motor cortex
- **spinal nociceptive tracts** (reflexive contraction)
  (Terman & Bonica, 2001)



Does a dose-response relation exist between spinal pain and temporomandibular disorders?

Wiesinger, Malker, Englund & Wanman, 2009

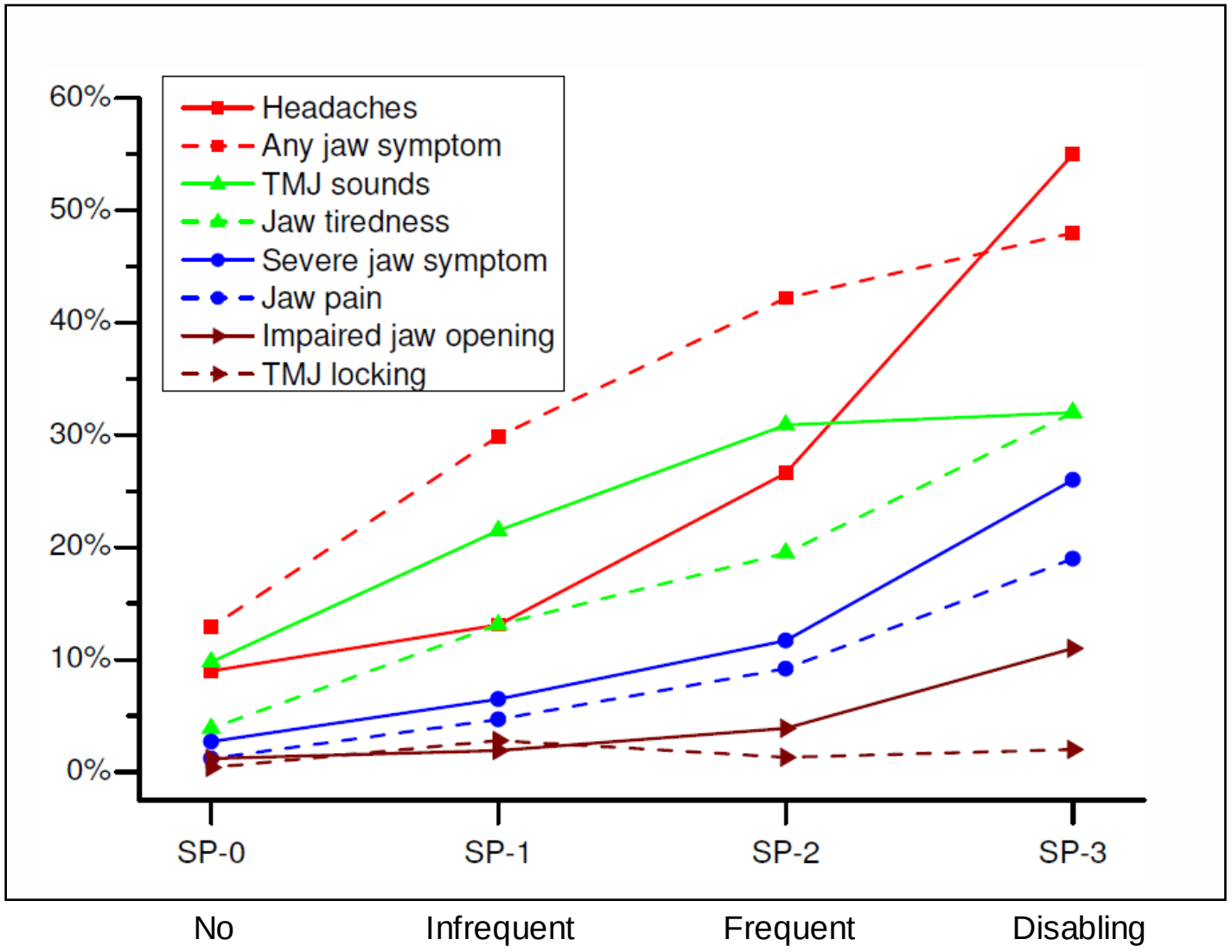
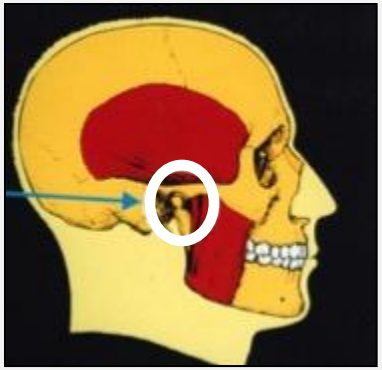


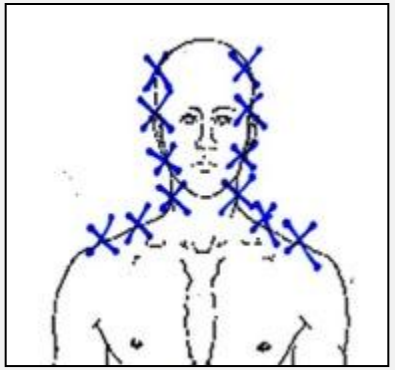
Image Courtesy of: BioMed Central

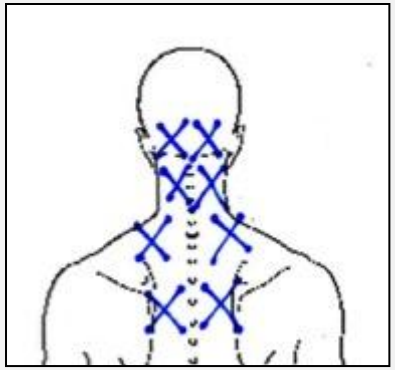
Temporomandibular Disorder and Comorbid Pain Conditions

Lim P, Maxiner W, Kahn A
JADA, Dec 2011

"Patients with TMD symptoms are often treated with a narrow dental paradigm while clinicians ignore co-existing pain conditions, resulting in treatment failure and perpetuation of the problem."



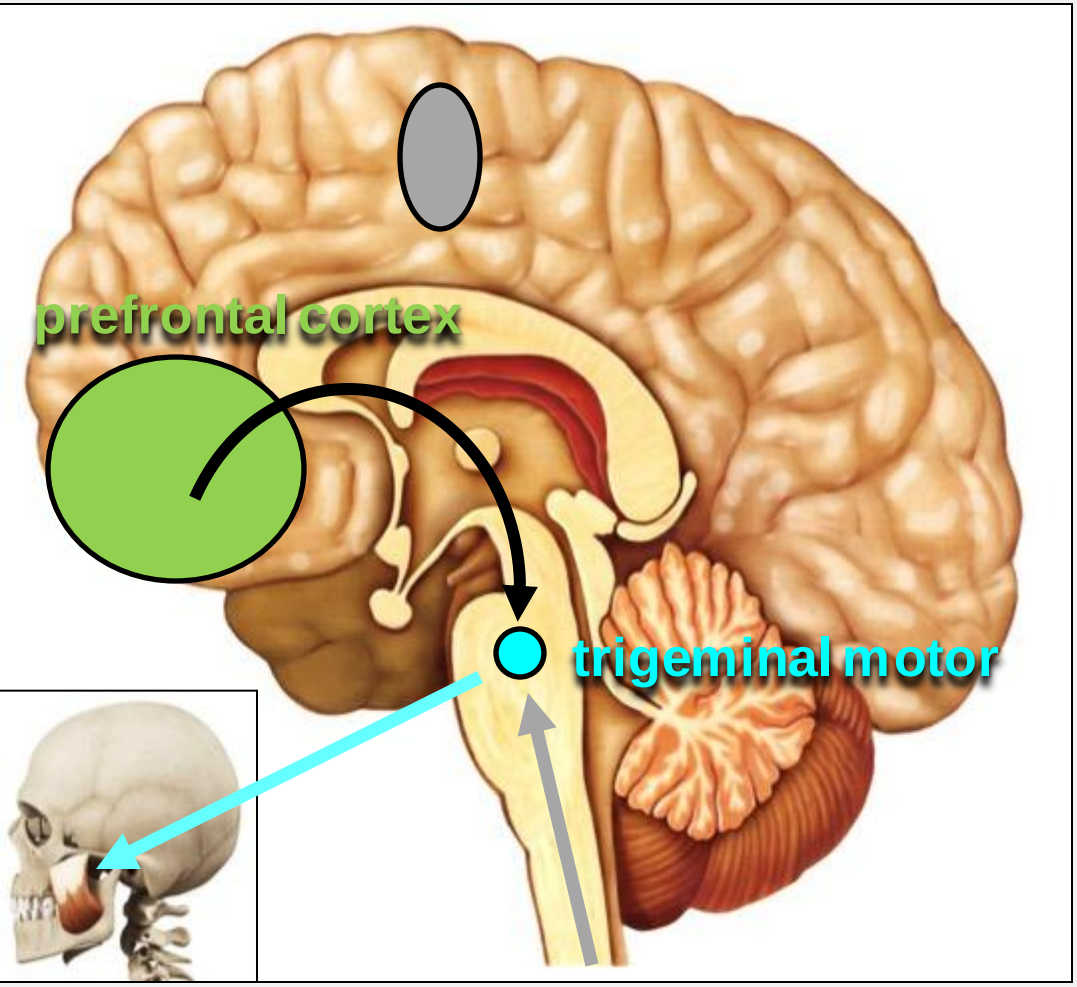




Graphic Courtesy of: Dr. J Okeson

Trigeminal Motor Nucleus

Non-Voluntary Neural Circuits



- primary motor cortex
- spinal nociceptive tracts
- **prefrontal cortex** (executive function) (Groenewegen & Uylings, 2000)

Photos Source: © Can Stock Photo

Trigeminal Motor Nucleus

Non-Voluntary Neural Circuits

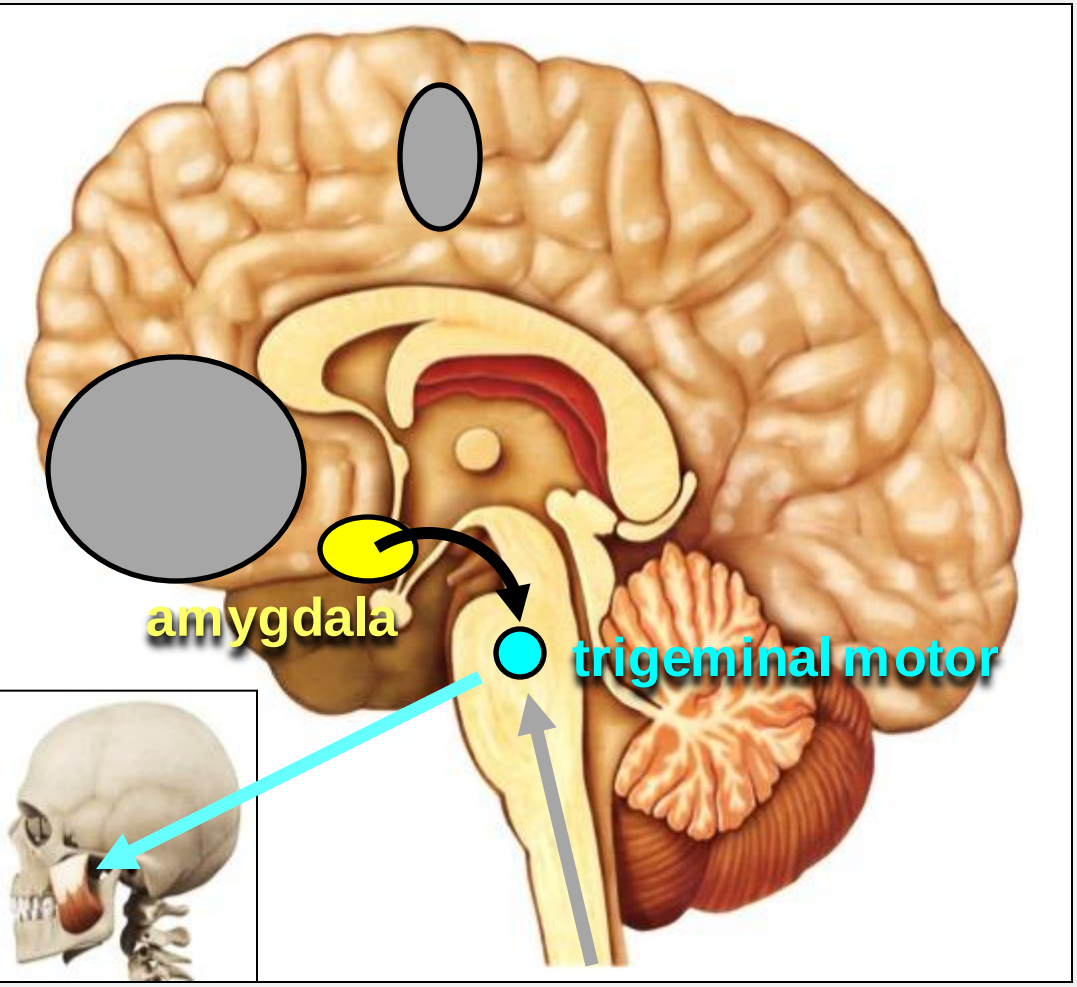


Photo Source: © Can Stock Photo

- primary motor cortex
- spinal nociceptive tracts
- prefrontal cortex
- **amygdala (limbic)** (valence, emotions) (Nieuwenhuys, 1996)

Trigeminal Motor Nucleus

Non-Voluntary Neural Circuits

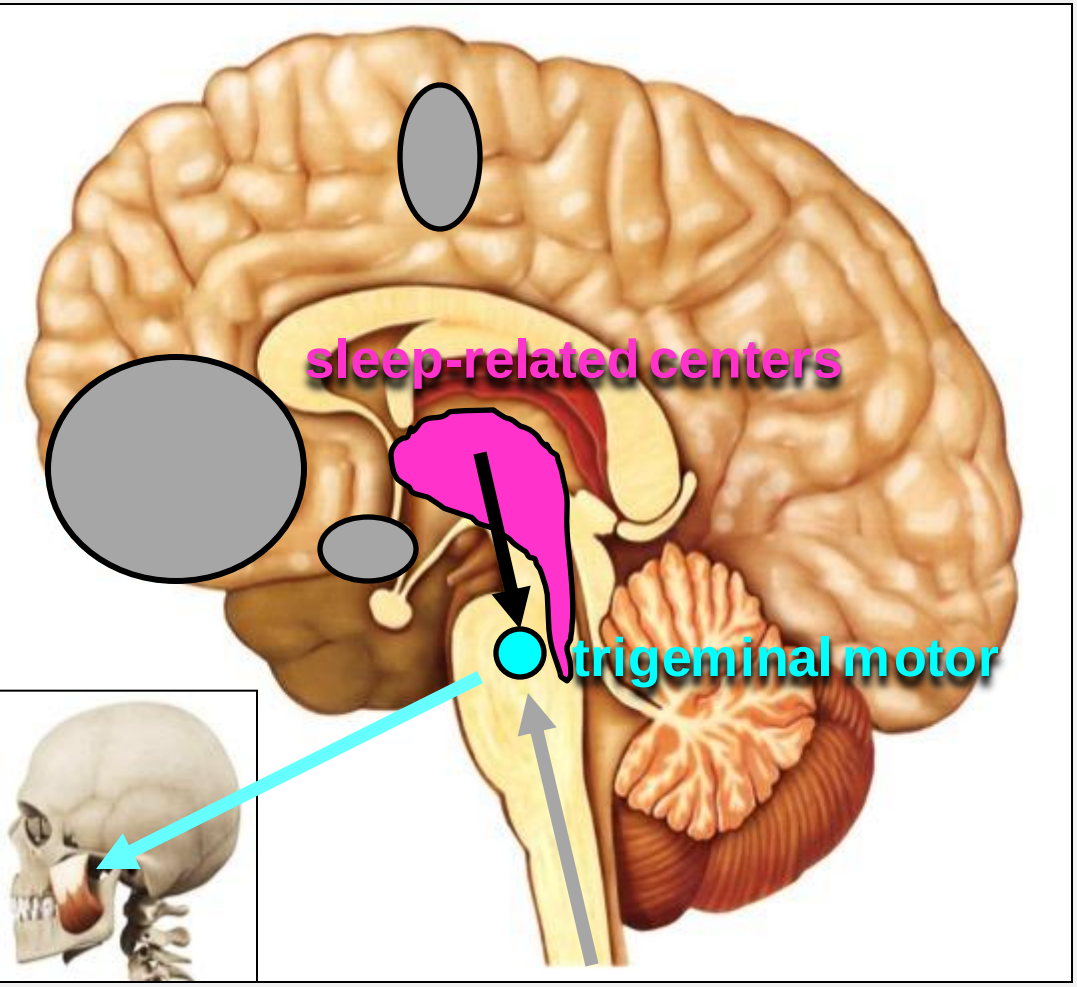
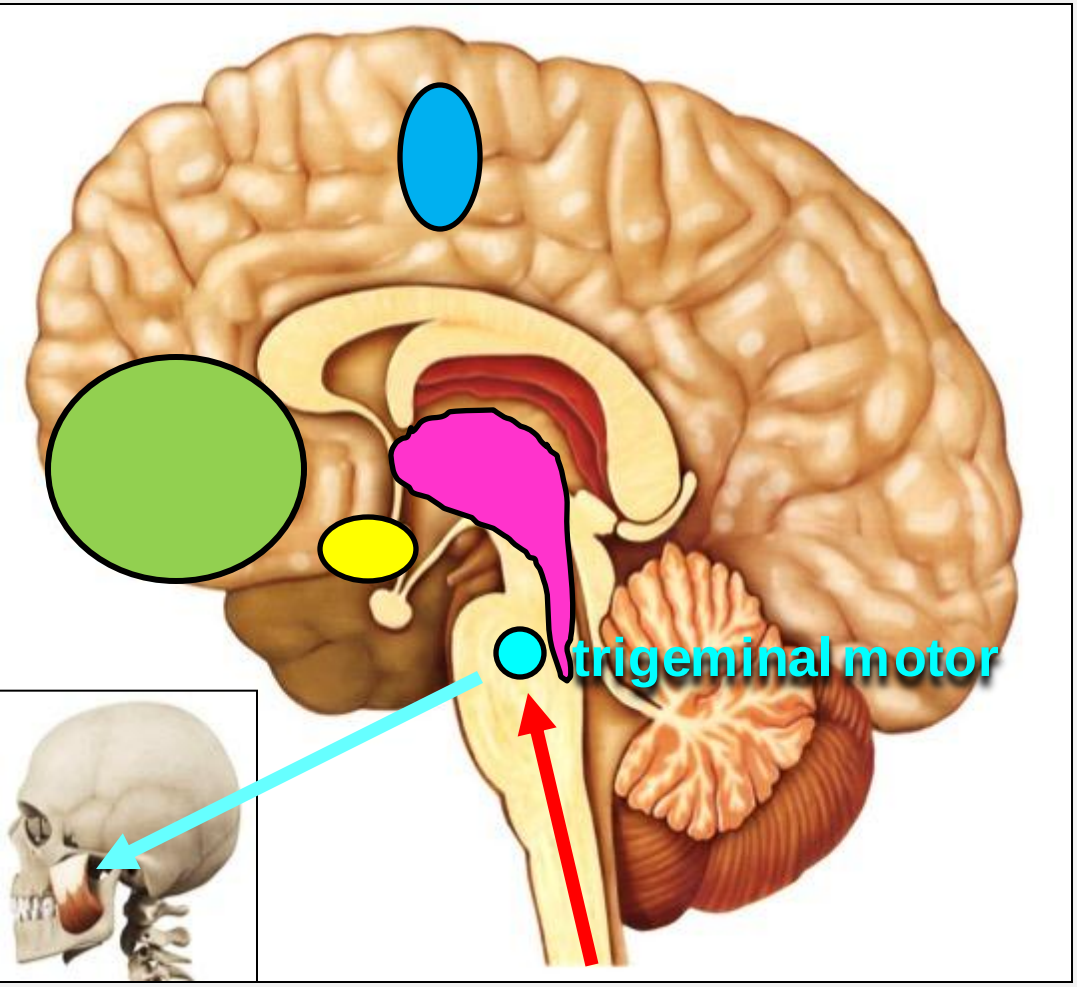


Photo Source: © Can Stock Photo

- primary motor cortex
- spinal nociceptive tracts
- prefrontal cortex
- amygdala (limbic)
- **sleep-related centers** (nocturnal bruxism)
  (Fay & Norgren, 1997)

Trigeminal Motor Nucleus

Areas Influencing Non-Voluntary Jaw Muscle Activity

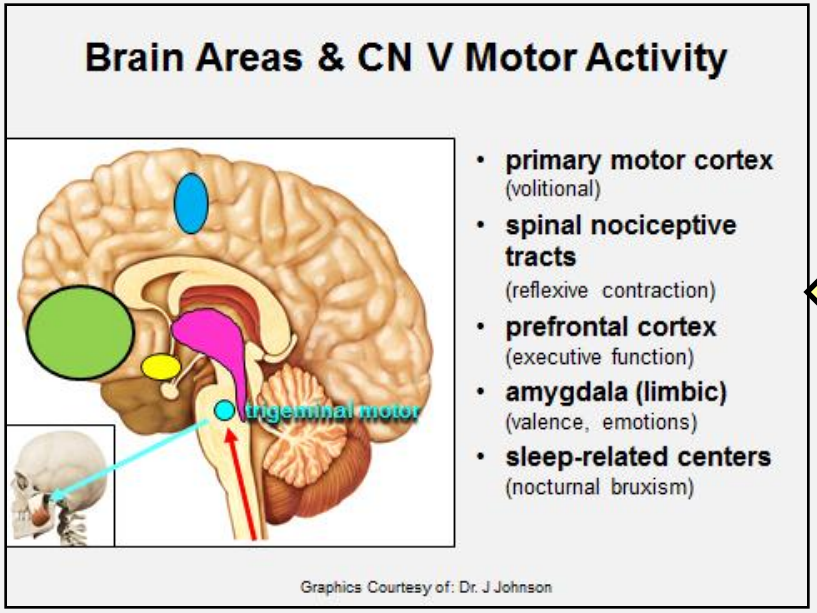


- **primary motor cortex** (volitional)
- ✓ **spinal nociceptive tracts** (reflexive contraction)
- ✓ **prefrontal cortex** (executive function)
- ✓ **amygdala (limbic)** (valence, emotions)
- ✓ **sleep-related centers** (nocturnal bruxism)

Photo Source: © Can Stock Photo

Trigeminal Motor Considerations

Other Factors

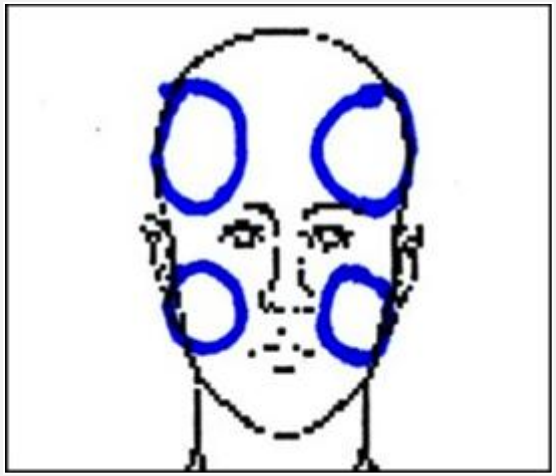


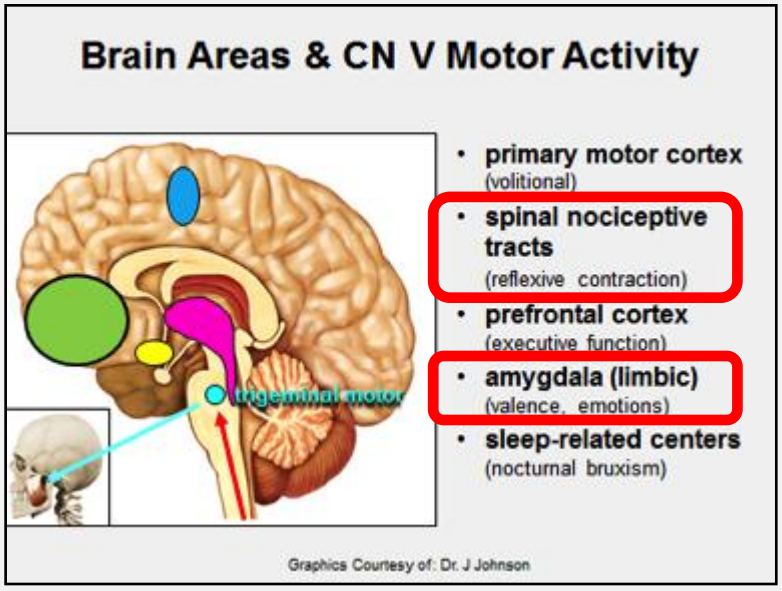
- TBI effects

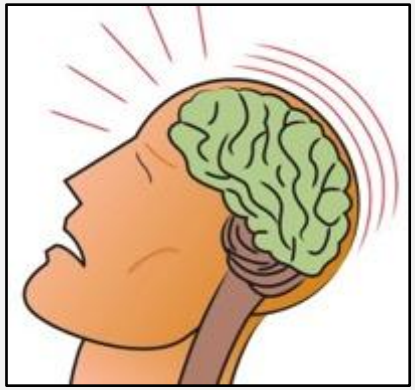
- medications
  - antidopaminergic
  - sympathomimetic

Photos Source: © Can Stock Photo

Our Patient…Why?







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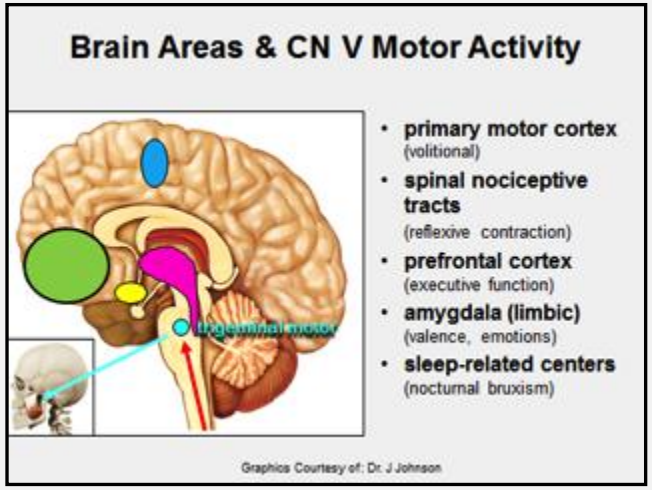
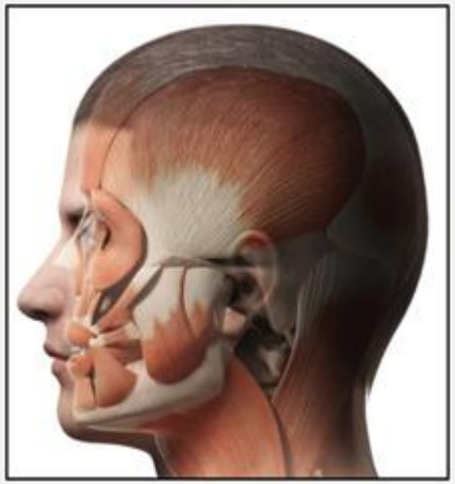
Pivotal Question





Can “peripheral” muscle and joint symptoms be effectively managed without an appreciation of “central” neural drive?

Photos Source: © Can Stock Photo

Objectives

1. distinguish site vs. source of pain

2. describe brain regions that can influence non-voluntary jaw muscle activity

3. **identify key patient characteristics that affect the outcome of therapy**

What?
Why?
What else?

Key Patient Characteristics
Factors Affecting TMD's - Onset & Outcomes

- physical or imaging findings are seldom predictive of onset or treatment outcomes of chronic TMD pain

1. other pain conditions, notably widespread pain (Aggarwal, Macfarlane, Farragher & McBeth, 2010)
2. psychological attributes (Litt & Porto, 2013)
   - ↑ anxiety, depression, etc.
   - ↑ catastrophizing
   - poor coping skills
3. poor sleep (Lei, Liu, Yap & Fu, 2015)

Graphic Courtesy of: Dr. J Johnson

Key Patient Characteristics

Factors Affecting TMD's - Onset & Outcomes

- ✓ other pain conditions, notably widespread pain
- ✓ psychological attributes
- ✓ poor sleep

Photo Source: © Can Stock Photo

Common Characteristics
TMD Patient Factors and OIF/OEF/OND Veterans

- Veterans Health Administration 2009-2011
  - 613,391 OIF/OEF/OND veterans & ICD 9 codes
  - 40.2% pain (head, neck and/or back)
  - 29.3% PTSD
  - 9.6% TBI
  - 6.0% polytrauma (pain, PTSD, TBI)

(Cifu, Taylor, Carne, Bidelspach, Sayer, Sholten & Campbell 2013)

- War Related Illness & Injury Study Center, New Jersey VA
  - 356 OIF/OEF patients, 2008-2010 chart review
  - 72 % pain
  - 62 % sleep (Strong, Ray, Findley Torres, Pickett & Byrne 2014)

Key Patient Characteristics

Factors Affecting TMD's - Onset & Outcomes

- ✓ other pain conditions, notably widespread pain
- ✓ psychological attributes
- ✓ poor sleep

In the absence of clear, contributory pathology, do not pursue invasive therapies if these patient characteristics are not adequately considered.

Key Patient Characteristics

Factors Affecting TMD's - Onset & Outcomes

Consider as <u>therapeutic targets</u>…

1. other pain conditions
2. psychological attributes
3. poor sleep

Photo Source: © Can Stock Photo

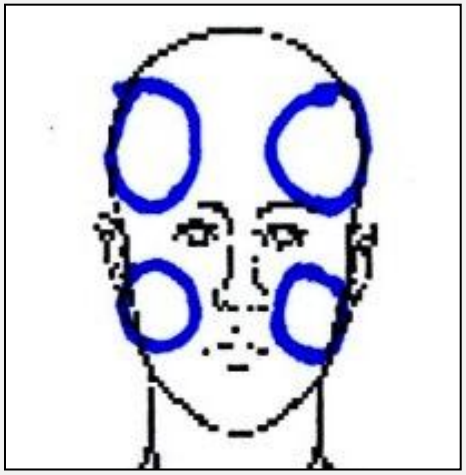
Sleep

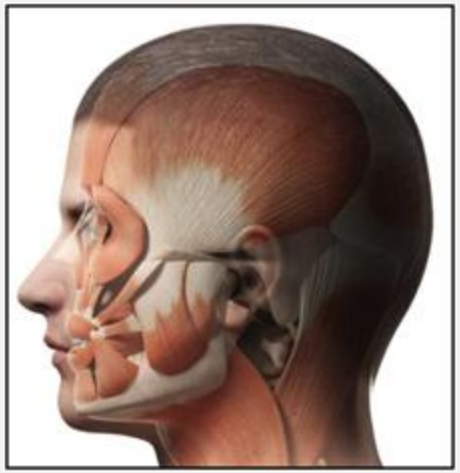
Photo Source: © Can Stock Photo

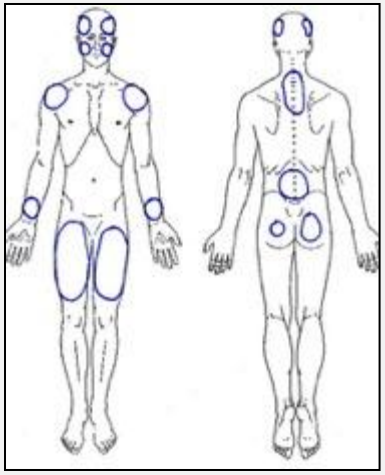
"Sleep is medicine."

Jessica Johnson, 2012

Our Patient…What else?







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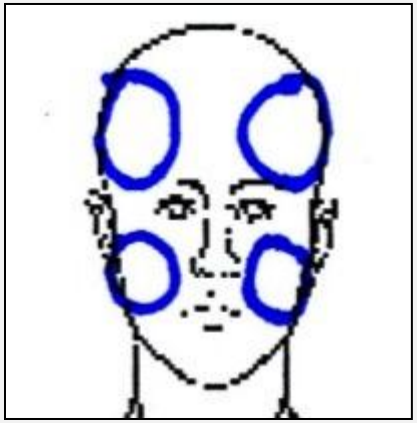
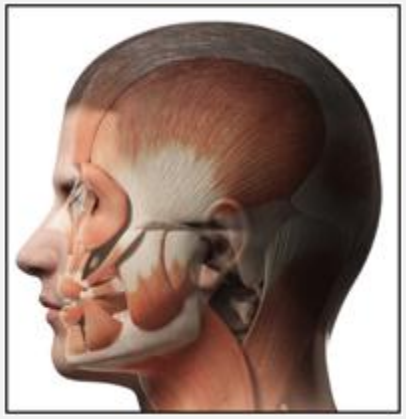
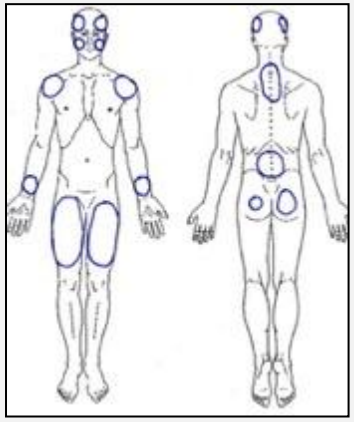
key characteristics:

- other pain = many sites, poor control
- affect = ↑ stress, anger
- sleep = poor

Our Patient

What? Why? What else?



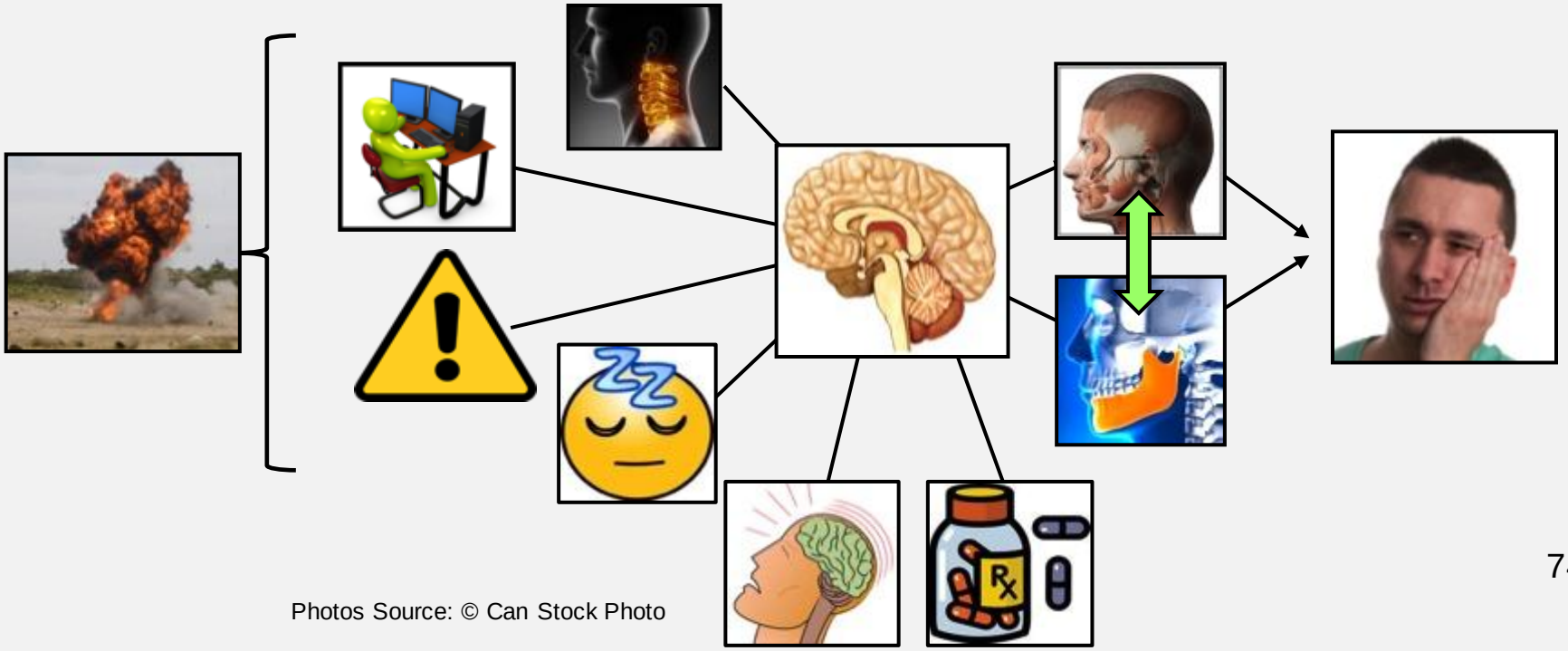
What? (site-source) = masticatory muscle
Why? (neural drive) = other pain, affect, TBI?
What else? (keys) = other pain, affect, sleep
Our Outcome? = no improvement…could not overcome comorbid CNS drivers

Photos Source: © Can Stock Photo

Summary

TMD's and the TBI Patient

- determine site vs. source
- non-voluntary masticatory muscle activity → neural drive (systems modeling)



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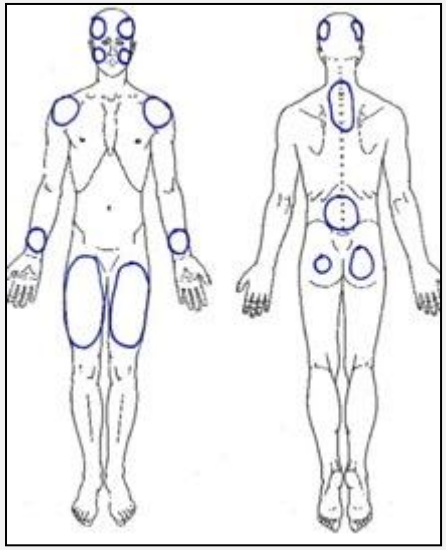
Summary
TMD's and the TBI Patient

- key patient characteristics
  1. other pain
  2. psychological attributes
  3. sleep

Photo Source: © Can Stock Photo



Conclusion

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physician
physician assistant
dentist
psychologist
physical therapist
nurse
social worker
counselor

What?
Why?
What else?

Provider Resources

- Google: Naval Postgraduate Dental School
- use wrnmmc.capmed.mil link
- Departments: Orofacial Pain
- Resources
  - NPDS Orofacial Pain Center Exam Form (.pdf)
  - DOD OFP Phone Directory (.pdf)

References

Aggarwal V, Mcfarlane G, Farragher T, McBeth J. Risk factors for onset of chronic oro-facial pain – results of the North Cheshire oro-facial pain prospective population study. Pain 2010;149:354-359.

Bogduk N, Govind. Cervicogenic headache: assessment of the evidence on clinical diagnosis, invasive tests, and treatment. Lancet Neurology 2009;8:959-968.

Carlson K, Nelson D, Orazem R, Nugent S, Cifu D, Sayer N. Psychiatric diagnoses among Iraq and Afghanistan war veterans screened for deployment-related traumatic brain injury. Journal Traumatic Stress 2010;23(1):17-24.

Cifu D, Taylor B, Carne W, Bidelspach D, Sayer N, Scholten J, Campbell E. Traumatic brain injury, posttraumatic stress disorder, and pain diagnoses in OIF/OEF/OND veterans. Journal of Rehabilitation Research Development 2013;50(9):1169-1176.

References

de Leew R, Klasser G. Diagnostic classification of orofacial pain, Chapter 3. In: Orofacial Pain Guidelines for Assessment, Diagnosis, and Management, Fifth Edition. Qunitessence Publishing, 2013.

Fay R, Norgren R. Identification of rat brainstem multisynaptic connections to the oral motor nuclei using psuedorabies virus. I. Masticatory muscle motor systems. Brain Research Reviews 1997;25:255-275.

Greene C. Managing patients with temporomandibular disorders: a new guide for care. Journal American Dental Association 2010;141:1086-1088.

Groenewegen H, Uylings H. The prefrontal cortex and the integration of sensory, limbic and autonomic information. Progress in Brain Research 2000;126:3-28.

Isreal H, Diamond B, Saed-Nejad F, Ratcliffe A. The relationship between parafunctional masticatory activity and arthroscopically diagnosed temporomandibular joint pathology. Journal Maxillofacial Surgery 1999;75:1034-1039.

References

Lazarov N. Neurobiology of facial proprioception. Brain Research Review, 2007;56:362-383.

Lei J, Liu M, Yap A, Fu K. Sleep disturbance and psychological distress: prevalence and risk indicators for temporomandibular disorders in a Chinese population. Journal Oral Facial Pain Headache 2015;29(1): 24-30.

Light A, Vierck C, light K. Myalgia and fatigue, Chapter 10. In: Krueger L, Light A, editors. Translational Pain Research: From Mouse to Man. CRC Press, 2010.

Lim P, Maxiner W, Kahn A. Temporomandibular disorder and comorbid pain conditions. Journal American Dental Association 2011;142(12):1365-1367.

Litt M, Porto F. Determinants of pain treatment response and nonresponse: identification of TMD patient subgroups. Journal Pain 2013;14(11):1502-13.

References

Muhvic-Urek M, Uhac I, Vuksic-Mihaljevic Z, Leovic D, Blecic N, Z Kovac. Oral health in war veterans with post-traumatic stress disorder. Journal of Oral Rehabilitation 2007;34:1-8.

Nieuwenhuys R. The greater limbic system, the emotional motor system and the brain. Progress in Brain Research 1996;107:551-580.

Nitzan D. The process of lubrication impairment and its involvement in temporomandibular joint disc displacement. Journal Oral Maxillofacial Surgery 2001;59:36-45.

Schiffman E, Look J, Hodges J, Swift J, Decker K, Hathaway K, Templeton R, Friction J. Randomized effectiveness study of four therapeutic strategies for TMJ closed lock. Journal Dental Research 2007;86(1):58-63.

Strong J, Ray K, Findley P, Torres R, Pickett L, Byrne R. Psychosocial concerns of veterans Operation Enduring Freedom/Operation Iraqi Freedom. Health & Social Work 2014;39(1):17-24.

References

Terman G, Bonica J. Spinal mechanism and their modulation, Chapter 4. In: Loeser J, editor. Bonica's Management of Pain. Lippincott Williams & Wilkins, 2001.

Questions?

- Please submit your questions now via the question box located on the left side of the screen.

Continuing Education Details

- In order to qualify for CEUs, the program evaluation and post test must be completed by **July 22, 2015** with a passing score of 80%.

- **VHA** participants:
  - Must be preregistered to complete the evaluation and post test in TMS.
  - Email Christopher.white3@va.gov if you were unable to register before the webinar started.
  - Certificate of completion may be printed through TMS upon successful completion.
- **Non-VA** participants:
  - Complete and email the program's fillable PDF Non-VA Evaluation Form to EESEPC@va.gov

Save the Date

VA/DVBIC TBI Clinical Grand Rounds Webinar:
Visual Dysfunction Associated with Traumatic Brain Injury
Dr. Suzanne Wickum, OD, FAAO
August 7, 2015
12:00-1:15 p.m. (ET)

*Available via Adobe Connect or in person at Brooke Army Medical Center if local.
Look for more information on the DVBIC website or DVBIC and DCoE Facebook page soon!

VA/DVBIC TBI Clinical Grand Rounds POCs

- **DOD:**

Sherray Holland, Sherray.L.Holland.ctr@mail.mil and
LCDR Cathleen Davies, Cathleen.A.Davies2.mil@mail.mil

- **VHA and all other federal partners:**

Christopher White, Christopher.white3@va.gov