Occlusion & TMJ to TMD & Orofacial Pain

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Occlusion & TMJ to TMD & Orofacial Pain

❖ History
  • Occlusion
  • TMJ

❖ Current TMD
  • Guidelines
  • Patient Care
  • Research

❖ Current OFP
  • Acute v. Chronic Pain
  • Neuroplasticity
  • Comobidity
  • Neuropathic Pain
HISTORICAL TMD/OFP MODEL
Medical Approach

❖ Biopsychosocial Multidisc. Model, 1980s -
(Schwartz, Laskin, Greene, Mohl, Rugh, Marbach, Dworkin, LeResche)
❖ Research Diagnostic Criteria for TMD; 1992
❖ International Headache Society: Dx Systems; 1988, 2013
❖ Commission on Dental Accreditation (CODA) 2009
❖ AADR TMD Statement 1996; AADR Neuroscience 2010
❖ OFP: Prospective Eval & Risk Assessment (OPPERA) 2013
❖ Intl RDC/TMD Consortium & OFP Interest Grp Guidelines; 2014
❖ IASP World Congress: Year of Orofacial Pain Focus; 2014
❖ Influential OFP/Pain Orgs./Jrs.: APS, IASP, AAPM, AAOP, ICOT
J Oral Fac Pain & HA, Pain, HA, Science, Neuroscience, Nature
“PAIN: The definition avoids directly relating pain to the stimulus, and thus, a pain experience reported in the absence of tissue damage is accepted as pain in the same way as pain clearly related to tissue damage.

**TYPES of PAIN**

- **ACUTE PAIN** *Protective*
  - Recurrent Acute Pain
  - Subacute Pain
  - Transient Pain

- **PERSISTENT (CHRONIC) PAIN**
  - Usually No Useful Purpose
  - Long-term CNS Changes
  - Assoc. w Psychological Sx
    - ↓sleep, ↓appetite, fatigue, ↓libido

International Association for the Study of Pain 1994
ACUTE PAIN

- Appropriate Pain Relieving Action
- Initial Anxiety Usually Dissipates
- Understanding of the Reason for Pain (i.e., Abnormal Biological process)
- Examples: Toothache, Inflammatory Response to Trauma, Acute TMD
CHRONIC PAIN - Neuroplasticity (Peripheral + CNS Pain Upregulation)

- Incidence: ~100 Million in U.S.; ~1.5 Billion Globally
- Economic Cost to U.S. Population: $150 Billion/Year
- Growth Rate > than that of Acute Diseases
- Account for 80% of All Morbidities
- Encompass Subjective Illness Issues w/o Meaning
- Increased Awareness of Physical Sx ↑ (Somatization)
- Emotional Concerns ↑ (Depression)

American Pain Society 2011
CHARACTERISTICS of CHRONIC (PERSISTENT) PAIN

- More than simply pain that lasts for a long time; Not just prolonged acute pain
- Pain that persists beyond the initial injury and beyond the normal healing time

- Serves No Useful Purpose
- Exceeds Expectations of Recovery
- Unrelenting & Often Variable Pain
- Becomes Component of Daily Routine
- Increases Irritability/Impatience
- Pain Invisible to Others
- Relationships Are Strained
PAIN SYSTEM

- Nociceptors: Detect noxious stimulus
- Primary afferent fibers (A-delta and C fibers): Transmit noxious impulses to the CNS
- Ascending nociceptive tracts: convey noxious stimuli to higher centers (e.g., Lat & Med Spinothalamic tracts)
- Higher centers: Pain discrimination; Affective, memory & motor responses to painful stimuli
- Descending pain modulating systems
PAIN TRANSMISSION
Trigeminocervical / Trigemino-vascular Nociceptive Complex

**NEURONAL SENSITIZATION & TMD**

**Noxious Stimulus**  
(CGRP-Induced Inflammation)  
Prostaglandins, Histamines, Cytokines,  
Nerve Growth Factor, Serotonin

**Release of Excitatory Amino Acids in TG**  
ATP, Substance P, NMDA  Ca2+

**Trigeminal Ganglion**  
Peripheral Sensitization

**Subnucleus Caudalis**  
Central Sensitization

**Release of Excitatory Neurotransmitters in Subnucleus Caudalis**  
Substance P, Glutamate, CGRP, NO, Bradykinin at the Synaptic Junction Sensitizing Secondary WDR Neurons in the CNS

Woolf CJ  *Pain* 2011;152:S2-15
PAIN MODULATION:
Descending Inhibitory Systems

Descending Inhibitory Neurotransmitters:
Endogenous Opiates, Serotonin, NA, NMDA, Substance P Antagonists & GABA

Dubner R et al, 2013; J Neuroscience
From Midbrain Release of Inhibitory Neurotransmitters to Spinal Nucleus (Subnucleus Caudalis)
(Endogenous Opiates, Serotonin, NA, NMDA, Substance P Antagonists & GABA)
EPIGENETIC (Environmental) MGT:
Changes in Gene Expression caused by mechanisms other than changes in the underlying DNA sequence; dynamic and reversible

Aging
Developmental
Sleep
Diet
Exercise
Stressors
Environ.Chem
Drugs

PAIN

Science 2010; 330:460-461
TREATMENT STRATEGIES

○ MULTIDISCIPLINARY:
  Multiple providers from different disciplines contribute to care

○ INTERDISCIPLINARY:
  Multiple providers from different disciplines integrate care as a team, through frequent communication and common goals
BIOPSYCHOSOCIAL MODEL

Social Roles for Pain and Illness

Pain Behaviors

Pain Appraisal

Pain

Nociception

Changes in Nucleus Accumbens & Med. Prefrontal Cortex White Matter Pain 2013
CHRONIC TMD & CO-MORBIDITIES

Acute TMD Mgt (Localized Musculoskeletal Disorders)

Chronic Pain Mgt (Global Pain/Co-morbidities)

- Localized TM Joint Pain
- Localized Masticatory Ms. Pain
- Chronic TMD
- Global Ms. Pain (Fibromyalgia)
- Migraine HA - Tension-Type HA (with Pericranial Muscle Tenderness)
- Cervicogenic HA
- Cranial Nerve Neuralgias (Painful Traumatic Trigeminal Neuralgia)
COMMON TMD CO-MORBIDITIES

- Acute TMD Mgt (Localized Musculo-skeletal Disorders)
  - Localized TM Joint Pain
  - Localized Masticatory Ms. Pain
  or
  - Chronic TMD

Chronic Musculoskeletal TMD/OFP Management Model

NIDCR Policy Statement 2013

Patient Education

Symptomatic Care

Behavior Modification

Pharmacotherapy

Physical Rehabilitation (Orthoses/Splints)

PERIPHERAL SENSITIZATION
Diagnostically Driven
Problem-Based
Goal Oriented

CENTRAL SENSITIZATION
Topical Anesthetics
Tricyclic Antidepressants
Membrane Stabilizers
Nonopiate Analgesics
PHARMACOTHERAPY for Neuropathic Pain

- **Topical Anesthetics**
  - Benzacaine 20% in Orobase
  - Lidoderm Patch 5%
  - Compound Topical Cream 0.1% - 1.5 oz tubes

- **Tricyclic Antidepressants**
  - Amitriptyline (Elavil) 10-25mg tid
  - Nortriptyline (Pamelar) 10-25mg tid
  - Doxepin (Sinequan) 10-25mg tid

- **Membrane Stabilizers**
  - Gabapentin (Neurontin) 300-1800mg tid
  - Pregabalin (Lyrica) 25-300mg tid
  - Clonazepam (Klonopin) 0.5 - 2.0mg tid

- **Nonopioid Analgesics**
  - Tramadol (Ultram/Ultacet) 50mg qid

- **Narcotics Contraindicated** *
  - Shuts down endogenous opiate system
  - Possible Risk for CNS Structural Changes

Klasser GD et al., JADA 2013;144:1006-1008
Haviv H et al., J Oral Fac Pain HA 2014;28:52-60
COMMON TMD CO-MORBIDITIES

Acute TMD Mgt (Localized Musculo-skeletal Disorders)

- Localized TM Joint Pain
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or

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- Chronic TMD
- Global Ms. Pain (Fibromyalgia)

RULE OUT FIBROMYALGIA
(3½ % of Women in USA)

- Chron. Widespread Allodynia w Cont. Aching
- Tend. in 11+/18 Specific Sites, but Normal EMG
- Pain in 3/4 Quadrants > 3 Mos.
- Associated With Following:
  - Chron. HA, Fatigue, Mood Changes, IBS,
  - Subj. Swelling, Paresthesias, Sleep Degrad.
- No biopsy Findings: No inflam. or Degen.
- ↑ Substance P & NGF; ↓ Seratonin

Serra J et al., Annals of Neurol 2014;75:196-208
TREATMENT for FIBROMYALGIA

Medications:
- Flexeril 10-40mg hs, TCAs hs - Strong efficacy
- Dual-reuptake Inhibitors (Effexor, Cymbalta - Mod eff.
- Pregabalin (Lyrica), Gabapentin (Neurontin)- Mod. eff.
- Opioids contraindicated due to ↓ mu-opioid receptors

Aerobic Exercise - Moderate efficacy
Cognitive Behavioral Therapy - Mod. eff.
Patient Ed. & Multidiscipl. Tx - Mod. eff
Acupuncture, BFB, TP & Chiropractic Therapy - Weak

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  or

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  - Chronic TMD
  - Global Ms. Pain (Fibromyalgia)
  - **Migraine HA - Tension-Type HA** (with Pericranial Muscle Tenderness)

_Fernandes G et al., J Orofac Pain 2013;27:14-20
Concalves DAG et al., J Orofac Pain 2013;27:325-335_
PRIMARY HEADACHE (Neurogenic)

- Migraine (w Aura & w/o Aura)
- Tension-Type Headache (w & w/o pericranial ms. Tend.)
- Cluster HA & Other Autonomic Cephalagias
  - Cluster Headache
  - Chron. Paroxysmal Hemicrania
  - SUNCT
  - Trigeminal Autonomic Cephalgia
- Other Primary HA

Olesen J (ed): Cephalgia 1988;8:1-96
The Int’l Classification of HA Disorders Cephalgia, 2004;2013
Tension-type Headache:
Episodic (< 15/mo) – Chronic (≥ 15 d/mo)

(With & without Pericranial Muscle Tenderness)

- Duration: 30 Min. to 7 Days
- At Least 2 of the Following:
  - Bilateral Location
  - Pressing / Tightening (Non-pulsating)
  - Mild or Moderate Intensity
  - No Aggravation By Physical Activity
- Both of the Following
  - No Vomiting
  - Only 1: Nausea, Photo-, Phonophobia

50% of adults suffer Tension-Type HA

Olesen J (ed): Cephalgia 1988;8:1-96
The Int’l Classification of HA Disorders  Cephalgia, 2004;24:9-160
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RULE-OUT CERVICOGENIC HEADACHE

- Mod-Severe, Non-throbbing & Non-lancinating Pain Starting in Neck & Spreading to Oculofrontotemporal Area
- Typically Unilat., but Can be Bilat., Lasting Hrs to Wks
- Pain from any structures innervated by C1, C2, or C3
- Typical Sources
  - Cervical facet joints
  - C1, C2, C3 peripheral nerves
  - Cervical muscles
- May be able to replicate HA with provocative testing of cervical spine

49% of 286 Patients Seeking Treatment for OFP Had Moderate to Severe Cervical Muscle Tenderness

Rudd PA PT, DPT, Shen Y DDS, MS
SENSORY DISTRIBUTION of C1–C3

Greater Auricular n. (C2, C3)

Greater Occipital n. (C2)

Lesser Occipital n. (C2, C3)

Facet Joints/Intervertebral Discs
CERVICAL MUSCLES

SCM Sternal Div.

SCM Clavicular Div.

SPLENIUS CAPITUS

SEMISPINALIS CAPITUS

OCCIPITAL
TRAPEZIUS MUSCLE
COMMON TMD CO-MORBIDITIES

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**Durham J et al., J OrofacPain 2013;27:6-135**
TRIGEMINAL NERVE NEUROPATHIC DISORDERS

- Episodic Neuropathic Pain
  - Paroxysmal Neuralgias
    - Trigeminal Neuralgia
    - (Pre-trigeminal Neuralgia)
- Continuous Neuropathic Pain
  - Idiopathic Continuous Neuropathic Pain
    - Painful Trigeminal Traumatic Neuropathy
      - "Persistent Dentoalveolar Pain",
      - "Atypical Odontalgia",
      - "Phantom Tooth Pain"

Nixdorf DR et al., J Oral Rehabil 2012;39:161-169
Durham J et al., J OrofacPain 2013;27:6-135
NEUROPATHIC PAIN
Persistent Idiopathic Facial Pain

Painful Traumatic Trigeminal Neuralgia
("Atypical Odontalgia"; "Phantom Tooth Pain")

- Nervous system dysfunction
- Often occurs in absence of tissue damage

Renton T J Orofac Pain 2011;25:333-344
Woda A J Orofac Pain 2013;27:97-98
ATYPICAL ODONTALGIA
Painful Traumatic Trigeminal Neuralgia

- Mod. To Severe Constant, Unrelenting Pain (Aching, Burning &/or Throbbing)
- Onset Often Delayed wks S/P Dental Treatment
- Duration Lasting for Mos-Yrs
- Provocation & Anes Response Equivocal
- Repeated Dental Treatment Failures

*deLeeuw R, Klasser GD* Orofacial Pain Guidelines, 2013:83-103
NEUROPATHIC PAIN: (Non-nociceptive pain)

Painful Traumatic Trigeminal Neuralgia

- Not related to activation of pain receptors
- Produced by a change in neurological structure or function in either PNS or CNS
- Thought to be linked to 4 possible mechanisms:
  - Ion gate control malfunctions (Na+, K+, Ca++)
  - Ectopic Signaling
  - Neuroplasticity changes
  - Central processing malfunction

e.g., Atypical Odontalgia (Phantom Tooth Pain)
NEUROPATHIC PAIN RISKS:
“Painful Traumatic Trigeminal Neuralgia”

(Persistent Pain Following Endo TX)

- History of Chronic Pain Disorders
- Pre-treatment Pain
- Fear of Pain
- Incomplete Anesthesia

Incidence OA S/P Endo Tx
- 2-5% UCLA Reports
- 3-6% Melis et.al: HA 2003

Misch CE, ResnikR Implant dent 2010;19:378-386
Klasser GD et al., Quintessence Int’l 2011;42:259-269
Durham J et al., J OrofacPain 2013;27:6-135
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*Klasser GD et.al., JADA 2013;144:1006-1008
Haviv H et al., J Oral Fac Pain HA 2014;28:52-60
*Cheatlie MD, Barker C J Pain Res 2014;7:301-311*
UCSF TMD/OFP Chronic Pain Management Model

MODIFY PT TREATMENT

MANAGEMENT (TRIAGE) PHILOSOPHY
- Medical Pain Management
- Central Sensitization Meds
- Biopsychosocial Management
- Epigenetic (Environmental) Mgt
- Patient Centered Care

NO ELECTIVE DENTAL/SURGICAL TREATMENT
Occlusion & TMJ to TMD & Orofacial Pain

“If you can’t change your mind, do you really have one?”
Bumper Sticker