Treatment Paradigm of Facial Pain: A multi-disciplinary approach

Andrew Kokkino, MD
Medical Director
Oregon Neurosciences Institute
Goals

- Present the common causes of facial pain
- Differentiate the major facial pain syndromes
- Present results of treatment for facial pain syndromes
Causes of facial pain

- Def: pain in the facial region including orofacial and craniofacial pain. May be associated with local inflammatory, neoplastic, or neuralgia syndromes. Conditions featuring recurrent or persistent facial pain as the primary manifestation disease are referred to as FACIAL PAIN SYNDROMES.

- 138 possible causes of facial pain
Causes of facial pain

- **Dental**
  - Ache, abscess, oral disease,
- **Ear (otalgia): infection**
- **Eye**
  - Infection, inflammation, virus, glaucoma, FB, shingles
- **Cerebral vascular dz**
  - Aneurysms of basilar, posterior comm, SCA, cavernous sinus thrombosis
- **Neck conditions**
- **TMJ**
- **Sinus disease**
- **Cancer**
  - Chordoma, meningioma, neuromas, esthesioneuroblastomas, mets, dermoids
- **Referred pain**
  - Nerve compression, angina
- **Psychogenic**
  - Depression, atypical features
Neurologic causes of facial pain

- Trigeminal neuralgia
- Sphenopalatine neuralgia
- Post-herpetic neuralgia
- Migrainous neuralgia
- Glossopharyngeal neuralgia
- Atypical facial pain
Most common causes of facial pain

- Temporomandibular joint and muscle disorder (TMJD)
- Causes recurrent or chronic pain and dysfunction in the jaw joint and its associated muscles and supporting tissues
- Second most commonly occurring musculoskeletal condition resulting in pain and disability (after chronic low back pain)
- Affects approximately 5 to 12% of the population, with an annual cost estimated at $4 billion
- About half to two-thirds of those with TMJ disorders will seek treatment. Among these, approximately 15% will develop chronic TMJD
Prevalence of TMJ

- Cross-sectional study (mail questionnaire, response rate 71%)
- (n=8,888)
- McFarlane TV2
- 2002
- Patients in a general medical practice, England
- One month period prevalence of oro-facial pain

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Prevalence</th>
</tr>
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<tbody>
<tr>
<td>18-25</td>
<td>20.8%</td>
</tr>
<tr>
<td>26-35</td>
<td>29.8%</td>
</tr>
<tr>
<td>36-45</td>
<td>30.0%</td>
</tr>
<tr>
<td>46+</td>
<td>27.6%</td>
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</table>
Prevalence of TMJ symptoms

- Pain from TMJ: 6.7% / 12.4%
- Joint sounds: 12.0% / 16.5%
- Difficulty opening jaw: 8.2% / 11.2%
- Bruxism: 15.5% / 20.2%
- Sensitive teeth: 30.0% / 38.9%
- Burning mouth: 4.1% / 5.3%
- Chewing difficulty: 27.2% / 24.8%
## Major Classification of Trigeminal Pain - Burchiel

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
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<tbody>
<tr>
<td>Idiopathic TN 1</td>
<td>Sharp, shooting, shock-like, episodic lasting seconds with pain-free intervals</td>
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<tr>
<td>Idiopathic TN 2</td>
<td>Aching, throbbing, or burning more than 50% of the time. Constant background pain.</td>
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<tr>
<td>Symptomatic TN</td>
<td>Association with multiple sclerosis (MS). Demyelination of the nerve or descending tracts. Episodic or constant pain</td>
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<tr>
<td>TNP: Neuropathic pain</td>
<td>Pain from unintentional injury, cancer, stroke. Unremitting throbbing or burning in affected area.</td>
</tr>
<tr>
<td>Trigeminal deafferentation pain</td>
<td>Intentional injury to TN causing burning, crawling, itching, or tearing.</td>
</tr>
<tr>
<td>Atypical facial pain</td>
<td>Facial pain in the context of a somatoform pain disorder. Often bilateral, outside of TN distribution with multiple pain complaints</td>
</tr>
<tr>
<td>Anesthesia dolorosa</td>
<td>Excruciating pain in an insensate facial region</td>
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</tbody>
</table>
Trigeminal Neuralgia

Epidemiology

- 4.7 /1,000,000 men
- 7.2 /1,000,000 women
- Peak incidence fifth to seventh decade
- Familial cases are rare
Trigeminal Neuralgia

- Clinical characteristics
  - “Electric Shock”
  - Continuous interictal pain (worse prognosis)
  - Paroxysmal disorder
Trigeminal Neuralgia

- Trigger zones
  - As small as 1-2 mm
  - Pain starts in trigger zone and spreads
  - Pain intensity independent of trigger zone size
Trigeminal Neuralgia

- Triggers-trivial stimuli
  - Cold air
  - Talking
  - Chewing
  - Tooth brushing
  - Facial movement
Trigeminal Neuralgia

- Diagnosis and testing
  - Clinical presentation
    - Normal exam except for trigger zones
    - 15% have sensory loss that patient does not recognize
Trigeminal Neuralgia

Diagnosis and testing

- International Headache Society criteria
  - Paroxysmal attacks of facial pain lasting seconds to less than 2 min
  - 4 of the following 5 characteristics
    - Distribution along one or more divisions of 5th nerve
    - Sudden, intense, sharp, stabbing pain quality
    - Severe pain
    - Evidence of trigger zones
    - No symptoms between attacks
Trigeminal Neuralgia

- Diagnosis and testing
  - Secondary neuralgia
    - MS
    - Neoplasm (epidermoid, acoustic neuroma, meningioma, trigeminal neuroma)
  - MRI, MRA
Trigeminal Neuralgia

Pathogenesis

- Unknown
- Centrally mediated mechanism
- Chronic focal demyelination
  - Increased afferent firing
  - Impaired inhibitory mechanisms in trigeminal brainstem complex
Trigeminal Neuralgia Treatment

- **Medications**
- **Percutaneous**
  - Percutaneous Radiofrequency Rhizotomy
  - Glycerol injection
  - Balloon compression
- **Surgical**
  - MVD
  - Rhizotomy
  - Peripheral denervation
- **Radiosurgery**
Trigeminal Neuralgia
Treatment-Medical

- **Dilantin-1940**
  - 300-500 mg d

- **Tegretol-1962**
  - 400-800 mg/ d. Begin 200 mg/ day
  - Autoinduction of metabolism
  - Taper after pain free 4-6 wks
  - Side effects
  - 94% pain relief within 48 hrs

- **Baclofen-1980**
  - 40-80 mg d
  - GABA analog
  - Combination drug
  - Supression of spinal trigeminal neurons
Trigeminal Neuralgia
Treatment-Medical

- **Clonazapam-1976**
  - 1.5-8 mg/d
  - Drowsiness, fatigue, dizziness

- **Valproic acid**
  - Antiepileptic
  - 500-1500 mg d

- **Lamotriginene**
  - 150-400 mg d
  - Na channel modulator
  - Combination drug (dilantin, tegretol)
  - Stevens-Johnson syndrome
Trigeminal Neuralgia
Treatment-Medical

- **Neurontin**
  - 900-2400 mg d
  - Anecdotally effective
  - Few side effects

- **Oxcarbazepine**
  - 600-1200 mg d
  - Derivative of carbamazepine
Trigeminal Neuralgia
Treatment-Medical

• Primary: Carbamazepine, oxcarbazepine
• Secondary: Lamotrigine
• Tertiary: Gabapentin, phenytoin
Trigeminal Neuralgia
Treatment - Medical

- General guidelines
  - Do not overtreat
  - Smallest possible pain relieving dose
  - Tolerance to medication with time
  - Aim for monotherapy
Trigeminal Neuralgia Treatment

- **Medications**
- **Surgical**
  - MVD
  - Rhizotomy
  - Peripheral denervation
- **Percutaneous**
  - Percutaneous Radiofrequency Rhizotomy
  - Glycerol injection
  - Balloon compression
- **Radiosurgery**

Invasiveness

Most

Least
Trigeminal Neuralgia
Invasive treatment

- Failed medical treatment
- 50% of patients require an invasive procedure
- Taylor your choice of invasive treatment to the patient
- Start with the pain distribution, age and previous procedures
- Tolerate patient preferences within reason
- Maintain full compliment of procedures
Percutaneous Procedures

- Percutaneous Radiofrequency Rhizotomy (PRR)
  - Partial destruction of gasserion ganglion with heat
  - Greater than 90% relief with initial procedure
Percutaneous Procedures

- PRR technique
  - Cannulation of foramen ovale
Percutaneous Procedures

- PRR technique
  - Cannulation of the foramen ovale
Percutaneous Procedures

- PRR technique
  - Cannulation of the foramen ovale
  - Aim for medial side
Percutaneous Procedures

- PRR technique
  - Cannulation of the foramen
  - Aim for medial side
Percutaneous Procedures

- PRR technique
  - Cannulation of the foramen ovale
  - Aim for medial side
Percutaneous Procedures

- **PRR technique**
- **Avoid**
  - Oral cavity
  - Carotid canal
  - Foramen lacerum
  - Cavernous carotid
Percutaneous Procedures

- PRR technique
  - Cannulation
Percutaneous Procedures

- PRR technique
  - Stimulation
    - Pain reproduction
    - Curved needle
Percutaneous Procedures

- PRR technique
  - Lesioning
    - Hypoalgesia rather than analgesia
Percutaneous Procedures

- PRR technique
  - Lesioning

<table>
<thead>
<tr>
<th>Stimulation Intensity (mV)</th>
<th>Probe Temperature (°C)</th>
<th>Duration of Lesion (sec.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.3</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>0.3-0.4</td>
<td>65</td>
<td>60</td>
</tr>
<tr>
<td>0.4-0.8</td>
<td>70</td>
<td>60</td>
</tr>
<tr>
<td>0.8-1.0</td>
<td>75</td>
<td>60</td>
</tr>
<tr>
<td>&gt;1.0</td>
<td>Abort and reposition electrode</td>
<td>60</td>
</tr>
</tbody>
</table>
Percutaneous Procedures

PRR

- Side effects
  - Sensory loss
  - Moderate dysesthesia 5-25%
  - Severe dysesthesia 2-10%
  - Corneal sensory loss 20%
  - Keratitis <1%
  - Anesthesia dolorosa 1-5%
  - Weak mastication 53%
Percutaneous Procedures

PRR

- **Outcome**
  - 14 yr recurrence rate - 25%
  - Rate of recurrence inversely proportional to density of lesion
- **Anticipated ½ life of procedure about 3-5 years**
Percutaneous Procedures

- Glycerol rhizotomy
  - Mild denervating agent
  - 90% initially effective
  - 28% recurrence within one year, 50% in 2 years
  - Sensory loss in 26-71%
  - Many initial failures
  - Anticipated ½ life 2-3 years
Percutaneous Procedures

- **Balloon Compression**
  - 80-90% initially effective
  - 28% recurrence within 6 months
  - Technical problems
    - General anesthetic
    - Large trochar
    - Non-selective with unknown degree of sensory loss
    - Bradycardia and hypotension
  - Anticipated ½ life 2-3 years
Trigeminal Neuralgia Treatment

- **Surgical**
  - MVD
  - Rhizotomy
  - Peripheral denervation
Trigeminal Neuralgia

MVD: Microvascular Decompression
- Treatment of choice for select population
- Failed medical treatment
- Classical tic symptoms respond best
- General anesthesia and ICU stay
- Morbidity of surgery
Trigeminal Neuralgia

- MVD technique
  - Position
    - Lateral oblique
    - Lumbar puncture
Trigeminal Neuralgia

- MVD technique
  - Incision
    - 2 fingers inside mastoid notch
    - Extend above superior nuchal line
Trigeminal Neuralgia

- MVD technique
  - Incision
    - Posterior emissary vein
    - Identify asterion
Trigeminal Neuralgia

- MVD technique
  - Craniectomy
    - Just below asterion
    - Extend superiorly and laterally to the transverse and sigmoid sinuses
    - 2.5 cm in diameter
    - Wax mastoid air cells
Trigeminal Neuralgia

- MVD technique
  - Dural opening
  - Retract cerebellum medially and inferiorly
Trigeminal Neuralgia

- MVD technique
  - Dural opening
  - Retract cerebellum medially and inferiorly
Trigeminal Neuralgia

- MVD technique
  - Open arachnoid
  - Identify petrotentorial junction
  - Transect petrosal vein
Trigeminal Neuralgia

- MVD technique
  - Quick look at 7th and 8th nerves
  - 5th N entry zone
  - Dissect arteries
  - Coagulate veins at entry
  - Ivalon sponge
Trigeminal Neuralgia

MVD

Complications
- Facial numbness 2%
- Cranial nerve deficit 3%
- Peri-operative morbidity 10%
- Cerebral hemorrhage or infarction 1%
- Peri-operative mortality .06%
Trigeminal Neuralgia

MVD long term results

- Barker et al. NEJM, 1996
  - 20 yr follow up on 1185 patients
    - 80% complete pain relief after procedure
    - 7.6% partial relief
    - At 10 yrs 70% still had excellent results, 4% partial relief
    - Of patients with incomplete relief
      - 34% resumed medication
      - 22% ablative procedure and medication
    - Recurrence rates 1-6%, most within 2 yrs
Trigeminal Neuralgia

- Surgical treatment
  - MVD
  - Rhizotomy
    - Last resort
Trigeminal Neuralgia

- **Surgical treatment**
  - MVD
  - Rhizotomy
  - Peripheral denervation
    - Interrupt afferents
    - Medically unfit patient
    - Immediate relief
Gamma Knife Radiosurgery for Trigeminal Neuralgia
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Gamma Knife Radiosurgery for Trigeminal Neuralgia
Trigeminal Neuralgia

- Radiosurgery
  - Technique: 80 Gy to 100% isodose line to nerve root entry zone
  - Profile: n=220. Symptoms present 96 months on average. 61% previous surgery. 36% sensory disturbance. 70 year old median age

Kondziolka et al, 2001
Trigeminal Neuralgia

- Radiosurgery
  - Results
  - Pain relief 82% (>50% relief)
  - 64.9% complete pain relief at 6 months
  - 70.3% at one yr
  - 55.8% at 5 yrs
  - 13% recurrent pain b/w 2-58 months
  - Time to response: 2 months median
  - Increased parasthesias 8-10%
  - Dysesthesias 3.5%
  - No motor deficits

Kondziolka et al, 2002
Trigeminal Neuralgia

- **Radiosurgery**
  - **Advantages**
    - Short procedure
    - Minimally invasive
    - Low complication rate
    - Less expensive than MVD
  - **Disadvantages**
    - Unpredictable latency to relief
Glossopharyngeal Neuralgia

- Etiology: vascular compression of 9\textsuperscript{th} and 10\textsuperscript{th} cranial nerves
- Symptoms: deep throat pain
- Treatment
  - Medical
  - Operative: decompression or transection
Glossopharyngeal Neuralgia

- Results
  - Microvascular decompression in the management of glossopharyngeal neuralgia: analysis of 217 cases.

- 90% immediate relief
- Swallowing difficulty
- Best results in patients with typical symptoms, throat pain only
Paradigm of treatment

- Gatekeepers: family medicine, ER, psychologists, psychiatrists, dentists, dental specialists
- Referral services: ENT, oral surgeons, neurologists, neurosurgeons
- Cross-talk and communication is key
Conclusions

- Facial pain has many causes
- Understanding of medical treatments and surgical approaches are in evolution
- Morbidity of these treatments, especially gamma knife radiosurgery, is being reconsidered as it develops into a safe and effective technique for the treatment of trigeminal neuralgia