Trigeminal Trifecta

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“I want men and women to study Osteopathy who reason and think for themselves. It is never a question as to what the remedy or the treatment will do to the body, but what the body will do with the remedy or treatment.”
Introduction

Part I:
• Trigeminal/Occipital anatomy and physiology
• Neuromodulation – summary of evidence based studies

Part II:
• Lab – integration of palpation, evidence and observation
• Summary and conclusion
Trigeminal Nerve “The 3 Twins”

V1 = ophthalmic
**Sensory for:** scalp & forehead; frontal & ethmoidal sinus; upper eyelid & conjunctiva; cornea; dura / meninges

V2 = maxillary
**Sensory for:** lower eyelid & conjunctiva; maxillary sinus; nasal cavity; upper lip; upper molar, incisor, & canine; superior palate; dura / meninges

V3 = mandibular
**Sensory for:** mucous membranes; external ear; lower lip; anterior 2/3 tongue pain / temp (not taste); lower molars, incisor & canines; dura / meninges

**Motor for:** medial and lateral pterygoids, masseter, temporalis; digastric anterior belly; tensor veli palatini & tympani
SENSORY INNERVATION of the DURA

TRIGEMINAL NERVE
- ophthalmic
- mandibular
- C2 and C3
- ?? VAGUS NERVE

TRIGEMINAL NERVE

VAGUS NERVE

BRANCHES of C2 and C3 entering skull through the FORAMEN MAGNUM

© 2010 PIXELATED BRAIN
Anterior/Middle fossa: Trigeminal nerve

Posterior fossa: Upper 3 cervical branches
Sympathetic branches
Vagus
Hypoglossal
Trigeminocervical Complex
Trigeminal Nucleus

Main sensory nucleus: posterior pons (touch & pressure)

Spinal nucleus: extends to the 2\textsuperscript{nd} – 3rd cervical seg. (pain & temp)

Mesencephalic nucleus: around cerebral aqueduct

Motor nucleus: pons (muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, ant bellydigastric)
Occipital nerve

- Originates from C2, C3
- Pierces fascia, trapezius and ascends the scalp
- Innervates scalp at the top of the head, the top of the ear and over the parotid glands.
TRIGEMINAL REFLEXES
Trigeminal Reflexes

Trigeminovascular system
Trigeminocardiac reflex
Trigeminocervical reflex
Trigeminomandibular reflex
Nociceptive Blink Reflex
Trigeminocervical complex C1-C3
“Hit your nose + eyes water” Reflex
“Sneeze in the sun” Reflex
Occipital reflexes

• Influence on nociceptive blink reflex of trigem
NEUROMODULATION
How to affect change?

Pharmacology

Neuromodulation: peripheral (nerve blocks, implantables or noninvasive)

Table 3. Efficacy of invasive neuromodulatory approaches.

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<tr>
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<th>ONS acute</th>
<th>ONS proph</th>
<th>DBS acute</th>
<th>DBS proph</th>
<th>SPGS acute</th>
<th>SPGS proph</th>
<th>VNS acute</th>
<th>VNS proph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic migraine</td>
<td>-</td>
<td>+/-</td>
<td>?</td>
<td>?</td>
<td>(+)</td>
<td>?</td>
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<tr>
<td>Chronic cluster headache</td>
<td>-</td>
<td>++</td>
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<td>(+)</td>
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<tr>
<td>Other trigemino-autonomic headaches</td>
<td>-</td>
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CCH: chronic cluster headache; DBS: deep brain stimulation of posterior hypothalamus; ONS: occipital nerve stimulation; proph: prophylactic; SPGS: sphenopalatine ganglion stimulation; VNS: vagal nerve stimulation. --: no efficacy; +: moderate efficacy; ++: good efficacy; (+): anecdotal reports on efficacy; ?: no studies found.

Neuromodulation

MOA

• Initially thought to be based on Gates Theory
• Evidence is suggesting PNS alters pain perception in central mechanisms
• There is a modulation of nerve activity within CNS pain processing and integration centers in the brain

Low freq = incite HA
High freq = inhibit HA
Noninvasive Brain Stim

Transcranial magnetic stimulation (TCs)
- Uses weak magnetic field to alter the global currents in the brain
- Repetitive pulses used for neuromodulation (rTMS)
  - High frequency = excites cortex
  - Low frequency = depresses cortex

Transcranial current stimulation (tCS)
- Direct or alternating current delivered to scalp via electrodes
Mechanical Stimulation

Mechanical pressure on trigeminal nerve endings can elicit pain reduction and motor relaxation

- Uses mechanotransduction mechanisms – mechanical stimulation is translated into electrical, chemical, and mechanical signals
Q’s on Anatomy/Physiology?

Let’s put it all together
A.T. Still – to a student

“I could not wish you any better luck than when you start practicing you may come up against hard problems that you have to solve. Go to a small town...but sleep with your anatomy under your pillow, and don’t forget you are supposed to have a brain inside your skull.”
FIRST and FOREMOST– No Agenda

1. History – any recent: HA, head injury, sacral injury, dental work, eye strain?

2. General Scan: assess head, OA, cervical, thoracic, lumbar, sacrum

3. MONITORING!!
Pay attention to what attaches where!
Let’s get started

OA Junction – what do you assess?
• Tenderness when comparing sides

Any changes with an OAD?

What doesn’t change might be related to the trigeminal and occipital influences – or a restriction downstream.
How do you monitor?

This is a major key in knowing when tissues change!
It’s different and more comprehensive than just checking for motion.

Being able to know that the area of restriction is changing is invaluable!
Occipital Nerves

Don’t forget – these innervate the posterior fossa of the head
Trigeminal and Occipital interaction

Find the Occipital notches
• Greater is 1 cm lateral to inion
• Lesser is halfway b/t inion and mastoid

Any tenderness? Any response where you are monitoring?

Now check V1, V2, V3 for tenderness and reciprocal change in the OAD where you’re monitoring
Trigeminal Foramen

- Supra-orbital
- Zygomatico-temporal
- Supratrochlear
- Palpebral branch of lacrimal
- Infraorbital
- External nasal
- Infra-orbital
- Zygomatico-facial
- Auriculo-temporal
- Posterior auricular
- Trunk of facial
- Branch to posterior belly of digastric and stylo-hyoid
- Mental
- Buccal
Auriculotemporal
Trigeminal

V1, V2, V3 – if you find tenderness and reciprocal changes at the OA

• Find a pulse frequency and pressure that allows the changes of TART at the OA where you are monitoring
Next in the progression is checking C2 (this is where the TCC lives, remember?)

• The association may be ipsilateral or contralateral – you have to pay attention to the monitoring hand
Trigeminal

RECHECK

Do you have any autonomic changes like heat and moisture?
Recheck the spine, has anything changed?

See if the inhibitory signals have influenced the rest of the system.
No one technique is everything

• Like any art, no one technique or tool will be the answer for every patient.
• If something doesn’t change – it means something else is holding it.
• Ask the question: “What does this person need at this moment.”
• This tool can be extremely effective in the right context.
Thank you from ATSU SOMA

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References