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• Introduction
Definition

- A sudden, usually unilateral, brief stabbing recurrent pain in the distribution of one or more of the trigeminal nerve.

- International Association for Study of Pain
Classification

1. Classical or Idiopathic [CTN]
   • No apparent cause other than vascular compression.

2. Symptomatic or Secondary [STN]
   • Structural lesions – Multiple sclerosis or compression of posterior fossa (tumor or cyst).
Epidemiology

CTN

- Rare: 0.7-1/1000 patients.
- Women > Man = 1.7-2.2 : 1.
- Annual incidence 2-6 per 100,000
- Age onset: 50-60 year old.
- Right side > Left side.

STN

- No gender difference.
- Onset younger.
- Right > Left side
2
Diagnosis
Diagnosis

- Trigeminal neuralgia is a clinical diagnosis.

**Key Feature:**
- Paroxysmal, Sudden, Severe, Lancinating pain
- From few seconds to 2 mins
- Within trigeminal distribution.
- Typically:
  - Maxillary or mandibular
- Variable
  - may be single episode!
Key Feature

• Often evoked by trivial stimulation of ‘trigger zones’ – thro’ touch or mechanical stimuli.
• Triggered by eating, drinking or brushing teeth.

Slight difference in features of CTN and STN
Diagnosis of Classical Trigeminal Neuralgia

• Paroxysmal attacks of pain lasting from a fraction of a second to 2 minutes that affect one or more division of trigeminal nerve.
• Pain has at least one of the following characteristics: intense, sharp, superficial, or stabbing precipitated from trigger areas or by trigger factors.
• Attacks are similar in individual patients.
• No neurological deficits is clinically evident.
• Not attributed to another clinical disorder.
‘Atypical’ or ‘Mixed’ Trigeminal Neuralgia

- Pain does not fit criteria exactly.
- Persistent ache between paroxysms or mild sensory loss.
- More likely to have symptomatic disease rather than idiopathic (classic) TN.
Abnormal Trigeminal Reflex in Symptomatic TN
# Differential Diagnosis of Trigeminal Neuralgia

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental infection/Cracked tooth</td>
<td>Well localized to tooth; local swelling and erythema; appropriate finding on dental examinations or X-ray.</td>
</tr>
<tr>
<td>Temporo-mandibular joint pain</td>
<td>Often bilateral and may radiate around ear, neck and temples; jaw opening may be limited and can “click”</td>
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<tr>
<td>Persistant idiopathic facial pain (odontalgia)</td>
<td>Often bilateral and may extend out of trigeminal territory; pain often continuous, mild to moderate in severity, aching or throbbing in nature</td>
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<tr>
<td>Temporal arteritis</td>
<td>Common in elderly pts; pain constant, a/w jaw claudication, fever, LOW. Temporal arteries may be firm, tender and non-pulsatile on examination.</td>
</tr>
<tr>
<td>Migraine</td>
<td>Aura; severe unilateral a/w nausea, photophobia, phonophobia and neck stiffness</td>
</tr>
<tr>
<td>Sinusitis</td>
<td>Facial tenderness. Aching increasing with position.</td>
</tr>
<tr>
<td>Acute Ear Infections</td>
<td>A/w inflammatory changes in the ear</td>
</tr>
</tbody>
</table>


Diagnosis

**PE:**

- Sensory examination.
- TN reflex testing (blink reflex) – not commonly done for all cases.
- TN evoked potentials – will need specialized centers.
- Exclude other differential diagnosis.
Diagnosis

**Investigations:**

**Xrays:**
- To clarify differential diagnosis – dental X-Rays

**MRI + Angiography:**
- Best option to image trigeminal nerve and associated vessels.
- To identify a cause - ? Surgical cure.
- May be diagnostic of secondary causes such as MS, tumors, abnormalities of skull base or AV Malformation. (5-10% of cases)
Classical explanation of CTN:

- Neuro-vascular contact between root-entry zone of trigeminal nerve and superior cerebellar artery.
- Root-entry zone: axons are coated with CNS myelin rather than PNS myelin.
- Contact may be venous.
Evidence for vascular cause:

• Aberrant artery/vein found in root entry zone in 80-90% of cases at surgery.
• Demyelination of TN at site.
• Elimination of compression – long term relief
• IntraOp Inx – improvement in TN conduction.
• Improvement of sensory fn.
• Other secondary causes produces similar lesions.
However:

- Not all CTN have neuro-vascular relationship.
- Not all neurovascular conflict (3-12% of asymptomatic PM) lead to CTN.

Other theories:

- Up-regulation of ion channels due to TN injury.
- Central sensitization of TN nucleus.
3. Treatment

- Medical Treatment
Medical Treatment of CTN

• 1\textsuperscript{st} line: Carbamazepine
  – several meta-analysis – 70% of patients benefit from therapeutic doses (100-2400mg). NNT=1.8
  – Side effects: Allergic rash, hypoNa, drug interactions.

• Alternatives: oxcarbazepine – prodrug, better tolerated, allergic cross-reactivity 25%.

• No evidence for IV agents for acute treatment of CTN.
Medical Treatment of CTN

- If Patient allergic or intolerant to Carbamazepine?
  - Gabapentin: commonly used although minimal evidence for TN.
  - Lamotrigine and Baclofen (supported by small studies)
  - Others: Phenytoin, clonazepam, valproate, mexiletine and topiramate.
Medical Treatment of CTN

• If Carbamazepine is not effective?
  – Adding second agent or switching drugs (as above).
  – Review of diagnosis?
  – Explore surgical or interventional treatments.
Medical Treatment of STN

• Effective agents?
  – None proven.
  – MS-associated TN: lamotrigine, gabapentin, topiramate or misoprostol been used.
4. **Treatment**

Surgical and Interventional Therapies
Surgical and Interventional Treatment

Classified into:

1. Peripheral techniques targeting portions of trigeminal nerve distal to Gasserian Ganglion.
2. Percutaneous Gasserian Ganglion targeting ganglion itself.
Surgical and Interventional Treatment

Peripheral techniques Outcomes:

- Includes using cryotherapy, neurectomies, alcohol, phenol, peripheral acupuncture, radiofrequency and thermocoagulation.
- 50% have recurrence of pain after 1 year.
- Morbidity low.
PGL: Percutaneous Ganglion Lesions
MVD: Microvascular depression.
GKS: Gamma Knife Surgery.

Perioperative complications:
Pneumonia, DVT etc

Sensory loss almost 50% of pt with PGL

Various sensory abnormalities
Surgical and Interventional Treatment

Percutaneous procedures on Ganglion:

• Involve penetration foramen ovale with a cannula and controlled lesion of trigeminal ganglion: Thermal (Radiofrequency), chemical (Glycerol), Mechanical (balloon compression).
Surgical and Interventional Treatment

Percutaneous procedures on Ganglion:

- Involve penetration foramen ovale with a cannula and controlled lesion of trigeminal ganglion: Thermal (Radiofrequency), chemical (Glycerol), Mechanical (balloon compression).
- 90% had pain relief from the procedures.
- 1 year: 68-85% pain free
- 3 years: 54-64% pain free
- 5 years: 50% (RF) pain free
Surgical and Interventional Treatment

Percutaneous procedures on Ganglion:

- Almost half have sensory loss.
- 12% c/o aching, burning, tiring, heavy discomfort.
- 50% balloon compression temporary masticatory problems.
- Mortality extremely low.
Surgical and Interventional Treatment

Gamma Knife Surgery:

- Focused beam of radiation in the trigeminal root in the posterior fossa.
- 1 year 69% pain free
- 3 years 52% pain free
- Pain free onset may be delayed 1-2 months post-procedure.
Surgical and Interventional Treatment

Gamma Knife Surgery:

- Facial numbness – 9-37% of patients.
- Trouble sensory loss – 6-13%
- Improvement of quality of life and 88% satisfied.
Surgical and Interventional Treatment

Microvascular decompression:

- Major neurosurgical procedure – craniotomy to reach trigeminal nerve in posterior fossa.
- Vessels identified and moved away.
- 90% pain relief;
- Pain free:
  - >80% (1 Yr);
  - 75% (3 Yr);
  - 73% (5 Yr).
Surgical and Interventional Treatment

Microvascular decompression:

- Mortality: 0.2-0.5%.
- Aseptic meningitis: 11%
- Sensory loss: 7%
- Hearing loss: up to 10%.
Surgical and Interventional Treatment

- Percutaneous procedures, Gamma knife and Microvascular decompression probably all effective in treatment of TN.
- Microvascular decompression: longer duration of pain control.
Summary

• TN is a rare but characteristic pain syndrome.
• Mostly classic or idiopathic – majority with vascular relationship.
• Minority secondary – MS or compression.
• Most will respond to medical therapy.
• Carbamazepine 1st line.
• Baclofen, Lamotrigine, Gabapentin may be considered.
• Medical Rx failure + Atypical features – consider investigating for STN.
• Surgery: an option in TN non-responsive to medications.
• Percutaneous ganglion lesions, Gamma Knife or Microvascular decompression – fairly good results but with risks of sensory loss.
Thank you for your attention