The Neurosurgeon’s Role in Cancer Pain

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Disclosures

- None
comprehensive care

- Pain & Symptom Team
- Complex Cancer Pain
- Radiation Oncology
- Surgical Oncology
- Functional Neurosurgery

ONCOLOGIST
Defining Pain

- Afferent effectors
  - Somatic
  - Visceral
- Location of pain
- Pain quality
  - Somatic typical pain
  - Neuropathic atypical pain
Physiologic Anatomy of Pain

- **Nociception**: Sensation mediated by neurons specialized to detect presence, location, quality, and intensity of tissue-damaging stimuli.

- **Somatic pain**: Nociception mediated by somatic neurons to cognitive recognition through a 3 neuron chain (1st – 3rd order neurons).

- **Visceral pain**: Nociception mediated by visceral neurons to cognitive recognition through less specific paths (e.g. sympathetic / parasympathetic, propriospinal).
Location - Somatic

Somatic sensory innervation of the face:
Trigeminal nerve (CN V)

- Ophthalmic division (V1)
- Maxillary division (V2)
- Mandibular division (V3)
- Dorsal rami of cervical spinal nerves
- Branches from cervical plexus
Location - Visceral

Nasal cavity: Sensation V1, mostly V2

Pharyngeal
Sensory
Innervation:

Pharyngeal n. V2

Glossopharyngeal n.

Internal laryngeal n.

CN X

Recurrent Laryngeal n. CN X

Cutaneous innervation of the ear

- Branch of Facial (CN VII)
- Auricular branch of Vagus (CN X)
- Auriculotemporal (CN V3 - Trigeminal)
- Lesser occipital (C2, C3)
- Great auricular (C2, C3)
Surgical options: Lesion vs Modulation

<table>
<thead>
<tr>
<th>Lesion</th>
<th>Modulation</th>
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<tbody>
<tr>
<td>Limited life expectancy</td>
<td>Long-term life expectancy</td>
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<tr>
<td>Easy access to pain generator or pathway mediating pain</td>
<td>Poor access or diffuse site for pain generator</td>
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<tr>
<td>Surgical risk typically more involved for 2\textsuperscript{nd} &amp; 3\textsuperscript{rd} order pathways</td>
<td>Typically lower surgical risk</td>
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Surgical options:
Lesion methodology

- Transection of pathway
- Destruction of neurons
Surgical options: Lesion methodology

- Transection of pathway
- Destruction of neurons
Lesioning

• Neurotomy CN V or IX transection posterior fossa Meckel's Cave

• dorsal root entry zone (DREZ) lesion

• Stereotactic Mesencephalaotomy

• cingulotomy
Radiofrequency Ablation
Neurectomy
FIG. 3-47. A. The rostrocaudal somatotopic organization of the subnucleus caudalis. B. The relation of the subnucleus caudalis to input from primary afferents on the face. The fibers nearest to the lips and lower nose (area 1) terminate highest in the subnucleus caudalis; the innervation of successively more lateral regions of the face ends progressively in more caudal parts of the subnucleus caudalis. This rostrocaudal somatotopic organization applies to all three divisions of the trigeminal nerves and produces the “onion peel” pattern in the face. Modified from Kunc, Z.: Significance of fresh anatomic data on spinal trigeminal tract for possibility of selective tractotomies. In Pain. Edited by R.S. Knighton and P.R. Dumke. Boston, Little Brown, 1966, pp. 351–366.
NC-DREZ

greater than 70% pain relief, transient complications, and very high patient satisfaction effective for postherpetic neuralgia, craniofacial pain conditions and has also been used for chronic cluster headache, vagal or glossopharyngeal neuralgias, and intractable pain syndromes secondary to cancer/craniofacial surgery/trauma

Mesencephalotomy

- Introduced in 1947
- Targets Lateral STT and trigeminothalamic tract in brainstem level of colliculus
- Remarkable and durable reduction in pain
Cingulotomy
Non Lesioning

- Motor Cortex stimulation
  - Introduced in 1991
  - Epidural stimulation
  - Takes advantage of motor Homonculus
  - Thought to reorganize sensory transmission
Several surgical approaches for difficult to manage cancer related pain

Functional neurosurgery can be part of a multispecialty care team to optimize pain control