Overview: Perineural Spread

- Review some key concepts
  - Surgical pathology
  - Clinical implications

- Recognizing perineural spread
  - Directly (neural involvement)
  - Indirectly (denervation changes)
Perineural Involvement: Surgical Pathology

- Perineural infiltration (local disease)
  - 36% major resections
  - Most cases, tumour confined to 1 cm of affected nerve
- Perineural spread (beyond primary site)
  - Distal spread >2 cm is unusual
  - Grave prognostic implications

Perineural Infiltration (Local): Adenoid Cystic Carcinoma
Perineural Infiltration (Local): Adenoid Cystic Carcinoma
Perineural Spread (Beyond Primary Tumour)

Mastoid → C2
Summary: Perineural Involvement
Surgical Pathology

Perineural Spread
Versus
Perineural Infiltration

Nerve Involvement: Histopathology

- Tumour concentrated at margins
- Anoxia & infarcts in nerve trunks
- Myelin and axonal degenerate
Why Perineural Spread?
“Mechanical” Explanation

- #1 Proximity of neural (rail) network
- #2 Path of least resistance

Growth Factor Binding Sites:
“Chemical” Explanation

- Axon
  - Nerve growth factor
  - Neural cell adhesion molecule (N-CAM)
- N-CAM
  - 95% of adenoid cystic Ca
  - 93% of SCCa

*Hutcheson et al. Neural cell adhesion expression in adenoid cystic carcinoma. Laryngoscope 2000; 110:946-948*

Growth Factor Binding Sites: “Chemical” Explanation

- Schwann cells
  - Growth factor receptor p75
  - Desmoplastic melanomas
  - Adenoid cystic carcinomas
  - Basal cell carcinoma

-Chang PC et al. Perineural spread of malignant melanoma of the head and neck. AJNR 2004; 25:5-11

“Mechanical” Explanation? “Chemical” Explanation?
"Mechanical" Explanation?
"Chemical" Explanation?

Clinical Significance:
Prognosis

- Independent predictor of local recurrence
  - Primary tumour biologically more aggressive
  - 30% decrease in 5-year survival rate
  - 3x increase in local recurrence
Detecting of PNS

If this patient has perineural spread, where would you look?

1. Palatine canals
2. Pterygopalatine fossa
3. Both
Hard Palate Carcinoma
Hard Palate Carcinoma:
*PNS usually seen as a recurrence*
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*PNS usually seen as a recurrence*

#Antegrade & Retrograde Spread:
Lingual & Inferior Alveolar Nerves

Patient with submandibular gland muco-epidermoid carcinoma, operated, presented with paraesthesia over chin
#Antegrade & Retrograde Spread: Lingual & Inferior Alveolar Nerves

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# Antegrade & Retrograde Spread: Lingual & Inferior Alveolar Nerves

[Images of anatomical structures related to the Lingual & Inferior Alveolar Nerves.]
Why does denervated muscle enhance?

- Increased perfusion
  - Vasodilatation due to decreased sympathetic tone
  - Total capillaries remain the same
  - Capillaries per unit mass of muscles increase ("overvascularization")

- Hudlicka O. Do changes in the vascular bed contribute to the development of denervation atrophy in skeletal muscles? Basic Applied Myology 2007; 17:123-124
Conclusion: Perineural Spread

- Surgical Pathology
  - Perineural infiltration (local disease)
  - Perineural spread (beyond primary site)
- Histopathology
  - Tumour concentrated at nerve margins
  - Anoxia & infarcts in nerve trunks

Conclusion: Imaging PNS

- Nerve
  - Thickened nerve
  - Foraminal erosion
- Muscle changes
  - Atrophy
  - Contrast enhancement