FNA: A Practical Architectural Pattern Recognition Approach With Emphasis on Head and Neck

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FNA of Neck Lesions: Advantages

• Rapid, safe, few complications
• Inexpensive, amenable to various practice settings
• Preoperative distinction of benign and malignant conditions
• Often specific diagnosis
• May circumvent additional surgery
• Helps anticipate need for frozen section
• Aids in conservative management of benign/low grade malignancies
• Allows palliative treatment for high grade or metastatic lesions
Head and Neck Lesions

- Salivary Gland
- Lymph Node
  - Primary Benign
  - Primary Malignant (Lymphoma)
- Metastatic Lesions
- Soft Tissue
  - Neural
  - Lipomatous
  - Other Soft Tissue
- Neuroendocrine/Neural Crest
  - Paraganglioma/Carotid body tumor
  - Melanoma
- Thyroid
Getting Started

- Learn to see the elements/details
- Watch for patterns
- Gain experience
- Learn from your mistakes
“Deconstructive Cytology”

- Recognize the individual and basic key elements of a architectural pattern
- Attempt to construct a cartoon of these elements in your mind’s eye
Which Image Will You Remember?
Concept of Practical Pattern Recognition Approach to Fine Needle Aspiration Biopsy: An Algorithmic Approach

- Categorize lesions that share a certain overall architectural pattern
  - grouping pathologic processes with an element or elements that they have in common

- Differentiate those lesions in a specific architectural category by unique characteristics specific to a pathologic process
  - subdivide processes into respective diagnostic categories based upon unique cellular characteristics
General Practical Architectural Pattern Based Approach: The Concept of “Deconstructive Cytology”

- First scan the slide at “low magnification”: 100-200x
- Evaluate Cellularity: scant, moderate, abundant
- Evaluate background: clean, dirty, extracellular material
- What types of cells are there?: epithelial, inflammatory, stromal, combination thereof, etc
- Are the cells grouped as tissue fragments? dispersed?
- Are different cell types separated from each other? or do they interact with each other?
- How would you describe the tissue fragments? do they form flat sheets, 3D haphazard formations, papillary structures?
Approach to Salivary Gland Aspirates

• Is the aspirate from the salivary gland?
• Is it a non-neoplastic condition or a neoplasm?
• Can a specific diagnosis of a salivary gland tumor be made?
• Is there cytologic pleomorphism or obvious criteria for malignancy?
• If one can’t render a specific diagnosis, what is the differential diagnosis?
• If the lesion is malignant, is the tumor low grade or high grade?
General Approach to Salivary Gland FNA: Low Magnification

- **Evaluate Background and Cell Type**
  - **Background**
    - Presence or absence of myoepithelial derived stroma
      - If present: abundant vs. scant
    - Presence or absence of cellular material/debris
      - Mucinous material, granular/cystic debris
  - **Cell Type**
    - Presence or absence of inflammatory/neoplastic hematopoietic
    - Presence or absence of epithelial-like cells
      - If present: single or multiple cell types (ductal cells, acinar cells, squamous cells, melanocytes, etc)
    - Distribution of epithelial-like cells
      - Tight clusters, loosely cohesive aggregates, discohesive intimately associated with stromal material
Salivary Gland: Architectural Patterns

- Mixed inflammatory
- Lymphocyte only
- Epithelial proliferations/neoplasms without stroma
- Epithelial neoplasms with abundant stroma
- Epithelial neoplasms with scant stroma
- Epithelial cell clusters associated with a lymphoid background
Mixed Inflammatory Pattern

• **Benign**

  • Acute/acute and chronic Sialadenitis (including cervicofacial Actinomyces)

  • Granulomatous sialadenitis

  • Necrotizing sialometaplasia

  • Branchial Cleft Cyst (inflamed)
Lymphocyte Only Pattern

- **Benign**
  - Benign/Reactive lymph node
  - Undersampled lymphoepithelial sialadenitis

- **Malignant**
  - Malignant lymphoma
Epithelial Proliferations/Neoplasms Without Stromal Component

- **Benign**
  - Normal salivary gland
  - Sialadenosis
  - Oncocytoma/ Nodular oncocytosis

- **Malignant**
  - Mucoepidermoid carcinoma
  - Acinic cell carcinoma
  - Adenocarcinoma, NOS
  - Salivary gland duct carcinoma
  - Squamous cell carcinoma
  - Metastatic lesions
Epithelial Neoplasms With Abundant Stromal Component

• **Benign**
  - Mixed tumor

• **Malignant**
  - Adenoid cystic carcinoma
  - Carcinoma ex pleomorphic adenoma
Epithelial Neoplasms With Scant Stromal Component

- **Benign**
  - Mixed tumor (cellular pleomorphic adenoma)
  - Basal cell adenoma
  - Myoepithelioma

- **Malignant**
  - Adenoid cystic carcinoma (high grade)
  - Carcinoma ex pleomorphic adenoma
  - Myoepithelial carcinoma
  - Epithelial-myop epithelial carcinoma
  - Polymorphous low grade adenocarcinoma
Epithelioid Cell Clusters Associated With A Lymphoid Background

- **Benign Non-Neoplastic**
  - Chronic sialadenitis
  - Chronic sclerosing sialadenitis (Kuttner tumor)
  - Lymphoepithelial sialadenitis (Benign lymphoepithelial lesion)
  - Benign lymphoepithelial cysts
  - Branchial cleft cyst
  - Post radiation sialadenitis
Epithelioid Cell Clusters Associated With A Lymphoid Background

- **Benign Neoplastic**
  - Warthin tumor
  - Sebaceous lymphadenoma/Lymphadenoma

- **Malignant**
  - Mucoepidermoid carcinoma
  - Acinic cell carcinoma
  - Sebaceous lymphadenocarcinoma
  - Lymphoepithelial-like carcinoma
  - Metastatic lesions
Lymph node: Common Architectural Patterns

- Dispersed hypercellular
- Dispersed hypocellular
- Hypercellular mixed dispersed and aggregated
- Hypocellular dispersed and aggregated
- Aggregated
- Spindle cell pattern
Dispersed Hypercellular

- **Benign**
  - Reactive hyperplasia
  - Granulomatous lymphadenitis
  - Suppurative lymphadenitis

- **Malignant**
  - Non-Hodgkin lymphoma
  - Hodgkin lymphoma
  - Metastatic malignancies
Dispersed Hypocellular

- **Benign**
  - Necrosis/Infarct
  - Status post chemotherapy/viral infections

- **Malignant**
  - Hodgkin lymphoma
Hypercellular: Dispersed and Aggregated

- **Benign**
  - Follicular hyperplasia with prominent germinal centers
  - Granulomatous lymphadenitis
  - Benign nodal inclusions

- **Malignant**
  - Metastatic carcinoma partially replacing lymph node
  - Hodgkin lymphoma, syncitial variant
Aggregated Pattern

- Metastatic Carcinoma
Soft Tissue

- Old fish net/twisted rope
- Lipomatous tumor
- Myxoid fragments and dispersed cell
Old Fish Net/Twisted Rope

- Schwannoma
Lipomatous Tumor

- Lipoma
- Spindle cell lipoma
Myxoid Fragments and Dispersed Cell

- Nodular fasciitis
- Metastatic Melanoma (mimic)
Neuroendocrine/Neural Crest

- Random loose aggregates and dispersed single cells
- Random loose aggregates and dispersed single small cells
Random Loose Aggregates and Dispersed Single Cells

- **Benign**
  - Paraganglioma

- **Malignant**
  - Metastatic medullary carcinoma
  - Metastatic melanoma
  - Metastatic adenocarcinoma (mimic)
Random Loose Aggregates and Dispersed Small Single Cells

- Metastatic small carcinoma
- Metastatic Merkel cell carcinoma
Sample Cases
“Deconstructive Cytology”

- Recognize the individual and basic key elements of a architectural pattern
- Attempt to construct a cartoon of these elements in your mind’s eye
When Applying the Practical Pattern Based Approach

• “The eye sees what the mind is prepared to comprehend.” Henri Bergson

• “You can observe a lot by just watching.” Yogi Berra