1. Medicine I: Introduction to Oral and Maxillofacial Pathology...

2. Introduction – Four Objectives

**Introduction – Four Objectives**

1. **Description of Soft Tissue Lesions of the Oral Cavity**
   - Site, morphology, color, size

2. **Premalignant Oral Lesions**
   - Leukoplakia, erythroplakia

3. **Screening Tools to Detect Oral Cancer**
   - Conventional and liquid-based cytology, brush biopsy, toluidine blue, chemiluminescence

4. **Diagnostic Tools to Diagnose Oral Cancer**
   - Scalpel biopsy, punch biopsy, laser biopsy

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3. Definition of Oral and Maxillofacial Pathology

Definition of Oral and Maxillofacial Pathology

- The specialty of dentistry & pathology which deals with the nature, identification, & management of diseases affecting the oral & maxillofacial regions. It is a science that investigates the causes, processes, & effects of these diseases.

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4. Definition of Oral and Maxillofacial Pathology

Definition of Oral and Maxillofacial Pathology

- The practice of oral & maxillofacial pathology includes research, diagnosis of diseases using clinical, radiographic, microscopic, biochemical or other examinations, & management of patients.

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5. Diagnosis of Soft Tissue Lesions

Diagnosis of Soft Tissue Lesions

- **Description - “The Big 3 Plus One”**
  - Site
  - Morphology
  - Color
  - Size

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6. Site

Site

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7. Oral Pathology: Physical Examination: Slide 7

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8. Oral Pathology: Physical Examination: Slide 8

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Basic Morphologic Types

- Elevated
  - Above the plane of mucosa
- Depressed
  - Below the plane of mucosa
- Flat
  - Even with the plane of mucosa
  - Detectable by change in color

Elevated Lesions

- Blisterform – contains a body fluid
  - Vesicle - ≤ 5 mm in diameter
  - Bulla - > 5 mm in diameter
  - Pustule – ≤ 5 mm and > 5 mm; filled with pus
11. Elevated Lesions

Elevated Lesions

- Nonblisterform – no fluid
  - Papule - $\leq 5$ mm in diameter
  - Nodule - $> 5$ mm and $\leq 2$ cm in diameter
  - Tumor - $> 2$ cm in diameter
  - Plaque – usually $> 5$ mm in diameter

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12. Depressed Lesions

Depressed Lesions

- Most are ulcers
  - Regular vs. irregular outline
  - Raised vs. smooth margin
  - Superficial vs. deep depth
    - $\leq 3$ mm vs. $> 3$ mm
    - Diameter $\leq 5$ mm vs. $> 5$ mm
  - Single vs. multiple
    - Separate vs. coalescing
- Other examples
  - Scar
  - Pit or blind pouch

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13. Flat Lesions

Flat Lesions

• Macule
  • Circumscribed area of color change
• Tongue Lesion – special case
  • Loss of lingual papillae
  • Single or multiple
    • Irregular or regular outline

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14. Color of Soft Tissue Lesions

Color of Soft Tissue Lesions

• 4 Primary Endogenous Pigments
  • Oxyhemoglobin - ___________
  • Reduced hemoglobin - __________
  • Melanin - __________
  • Carotene - __________

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15. Color of Soft Tissue Lesions

Color of Soft Tissue Lesions

- Red – 80%
- Pink – 50%
- White – 50%
- Red and White – 34%
- Blue – 13%
- Purple – 8%
- Gray – 7%

- Black – 7%
- Brown – 5%
- Translucent
  - Pink
  - Blue
  - Red or purple

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16. Color of Soft Tissue Lesions

Color of Soft Tissue Lesions

- Extravascular (red and macular)
  - Purpura
    - Petechia – 1-5 mm in diameter
    - Ecchymosis – > 5 mm in diameter
    - Hematoma – > 2 cm in diameter
      - Elevated in early stages

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17. Miscellaneous Terminology

Miscellaneous Terminology

- Ulceration vs. erosion
- Keratosis
- Sessile vs. pedunculated
- Smooth vs. rough
  - Papillary; papillomatous
  - Verrucous; verrucoid

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18. A 4.0 mm Sessile

A 4.0 mm sessile, smooth, yellow vesicle of the right anterior floor of mouth.

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19. A 6.0 mm Gray-black Macule

A 6.0 mm gray-black macule of the left, posterior mandibular vestibule adjacent to tooth #19.

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20. A 2.5 cm x 1.7 cm Sessile

A 2.5 cm x 1.7 cm sessile, smooth, bosselated, pink-red tumor of the left anterior maxillary alveolar ridge.

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21. A 1.0 cm Diameter Deep Ovoid Ulcer

A 1.0 cm diameter, deep, ovoid ulcer of the right posterior hard palate exhibiting raised, regular margins and extending to the midline.

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22. A 1.1 cm, Blue Bulla

A 1.1 cm, blue bulla of the left anterior floor of mouth.

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23. A 5.0 mm, Pedunculated, White, Papillary Papule

A 5.0 mm, pedunculated, white, papillary papule of the left, mid-lateral border of the tongue.

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24. Bilateral, Multiple Individual and Confluent, Red Macules

Bilateral, multiple individual and confluent, red macules (i.e., ecchymosis) at the junction of the hard and soft palate, measuring, in aggregate, 1.2 cm x 0.6 cm.

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25. Classic Warning Signs of Cancer

Classic Warning Signs of Cancer

- Any change in bowel or bladder habits
- Any change in a mole on the skin
- Persistent cough or hoarseness
- Persistent indigestion or dysphagia
- Difficulty in speaking or chewing
- A lump or thickening in mucosa, gland or lymph node area
- An ulcer that does not heal
- Abnormal bleeding or discharge
- Pain or numbness

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26. Highest Risk Sites

Highest Risk Sites – Premalignant and Malignancy (Squamous cell carcinoma)

- Lower lip
  - Skin/vermilion
- Tongue
  - Lateral and ventral
- Floor of mouth
- Soft palate complex
  - Uvula
  - Soft palate proper
  - Anterior tonsillar pillar
  - Lingual retromolar trigone

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27. Leukoplakia

Leukoplakia

- White patch that won’t wipe off
- 85% of oral cancers are clinically leukoplakias
- Typical presentation
  - 70% Male
  - Average age = 60
- 80% are tobacco smokers
- Frequent smokers have more and larger lesions

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28. Leukoplakia

Leukoplakia

- 80% hyperkeratosis
- 20% epithelial dysplasia
- Least common sites have > dysplasia
  - Tongue
    - 25% dysplastic
  - Floor of mouth
    - 50% dysplastic


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29. Leukoplakia

Leukoplakia

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30. Leukoplakia

Leukoplakia

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31. Erythroplakia

Erythroplakia

- Red patch that won’t wipe off
- 91% prove to be severe dysplasia or invasive cancer
- Older men; avg. age = 65-75
- Most common sites
  - Lateral tongue
  - Floor of mouth
  - Soft palate
  - Alveolar ridge

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Erythroplakia

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33. Oral Screening and Diagnostic Aids

**Exfoliative Cytology**
- Conventional Pap smear
- Brush “biopsy”
- Liquid-based cytology

**Vital Dyes**
- Toluidine blue
- Chemiluminescence

**Tissue Biopsy**
- Punch
- Scalpel
- Laser

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34. Oral Pathology: Physical Examination: Slide 34

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35. Exfoliative Cytology

Exfoliative Cytology

- Lesion stroked gently, firmly with wet wooden tongue blade or cotton tip applicator
- Collected cells spread ("smeared") on a frosted glass slide
- Immediately fixed with commercially available spray (alcohol-ether)
- After drying, slide is packaged and sent to oral path lab for staining and coverslipping

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36. Exfoliative Cytology

Exfoliative Cytology

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37. Exfoliative Cytology

Exfoliative Cytology

- Obscuring elements and poorly preserved cells limit diagnostic accuracy
- Studies have shown a 15% false-negative rate
- Significant false-positives also reported
- ~ 80% of harvested cells discarded on collection device

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38. Brush Biopsy

Brush “Biopsy”

- Introduced October 1999
- Transepithelial cytology procedure
- Commercial processing lab in New York state receives all specimens
- Diagnosed by trained cytopathologist after screening by neural net computer with digital image capture

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39. Brush Biopsy

Brush Biopsy

- Transepithelial cell sample obtained by twirling a patented spiral-shaped, stiff nylon bristle brush
- Collected cells transferred to bar-coded, clear glass slide
- Supplied pouch of alcohol fixative is immediately poured over slide
- Specimen mailed in provided box to commercial lab for analysis
- Diagnosis report mailed to clinician

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40. Brush Biopsy

Brush Biopsy

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41. Brush Biopsy

**Brush Biopsy**

- Transepithelial cells harvested
- ~80% of harvested cells not transferred to glass slide
- Controversial cost/benefit ratio
  - If positive or suspicious, then biopsy; if negative, but lesion remains then repeat or tissue biopsy

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42. Liquid-Based Cytology

**Liquid-Based Cytology**

- Past few years, replacing conventional pap smears in hospitals and private OB/GYN offices
- Numerous clinical trials demonstrate superiority over conventional
- FDA-approved and insurance reimbursement

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Liquid-Based Cytology

- Transepithelial cells harvested with a nylon bristle brush
- Brush immersed, twirled in liquid preservative container; brush disposed
- Liquid container sent to oral path lab
- Patented machine filters cells from debris and lays cells in a monolayer on glass slide
- Examination by the local oral pathologist following staining and coverslapping

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Liquid-Based Cytology

- Better representative collection of lesional cells
- Easier interpretation since monolayer of cells with elimination of blood, obscuring debris
- Decreased false-positives and false-negatives

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47. Toluidine Blue Vital Staining

Toluidine Blue Vital Staining

- First touted in 1970s
- Basic metachromatic dye (tolonium chloride) that stains nuclear material of malignant lesion
  - Nuclei of cancerous cells have increased DNA synthesis (but so does wound repair)
- For lesions not clinically detectable or guide for biopsy site

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48. Toluidine Blue Vital Staining

Toluidine Blue Vital Staining

- Rinse mouth with water twice, for about 20 seconds each time (removes debris)
- Rinse mouth with 1% acetic acid for 20 seconds (removes saliva)
- Gently dry area
- Apply 1% toluidine to high-risk areas or lesion
- Rinse with acetic acid for 1 minute to clear excess stain
- Rinse with water

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49. Toluidine Blue Staining

Toluidine Blue Staining

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50. Toluidine Blue Vital Staining

Toluidine Blue Vital Staining

- Immediate reinforcement of clinical impression and guide to biopsy
- Expertise required to interpret true staining from inconsequential diffuse film or mechanical retention
- Keratin does not allow stain penetration
- May wait 10 to 14 days to allow inflammation to subside and restain

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51. Chemiluminescence

**Chemiluminescence**

- Normal epithelium will absorb device’s illumination and appear dark, while abnormal epithelial cells will reflect it and appear bright white.
- Acetic acid solution is a cytoplasmic dehydration agent.
- Changes in refractile properties that occur in atypical nonkeratinized squamous epithelium due to an increase N/C ratio.

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52. Chemiluminescence

**Chemiluminescence**

- Rinse mouth with raspberry-flavored 1% acetic acid solution for 1 minute and spit.
- Activate capsule and assemble with retractor.
- Bend flexible outer capsule breaking inner vial.
- Shake to mix contents of the capsule.
- Insert illuminated capsule into open piece of retractor and assemble two pieces.
- Dim ambient room lights.
- Look for acetowhite lesion(s) and discard Vizilite device.

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54. Oral Pathology: Physical Examination: Slide 54

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55. Oral Pathology: Physical Examination: Slide 55

Adjunctive Screening Technologies
- Mammogram → Breast Screening
- Pap Smear → Cervical Screening
- PSA → Prostate Screening
- ViziLite® → Oral Screening

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56. Oral Pathology: Physical Examination: Slide 56

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57. Oral Pathology: Physical Examination: Slide 57

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58. Chemiluminescence

Chemiluminescence

- Improves identification, evaluation and monitoring of oral mucosal abnormalities
- Must use within 10 minutes of light activation
- May obtain positive illuminescence of reactive inflammatory lesions

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59. Scalpel Tissue Biopsy

Scalpel Tissue Biopsy

• **Introduction**
  • The “gold standard” of oral diagnosis
  • Surgical removal of body tissue from the living for pathologic examination
    • Intact orientation and relationship of the removed tissues
• **Indications**
  • When a lesion does not respond to therapy
  • When a lesion is suspicious for neoplasia despite negative results with other dx techniques
  • When the clinician is unsure of the clinical diagnosis

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60. Scalpel Tissue Biopsy

Scalpel Tissue Biopsy

• **Technique**
  • Appropriate local anesthesia injected adjacent to the suspicious lesion
  • Traction suture placed for ease of cutting and retention of specimen
  • Scalpel blade (e.g., #15 or #12) used to incise tissue in an elliptical outline with a V-shaped cross-section
  • Specimen immediately placed in 10% neutral buffered formalin, tissue-side down on a piece of paper
  • Suture(s) placed to promote primary intention wound healing, when possible

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61. Scalpel Tissue Biopsy

Scalpel Tissue Biopsy

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62. Scalpel Tissue Biopsy

Scalpel Tissue Biopsy

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Scalpel Tissue Biopsy

Scalpel Tissue Biopsy - Technical Considerations

- Small lesions should be completely excised
- Large lesions that are incompletely removed incised must include a border of clinically normal tissue (i.e., perilesional)
- Local anesthesia should not be injected into the area to be biopsied (artifact creation)
- Fixation in 10% neutral buffered formalin should be immediate and should completely bathe the specimen
  - Alcohol may be used for fixation as a poor second choice
  - Never use water or saline (artifact creation)

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Scalpel Tissue Biopsy

Scalpel Tissue Biopsy - Technical Considerations

- Attach traction suture for soft tissue retraction rather than clamping mucosa
- Tissue should be handled gently, not crushed with tissue forceps
- Retain suture in specimen once excised and indicate its position for orientation at gross examination by pathologist
- Multiple biopsies from different sites should be submitted in separate containers to allow discrimination if diagnoses different
  - If separate containers are not available then indicate with different length sutures

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65. Heat and Fixation Artifacts

Heat and Fixation Artifacts

Heat  Improper fixation

Compromise Diagnostic Accuracy

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66. Tissue Punch Biopsy

Tissue Punch Biopsy

- Introduction
  - Disposable sterile plastic-handled or sterilizable surgical steel handled
  - Each has surgical steel round cutting blade
    - Various diameters available from 2.0 – 8.0 mm

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67. Tissue Punch Biopsy

Tissue Punch Biopsy

• **Technique**
  - Inject local anesthesia
  - Insert punch into peri-lesional mucosa and supporting tissues
  - Press and turn the handle, remove punch; separate specimen from surrounding tissue with iris scissors
  - Immediately place specimen in routine fixative
  - No sutures need be placed
    - Pressure is applied for coagulation
    - Granulation tissue will form

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68. Tissue Punch Biopsy

Tissue Punch Biopsy

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69. Tissue Punch Biopsy

**Tissue Punch Biopsy**

- **Indications and Advantages**
  - Small lesions
  - Easier than scalpel
  - Sutures not needed

- **Limitations**
  - Limited number of anatomic sites suitable
  - Generally, for incisional biopsy only

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70. Laser Soft Tissue Biopsy

**Laser Soft Tissue Biopsy**

- **Hydrolaser**
  - Laser Medium: Er,Cr:YSGG
    - (Erbium, Chromium, Yttrium, Scandium, Gallium, Garnet)
  - Wavelength = 2780 nm

- **Advantages**
  - No anesthesia
  - No blood

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Oral Pathology: Physical Examination: Slide 71

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