

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



Medicine I: Introduction to Oral and Maxillofacial Pathology

2005

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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

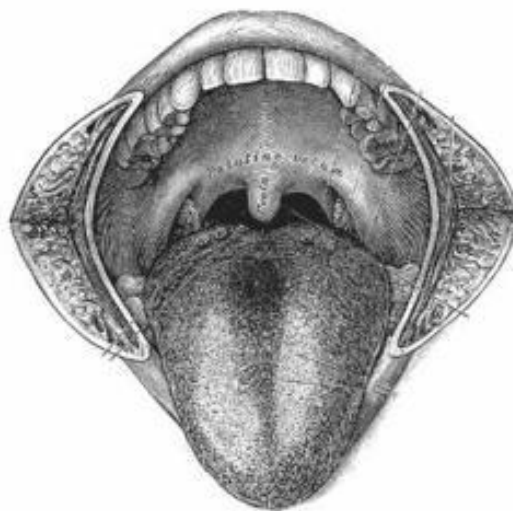


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6. Site



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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9. Basic Morphologic Types



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



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10. Elevated Lesions



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



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11.

Elevated Lesions



Elevated Lesions

- **Nonblisterform – no fluid**
 - Papule - ≤ 5 mm in diameter
 - Nodule - > 5 mm and ≤ 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
 - ≤ 3 mm vs. > 3 mm
 - Diameter ≤ 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



Mashberg, Samit. Early Diagnosis of Oral Cancer, ACS, 1969

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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

Waldron CW, Shafer WF. *Cancer* 1975;36:1386-92.



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29.

Leukoplakia



Leukoplakia



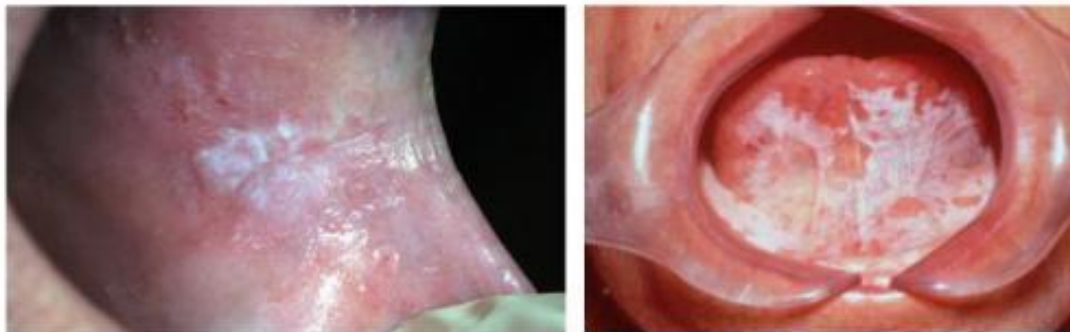
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30.

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

Waldron CW, Shafer WF. *Cancer* 1975;36:1021-28.



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32. Oral Pathology: Physical Examination: Slide 32



Erythroplakia



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33. Oral Screening and Diagnostic Aids



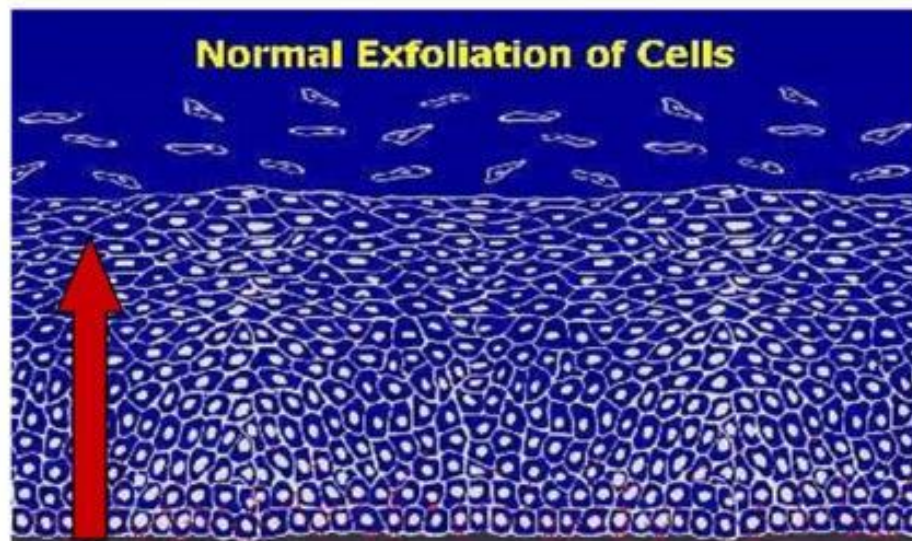
Oral Screening and Diagnostic Aids

- **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 ("smear") 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



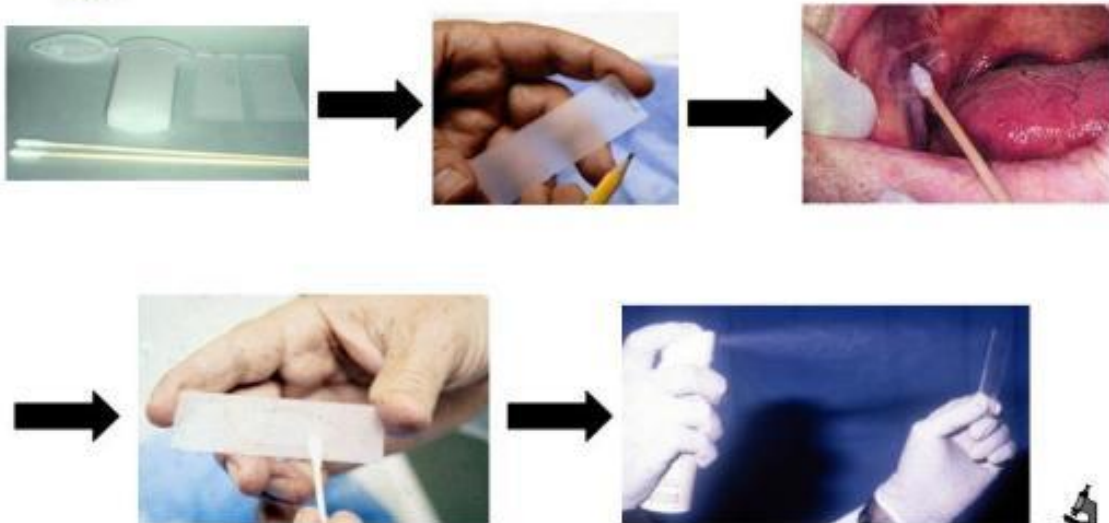
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36.

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**



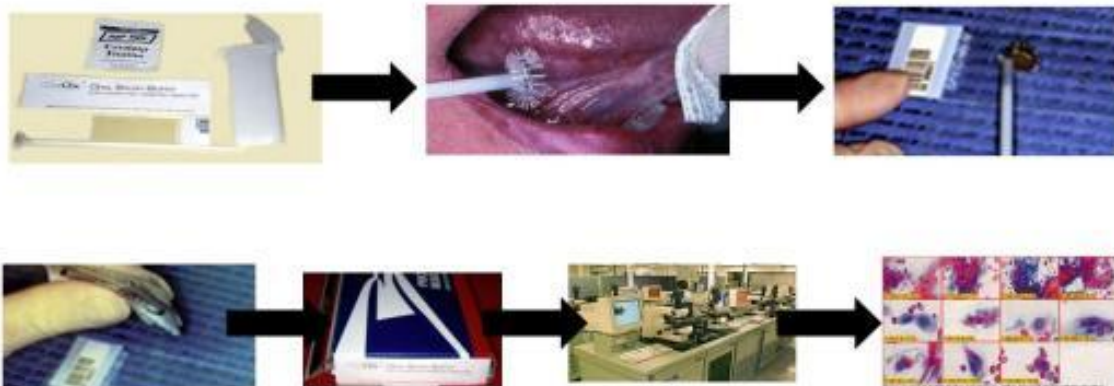
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40.

Brush Biopsy



Brush Biopsy



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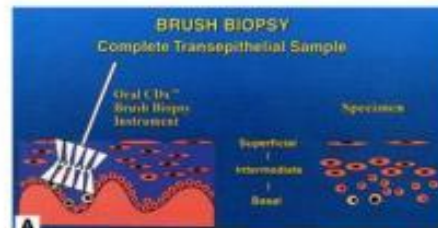
41.

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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43.

Liquid-Based Cytology



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 coverslipping**



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44.

Liquid-Based Cytology

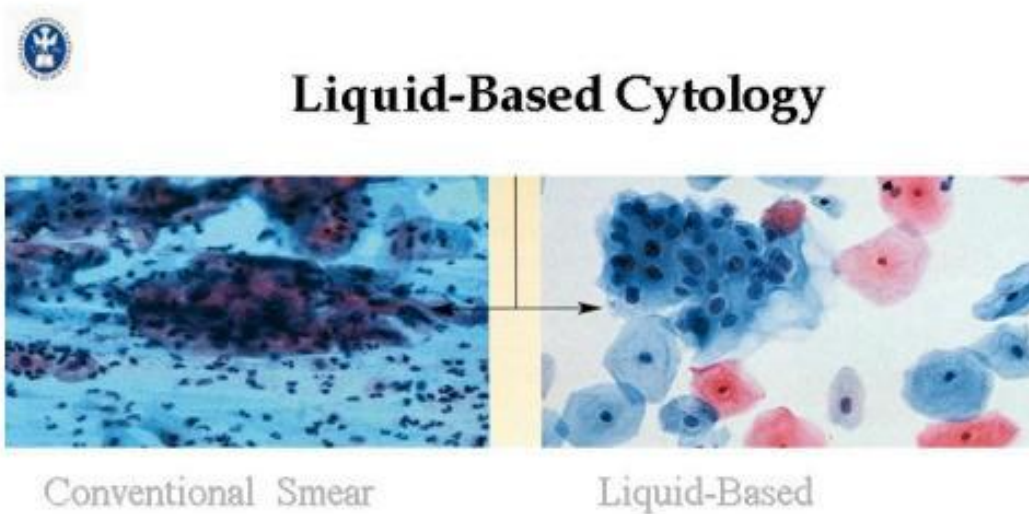


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45.

Liquid-Based Cytology



Conventional Smear

Liquid-Based



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46.

Liquid-Based Cytology

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

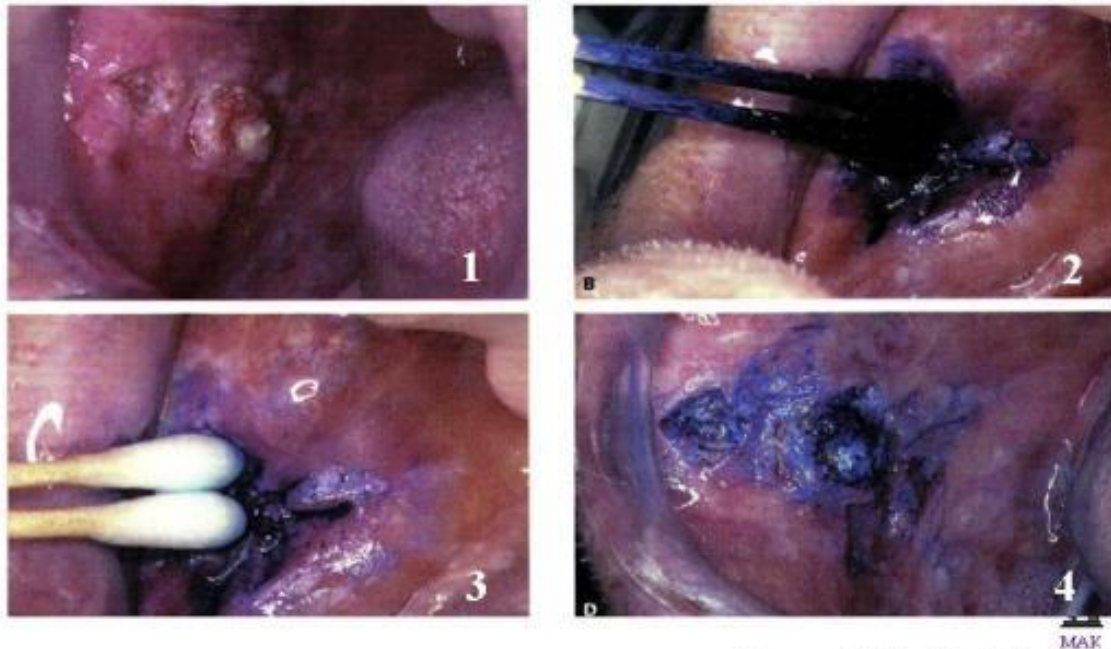
- **Rinse mouth with water twice, for about 20 seconds each time (removes debris)**
- **Rinse mouth with 1% acetic acid for 20 seconds (removes saliva)**
- **Gently dry area**
- **Apply 1% toluidine to high-risk areas or lesion**
- **Rinse with acetic acid for 1 minute to clear excess stain**
- **Rinse 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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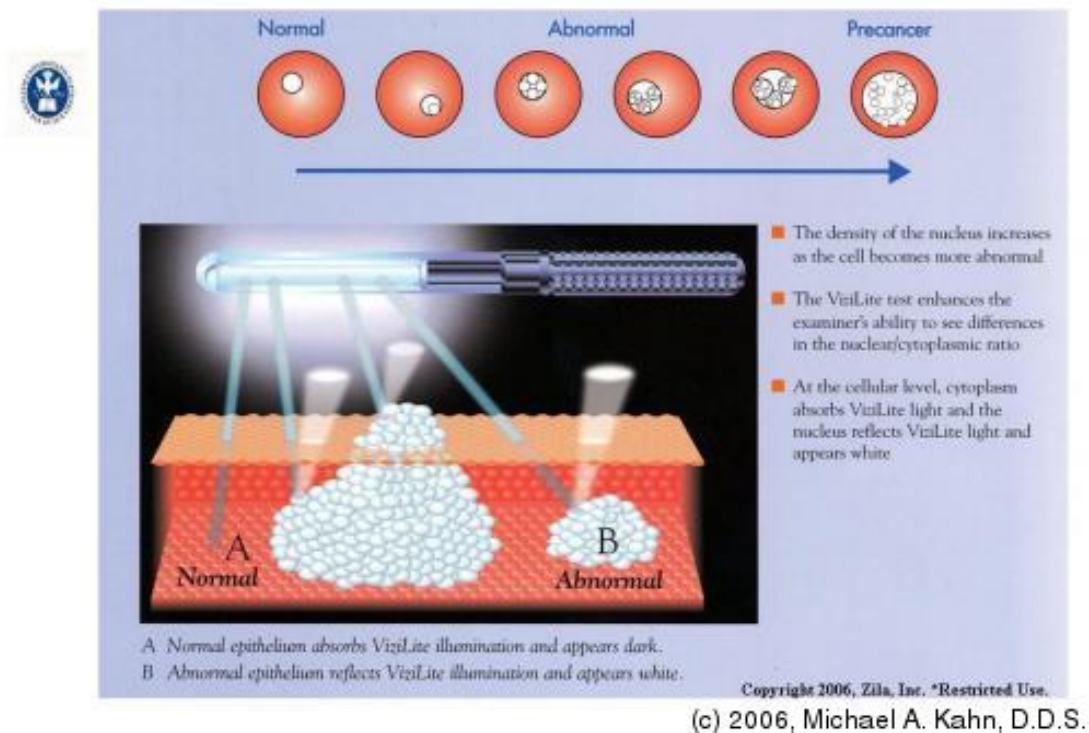
53. Oral Pathology: Physical Examination: Slide 53



The image shows the ViziLite product packaging and a flowchart titled "Steps to Diagnosis". The flowchart starts with "Visual & Manual" leading to "ViziLite". From "ViziLite", the process can lead to "Brush Biopsy" or "Incisional Biopsy". Both "Brush Biopsy" and "Incisional Biopsy" lead to "Histological Analysis". A small microscope icon with "MAK" is also present.

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54. Oral Pathology: Physical Examination: Slide 54



The diagram illustrates the cellular mechanism of the ViziLite test. It shows a progression from "Normal" to "Abnormal" to "Precancer" cells. Below this, a cross-section of epithelium shows a ViziLite probe illuminating two areas: "A Normal" and "B Abnormal".


- The density of the nucleus increases as the cell becomes more abnormal.
- The ViziLite test enhances the examiner's ability to see differences in the nuclear/cytoplasmic ratio.
- At the cellular level, cytoplasm absorbs ViziLite light and the nucleus reflects ViziLite light and appears white.

A Normal epithelium absorbs ViziLite illumination and appears dark.
B Abnormal epithelium reflects ViziLite illumination and appears white.

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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 illumination 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

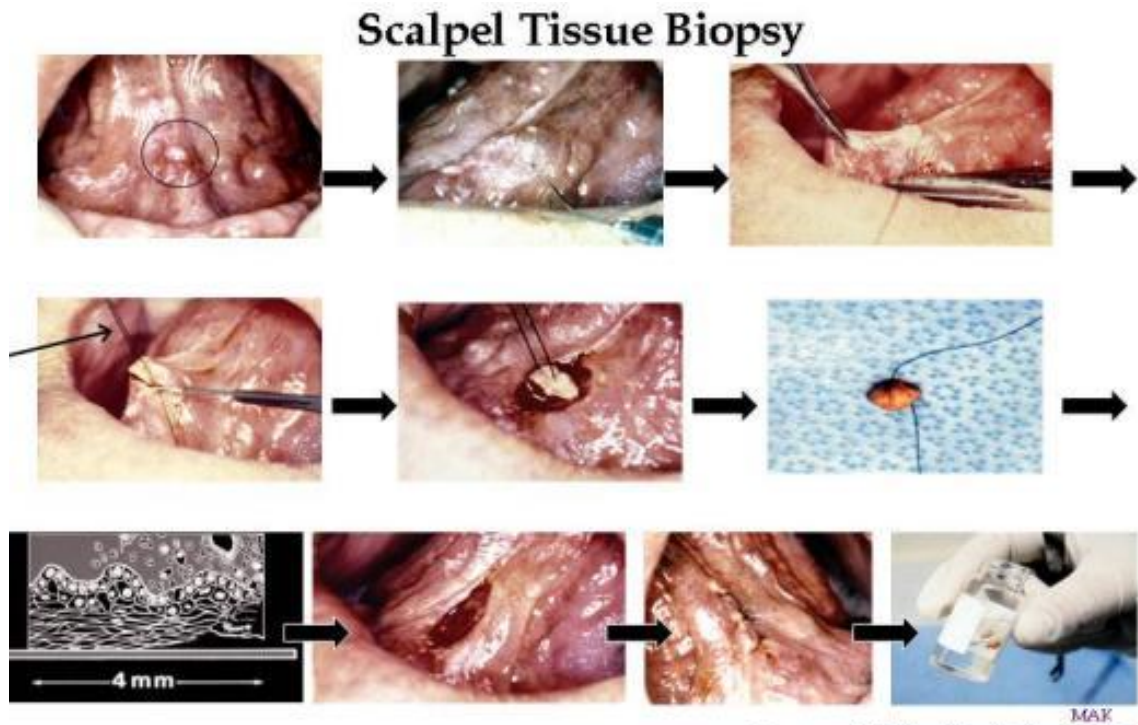
• Technique

- 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



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62. Scalpel Tissue Biopsy



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63.

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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64.

Scalpel Tissue Biopsy



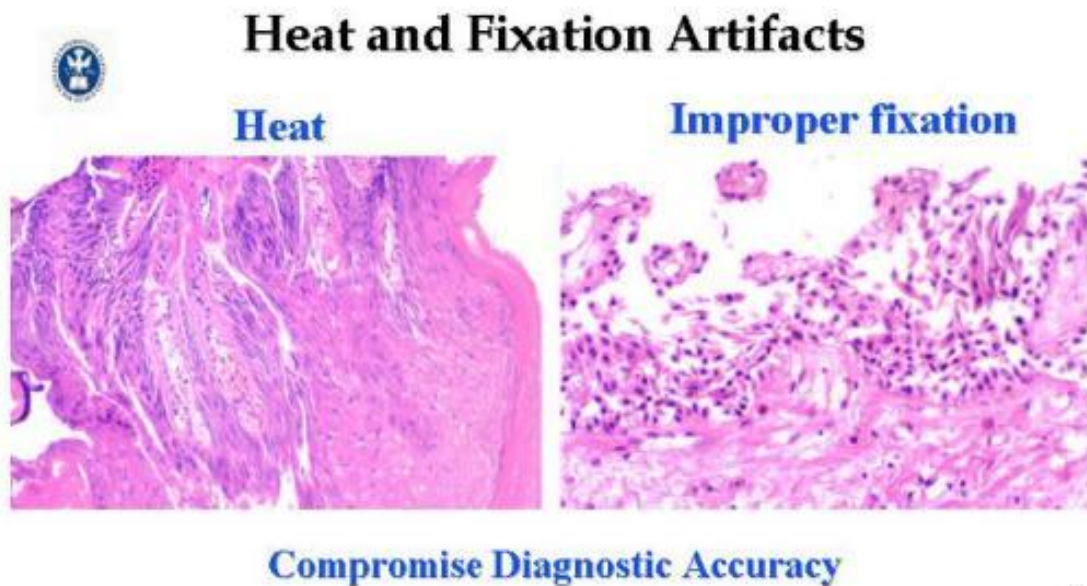
Scalpel Tissue Biopsy - Technical Considerations

- **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



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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.

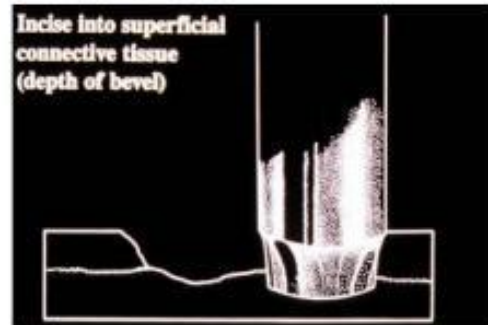
Tissue Punch Biopsy



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



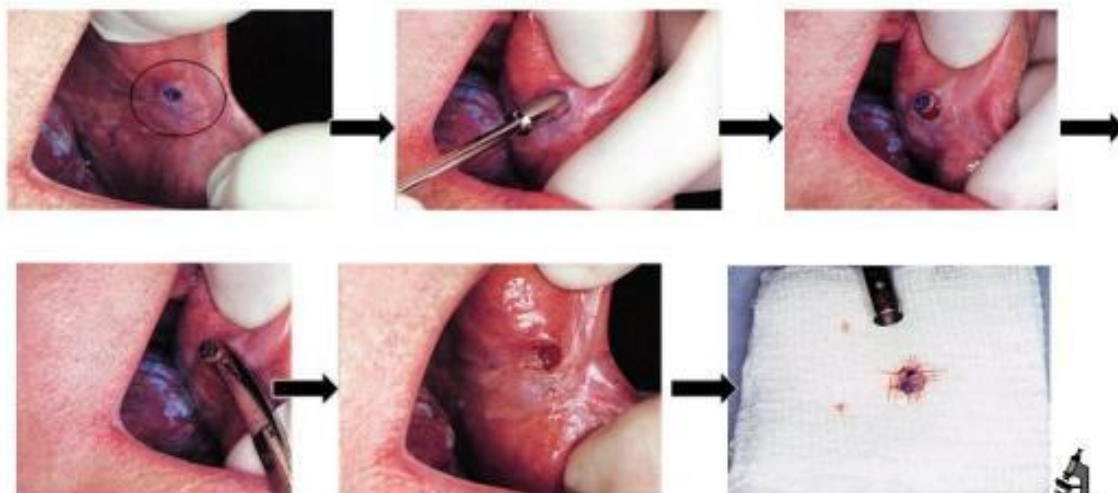
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68.

Tissue Punch Biopsy



Tissue Punch Biopsy



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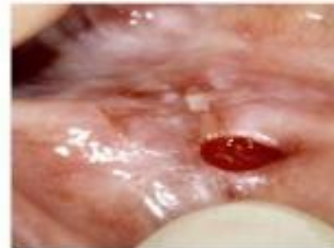
69.

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



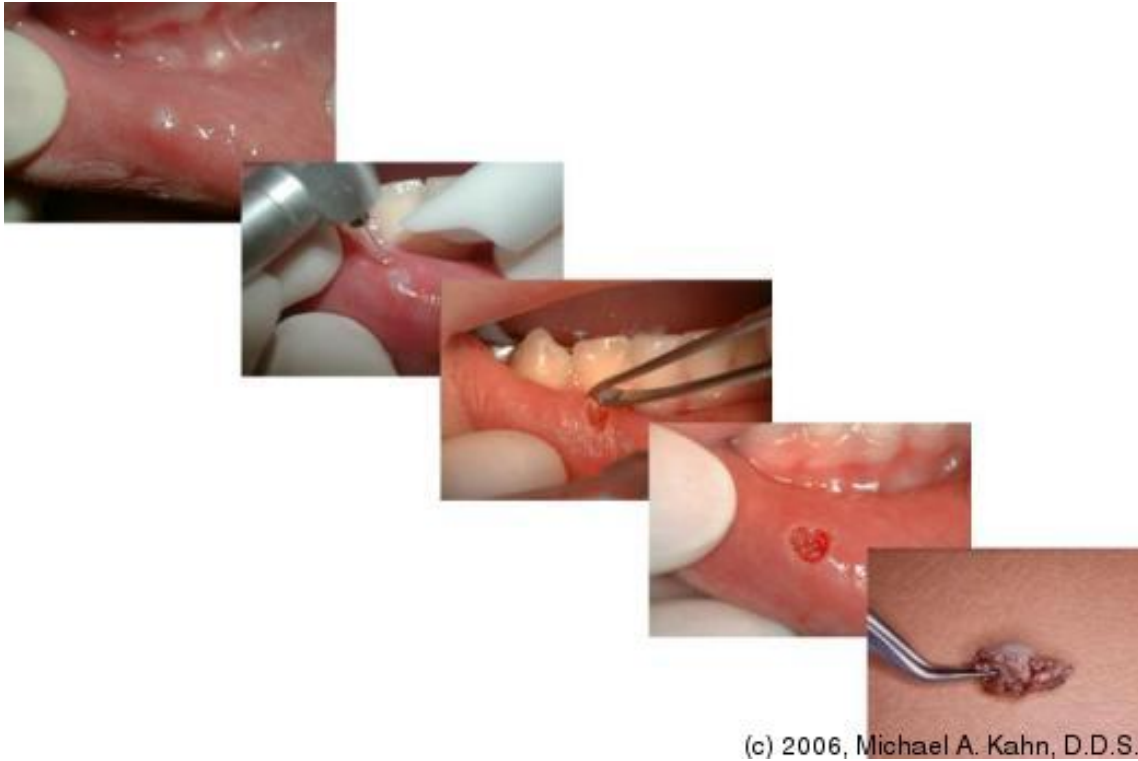
Laser Soft Tissue Biopsy

- **Hydrolaser**
 - **Laser Medium:**
Er,Cr:YSGG
(Erbium, Chromium,
Yttrium, Scandium,
Gallium, Garnet)
 - Wavelength = 2780 nm
- **Advantages**
 - No anesthesia
 - No blood



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71. Oral Pathology: Physical Examination: Slide 71



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