Introduction to CYTOLOGY

The 25th Congress of the International Academy of Pathology / Arab Division
The 5th International Conference of the Jordanian Society of Pathologists

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Professor of Pathology & Cytopathology
King Fahad Specialist Hospital – Dammam
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Fadi Abdul-Karim, MD

Professor of Pathology at Cleveland Clinic

1979 MD AUB

AP & Cytopathology certification

- >180 publications, chapters
- Gyn, bone and soft tissue cytology
ISAM-ELDIN ELTOUUM, MD

- Professor of Pathology at UAB
- School of Medicine University of Khartoum, Sudan 1983
- CP residency, Assistant Professor at alma mater
- Postdoctoral fellowship at NIH
- AP residency at GWU
- Cytopathology & Surgical pathology fellowship at UAB
- > 100 publication, chapters
- Thyroid, EUS GI and Lung
Outline

- History
- Exfoliative vs FNA
- Utilization and advantages
- Technical aspects...videos
- Cytology vs tissue
- Morphologic criteria
- Pitfalls
- Report
- Examples
"My interest is in the future because I am going to spend the rest of my life there"

Charles F. Kettering
Cytology Old & New

- Historical reports are found as early as the 12th century
- 1928 Papanicolaou....Pap smear
- 1930-34 American Trio: Martin, Stewart & Ellis from NY...Asp. Bx.
- European Era: post WWII
- Certification in Cytopathology, ABP 1989

Frable, 1989. Hum Pathol 20:504
“A story lives only when it is told”
HISTORY

- George Papanicolaou era
  ...1917...1928..1962.....

...’’ …WITH HIS DEATH, THE HEROIC ERA OF DIAGNOSTIC CYTOLOGY HAS COME TO AN END’’…

Leopold Koss
Cytopathology

- Exfoliative
- Aspiration
Exfoliative

- Pap smear...anal smears
- Scrape cytology...skin & eye
- Nipple discharge
- Any other fluid collection
ASPIRATION

- Any where
- Palpable...non guided
- Non-palpable or deep...Guided
- Fine Needle Aspiration = FNA
- Needle Aspiration Biopsy = NAB
- Aspiration Biopsy Cytology = ABC
- Fine Needle Aspiration Biopsy = FNAB
UTILIZATION

- REACH A DEFINITIVE DIAGNOSIS
- Screening
- Follow up
- Prognostication
ADVANTAGES

- SAFE
- SIMPLE
- QUICK
- ACCURATE
- COST EFFECTIVE
What do we need

- Team work
- Common language
Technical

- **Smears**: air-dried or fixed
- **Stains**: Diff-Quik or Pap. +/- H & E
- **Preparation types**:
  - Direct smears
  - Liquid-based: TP, SP, Cytospin
  - Membrane filter
  - Cell block “ mini biopsy “
End result

- Air dried, DQ stained smears
- Pap stained slides
- Cell block slides stained by H&E
- +/- RPMI cellular solution: flow cytometry, cytogenetic analysis, molecular studies
- Microbiology
Diff Quik stain “Modified Romanowsky”

- Air dried…“hand held fan”
- Fast …< 1 minute
- Immediate adequacy & triage
- Advantages:
  - Triage - Mucin & colloid
  - Cytoplasmic details & vacuoles
  - Pigments - Heme (LGB, Cyt basoph)
  - Matrix & background - B Membrane
  - Organisms
Papanicolaou stain

- Alcohol fixation
- Longer “ultrashort Pap”
- Advantages:
  - Nuclear details: Chromatin pattern, outline and nucleoli
  - Squamous differentiation
  - Cleaner background - Oncocytes
  - Psammoma bodies
Features well-emphasized by DQ stain

- Cytoplasmic details
- Stroma
- Background

Pap

- Nuclear details
- Nucleoli
- Oncocytosis
- Psammoma bodies
ANCILLARY STUDIES

- Simple special stains
- Immunophenotypic: IMX, FCM, DIF
- Cytogenetic analysis
- Molecular studies: PCR
- EM: ?!
## “Surgical Biopsy” vs “Cytology & FNA”

<table>
<thead>
<tr>
<th></th>
<th>Exc. Biopsy</th>
<th>Cytology &amp; FNA</th>
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</thead>
<tbody>
<tr>
<td>Material</td>
<td>Tissue</td>
<td>Cells</td>
</tr>
<tr>
<td>Cost</td>
<td>More expensive</td>
<td>Minimal</td>
</tr>
<tr>
<td>Anesthesia</td>
<td>S.t. necessary</td>
<td>Unnecessary</td>
</tr>
<tr>
<td>Equipment</td>
<td>Extensive</td>
<td>Minimal</td>
</tr>
<tr>
<td>Sampling error</td>
<td>Rarely an issue</td>
<td>Possible</td>
</tr>
<tr>
<td>Complications</td>
<td>Uncommon</td>
<td>Rare</td>
</tr>
<tr>
<td>Scar</td>
<td>Always</td>
<td>Never</td>
</tr>
<tr>
<td>Pathologists</td>
<td>Wide expertise</td>
<td>S.t. Limited</td>
</tr>
<tr>
<td>Ancill. studies</td>
<td>Possible</td>
<td>Possible</td>
</tr>
<tr>
<td>Architecture</td>
<td>Present</td>
<td>Absent</td>
</tr>
</tbody>
</table>
Interpretation

- THE GOOD

- THE BAD

- THE UGLY
The following is a picture taken directly above these camels in the desert at sunset. It is considered one of the best pictures of the year. Look closely, the camels are the little white lines in the picture. The black you see are just the shadows!!
Cytopathological Features of malignancy

- High cellularity
- Cellular enlargement
- Increased N/C ratio
- **Hyperchromasias**
- Discohesiveness of cells
- Prominent and large nucleoli
Cytopathological Features of malignancy.... cont.

- Abnormal distribution of chromatin
- Increased mitotic activity and specially the presence of abnormal ones.
- Cellular and nuclear pleomorphism
- Background tumor necrosis/diathesis
DIAGNOSIS

- Negative or Positive for malignancy
  - more specific diagnosis
- Suspicious
- Benign cellular changes
- Description
Who is responsible about the process?

- We all are
- Problems can arise any time by any one
- Collection.......final report
Pitfalls...why?

- Poor collection technique
- Improper fixation
- Changes of radiation and Chemotherapy
- Changes of infarction, inflammation, necrosis...etc
False negative

- Desmoplasia (fibrosis)
- Geographic miss
- Well differentiated tumors
- Inflammation, chemotherapy, radiation
- Inexperience of interpreter
False positive

- Pregnancy
- Contamination
- Hemorrhage and infarction
- Inflammation, chemotherapy, radiation
- Inexperience of interpreter
“The adequacy of fine needle aspirates is operator dependent”

Raul Braylan, MD
Basic FNA rule...

DO YOUR OWN FNA

OR

PERFORM IMMEDIATE ADEQUACY EVALUATION (ROSE)
Cameo (Swed) : Inrad (USA)
Different FNA techniques
67 year old male with submental lymph node enlargement for the last 4 weeks. No response to antibiotics
CRAT Technique

- Continuous Radial Aspiration Technique (CRAT)
- Mirror image smears for air dried and ethanol fixed
- Air dried DQ stained smears for triaging
- Dedicate a separate pass for cell block and ancillary studies
- Cystic lesions
What do we need to establish FNA service/clinic? “101 FNA”

- Convince your colleagues the pathologists
- Team work
- Communications with the clinicians and the **RADIOLOGISTS**...develop an understanding
- The FNA WAGON
- The FNA Clinic
Syringes, Needles (gauge: 21-25) & Slides
Ethanol based fixative: Spray
Gun?!
Ethanol based solution: Saccomanno
Ancillary studies solution: RPMI
Culture swabs and related
Quick Stain: Diff-Quik
Contraindications to FNA

- The absolute are very rare: hydatid cyst, subcapsular hepatic adenoma, Paraganglioma

- Watch out for:
  - Anticoagulation (thyroid, liver, kidney)
FCM  MP  CG

Saline
Formalin
Ethanol

RPMI

Baig & Al-Abbadi..et al Cytojournal. 2006 Apr 9;3:12
Good relationship with

- ENT
- Heme/onc (tumor boards)
- Radiologists
- General surgeons
- GI (EUS-FNA)
- Prostate: NO
Good relationship with

- Pulmonary ...(Fluoroscopy)
- Orthopedics
- ID
- Melanoma
- Breast ??!!
EUS-FNA

- >>>>> frequency
- Learning curve
- Trans upper or lower GI
- Liver, pancreas, L.nodes, B.ducts, perirectal masses
- ? EUS-Core biopsy
Tools to help:

- Lectures
- CPC conferences
- Tumor boards
- Announcements (local media, e-mail, flyers..etc)
- Immediate dx. (Friday evening dx.)
- Word of mouth
THE FINAL REPORT

- Adequacy
- Diagnosis
- Descriptive diagnosis
- Comment
- Recommendation
- We have to talk
ADEQUACY

- Pathologists don’t like to report inadequate...but sometimes it is necessary
- Inadequate → no diagnosis
- Adequate but suboptimal...not recommended
- Descriptive diagnosis with differential diagnosis
DIAGNOSIS

- Negative or Positive for malignancy
  - more specific diagnosis
- Suspicious
- Benign cellular changes
- Description
Cervix
Breast
Esophagus
Axill. Node, Hx. Of bladder and lung carcinoma

CK 7 +
CK 20 -

Mets. Lung
Neck mass: No Tenderness
“Cold abscess”

- DX: Mycobacterial Lymphadenitis
71-year-F- cervical node
Metastatic Small Cell Carcinoma

AE1/3

CG
Parotid mass FNA

Metastatic HCC to mandible
83 YBF, gastric wall mass, EUS-FNA

CD 117 (C-Kit): GIST
Back soft tissue mass: hx. LCC-NE of lung and SQ.CC of neck

CK 7 – CK 20 - TTF-1 -

P63

Mets. SQ
Problems of the FNA:

- Follicular lesions/neoplasms of thyroid
- WD epithelial neoplasms (HCC, PNC)
- Necrotic/cystic tumors
- Basaloid salivary gland tumors
- Low grade MEC of Saliv. Glands
- Invasion in mammary carcinoma
Problems of the FNA approach:

- Papillary mammary neoplasms
- Benign lymphoid lesions...no specific diagnosis
- Hodgkin’s lymphoma
- T-cell rich B-cell Lymphoma
- T-cell lymphomas
- Necrotic/cystic tumors
- Grading of some lymphomas

Young N 2006 Cancer Feb.
Faculty Index

Mousa A. Al-Abbadi, MD, FCAP, FIAC
Professor of Pathology and Cytopathology
King Fahad Specialist Hospital – Dammam
Dammam, Saudi Arabia

12:00 pm – 1:45 pm
ROUNDTABLE DISCUSSIONS 18
Credit Hours: 1.75 CME/CMLE

Fine Needle Aspiration Immediately Followed by Core Biopsy: Modifying the Cytology Approach
Mousa A. Al-Abbadi, MD, FIAC

+SHOW/HIDE DESCRIPTION
DON’T BE A HERO
THANK YOU