EUS FNA of abdominal organs: An approach to reporting on site and triage for ancillary testing

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“Endosonographically obtained samples will soon become the standard of practice to obtain samples from deep seated organs.”
Qian and Hecht suggested that US/CT-guided biopsies may be more accurate and sensitive for documenting malignancy than EUS, but noted that EUS-guidance was used in more difficult lesions [41]. In contrast, in a small series, Jhala et al. demonstrated that EUS-FNA was superior to CT-FNA in obtaining adequate cells from neuroendocrine tumors of the pancreas for the diagnosis and performing additional immunohistochemical stains [42].

Endoscopic ultrasound-guided fine-needle aspiration biopsy (EUS-FNAB): past, present, and future

Kenji Yamao¹, Akira Sawaki¹, Nobumasa Mizuno¹, Yasuhiro Shimizu², Yasushi Yatabe³, and Takashi Koshikawa⁴

Table 1. History of EUS-FNAB

<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1980</td>
<td>DiMagno et al.³</td>
<td>Linear array echoendoscope</td>
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<tr>
<td></td>
<td>Strohm et al.⁴</td>
<td>Mechanical radial echoendoscope</td>
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<tr>
<td>1984</td>
<td>Tio and Tytgat⁵</td>
<td>Possibility of EUS-FNAB</td>
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<td>1989</td>
<td>Kouzu⁶</td>
<td>Possibility of EUS-FNAB</td>
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<tr>
<td>1991</td>
<td>Harada et al.⁶</td>
<td>Experimental study of EUS-FNAB</td>
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<tr>
<td></td>
<td>Calletti et al.⁷</td>
<td>EUS-assisted FNA for gastric submucosal tumor using guillotine needle biopsy</td>
</tr>
<tr>
<td>1992</td>
<td>Vilmann et al.²</td>
<td>EUS-FNAB using convex linear array echoendoscope for pancreatic cancer</td>
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<tr>
<td>1993</td>
<td>Vilmann et al.⁸</td>
<td>Development of a new needle (steel needle with Teflon sheath) and EUS-FNAB</td>
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<tr>
<td></td>
<td>Wiersema et al.⁹</td>
<td>EUS-FNAB for upper gastrointestinal tract lesion</td>
</tr>
<tr>
<td></td>
<td>Tio et al.¹⁰</td>
<td>EUS-FNAB using mechanical radial echoendoscope for pancreatic cancer</td>
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</tbody>
</table>

2002  | Jhala et al.³⁰        | EUS-FNAB for pancreatic endocrine tumor                                      |
|      | Gress et al.³⁴        | EUS-FNT (tattooing)                                                         |
|      | Wiersema et al.³⁵     | Development of a new needle (Trucut biopsy needle)                           |
|      | Jacobson et al.³¹     | EUS-FNAB for gallbladder                                                    |
| 2003  | Matsumoto et al.³²    | EUS-FNAB for autoimmune pancreatitis                                         |
|      | Fritscher-Ravens et al.³³ | EUS-FNAB for splenic lesion                        |

DOI 10.1007/s00535-005-1717-6
A negative biopsy should be confirmed by at least one repeat EUS biopsy.
Trend Continues


[Graph showing trends from 1990 to 2010 with the following categories:
- Violet line: Surgical without cytology
- Blue line: Cytology alone
- Orange line: Surgical with cytology]
EUS-FNAB: Site Distribution

N = 3,684

Others (30%) include GI Tract, Hepatobiliary Tree, Adrenal gland, Spleen, Lung, Kidney, urinary bladder, peritoneum, primary mediastinal lesions

Jhala Algorithm for Pancreas

Morphology Based Practical Algorithmic Approach to Pancreatic FNA

Pancreatic FNA

Cellular Specimen

Predominantly single cells

- Single plasmacytoid cells
  - PEN
  - SPN
  - Others (Melanoma, lobular breast ca, myeloma)

- Single monomorphous cells (Likely Lymphoma)

- Single polymorphous cells (Lymphoid lesion)

Not a neoplasm

Sampling Error

- Anatomical Location (tail of the pancreas)
- Operator Dependent (new Endosonographer)
- Nature of the lesion (cystic lesion, presence of fibrosis)

Paucicellular Specimen

Predominantly ductal cells

- Acinar cells with rare ductal cells

Adenocarcinoma

Presence of fibrosis and acute or chronic inflammatory cells

Acute or chronic pancreatitis

Presence of fibrosis and lymphoplasmacytic infiltrate

Autoimmune pancreatitis

Predominantly acinar cells

- Acinar cell carcinoma

Groups of epithelial cells, but not ductal or acinar cells

Metastatic carcinoma (e.g. metastatic RCC or colon carcinoma)

Jhala Algorithm for Lymph Node FNA

EUS-FNA (EUS features, clinical history)

Lymph Node (+)
- Polymorphous lymphoid population
  - Reactive follicular hyperplasia
  - Follicular center cell lymphoma
- Monomorphous lymphoid population
- Hodgkin’s Lymphoma
- Non-Hodgkin’s Lymphoma
  - B cell Lymphoma
  - T/NK cell Lymphoma
    - Anaplastic large cell lymphoma

Lymph Node (-)
- Non-hematopoietic cells in the background of polymorphous lymphoid cells.
  - 1. Carcinoma
  - 2. Sarcoma
  - 3. Melanoma
  - 4. Neuroendocrine tumor
- 1. Not a lymph node
- 2. Completely replaced by the tumor
- 3. Therapy associated changes/post chemotherapy/radiation

A. Large cell lymphomas (e.g. diffuse large B cell lymphoma, )
B. Small cell lymphoma
  1. Mantle cell lymphoma
  2. SLL/CLL
  3. Marginal zone lymphoma

Jhala D & Jhala N. Endosonography. A cytology primer for endosonographer
Saunders 2010, page 246
Jhala Algorithm
Impact
Ancillary studies in our Arsenal
(diagnosis, prognosis and predictive markers/personalized therapy)

- Immunohistochemistry (Protein Expression)
- Flow Cytometry (Antigenic Epitopes)
- FISH
- Molecular techniques such as:
  - PCR
  - Next gen sequencing
Case 1

- 62 year old with mass in pancreas. R/O Carcinoma, EUS FNA is performed
Male 78 yrs With Pancreatic Mass

Papanicolaou

Diff-Quik
Male 78 yrs with mediastinal mass/ lymph node
Follicular Center Cell Lymphoma
Differential Diagnosis and Immunophenotyping of Small B-cell Lymphomas

<table>
<thead>
<tr>
<th>CD #</th>
<th>SLL/CLL</th>
<th>MCL</th>
<th>FL</th>
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<td>+</td>
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<td>+</td>
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</tbody>
</table>

Jhala D et al., Am J Clin Pathol. 2009 Feb;131(2):286-299
Patient Population (128 patients)
Age range 4-91 yo (mean 59.4 yo)

43 Lymphoma
0.12 – 62.32 million
Mean 5.66 million

71 Reactive Hyperplasia
0.003 – 212.85 million
Mean 5.85 million

14 Metastatic Lesions
0.02 – 307.89 million
Mean 23.66 million

Endoscopic ultrasound and endobronchial ultrasound-guided fine-needle aspiration of deep-seated lymphadenopathy: Analysis of 1338 cases

Cytojournal 2012,9:14
Retroperitoneal mass-Bx
Case 3

- Male/70 yrs
- History of Jaundice
- Ultrasound- Peri-Pancreatic lymphnode
- EUS FNA is performed
Diagnosis/Differential Diagnosis

Poorly differentiated carcinoma
Melanoma
High grade lymphoma
Differential Diagnosis

- Cytokeratin-Negative
- LCA-Negative
- S 100 and HMB 45-Positive
- Molecular testing performed on FNA sample
BRAF Mutation Analysis Result: **Mutation present**
BRAF Codon 600 Genotype: **V600E (c.1799T>A)**

Pt will respond to zelboraf
Diagnosis

Metastatic Melanoma
Unknown EUS FNA

- F/45 Yrs Pancreatic mass
unknown

• M/45 yrs Pancreatic mass EUS FNA
M/58 yrs Pancreatic Mass EUS FNA