

# Cytology Monday Conference

10/7/13

The Art and Science of  
Cytopathology  
Demay, 2012 (p548-551)

# History

- 1870 – seeding of thoracentesis needle tracts, considered confirmation of malignancy
- 1885 – tumor implantation during surgery
- 1913 – William Mayo – abdominal wall implants after gastric cancer resection
- 1936 – tumor cells recovered from biopsy scalpels

# History

- 1940s – “Aspiration biopsy is... dangerous because of the possibility of transplanting malignant cells into the tissue through which the needle passes.” Alton Ochsner
- Widely accepted without virtually without proof – “development of needle aspiration delayed by at least a generation.”
- James Ewing thought surgical biopsies contributed to the spread of cancer.

# Ewing

- “The burden of proof that surgical excision is a less traumatizing procedure than simple needle aspiration appears to rest on those who advocate for the former method.”
- “It is only logical that aspiration by a relatively small needle should be less harmful than surgical excisional biopsy, which cuts through tumor, lymphatics, and blood vessels.”

# Crile 1956

- Bona fide case, papillary thyroid carcinoma (PTC) in skin over LN with metastatic PTC
    - Large-gauge Silverman needle
    - Pt. died of lung and bone mets
- “sticking a needle into an operable cancer could be likened to plunging a percussion cap into a box of dynamite to test whether it is really dynamite or just a lot of sawdust.”

# History

- 20 years later (Crile) – danger of needle tract implantation “greatly overestimated”
- “Inexplicably, this practice has not been widely adopted in the United States. As a result, thousands of small benign thyroid nodules are being removed needlessly and the patients subjected to unnecessary anxiety, discomfort, expense, and risk.”

# Tumor seeding/ Tumor cell release

- Skin grafting
- TUR
- Percutaneous ablation
- Laparoscopic
- Mediastinoscopy
- Peritoneoscopy
- Hysteroscopy
- Endoscopy
- Paracentesis
- Bone marrow biopsy
- Catheters/drains
- Brain bx/VP shunt
- Tracheostomy
- Nephrostomy
- Cystostomy
- Gastrostomy
- Thorascopy
- Vertebroplasty
- VATS
- Cryotherapy
- Trabeculectomy
- Cyst aspiration
- I&D
- Mammographic bx
- **Mammographic compression**
- Sutures
- Staples
- Clamps
- Trocars
- Gloves
- **General anesthesia (immunosuppressive)**
- **Vigorous physical examination**
- **Vigorous scrubbing before surgery**
- **Injecting local anesthetic**



# Tumor seeding/ Tumor cell release

- Tumors can be detected at needle puncture site in needle tract
- Can be shed into blood but rapidly disappear from circulation

# Animal experiments

- Tumors transplanted into animals
  - 126 tumors aspirated with 18-gauge needles 894 times... “literally hashed”
    - No increase in distant metastases nor any evidence of implantation along needle tract
  - 82 animals with transplanted tumors (FNA, FNA with heparin, control [no FNA])
    - Only 2 animals had mets, 1 heparin and 1 control
    - Heparin thought to be protective
  - Another study showed increased mets after incisional biopsy, and FNA to a lesser extent

# Human Experiments (cancer patients and healthy prisoners) 1957, 1967

- Tumors transplanted with 20-gauge needles
- Local inflammatory response
  - Longer and more severe in healthy prisoners
  - Implants developed in both groups
    - Cancer patients – if not immediately excised, lesions usually regressed spontaneously and completely by 4 to 6 weeks, few recurred and 1 metastasized
    - Prisoners – all un-excised lesions regressed by 4 weeks, none recurred

# By the numbers

- Estimated that 1 in 100,000 to 1,000,000 tumor cells entering circulation eventually give rise to an overt metastasis
- Tumor cells likely destroyed by host immune response or other process (?stroma needed)

# By the numbers

- Tumor cells adhere to biopsy needles
- Polyethylene needle sheaths investigated to reduce risk
- Epithelial cells are commonly displaced but usually don't form new tumors
  - Estimated **1,000,000 cells needed for successful tumor autotransplantation**
  - Significantly less cells implanted with FNA

# Fine needle = 22-gauge or smaller

- Only 500 reported cases of needle tract tumor implantation
  - 100 with fine needles (not all well-documented)
- Large series estimate risk of tumor seeding as **1 in 10,000**
  - **Getting struck by lightning lifetime risk 1 in 9,000**
- Higher rates reported (up to 12.5%), small case series, large diameter needles, or therapeutic procedures

The great majority of **needle tract seeding happens in 18-21-gauge needles or tissue core biopsy needles**  
(Tru-Cut etc.)

# Other risk factors for seeding

- Multiple passes
- Length/depth of needle tract
- Serrated/rough needle tips
- Withdrawing needle without releasing suction
- Injecting something into lesion (EtOH, anesthetic)
- Deep-seated biopsies
- Immune status
- Tumor grade
- Time course varies – <3 weeks to 10 years



- Many cases of seeding are in setting of already advanced disease
  - Mesothelioma – large diameter needle/thoracentesis
  - Hepatocellular carcinoma – frequent addition of therapeutic procedures
  - Pancreatic adenocarcinoma
- Needle tract can always be excised
- Radioablation also an option

# Non-malignant FNAs

- Seeding rarely happens with benign neoplasms
  - Parathyroid adenoma
  - Pleomorphic adenoma
  - Breast papilloma
  - Hemangioma
  - Thymoma
- Endometriosis, parathyromatosis
- PNI by non-neoplastic epithelial cells

# Effects of FNA tumor seeding

- Needle tract tumor implantation usually has minimal clinical significance
  - No adverse effect on prognosis
  - Can be managed by excision, radiation, or ablation
- Usually occurs in the setting of advanced cancer/ disseminated disease

# Summary (what to say if asked)

- FNA does not decrease life expectancy
- No decreased long-term survival
- No increased metastasis
- Better survival in patients who have had FNAs – earlier detection
- Seeding from FNA lower than tissue biopsy
- Physician needle stick injuries are riskier than needle tract implantation