Urinary Tract Cytology

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http://137.189.150.85/cytopathology/CytoTraining/Timetable.html

Photomicrograph: http://137.189.150.85/cytopathology/Slide/Cytotaining_urine.asp

Specimen Types

• Voided urine
  i. Low cellularity in male
  ii. Increase epithelial cells in female (Contamination from genital tract)
  iii. Exfoliated cells lying in urine for several hours are usually too degenerate for accurate evaluation (early morning urine not suitable for diagnosis)
  iv. Fresh specimens: process quickly
  v. Delayed specimens: equal vol. of 50% alcohol and refrigerated

• Catheterized specimens
  i. Patient feel discomfort during collecting
  ii. Contamination for genital tract is avoided
  iii. Disadvantage: mimic low grade papillary carcinoma

• Ileal conduit
  i. Total cysterectomy
  ii. Anatomosis of ureters to an ileal loop → skin of abdomen → ostomy bag
  iii. Cellular, degeneration, intestine cells (round / columnar, rare well preserved)

• Bladder washing
  i. Irrigating bladder with saline or an electrolytic solution
  ii. Better yield
  iii. Relatively rare in PWH
Normal Cytology

- Scanty cellularity in voided urine: few epithelial cells / urothelial cells / polymorph
- Epithelial cells contaminated from genital tract
  - Umbrella cells (Superficial urothelial cells)
    ◦ Binucleated or multinucleated
    ◦ Hyaline or vacuolated cytoplasm
    ◦ Size larger than deeper layer cells
- Deeper layer urothelial cells
  ◦ Cuboidal / columnar /
  ◦ Degeneration: vacuolation, red intra-cytoplasmic inclusion
  ◦ ↑ in bladder washings and catheterized specimens
- Corpora amylacea
  ◦ Occasional
  ◦ From Prostate gland
- Urinary Crystals
  ◦ Limited clinical significance especially in overnight urine
  ◦ Normal crystals: phosphates, urates, oxalates
  ◦ Abnormal crystals: e.g. cystine, tyrosines, Leucine, (need biochemical tests / urinalysis in microbiology)
  ◦ Report as urinary crystals in routine specimens
- Seminal vesicle cells
  ◦ Occasional
  ◦ Yellow intracytoplasmic granules of lipochrome pigment
- Spermatozoa
  ◦ Limited clinical significant in old man
  ◦ Young boy: defect in genital tract development

Urine Specimen Adequacy

From Dr. WE Khallus lecture on TOC 2012, Hong Kong:

- Specific guidelines have not been established.
- Papanicolaou Society of Cytopathology:
  1. Adequate: at least 15 epithelial cells (well-visualized epithelial cells)
  2. Less than optimal: <15 epithelial cells
  3. Inadequate: No epithelial cells.

Any abnormal cells is by definition satisfactory for evaluation
Haematuria

- Macroscopic / microscopic

- Common causes:
  1. Inflammation (Infections / chemicals / others)
  2. Renal glomerular diseases
  3. Calculus
  4. Neoplasm

1. **Inflammation**

Secondary to the presence of other pathology (neoplasm, calculus, eg.)
DM & immunosuppression: prone to infection

A. Non-infectious causes
   - e.g. RT effect, chemicals, irritation, chemotherapy

B. Infection
   - Acute such as E coli
   - Chronic (less common, eg TB)
   - Need culture to confirm

C. Specific organisms
   - Trichomonas hominis in males
   - Candida albicans (debilitated patients / may be due to contamination from genital tract)
   - Viral changes (immunocompromised patients)
   - Human polyomavirurs
     - (renal allograft rejection: nuclei show: hyperchromatic, homogenous, degneration)
   - Cytomegalovirus
   - HPV
   - Pinworm Enterobius Vermicularis
   - Schistoma haematobium

2. **Renal glomerular diseases**

   - Renal casts from tubules, eg. Hyaline, granular, RBC casts
   - Proximal & distal tubular cells (granular cytoplasm, pyknotic nuclei, round)

3. **Urinary Calculus**

   - Loose or papillary cluster of atypical urothelial cells (hyperchromatic, ↑ N/C ratio, irregular nuclear outline, nucleoli)
   - Mimic low grade papillary carcinoma
4. **Neoplasms**

- Urothelial carcinoma
- 90%
- May show squamous / glandular metaplasia
- Late middle age; men > women
- Papillary / infiltrative / flat (in-situ)
- Urine cytology can identify high grade neoplasm
- Limitations in low grade neoplasm: reactive vs low grade, etc

**Low-grade urothelial carcinoma**
May be non-invasive
◊ Tend to recur
◊ Resemble normal / reactive urothelial cells
◊ Cytology:
  - Loose cluster / papillary structure / single cells
  - Mild loss of polarity
  - Mild nuclear irregularity and contour
  - Evenly distributed fine chromatin
  - Eccentric nuclei
  - Homogenous cytoplasm (no vacuole)

**High grade urothelial carcinoma**
Usually invasive
◊ Rarely papillary
◊ ↑ cellularity
◊ Singly / cluster / syncytial / papillary
◊ Loss of polarity
◊ Pleomorphic nuclei / nucleoli
◊ Eccentric nuclei
◊ Dirty background

**Urothelial carcinoma with squamous and/or glandular differentiation**

- Divergent differentiation is a very peculiar capacity of urothelial tumors
- Squamous differentiation: intercellular bridges / keratinization (20% of urothelial tumor)
- Glandular differentiation: less common
- More aggressive tumors

**Carcinoma in-situ/High grade dysplasia**
◊ Flat lesion confined to epithelium
◊ Similar to high grade lesion with clean background and no nucleoli

Primary Squamous cell carcinoma (pure squamous cell carcinoma) (5%)
Primary adenocarcinoma (pure adenocarcinoma) (2%)
Small cell carcinoma (neuroendocrine origin)
Anaplastic seminoma / Lymphoma / melanoma / sacroma / germ cell tumour / other
Metastatic tumors
◊ Prostatic adenocarcinoma
◊ Adenocarcinoma from intestine
◊ Renal cell carcinoma (rare)

Iatrogenic Changes

1. Bacillus Calmette Guerin (BCG)
   - Treatment of widespread carcinoma of bladder
   - Complications: cystitis
   - Cluster of degenerated urothelial cells admixed with acute inflammation
   - Granuloma (epitheloid histocytes, multinucleated Langhan’s type giant cell)

2. Chemotherapy effect