Urinalysis and Body Fluids CRg

Unit 4

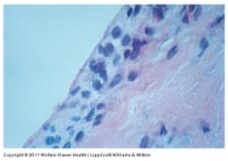
Serous Body Fluids

Serous Fluids

- Serous fluids
  - small amount of fluid that lies between the membranes lining the body cavities (parietal) and those covering the organs within the cavities (visceral).
    - ***acts as lubricant,***
    - ***provide nutrients,***
    - ***remove wastes***

Serous Fluids

- Body cavities
  - Pericardial - heart
  - Pleural - lungs
  - Peritoneal – abdominal
- Membranes
  - Lined with mesothelial cells
  - Parietal – lines cavity wall
  - Visceral – covers organs contained within
  - Serous fluids fill the space between



Serous Fluids

- "ultra filtrate" of the plasma
  - **closely** resembles the plasma *(as opposed to CSF)*

Appearance	Possible reason / condition
Pale yellow & clear	Normal
White, turbid	WBCs / infection
Bloody	RBCs/ hemorrhage
Milky	Chyle – lymph & emulsified fats
Viscous	Increased hyaluronic acid / malignant mesothelialoma

Serous Fluids

- Produced by hydrostatic and oncotic (protein) pressure in the capillaries lining the membranes
  - Normally produced at a constant rate.
  - Production ***(☛ parietal membrane)***
  - Re-absorption ***(☛ visceral membrane)***

Serous Fluids

- Production and re-absorption are influenced by:
  - Changes in osmotic and hydrostatic pressure in the blood
  - Concentration of chemical constituents in the plasma
  - Permeability of blood vessels and the membranes

Serous Fluids

- Types of serous fluids
  - Pericardial fluid – around heart
  - Pleural fluid (thoracic fluid) – lung cavity
  - Peritoneal (ascitic fluid) – abdominal cavity
- Reasons for analysis
  - Infections
  - Hemorrhages
  - malignancies,
  - and other disorders.

Serous Fluids

- Specimen Collection and Handling
  - Needle aspiration
    - Paracentesis
    - Thoracentesis
    - Pericardiocentesis
  - Lavage (ie. peritoneal lavage)
    - Ringer's lactate / saline is infused into abdomen then retrieved for analysis.
    - Specimen sometimes called ascites fluid.

Serous Fluids - Composition & Formation

- ***Effusion***
  - an increase in the serous fluid due to some disruption in production &/ re-absorption processes.
  - Classification of cause of an effusion is aided by determining if the fluid is a "transudate" or an "exudate".

Serous Fluids - Effusion

- ***Transudate***
  - an effusion that is a result of a systemic disorder that disrupts the balance of fluid production / fluid re-absorption.
    - Examples:
    - Pleural transudate – congestive heart failure;
    - Pericardial transudate – nephrotic syndrome, metastatic cancer

Serous Fluids

- ***Exudates***
  - term to classify the effusion that is a result of a problem with the membranes themselves.
  - Produced by conditions that directly involve the membranes of the particular cavity, ex. infections, inflammation, and malignancies
  - Thought of as an inflammatory process
  - Exudate examples:
    - Pleural exudate – carcinoma, pneumonia, trauma
    - Pericardial exudate – infection, cardiovascular disease (CV) trauma, cancer

Differentiation Between Transudates and Exudates

CHARACTERISTIC / TEST	TRANSUDATE	EXUDATE
Color	Pale yellow	Any abnormal color
Clarity	Clear	Bloody cloudy, purulent, turbid
Specific gravity	< 1.015	>1.015
Glucose	Equal to serum	Over 30 mg less than serum level
Protein	<3.0 g/dL	>3.0 g/dL
Fluid / serum protein ratio	<0.5	>0.5
Fibrinogen / Spontaneous clotting	No	Possible
Fluid / serum amylase	<2.0	>2.0
Fluid / serum bilirubin ratio	<0.6	>0.6
Lactate dehydrogenase	< 60% of serum	> 60% of serum
Fluid/ serum LD ratio	<0.6	>0.6
Cell counts (total)	<300/L	>1000/L

Serous Fluids

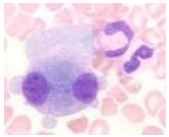
- Specimen Collection and Handling
  - EDTA tube for cell count & differential
  - Heparin tube for chemistries, serology, microbiology and cytology.
  - Since procedure not performed unless an effusion exists, large amount of fluid often collected.
  - Blood specimens usually collected at same time and comparisons of test results made.

Serous Fluids - Testing overview

- Variety of tests used to aid in determining the cause of the effusion
  - Appearance
  - Evaluation of clotting ability whether or not it will form a clot, etc.
  - Cell counts
  - Protein level
    - Both fluid and current serum level to make comparison: fluid protein / serum protein
  - LDH enzymes
    - Both fluid and current serum level to make comparison: fluid LDH/ serum LDH
  - Cultures
  - Serology – rarely done on serous fluids as blood testing is adequate
  - Cytology / Pathology – if malignancy is suspected.

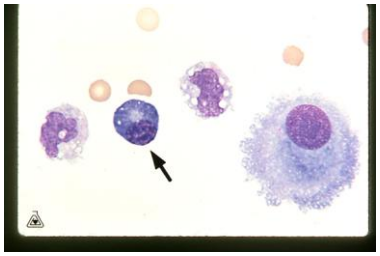
Serous Fluids

- Hematology / Gross examination
  - Color & clarity
    - NV = yellow & clear (other terms as for CSF are sometimes used, EXCEPT 'xanthrochromic'
  - Cell count
    - same as for CSF
  - Differential
    - any cell in peripheral blood,
    - mesothelial cells,
    - malignant cells

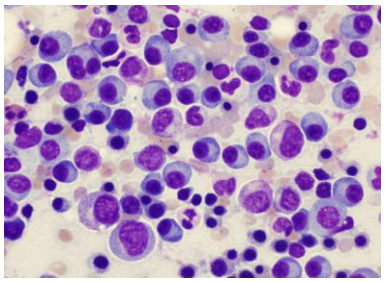


Serous Fluids

- 1991 CAP CM 20

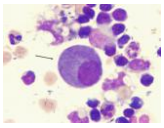


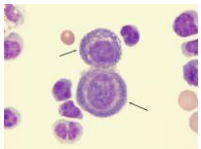
Abdominal fluid – plasma cells / multiple myeloma



Mesothelial cells

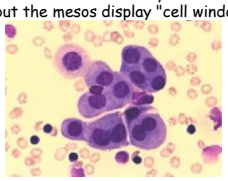
- Unique to serous fluids, originate from lining of peritoneal, pleural, and pericardial cavities.
- Large round cell with abundant blue cytoplasm and purple nucleus which may be eccentric
- Cell sometimes described as having a "fried egg" appearance. - usually are single or may be in sheets
- Nucleus round to oval & has a smooth outline, takes up @ 1/3 - ½ of the space.
- Smooth spherical nuceoi may be seen.





Mesothelial cells

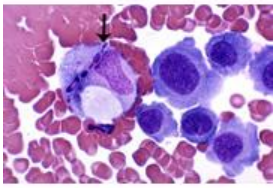
- Pleomorphic
- If 'reactive' may appear in clusters, have prominent nucleoli and be multinucleated
- Nucleus still distinct and round with uniform staining characteristics.
- A cluster of reactive mesos may resemble malignant cell clusters, but the mesos display "cell windows."



Reactive mesothelial cells

Serous Fluids

- Macrophage engulfed Candidia species in a pleural fluid, mesothelial cells.



Serous Fluids

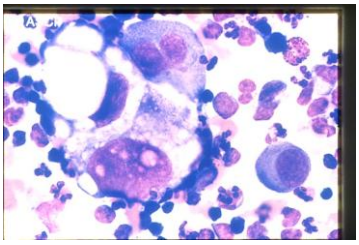
- Malignant cells
  - A frequent concern in any serous fluid due to possibility of cancer of any organ and/or metastasis of CA from one location to another.
  - Cells have irregular size, shape, and staining characteristics of nucleus and cytoplasm. Usually deeply basophilic, molded or balled up clusters of cells with little distinction from one cell to the next. May be vacuolated.

Serous Fluids

- Malignant cells
  - Characteristics
    - Irregular shape
    - Uneven chromatin distribution
    - Prominent large irregular nucleoli,
    - Community borders
    - Increased nuclei / cytoplasm ratio.
  - Always send suspicious cells to cytology / pathology

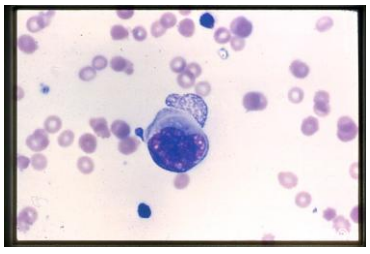
Serous Fluid Malignant cells

- ACSP 7, Case 1 peritoneal fluid, malignancy



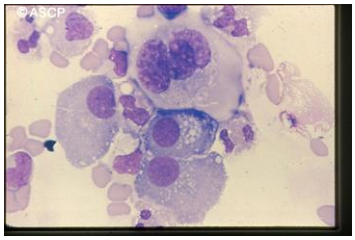
Serous Fluid Malignant cells

- ASCP 9 Case 2 pleural fluid 42 year old, breast cancer



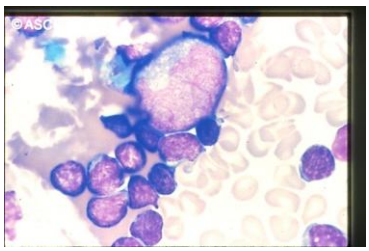
Serous Fluid Malignant cells

- ASCP 10 Case 3, ascitic fluid, 62 year old admitted for GI bleeding



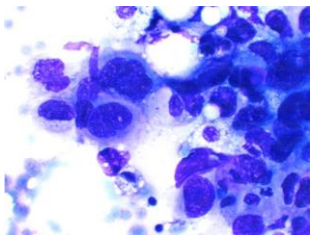
Serous Fluid Malignant cells

- ASCP 12 Case 4, 30 year old with back pain and inability to work. Pleural effusion fluid – malignant tumor on spinal cord



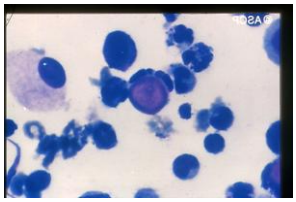
Serous Fluid Malignant cells

- sheets of atypical cells with irregular nuclear contours, nuclear hyperchromasia, basophilic cytoplasm, and jagged outline of cell borders.
- Squamous cell carcinoma (x400 , Diff-Quik staining)



Serous Fluids-LE cells

- Seen in patients with Systemic Lupus Erythmatosis (SLE) a systemic disease in which an autoantibody attacks the patients organs and body systems
- LE cell is a ***neutrophil*** that has engulfed a homogeneous mass of purple staining nuclear material



Serous Fluids

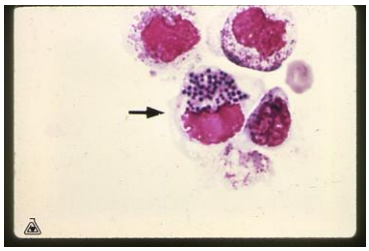
- Chemistry
  - Total protein, and ratio to serum protein
  - LDH and ratio to serum LDH
  - Glucose
  - Amylase & Lipase – pancreatic disorders
  - Bilirubin - peritoneal fluid
    - ***suspicion of perforated GI or gall bladder***
  - Alkaline phosphatase - peritoneal fluid
    - ***suspicion of perforated intestine***
  - pH & ammonia

Serous Fluids

- Microbiology
  - Gram stain & acid fast
  - Cultures – aerobic & anaerobic

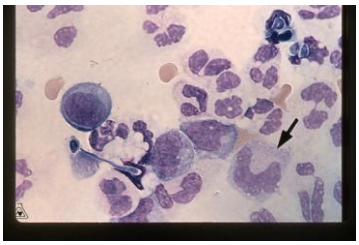
Serous Fluids – pericardial fluid

- 1987 CAP CM21 Pericardial fluid, intracellular bacteria



Serous Fluids – peritoneal fluid

- 1992 CAP CM41 Peritoneal fluid. Seg, macro, yeast



Serous Fluids

- Quality control
  - no commercial controls
  - use serum controls.

Summary

- Serous fluids are serum-like ultrafiltrates of plasma
- Volumes are maintained by tissue and capillary pressures
- Effusions are excessive accumulations of fluids – and can occur in the pericardium, pleural and abdominal cavities.
- Laboratory testing is required to differentiate exudates from transudates.
- Various causes contribute to the accumulation of fluids in the serous body cavities.
- Laboratory testing
  - Hematology (physical properties, cell counts and differential)
  - Chemistry (serum &fluid values are compared. QC is same as for serum)
  - Serology – rarely
  - Cytology – if suspicious cells are seen during differential