Serum-Ascites Albumin Gradient

Runyon, Bruce, MD. “Diagnosis and evaluation of patients with ascites.” *UpToDate* v11.2.

### Key Points:
- **SAAG has a 97% accuracy based on 1992 study with subsequent validation in smaller trials and can provide rational clinical approach to work-up of causes for ascites.**
- **Other tests on peritoneal fluid have lower sensitivity and specificity and should be ordered based on clinical suspicion, rather than routinely.**
- **If numbers do not agree with clinical scenario – repeat the test.**

**Serum-to-ascites albumin gradient:** Runyon et al (1992)

<table>
<thead>
<tr>
<th>&gt;=1.1g/dL</th>
<th>&lt;1.1g/dL</th>
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</thead>
<tbody>
<tr>
<td>Cirrhosis</td>
<td>Peritoneal carcinomatosis</td>
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<tr>
<td>Alcoholic hepatitis</td>
<td>Peritoneal TB</td>
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<tr>
<td>CHF</td>
<td>Pancreatitis</td>
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<tr>
<td>Massive hepatic metastases</td>
<td>Serositis</td>
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<tr>
<td>Vascular occlusion</td>
<td>Nephrotic syndrome</td>
</tr>
<tr>
<td>Fatty liver disease of pregnancy</td>
<td>Bowel obstruction / infarction / perforation</td>
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<tr>
<td>Myxedema</td>
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- Prospective study to compare SAAG with total protein ratio
- Hepatology inpatient, consult, and outpatient service at USC
- 901 paired serum/ascitic fluid samples (max 30 minutes apart) from 330 consecutive patients with confirmed diagnosis
  - Portal hypertension: wedged pressure – IVC >4mmHg; varices by scope; biopsy for cirrhosis or alcoholic hepatitis; autopsy / laparotomy findings
  - Other causes: by culture, imaging, scope, autopsy, cardiac imaging/cath, thyroid studies, etc.
- 97% accuracy using 1.1g/dL as cut-off
- Not affected by diuresis, paracentesis, alcohol vs. non-alcoholic liver disease
- Etiologies:
  - Cirrhosis 81%
  - Cancer 10%
  - Heart failure 3%
  - TB 2%
  - Dialysis 1%
  - Pancreatic 1%
  - Other 2%
  - More than one cause: 5%

### Test by utility
- **Always:**
  - Cell count and differential
  - Bloody fluid: 50% of pts with HCC, 22% of pts with malignancy, rare in TB
  - Cultures
    - Gram stain: >10,000 bacteria/mL for gram stain (median for SBP 1/mL)
    - Total protein: <1 g/dL high risk of SBP
- Appropriate clinical setting:
  - Glucose: lower in infection (gut perforation), malignancy
  - LDH: infection, malignancy
  - Amylase (fluid/serum ratio > 0.4): pancreatitis, gut perforation
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- Triglyceride: when fluid milky (>200mg/dL triglyceride); 10X more likely cirrhosis than malignancy; 0.5% of those with cirrhotic ascites
- Bilirubin: when fluid very brown; risk of bowel / biliary perforation

- Unclear or useless:
  - CEA: unclear utility
  - PH
  - Lactate

- “Humoral tests of malignancy”: fibronectin, cholesterol, ascitic AFP etc.
- If numbers do not agree with clinical scenario: repeat paracentesis, supplement with other tests

**Cytology:**
- Overall sensitivity: 58-75%
- Peritoneal carcinomatosis: near 100% sensitivity
- Malignancy-related ascites: 2/3 have peritoneal carcinomatosis
- Liver metastases, lymphoma with chylous ascites, HCC -> usually negative
- Increased sensitivity with increased volume (minimum 50cc)
- Runyon: history or high clinical suspicion of cancer, no physical findings suggestive of liver disease, initial fluid sample with high lymphocyte count (>500cells/mm)

**TB peritonitis**
- Smear: 0-2% sensitivity
- Culture: 1 liter yields 62-83% sensitivity (most labs can process 50cc)
- Peritoneoscopy with biopsy: near 100%
- Adenosine deaminase: falsely low when cirrhotic with TB (useful in India vs. U.S.)
- Runyon: chronic fever, high-risk epidemiology, HIV+

**New onset ascites in known cirrhosis:**
- Progression
- Acute liver injury (EtOH, viral hepatitis)
- Vascular thrombosis
- Hepatocellular carcinoma
- Change in diet / meds