Treatments for Ascites

Amy Hou
UCHSC Surgery Grand Rounds
January 22, 2007
Pathogenesis of Ascites

Figure 1
Ascites

- Grade I - mild
  - Detectable by ultrasound only
- Grade II – moderate
  - Moderate symmetrical distention of abdomen
- Grade 3
  - Large / gross ascites with marked abdominal distention
Medical Management

• Restrict Na in diet to 50mEq daily (3gm salt)
• Diuretics
  – Spironolactone: inhibit aldosterone at distal renal tubules
    • Start at 100mg/d
  – Lasix/bumetanide: inhibit sodium absorption proximally at ascending loop of Henle
    • Start at 40mg lasix or 1mg bumetanide
• Goal is to increase urine output by 500cc/d – equivalent to 1 lb weight loss daily
Prognostic factors

IMPROVED SURVIVAL
• Childs-Pugh score <10 (p=0.0004)
• Alcoholic etiology (p=0.0013)

DECREASED SURVIVAL
• History of spontaneous bacterial peritonitis (p=0.0038)
• Ascitic fluid protein concentration <15g/L (p<0.0001)

Guardiola J, Xiol. Px assessment of cirrhotic patients with refractory ascites treated with PVS. Am J Gastro 1995. (Barcelona, Spain)
Refractory Ascites

Table 1. Revised Diagnostic Criteria of Refractory Ascites

1. Treatment duration: Patients must be on intensive diuretic therapy (spironolactone 400 mg/d and furosemide 160 mg/d) for at least 1 week and on a salt-restricted diet of less than 90 mmoles or 5.2 g of salt/d.
2. Lack of response: Mean weight loss of <0.8 kg over 4 days and urinary sodium output less than the sodium intake.
3. Early ascites recurrence: Reappearance of grade 2 or 3 ascites within 4 weeks of initial mobilization.
4. Diuretic-induced complications: Diuretic-induced hepatic encephalopathy is the development of encephalopathy in the absence of any other precipitating factor. Diuretic-induced renal impairment is an increase of serum creatinine by >100% to a value >2 mg/dL in patients with ascites responding to treatment. Diuretic-induced hyponatremia is defined as a decrease of serum sodium by >10 mmol/L to a serum sodium of <125 mmol/L. Diuretic induced hypo- or hyperkalemia is defined as a change in serum potassium to <3 mmol/L or >6 mmol/L despite appropriate measures.
Treatment options

- Repeated large volume paracentesis (4-6L)
- Transjugular intrahepatic portosystemic shunting (TIPS)
- Peritoneovenous shunting
- Liver transplant
Paracentesis

- Increases cardiac output
- Increase right atrial size
- Lowers systemic vascular resistance
- Improved renal function

- Postparacentesis effective hypovolemia
  - Occurs hours to days after procedure
  - Problem arises from vasodilatation associated with removal of ascitic fluid
TIPS vs Paracentesis in treatment of Ascites

• TIPS
  – Increased time to recurrence of ascites
  – Decreased HRS
  – Manages refractory ascites in 90%
  – New or worsening hepatic encephalopathy in 25%

• Paracentesis
  – Less severe hepatoencephalopathy
  – Less costly

➢ Overall, no difference in survival
Peritoneovenous Shunting

- Recirculate ascitic fluid back to the right heart
- Flow propagated by negative intrathoracic pressure during inspiration
- Immediate increase in plasma volume
- ↑ cardiac output, ↓ SVR, signific ↑ GFR and RBF, ↓ PRA and aldosterone
- Dramatic natriuresis associated with ↑ ANP
- No effect on norepinephrine – systemic vasodilatation remains
PVS on Renal Function (1981)

- Followed 11 patients 29 months postop
- Found 100% increase in creatinine clearance compared to preop level (p<0.0005)
- Marked improvement in renal sodium handling but most patients continued to retain sodium when challenged with sodium load
  - Allowed liberalization of dietary salt restrictions and reduction/elimination of diuretic use
  - Patients could not tolerate unrestricted salt intake without reaccumulation of ascites

LeVeen Shunt


Fig. 2. Construction of the valve used by the authors. The valve is held in the normally closed position by tension on the silicone rubber struts.

Fig. 8. The phantom view illustrates the placement of the valve and collecting tube in the peritoneal cavity and the venous tube in the superior vena cava in the completed operation.
LeVeen vs Denver Shunt
randomized prospective study 1985

- 12 LeVeen shunt, 9 single mitre valve Denver shunts
- No statistically significant survival difference (p=0.1343)
- LeVeen PVS had significantly better patency rates for period of time patency documented at 1000 days (p=0.04)
- Recommend LeVeen over Denver shunt due to better patency rates but ultimately believe neither will prove useful to intractable ascites in the long run

Denver vs LeVeen Patency

Fig 2.—LeVeen (open circles) and Denver (closed circles) peritoneovenous shunt patency rates compared by Kaplan-Meier analysis. LeVeen shunts proved to be significantly superior in patency ($P = .004$ by the Mantel-Cox comparison). Arrows indicate patent shunts.
Complications of PVS

- Valve stenosis
  - Require frequent intervention to repair/ replace shunt

- Consumptive coagulopathy
  - Due to circulation of collagen
  - DIC – requires interruption of shunt
  - Suggested that removal of ascites and replacement with saline helpful in prevention but no studies show benefit

- Fibrinous peritoneal adhesions
  - Causing bowel obstructions
  - Make subsequent OLTx technically difficult
PVS vs Medical Treatment
VA Cooperative Study 1989

PVS ADVANTAGES

- Relieves ascites promptly (medical 2.5%BW in 5.4wks vs surgical 5.4%BW in 3 wks, p>0.001)
- Decreases length of initial hospital stay (medical vs surgical 5.4wks vs 3.0 wks, p=.0001)
- Delays recurrence of ascites (medical 3-4 wks vs 12-18 weeks, p-0.01-0.4)

- No significant difference in survival between the 3 risk groups
- No significant difference in complication rate, except for hepatic encephalopathy in risk group 2 (22.7% vs 10.1%, p=0.04)
- Recommendation: PVS for ascites refractory to medical treatment

Poor Outcome with PVS

• Mayo review study 1989: 23 pts, 35% mortality, 61% complication rate associated with shunt
• High rate of complication, morbidity and mortality in advanced liver disease patients
• In combination with lack of survival benefit, does not support use of PVS in the management of refractory ascites

Scholz DG, Nagorney et al. Poor outcome from PVS for refractory ascites. Am J Gastro 1989 (Mayo Clinic)
PVS vs Medical Management

Table 2
Randomized Trials of Therapy of Cirrhotic Ascites: Peritoneovenous Shunting vs Medical Controls

<table>
<thead>
<tr>
<th>Study/Author</th>
<th>Reference</th>
<th>No. Patients</th>
<th>Median overall survival (days)</th>
<th>At 30 days (%)</th>
<th>At 1 yr (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Medical</td>
<td>Surgical</td>
<td>Medical</td>
</tr>
<tr>
<td>Wapnick et al.</td>
<td>10</td>
<td>34</td>
<td>57 (n = 9)</td>
<td>86 (n = 9)</td>
<td>NS</td>
</tr>
<tr>
<td>Linas et al.</td>
<td>12</td>
<td>20</td>
<td>4.1 (n = 10)</td>
<td>13.8 (n = 10)</td>
<td>0</td>
</tr>
<tr>
<td>Bories et al.</td>
<td>34</td>
<td>57</td>
<td>NS</td>
<td>NS</td>
<td>5 (18%)</td>
</tr>
<tr>
<td>Stanley et al.</td>
<td>35, 36</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 3&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
<td>33</td>
<td>37 (n = 19)</td>
<td>28 (n = 14)</td>
<td>10 (53%)</td>
</tr>
<tr>
<td>Group 4&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
<td>144</td>
<td>210 (n = 75)</td>
<td>231 (n = 69)</td>
<td>68 (89%)</td>
</tr>
<tr>
<td>Group 5&lt;sup&gt;5&lt;/sup&gt;</td>
<td></td>
<td>122</td>
<td>1092 (n = 59)</td>
<td>908 (n = 63)</td>
<td>59 (100%)</td>
</tr>
<tr>
<td>Ring-Larsen et al.</td>
<td>37</td>
<td>44</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

<sup>1</sup> Adapted from Stanley et al. (29). <sup>2</sup> All patients in these groups had HRS. <sup>3</sup> Survivals are means (not medians) in both medical and surgical groups; The surgical figures exclude one patient who lived 210 days. <sup>4</sup> Stratified as to moderate to severe liver disease but not HRS. <sup>5</sup> Stratified as to milder liver disease. NS, not stated.

Moskovitz MM. The peritoneovenous shunt: expectations and reality. Am J Gastro 1990
TIPS vs Peritoneovenous Shunt

- 32 patients, 16 in each arm
- All Child’s class C
- None underwent transplant
- After TIPS – 2/3 underwent revision
- After PVS – ¾ underwent revision
- 5-year survival with shunt patency seen only in TIPS patients
- No significant survival advantage, although trend toward early mortality after TIPS and trend toward late mortality with PVS
- Conclusion: promotes use of TIPS if patients have prospects beyond short-term survival

### TABLE 6. Efficacy of TIPS or Peritoneovenous (PV) Shunts in Treating Ascites

<table>
<thead>
<tr>
<th></th>
<th>1 mo</th>
<th>3 mo</th>
<th>6 mo</th>
<th>12 mo</th>
<th>36 mo</th>
<th>60 mo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TIPS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients alive (no.)</td>
<td>13</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Absent (%)</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Controlled (%)</td>
<td>46</td>
<td>67</td>
<td>80</td>
<td>80</td>
<td>86</td>
<td>100</td>
</tr>
<tr>
<td>Refractory (%)</td>
<td>46*</td>
<td>33</td>
<td>20</td>
<td>20</td>
<td>14†</td>
<td>0‡</td>
</tr>
<tr>
<td><strong>PV shunts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients alive (no.)</td>
<td>15</td>
<td>13</td>
<td>11</td>
<td>9</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Absent (%)</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Controlled (%)</td>
<td>73</td>
<td>77</td>
<td>73</td>
<td>56</td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>Refractory (%)</td>
<td>20</td>
<td>23</td>
<td>27</td>
<td>44</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

*Compared to after PV shunts (log-likelihood ratio test, $P = 0.14$).  
†Compared to after PV shunts (log-likelihood ratio test, $P = 0.09$).  
‡Less than after PV shunts (log-likelihood ratio test, $P = 0.006$).  

Current recommendations

- Large volume paracentesis with volume expansion
- TIPS
- Liver transplant
- PVS now out of favor secondary to poor longterm patency, excessive complications, no survival benefit

Sources

Sources

- Runyon BA. Semin Liver Dis 1997;17(3): 249-60.
- Söderlund C. Denver PVS for malignant cirrhotic ascites.