Denver Shunts vs TIPS for Ascites

Hooman Yarmohammadi MD
Assistant Professor of Radiology
Interventional Radiology & Image Guided Therapies
Memorial Sloan-Kettering Cancer Center,
New York, USA
Hooman Yarmohammadi, MD

- Research Grants: Carefusion
Etiology of Ascites

• Nonmalignant 90%
  – Cirrhosis 80%
  – Heart failure 3%
  – TB, infections 2%
  – Pancreatitis 1%

• Malignancy 10%
Etiology of Ascites

- Cirrhosis leading on to portal HTN 80%
  - Ascites is the most common major complication of liver cirrhosis.
    - Seen in 50% of patients with compensated cirrhosis within 10 yrs.
- Infection and other etiologies 10%
- Malignancy 10%
Treatment of Ascites

- Medical therapy
  - Diuretics and Paracentesis
- Permanent catheters
  - Tunneled and non-tunneled catheters and ports
- Internal devices or shunts
  - TIPS and Denver shunt
History Peritoneovenous Shunt

- 1962: Smith surgically created a PVS
- 1966: Hyde shunt with a valve for hydrocephalus
- 1974: LeVeen designed a PVS with a one-way pressure-activated valve
- 1979: Lund and Newkirk developed the Denver shunt with a manual compressible pump to help with shunt occlusion
Denver Shunt

- LeVeen shunt was discontinued in the late 1990s.
- In 1979, Robert H. Lund and Newkirk presented a unidirectional pump that could be manually compressed.
Denver Shunt

- Denver shunt is made of two silastic tube that are connected by a **single** valve or **double** valve pump.
Denver shunt

- Transmit ascitic fluid from the peritoneal cavity back into the central venous circulation.
TIPS (Transjugular Intra-hepatic Porto-systemic Shunt)
## Advantages of Denver shunt vs TIPS

<table>
<thead>
<tr>
<th>Denver shunt</th>
<th>TIPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No external device</td>
<td>No external device</td>
</tr>
<tr>
<td>Not lifestyle limiting</td>
<td>Not lifestyle limiting</td>
</tr>
<tr>
<td>No loss of fluid/proteins</td>
<td>No loss of fluid/proteins</td>
</tr>
<tr>
<td>Simple procedure</td>
<td>Durable</td>
</tr>
<tr>
<td>Early success rate (immediate)</td>
<td>Can also treat variceal bleed</td>
</tr>
<tr>
<td>Easily reversible</td>
<td></td>
</tr>
</tbody>
</table>
### Advantages of Denver shunt vs TIPS

<table>
<thead>
<tr>
<th>Denver shunt</th>
<th>TIPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No external device</td>
<td>No external device</td>
</tr>
<tr>
<td>Not lifestyle limiting</td>
<td>Not lifestyle limiting</td>
</tr>
<tr>
<td>No loss of fluid/proteins</td>
<td>No loss of fluid/proteins</td>
</tr>
<tr>
<td>Simple procedure</td>
<td></td>
</tr>
<tr>
<td>Early success rate (immediate)</td>
<td>Can also treat variceal bleed</td>
</tr>
<tr>
<td>Easily reversible</td>
<td>Durable</td>
</tr>
</tbody>
</table>
## Disadvantages of Denver shunt vs TIPS

<table>
<thead>
<tr>
<th>Denver shunt</th>
<th>TIPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not for everyone</td>
<td>Not Always effective</td>
</tr>
<tr>
<td></td>
<td>Delay resolution</td>
</tr>
<tr>
<td></td>
<td>Needs Surveillance</td>
</tr>
<tr>
<td></td>
<td>Difficult to reverse</td>
</tr>
<tr>
<td>Complications</td>
<td>Complications</td>
</tr>
<tr>
<td>Occlusion (30-33%)</td>
<td>30-50% Encephalopathy</td>
</tr>
<tr>
<td>DIC</td>
<td>Liver Failure</td>
</tr>
<tr>
<td>Infection</td>
<td>Occlusion</td>
</tr>
</tbody>
</table>
Reimbursements Denver shunt vs TIPS

CMS physician fee schedules

Denver shunt          TIPS

~$1200                ~$1200

Both are coded as In-patient procedures

US-guided Paracentesis, ~$400
How to select?
Cirrhosis with Varices +/- bleeding
Budd-Chiari with varices
Cirrhosis with Hx of SBP

TIPS

No Contraindication for TIPS
Malignant Ascites
Chylous ascites
Cirrhosis with no vacices
Cirrhosis with no Hx of SBP
Difficult/Challenging TIPS procedure

NO CONTRAINDICTION for Denver shunt
Best for Denver Shunt

- Bridge for Transplant
  - Improves renal function
    - Significantly reduces ARF (17% vs 72%; p < 0.05)

**Peritoneovenous Shunt as a Bridge to Liver Transplantation**

Jérôme Dumortier*, Emmanuelle Pianta, Yannick Le Derf, Pierre Bernard, Yves Bouffard, Catherine Boucaud, Pierre Sagnard, Bertrand Delafosse, and Olivier Boillot

Blackwell Munksgaard
Best for Denver Shunt

- Selected Cirrhotic patients
  - Uncompensated hepatic encephalopathy not responding to medical Rx
- Allows spontaneous improvement of liver function
Best for Denver Shunt

• Selected Cirrhotic patients
  – Transplant-eligible with MELD score > 25 in nonemergent setting = in patient with ascites only
    • These pt have increased risk of worsening encephalopathy
    • 50% mortality rate at 30 days
    • Denver shunt: as bridge to Transplant
Best for Denver Shunt

• Selected Cirrhotic patients
  – Non-transplant eligible with MELD > 18 in nonemergent setting
    • High mortality and morbidity with TIPS
Best for Denver Shunt

- Selected Cirrhotic patients
  - Uncompensated hepatic encephalopathy not responding to medical Rx
  - Transplant-eligible with MELD score > 25 in nonemergent setting = in patient with ascites only
  - Non-transplant eligible with MELD > 18 in nonemergent setting
  - Difficult/Challenging TIPS procedure
Best for Denver Shunt

- Difficult/Challenging TIPS procedure
  - Hepatocellular carcinoma in a critical location
  - Portal vein occlusion
  - Prior hepatic resection
  - Complex cases of Budd-Chiari
Chylous Ascites is the BEST

Therapeutic Application of Percutaneous Peritoneovenous (Denver) Shunt in Treating Chylous Ascites in Cancer Patients

Hooman Yarmohammadi, MD, Lynn A. Brody, MD, Joseph P. Erinjeri, MD, PhD, Anne M. Covey, MD, F. Edward Boas, MD, PhD, Etay Ziv, MD, PhD, Majid Maybody, MD, Adrian J. Gonzalez-Aguirre, MD, Karen T. Brown, MD, Joel Sheinfeld, MD, and George I. Getraudman, MD

J Vasc Interv Radiol 2016; 27:666–673

http://dx.doi.org/10.1016/j.jvir.2015.12.014
Chylous Ascites is the BEST

– Our experience with 28 patients with Chylous Ascites treated with Denver shunt
  – 100% Technical success
  – 37% post procedure complications
  – 0% DIC
  – 0% mortality
  – Successful treatment of Ascites and removal in 46%

Yarmohammadi et al, Therapeutic application of Percutaneous Peritoneovenous (Denver) Shunt in treating Chylous Ascites in Cancer patients. JVIR: Accepted
TIPS Versus Peritoneovenous Shunt in the Treatment of Medically Intractable Ascites

A Prospective Randomized Trial

Alexander S. Rosemurgy, MD,* Emmanuel E. Zervos, MD,* Whalen C. Clark, BS,* Donald P. Thometz, BA,* Thomas J. Black, MD,† Bruce R. Zwiebel, MD,† Bruce T. Kudryk, MD,† L. Shane Grundy, MD,† and Larry C. Carey, MD*

Prospective, randomized

32 cirrhotic pt.

Shunt patency = Similar (4.4 m vs 4.0 m)

Survival: TIPS longer survival (28.7 m vs 16.1 m)

Control of Ascites: Sooner with Denver shunt (73% after 1 months vs 46%)

Long-term efficiency: TIPS effective longer (85% vs 40% at 3 years)
Conclusion

– Both TIPS and peritoneovenous shunts are effective treatments for intractable ascites.
– PV shunts control ascites sooner, although TIPS provides better long-term efficacy.
– After either shunt, numerous interventions are required to assist patency.
What are the contraindications?
Contraindications for Denver shunt

- Renal failure [if pt is not on dialysis]
- History of Varicose vein bleeding (90% re-bleed, half die)
- Grade 3 esophageal varices
- CHF
- Respiratory failure with pulmonary edema
- Liver failure (T Bili > 2.0)
- Bloody ascites
- Low plt counts < 50 x 10^9
- High INR > 2.0 or subclinical DIC
- Peritonitis or History of SBP
- Poor performance status
Relative Contraindications for Denver shunt

- Renal insufficiency not related to HepatoRenal Syndrome
- Compensated CHF
- Loculated ascites or severe peritoneal adhesions
- Patients planned to get laparoscopic procedure
- Peritoneal disease
  - Peritoneal mesothelioma
Contraindications for TIPS

- Hepatic encephalopathy
- Poor hepatic function
- Poor performance status
Summary & Recommendations

TIPS

Cirrhosis with Varices +/- bleeding
Budd-Chiari with varices
Cirrhosis with History of SBP
Summary & Recommendations

Denver shunt

Malignant Ascites

Chylyous ascites

Cirrhotic pt. with no varices or history of SBP

- Uncompensated hepatic enc.
- Transplant-eligible with MELD score > 25 in nonemergent setting
- Non-transplant eligible with MELD > 18 in nonemergent setting
- Difficult/Challenging TIPS procedure
Thank you