Direct Intrahepatic Porta-Caval Shunt

Technique & Tips-Tricks

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Background: Regular TIPSs

- Challenging (technical limitations)
  - Portal vein anatomy (hepV- PV relationship)
  - Budd-Chiari
  - Children (Biliary atresia)
  - Tumor
  - Liver transplantation (caval anastomosis – Piggy-back)

- Failure and complications
  - Blind puncture
  - Hepatic vein stenosis (recurrent TIPSs failure)
Alternative Percutaneous Techniques to create Porto-Systemic Shunt

- Femoral venous access
- Direct intrahepatic Porta-caval shunt (DIPSs)
- Reverse TIPSs (Gunsight-like, Raza 2006)
- Mesocaval shunt (CT guidance, Nyman 1996)
- Spleno-renal shunt (transplenic & translumbar approaches)
- Combined transjugular-transmesenteric approach
2.5 yr old Girl – Long-term parenteral nutrition

- Bleeding stomal varices
- Occlusion R/L jug v, R fem v

Reversed TIPSs

2 self-expandable Walstent
### Direct Intrahepatic Portocaval Shunt (DIPSs)

- **1996** (Haskal, JVIR): « **Gunsight** » technique
  - Combined transhepatic & transjugular approaches
  - Fluoroscopy guidance alone

- **2006** (Boyvat, CVIR): Transabdom. US-guided puncture
  - Transhepatic porto-caval connexion (caval ballon assistance)
  - Alternatives: CT or EUS guidance

- **2001** (Petersen, JVIR): **IVUS-guided DIPSs**
  - From IVC-to-PV through caudate lobe
  - Combined Jug&fem venous approach
Gunsight Technique

- **Two nitinol snares as target**
  - Transhepatic (10mm) in the portal vein
  - Transjugular(fem) (25mm) in the retrohepatic IVC (6.5-7.1cm height)

- **Sequential transhepatic PV&IVC (HV) puncture**
  - X-Ray beam rotated in ROP or profil
  - Snares superposition: small(PV) snare projecting inside the large(IVC)

Haskal Z. JVIR 1996, 7:139-42
Transhepatic direct porto-caval shunt

48 yr old male  Alcoholic cirrhosis – Budd-Chiari syndrome

Refactory acitis-hepatic hydrothorax - hepatorenal syndrome

Xray + transabdo US guidance
Transhepatic direct porto-caval shunt

Viatorr stent 10/5 – caval flaring
PSG pre/post: 21-6 mmHg

8 mo Fup: DIPSs patent
PSG 5 mmHg
41 yr-old F
BCS > Caval WEB
> HepV occlusion
2 PTFE-covered stents

PSG 19-7 mmHG

Death > SAH (7 months)
US-guided percutaneous transportal-transcaval connexion

6 yr-old girl with ascites and variceal bleeding

Intracaval balloon

Boyvat F, AJR 2008, 191:560-64
IVUS-guided DIPSs
Petersen B  JVIR 2001, 12: 475-486

- Caudate lobe as tract
- Jug & fem venous approach
- Safe transcaval puncture of the portal vein through caudate lobe
- Real-time intra-vascular PV puncture guidance

Blind puncture of TIPSs avoided
IVUS-guided DIPSs

- **Material**
  - *Modified Rösch-Uchida needle*
  - *65-cm Chiba needle*
  - *Double curve (sufficient back)*
    - Broad angulation up to 90° (posterior caval exit)
    - Longer curvature
  - *5-10 MHz AcuNav: IVUS with sagittal display Imaging*
    - Entire needle pass viewed in real time

Petersen, JVIR 2001,12: 475-86
IVUS-guided DIPSs

- Puncture needle kit from L jugular vein, IVUS from L femoral vein. (R<L:easier)
- Real-time IVUS guided puncture from IVC to PV trunk (extrahepatic PV is possible, too)
- Balloon inflation as TIPS. If it’s extrahepatic pathway, do it quickly!
- Stent-graft deployment from IVC to PV. Viatorr (Gore) is ideal (2-cm bare part at PV side, heparin-coated and good flexibility).
51 yr-old-man with RA – PSG 18 mHg

10 mm Viatorr stent dilated to 8mm.
PSG 2mmHg

1 year follow-up

Marginal candidate with RA - PSG 18 mHg

Icast stent dilated to 6 mm
15mmHg PSG

7mm dilatation
PSG 12mmHg

Petersen B, Clark T, Tech Vasc Intervent Rad 2008, 11: 230-34
Technical success, Patency & complications

Dotter Interventional Institute 58 Pts

- TS 100% (PSG <15mmHg)
- Peritoneal bleeding 3 (5-6%)
  - Additional stent-graft
- Mortality (acute liver failure)
- HE 13.5% - 26% if Viatorr

30 days, 6 M, 12 M patency was 100%, 100%, 75%

(N=19 with Viatorr, B Petersen et al. Radiology 2008)

Need flor Suture Flow restrictor device (2 in Viatorr series)

Horikawa M, Poster session, CIRSE 2014
DIPSs in challenging anatomy
(Massive ascitis, large IVC, tortuous IVC)

- **Technical refinements** (*Petersen, JVIR 2003; 14: 21-32*)
  - US + fluoroscopy guidance
  - Through-and-through interlocked sheaths
    - 12Fr jug sheath docked within 14 Fr fem sheath
    - Lateral slit in 14 fr sheath for needle
    - Alignment of both needle and ivus

- **Modified Gunsight approach** (if no IVUS)
  - Snare into PV through percutaneous/transumbilical ap.

*Petersen JVIR 2003, 14: 21-32*
Primary/secondary DIPSs 9 /4

TS 100%
  ✓ Variceal embolization 100%

Mean procedure time < 2hr

Mean PSG
  ✓ Pre: 14 +/- 3, Post: 5,7 +/- 2,1

Portal vein wall rupture  1

Fup (13,0 Mo +/-15,1)
  ✓ Thrombosis  1 (rec hemo)
Advantages of the IVUS-guided DIPSs

- Direct IVC-to-PV puncture in one single pass
  - *Direct needle tract visualization*
- Precise stent-graft placement
- Improved Patency
  - *Shorter liver tract: less pseudo-intimal hyperplasia*
  - *Venous shunting into large IVC: HV stenosis avoided*
- Fluoro time under 10 min
- Total procedure time under 60 min
- Preferred techniques in some IR practices
Conclusions

✓ Various alternatives to TIPSs

✓ Advantages of DIPSs:
  - Improved patency
  - Reduced procedural/fluoro time
  - Safety

✓ Indications: BCS, distorted liver anatomy or more..

✓ Guidance: intravascular (transabdominal)US

✓ Viatorr Stent