Onion Skin And Other Techniques For Decreasing, In A Controlled Manner, Excessive Flows Through Blood Vessels Or Stent-Grafts While Maintaining Patency

Precision Onion Skin Technique (POST)

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Introduction

TIPS-standard of care & definitive treatment for complications of:

1. Portal hypertension
2. Variceal bleeding
3. Refractory ascites
4. Hepatic hydrothorax

Disclosures: None

If medical management is unsuccessful, IR is asked to close or revise the TIPS shunt.

54 y/o M w/EEOH & Hep C cirrhosis, portal hypertension, ascites, hepatic hydrothorax refractory to aggressive medical management.

MELD = 12, LVEF was >75% by ECHO

Refferred by CT surgery for TIPS to Tx refractory ascites and hepatic hydrothorax.

Major complications after TIPS creation:

1. Hepatic encephalopathy
2. Hepatic insufficiency
3. Right heart failure

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**Case**

Successful TIPS from RHV to RPV with 10mm x 6/2cm Viatorr stent graft.

Reduced the portosystemic gradient from 14 mmHg to 5 mmHg.

Patient's condition improved and was discharged home in stable condition.

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A month later, pt presented to ED w/ high output right heart failure aggravated by new TIPS shunt.

Pt admitted to MICU and aggressively diuresed.

Pt referred to VIR for TIPS revision.

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Closure of the TIPS shunt could result in a dangerously abrupt increase in portal venous pressure, putting the patient at risk for life threatening variceal bleeding.

Therefore, there is a need for a controlled technique to calibrate desired portosystemic gradient.
**Case**

Closure of the TIPS shunt could result in a dangerously abrupt increase in portal venous pressure, putting the patient at risk for life-threatening variceal bleeding. Therefore, there is a need for a controlled technique to calibrate the desired portosystemic gradient.

**Technique**

POST is a novel technique for TIPS revision that utilizes carefully sized covered stents deployed in an "onion skin" fashion of the shunt to precisely calibrate the desired portosystemic gradient.

**Technique**

At the time of revision, initial pressures were taken from the RH & PV, measuring 25 mmHg & 20 mmHg respectively for a portosystemic gradient of 5 mmHg. The goal was to precisely bring the portosystemic gradient to 9 mmHg.

**Back Table Imaging**

#1

#2
Portosystemic gradients after each stent layer measured 6 mmHg, 7 mmHg, and 9 mmHg respectively. The right atrial pressure was decreased from 20 mmHg to 12 mmHg.

Hemodynamic changes after TIPS creation result in preferential flow of portal blood through the shunt, which can elevate pulmonary artery pressure, right atrial pressure, cardiac index, and pulmonary vascular resistance.

Measurement | Significance
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6-10 mmHg | Preclinical sinusoidal portal hypertension
>= 10 mmHg | Clinically significant portal hypertension
>= 12 mmHg | Increased risk for rupture of varices
1-5 mmHg | Normal
>= 16 mmHg | Increased risk of mortality


Various methods of revising the TIPS shunt have been reported, however they often result in coarse adjustments in shunt diameter resulting in rapid changes in portosystemic gradients. Therefore a precision TIPS revision method was needed to reduce the gradient.
Discussion

Other reported methods for TIPS revision, such as:

- **Suture-constrained stent placements** can result in coarse adjustments in shunt diameter resulting in rapid changes in portosystemic pressure gradient. Difficult to perform and replicate.

- **“Bow tie” deployed stent placements** can result in coarse adjustments in shunt diameter resulting in rapid changes in portosystemic pressure gradient. Difficult to perform and replicate.

- **Parallel constrained stent placements** can result in coarse adjustments in shunt diameter resulting in rapid changes in portosystemic pressure gradient. Difficult to perform and replicate.

- **“Lasso Catheter” deployed stent placements** can result in coarse adjustments in shunt diameter resulting in rapid changes in portosystemic pressure gradient. Difficult to perform and replicate.
Discussion

Precision Onion Skin Technique (POST) is a TIPS shunt reduction technique utilizing carefully sized covered stents deployed in an "onion skin" fashion to create a customized precision hourglass narrowing within the hepatic venous limb of the TIPS shunt to precisely calibrate the desired portosystemic gradient.

Conclusion

Precision Onion Skin Technique (POST) is a TIPS shunt reduction technique utilizing carefully sized covered stents deployed in an "onion skin" fashion to create a customized precision hourglass narrowing within the hepatic venous limb of the TIPS shunt to precisely calibrate the desired portosystemic gradient.
Conclusion

POST has so far been successfully utilized at our institution to treat four patients with TIPS-related complications refractory to medical management.

Companion Case

POST can be applied to other vascular structures such as a "steal phenomenon" in an HD pt at the anastomotic site.

Companion Case

Placement of covered stent #1 for exclusion of pseudo.

Companion Case

What’s Missing?

Arterial inflow

Companion Case

Arterial inflow

Companion Case

Venous outflow

Companion Case

Venous outflow

Companion Case

Pseudo

Arterial inflow
Placement of covered stent #2 and #3 for onion skin technique to produce narrowing and reduce steal.

Arterial inflow

Venous outflow

Onion Skin

Restored flow to hand

Thank you