PV patency and integrity problem percutaneal management by stenting, endoluminal RFA and angioplasty or endoluminal RFA and stenting

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Aims and objectives

PV angioplasty by balloon dilatation and stenting is accepted low-invasive technique for recanalization of portal vein strictures, caused by pancreatic and biliary neoplasms (1, 2, 7, 10), benign stenosis (5, 6), postsurgery complications (9). Few reports are dedicated to PV integrity problem - Some authors report porto-enteric fistula (4) and pancreatic pseudocyst-portal fistula (8, 11); first treated by surgery, second - by endoscopic wirsung duct stenting, third - by pseudocyst percutaneal drainage. 2 cases of bilio-portal fistula (3) were treated percutaneally - in one case - biliary and the other case - PV stent palecement. Endovascular approach (GDA embolizatuion) is suggested as a first-choce treatment option for the management of arterio-portal fistula (12).

We elected to study the use of HabibTM Percutaneous Endoluminal Radiofrequency (RF) ablation catheter (EMcision Ltd, London, UK) for PV stenosis management. This device was developed in order to exert local tumor destruction and "melt" the PV thrombus. The Percutaneous Endoluminal RF ablation catheter is a single use, disposable, bipolar catheter, designed having different diameters (1 to 8F) that can be inserted in tubular structures for coagulation and ablation of tissue. RF power is applied to electrodes at the tip of the catheter so that heat is applied to tissue surrounding the catheter. The device comprises a catheter with two contact electrodes, which create a cylindrical coagulation/ablation zone that is connected to a compatible RF generator with the percutaneous approach. This study reports the early results of PV percutaneal RF ablation and stenting; The logic of this approach is that intraductal RF ablation may destroy small tumor volume, destroy the tumor thrombus and palliate large tumors in conjunction with chemotherapy. We also present the one case of spontaneous porto-biliary fistula, managed by PV stenting.

This pilot study reports only the feasibility and early results rather than efficacy and long-term potential benefits. Our group demostrated the safety of endolouminal application of RF in portal vein via direct transhepatic puncture (13).

Methods and materials

Total 15 patients with portal hypertension due to PV patency problem; among them 14 underwent percutaneous recanalization using a novel endovascular bipolar radiofrequency device. RFA was followed by balloon angioplasty in 4 cases (3 - HCC, 1-retroperitoneal sarcoma) or vascular stent placement - 7 cases (6 - HCC, 1 - liver cirrhosis). in 1 case (choledocholithiasis and pancreatitis induced PV stricture and porto-biliary fistula) PV stenting was performed. PV access and recanalization or integrity restoration procedure has been performed simultaneously. The PV tributary was percutaneously accessed under US guidance; After guidewire and 5 Fr diameter
guiding catheter placement in the PV, manipulation under X-ray Fluoroscopy control by guiding catheter and 0.035 inch diameter wire enables to conduct them via PV lumen caudally from the problem (tumor thrombus - in cases of PV stenosis or fistula - in case of portobiliary fistula) - this is the key point of recanalization and/or integrity restoration procedure. After portography and problem location final documentation in cases of PV thrombus Intraductal (endoluminal) RF processing was performed using novel bipolar endoluminal RF electrode - 5 or 8 Fr diamater device, using the appropriate diameter (0.035 or 0.018 inch) guidewire. The blocked area was processed during 2 minutes applying 10 to 15 W of power. RF processing was followed by ductoplasty, performed by balloon dilatation or stent placement. 10 mm balloons or 14 mm diameter self-expanding metal stents were used. The balloon or stent placement is performed according 0,035 inch diameter wire. The appropriate stent length was suggested basing on CT and/or MRI studies, but stent length final selection is performed basing on portography data, received in the process of recanalization procedure itself. Final portography is performed to document PV patency and/or integrity and procedure is finished either by track ablation or coil placement for intraperitoneal bleeding prevention. Patients were followed-up every 2 weeks for 1 month and thereafter as per the oncology follow-up protocol. Patients had clinical examination, liver function tests, and ultrasound scans to rule out the possible complications.

Images for this section:
Fig. 1: Case#1. 66 years old patients with mechanical jaundice and cholangitis. The primary suggestion was CBD neoplasm, but CT suggested CBD stones; patient was referred to IR for probable PTC
Fig. 2: Case #1. PTC has been performed, CBD blocking stone has been revealed and Balloon Assisted Percutaneal Descending Litholapaxy (BAPDL) procedure has been scheduled. Porto-biliary fistula has been documented during BAPDL.
Fig. 3: Case #1. It was really tough to conduct the guiding catheter via distal CBD to duodenum
**BAPDL procedure has been terminated; external-internal biliary drainage has been performed**

*Fig. 4: Case #1. BAPDL procedure has been terminated, external-internal drainage catheter has been positioned*
PV stenting – Ultrasound guided puncture

**Fig. 5:** Case #1. Next step was PV stent percutaneous transhepatic implantation - the puncture is performed under US guidance
Fig. 6: Case #1.
PV stenting – guiding catheter is advanced and portography performed

Fig. 7: Case #1.
PV stenting

Fig. 8: Case #1.

Guiding catheter is in SMV; PV has not only integrity, but the patency problem also

Self-expanding stent is positioned
PV stenting

Fig. 9: Case #1.
Results

The technical success rate was 80.0%; in 3 cases (20.0%) wire conduction through the organized thrombus was impossible. Postprocedure portography documented significantly improved portal vein blood flow in all patients, to whom the procedure was completed. Porto-biliary fistula was successfully managed by percutaneous stenting. Patients tolerated the procedure easily; no intra- or postprocedural complications were detected.

Images for this section:

**PV thrombus RFA&stenting**

Fig. 10: Case #2. Inoperable giant HCC, complicated with PV thrombosis; RPV is ocluded totally and completely, LPV - almost completely. Portal vein recanalization by endovascular RFA with subsequent stenting is initialised.
Fig. 11: Case #2.

PV thrombus RFA&stenting – left anterior PV access under US guidance and endoluminal RFA&stenting under DSA guidance (thrombus – yellow arrow, puncture needle – red arrow)

Guidewire is conducted through the thrombus

Guiding catheter in SMV

Portography
Fig. 12: Case #2
PV thrombus RFA&stenting – after PV recanalization patient undrewent lipiodol-TACE. Postembolization CTA shows the possible targets of the next embolization session

Fig. 13: Case #2
Fig. 14: Case #2. Bipolar endoluminal device
Conclusion

The percutaneous management of PV patency and integrity problems by percutaneous stenting or percutaneous endoluminal RFA/stenting is safe and effective technique; it should be suggested as a treatment option for otherwise incurable patients preparation for further treatment. However, a larger study is needed to assess its usefulness and long-term impact on patient outcome.

Personal information

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10. Percutaneous Transhepatic Stent Placement in the Management of Portal Venous Stenosis After Curative Surgery for Pancreatic and Biliary Neoplasms

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