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PATTERNS OF VASCULAR OBSTRUCTION AND OUTCOMES OF ENDOVASCULAR INTERVENTIONS IN BUDD-CHIARI SYNDROME: OBSTRUCTION-SPECIFIC STRATEGIES

Authors: Rajeev N. Priyadarshi[1], Manik Aggarwal[1], Ramesh Kumar[1]

[1]All India Institute of Medical Sciences, Patna, Bihar, India

INTRODUCTION

- Budd–Chiari Syndrome (BCS) results from hepatic venous outflow obstruction, leading to portal hypertension and liver dysfunction.
- The obstruction may affect the hepatic veins (HVs), the inferior vena cava (IVC), or a combination of both, either in isolation or concurrently.
- This anatomical variation has significant implications for selecting the most appropriate endovascular therapy, which is the treatment of choice for symptomatic patients.
- A pattern-based approach has been shown to improve the outcomes by tailoring intervention according to anatomical involvement.
- IVC angioplasty alone may suffice in combined obstruction if collaterals/accessory veins are functional.

AIM

- To evaluate outcomes of endovascular treatment based on obstruction patterns in BCS, with a focus on IVC angioplasty-alone strategy in combined-type disease.

METHOD

▸ **Design**: Retrospective study of 100 consecutive BCS patients treated between Jan 2022–June 2024. Asymptomatic cases were excluded.

▸ **Classification**: Group A: Combined IVC + HV occlusion (n = 45);

- Group B: HV occlusion with patent IVC (n = 55);
- No cases of isolated IVC occlusion

▸ **Demographics**: Mean age 31.7 years; 62 females, 38 males.

- Group A: 23 males, 22 females; Group B: 21 males, 34 females

▸ **Diagnosis**: Doppler USG in all cases;
CT for anatomical mapping and procedural planning

▸ **Collateral Evaluation**: Used to determine need for HV intervention or TIPS.
Accessory HVs >10 mm; Intrahepatic hepatocaval and bridging veno-venous collaterals

▸ **Procedure Selection**:

- **Group A**: IVC angioplasty first-line (balloon: 18–22 mm); stenting for recoil/residual stenosis
- **Group B**: HV angioplasty (n = 24; balloon: 10–12 mm); HV stenting (n = 6); TIPS for acute cases or poor collaterals (n = 25)

▸ **Outcomes**:

- **Technical success**: Flow restoration on imaging
- **Clinical success**: Symptomatic and biochemical improvement at 6

RESULTS

▸ **Group A: Combined IVC + HV Obstruction (n = 45)**

•All underwent IVC angioplasty; stenting required in 2 cases (long-segment stenosis).
•Technical success: 97.7%; Clinical success: 97.7%
•Restenosis: 1 patient (2.3%) following balloon angioplasty alone
•Complications: 1 case of pericardial tamponade, managed conservatively

▸ **Group B: HV Occlusion with Patent IVC (n = 55)**

•Interventions: HV angioplasty (n = 24); HV stenting (n = 6); TIPS (n = 25)
•Technical success: 90%; Clinical success: 85%
•Restenosis: 4 patients (16.7%) after HV angioplasty
•Complications: 4 major events—2 intraperitoneal bleeds, 2 perihepatic hematomas; all managed without surgical intervention

▸ **Outcome Summary**

•All restenosis cases (n = 5) occurred post-angioplasty; more frequent in Group B
•Major complications also more common in Group B (4 cases vs. 1 in Group A)
•No procedure-related mortality in either group

▸ **Statistical Correlation**

Table : Procedural Outcomes Based on Obstruction Patterns

Pattern of Obstruction	Type of Procedure Performed	No. of Patients	Technical success (%)	Clinical Success (%)	P- value
Combined IVC and HV Occlusion	IVC Angioplasty (± Stenting)	45	97.70%	97.70%	<0.001
HV Occlusion without IVC Involvement	HV Angioplasty (n=24), HV Stenting (n=6), TIPS (n=25)	55	90%	85%	0.02
Isolated IVC Occlusion	None	0	N/A	N/A	N/A

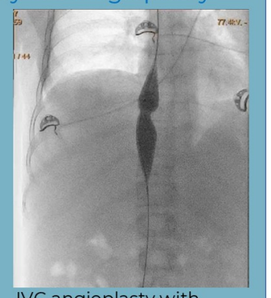
CONCLUSIONS

- In combined IVC + HV obstruction, IVC angioplasty alone is often sufficient when accessory hepatic veins and intrahepatic hepatocaval collaterals are present.
- In isolated HV occlusion, bridging intrahepatic veno-venous collaterals enable successful HV angioplasty or stenting, reducing the need for TIPS.

Combined IVC + HV Obstruction – Treated by IVC Angioplasty

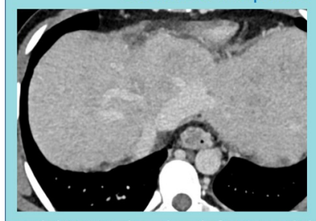
Sagittal CECT showing membranous IVC occlusion.

Axial CECT showing dilated accessory HV draining into infrastenotic IVC—HV intervention avoided.



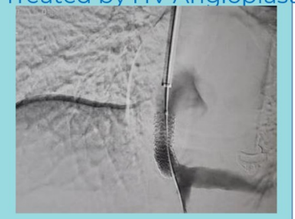
IVC angioplasty with balloon inflation at stenotic segment.

Isolated Hepatic Vein Occlusion (Patent IVC) – Treated by HV Angioplasty



Axial CECT showing left HV ostial occlusion with veno-venous collaterals; IVC patent.

DSA showing balloon angioplasty of left HV.

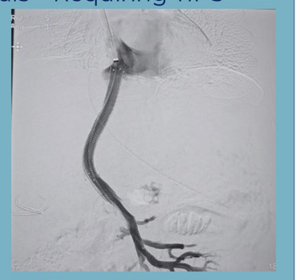


DSA post-stenting of left HV showing restored flow.

HV Occlusion with Insufficient Collaterals – Requiring TIPS

Coronal CECT showing right HV thrombosis

DSA showing portal vein access for TIPS via transjugular route.



DSA post-TIPS showing contrast flow through the stent.

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CONTACT INFORMATION

Dr. Rajeev N. Priyadarshi
Professor, Department of Radiodiagnosis
All India Institute of Medical Sciences (AIIMS), Patna, India
Email: drrajeevnayan@aiimspatna.org ; Mobile (WhatsApp): +91-8986461669