

IMPELLA LVAD FOR SEVERE AORTIC REGURGITATION IN LIVER TRANSPLANTATION

Aaron Kotamarti¹, Bani, Dhoother², Jian Azimi¹, Scott Lindberg¹

[1] Houston Methodist Hospital, Houston, TX 77030

[2] School of Engineering Medicine, Texas A&M University, Houston Methodist Hospital, Houston, TX 77030



ENMED
ENGINEERING MEDICINE

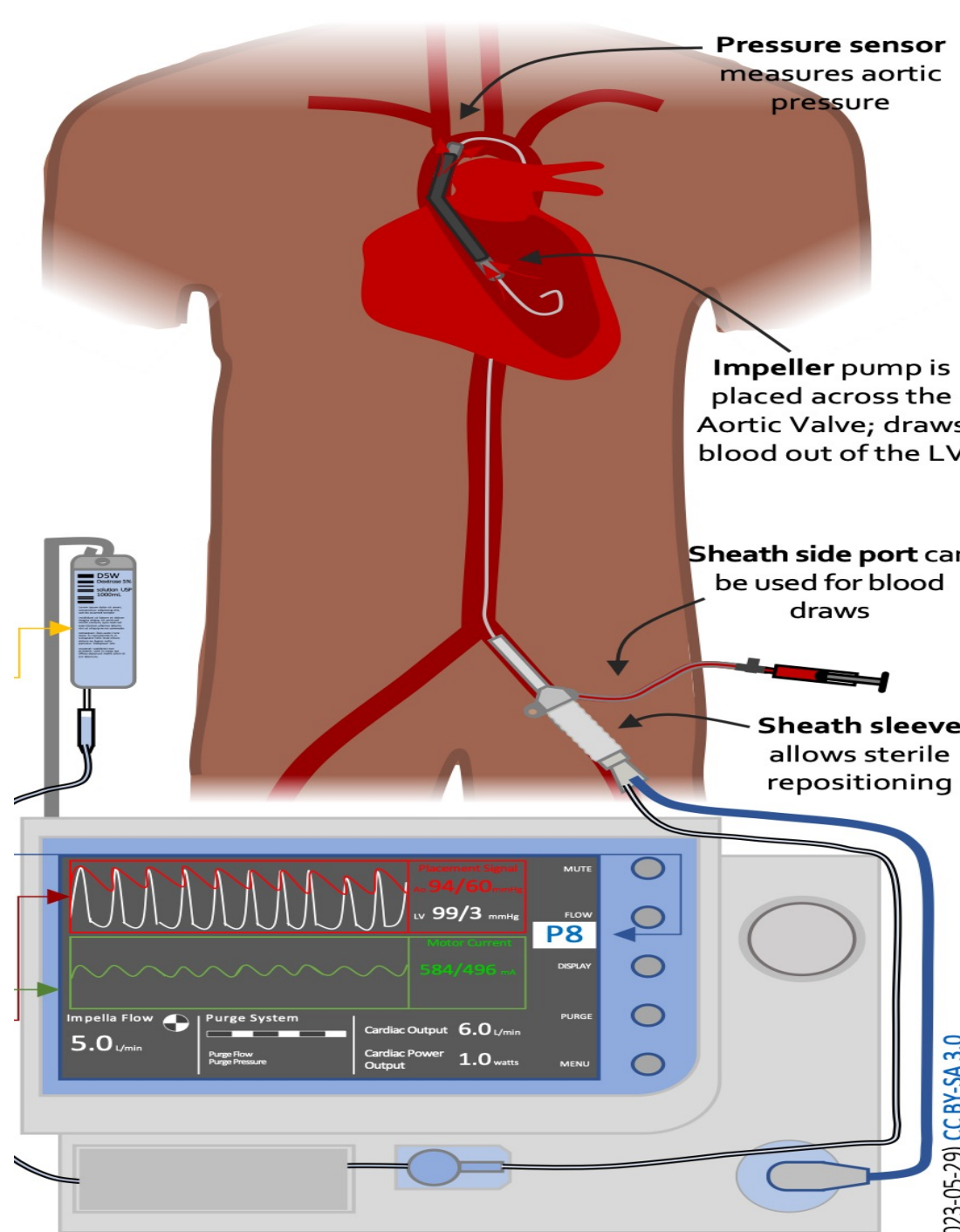
HOUSTON
Methodist
LEADING MEDICINE

CASE SUMMARY

64 year old female with history of **decompensated ETOH Cirrhosis (MELD 34)** and **severe non-rheumatic aortic regurgitation** and preserved ejection fraction evaluated for liver transplant. Candidacy for combined heart transplant or aortic valve replacement precluded due to degree of decompensated liver cirrhosis as well as concern for bacterial endocarditis and bacteremia present on admission. Plan was to proceed with impella-assisted orthotopic liver transplant with aortic valve replacement candidacy reassessed after liver function stabilized. Pre-operatively patient managed in ICU on CRRT, HFNC (35L/30%), vasopressor support (Norepinephrine and Vasopressin infusions). Intra-operative CRRT, VV Bypass, iNO, Cell Saver was utilized.

LVAD IN OLT

Mechanical circulatory assistance either through ECMO or LVAD has been demonstrated successfully in liver transplant surgery [1]. ECMO reserved for severe cardiac dysfunction, and use of LVAD in patients with marginal, but still concerning cardiac function. Chronic mild to moderate, compensated, AR in OLT has been studied prior demonstrating increased incidence of refractory intra-operative hypotension, but no increased incidence of reperfusion syndrome or peri-operative mortality [2]. Limited literature exists on severe aortic regurgitation in context of liver transplant, let alone in the setting of mechanical circulatory support [3].

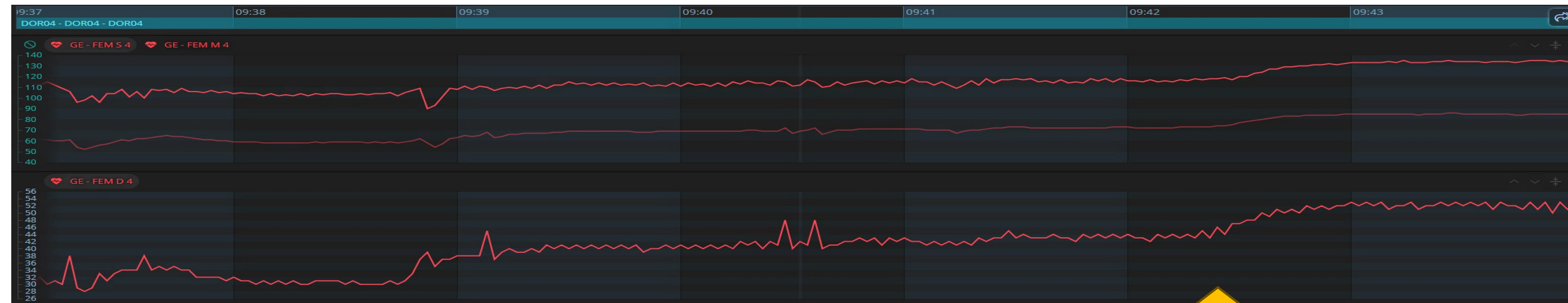


Causes of Hemodynamic Instability in ESLD

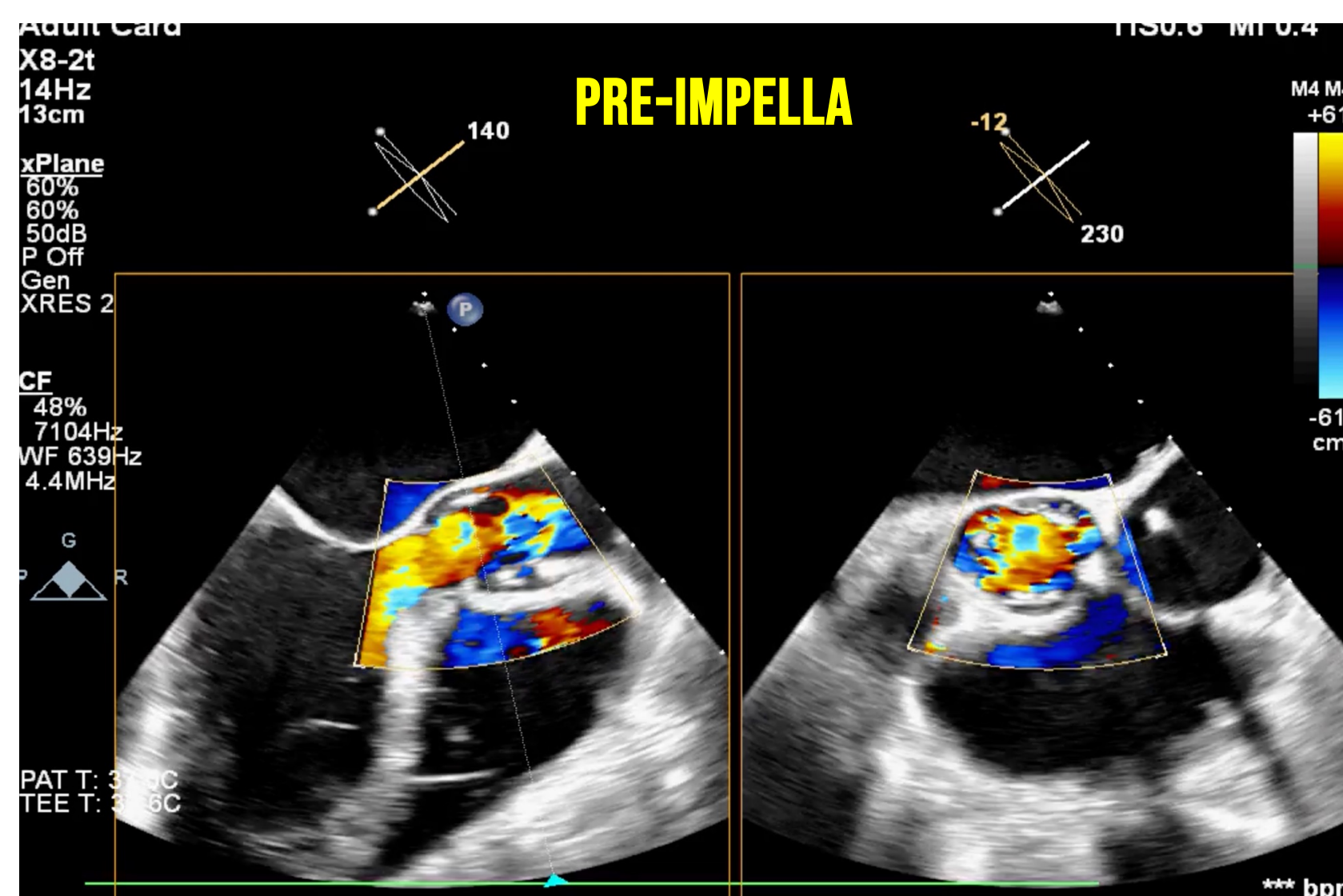
Low Preload	Vasodilatation	Impaired Cardiac Performance	Combined Causes
- Hemorrhage - Placement of inferior vena cava clamp - Complete inferior vena cava clamp - Partial inferior vena cava clamp	- Profound hypotension responsive to usual doses of vasopressors - Vasoplegic Syndrome: not responsive to usual doses of vasopressors	- Left ventricular failure - Ischemic myocardium - Cardiomyopathies - Cirrhotic cardiomyopathy - Dilated cardiomyopathy - Restrictive cardiomyopathy - Stress (Takotsubo) cardiomyopathy - Right ventricular failure - Acute - Chronic - Cardiac tamponade - Arrhythmias	Post-Reperfusion Syndrome

INTRA-OP HEMODYNAMICS/TEE

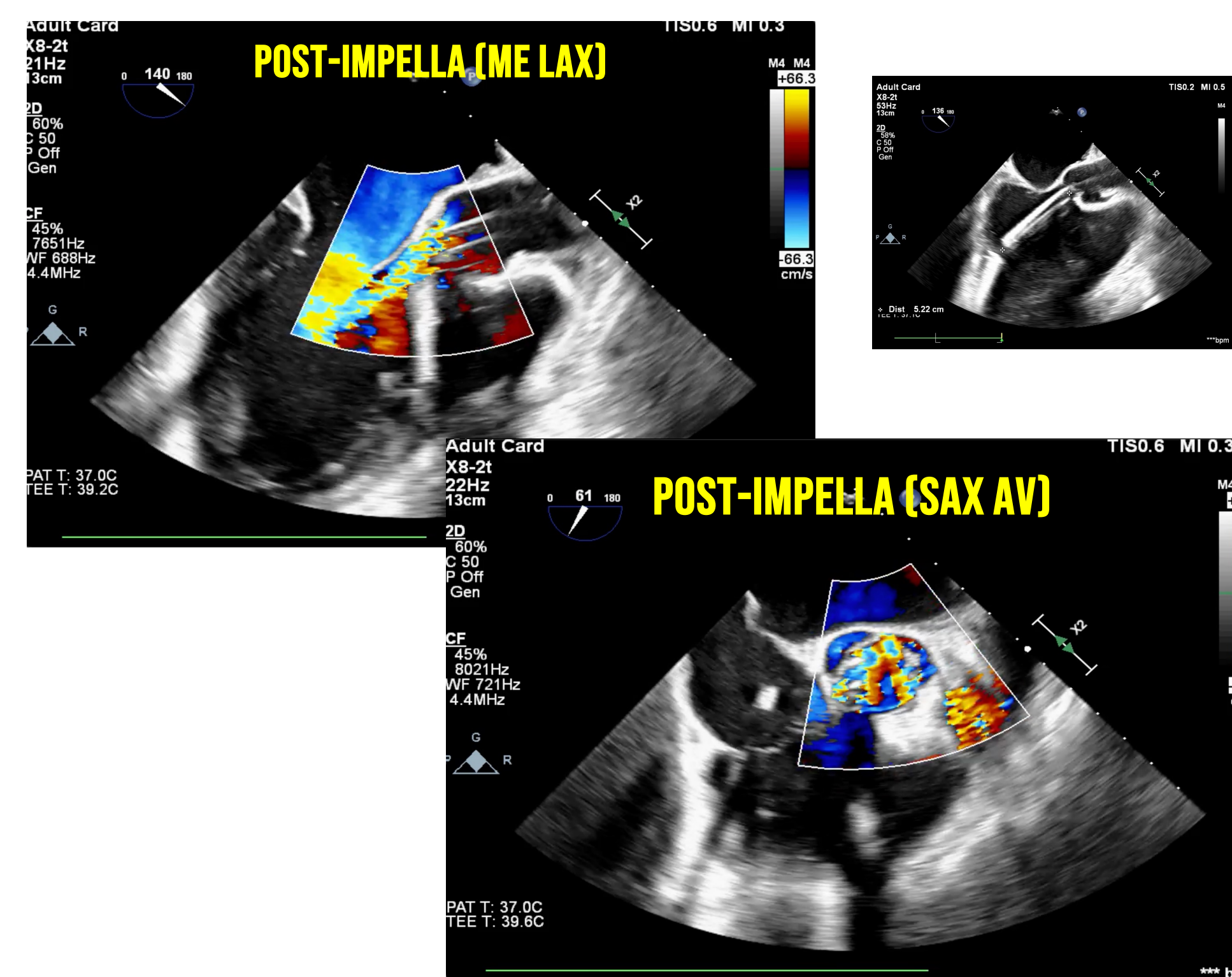
IMPELLA INSERTION



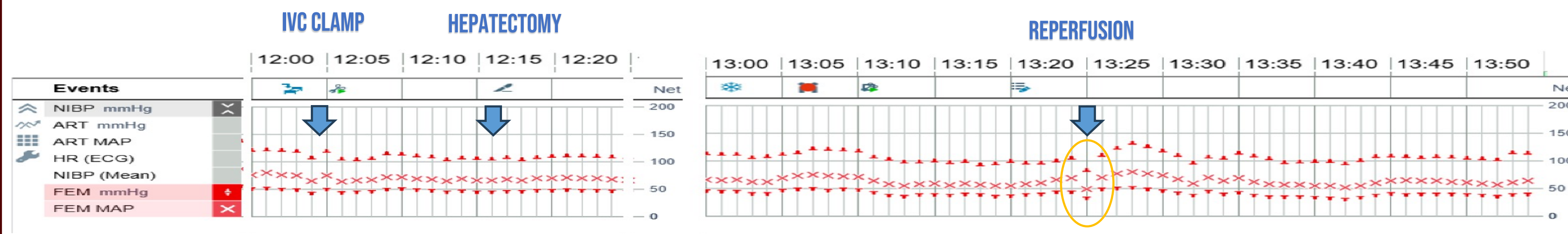
Two distinct step ups in diastolic pressure and cardiac output: 30 to 40 DBP with pump across the valve, 40 to 50 DBP with initiation of pump flow. Cardiac output by fick increased 6.5 LPM to 7.7 LPM. Pressor requirements halved.



Our patient has severe aortic regurgitation with a baseline intra-op TEE showing left coronary leaflet with severe flail and mal-coaptation contributing to AR, as well as mild-moderate mitral regurgitation. Ejection fraction was 55-60% on norepinephrine infusion at 6mcg/min and Vasopressin at 0.04U/min



Impella 5.5 placed without issue, with notable improvement in AR (additionally likely from device securing the flailing leaflet or occluding portion of LVOT reducing regurgitant jet), cardiac output, and diastolic blood pressure.



CLINICAL COURSE

Proceeding with the liver transplant, intra-operative course notable for moderate, but not atypical, amount of transfusion requirements, a well-tolerated reperfusion stage, and hemodynamics improving further noted post-reperfusion. Impella support weaned off days later with ongoing re-evaluation of AVR as liver function normalizes.

2 months out: Re-intubation with subsequent tracheostomy due to Acute on Chronic Hypoxic Respiratory Failure. Remains on hemodialysis 2/2 ESRD (CRRT intra-op utilized).

3 months out: s/p Aortic Valve Replacement with resolution of pulmonary hypertension (off pde5i).

4 months out: Discharged from hospital tolerating trach collar after successful AVR.

CONCLUSION

We demonstrate here in this case favorable use of left ventricular assist device for a unique setting of severe aortic regurgitation in liver transplant. A first of its kind procedure at Houston Methodist Hospital. A multi-disciplinary discussion between liver, cardiac, and anesthesia care teams was paramount for assessing risk stratification and logistical feasibility. Limited guidelines and scarce prior literature exists pertaining to this application.

ACKNOWLEDGEMENTS AND REFERENCES

- Hogen R, Sedra AH, Motamed A, Emamaullee J. The evolving role of ECMO in liver transplantation. Curr Opin Organ Transplant. 2021 Jun 1;26(3):333-338. doi: 10.1097/MOT.0000000000000874. PMID: 33782248; PMCID: PMC8269746.
- Chronic Moderate Aortic Regurgitation in Liver Transplantation: Prevalence, Perioperative Management, and Short-Term Outcomes Fukazawa, Kyota et al. Journal of Cardiothoracic and Vascular Anesthesia, Volume 33, Issue 2, 584 – 587
- Kazimi M, Beydullayev K, Farajov E, Shindiyeve S, Jafarova S, Khalilov Z, Nadirov T, Abdulkarimov V, Mammadov A, Farzaliyeva A, Kazimzade N, Musayev K, Vatansever S. Simultaneous Live Donor Liver Transplantation, Aortic Valve Replacement, and Atrial Septal Defect Repair in a Patient With End Stage Liver Disease: A Case Report. Transplant Proc. 2023 Apr;55(3):672-675. doi: 10.1016/j.transproceed.2023.02.027. Epub 2023 Mar 21. PMID: 36959029.
- Bezinovert, Dmitri & Mukhtar, Ahmed & Wagener, Gebhard & Wray, Christopher & Blasi, Annabel & Kronish, Kate & Zerillo, Jeron & Tomescu, Dana & Pustavoitau, Aliaksei & Gitman, Marina & Singh, Anil & Saner, Fuat. (2021). Hemodynamic Instability During Liver Transplantation in Patients with End-Stage Liver Disease: A Consensus Document from ILTS, LICAGE, and SATA. Transplantation. Publish Ahead of Print. 10.1097/TP.0000000000003642.
- <https://onepagericu.com/impella>