
Unanticipated severe pulmonary hypertension in a patient undergoing living donor liver transplant - Role of milrinone and transesophageal echocardiography

Sir,

Liver transplantation is a definitive treatment for end-stage liver disease patients.^[1] These

patients can have cardiomyopathy, coronary artery disease, hepato-pulmonary syndrome and porto-pulmonary hypertension.^[2] Despite a screening echocardiography, patients with severe pulmonary artery hypertension (PAH) may go unrecognised until the time of surgery resulting in case cancellation with grave consequences. Here we report a case where combining transesophageal echocardiography (TEE) to pulmonary artery catheterisation helped establish the aetiology of severe PAH in a liver transplant patient. Further, the reversibility of raised pulmonary artery pressure (PAP) with milrinone injection helped in deciding to proceed with the surgery.

A 51-year-old man, weighing 64 kg, was posted for living donor liver transplantation. Model for end stage liver disease score was 27. His preoperative echocardiogram, done 2 months ago, showed mildly dilated left atrium, mild aortic regurgitation (AR) with normal ejection fraction. Abnormal pre-operative laboratory findings were: Hb – 7 gm dl⁻¹, Platelets – 42,000 µl⁻¹, International Normalised Ratio (INR) – 1.95, and serum albumin – 2 gm dl⁻¹. All standard American Society of Anesthesiologists (ASA) monitors were instituted. Anaesthesia was induced as per institutional protocol. Pulmonary artery catheter (PAC) was placed. To our surprise, PAP was 84/38 (55) mm Hg, pulmonary capillary wedge pressure was 28 mm Hg and calculated pulmonary vascular resistance was 370 dynes sec cm⁻⁵. Donor surgery was immediately stopped. TEE probe inserted, revealed moderate AR with vegetation, moderate mitral regurgitation (MR), mild tricuspid regurgitation, mildly dilated left atrium, and moderate diastolic dysfunction (pseudonormal pattern)[Figure 1]. The points for discussion at this stage were PAH and endocarditis. Since there were no signs of active endocarditis, it was managed conservatively. For PAH, injection furosemide 60 mg i.v was given in increments. After sometime, PAP came down to 68/32 (45) mm Hg. Injection milrinone 1 mg i.v bolus was also given which further decreased PAP to 55/25 (36) mm Hg [Table 1]. Milrinone infusion was started at 0.2 µg kg⁻¹ min⁻¹ and the surgery was resumed. Intraoperative blood loss

was 5240 mL. A total of 14 units of packed red blood cell, 8 units of fresh frozen plasma, and 10 units of cryoprecipitates were administered. Reperfusion went uneventful. Milrinone infusion was stopped 1 h after the reperfusion due to the increasing haemodynamic instability. The patient was transferred to the ICU for elective mechanical ventilation. In ICU, his mean PAP remained moderately raised (35–40 mm Hg). The patient was extubated on postoperative day one. Immunosuppression was started from postoperative day one (methylprednisolone 80 mg, tacrolimus 1mg and

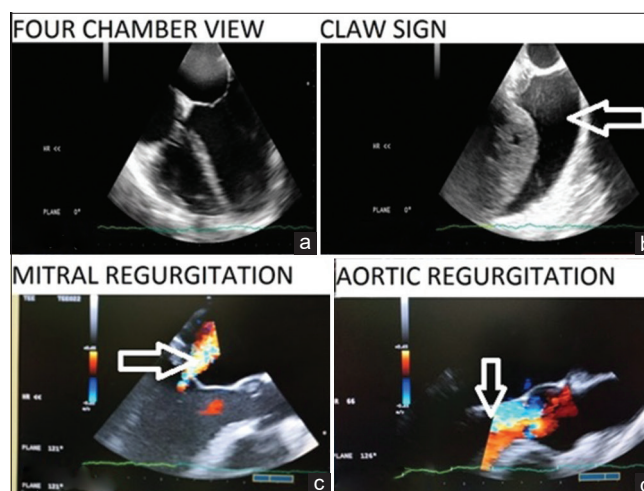


Figure 1: (a) – Four chamber view. (b)– Arrow is showing the pleural effusion on left side. (c) – Arrow is showing the mitral regurgitation. (d) – Arrow is showing the aortic regurgitation

Table 1: Haemodynamic variables during the surgery

Liver Transplant stages	Time (minutes)	H.R (bpm)	SBP (mm Hg)	DBP (mm Hg)	MAP (mm Hg)	PAP Systolic (mm Hg)	PAP Diastolic (mm Hg)	PAP Mean (mm Hg)	CVP (mm Hg)
Dissection phase	60	84	94	42	63	84	38	55	25
	90	85	94	47	67	82	37	52	24
	120	86	94	48	67	78	38	52	23
	150	83	103	44	65	82	38	53	24
	180	80	105	38	64	68	32	45	18
	210	81	101	38	61	55	25	36	14
	240	82	107	35	62	56	24	35	13
	270	85	102	36	62	48	24	33	12
	300	88	98	39	63	49	20	32	12
Anhepatic phase	330	89	96	41	64	51	21	33	10
	360	93	92	43	64	55	24	35	10
	390	92	98	42	65	47	21	31	11
	420	90	101	39	62	46	22	32	10
Post Reperfusion phase	450	95	100	35	60	48	25	34	10
	480	98	108	40	65	48	25	35	11
	510	93	111	43	69	53	26	38	12
	540	92	110	40	67	55	25	38	13
	570	91	94	38	61	57	26	39	13
	600	94	100	36	61	55	24	37	12
	660	93	104	38	64	56	26	38	12
	720	92	103	39	62	58	26	39	13

H.R: Heart rate, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, MAP: Mean arterial pressure, PAP: Pulmonary artery pressure, CVP: Central venous pressure, bpm: Beats per minute

mycophenolate mofetil 250 mg). Cardiology consultation was obtained and patient was advised conservative management. The patient got discharged after 28 days.

Our patient had mixed high PAP pathology: precapillary due to high cardiac output and anemia, capillary due to portopulmonary hypertension and post-capillary due to AR, MR and volume over load. Milrinone is a phosphodiesterase-3 enzyme inhibitor, which causes systemic and pulmonary vascular dilatation.^[3] We have used milrinone for the following reasons:(1) To prevent and treat right ventricle dysfunction which may ensue during reperfusion phase.(2) Our patient had diastolic heart failure and milrinone does improve lucitropy and relaxation properties of the heart. On one side proceeding with the surgery in a patient with high PAP can be associated with adverse outcomes, while on the other hand, case cancellation may not be an option where live donor liver surgery has already progressed.^[4] We took a decision to proceed with the surgery based on the following reasons: (1) moderate left heart pathology,(2) normal right ventricular function on TEE,(3) reversibility of high pulmonary artery pressure with injection milrinone,(4) progressed donor surgery. To conclude, severe PAH rarely is diagnosed on the operating table. Our report highlights the complementary roles of pulmonary artery catheter and TEE in diagnosis and decision-making. Demonstration of reversibility of high PAP with milrinone injection is an important indication of feasibility for liver transplant. Proper management improves the patient outcome and avoids unnecessary case cancellation.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given his consent for images and other clinical information to be reported in the journal. The guardian understands that names and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

**Gaurav Sindwani, Mahesh K Arora, Achal Dhir²,
Viniyendra Pamecha¹**

Departments of Anaesthesia and ¹Liver Transplant and HPB Surgery, ILBS, New Delhi, India, ²Programme Director, Liver Transplant Anaesthesia (Department of Anaesthesia and Perioperative Medicine), Western University, London, Ontario, Canada

Address for correspondence:

Dr. Gaurav Sindwani,
Department of Anesthesia, ILBS, New Delhi - 110 070, India.
E-mail: drsindwani25@gmail.com

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REFERENCES

1. Samuel D, Coilly A. Management of patients with liver diseases on the waiting list for transplantation: A major impact to the success of liver transplantation. *BMC Med* 2018;16:113.
2. Bozbas SS, Bozbas H. Portopulmonary hypertension in liver transplant candidates. *World J Gastroenterol* 2016;22:2024-9.
3. Swamy MC, Mukherjee A, Rao LL, Pandith S. Anaesthetic management of a patient with severe pulmonary arterial hypertension for renal transplantation. *Indian J Anaesth* 2017;61:167-9.
4. Singh SA, Ashraf H, Subramanian R, Krishnan GA, Pandey V, Gupta S. Living donor liver transplantation in a patient with severe portopulmonary hypertension. *Indian J Anaesth* 2020;64:153-5.

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