Research of the month (August 2015) Clinical research

Successful Hepatectomy using Venovenous Bypass in a Patient with Carcinoid Heart Disease With Severe Tricuspid Regurgitation

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Successful Hepatectomy Using Venovenous Bypass in a Patient With Carcinoid Heart Disease With Severe Tricuspid Regurgitation

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Gastrointestinal neuroendocrine tumor (GINET) is an uncommon, slow-growing tumor arising from neuroendocrine cells. Its incidence, about 2.5 to 5 cases per 100,000, has been increasing up to 10% per year.[1] Its ability to synthesize and secrete active peptides and other neuroamines can lead to carcinoid syndrome, which may manifest as cutaneous flushing, gastrointestinal (GI) hypermobility, and bronchospasm. Carcinoid heart disease is a process of endomyocardial fibroelastosis usually affecting the right heart valves (tricuspid and pulmonic) with involvement of subvalvular apparatus. The degeneration of one or both right heart valves leads to dilation of the right heart chambers and right ventricular (RV) dysfunction, and the resulting increase in right-sided pressures and liver congestion can result in significant hemorrhage during liver resection.

The authors present the successful management of right hepatectomy using venovenous bypass in a patient with severe tricuspid regurgitation and moderate pulmonic regurgitation due to carcinoid heart disease. They also present a review of the literature regarding the appropriate sequence of surgeries in this unique situation.

CASE REPORT

A 54-year-old woman (height: 163 cm, weight: 79 kg) diagnosed with GINET and liver metastases as well as RV dysfunction from carcinoid heart disease was scheduled for right hepatectomy. One year before, she had undergone an octreotide scan and cross-sectional imaging and received a diagnosis of carcinoid tumor originating at the ileocecal valve. The lesion was suspected to be in the terminal ileum, but the patient had not undergone excision of the primary lesion at that time.

She presented with occasional flushing and shortness of breath. She was a former smoker with a 15-pack-year smoking history. She had quit 15 years earlier and denied having any drug or food allergies. Transthoracic echocardiogram revealed a significantly dilated right ventricle, severe tricuspid regurgitation (TR), mild pulmonary stenosis (PS), and moderate pulmonary regurgitation (PR). The patient had undergone chemoembolization of the hepatic artery 3 months before surgery, but her symptoms had remained unchanged. Her medications were furosemide, slow-release potassium chloride, and octreotide acetate for injectable suspension (60 mg subcutaneously every 21 days).

On physical examination, she was not in acute distress. She had stable vital signs, no peripheral edema, and a pan-systolic murmur best heard over the right parasternal area. Her airway assessment was normal. She had a normal complete blood count and electrolyte levels. Her international normalized ratio (INR) was 1.2. Partial thromboplastin time was 22 seconds. Liver and kidney function tests were unremarkable. Chest x-ray and electrocardiogram were within normal limits. Preoperative urinary 5-hydroxyindoleacetic acid (5-HIAA) ranged from 7.7 to 11.06 mg/24 h.

Because the patient had significant cardiac involvement in the form of severe TR and RV dilatation, multidisciplinary team meetings involving cardiac surgery, hepatobiliary surgery, and anesthesiology were held. Discussions mainly concerned the appropriate sequence of the 2 required surgeries, hepatectomy and tricuspid valve replacement. The cardiac surgeons believed the carcinoid disease would affect the new bioprosthesis and were, therefore, reluctant to replace the tricuspid valve first. After much discussion, the team decided to proceed with hepatectomy first. It was decided that venovenous bypass (VVB) would be performed to prevent excessive hepatic congestion and blood loss from high right-sided cardiac pressure because of the planned total vascular exclusion. The risks and benefits of the surgery were discussed extensively with the patient, and she provided written informed consent.

In the operating room, after attaching the standard American Society of Anesthesiologists–recommended monitors (which were the same as those recommended by the Canadian Anesthesiologists' Society) and before the induction of anesthesia, an arterial line was inserted. Anesthesia was induced with midazolam, fentanyl, propofol, and rocuronium. After uneventful induction and intubation, octreotide, 1,600 μg (20 μg/kg), was injected subcutaneously. Anesthesia was

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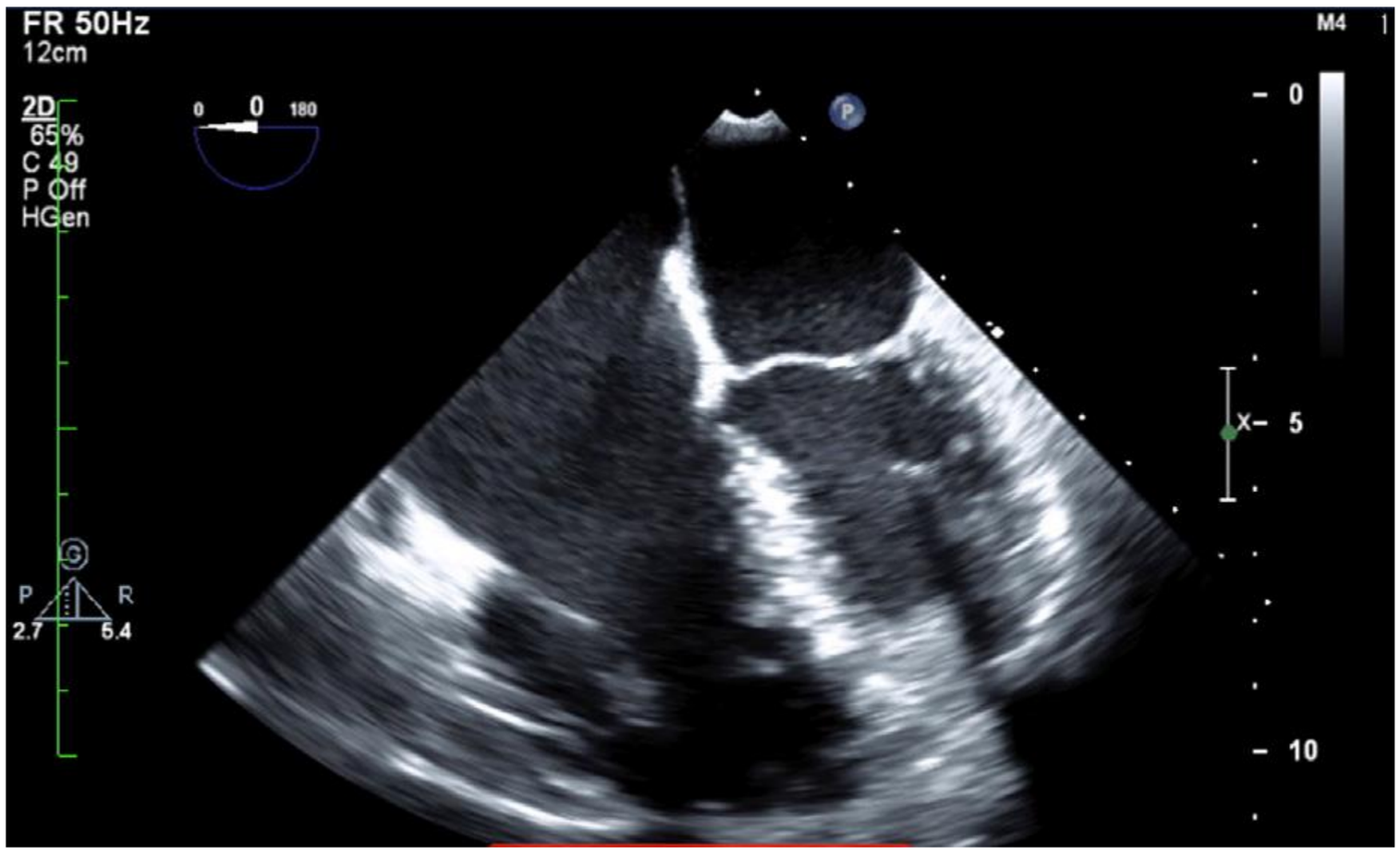

Fig 1. Intraoperative transesophageal echocardiography (TEE) showing severe right ventricle dilatation.

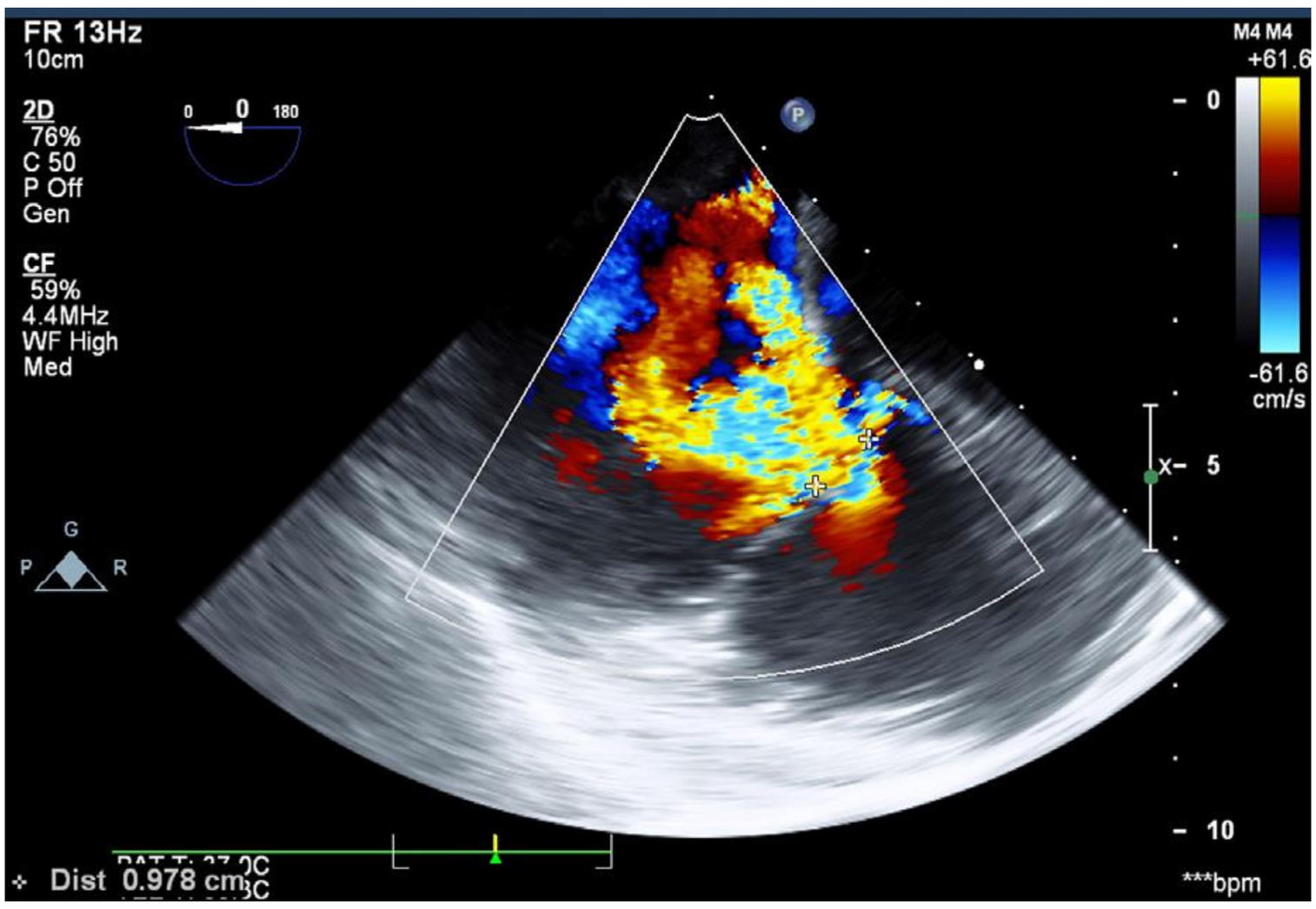

Fig 2. Intraoperative TEE showing severe tricuspid regurgitation.

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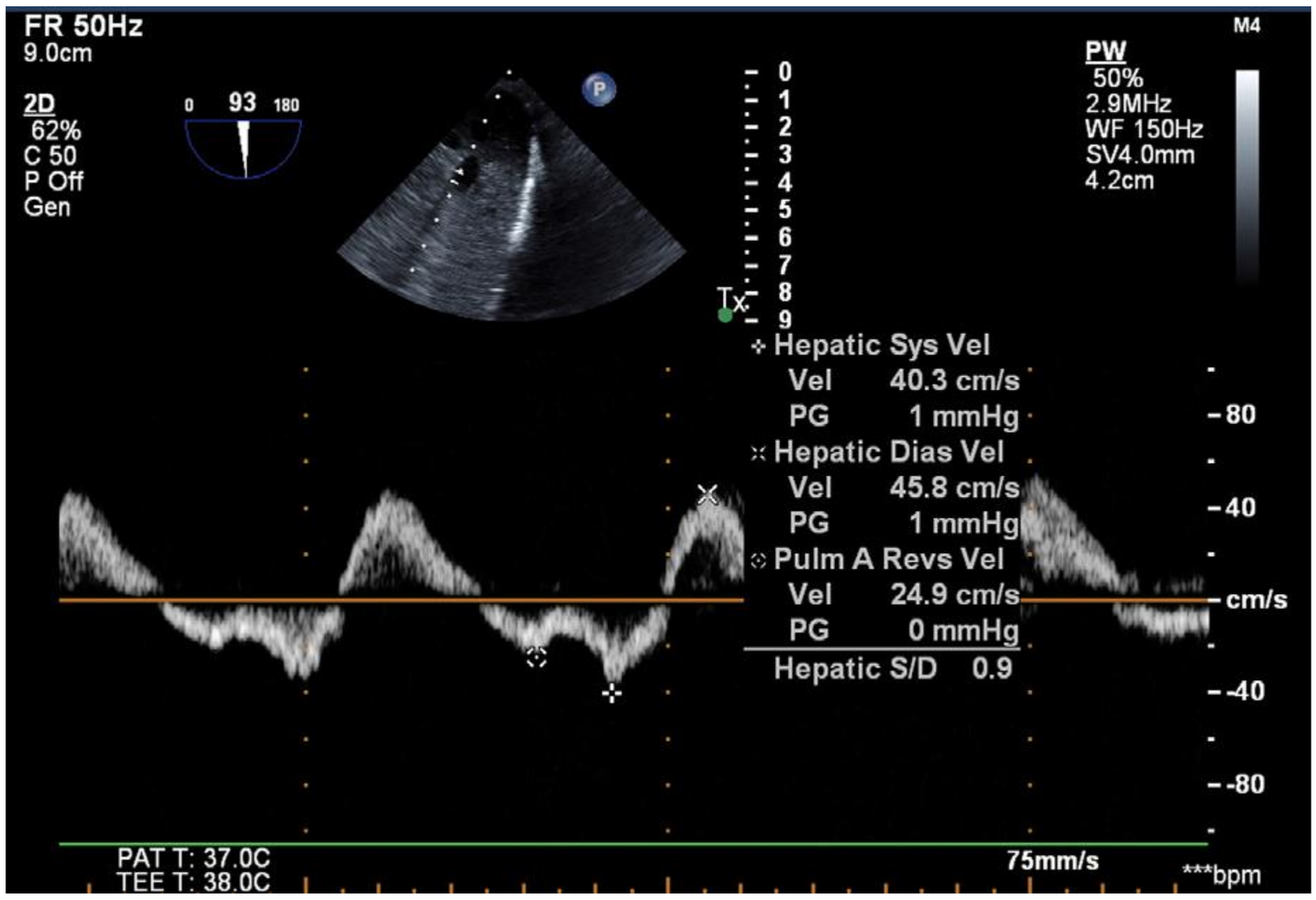

Fig 3. Intraoperative TEE: Hepatic vein flow depicting severe tricuspid regurgitation (systolic reversal flow)

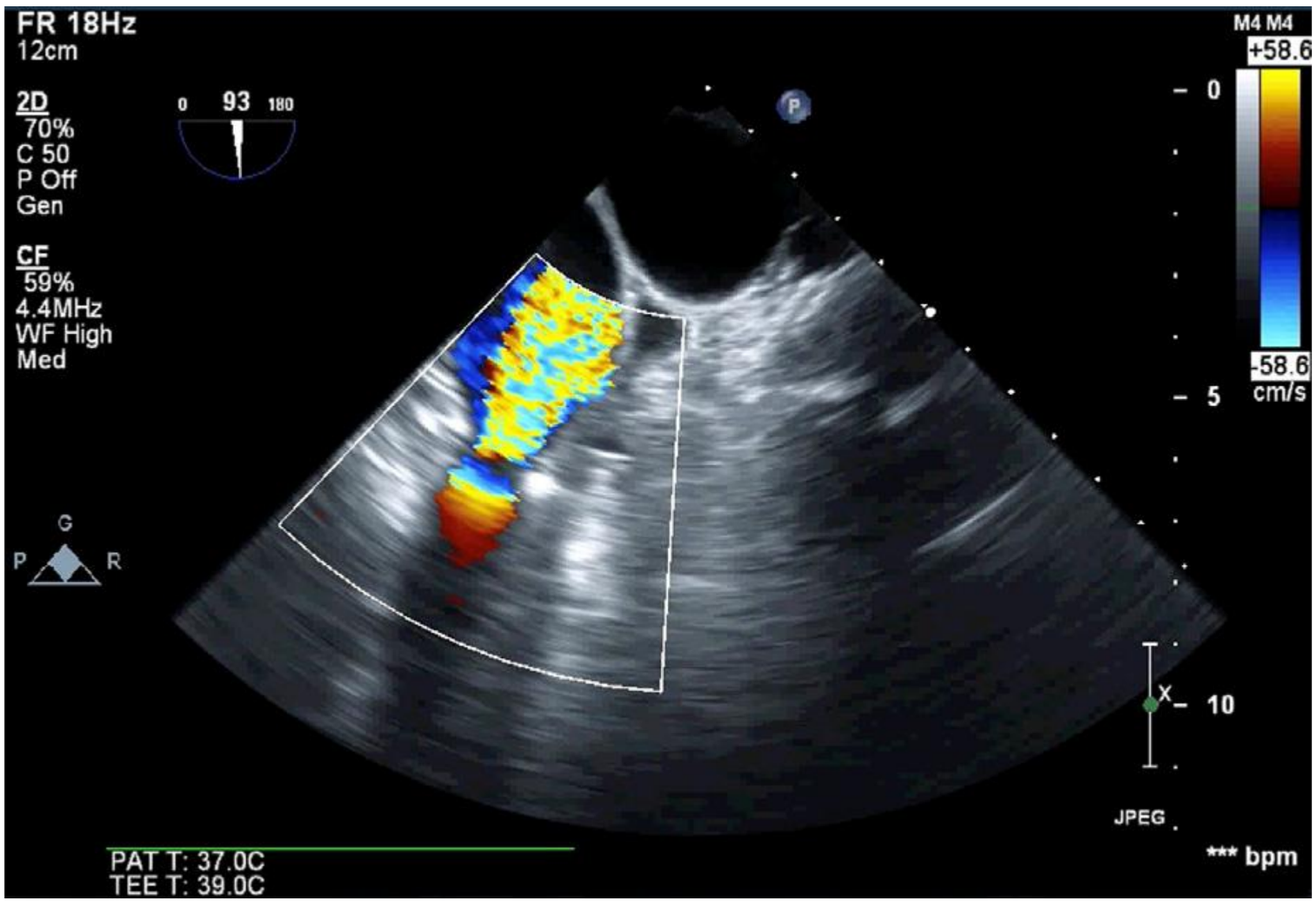

Fig 4. Intraoperative TEE showing mild pulmonary artery stenosis and moderate pulmonary regurgitation.

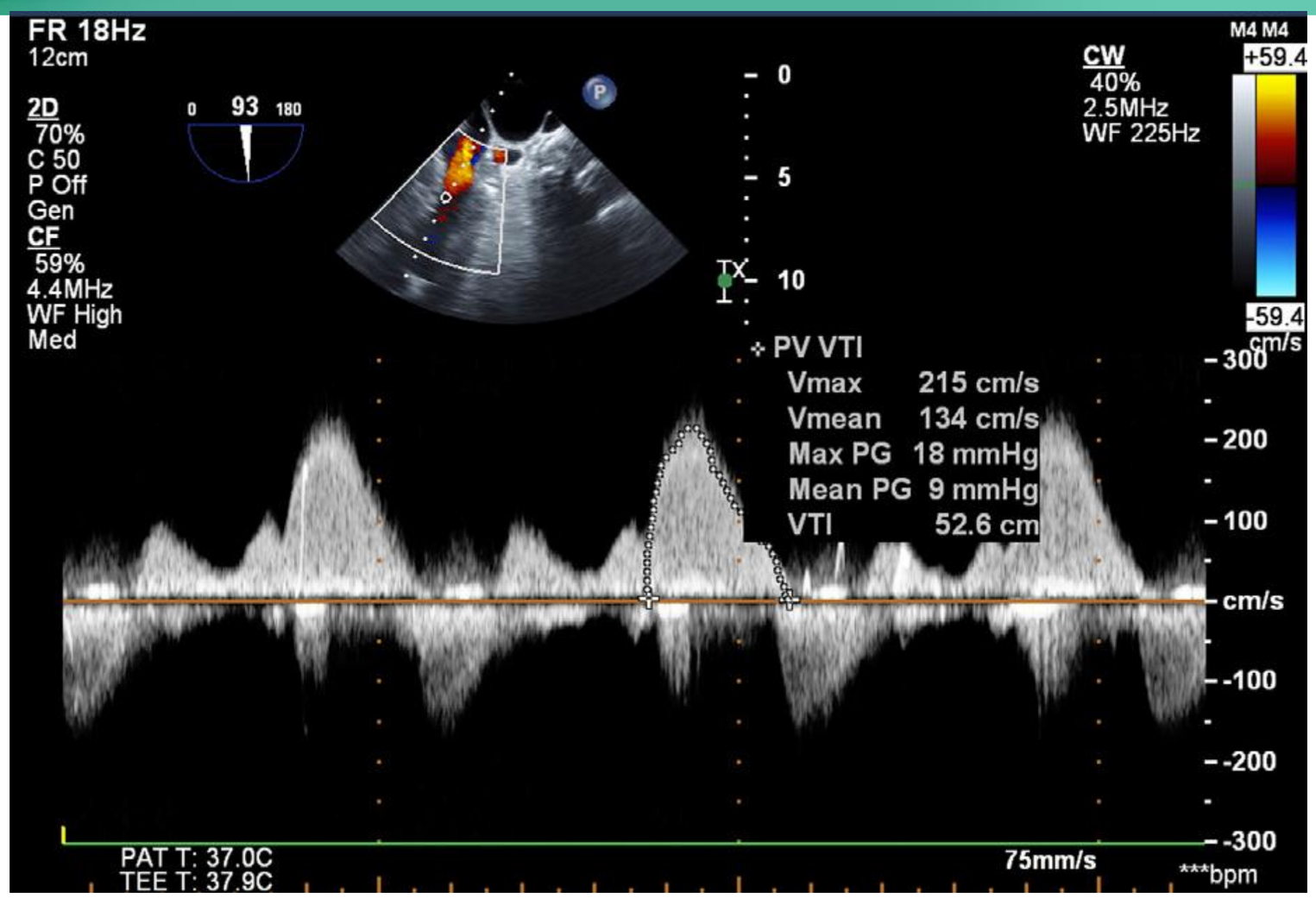

Fig 5. Intraoperative TEE: Pulmonary valve velocity time integral showing mild pulmonic stenosis.

Fig 6. Intraoperative photograph of resected tumor.

Table 1 : Selected Laboratory Values

	Time Point						
		Intraoperative			Postoperative		
Variable	Preoperative	2 h Prehepatectomy	30 min Prehepatectomy	1 h Posthepatectomy	Immediate	POD 2 (Peak)	POD 5
Hb (g/L)	155	115	82	99	73	81	87
Platelets ($\times 10^3/mm^3$)	250	170	79	92	103	66	174
INR	1.2	1.5	1.5	1.5	1.8	2	1.6
Lactates	—	2.2	3.6	6.3	6.3	7.2	3.5
ALT (u/L)	10	—	—		109	164	58
AST (u/L)	17	—	—		248	220	39

Table 2 : Perioperative Octreotide Management

Authors	Preoperative	Intraoperative	Postoperative
Modlin et al.[3]	50 μg before skin incision	50-μg/h infusion (50-μg boluses)	
Ellis et al.[1]	50-100 μg/h overnight	50-100 μg/h 50-100 μg boluses	50-100 μg/h up to 48 h
Le et al.[26]		25 μg/hr	