Refractory heart failure in severe stand alone tricuspid regurgitation

When the valve is not the target

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I have no potential conflicts of interest to declare

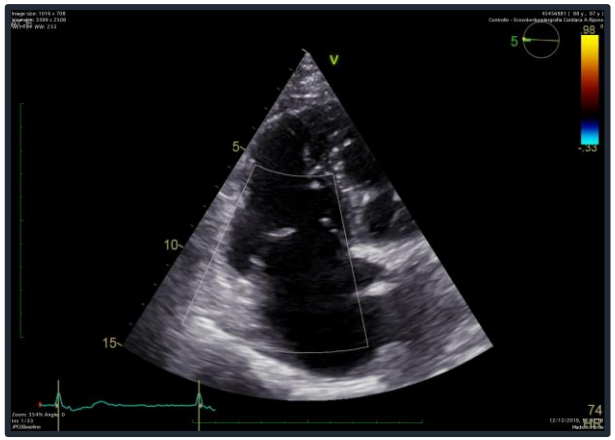
Clinical history and clinical presentation

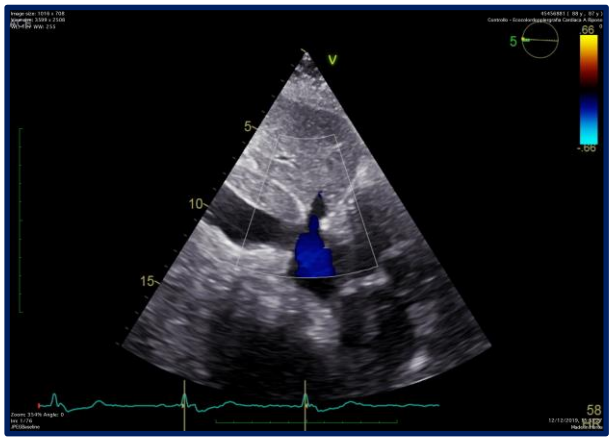
- 88 year-old woman
- Arterial hypertension
- Atrial fibrillation in NOAC therapy
- Mild mitral and moderate tricuspid regurgitation in medical therapy
- Hepatic fibrosis virus related

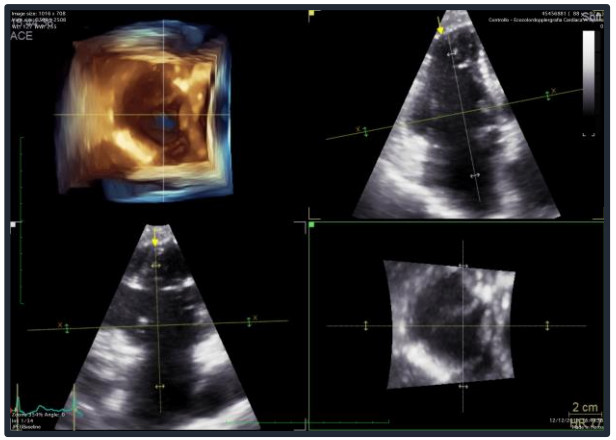
June 2020: admission to cardiac ward for worsening weakness, fatigue and congestive oedema in the last year, despite medical therapy optimization (atenolol, ramipril, high dose furosemide).

Transthoracic echocardiography

Four-chamber view (right ventricle)	Subcostal view	3D view

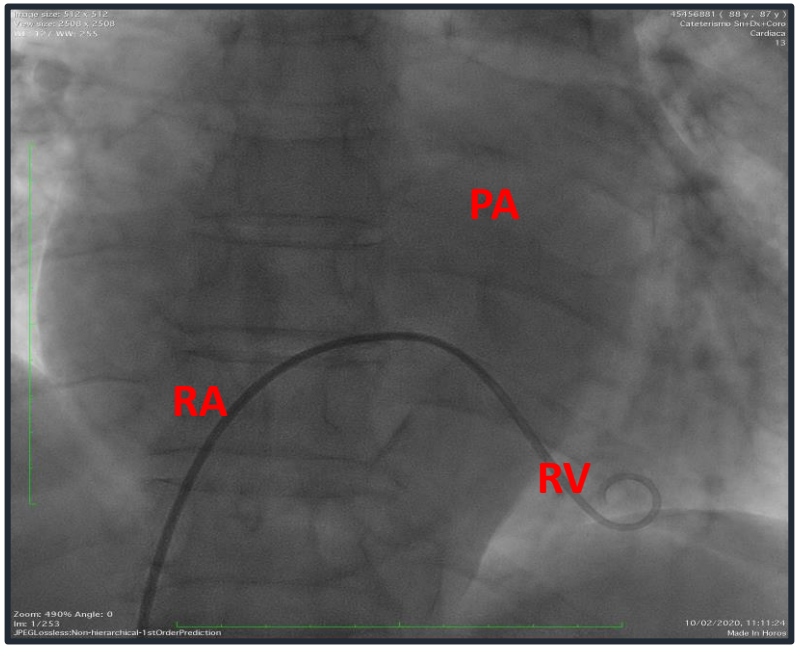


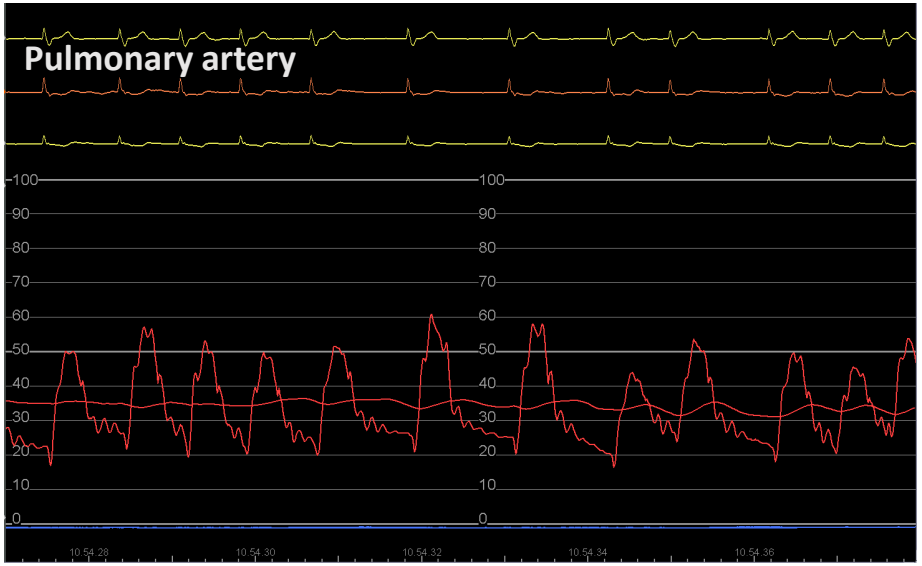


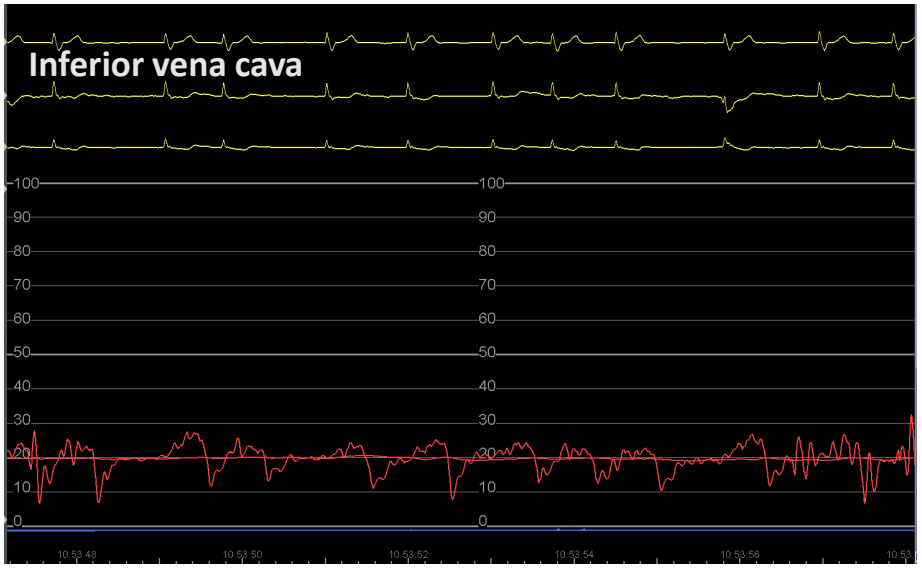


TTE: severe functional tricuspid regurgitation, right ventricle dilatation with normal systolic function, inferior vena cava dilatation with systolic flow reversal in hepatic veins.

Cardiac catheterization and angiography







- Right ventricle dilation, severe tricuspid regurgitation
- Pulmonary artery: 52/20/35 mmHg
- Right ventricle: 52/10/30 mmHg
- Right atrium: 28/9/20 mmHg
- V-wave inferior vena cava 27 mmHg
- V-wave superior vena cava 26 mmHg

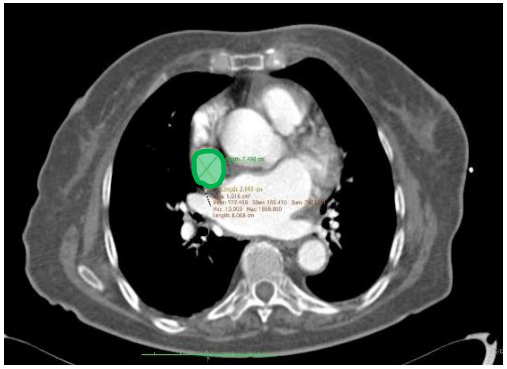
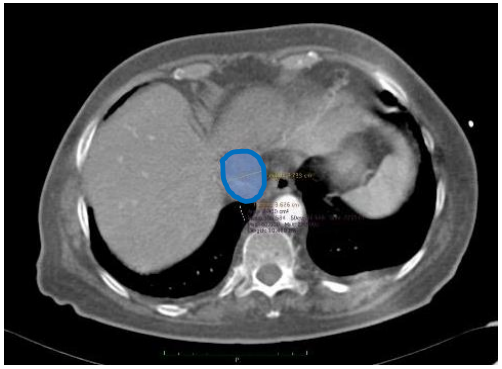
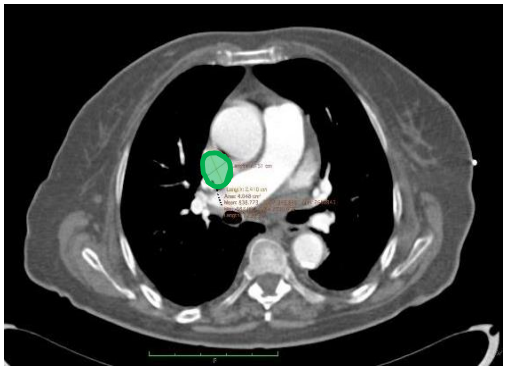
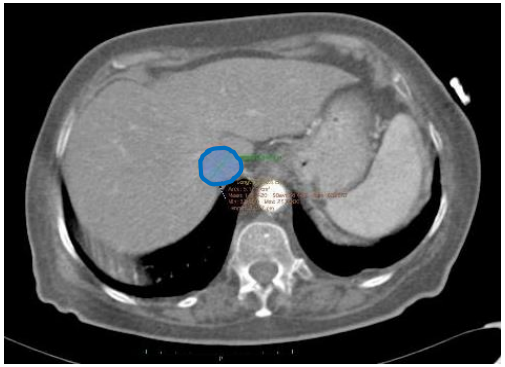
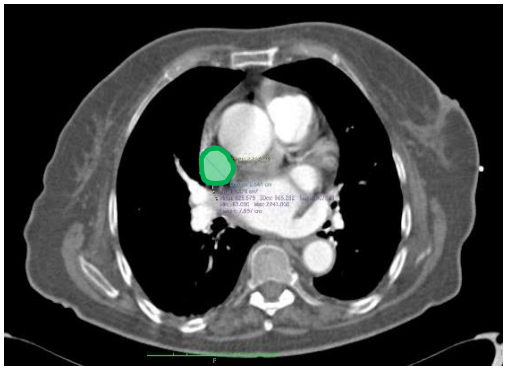
Computed tomography screening and measurements

Superior vena cava (SVC)

- Brachiocephali confluence 19.61 mm
- SVC at pulmonary artery top 23.23 mm
- SVC at pulmonary artery middle 23.75 mm
- SVC at pulmonary artery bottom 24.51 mm
- SVC at pulmonary artery junction 25.69 mm

Inferior vena cava (IVC)

- IVC at RA junction 34.6 mm
- IVC at top of hepatic veins 33.3 mm
- IVC below hepatic veins 26.6 mm
- IVC at 5 cm below RA junction 27.5 mm


Heart team discussion

- Old age
- High surgical risk (STS score 12%, Euro score II 23%)
- Anatomical features unfavorable for percutaneous transcatheter edge-to-edge repair (annulus dilatation 50 mm, large coaptation gap)
- Backflow in superior and inferior vena cava with v-wave >25 mmHg at catheterization
- Computed tomography anatomical features favorable for heterotopic bicaval valve implantation

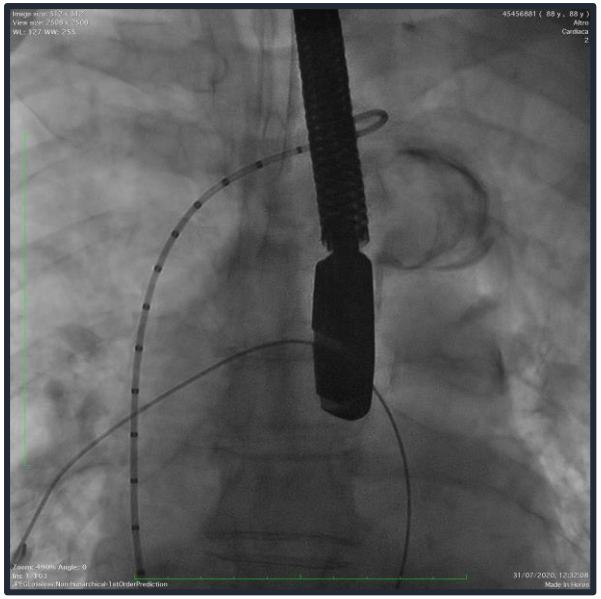
Percutaneous transcatheter bicaval valve implantation

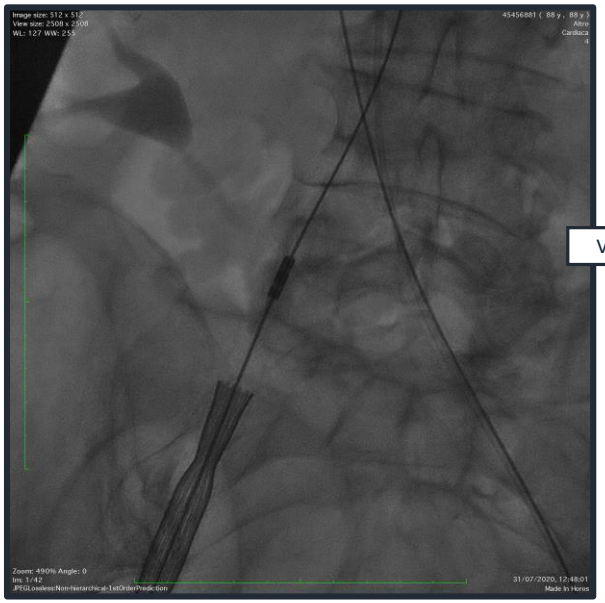
- General anesthesia and orotracheal intubation
- Right and left femoral vein access, 27 Fr and 9 Fr
- Fluoroscopy and TEE guided

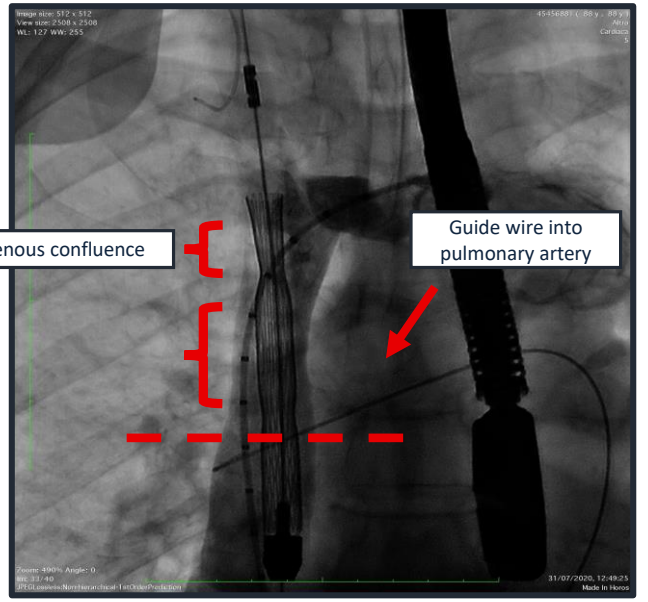
Superior vena cava valve
25 mm

Inferior vena cava valve
35 mm

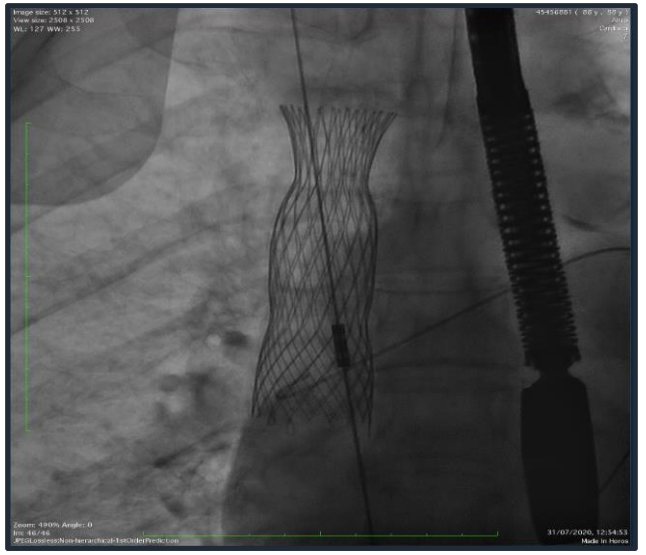
Procedure (1)
Superior vena cava valve implantation



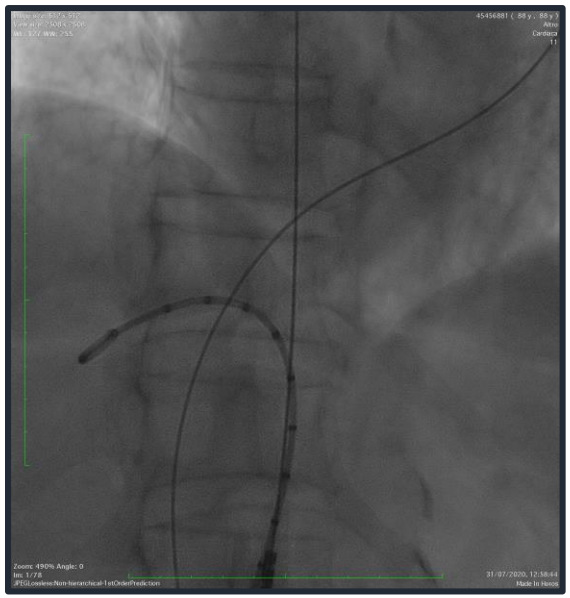


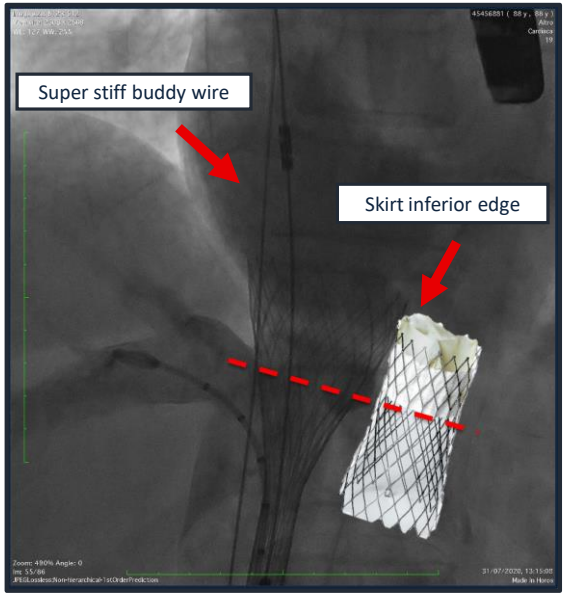


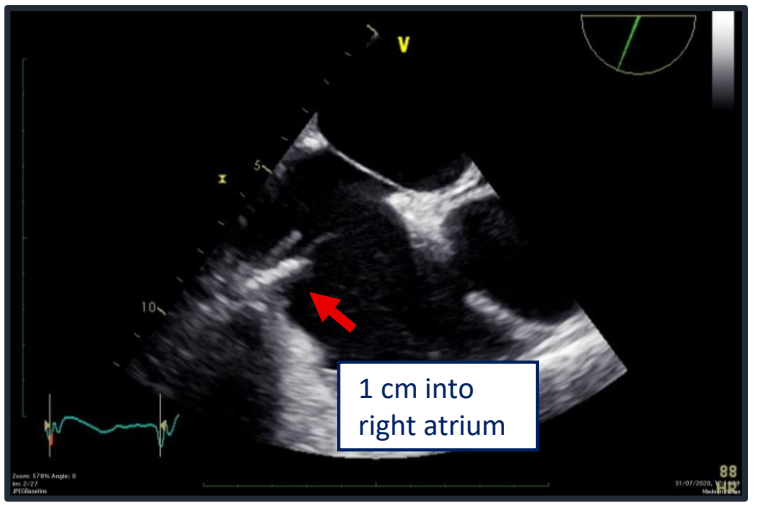
- Superior vena cava and brachiocephalic vein confluence angiography
- Guidewire into pulmonary artery used as a marker for valve positioning
- The central part of the valve is located between the brachiocephalic vein confluence and the right atrium

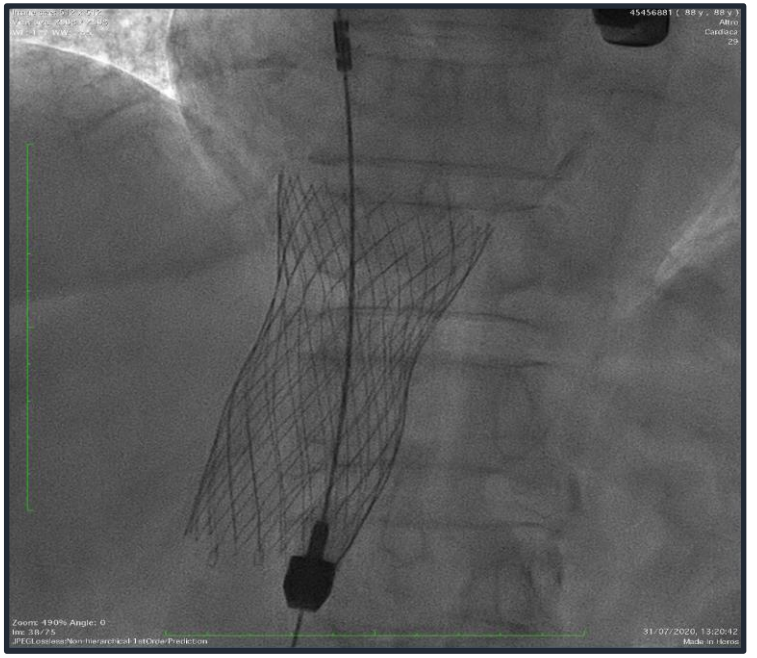


Procedure (2)
Inferior vena cava valve implantation





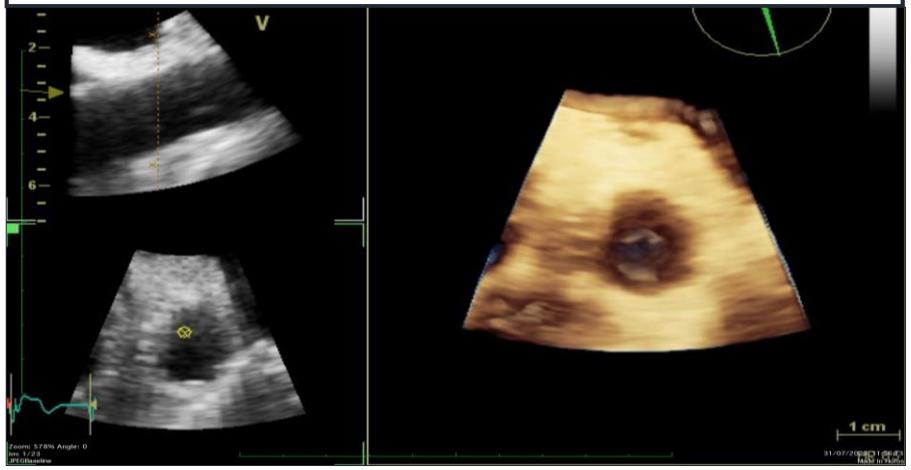




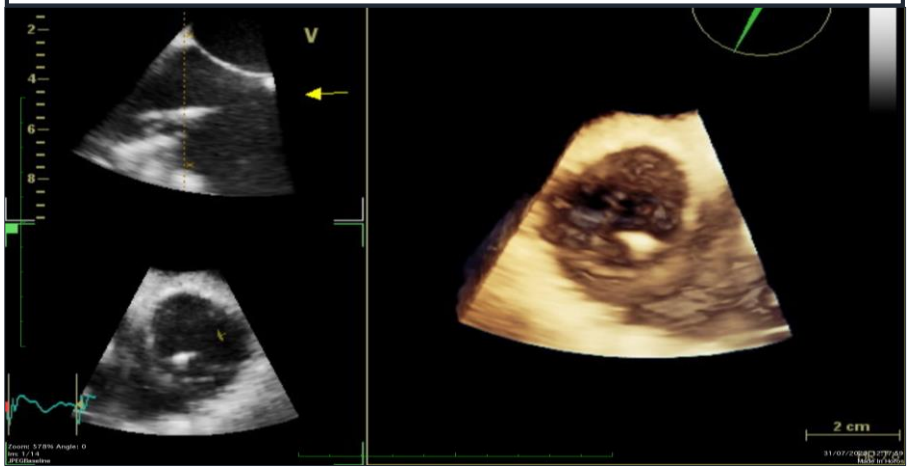
- Hepatic vein and inferior vena cava angiography
- Super stiff buddy wire to allow easier valve advancement
- Skirt inferior edge in inferior vena cava
- Upper edge of the valve protrudes 1 cm into the right atrium

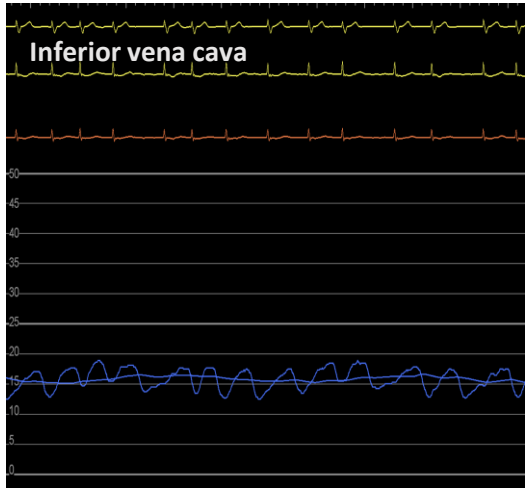
Post-implantation TEE and right catheterization

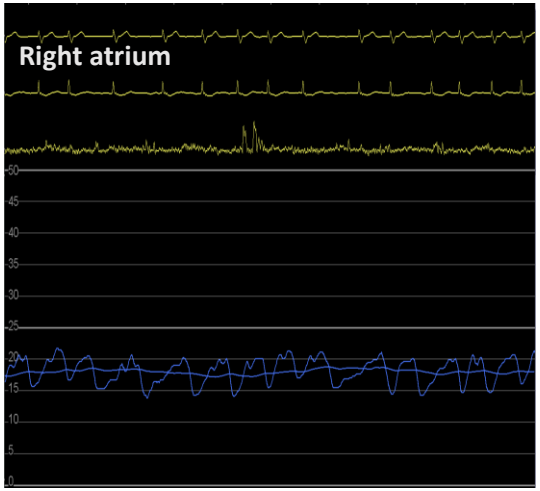
Superior vena cava



Inferior vena cava





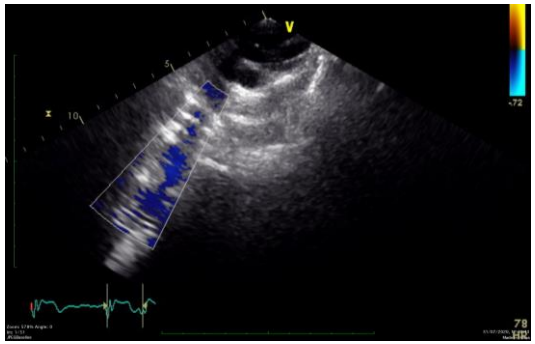


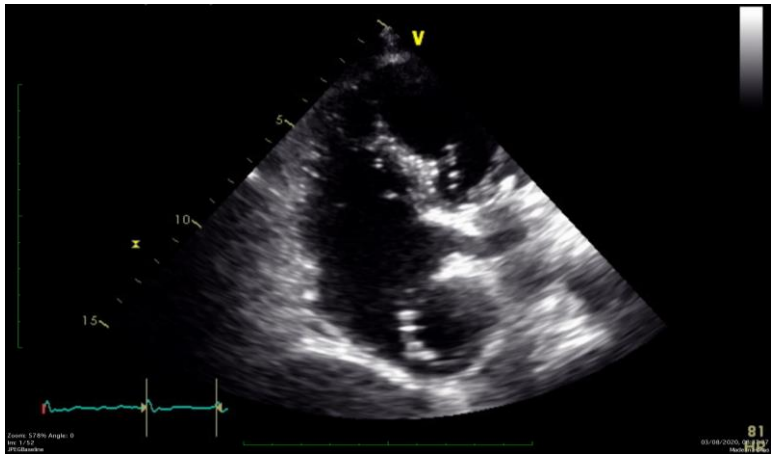
- ✓ TEE: successful implantation into superior and inferior vena cava
- ✓ Right catheterization: early reduction of inferior vena cava pressure (V-wave inferior vena cava 18 mmHg

Post-procedure transthoracic echocardiography and mild-term outcome

Subcostal view: bicaval valve, with normal antegrade flow in hepatic veins (minimal reversal flow).

Apical four-chamber view: normal position of the inferior vena cava valve in the right atrium.





- Transthoracic echocardiogram before discharge: absence of retrograde flow in superior vena cava, minimal retrograde flow in hepatic veins.
- At 8-months follow up: subjective improvement of symptoms, weight loss (-9 Kg), absence of legs oedema and jugular distention.

Take-home message

- Tricuspid valve disease has notoriously a poor prognosis and is an independent predictor of mortality
- Despite the clear relationship between tricuspid regurgitation and mortality, surgical treatment is often unsuitable due to several comorbidities affecting this group of patients
- Recently, several percutaneous therapeutic options have been developed in prohibitive surgical risk patients
- Among patients affected by severe symptomatic tricuspid regurgitation with prohibitive surgical risk, the bicaval valve implantation is a feasible and safe therapeutic option in order to improve symptoms