



**Institute for Cardiovascular Diseases of Vojvodina
Clinic for Cardiovascular Surgery
Sremska Kamenica, Serbia**

Left ventricle restoration in end-stage ischemic dilated cardiomyopathy

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Speaker Disclosure

Nothing to disclose



Background / Study Objective

- Increasing number of patients
- High costs for medical treatment
- High surgical morbidity and mortality
- Long waiting lists for heart transplantation
- No available donors



LV restoration in end-stage IsDCM

LEFT VENTRICULOGRAPHY

NORMAL



EF ~ 65% WITHOUT MITRAL AND
TRICUSPID REGURGITATION

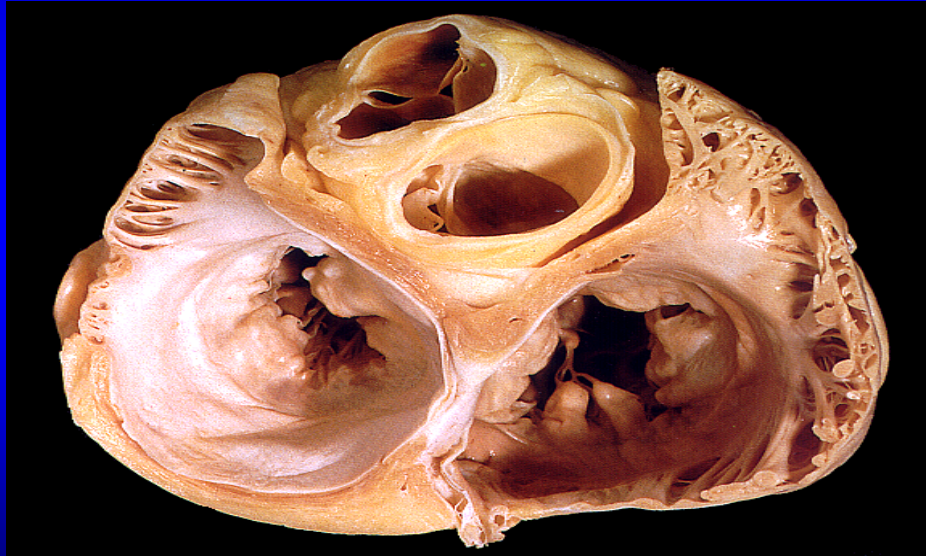
REMODELING OF THE HEART



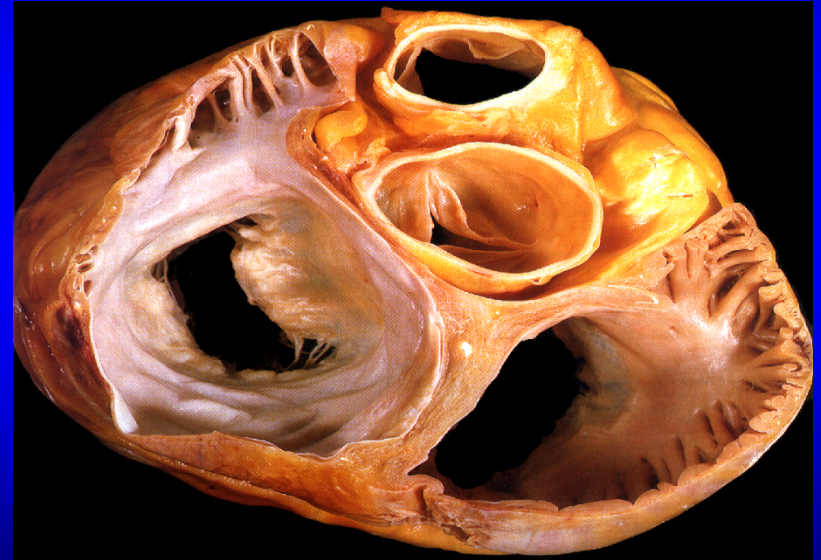
DILATED CARDIOMYOPATHY
EF ~ 20% MITRAL AND
TRICUSPID REGURGITATION



REMODELING OF THE HEART



Normal



Dilated



LV restoration in end-stage IsDCM

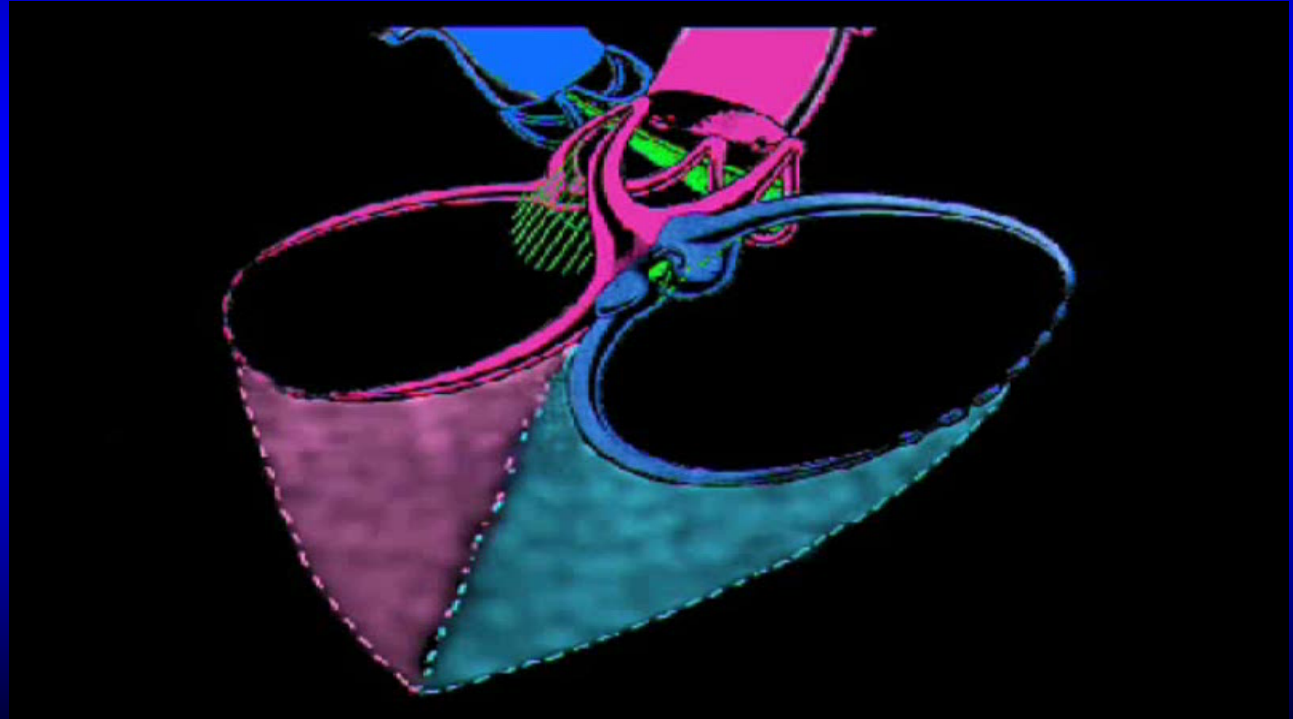
Mitral and tricuspid annulus dilatation in dilated cardiomyopathy



**DILATATION of
MITRAL ANNULUS**



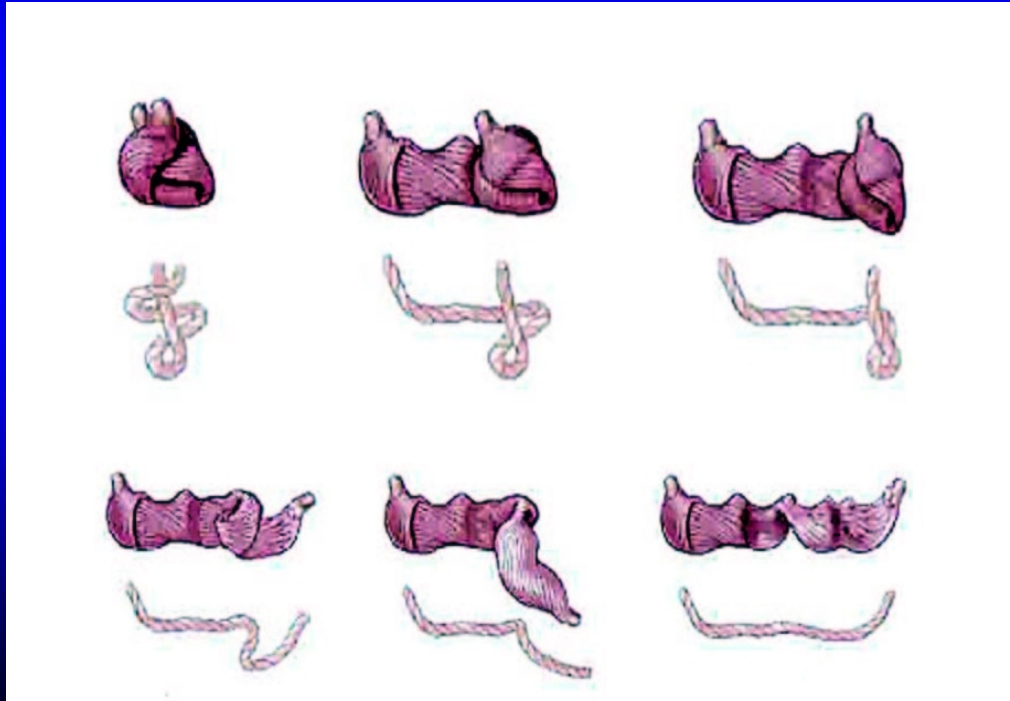
**DILATATION of
TRICUSPID
ANNULUS**





LV restoration in end-stage IsDCM

The helical myocardial band of Torrent Guasp: Potential implications in dilative cardiomyopathy





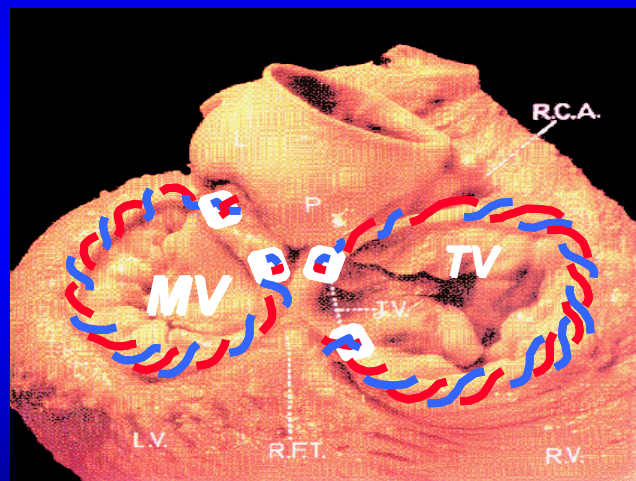
LV restoration in end-stage IsDCM

RADO procedure

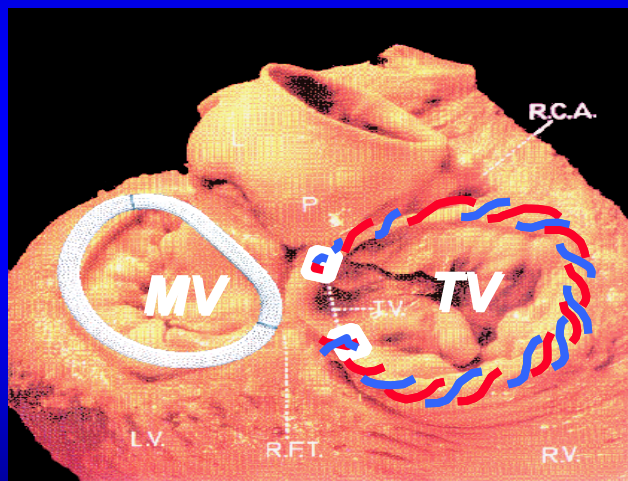
POSTERIOR SEMICIRCULAR
MITRAL ANNULOPLASTY

RING MITRAL ANNULOPLASTY

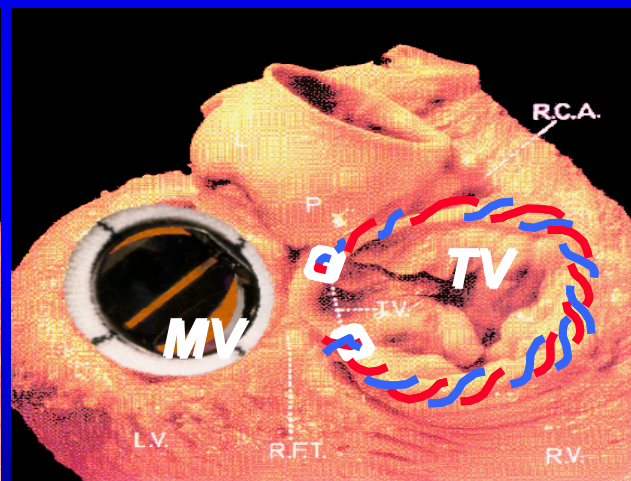
VALVE+ PRESERVATION OF
NATIVE MITRAL VALVE



- Reduction
- Flexibility
- 3-dimensional movement



- Reduction
- Flexibility



- Reduction

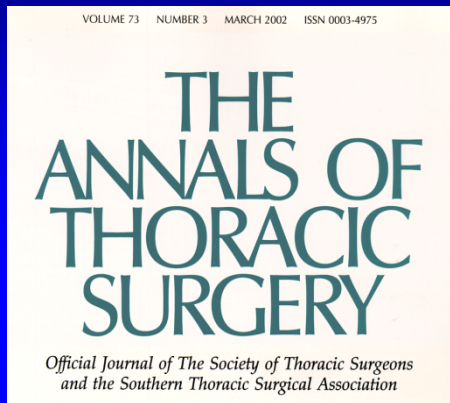


LV restoration in end-stage IsDCM





LV restoration in end-stage IsDCM



Reductive Annuloplasty of Double Orifices in Patients With Primary Dilated Cardiomyopathy

Ninoslav Radovanović, Bogoljub Mihajlović, Jan Seleštiansky, Vladimir Torbica, Milan Mijatov, Miroslava Popov and Živojin Jonjev

Systematic Reductive Annuloplasty of the Mitral and Tricuspid Valves in Patients with End-Stage Ischemic Dilated Cardiomyopathy

Živojin Jonjev, Milan Mijatov, Mikloš Fabri, Snežana Popović, Ninoslav Radovanović

University of Novi Sad, Clinic of Cardiovascular Surgery - Novi Sad, Serbia





Background / Study Objective

- Patients with end stage ischemic dilated cardiomyopathy (IsDCM) exhibit extensive remodeling of the left ventricle, and significant mitral and tricuspid regurgitation.
- We investigated if implantation of the artificial mitral valve with preservation of the native mitral valve could be used as a method combined with tricuspid annuloplasty and complete myocardial revascularization in end stage IsDCM.



LV restoration in end-stage IsDCM

Patients

Inclusion criteria for the study

- EF<30% ($25.6\pm 3.1\%$)
- LVEDd>7.0cm (7.3 ± 0.3 cm)
- Significant mitral and tricuspid regurgitation (3/4)
with coaptation depth of the mitral valve significantly
greater than 1.1cm

STS “risk of mortality score”= $22.04\pm 1.5\%$

Euroscore II= 7.04 ± 1.02



LV restoration in end-stage IsDCM

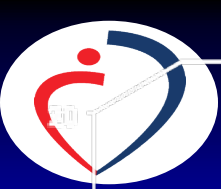
Patients

Inclusion criteria for LVAD clinical trials

- New York Heart Association functional class IV for 60 days,
- LVEF $<25\%$
- peak oxygen consumption <14 ml/min/kg (unless on balloon pump, intravenous inotropes, or physically unable to perform exercise test)
- or intra-aortic balloon pump or IV inotrope dependent for 14 days

Left Ventricular Assist Devices: A Rapidly Evolving Alternative to Transplant.

Mancini D, Colombo PC. J Am Coll Cardiol. 2015 Jun 16;65(23):2542-55.



LV restoration in end-stage IsDCM

No of PATIENTS 31

PERIOD

July 1, 2010
September 20, 2021

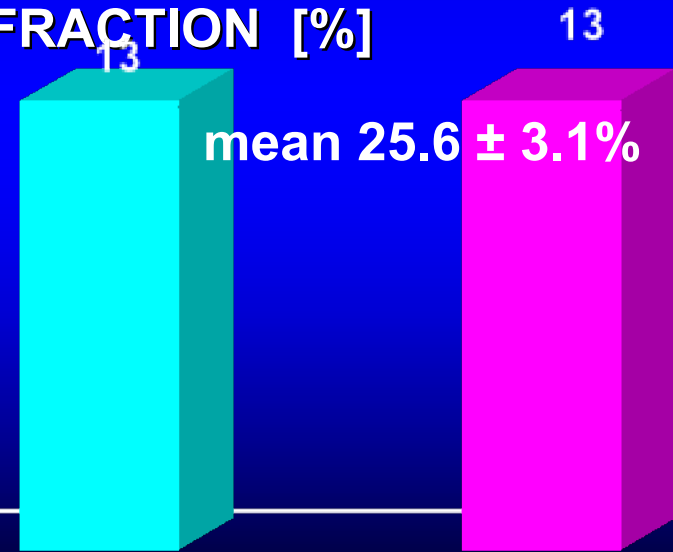
GENDER

Male 26 (83.87%)
Female 5 (16.12%)

AGE

57.7 years
(34-70)

**PREOPERATIVE EJECTION
FRACTION [%]**



Nº
P
t
s



LV restoration in end-stage IsDCM

MITRAL REGURGITATION

DEGREE	No PTS	%
IV	20	64.5
III	11	35.5
II	0	0.0
I	0	0.0

TRICUSPID REGURGITATION

DEGREE	No PTS	%
IV	9	29.1
III	22	70.9
II	0	0.0
I	0	0.0

PREOPERATIVE TRANSTHORACIC DOPPLER ECHOCARDIOGRAPHY

PREOPERATIVE HEMODYNAMIC DATA

MEAN CO	2.7	(2.1 to 6.8 l/min)
MEAN CI	1.4	(1.2 to 3.1 l/min/m ²)
MEAN CVP	8.2	(4 to 28 mmHg)
MEAN mPAP	40.2	(16 to 70 mmHg)
MEAN PCW	25.3	(10 to 41 mmHg)
MEAN PVR	649	80 to 1829 dyn.sec.cm-5



LV restoration in end-stage IsDCM

PREOPERATIVE MEDICAL TREATMENT

	No of pts	%
DIURETICS	31	100
DIGOXIN	26	83.8
ANTIARRHYTHMICS	13	41.9
ACE-INHIBITORS	31	100
INOTROPIC I.V. SUPPORT (>14 days)	19	61.3



LV restoration in end-stage IsDCM

OPERATIVE TECHNIQUE AND TACTICS

**CPB: MODERATE HYPOTHERMIA 30-32 °C
HEMODILUTION
OXYGENATOR - MEMBRANE**

STANDARD MYOCARDIAL PROTECTION

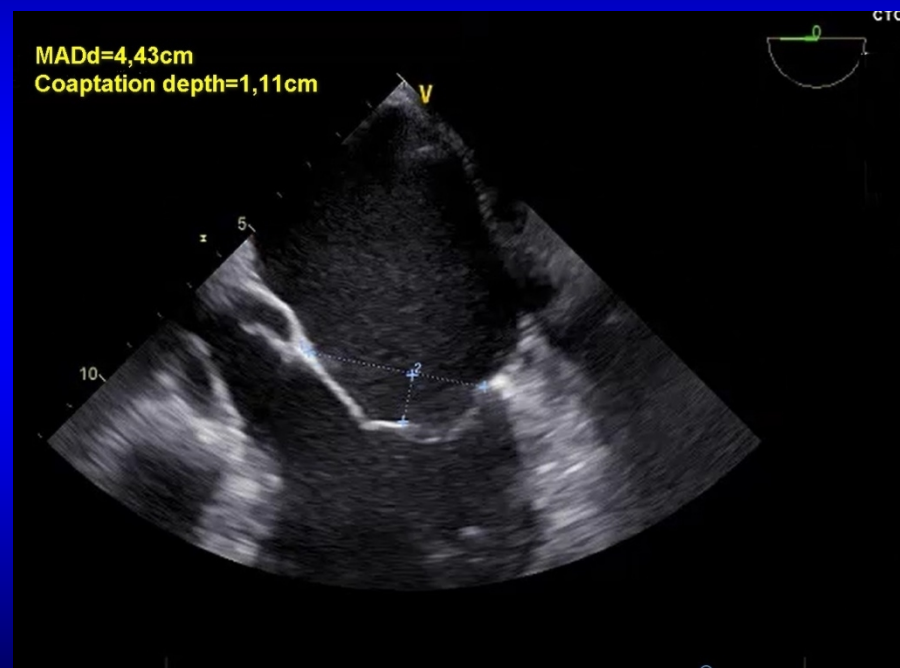
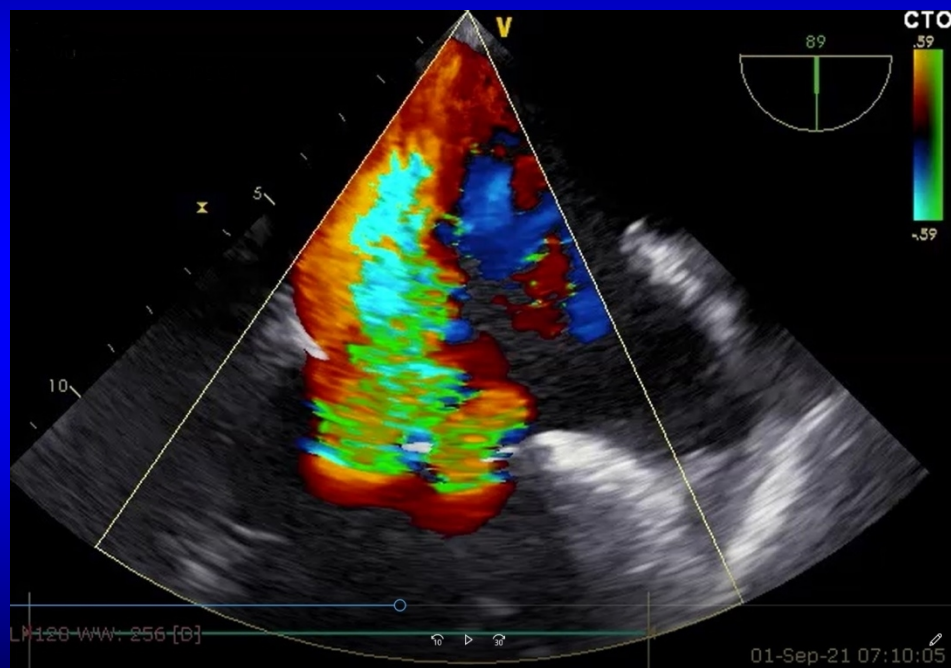
MINI TRANSSEPTAL APPROACH

**HEMODYNAMIC MONITORING:
SWAN GANZ
TEE**



LV restoration in end-stage IsDCM

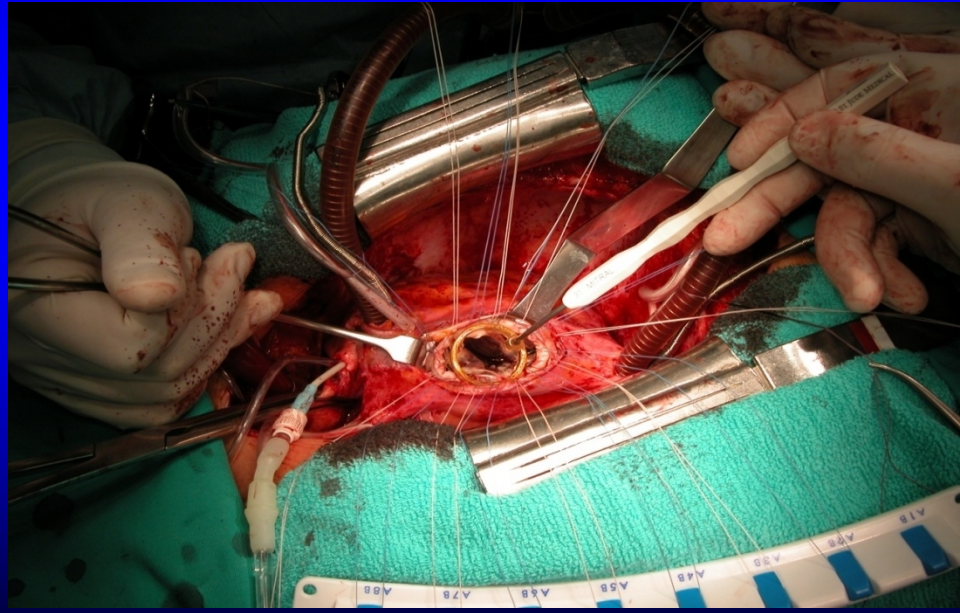
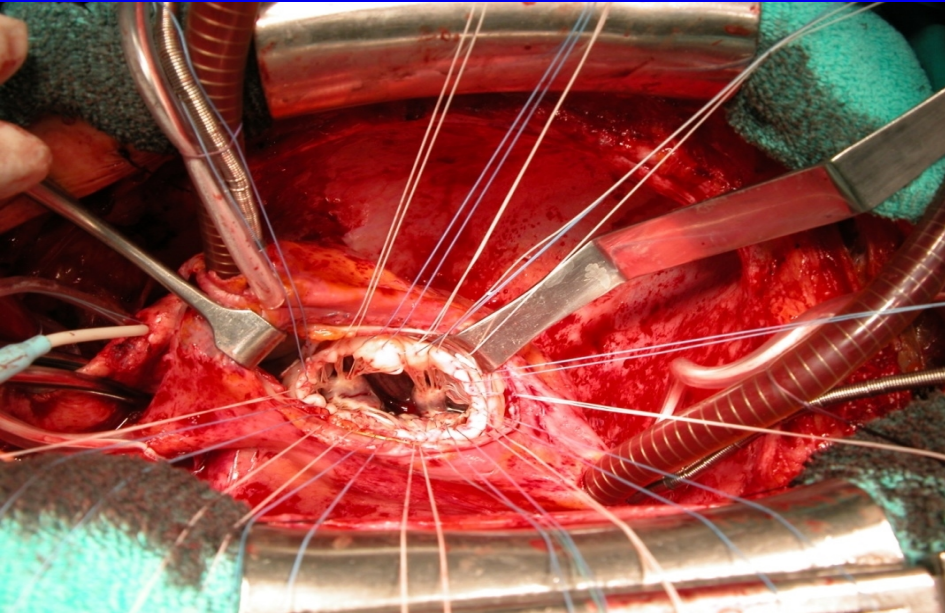
Perioperative TEE study





LV restoration in end-stage IsDCM

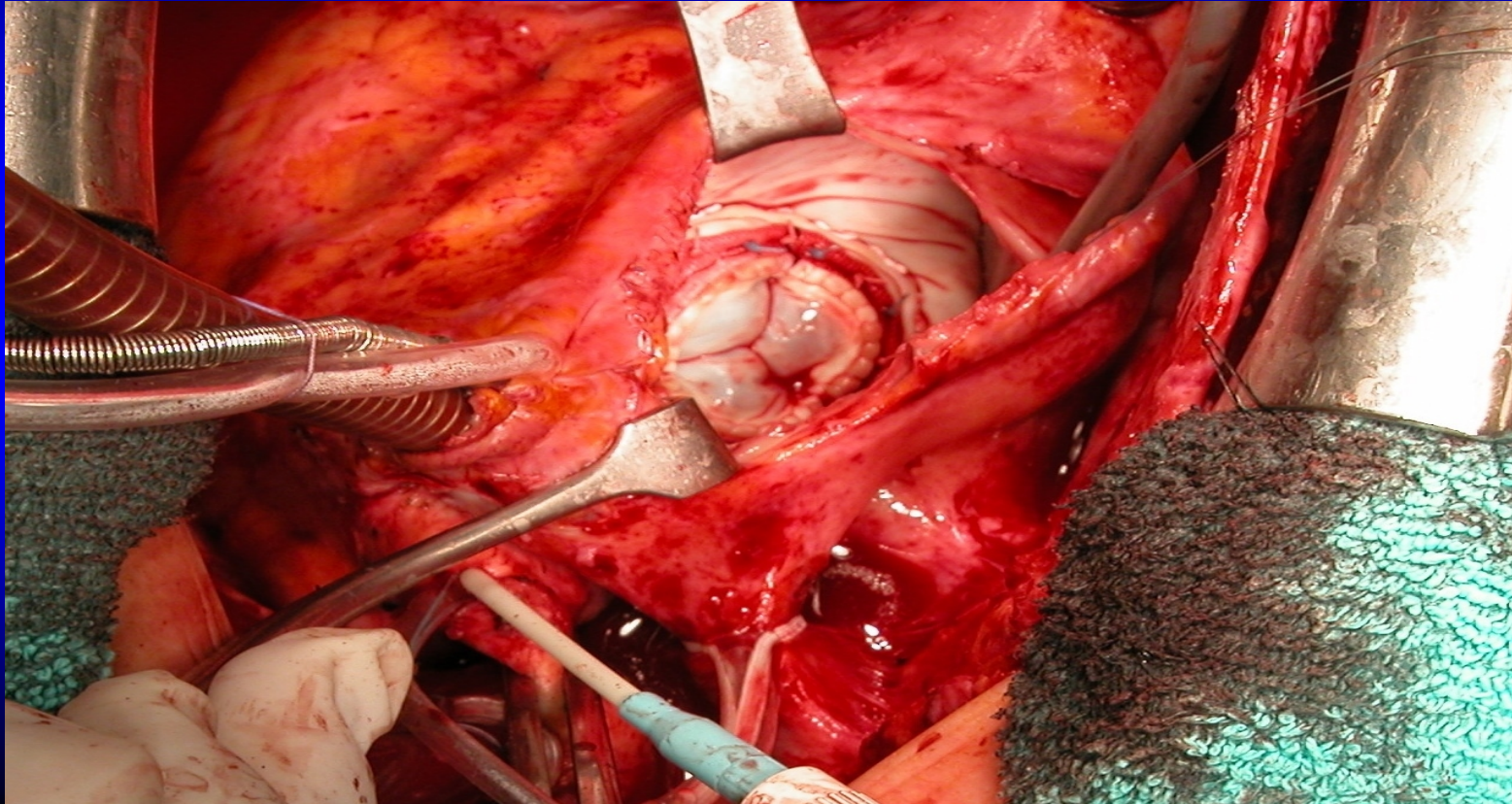
Implantation of the artificial mitral valve with preservation of the intact native mitral valve





LV restoration in end-stage IsDCM

**Implantation of the artificial mitral valve with
preservation of the intact native mitral valve**

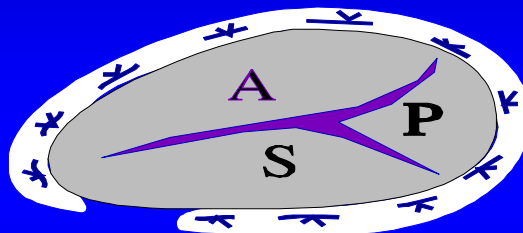




LV restoration in end-stage IsDCM

TRICUSPID ANNULOPLASTY

740 \$

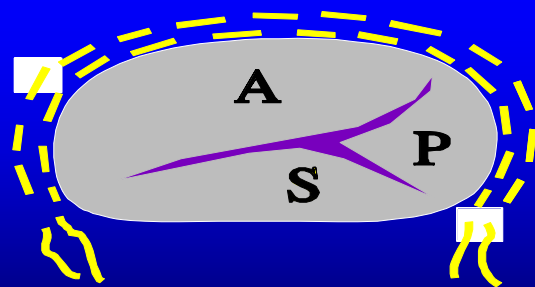


Ring annuloplasty

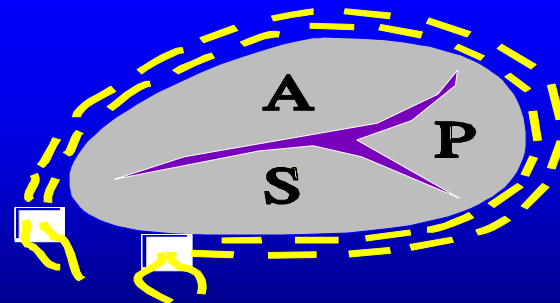


3 \$

REDUCTION
REMODULATION
RIGIDITY



DE VEGA



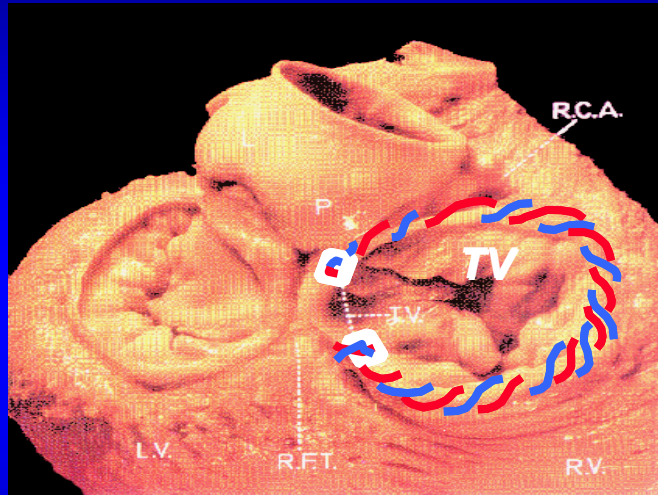
Novi Sad-Serbia



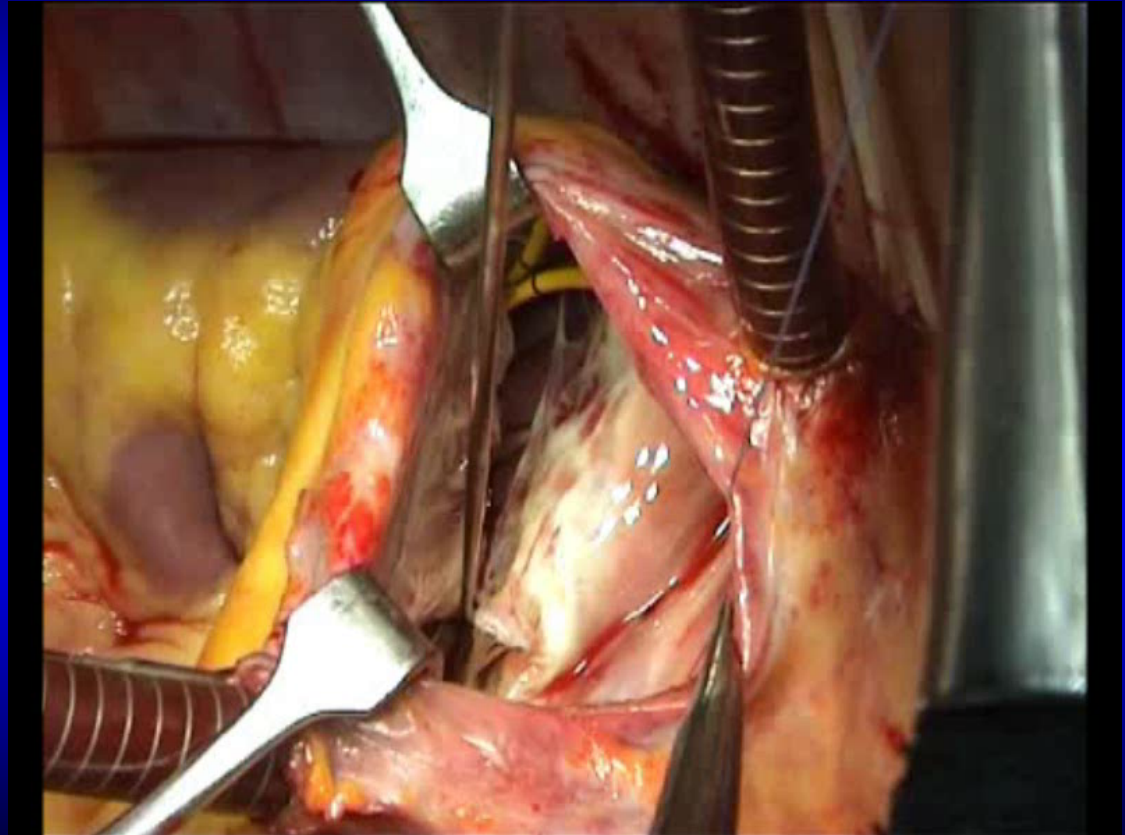


LV restoration in end-stage IsDCM

TRICUSPID ANNULOPLASTY – DE VEGA'S MODIFICATION



- Reduction
- Flexibility
- 3-dimensional movement

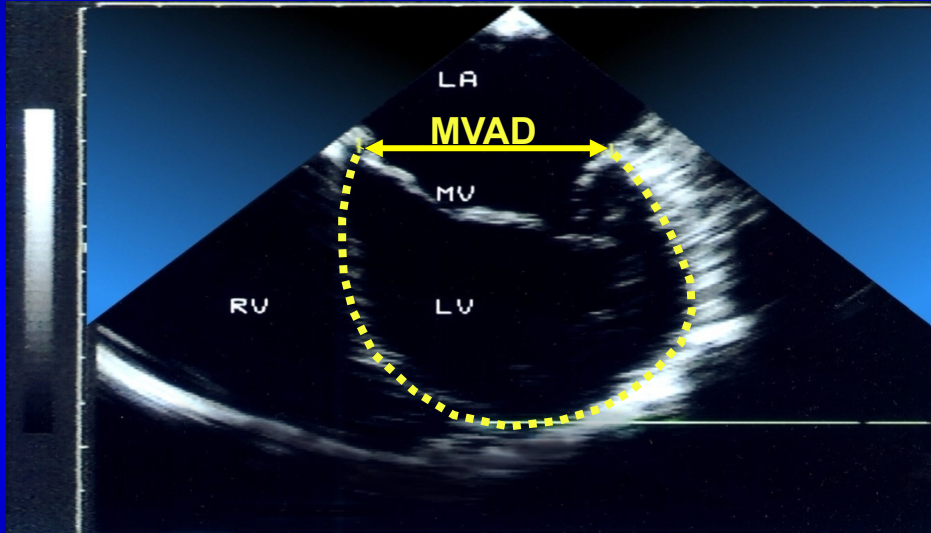




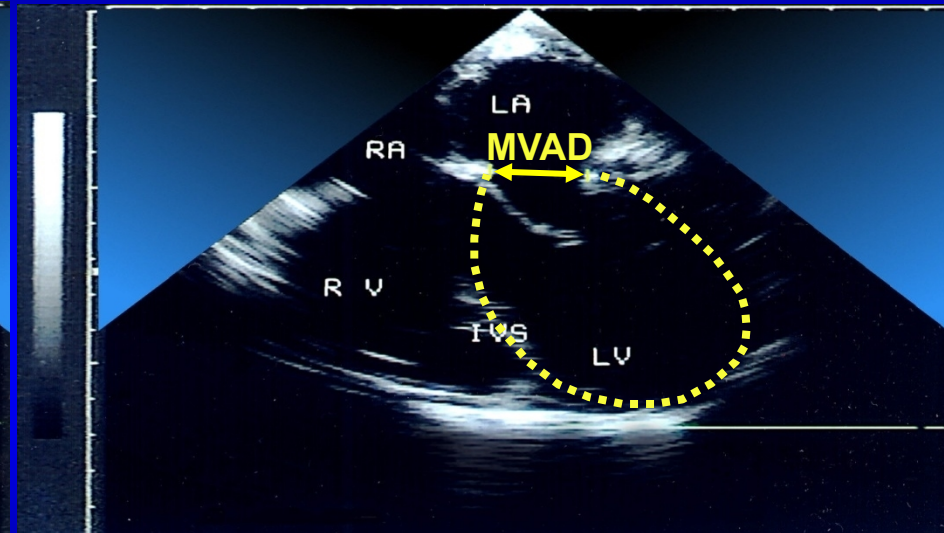


LV restoration in end-stage IsDCM

REVERSE REMODELING OF THE LEFT VENTRICLE



MITRAL ANNULUS AREA=13.1 cm²
BEFORE ECC



DECREASED MITRAL ANNULUS AREA
AFTER ECC

**REDUCTION of MITRAL ANNULUS AREA DECREASES
SPHERICITY of the LEFT VENTRICLE**

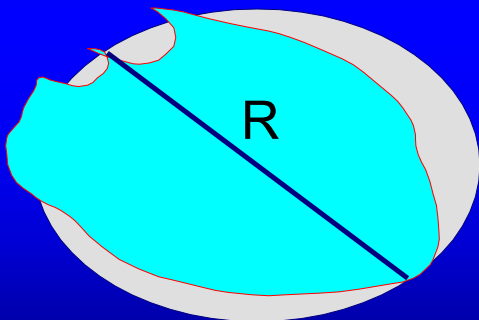


LV restoration in end-stage IsDCM

TRANSESOPHAGEAL ECHOCARDIOGRAPHYC STUDY

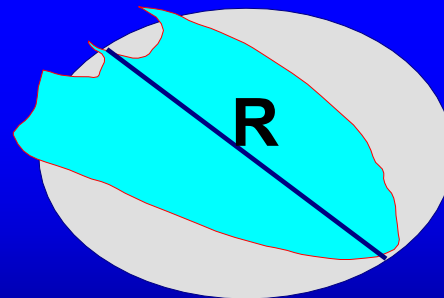
	Before op.	p	After CPB	Normal physiological value
SI	84.2%	< 0.01	68.9%	60%

DILATED HEART



TEE
4 CHAMBER
VIEW

NORMAL HEART



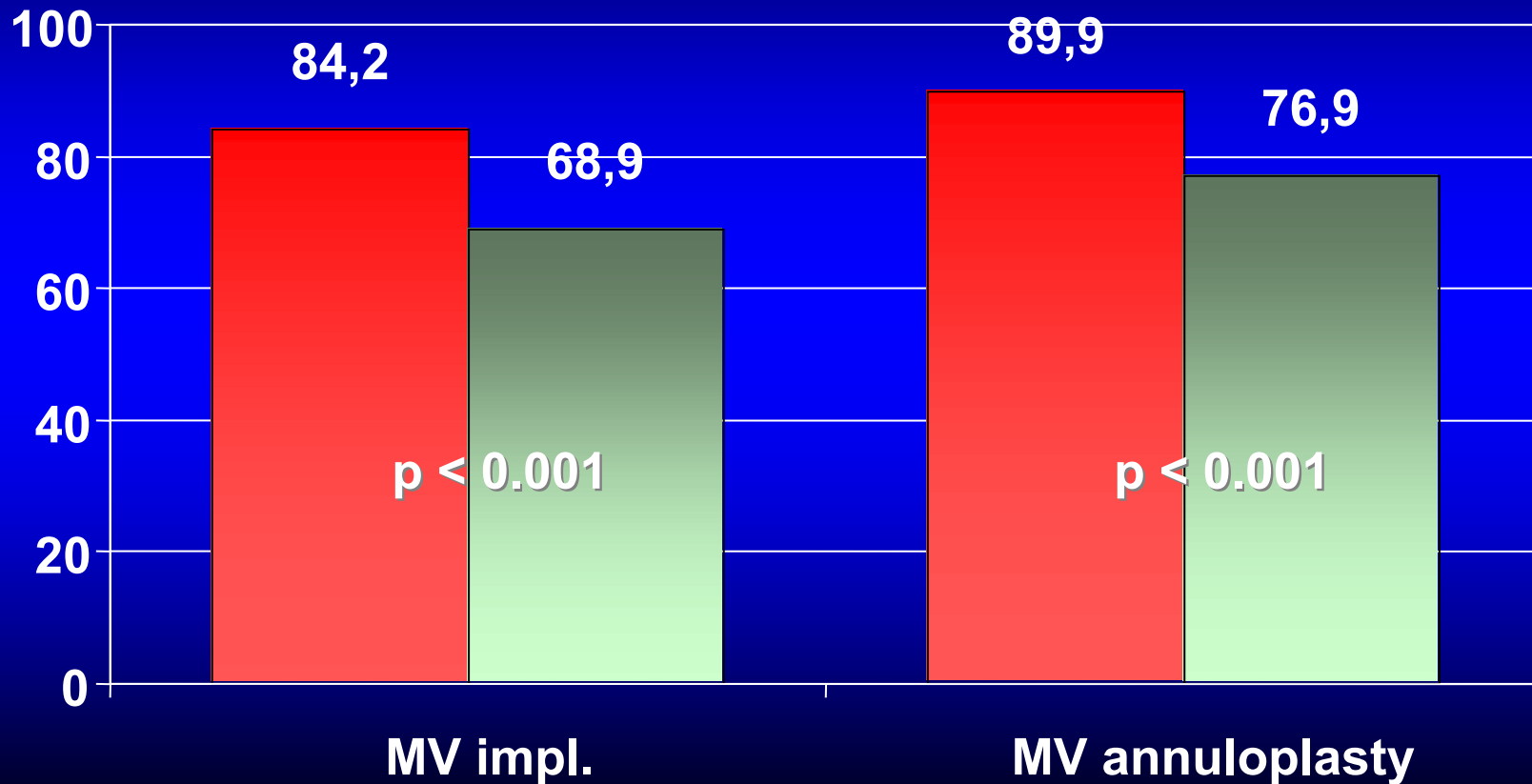
$$SI = \frac{LV\ AREA}{CIRCLE\ AREA} \times 100$$

R – CIRCLE DIAMETER (LV LONG AXIS)
CIRCLE AREA $P = R^2 \pi / 4$



LV restoration in end-stage IsDCM

ENDSYSTOLIC SPHERICITY INDEX- SI (%)

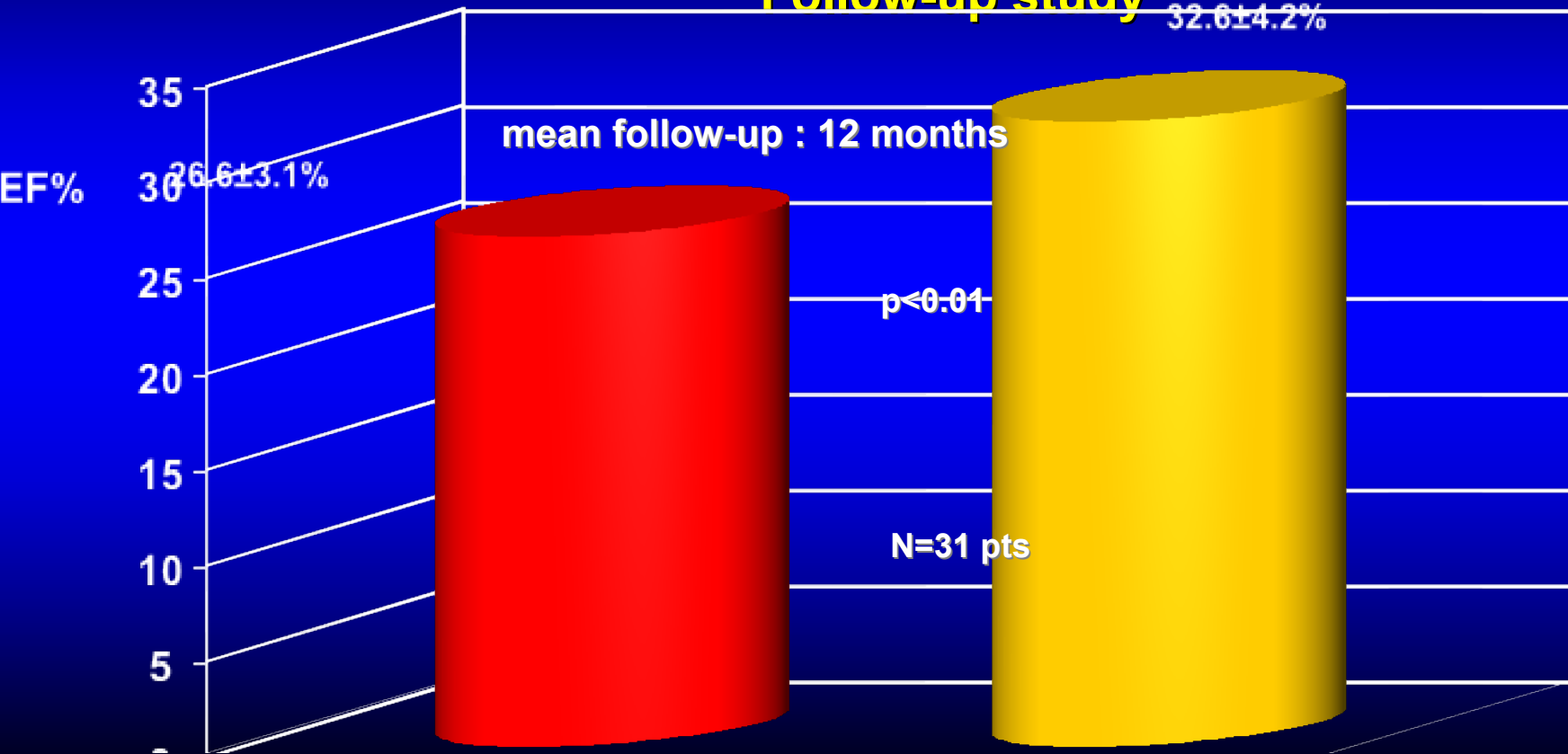




LV restoration in end-stage IsDCM

EJECTION FRACTION - TTE

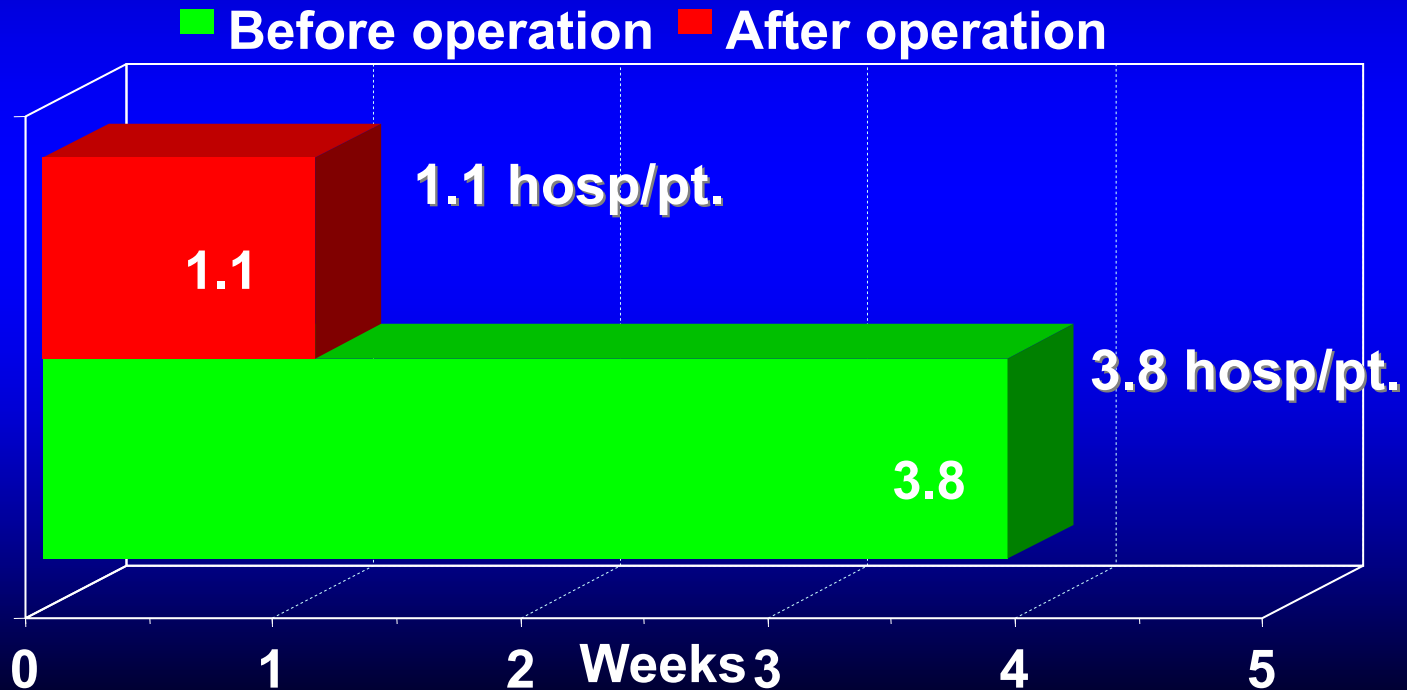
Follow-up study





LV restoration in end-stage IsDCM

AVERAGE LENGTH OF HOSPITALIZATION





LV restoration in end-stage IsDCM

NYHA CLASSIFICATION

Follow-up study

No pts

24

IV°

7

III°

0

II°

0

I°

Before Op.

2

5

$p < 0.001$

1

death

No pts

1

IV°

0

III°

2

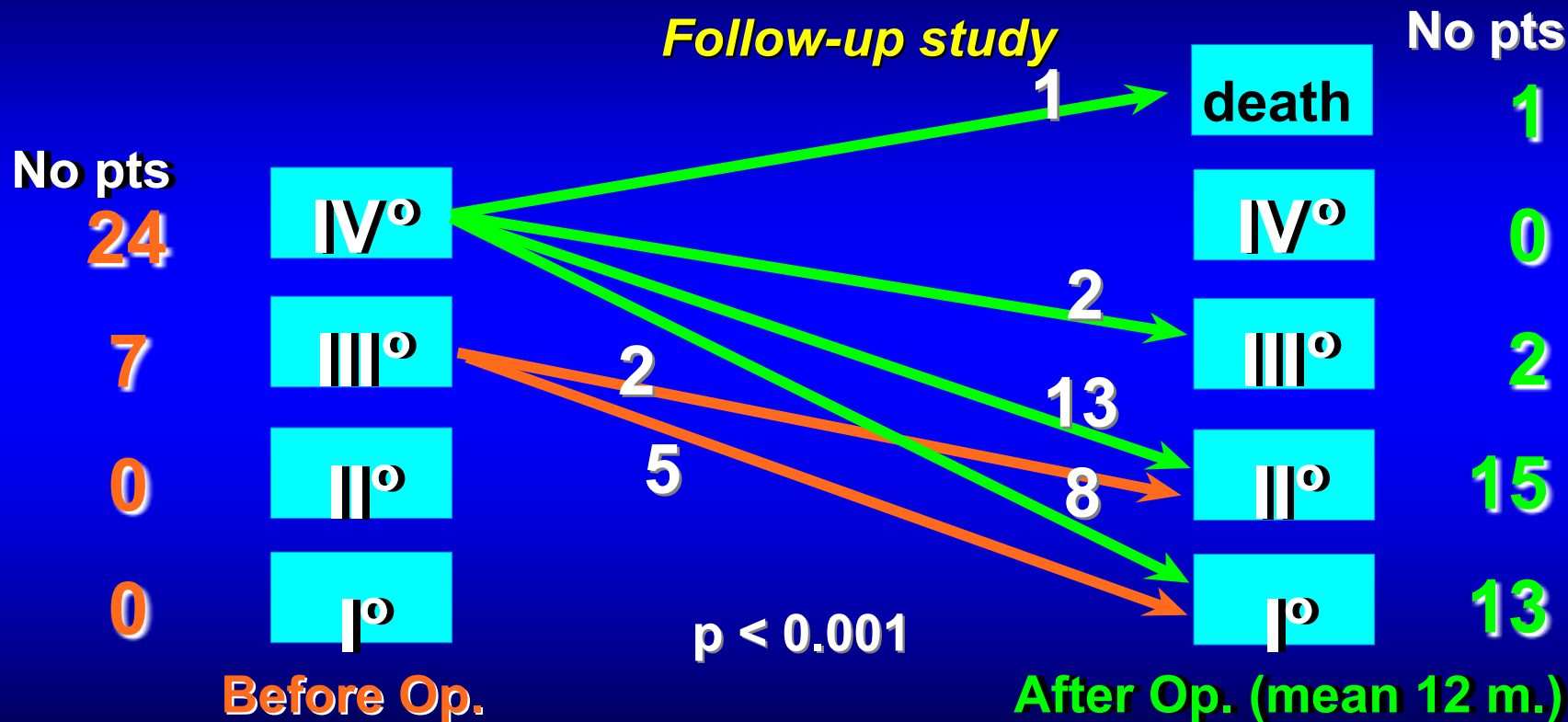
II°

15

I°

13

After Op. (mean 12 m.)





CONCLUSION - I

- **Implantation of the arteficial mitral valve with preservation of the native mitral aparathus changes spherical geometry of the left ventricle, and slows down progression of heart failure.**
- **Such procedure should not be considered as a simple valve repair but ventricular repair as well.**



CONCLUSION - II

Our procedure could be accepted as a bridge to heart transplantation, or even a destination therapy in selected cases.

We recommend LV restoration in addition to CABG in the treatment of IsDCM, before or just after the first episode of decompensation.