Percutaneous Intervention in Valvular Heart Disease: MS & MR

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Worldwide perspective of VHD;

-***Epidemiology :*** Western Vs Developing countries

-***Classification, Categorization, Definitions:***

Single,Multi,Mixed ,Combined

Pathophysiology, Mechanisms & Hemodynamics

Severity:Subjective/Objective

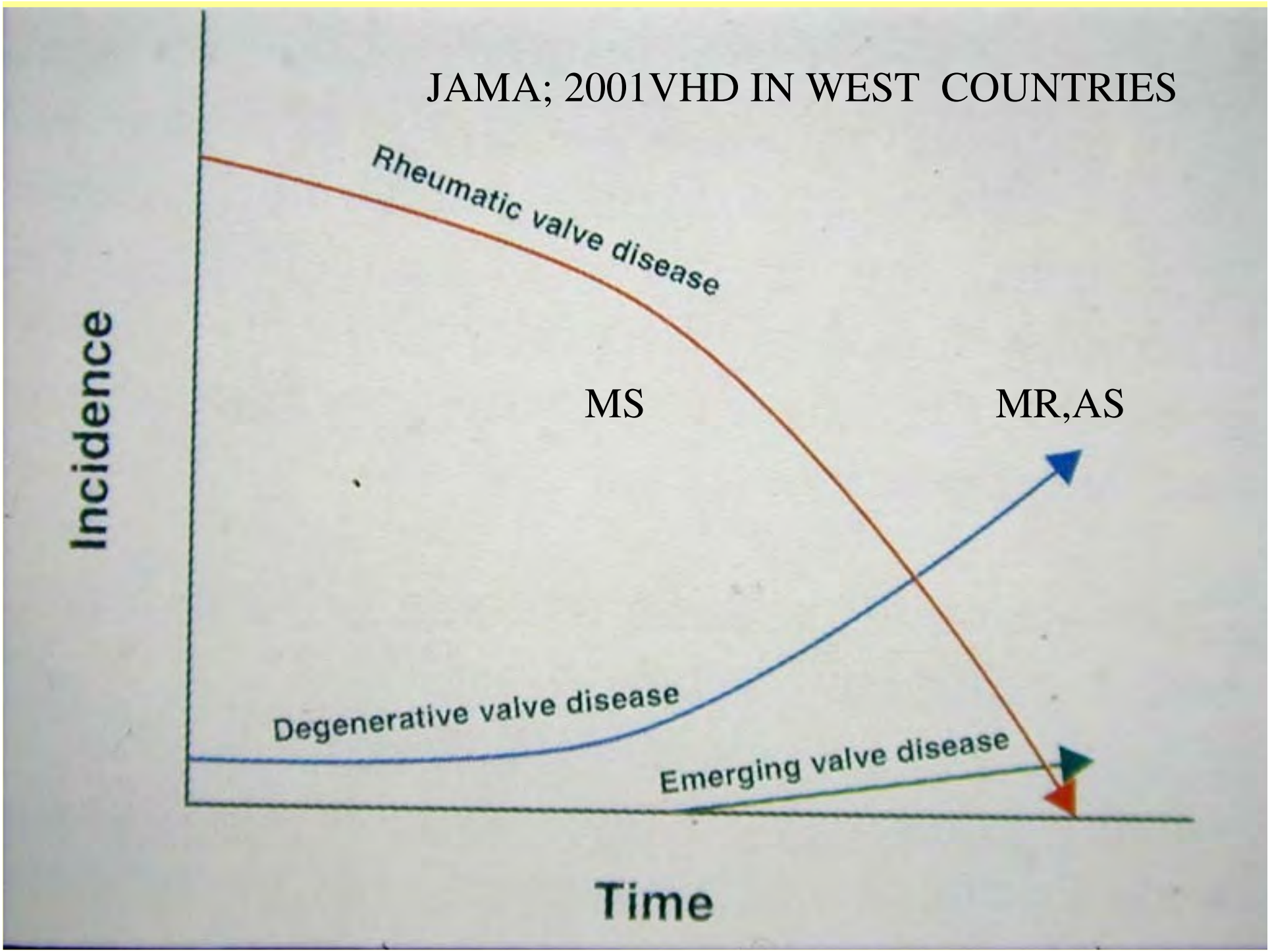
-***Approach :***Structure/Morphology & Functioning interrelations

Ventricular function

- ***Indications Vs Contraindications for Intervention***

Therapeutic Aim :

maintaining native valve normal function !

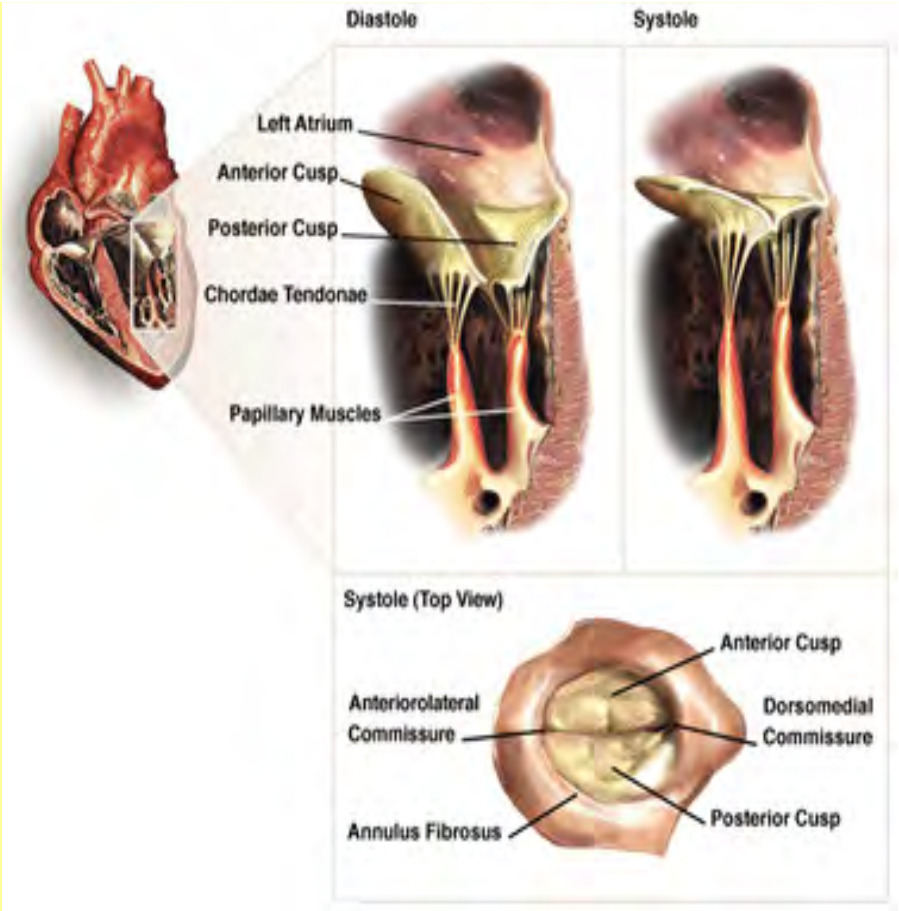

JAMA; 2001VHD IN WEST COUNTRIES
Rheumatic valve disease
MS
MR,AS
Incidence
Degenerative valve disease
Emerging valve disease
Time

Mitral valve apparatus;

Anatomical **Vs** ***Functional***

Elements

Annulus	LA Wall
Leaflets	
Chordae Tendinae	LV Wall
Papillary Muscles	



A valve may function normally and yet be anatomically abnormal !

Beware of anatomical variations !

Keeping Native Structures ; Maintaining Function!

Assessment of Structure & Function of Rh MS:

Non Invasive **-**Cardiac Auscultation;The issue of pliability

-Echocardiography; Morphology & Function

- The different Scores

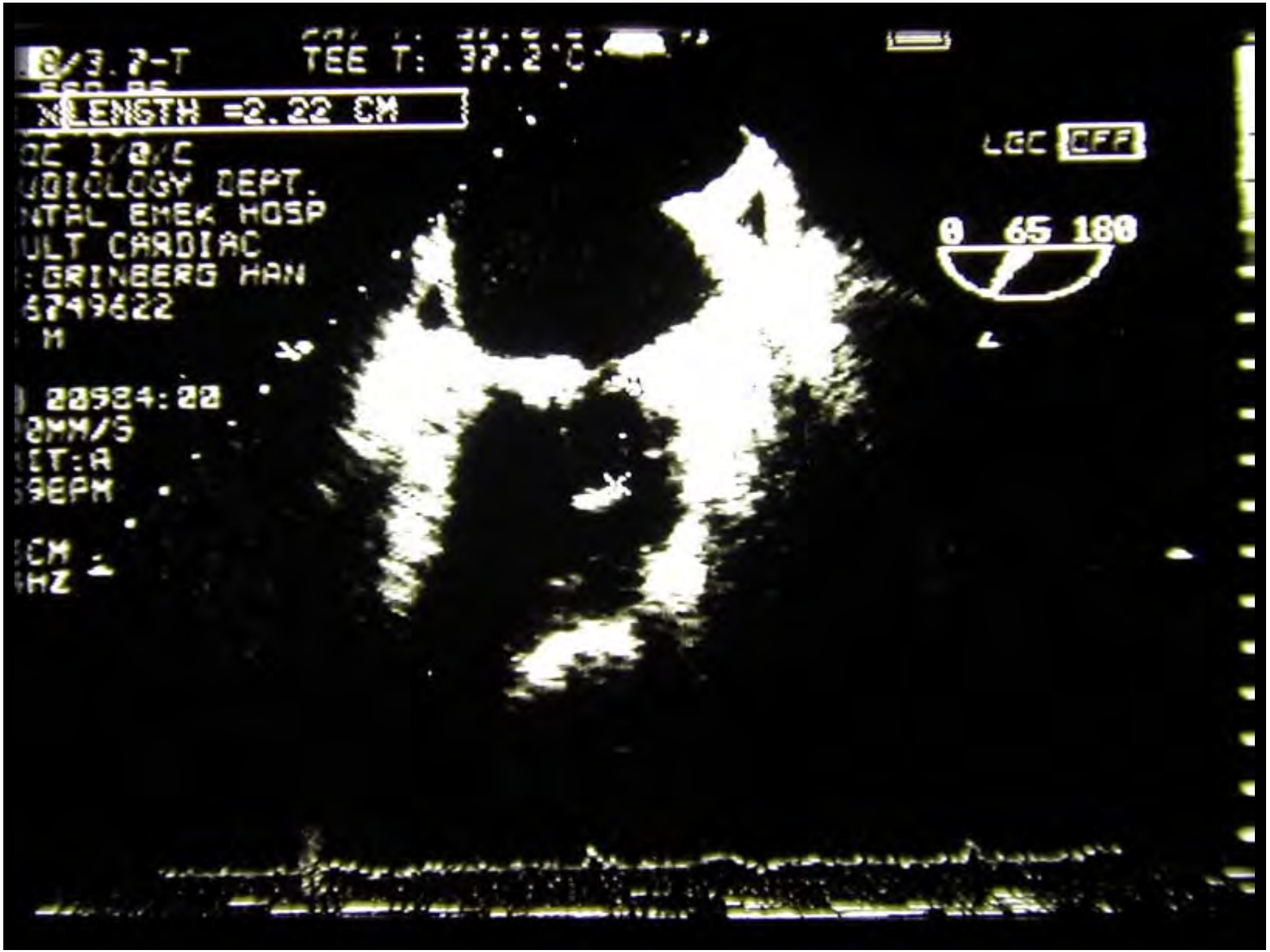
Invasive **-** Fluoroscopy; Calcification

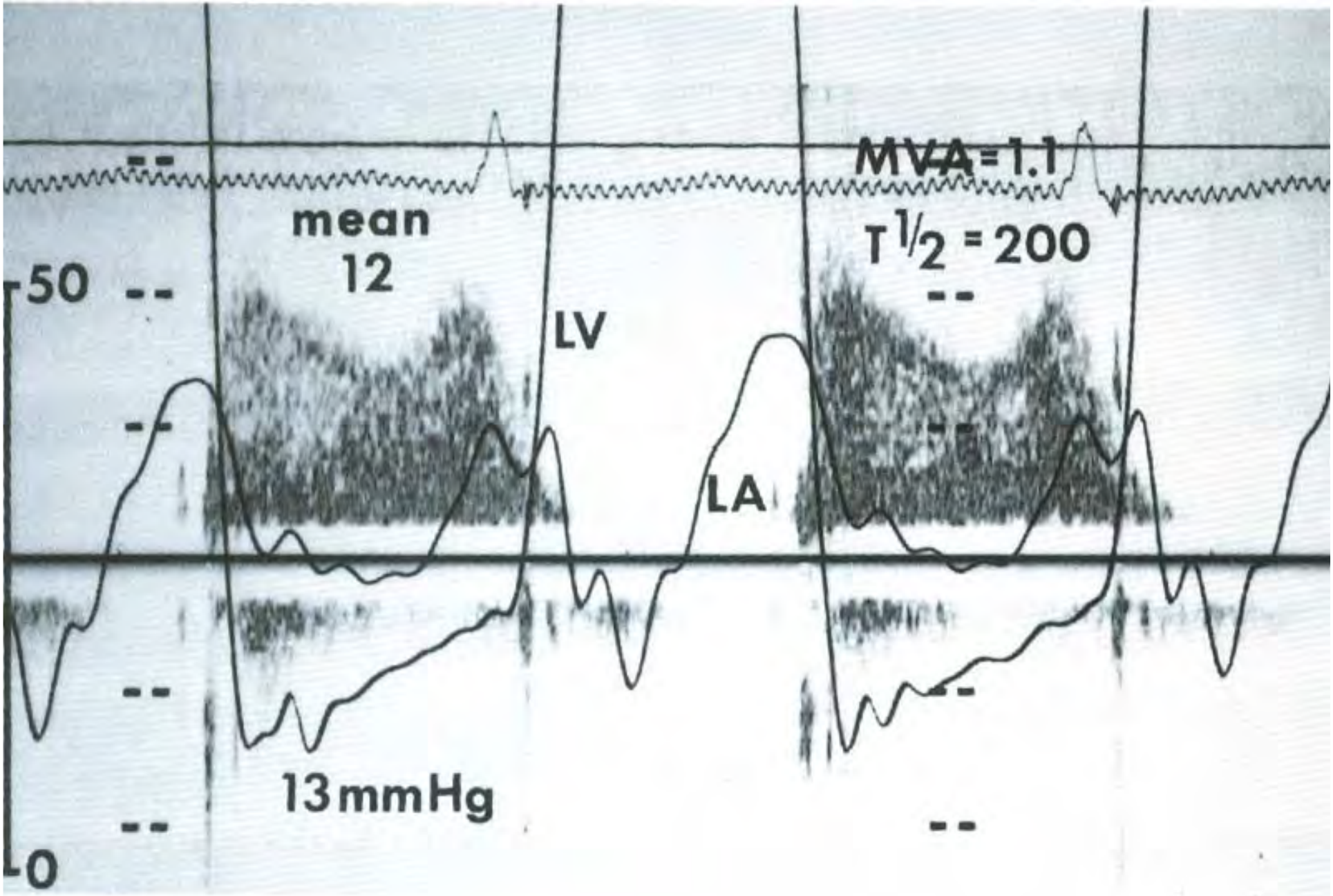
-Ventriculography: MSDR

-LA- Pressure Wave Analysis: LAC- Wave

During PBMC**- "Balloon impasse "- sign**

-"Balloon Compression "-sign


TEE T: 37.2°C
LENGTH =2.22 CM
LGC CFF
0 65 180
UROLOGY DEPT.
NTAL EMEK HOSP
ULT CARDIAC
:GRINBERG HAN
6749622
M
20:20
2MM/S
T:A
96PM
CM
HZ


MVA=1.1
mean
12
T 1/2 = 200
50
LV
LA
13mmHg
0

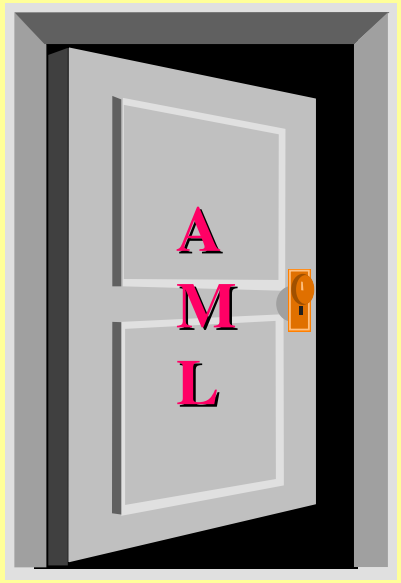
The Phenomen of Rheumatic Frozen Post Mitral Leaflet;

The Single Wing Door Mechanical Model

Equivalent model

Mitral ring annuloplasty

Ant. An Segment



Post An. Segment

Different Echocardigraphic scores

1. T Wilkins, V Abascal - 1988-MGH

2. C Reid -1989-USC

3. B Cormier -1994 - Tenon, & Bichat

4. R Padial -1996 -MGH-(for MR prediction)

5. D Shaw - 2000-WGH- Ed-UK-(for commissural calcification)

Table 5: Anatomic classification of the mitral valve (Massachussetts General Hospital, Boston): echocardiographic examination

Leaflet Mobility
1. Highly mobile valve with restriction of only the leaflet tips
2. Midportion and base of leaflets have reduced mobility
3. Valve leaflets move forward in diastole mainly at the base
4. No or minimal forward movement of the leaflets in diastole
Valvular Thickening
1. Leaflets near normal (4-5mm)
2. Midleaflet thickening, marked thickening of the margins
3. Thickening extends through the entire leaflets (5-8 mm)
4. Marked thickening of all leaflet tissue (>8-10 mm)
Subvalvular Thickening
1. Minimal thickening of chordal structures just below the valve
2. Thickening of chordae extending up to one third of chordal length
3. Thickening extending to the distal third of the chordae
4. Extensive thickening and shortening of all chordae extending down to the papillary muscle
Valvular Calcification
1. A single area of increased echo brightness
2. Scattered areas of brightness confined to leaflet margins
3. Brightness extending into the midportion of leaflets
4. Extensive brightness through most of the leaflet tissue

Source: Wilkins GT, Gillam LD, Weyman AE, et al. Percutaneous balloon dilatation of the mitral valve: an analysis of echocardiographic variables related to outcome and the mechanism of dilatation. *Br Heart J* 1988; 60: 299-308.
Note: The final score is found by adding each of components.

Our daily practice

Commissures

Chordae T.Length

<u>Ant</u> Mitral Leaflet

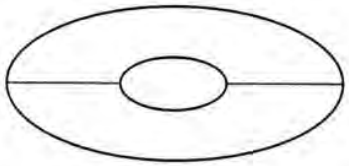
Table 6: Anatomic classification of the mitral valve

Echocardiographic Group	Mitral valve anatomy
Group 1	Pliable noncalcified anterior mitral leaflet and mild subvalvular disease, i.e., thin chordae ≥ 10mm long
Group 2	Pliable noncalcified anterior mitral leaflet and severe subvalvular disease, i.e., thickened chordae < 10 mm long
Group 3	Calcification of mitral valve of any extent, as assessed by fluoroscopy, whatever of subvalvular apparatus

Source: Iung B, Cormier B, Ducimetiere P, et al. Immediate results of percutaneous mitral commissurotomy. *Circulation* 1996; 94: 2124-2130

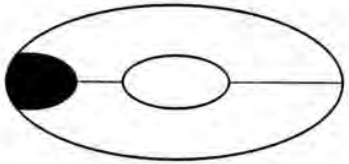
Severe stenosis but no bright echos across either commissure

Grade: 0+0+0+0=0



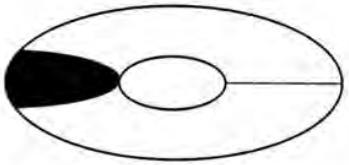
Bright echos extending across one half of posteromedial commissure

Grade: 1+0+0+0=1



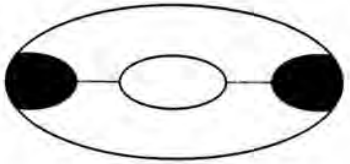
Bright echos extending throughout posteromedial commissure

Grade: 1+1+0+0=2



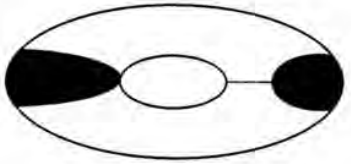
Bright echos across half of each commissure

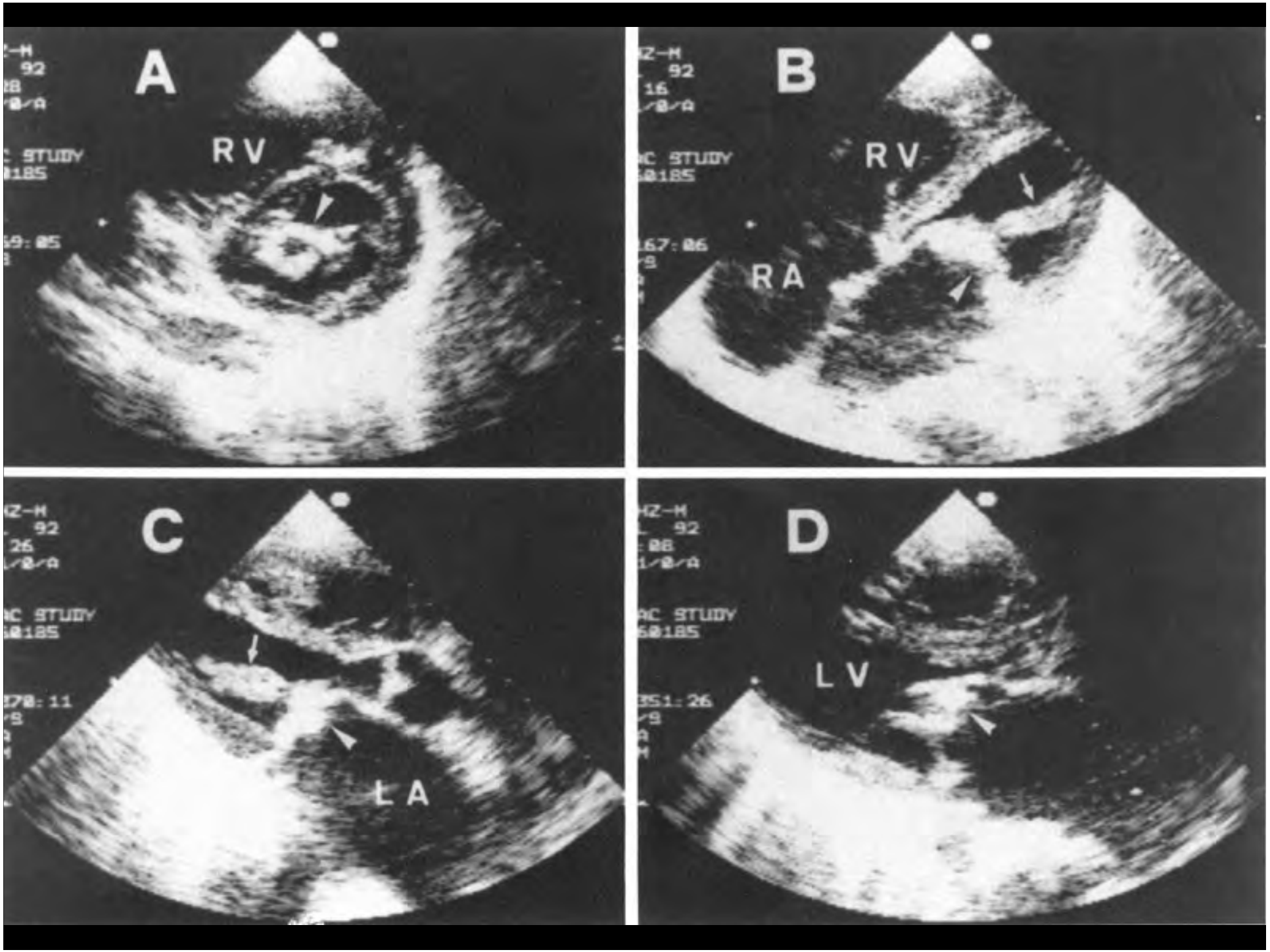
Grade: 1+0+0+1=2

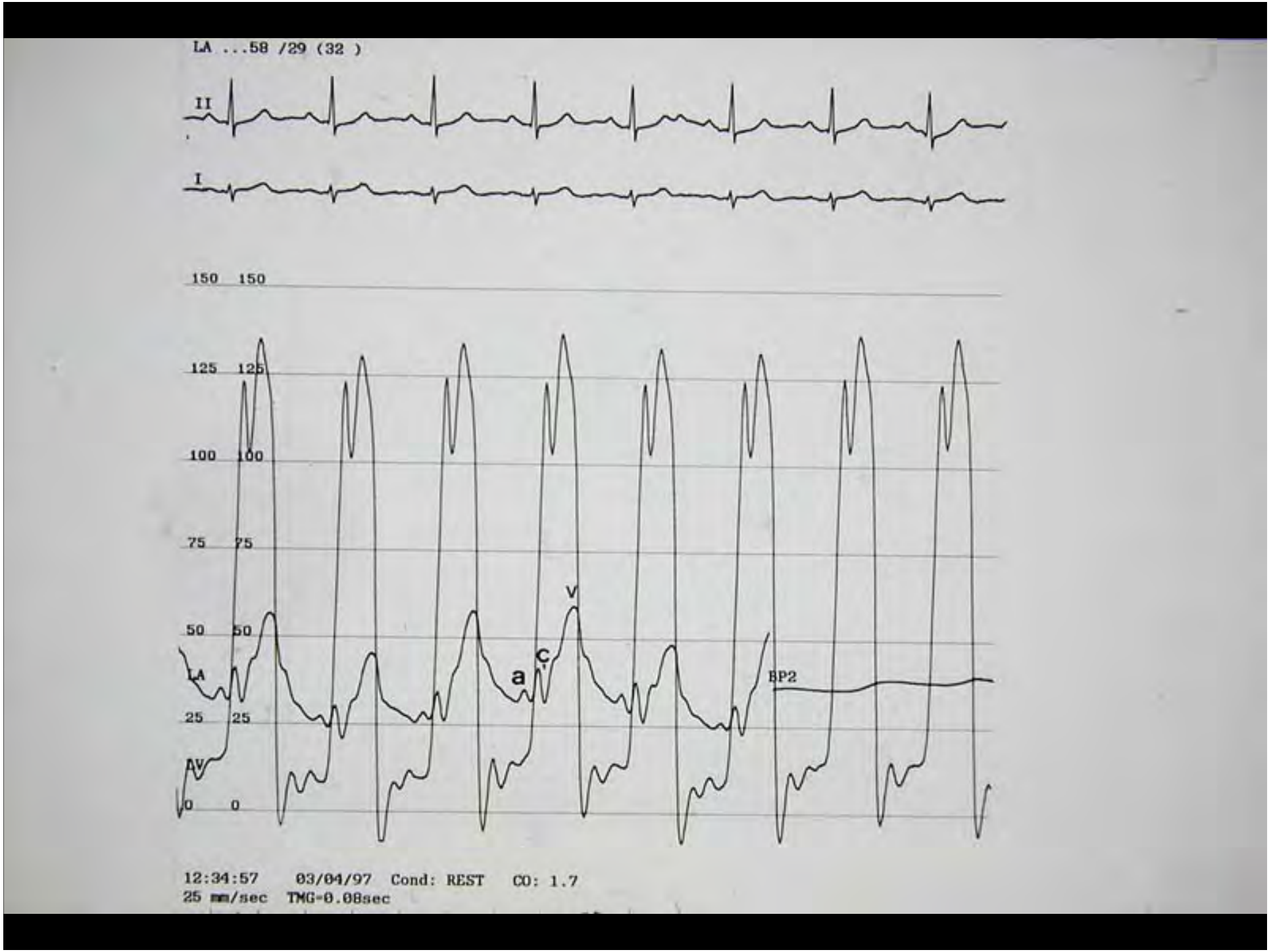


Bright echos across all of posteromedial and half of anterolateral commissure

Grade: 1+1+0+1=3



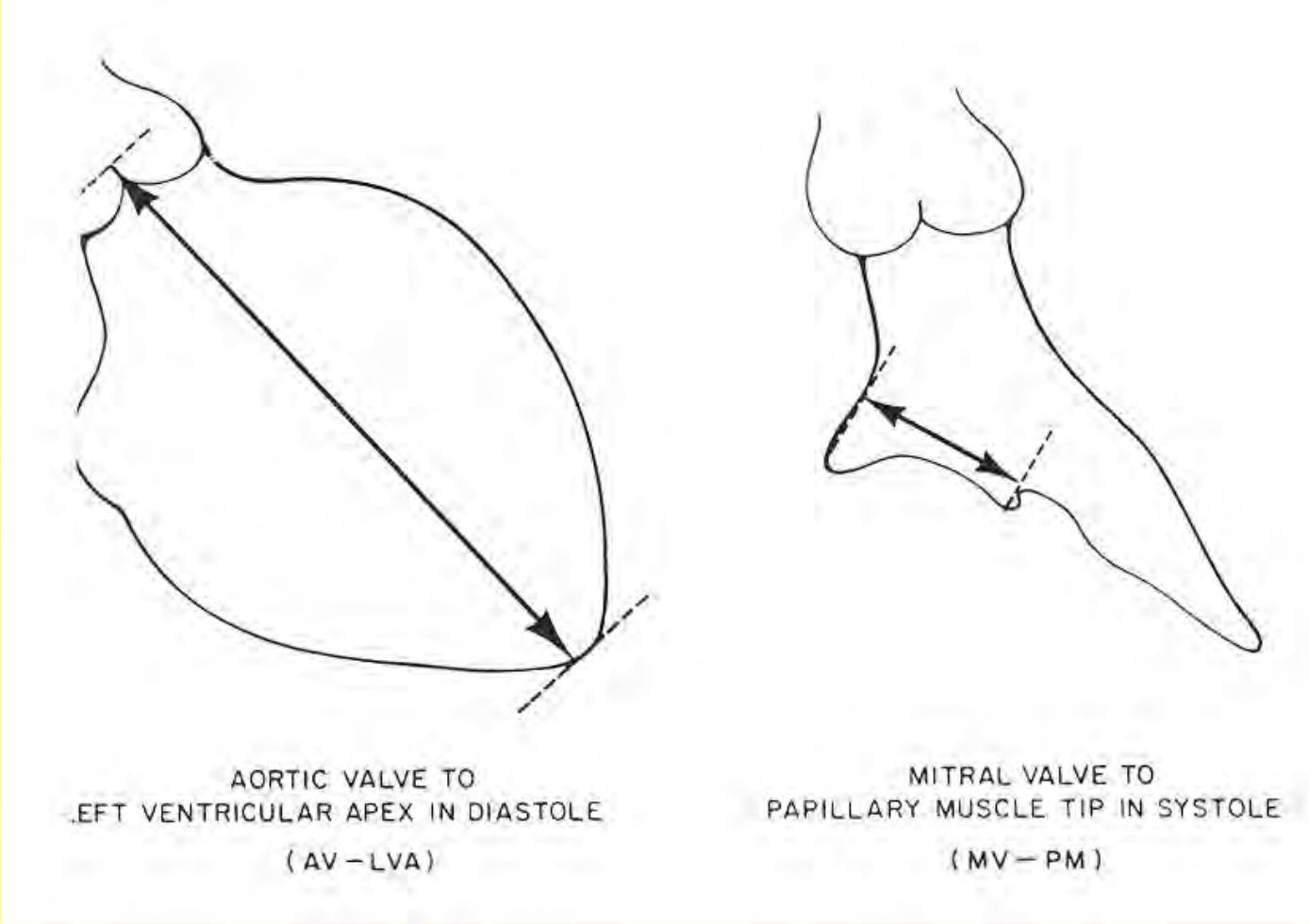

A
RV
B
RV
RA
C
LA
D
LV

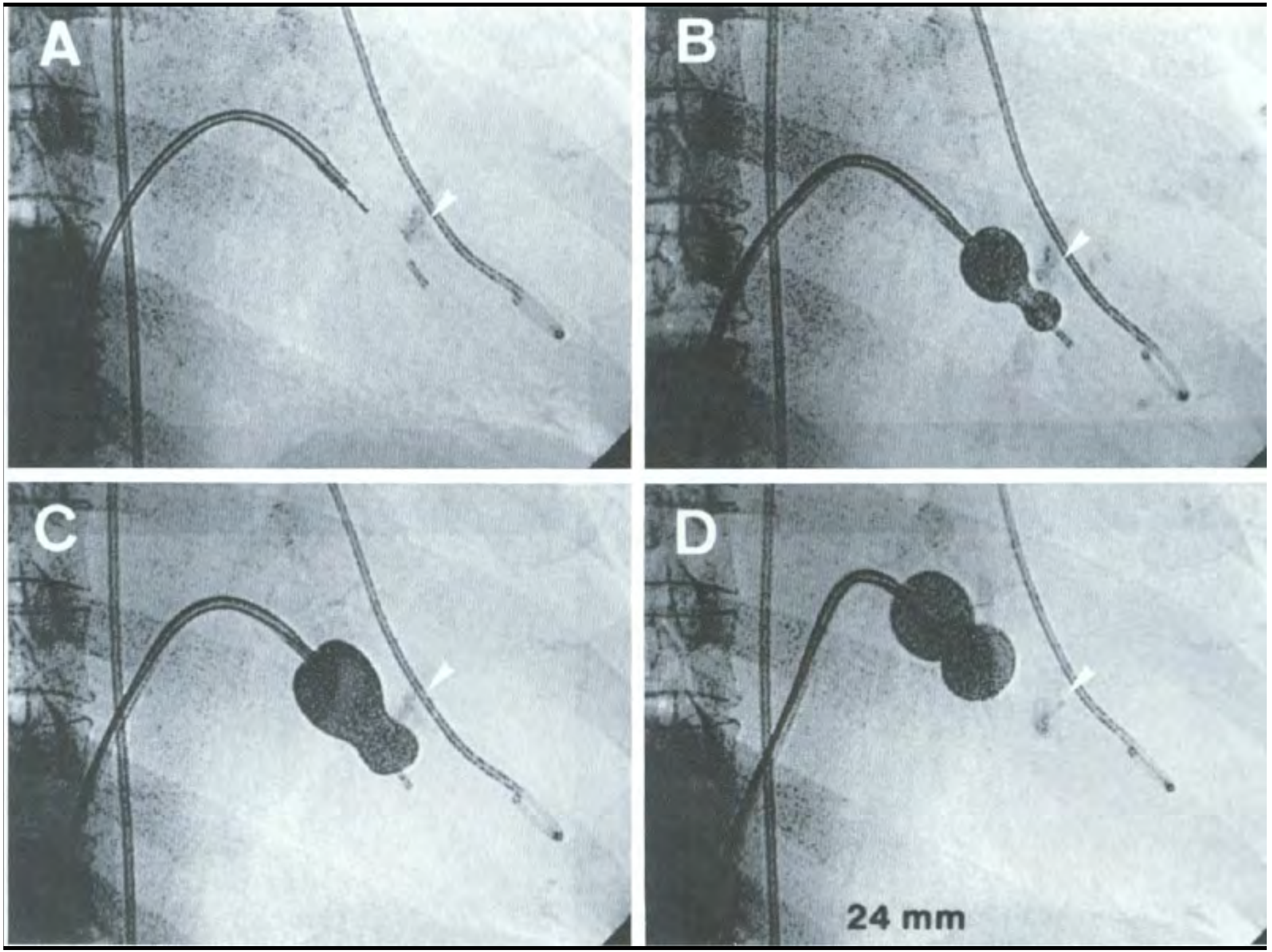

LA ...58 /29 (32)
II
I
150 150
125 125
100 100
75 75
50 50
LA
25 25
AV
0 0
a
c
v
BP2
12:34:57 03/04/97 Cond: REST CO: 1.7
25 mm/sec TMG=0.08sec

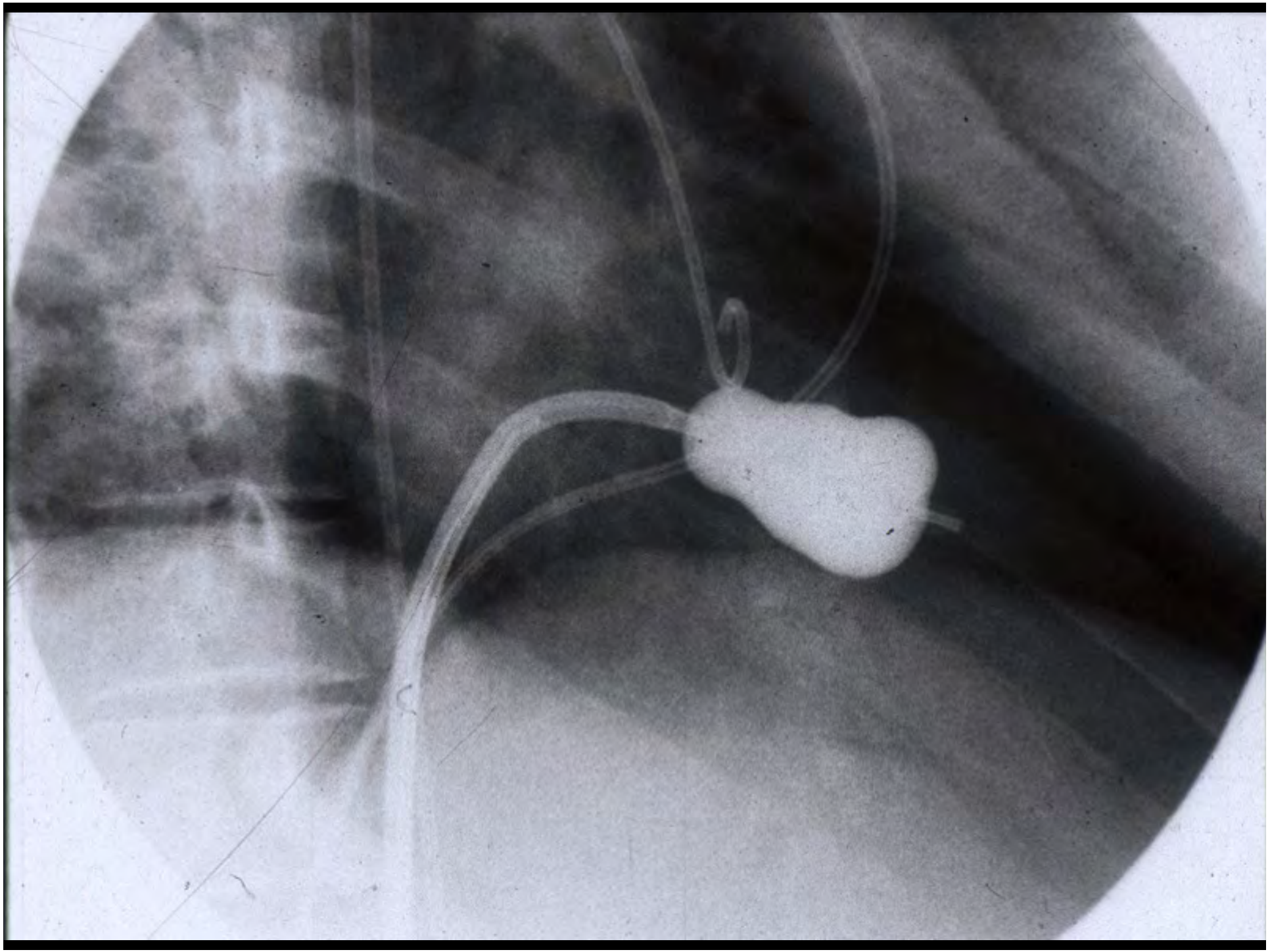
Ventriculography: MSDR:MV-PM/AV-LVA

-Short rigid CT: DR<0.14 (n~0.24)

Circ 1960 ;60:I-71 CW Akins et al.




A
B
C
D
24 mm



Management of Rheumatic MS:

1.***Directed to primary valve pathology***: dilatation- PMI

-Surgery

Replacement- Mechanical

- Biological

2.***Directed to secondary phenomenae***:

Slowing heart rate , maintaining NSR

Congestion

Thromboembolism

LV dysfunction

Infections

Technique

Antegrade approach*: *needs TSLHC

Balloon Vs Non balloon techniques

Single Vs Multiple balloons

Over the wire Vs Non wire guided

Retrograde approach:no need for TSLHC

Criteria for successes;Opt. sub optimal

Complications related to : Vascular access

TSLHC

Valvular dilatation

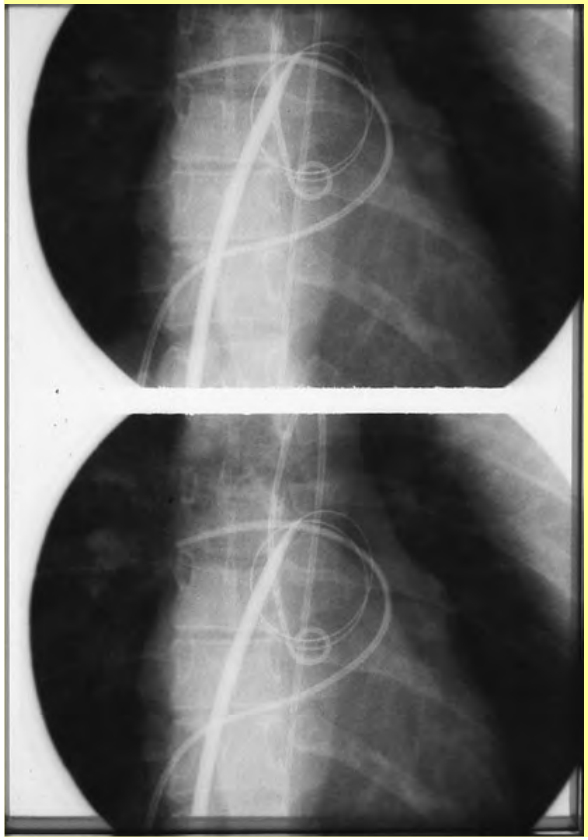
Atrial Septostomy ;Static Vs Dynamic –after TSP

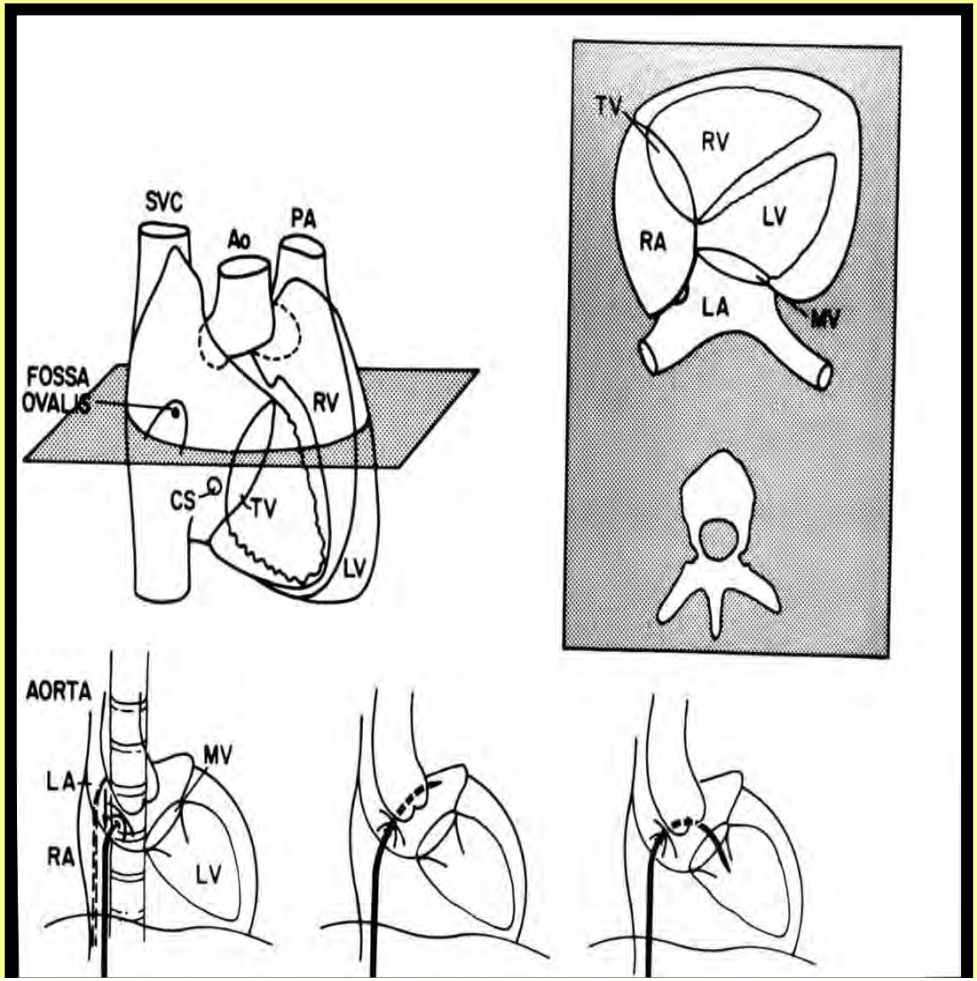
Guided by :

Fluoroscopy

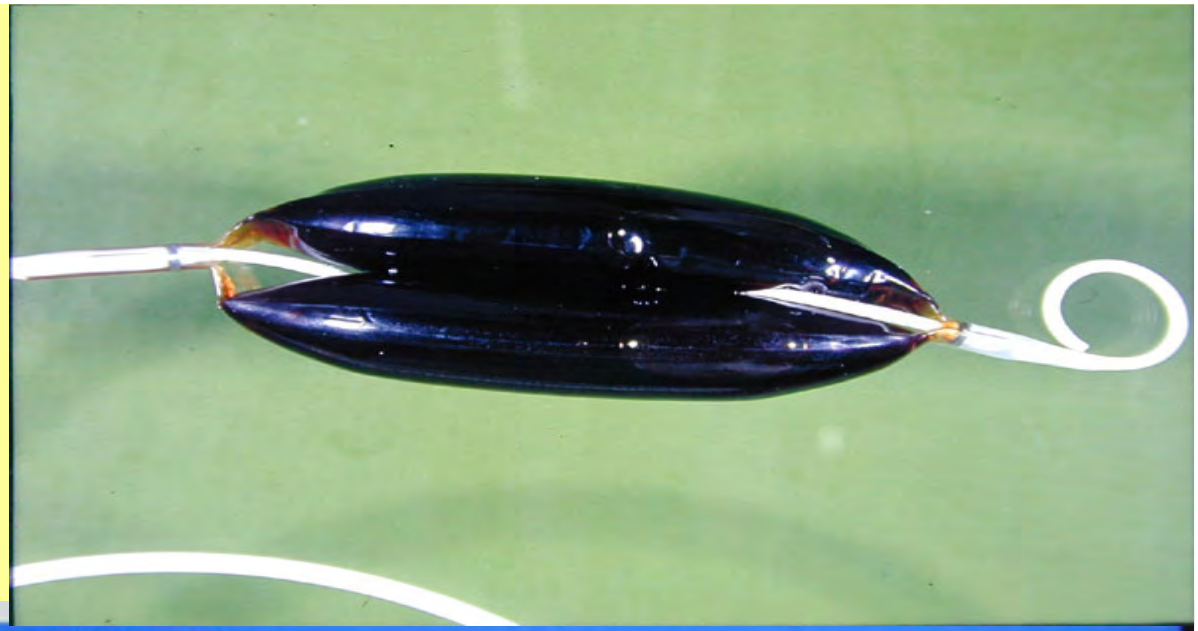
Echo:TTE, TEE, IVS

Intracavitary ECG





Single shaft-DB



I N O U E

Simple Operative Procedure:

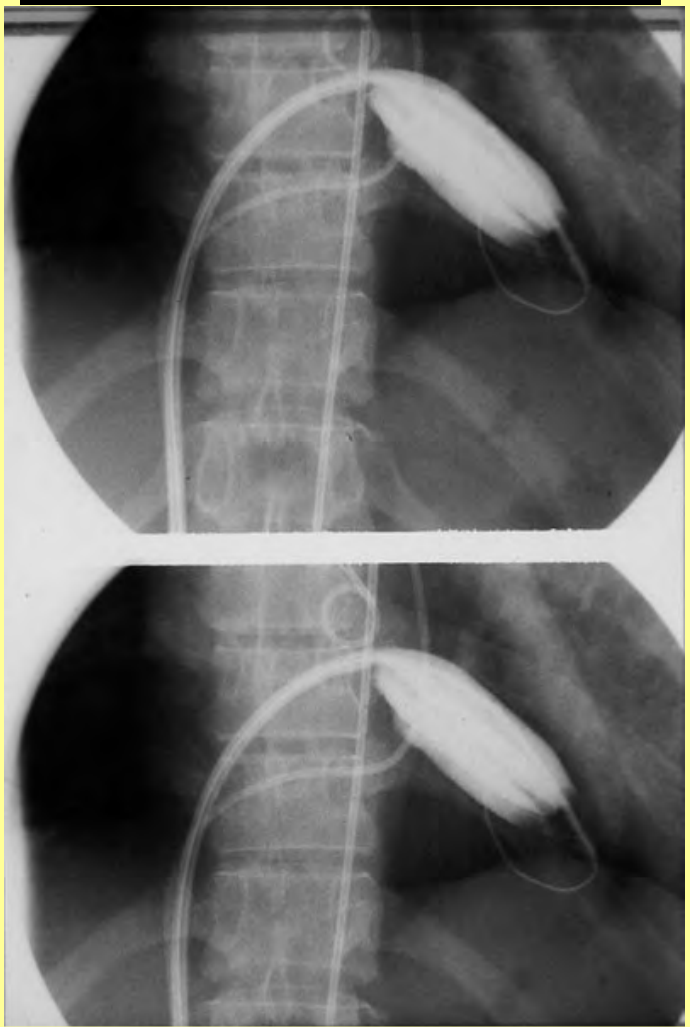
①Insert the balloon stretching tube into the balloon catheter to narrow the outer diameter of the balloon.

②Remove the balloon stretching tube and pull the inner tube.

Antegrade approach – needs TSLHC

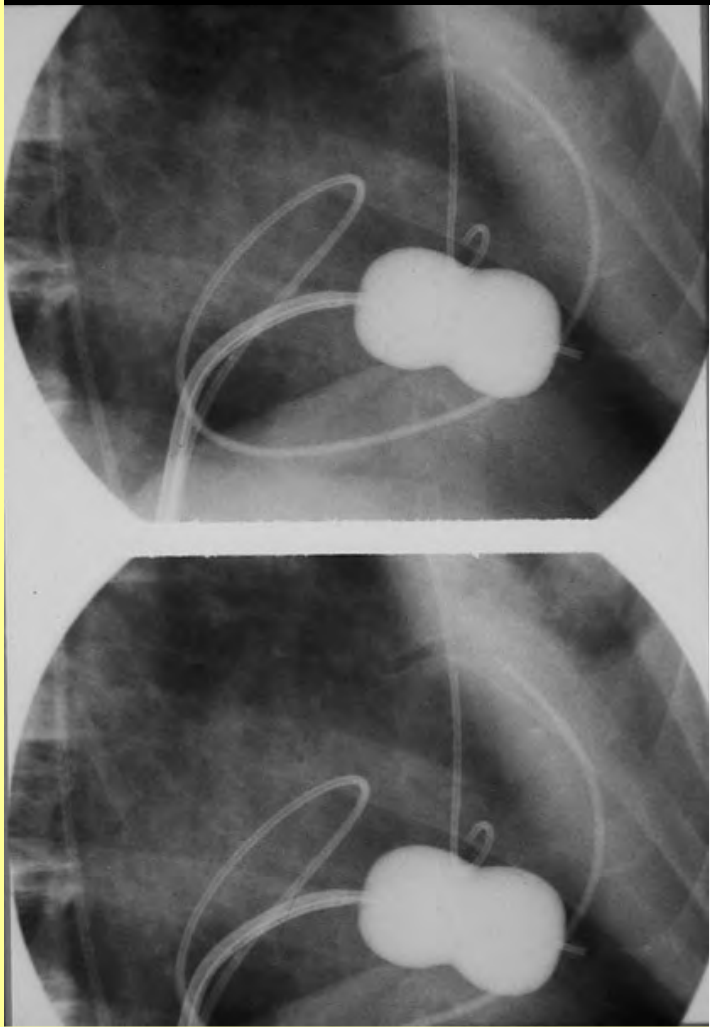
OVER THE WIRE

Double Balloon Tech.



Non OVER THE WIRE

Inoue Balloon –SB Tech



Retrograde approach

No need for TSLHC

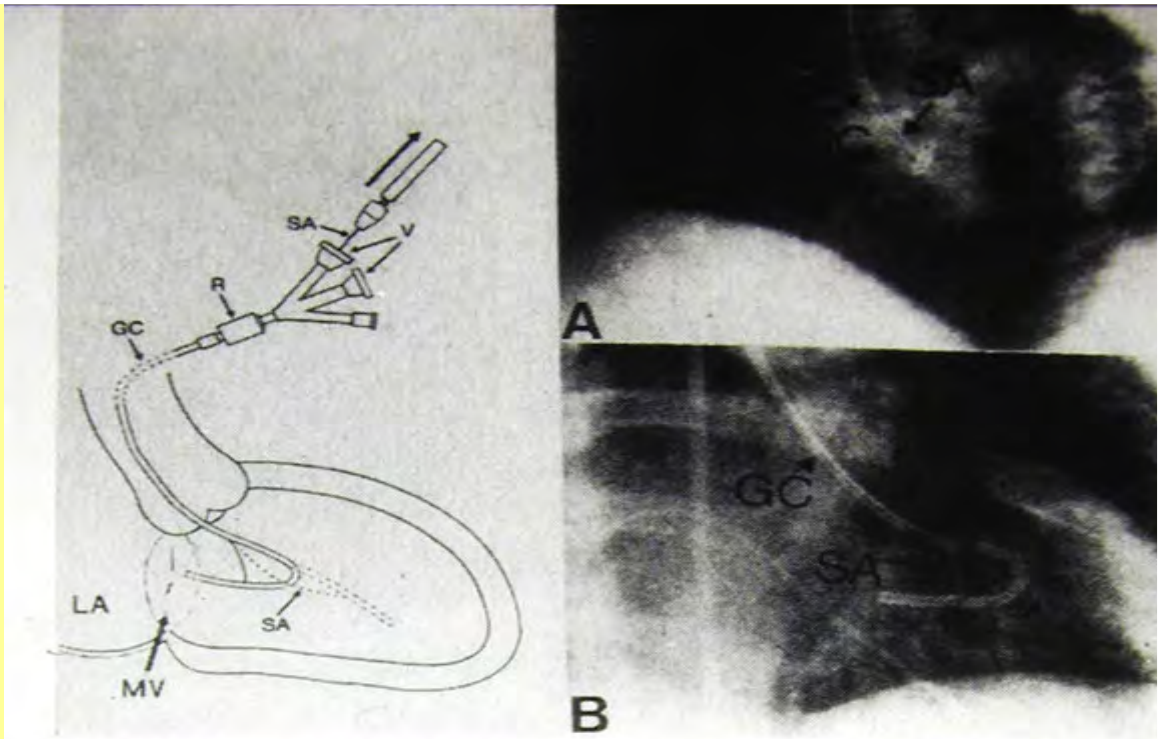


FIGURE 2. Placement of the guiding catheter (GC) below the mitral valve (MV). *A* and *B*, anterior oblique views. LA = left atrium. Other abbreviations as in Figure 1.

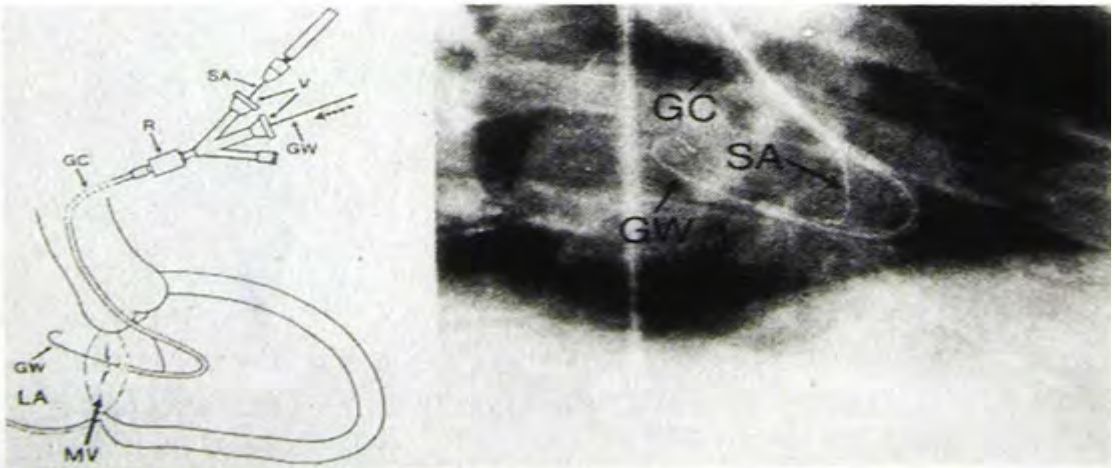
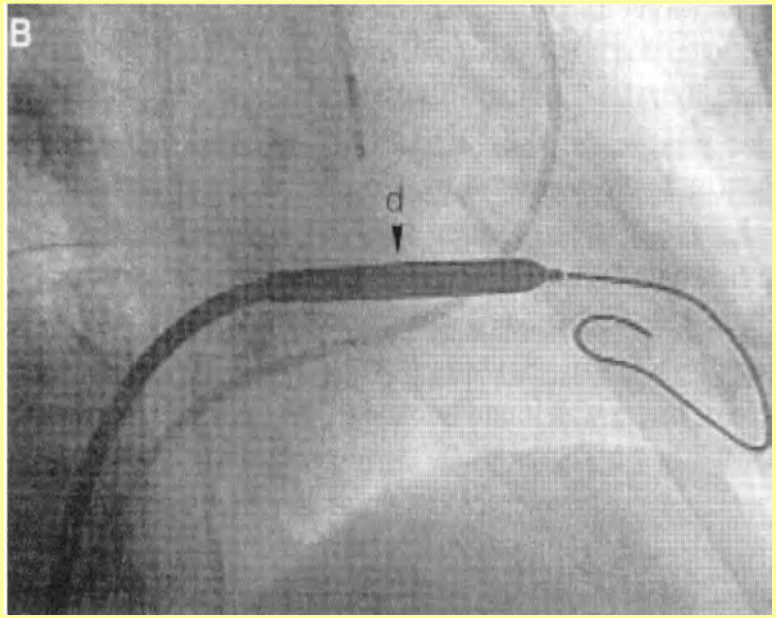
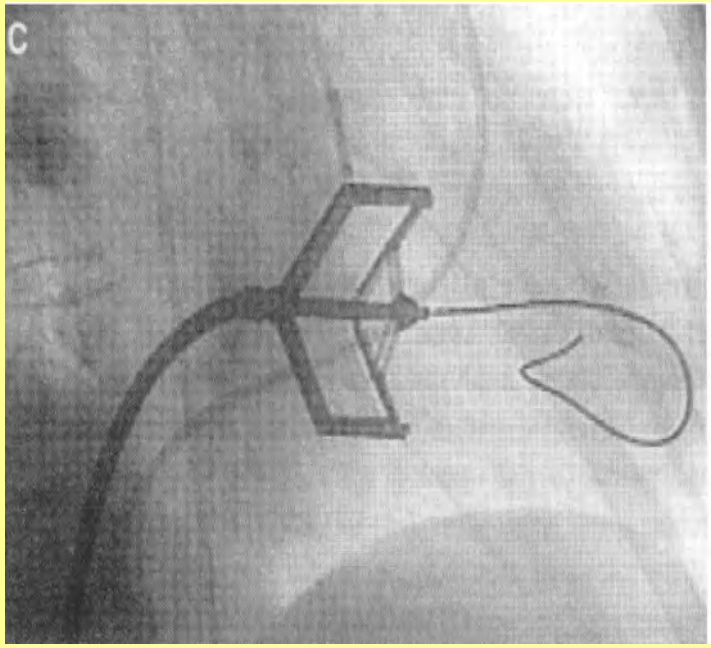


FIGURE 3. Introduction of the 0.025-inch guidewire (GW) to the atrial cavity (LA). Right anterior oblique view. Other

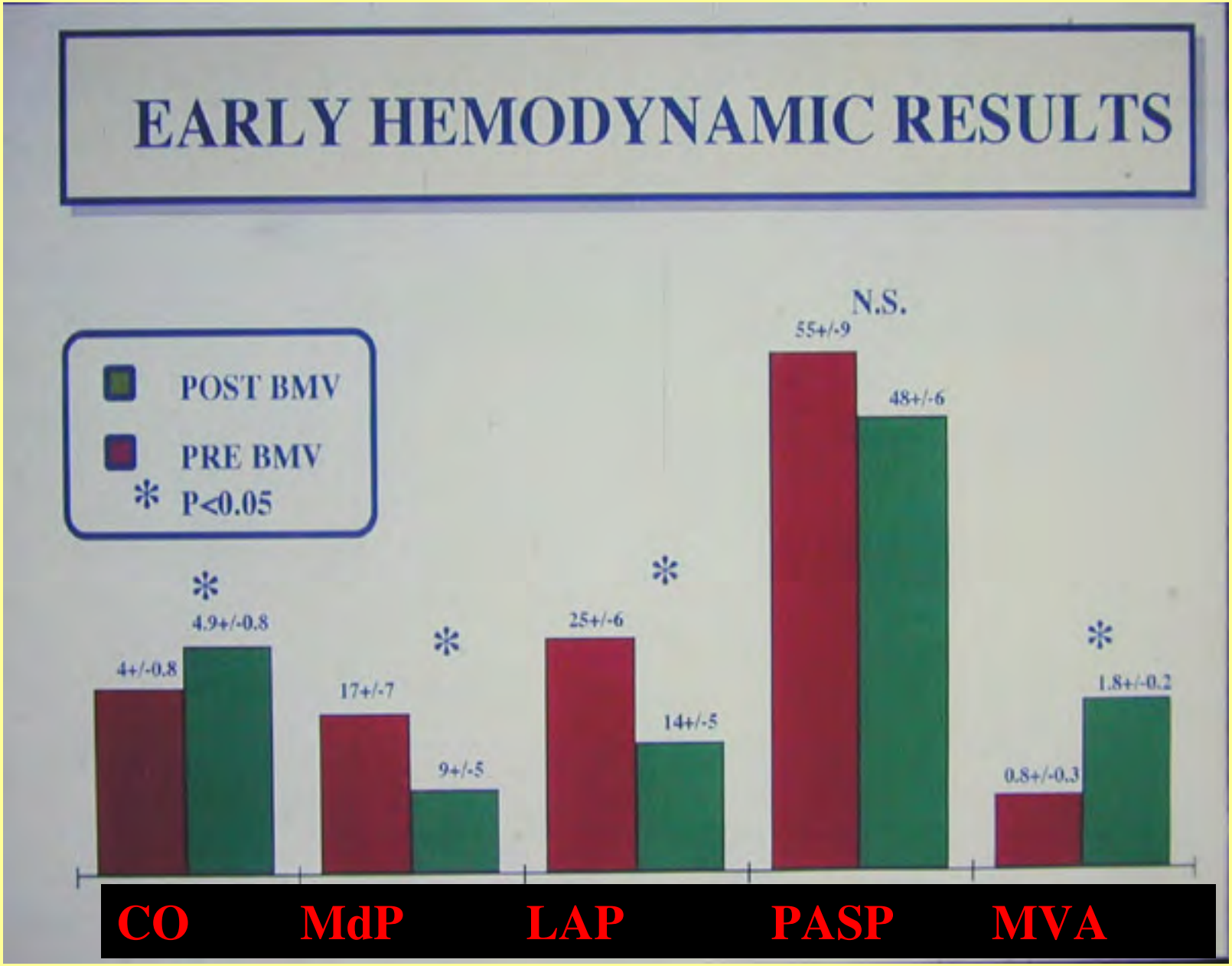
PMI- Mechanical Commissurotomy



Positioning



Dilating


EARLY HEMODYNAMIC RESULTS
POST BMV
PRE BMV
* P<0.05
N.S.
4+/-0.8
4.9+/-0.8
17+/-7
9+/-5
25+/-6
14+/-5
55+/-9
48+/-6
0.8+/-0.3
1.8+/-0.2
CO
MdP
LAP
PASP
MVA

Prediction of outcome of PBMC: Multifactorial

-Morphological characteristics of the valve

-(Commissures, AML-morphology, mobility, CT-length)

- Age , FC, AF, s/p surgery,LA size, PHT, TR,LV-function

- Effective balloon dilating area

- Final MVA

- Experience of the team

Issues to be discuses

Associated MR , LA thrombi , LV function ,

Associated V.H.D

Non Pharmacologic Therapeutic Modalities in Rheumatic MS;

Consider:

Pts : Age , Fertility period, life expectancy, compliance

AF (Maze procedure)

Needs Vs Risk of Anticoagulation

Associated Valvular Abnormalities ,Comorbidities

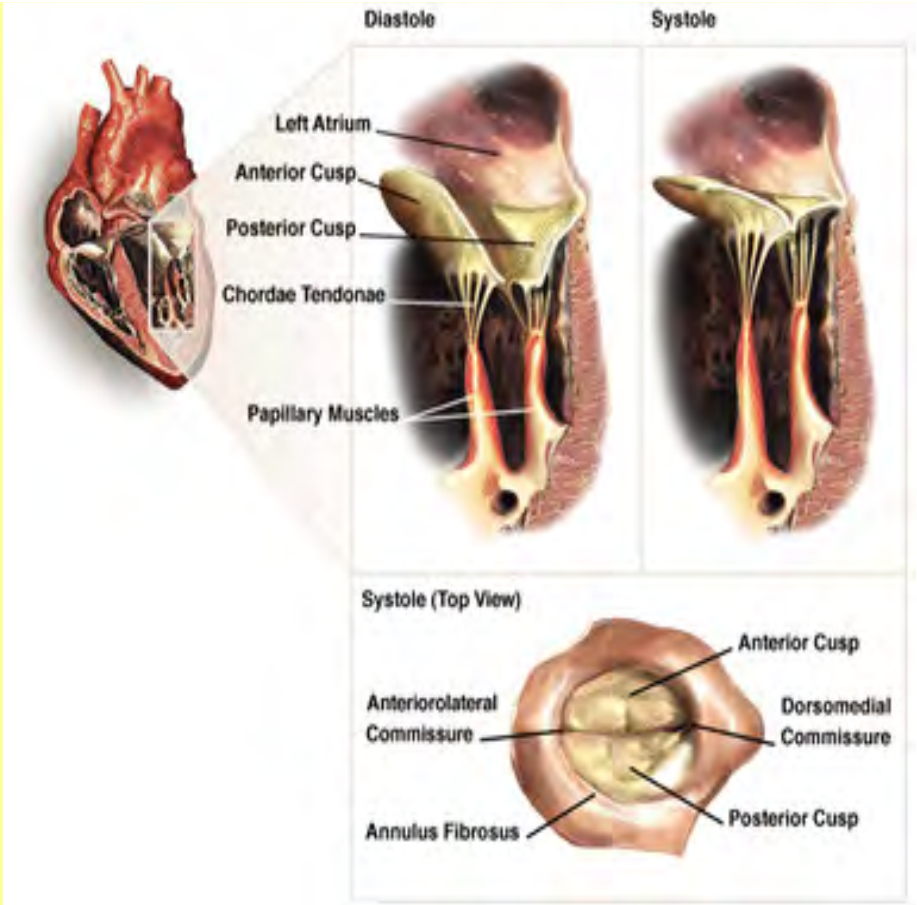
Valvular Morphology and Function

PHT, LV Function

CI to Surgery Vs PCMI

Complexity & Durability of Therapeutic Approach

Mitral Regurgitation



Classifications:

Primary , Secondary

Based on etiology: Degenerative,Ischemic

Acute, Chronic

Congenital Acquired

Surgical Mitral Valve repair

Successful “corrective” operation: restores longevity and quality of life

The choice of operation depends on etiology, mechanisms, experience of surgeon

Surgical Concepts

- Degenerative MR: Leaflet repair techniques + annuloplasty ring
- FMR: Annuloplasty approaches
- IMR: Coronary revascularization +reduction annuloplasty

Can we mimic it in the Cath Lab ? Oh yes we can !

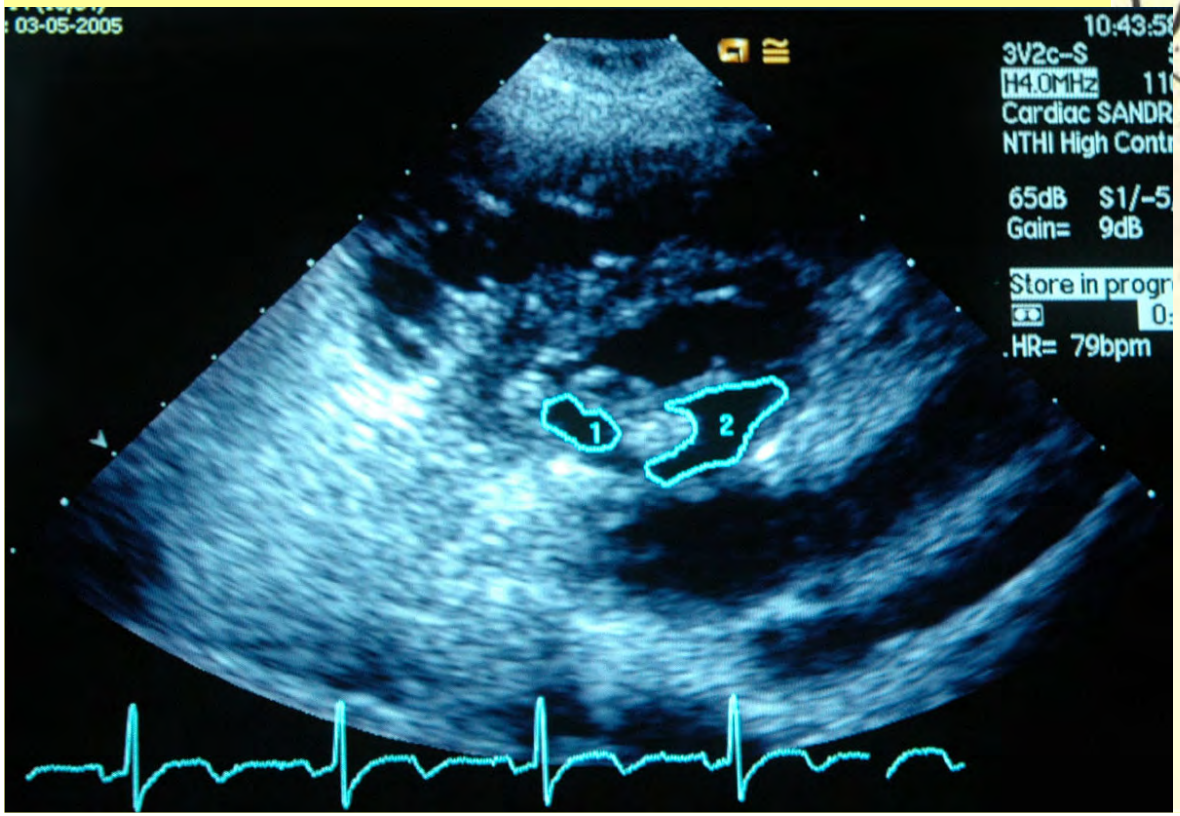
Trans catheter MV Therapies

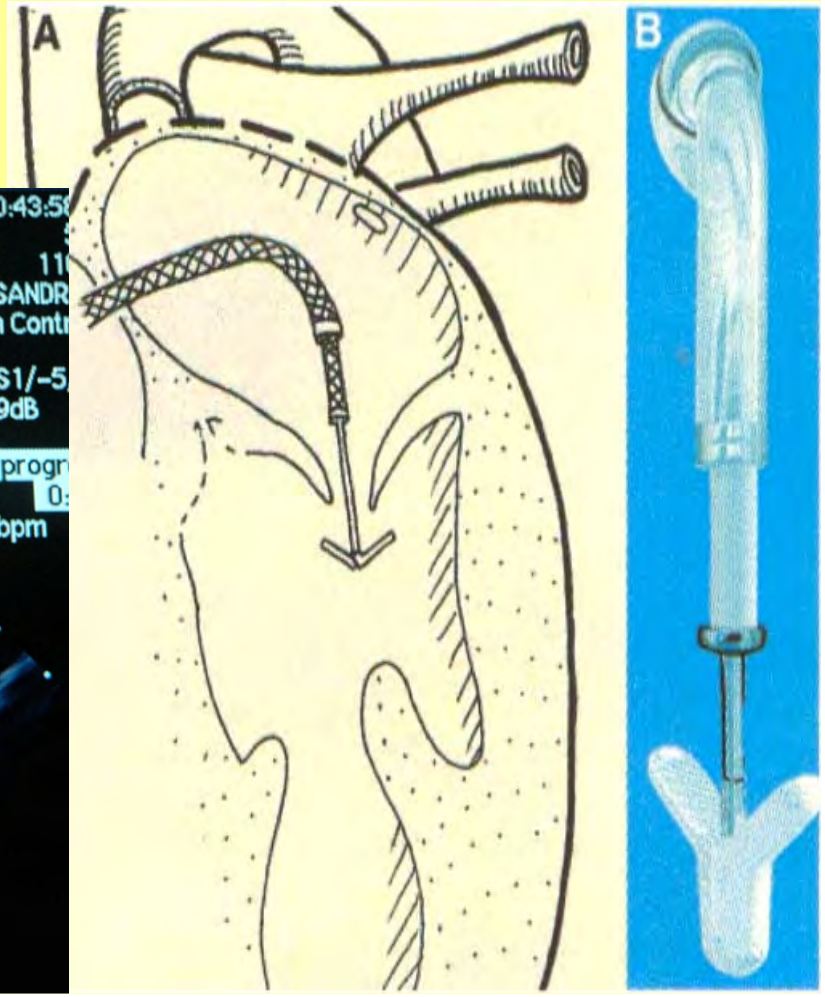
MV –Leaflet Interventions: Either the Clip or the Stitch techniques

Isolated approach: only in A2 –P2 pathologies

Freedom from Reop. & Rec MR for 12 years :80%

Maisano F. Eurointervention 2006; 2 181-6





MV – Leaflet Interventions: Beware of the Limitations!

Look for:

Leaflet morphology, anatomy & MR jet
(only 20% are suitable based on Echo Cr)

A team approach technique

Device: Clip can reposition , removed

2nd clip can be placed

EVEREST –I: Feasibility & Safety

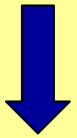
Acute procedure success:73%

30 days MACE:7%

Hospital stay<2 days 85%

2 years freedom death , Rec. Surg or Rec MR -80%

JACC 2005;462134-40



EVEREST –II: Randomizing Pts

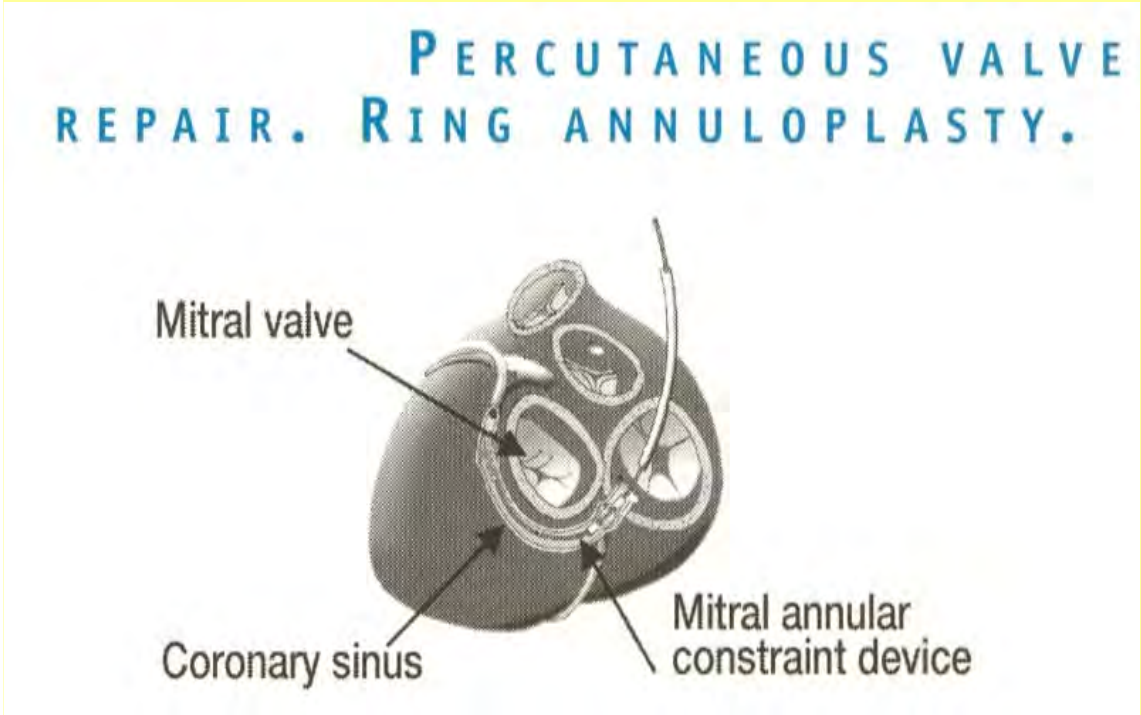
PVI Vs Standard Surgery.

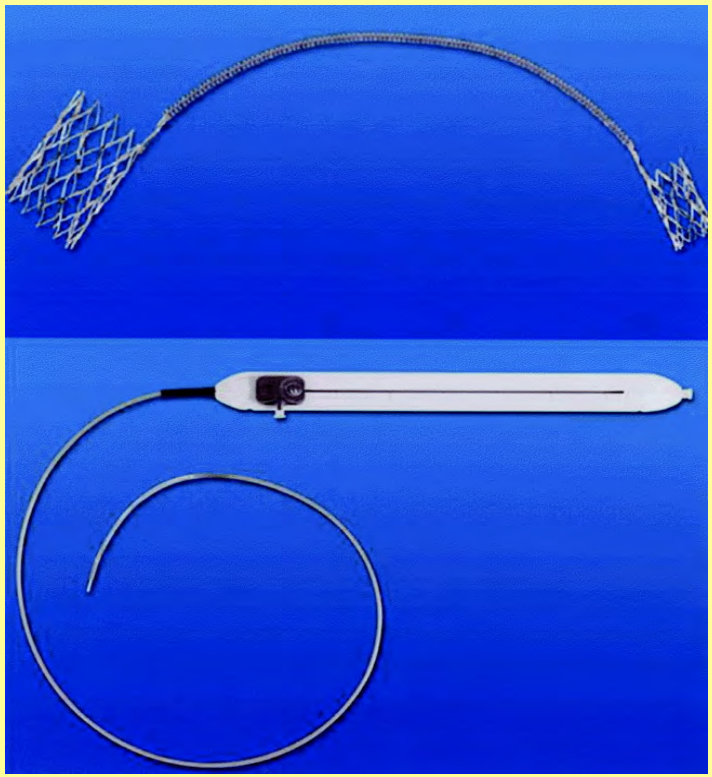
Mitral Valve Annuloplasty

MV Annular reduction diameter

The Indirect (CS) & Direct techniques

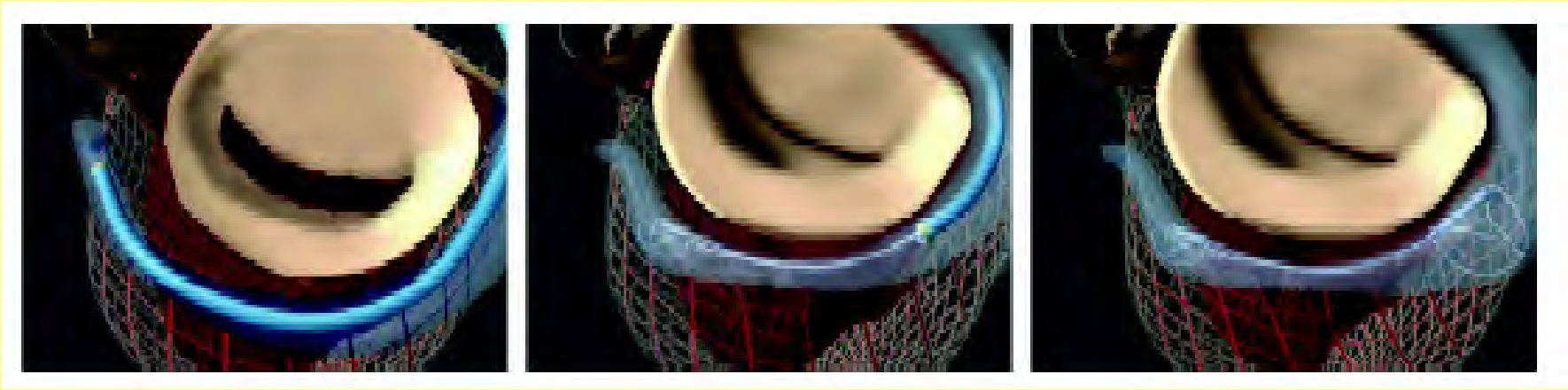
Indirect: via CS





Monarc Device (Edwards Lifescinces), Carillon (Cardiac Dimension), Viacor

Limitations of the CS approach



-CS doesn’t directly parallel to the mitral annulus

-The issue of the Cx artery

-CS erosion, thrombosis

-CS : A conduit for CRT, Retrograde cardioplegia

Direct Mitral Annuloplasty

The Mitralign Device (Tewksbury, Mass)

Transpericardial Annulus & LV Remodeling

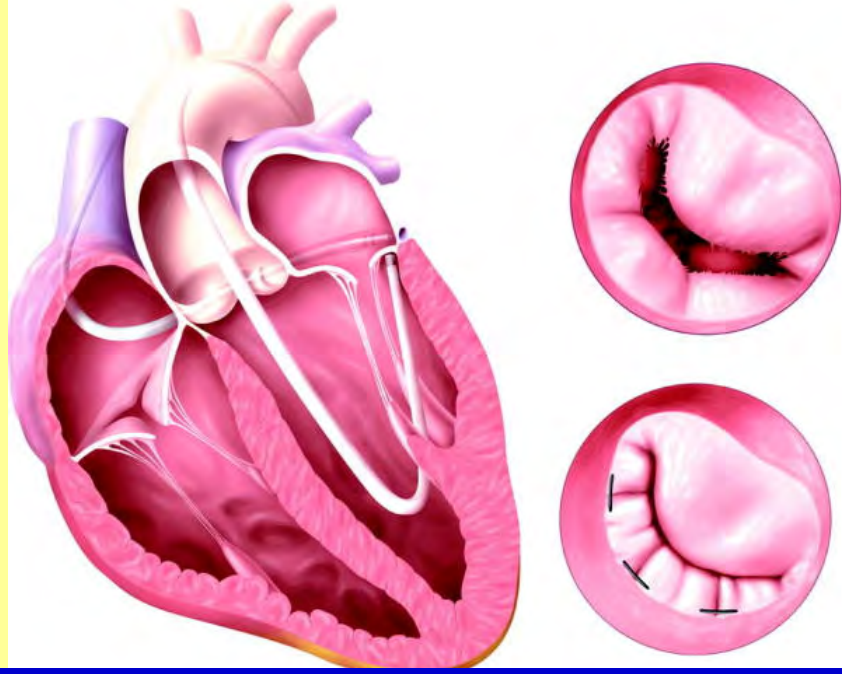
Ann Thorac Surg 2005;:80:1706-11

SLAC:Septal to Lateral Annular Cinching tech.

Off Pump Approach

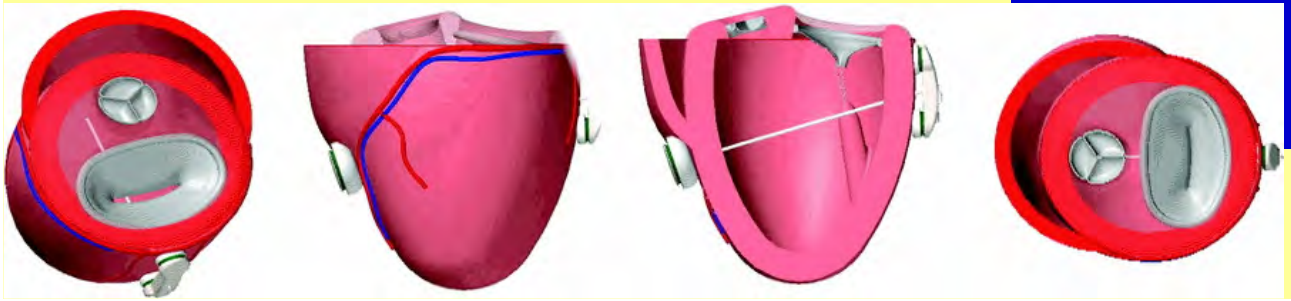
Coapsys surgical system(Myocor, Minn)

Applying tension on both MA & basal LV cavity



The Transventricular bridge

iCoapsys:Percutaneous approach



Analogous to the surgical plication tech.

J Thorac Cardiovasc Surg

1977;73:589-95

SL enlargement is the final common pathway of FMR or IMR

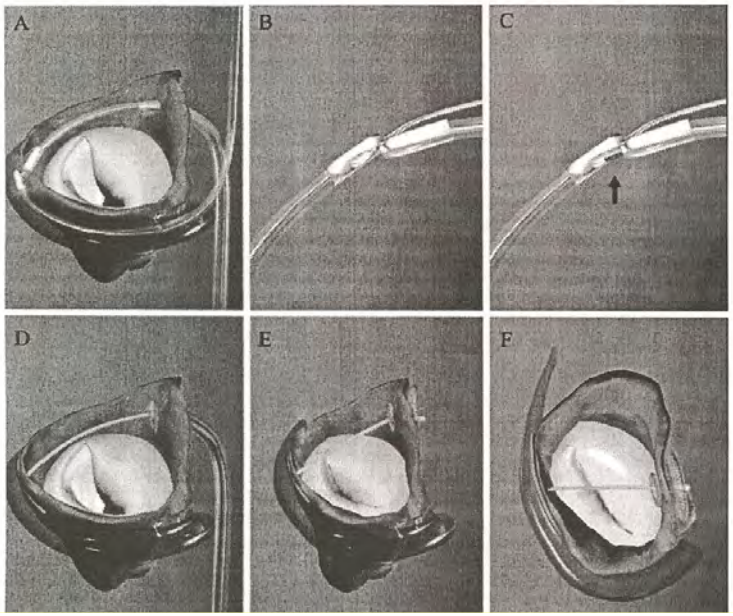
Miller DC et al.Circ 2001;104:I-47-53

Percutaneous septal-sinus shortening procedure

Effective procedure in ameliorating FMR in ovine tachycardia model. Rogers JH et al

Circ 2006 ;113:2329-34

Transatrial bridge PS^3 system



Echo Data	SLS mm	MR grade
B	32±5	2.1 ±0.6
A 30 days	24 ±2	0.4 ±0.1

Lets be honest and confess:

:"Many pts are willing to have everything fixed percutaneously"

1. Less pain , less trauma
2. Less invasive
3. Early recovery
4. Short hospital stay
5. Cheaper procedure

The train of PVI left the station

but

"Real progress is undertaken when we look to the sky but still stand on a solid ground "

Nicolaus Copernicus 1473-1543