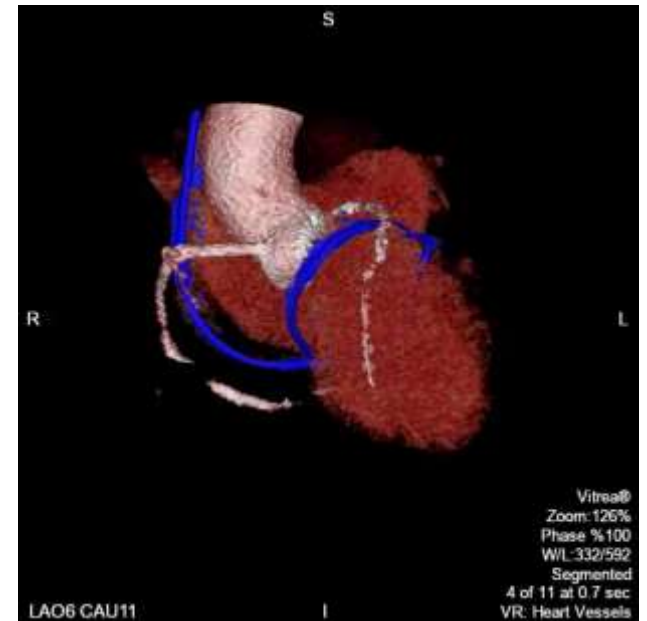


Reduction of Functional MR by 'Mitral Loop Cerclage' May also Contribute to Reversion of Atrial Fibrillation to Normal Sinus Rhythm?

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Disclosure of 'Conflict of Interest'

- Founder and stock holder : Tau-PNU Medical Co. of Pusan National University
- Intellectual Property of 'Mitral Cerclage ' and 'Mitral Loop Cerclage' that are assigned to NIH, or Tau-PNU or Pusan National University.
- Collaborator with NHLBI Division of Intramural Research (Z01-HL006040)

Technologies for catheter based Tx for Mitral Regurgitation

Leaflet Solutions

- Evalve/Abbott MitraClip
- Neochord
- Cardiosolutions, Middle Peak Medical

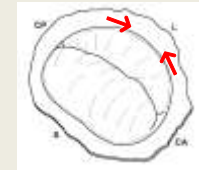
Leaflet Clip



Direct Annular Shape Change

- Mitralign
- Valtech (Cardioband)
- Guided Delivery Systems

Annular Reshaping



Coronary Sinus Annuloplasty

- Carillon
- Mitral Valve Cerclage

Coronary Sinus Reshaping



Mitral Valve Replacement

- Endovalve
- CardiAQ
- Tiara
- M-Valve

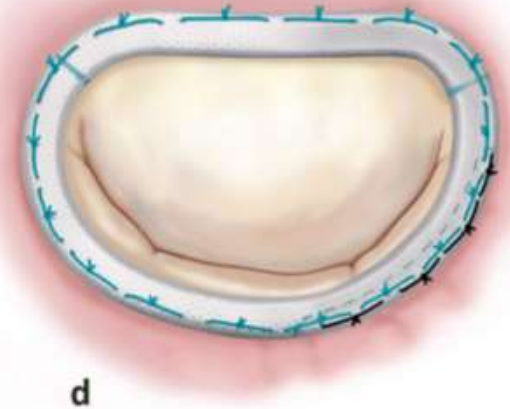
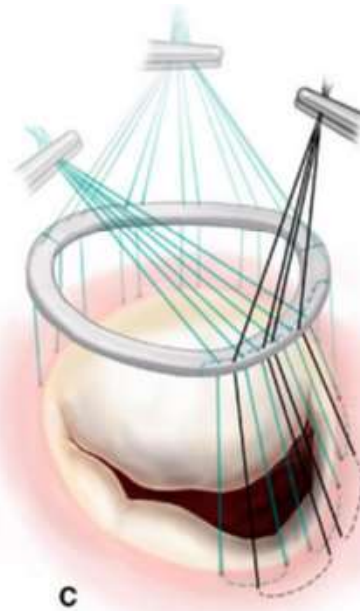
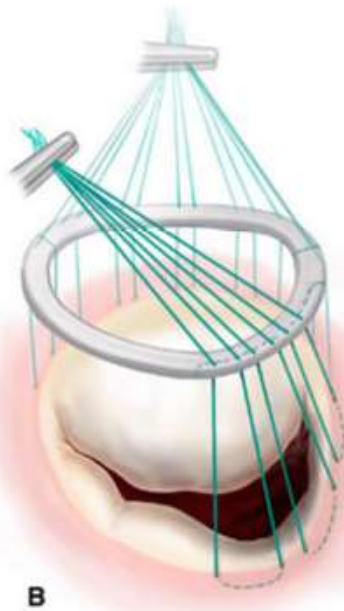
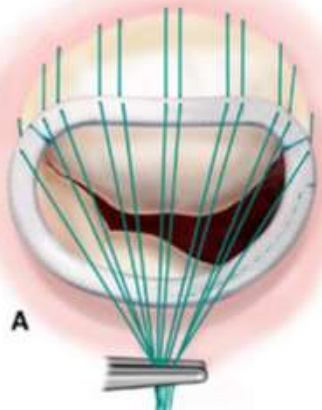
MV Replacement



Surgical treatment for functional MR



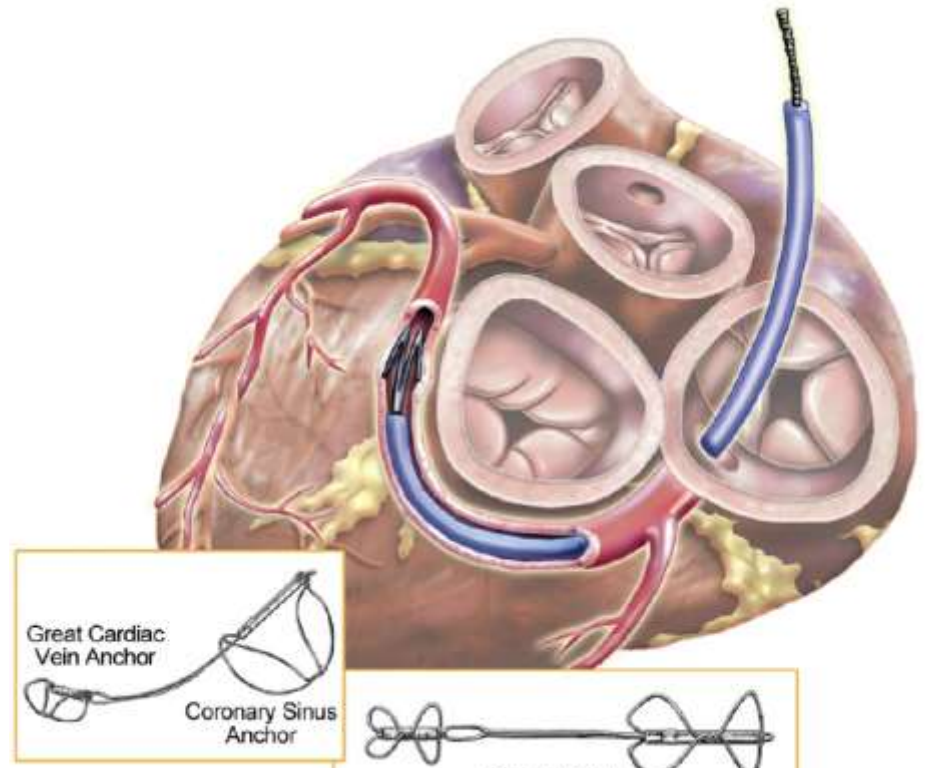
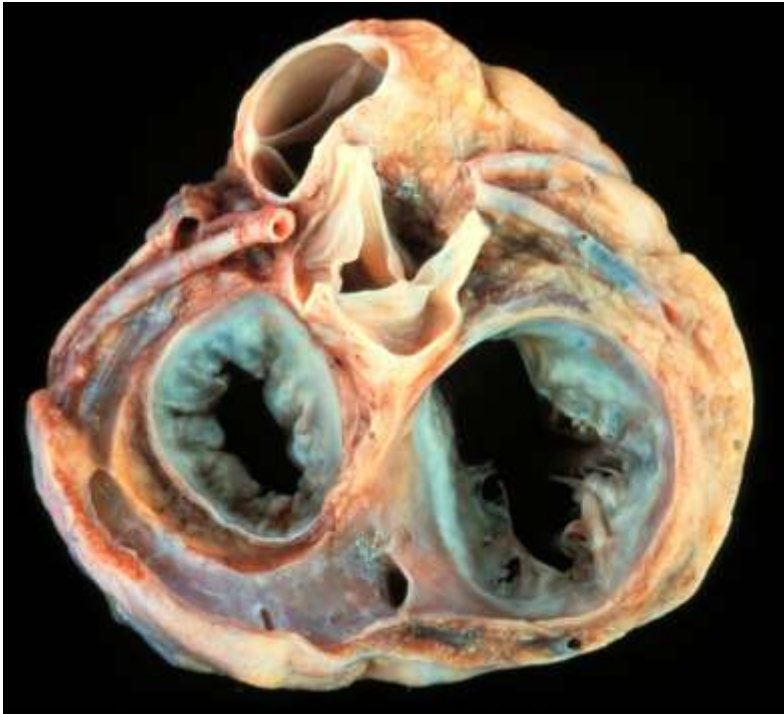
Restrictive Annuloplasty



The Coronary Sinus Approach

Indirect annuloplasty

Takes advantage of proximity of CS to the mitral annulus

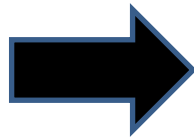
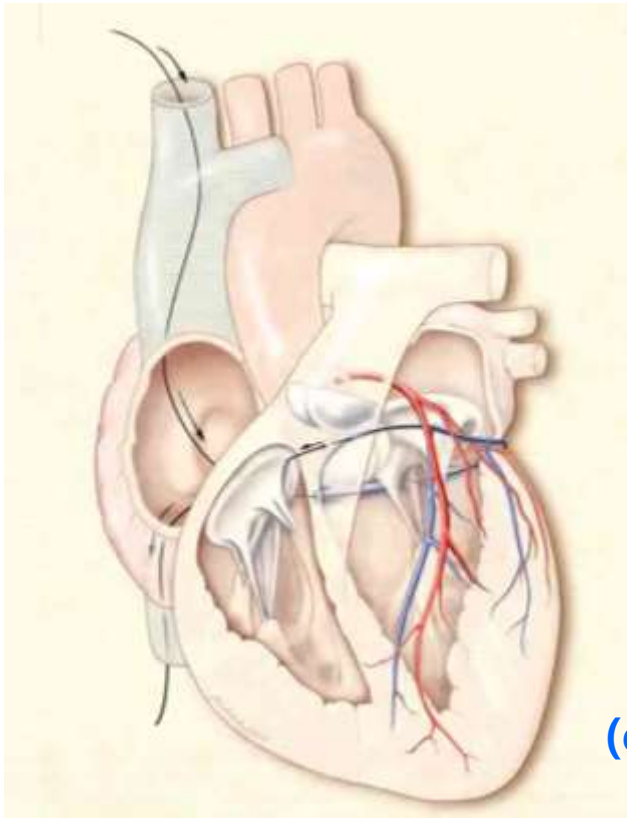


Carillon

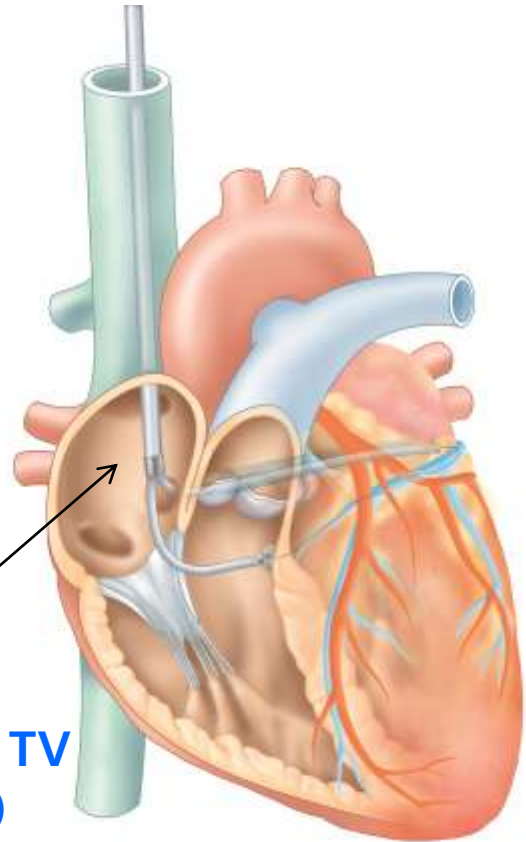
'Mitral Cerclage' & 'Mitral Loop Cerclage'

- Circumferential tension around MV annulus by LV basal squeezing

- Reinforce of safety issues
- improving technical feasibility



CSTV
(coronary sinus and TV protective device)

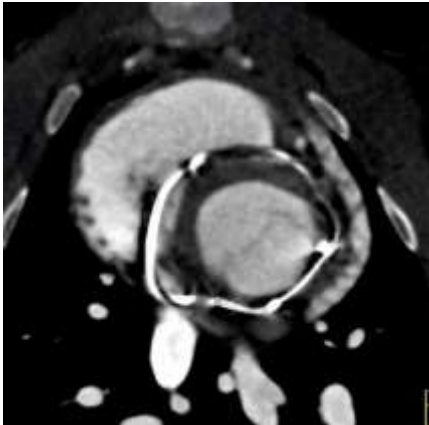


Mitral Cerclage + a bifid appliance = Mitral Loop Cerclage

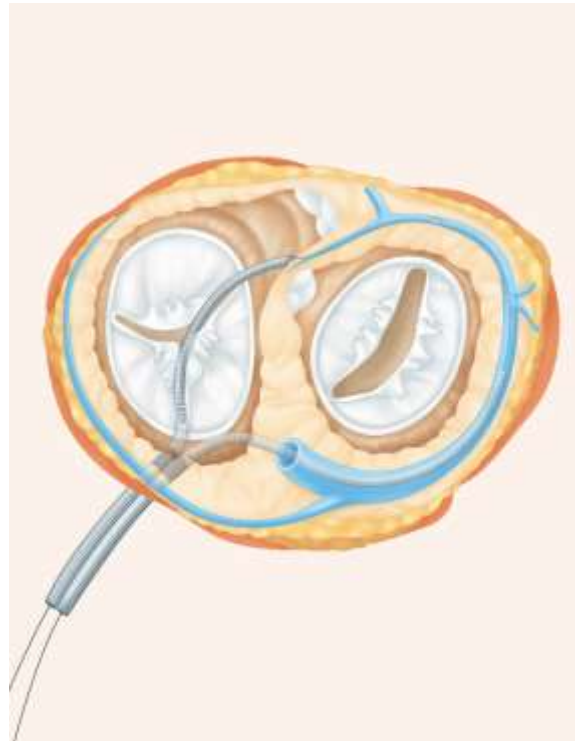
How to function?

(1) TV & conduction protection

(2) Interactive tension adjustment



Arch formation during tension



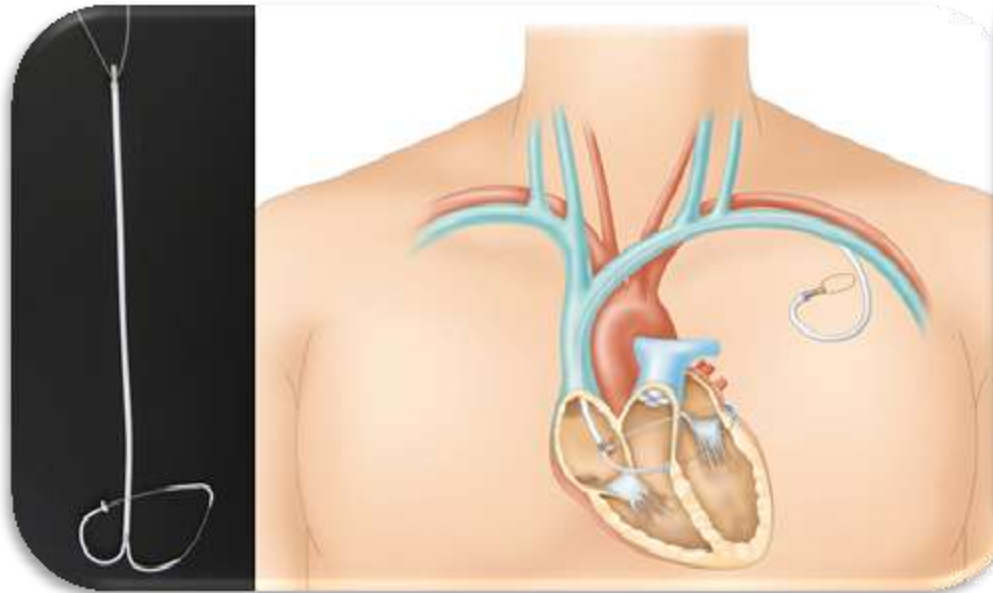
Septal lateral dimension

Tensioning through a tip
of CSTV loop

(3) Easy re-adjustment of tension
when it is needed

The exploratory proof of concept study of Mitral Loop Cerclage (n=5)

The first case of Mitral Loop Cerclage FIM
in PNUYH, Korea (July 10th 2015)



The exploratory proof of concept study of Mitral Loop Cerclage (n=5)

Inclusion criteria

NYHA class III or IV dyspnea due to severe functional MR in spite of optimal medical TX at least for 3 months

Endpoints : at postprocedure, 1,3,6 month FU

- efficacy endpoint
: reduction of mitral regurgitation, reverse remodeling
 - safety endpoints
: MACE, conduction block, TR
-

Procedure



Pressurized venogram



Delivery of CSTV

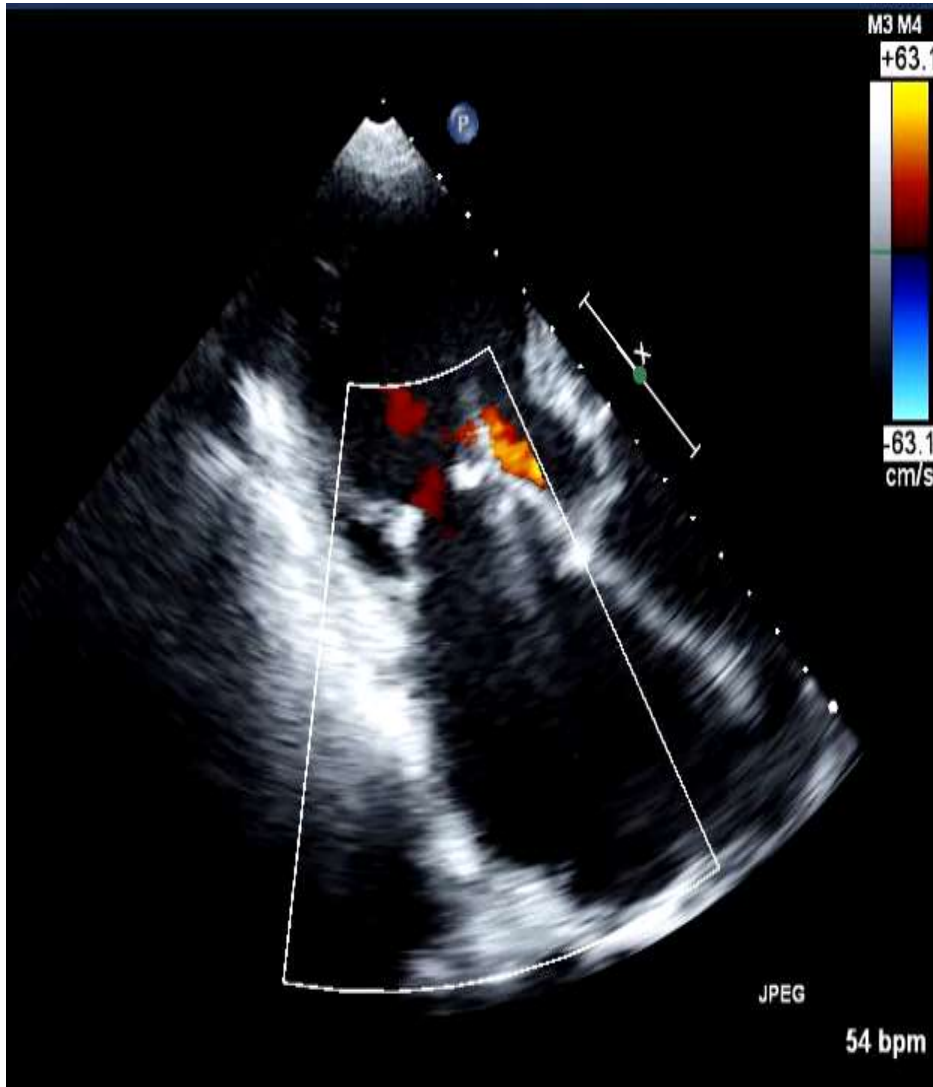


Interactive tension adjustment

Mean fluoroscopic time : 79 ± 20 min (n=4)

Case #1. 74/F. Class IV Dyspnea despite aggressive medical Tx over 1year

Symmetric tethering due to persistent AF



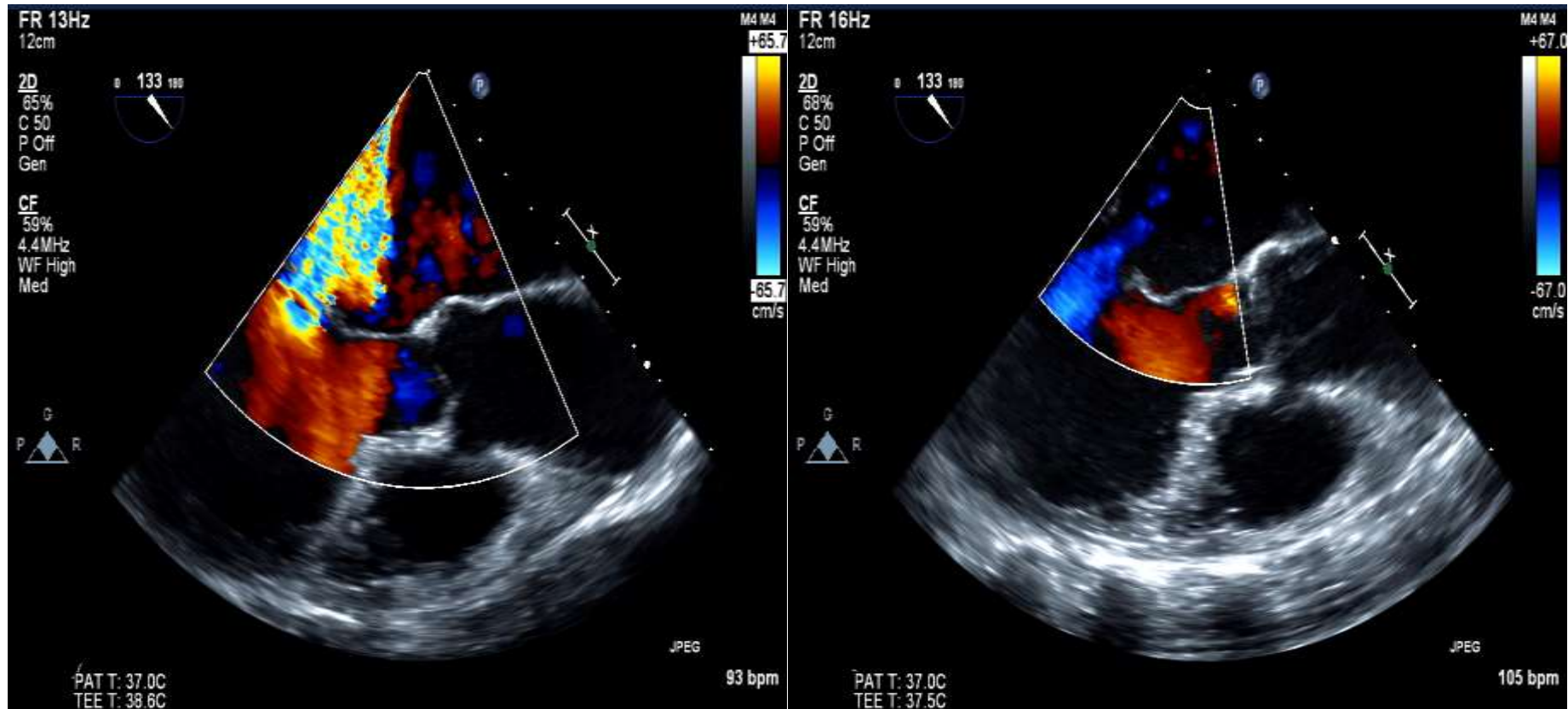
- ERO : 0.34 cm²
- Regurgitant volume 63 ml
- EF 58%



BNP : 3269 pg/mL.

Interactive tension adjustment under imaging guidance

12% reduction of septal lateral annulus (45.2 → 39.7 mm)



Before tension

After tension

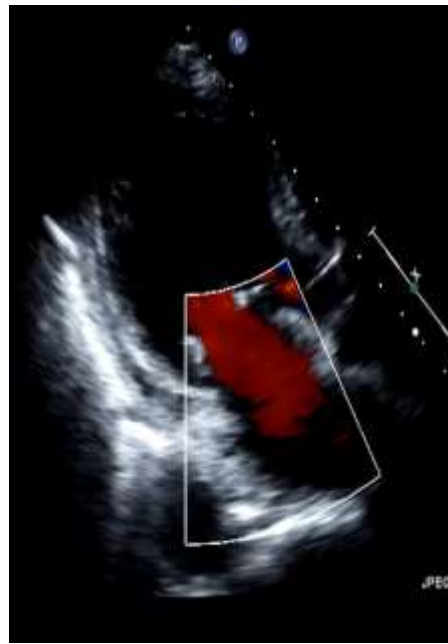
Serial Echo FU data

Before



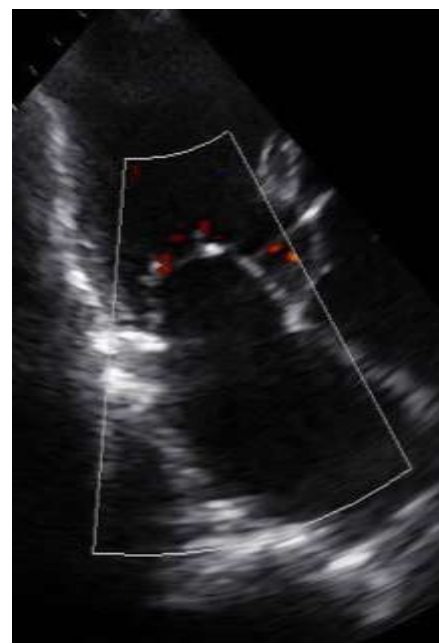
- ERO 0.34 cm²
- RV 62.6 cc

1 month FU



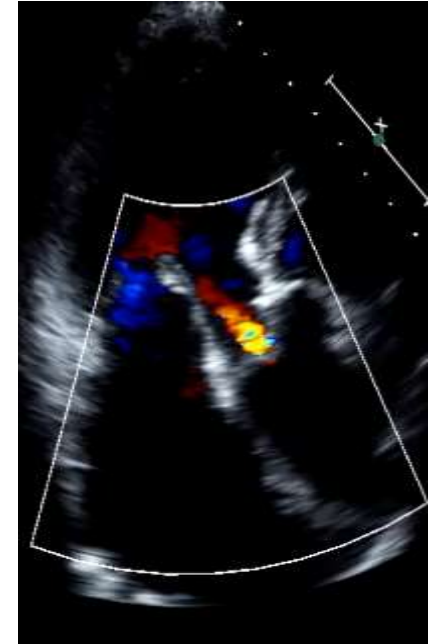
- ERO 0.12 cm²
- RV 20.2 cc

3 month FU



- ERO 0.14 cm²
- RV 24.8 cc

6 month FU



- ERO 0.10 cm²
- RV 23.2cc

Reverse remodeling & LV function



BNP 3269 pg/mL

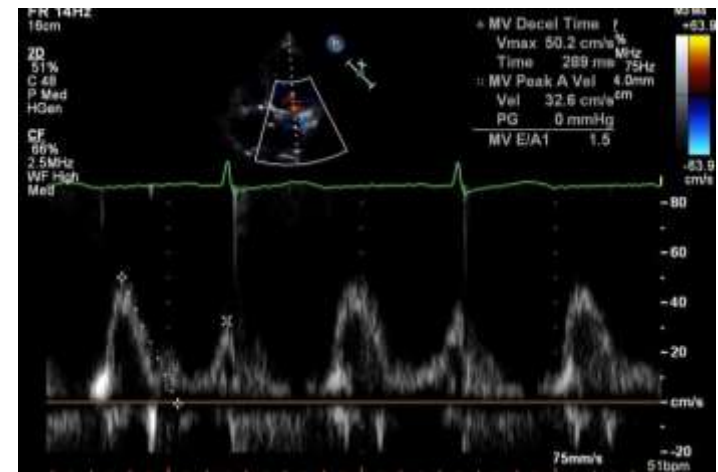
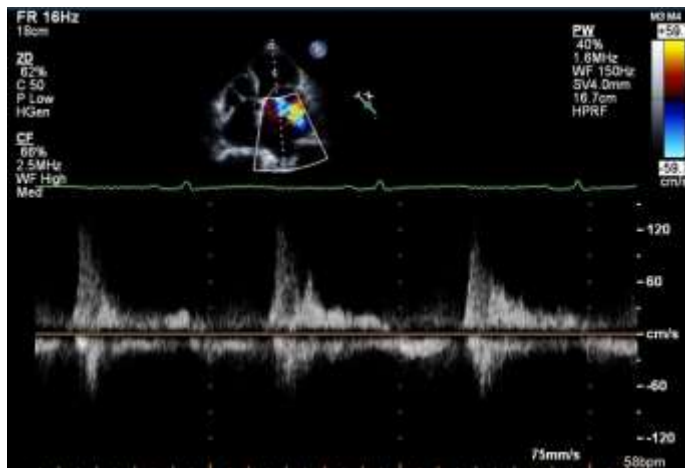
BNP 56 pg/mL

Cardiac CT volume data

	Baseline	1 month	6 months
LA volume (ml)	370	282	298 (19% ↓)
LVES volume (ml)	92	81	57 (38% ↓)
EF(%)	57	52	64

Reversion of persistent AF to sinus rhythm

Reversion to sinus rhythm right after procedure and maintained

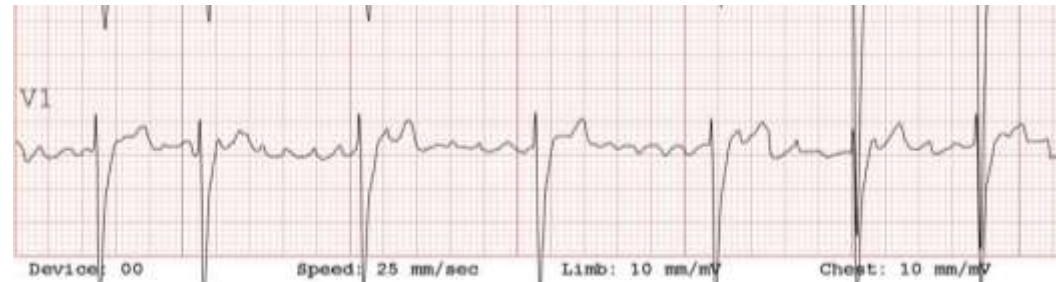


Case #2. 62/M, Dyspnea due to nonischemic dilated cardiomyopathy (LVEDD 74mm, LVEDV 260mL, NYHA class III-IV)

Baseline



- ERO : 0.27 cm²
- Regurgitant volume 39 ml
- EF 34%



Permanent AF

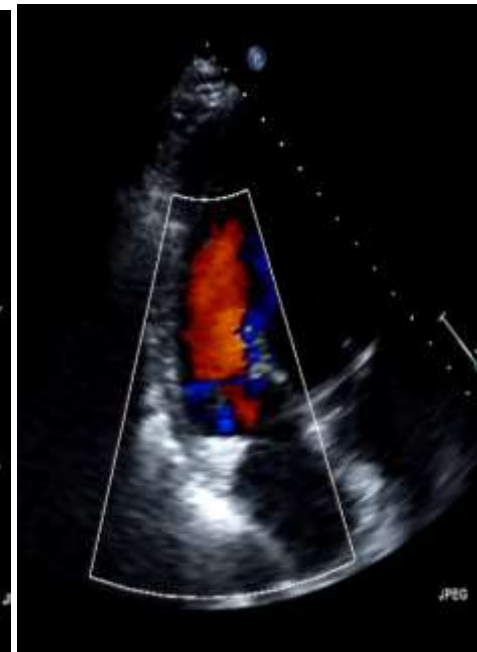
Serial Echo FU

Before

Immediate
postprocedure

1 month FU

6 month FU



- ERO 0.27 cm²
- RV 38.6 cc

- 18% reduction
of SLD
- (50.5 → 41.3 mm)

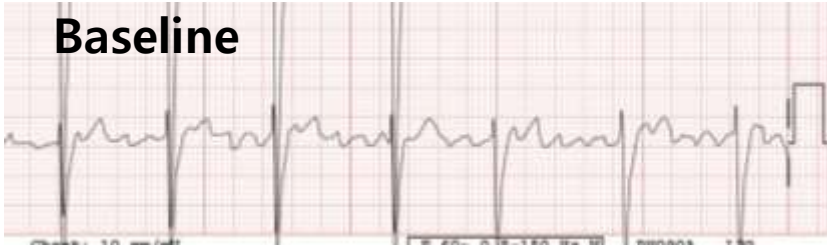
- ERO 0.12 cm²
- RV 21.3 cc

- ERO 0.08 cm²
- RV 17 cc

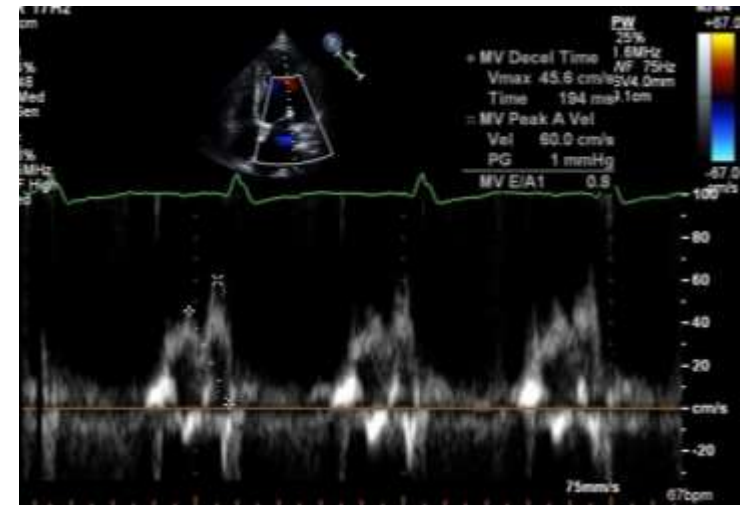
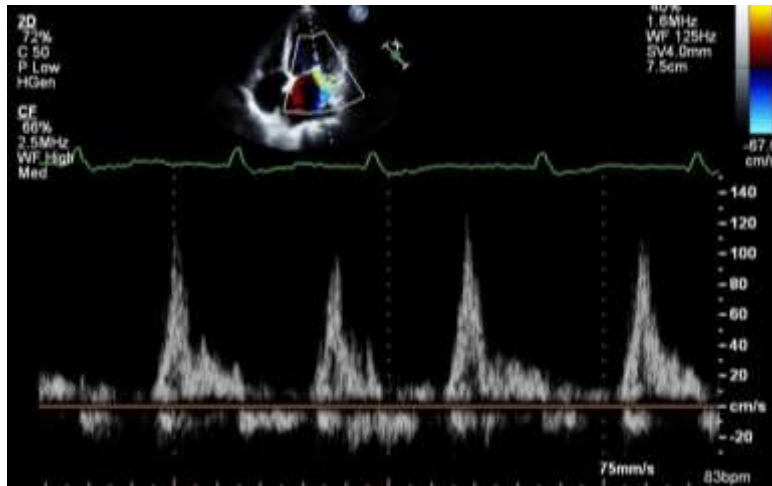
Reversion of **permanent** AF to sinus rhythm

Found at 3 months FU and maintained

Baseline



3 month FU

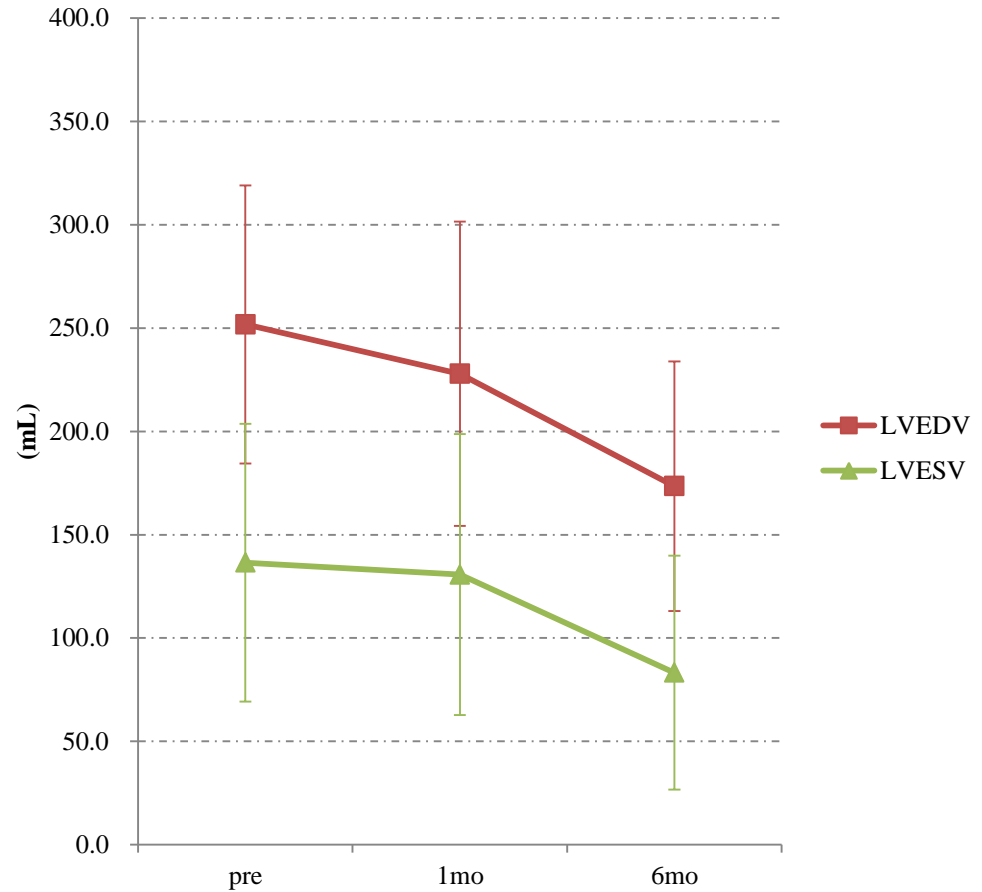


Reverse remodeling of LA & LV

LA volume



LV volume



	Baseline (n=4)	1 month (n=4)	6month (n=3)	P Value
LAESV (ml)	312.79±49.68	258.03±40.44	207.33±78.96	.0617
LVEDV (ml)	251.75±67.35	227.89±73.61	173.47±60.39	.0617
LVESV (ml)	136.47±67.24	130.68±67.98	83.26±56.68	.0336

In summary

1. Mitral Loop Cerclage is a novel approach for treating functional MR as a catheter based approach via coronary sinus
2. Mitral Loop Cerclage is now under early phase of exploratory clinical trial in Korea as a 'proof of concept' study
3. In these two cases, Cerclage reduced mitral regurgitation with reverse remodeling of LV and LA
4. Atrial electrical remodeling shown as 'sinus rhythm recovery' is also a very interesting finding in this study

Acknowledgement

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Kyoungmi Lee BS

Gu-Teck Lim

Sung-Min Kim

Other

Jin-Pyeong Kim

Justin Kim

Kyung-Hee Hong

Mari-Goretti Kim

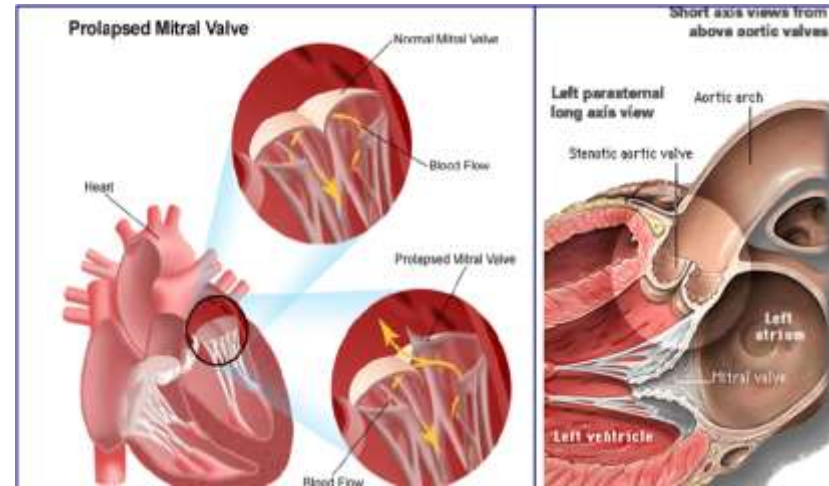
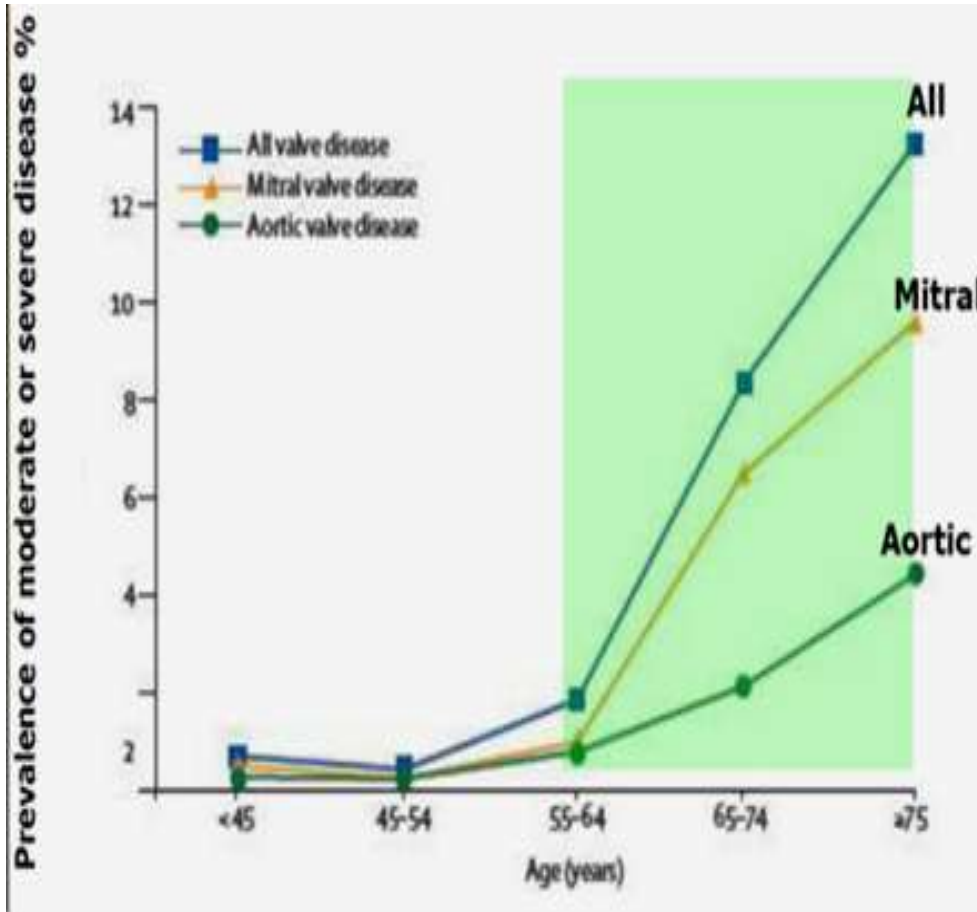
Filipe Carvalho

Thank you for your attention



Valvular Heart Disease

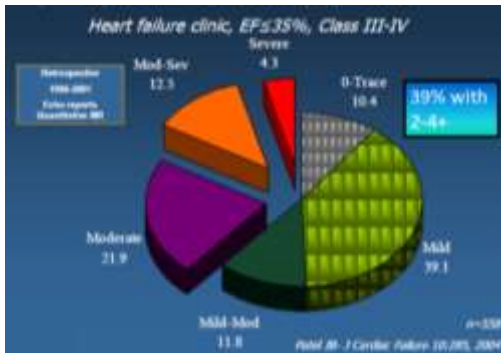
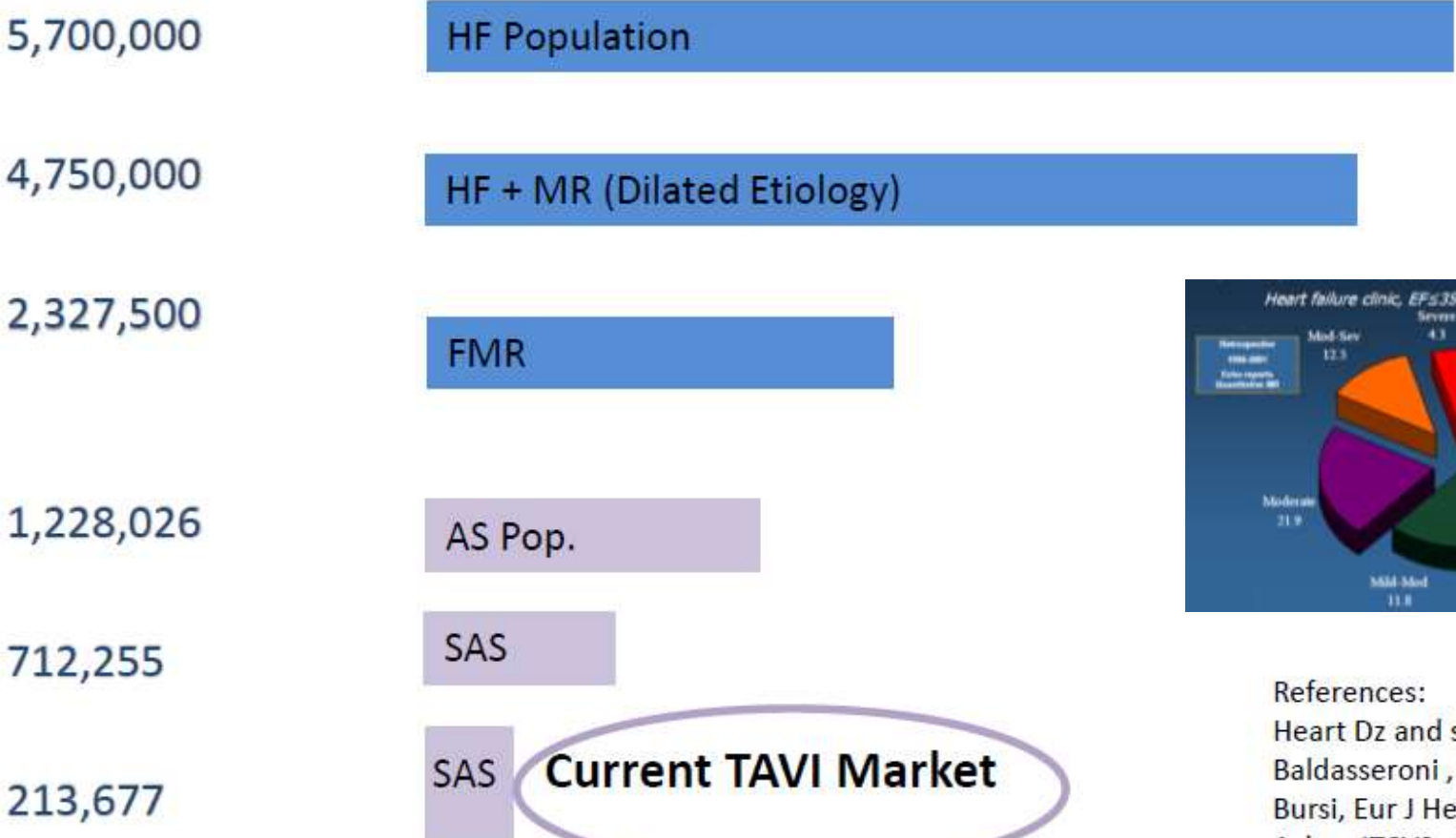
MR : 6% in population over than 55 years



Lancet. 2006;368:1005-11

US Prevalence of Functional MR vs Severe AS

Population



References:
 Heart Dz and stroke stats Circ 2011
 Baldasseroni , Am Heart J 2002
 Bursi, Eur J Heart Failure, 2010
 Acker, JTCVS , 2006
 Nkomo, Lancet, 2006
 Batur, Arch Int Med, 2003
 Leon, NEJM, 2010

The baseline characteristics of the enrolled cases (n=5)

Endpoints : Efficacy and safety endpoints at postprocedure, 1month and 6months

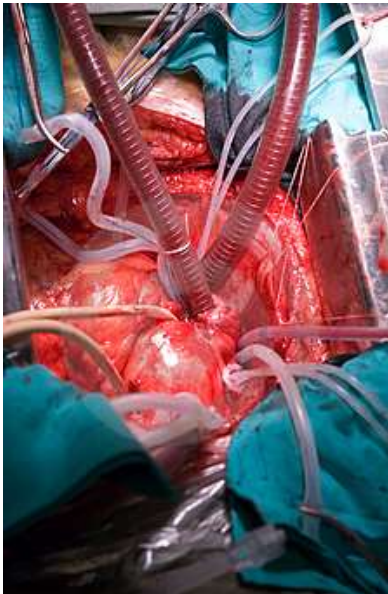
#	Proc date	Sex/age	Mechanism of FMR	EF (%)	LVEDD (mm)	LVEDV (mL)	Imaging guidance	Procedural success
1	July 2015	F/76	Ischemic MR	65	72	190	AX+TTE (sedation)	Yes
2	Oct 2015	M/71	Annular dilation	61	63	229	AX+TTE (sedation)	No*
3	Oct 2015	F/74	Atrial fib. & annular dilation	58	65	218	AX+TEE (Gen Anesthesia)	Yes
4	Jan 2016	M/62	Non-ischemic cardiomyopathy & leaflet tethering	34	74	260	AX+TEE (Gen Anesthesia)	Yes
5	Feb 2016	M/68	Non-ischemic cardiomyopathy & leaflet tethering	37	84	350	AX+TTE (sedation)	Yes

- Dimension and volumetric data were from cardiac CT measurement
- Procedure was aborted due to unsuitable anatomy of proximal septal vein. The patient was discharged next day without any complication.
- TEE was done under general anesthesia

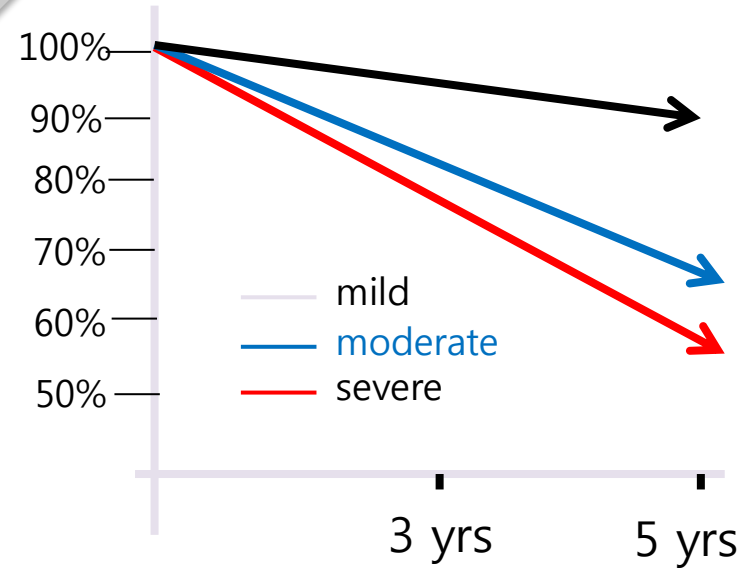
Minimal invasiveness makes patients happy

Conventional stenotomy

Catheter based approach



Survival according to MR severity



+ **Functional** MR moderate or severe

	Surgical Probe (real world)		Catheter based device (expected)	
	US	World	US	World
Procedure (annual)	50,000	150,000	250,000	750,000