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VI CONGRESSO NAZIONALE DI
ECOCARDIO
CHIRURGIA

INSUFFICIENZA MITRALICA RESIDUA O RECIDIVANTE

Quanto è prevedibile con un'accurato studio preoperatorio o intraoperatorio un risultato incerto della riparazione?

*Quando si può attendere e quando si deve reintervenire.
Le opzioni terapeutiche*

Prof. F. Alamanni



CHIRURGIA RIPARATIVA DELLA MITRALE

Malattia degenerativa: risultati

Outcomes of Mitral Valve Repair for Mitral Regurgitation Due to Degenerative Disease

Tirone E. David, MD

2007

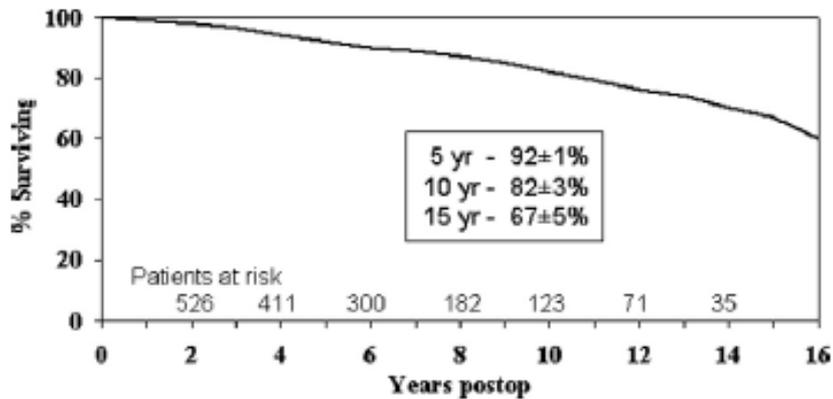


Figure 1 Long-term survival after mitral valve repair.

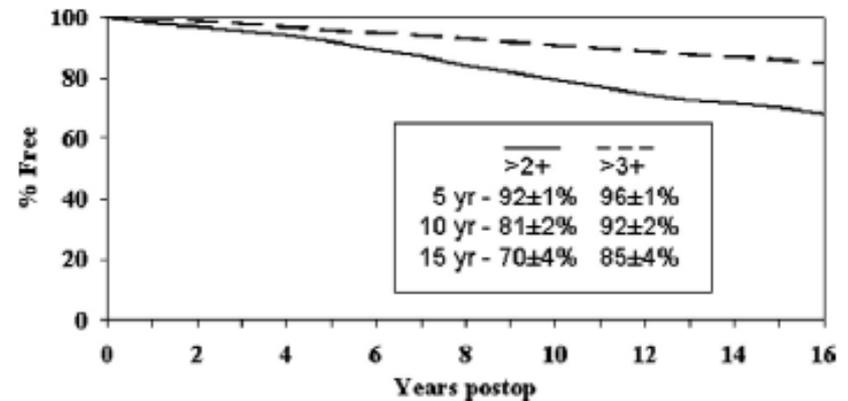


Figure 3 Freedom from recurrent mitral regurgitation.

DURABILITY OF MITRAL VALVE REPAIR FOR DEGENERATIVE DISEASE

A. Marc Gillinov, MD^a
Delos M. Cosgrove, MD^a

The Journal of Thoracic and Cardiovascular Surgery
November 1998



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IM recidivante: cause e fattori predittivi

A comparison of outcomes of mitral valve repair for degenerative disease with posterior, anterior, and bileaflet prolapse

Tirone E. David, MD, Joan Ivanov, PhD, Susan Armstrong, MSc, Debbie Christie, RN, and Harry Rakowski, MD

DURABILITY OF MITRAL VALVE REPAIR FOR DEGENERATIVE DISEASE

A. Marc Gillinov, MD^a The Journal of Thoracic and Cardiovascular Surgery
Delos M. Cosgrove, MD^a November 1998

Mechanisms of Recurrent Regurgitation After Valve Repair for Prolapsed Mitral Valve Disease

Tomoki Shimokawa, MD, Hitoshi Kasegawa, MD, Yuzo Katayama, MD, Shigefumi Matsuyama, MD, Susumu Manabe, MD, Minoru Tabata, MD, Toshihiro Fukui, MD, and Shuichiro Takanashi, MD

2011

Long-term clinical results of mitral valvuloplasty using flexible and rigid rings: A prospective and randomized study

Byung-Chul Chang, MD,^a Young-Nam Youn, MD,^a Jong-Won Ha, MD,^b Sang-Hyun Lim, MD,^a You-Sun Hong, MD,^a and Namsik Chung, MD^b 2003

Durability of mitral valve repair in Barlow disease versus fibroelastic deficiency

Willem Flameng, MD, PhD,^a Bart Meuris, MD, PhD,^a Paul Herijgers, MD, PhD,^a and Marie-Christine Herregods, MD, PhD^b

2008



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IM recidivante: cause e fattori predittivi

PROCEDURE - RELATED	VALVE - RELATED
Suture dehiscence	Anterior leaflet prolapse
Rupture of shortened chordae	Progressive degeneration
Incomplete repair	Endocarditis
Ring detachment	Leaflet thickening
Hemolysis	Pre-op TR ≥ 3
Non use of ring	Post-op MR ≥ 2
Non use of sliding	Dilated cardiomyopathy
	New calcifications



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L'ecografia 3D: accuratezza

Pre-operative transthoracic real-time three-dimensional echocardiography in patients undergoing mitral valve repair: accuracy in cases with simple vs. complex prolapse lesions

Gloria Tamborini*, Manuela Muratori, Anna Maltagliati, Claudia Agnese Galli, Moreno Naliato, Marco Zanobini, Francesco Alamanni, Luca Salvi, Erminio Sisillo, Cesare Fiorentini, and Mauro Pepi



European Journal of Echocardiography (2010) 11, 778–785
doi:10.1093/ejechocard/jeq066

Table 3 Detection of pathology with transthoracic three-dimensional and transoesophageal two-dimensional echocardiography

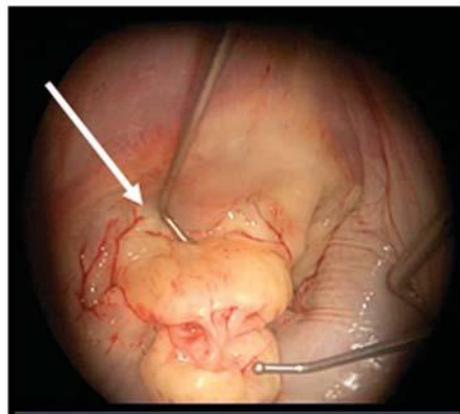
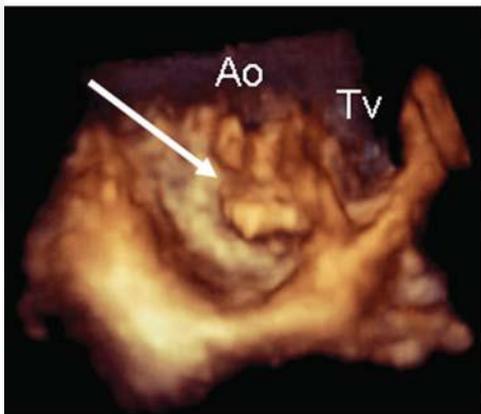
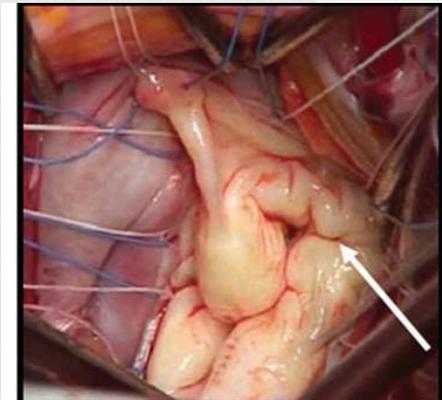
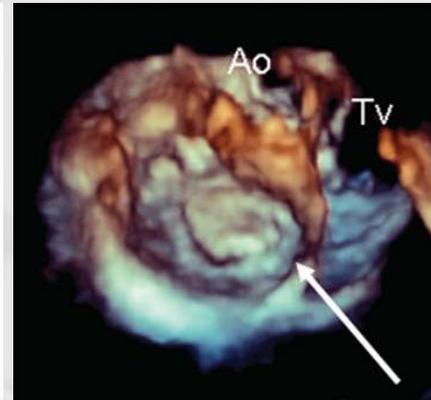
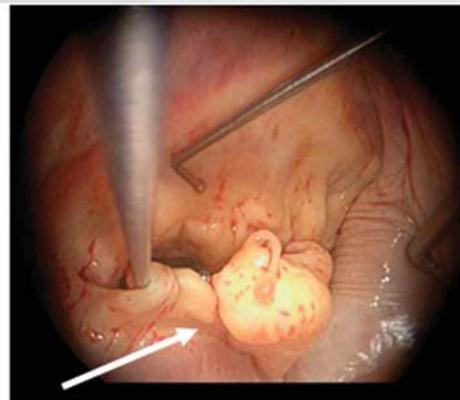
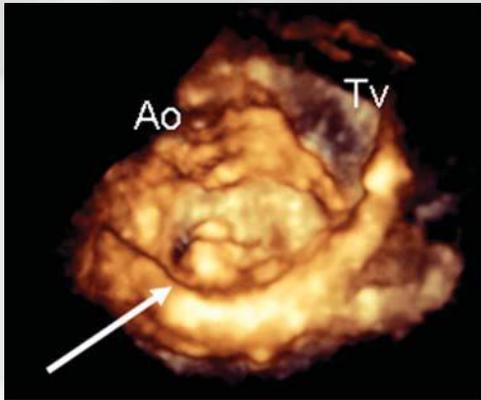
	Sensitivity (%)		Specificity (%)		Accuracy (%)	
	3DTTE	2DTOE	3DTTE	2DTOE	3DTTE	2DTOE
Posterior leaflet						
P1	70	70	98	94	93	89 [ⓐ]
P2	99*	98.2*	89*	85*	97.5*	95*
P3	89* [†]	83* [ⓐ]	95	89	92 [†]	86.5 [†]
Posterior leaflet >1 scallop	92	85 [ⓐ]	96	94.5	95	92 [ⓐ]
Anterior leaflet						
A1	73	69	100	93.5 [ⓐ]	97	88.5 [ⓐ]
A2	100 [§]	94 ^{§,ⓐ}	91 [§]	88	94 [§]	91
A3	92 ^{§,}	89 [§]	100	93 [ⓐ]	94.5	89 [ⓐ]
Anterior leaflet >1 scallop	92	85 [ⓐ]	97	93.5 [ⓐ]	95	92 [ⓐ]
Anterolateral commissure	71	70	99	96.5 [ⓐ]	95	92.5 [ⓐ]
Postero-medial commissure	89.5 [#]	85 [#]	96	91 [ⓐ]	94	88 [ⓐ]
Chordal rupture	95	98 [ⓐ]	90	90	93	95
Overall accuracy	92.5	85 [ⓐ]	96	93	95	93.5

P1, lateral scallop of the posterior leaflet; P2, middle scallop of the posterior leaflet; P3, medial scallop of the posterior leaflet; A1, lateral scallop of the anterior leaflet; A2, middle scallop of the anterior leaflet; A3, medial scallop of the anterior leaflet.



CHIRURGIA RIPARATIVA DELLA MITRALE

L'ecografia 3D: accuratezza



Pre-operative transthoracic real-time three-dimensional echocardiography in patients undergoing mitral valve repair: accuracy in cases with simple vs. complex prolapse lesions

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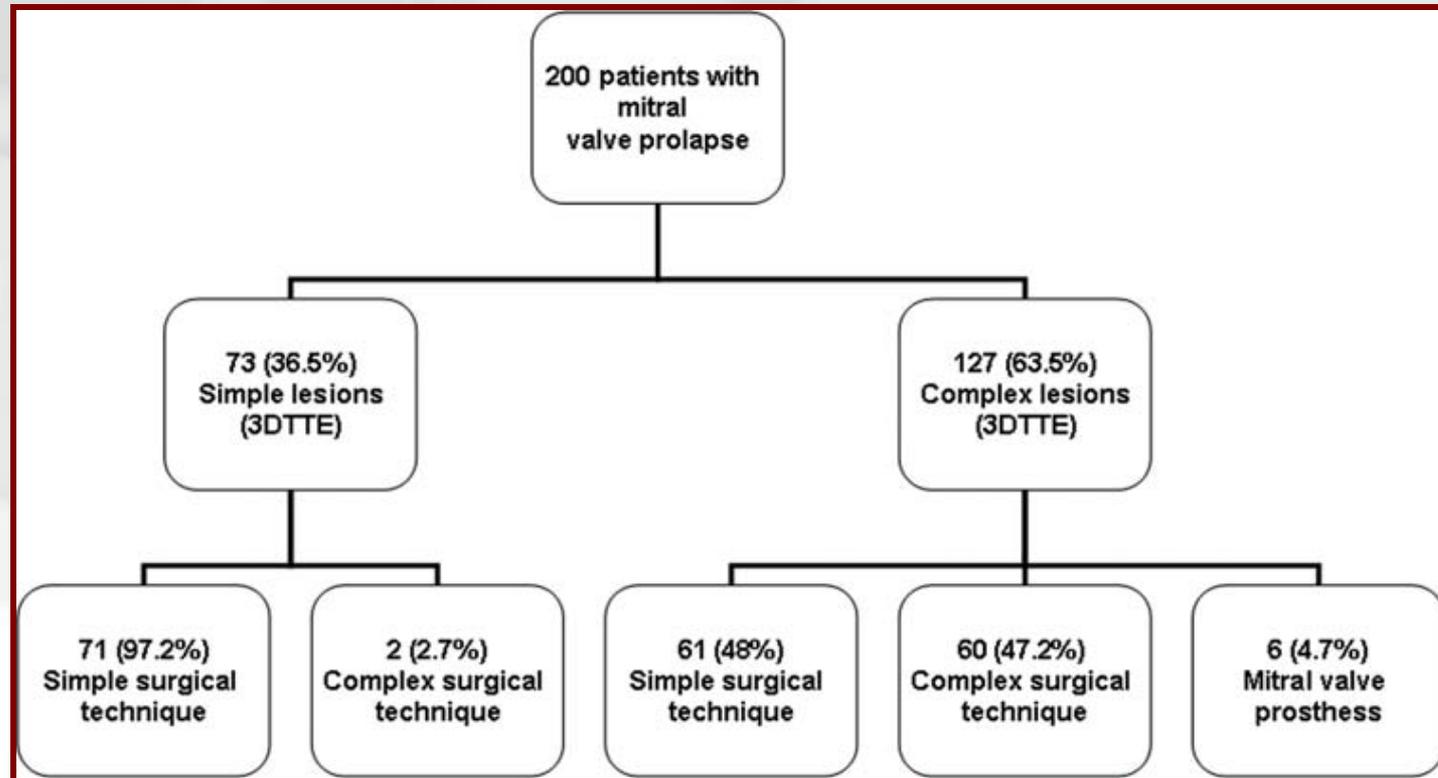


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CHIRURGIA RIPARATIVA DELLA MITRALE

L'ecografia 3D: accuratezza



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Tecniche chirurgiche

Simple surgical techniques

Quadrangular resection of posterior leaflet	166 (83%)
Posterior annular plication	72 (36%)
Posterior leaflet folding plasty	60 (30%)
Sliding of posterior leaflet	76 (38%)
Annuloplasty	199 (99.5%)
Edge-to-edge technique	0

Pre-operative transthoracic real-time three-dimensional echocardiography in patients undergoing mitral valve repair: accuracy in cases with simple vs. complex prolapse lesions

Gloria Tamborini*, Manuela Muratori, Anna Maltagliati, Claudia Agnese Galli, Moreno Naliato, Marco Zanobini, Francesco Alamanni, Luca Salvi, Erminio Sisillo, Cesare Fiorentini, and Mauro Pepi



European Journal of Echocardiography (2010) 11, 778–785
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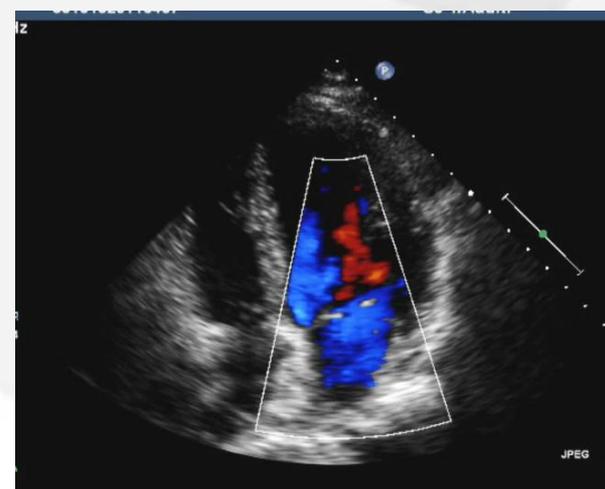
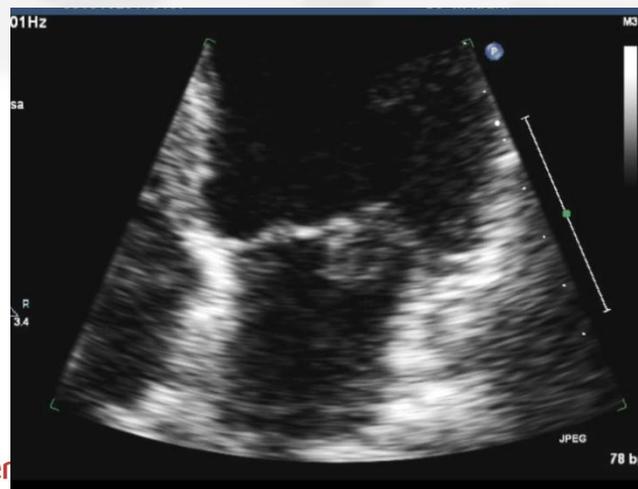
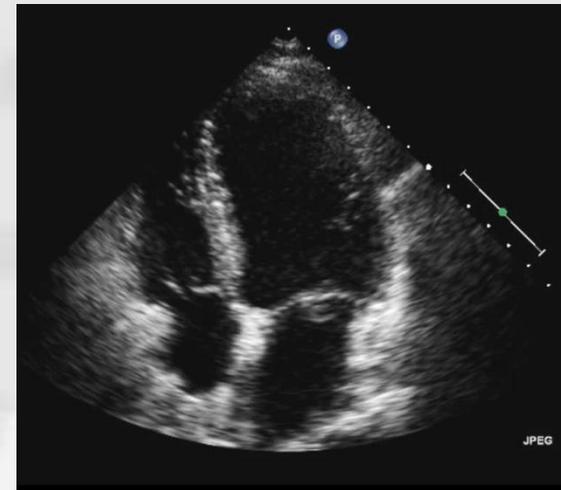
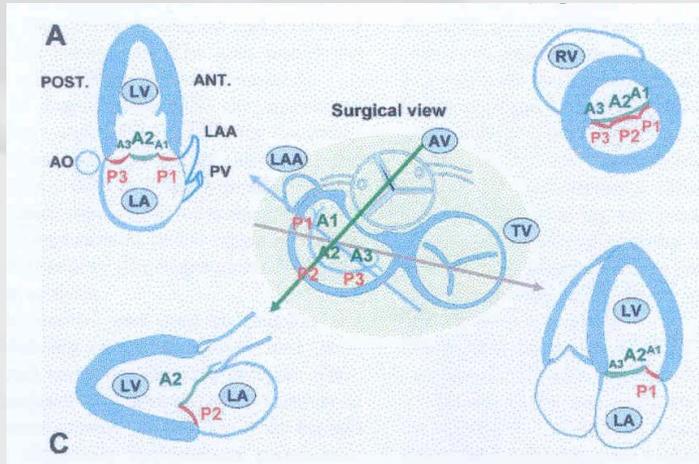
Complex surgical techniques

Replacement of chordae tendinae with Gore-Tex neo-chordae	24 (12%)
Transfer of chordae tendinae on anterior leaflet and one or more technique(s) for simple case(s)	12 (6%)
Papillary muscle repositioning	40 (20%)
Replacement of chordae tendinae with Gore-Tex neo-chordae and one or more technique(s) for simple case(s)	10 (5%)
Papillary muscle repositioning and one or more technique(s) for simple case(s)	13 (6.5%)
Edge-to-edge technique and one or more technique(s) for simple case(s)	0



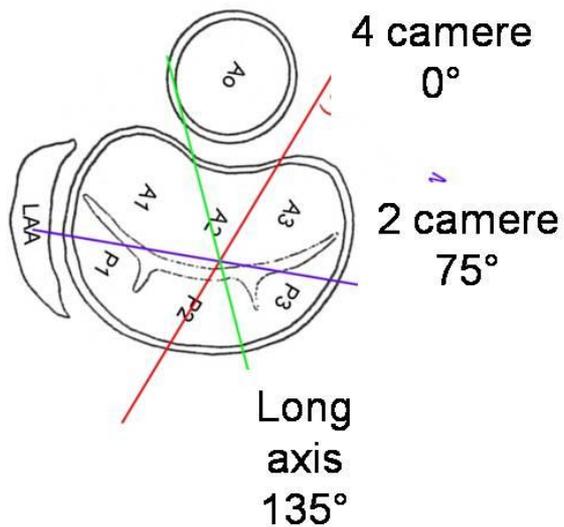
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La valutazione pre-operatoria (Caso 1)



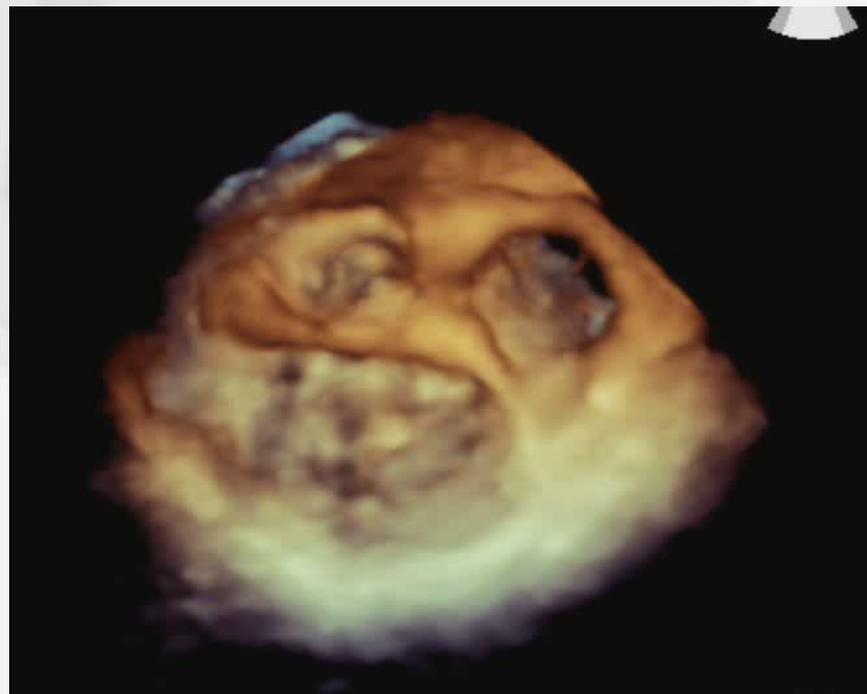
CHIRURGIA RIPARATIVA DELLA MITRALE

La valutazione pre-operatoria (Caso 1)



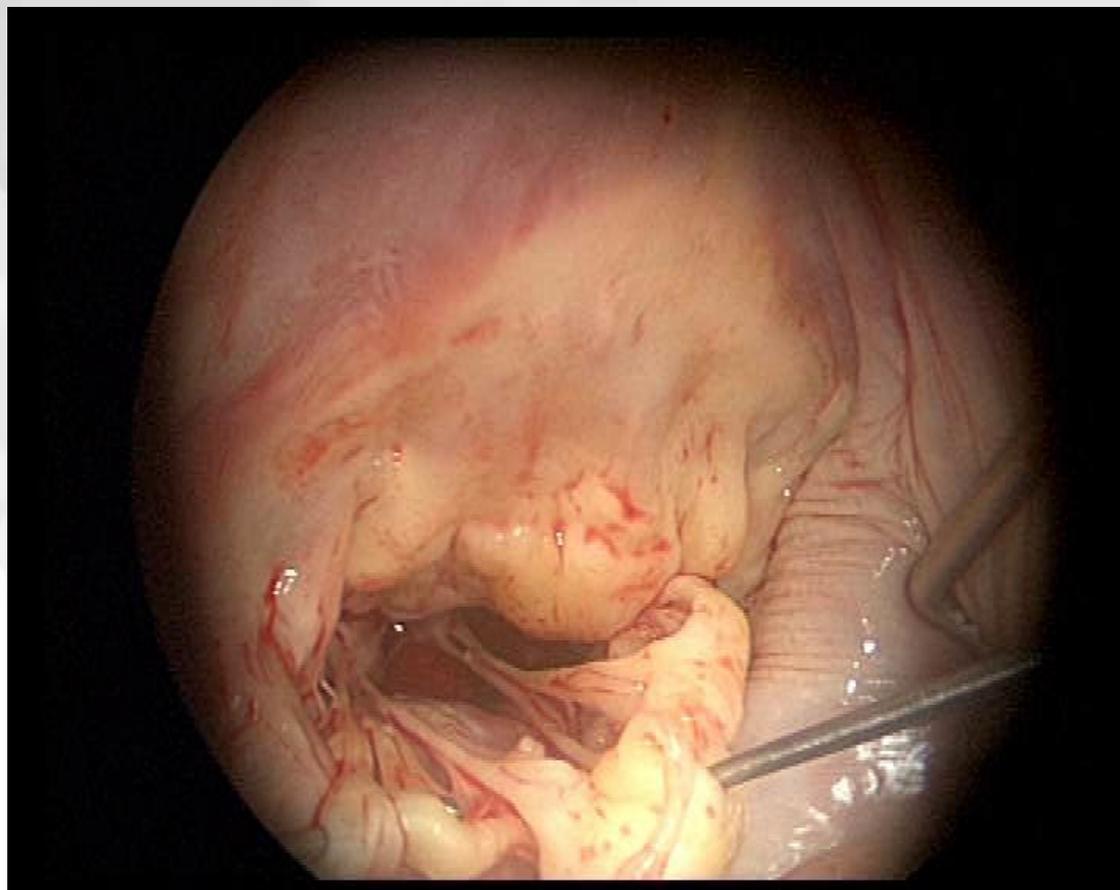
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La valutazione pre-operatoria (Caso 2)



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La visione intraoperatoria (Caso 2)



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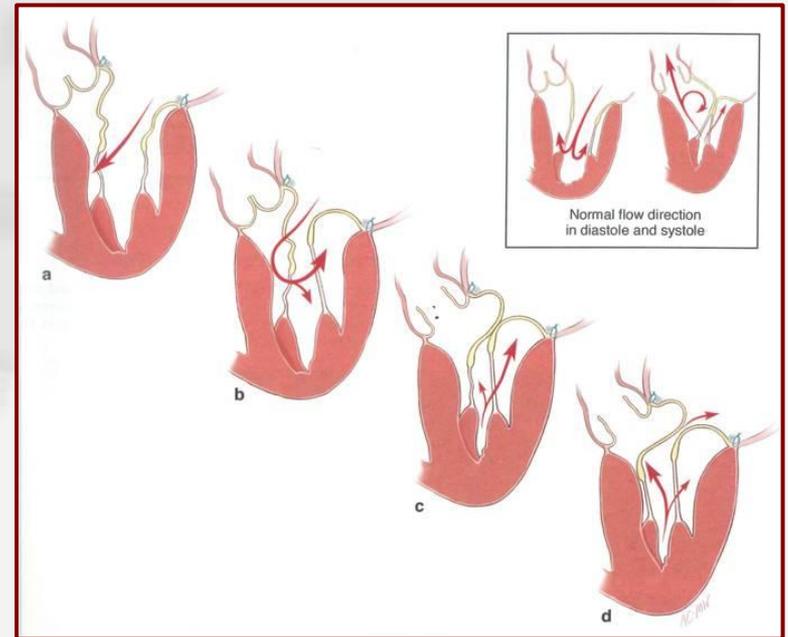
Sistolic Anterior Motion: fattori di rischio

MAGGIORI:

- Eccessivo tessuto valvolare
- Anello troppo piccolo

MINORI:

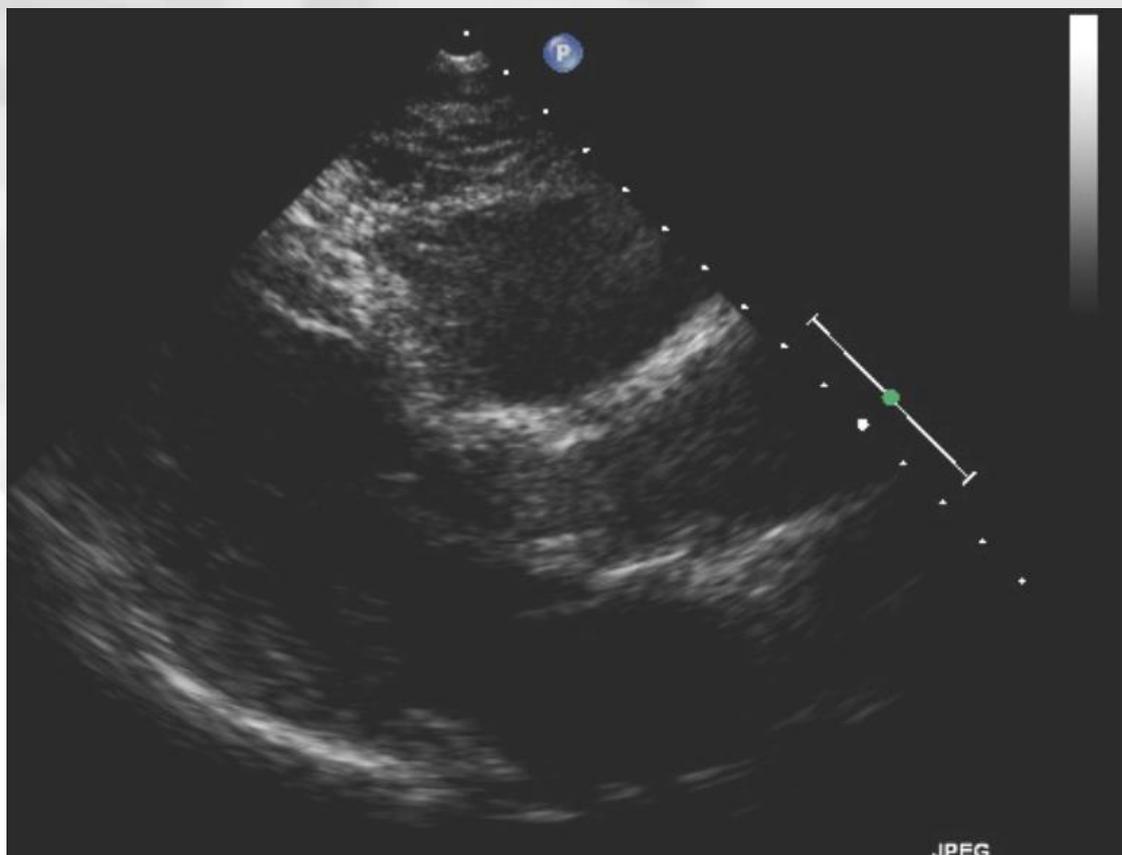
- Angolo mitro-aortico $< 120^\circ$
- Ipertrofia settale
- Ventricolo piccolo e ipercinetico
- Atriomegalia
- Anormale configurazione cuspidi anteriore



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Systolic Anterior Motion: caso clinico

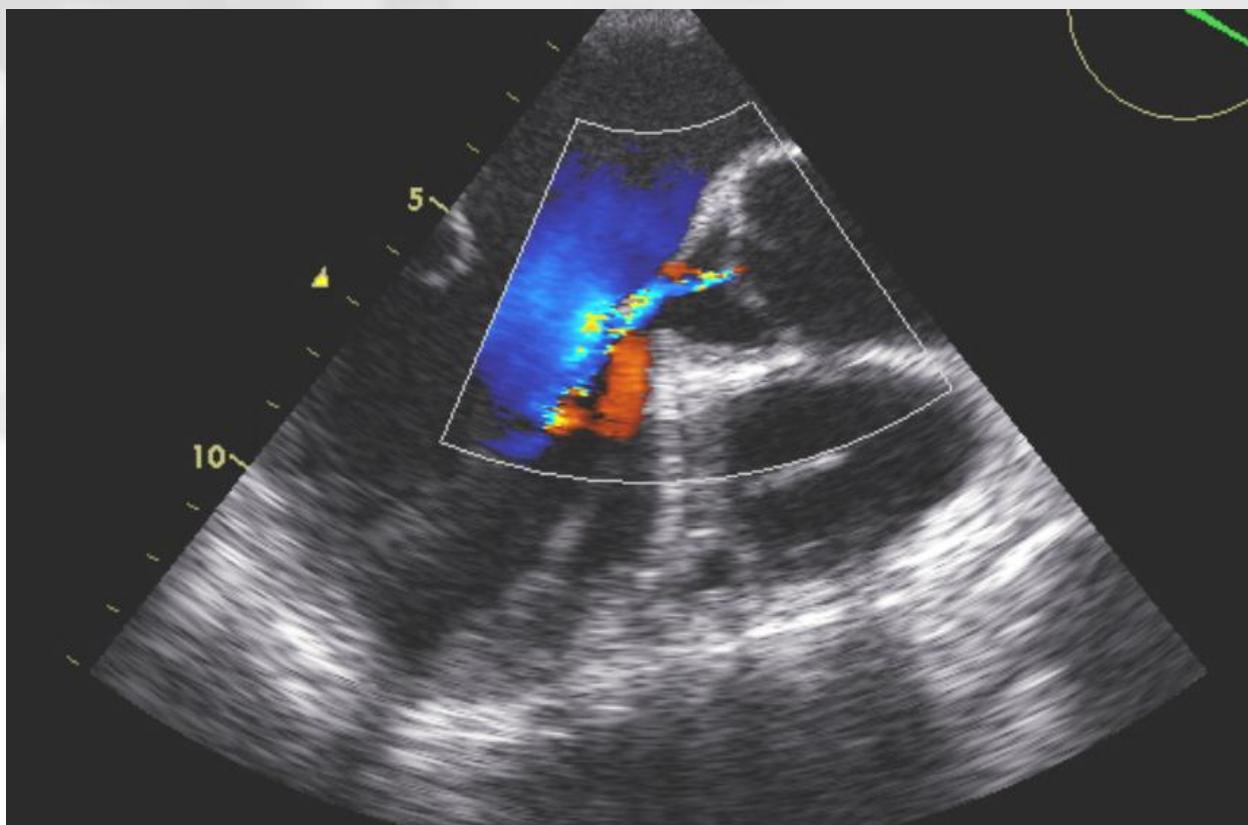
TEE PRE-OPERATORIO



CHIRURGIA RIPARATIVA DELLA MITRALE

Sistolic Anterior Motion: caso clinico

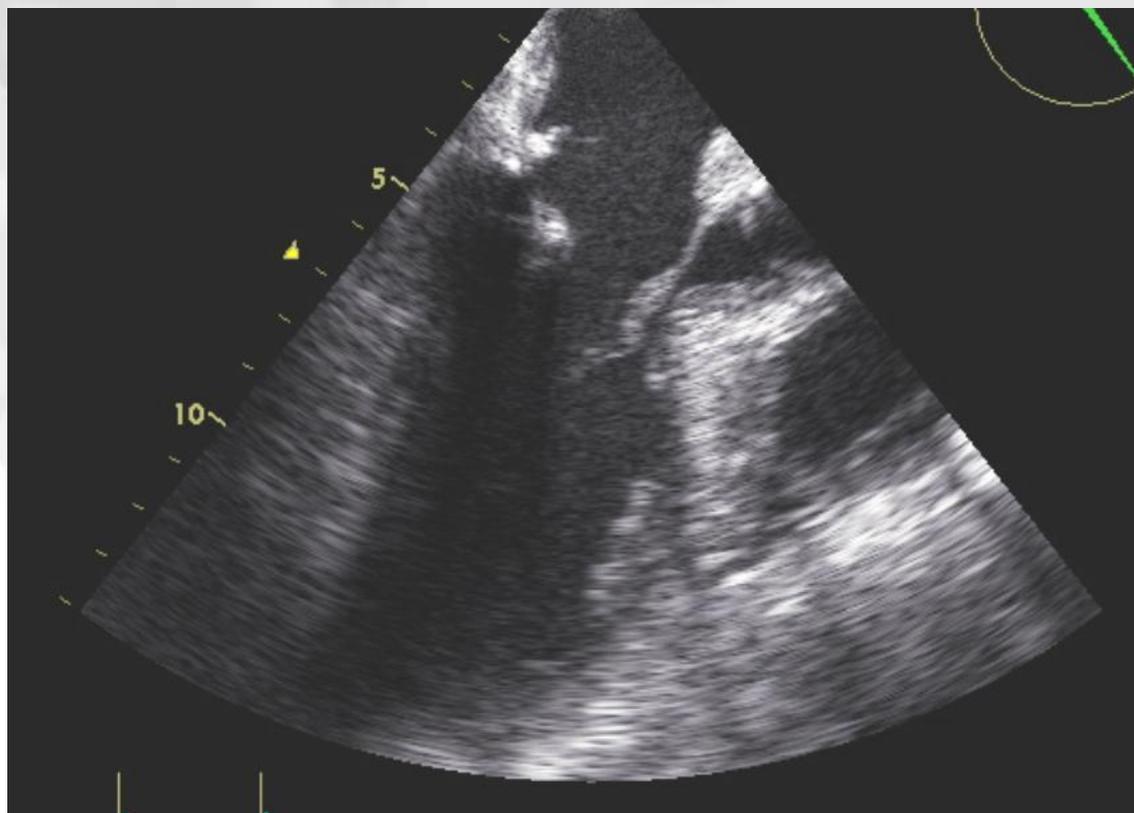
TEE PRE-OPERATORIO



CHIRURGIA RIPARATIVA DELLA MITRALE

Sistolic Anterior Motion: caso clinico

TEE POST-OPERATORIO → **SAM**



CHIRURGIA RIPARATIVA DELLA MITRALE

Sistolic Anterior Motion: caso clinico

TEE PRE-OPERATORIO (REDO)



CHIRURGIA RIPARATIVA DELLA MITRALE

Sistolic Anterior Motion: caso clinico

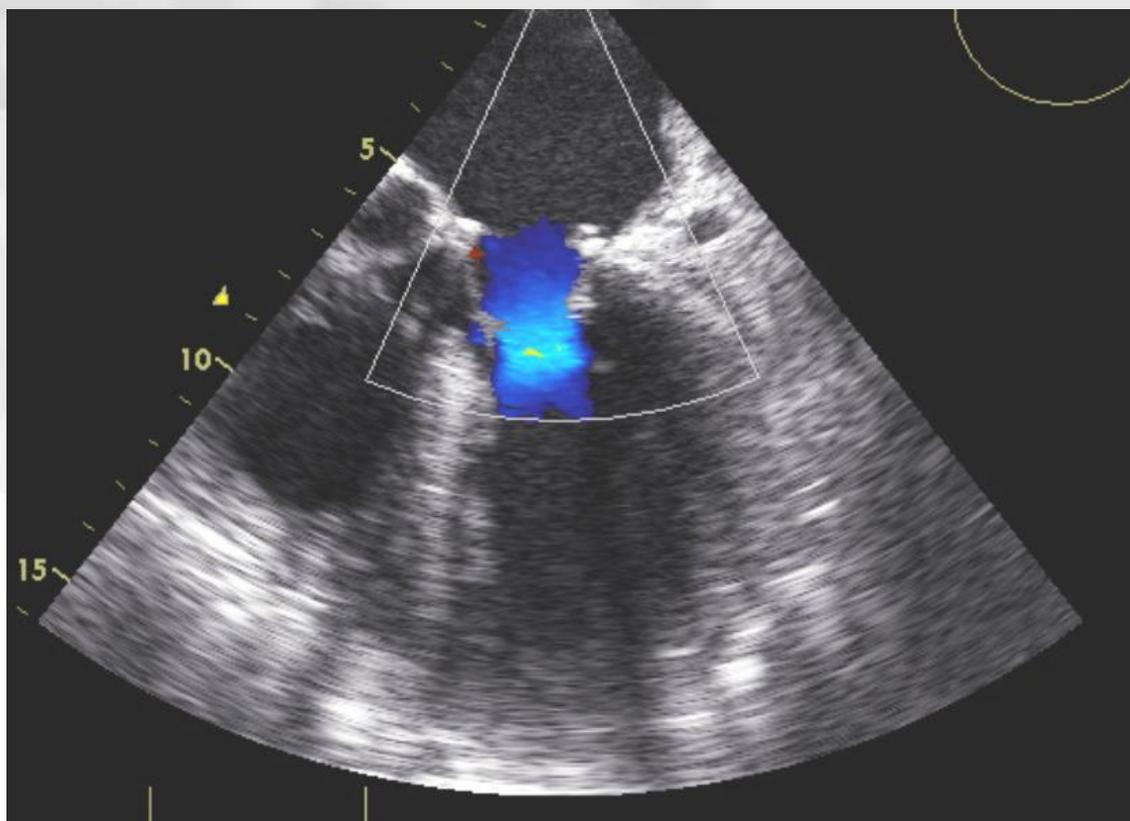
TEE POST-OPERATORIO (REDO)



CHIRURGIA RIPARATIVA DELLA MITRALE

Sistolic Anterior Motion: caso clinico

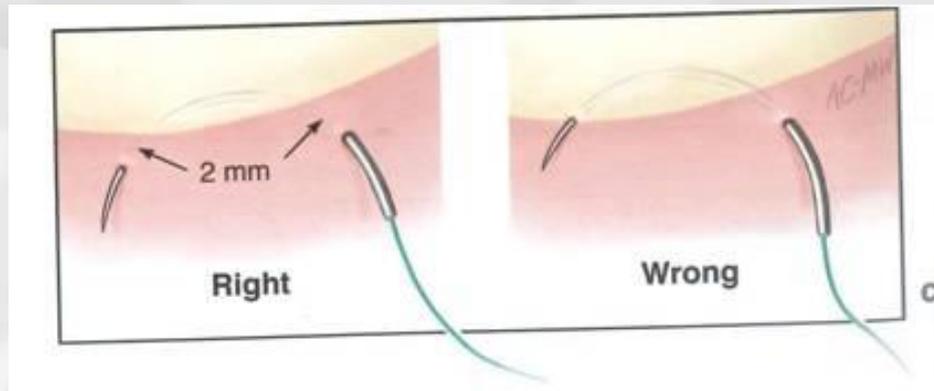
TEE POST-OPERATORIO (REDO)



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La condotta intraoperatoria: parametri

1. Corretto posizionamento dell'anello



2. Adeguata continenza post-operatoria

- Rischio di ricorrenza aumentato per risultati sub-ottimali



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La condotta intraoperatoria: parametri

3. Adeguata superficie di coaptazione
 - ≥ 1 cm

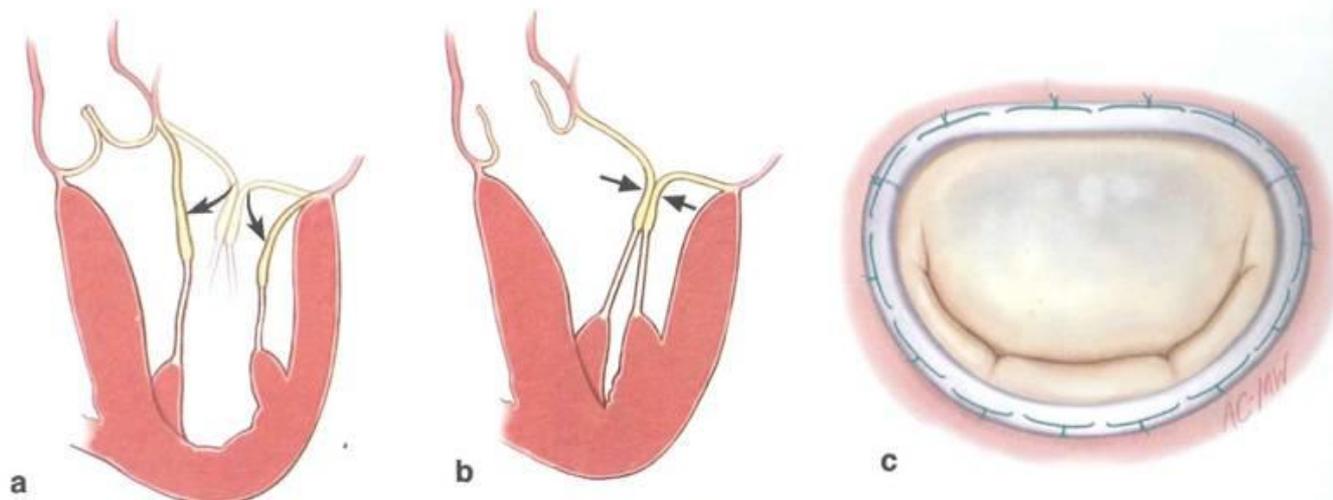


FIGURE 7-6



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Il chirurgo: il follow-up

Repair failure can occur during entire follow-up period:

→ Need for continued **echocardiographic surveillance**

- Procedure related: earlier
- Valve related: later

NO “SAFE” PERIOD!!



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Il reintervento: indicazioni

1. Insufficienza moderato-severa sintomatica o associata a significativo sovraccarico di volume
2. Scompenso Cardiaco
3. Emolisi significativa
4. Endocardite
5. Problema tecnico (SAM, riparazione incompleta) ++ se associato a 1-4



CHIRURGIA RIPARATIVA DELLA MITRALE

Il chirurgo: il reintervento

Reoperation After Mitral Valve Repair for Degenerative Disease

Eric Dumont, MD, A. Marc Gillinov, MD, Eugene H. Blackstone, MD, Joseph F. Sabik III, MD, Lars G. Svensson, MD, PhD, Tomislav Mihaljevic, MD, Penny L. Houghtaling, MS, and Bruce W. Lytle, MD

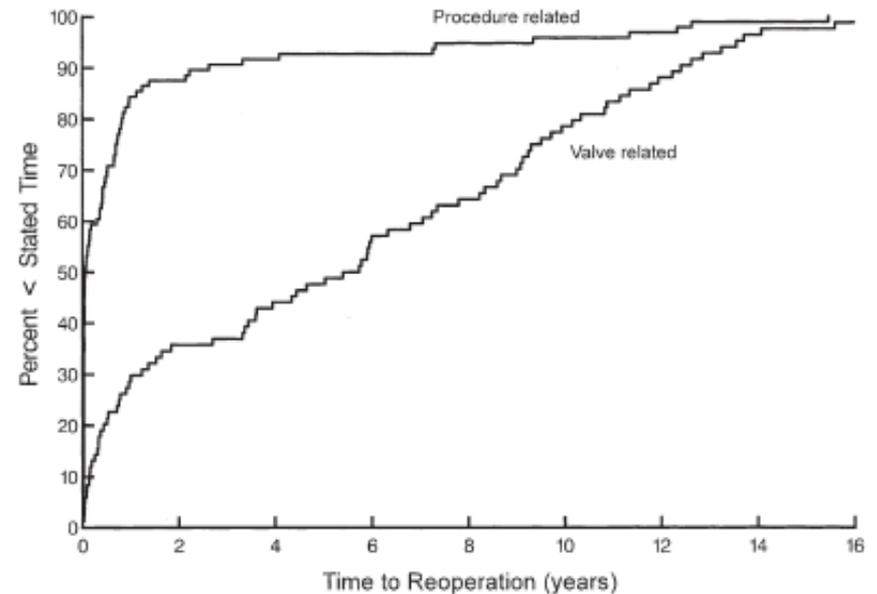
Departments of Thoracic and Cardiovascular Surgery, and Quantitative Health Sciences, The Cleveland Clinic, Cleveland, Ohio

Ann Thorac Surg
2007;84:444-50

Table 2. Mechanisms of Repair Failure

Mechanism ^a	No.	No. of Patients
Procedure related	96	
<u>Suture dehiscence</u>		40
<u>Hemolysis</u>		21
<u>Chordal shortening</u>		20
<u>Systolic anterior motion</u>		20
<u>Incomplete initial repair</u>		11
Valve related	109	
<u>Progressive degeneration</u>		100
<u>Endocarditis</u>		11
Unknown	8	

^a Categories are not mutually exclusive: 25 patients had both procedure-related and valve-related mechanisms of repair failure.



CHIRURGIA RIPARATIVA DELLA MITRALE

Il chirurgo: il reintervento

Reoperation for Failure of Mitral Valve Repair in Degenerative Disease: A Single-Center Experience

Rachid Zegdi, MD, PhD, Ghassan Sleilaty, MD, Christian Latrémouille, MD, PhD, Alain Berrebi, MD, Alain Carpentier, MD, PhD, Alain Deloche, MD, and Jean-Noël Fabiani, MD

AP-HP, Assistance Publique-Hôpitaux de Paris, Service de Chirurgie Cardiovasculaire, Hôpital Européen Georges Pompidou, Université René Descartes, and Inserm U849, Faculté de Necker, Paris, France

Ann Thorac Surg
2008;86:1480-4

Table 3. Causes of Failure of the First Mitral Valve Repair

Lesions	MVRep Group (n = 21)	MVR Group (n = 22)	p Value
Rupture of shortened or transferred chordae	3 (14%)	10 (45%)	0.045
Elongation/rupture of chordae from shortened papillary muscles	4 (19%)	1 (5%)	0.19
Chordal elongation/rupture in progressive disease	6 (29%)	8 (36%)	0.58
Posterior leaflet retraction	3 (14%)	1 (5%)	0.35
Leaflet dehiscence	1 (5%)	1 (5%)	0.99
Leaflet perforation	2 (10%)	0 (0%)	0.23
Incomplete repair	4 (19%)	0 (0%)	0.048
Ring dehiscence	4 (19%)	3 (14%)	0.70
Endocarditis	1 (5%)	0 (0%)	0.49

MVR = mitral valve replacement; MVRep = mitral valve repair.

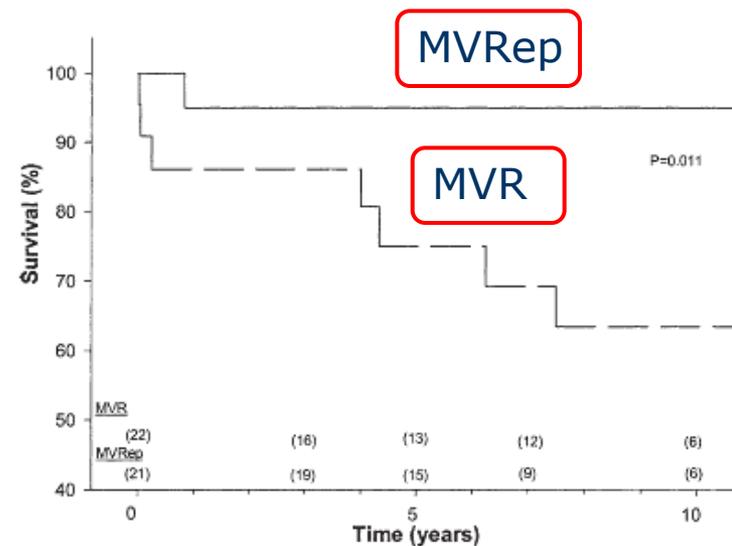


Fig 1. Survival curves of patients with late failure of mitral valve repair in degenerative disease who underwent either redo mitral valve repair (solid line) or redo mitral valve replacement (broken line).



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Il chirurgo: il follow-up

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Departments of Thoracic and Cardiovascular Surgery, and Quantitative Health Sciences, The Cleveland Clinic, Cleveland, Ohio

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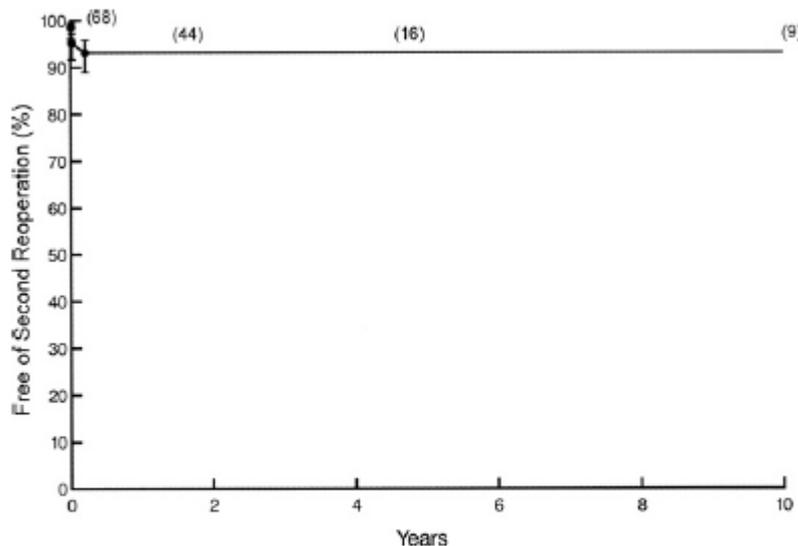
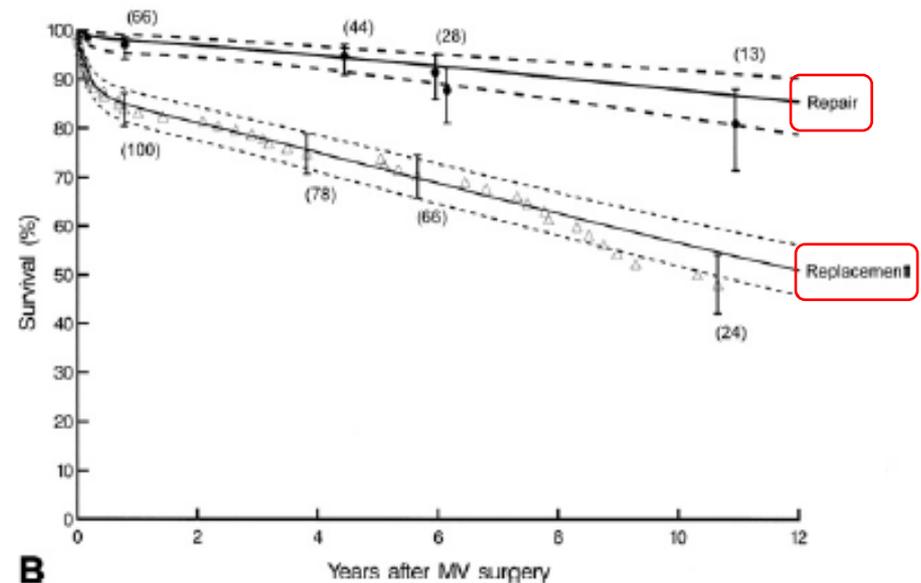


Fig 3. Freedom from reoperation after mitral valve re-repair (line). Each solid circle is a reoperation, vertical bars are asymmetric confidence limits equivalent to ± 1 standard error, and numbers in parentheses patients are remaining at risk.



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Il chirurgo: conclusioni

VALUTAZIONE PRE-OPERATORIA

1. Essenziale un'accurata valutazione pre-operatoria con l'ausilio dell'eco-3D
2. Probabilità di riuscita della plastica associata alle caratteristiche ecografiche pre-operatorie
(Lesione/Intervento facile/difficile)
3. Individuare presenza di fattori di rischio per SAM



CHIRURGIA RIPARATIVA DELLA MITRALE

Il chirurgo: conclusioni

ACCORGIMENTI INTRA-OPERATORI

1. Rimuovere il prollasso/billowing rispettando le simmetrie
2. Suturare l'anello sui trigoni
3. Evitare le suture sull'atrio o sul lembo valvolare
4. Ottenere sempre buona coaptazione (non basta il color-doppler)
5. Accertarsi che le linee di sutura siano sicure



CHIRURGIA RIPARATIVA DELLA MITRALE

Il chirurgo: conclusioni

1. Il fallimento della plastica per ragioni tecniche è più precoce ed associato a meccanismi individuabili e precisi
→ Ottime probabilità di re-riparazione con buoni risultati a distanza!!
2. Quando la causa della recidiva è la progressione di malattia la re-riparazione è meno favorevole
→ Considerare la sostituzione valvolare
3. Riparazioni complesse in pazienti anziani e limitata esperienza dell'operatore
→ Considerare la sostituzione valvolare



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La nostra esperienza

DATA PRIMO INTERVENTO	EZIOLOGIA	TIPO INTERVENTO	DATA REDO	TIPO INTERVENTO
2004	Degenerativa	PLM (Cosgrove 28)	10/2004	MVR Carpentier 27
2004	Degenerativa	PLM (Carpentier 26)	01/2005	Physio 34
2004	Degenerativa	PLM (Physio 26)	05/2005	MVR St jude 25
1992	Reumatica	Commissurotomia	05/2005	Carpentier 27
2000	Degenerativa	PLM	07/2005	MVR Carpentier 27
1993	Degenerativa	PLM	08/2005	Physio 30 + CABG
1999	Degenerativa	PLM	03/2006	Carpentier RIng 4100 n. 30
1991	Degenerativa	PLM	05/2006	St Jude 27
1993	Reumatica	Commissurotomia + Carpentier 34	11/2006	MVR Magna 25



CHIRURGIA RIPARATIVA DELLA MITRALE

La nostra esperienza

DATA PRIMO INTERVENTO	EZIOLOGIA	TIPO INTERVENTO	DATA REDO	TIPO INTERVENTO
1999	Degenerativa	PLM (Carpentier 28)	02/2007	MVR Carpentier 27
1997	Degenerativa	PLM	04/2007	Magna 25
01/2007	Degenerativa	PLM	07/2007	MVR Magna 27
02/2006	Degenerativa	PLM (Cosgrove 26)	10/2007	Carbomedics 25
03/2008	Degenerativa	PLM	03/2008	MVR Magna 25
08/2008	Degenerativa	PLM	11/2008	Magna 27
2005	Degenerativa	PLM+PLT+Abl FA	04/2009	McCarthy 30
05/2009	Degenerativa	PLM (minitoraco)	06/2009	Physio 34
1994	Ischemica	CABG + PLM	09/2009	CABG + Physio 32
1999	Degenerativa	PLM	05/2010	Magna 27



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La nostra esperienza

DATA PRIMO INTERVENTO	EZIOLOGIA	TIPO INTERVENTO	DATA REDO	TIPO INTERVENTO
2005	Degenerativa	PLM (senza anello)	06/2010	Physio 30
04/2010	Degenerativa	PLM (Cosgrove 28)	07/2010	Rifissaggio anello mitralico e punto di Alfieri tra A2 e P2
2007	Ischemica	PLM + CABG	10/2010	MVR (Magna Edwards 25)
1964	Reumatica	Commissurotomia	05/2011	MVR Magna 25
1995	Reumatica	PLM	09/2011	Carbomedics 25
2010	Reumatica	PLM	03/2012	Physio 34 + corde artificiali
1996/2011	Degenerativa	PLM (Cosgrove 28)	03/2012	Physio 30
2006	Degenerativa	AVR + PLM	05/2012	Cosgrove 26 + corde + sliding
apr-11	Degenerativa	PLM (Edwards 36)	05/2012	Physio 30
1996	Ischemica	CABG + PLM	10/2012	Cosgrove 28



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Caso n.1

DONNA, 69 ANNI, NIDDM

Aprile 2011: MVRep → plicatura annulus + resezione quadrangolare P2 e sliding P1-P3 + posizionamento di 6 corde su A2 + annuloplastica (Edwards Ring 36)

→ sintomatica per dispnea (NYHA II-III)

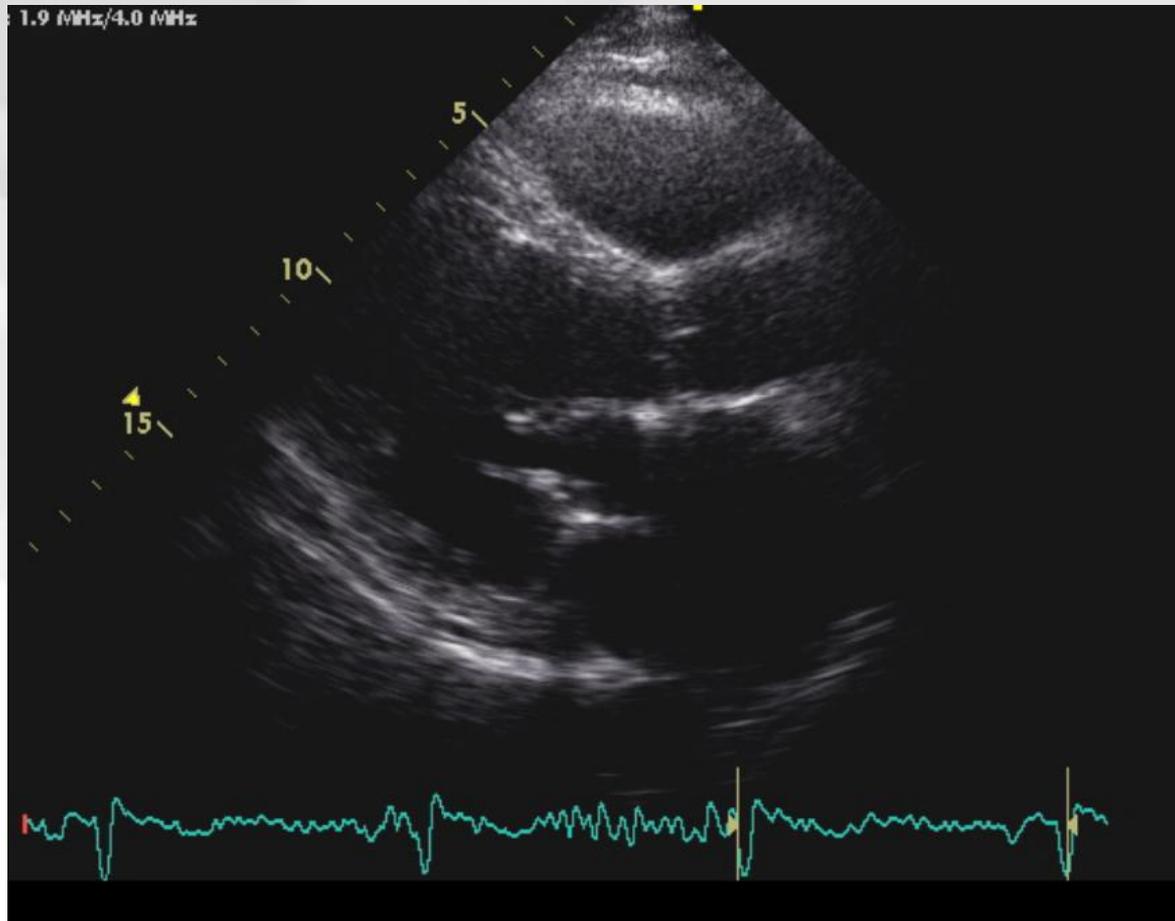
Aprile 2012: TTE → IM moderato-severa

Maggio 2012: Redo MVRep → sutura soluzione di continuo su LPM + annuloplastica (Physio Ring 30)



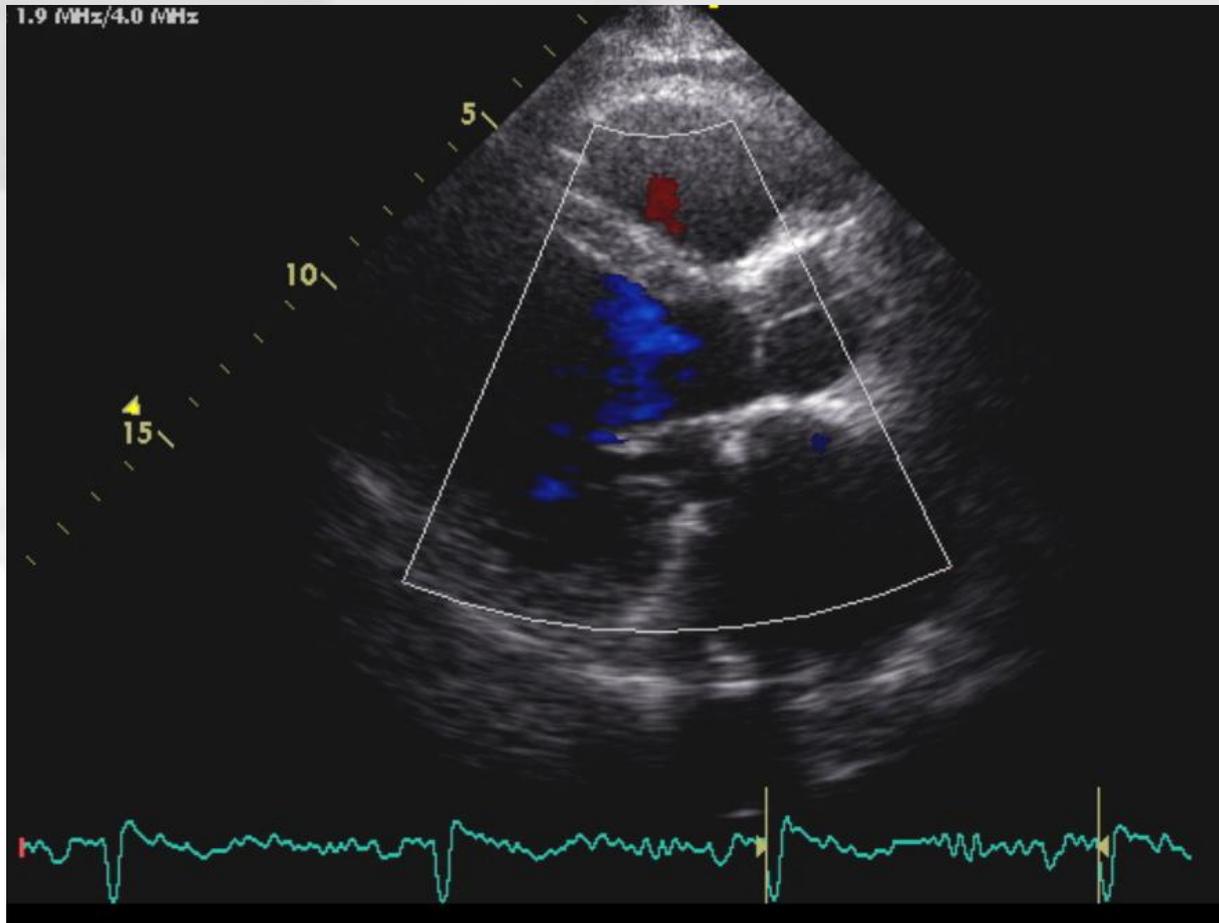
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE pre-operatorio



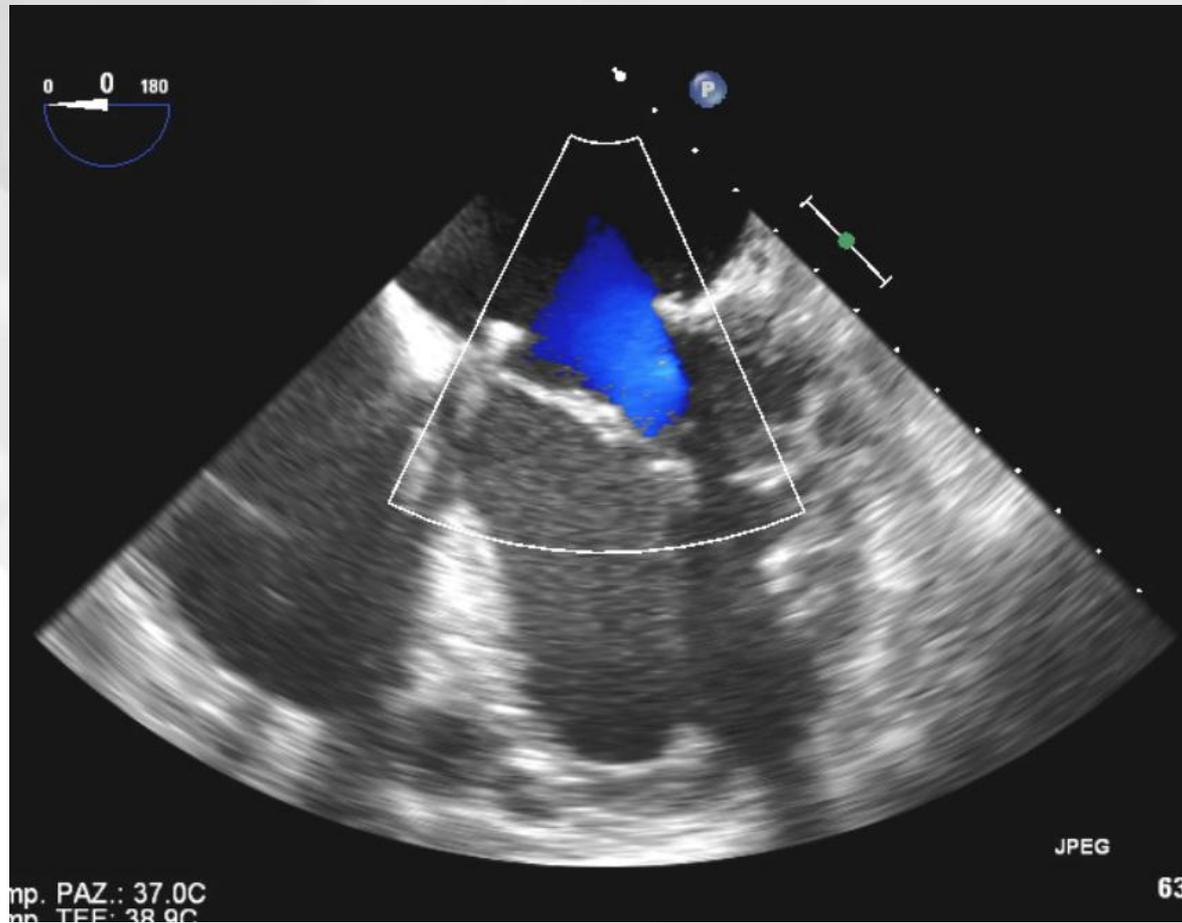
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE pre-operatorio



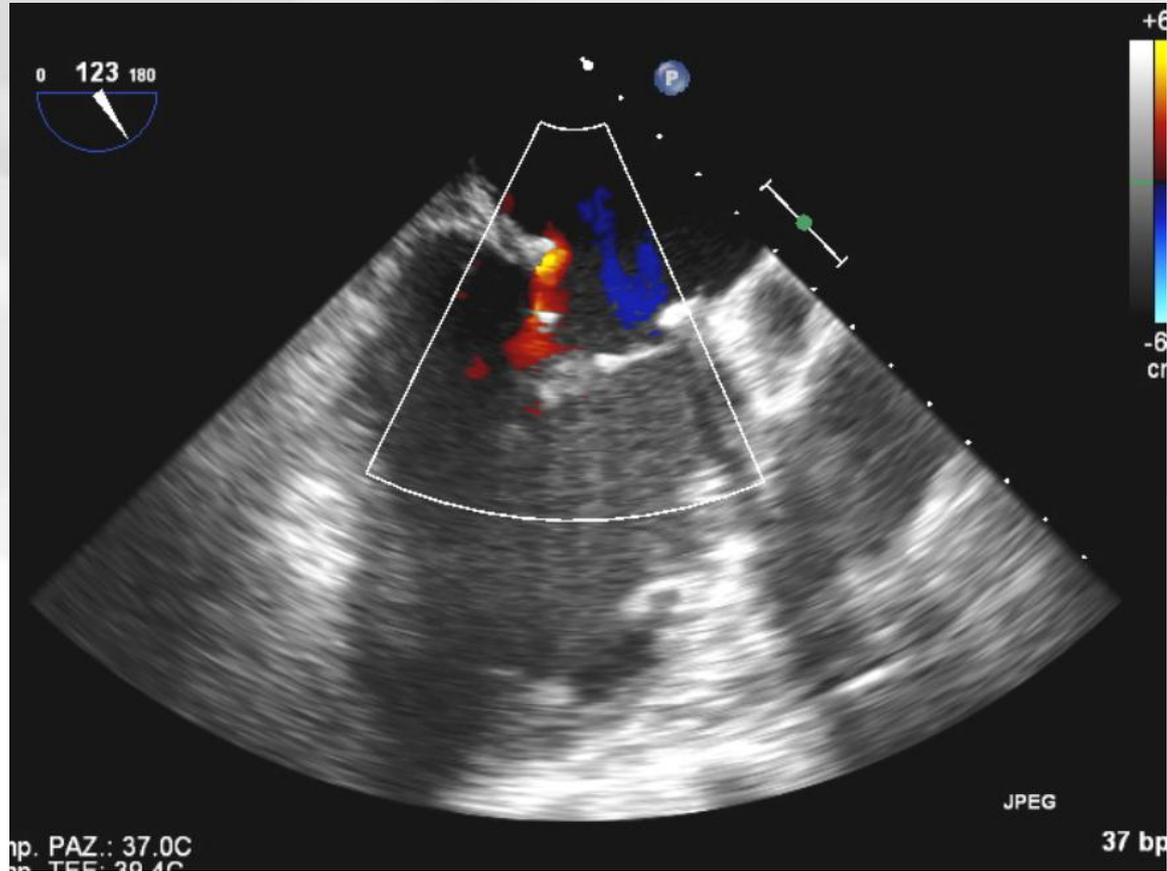
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE pre-operatorio



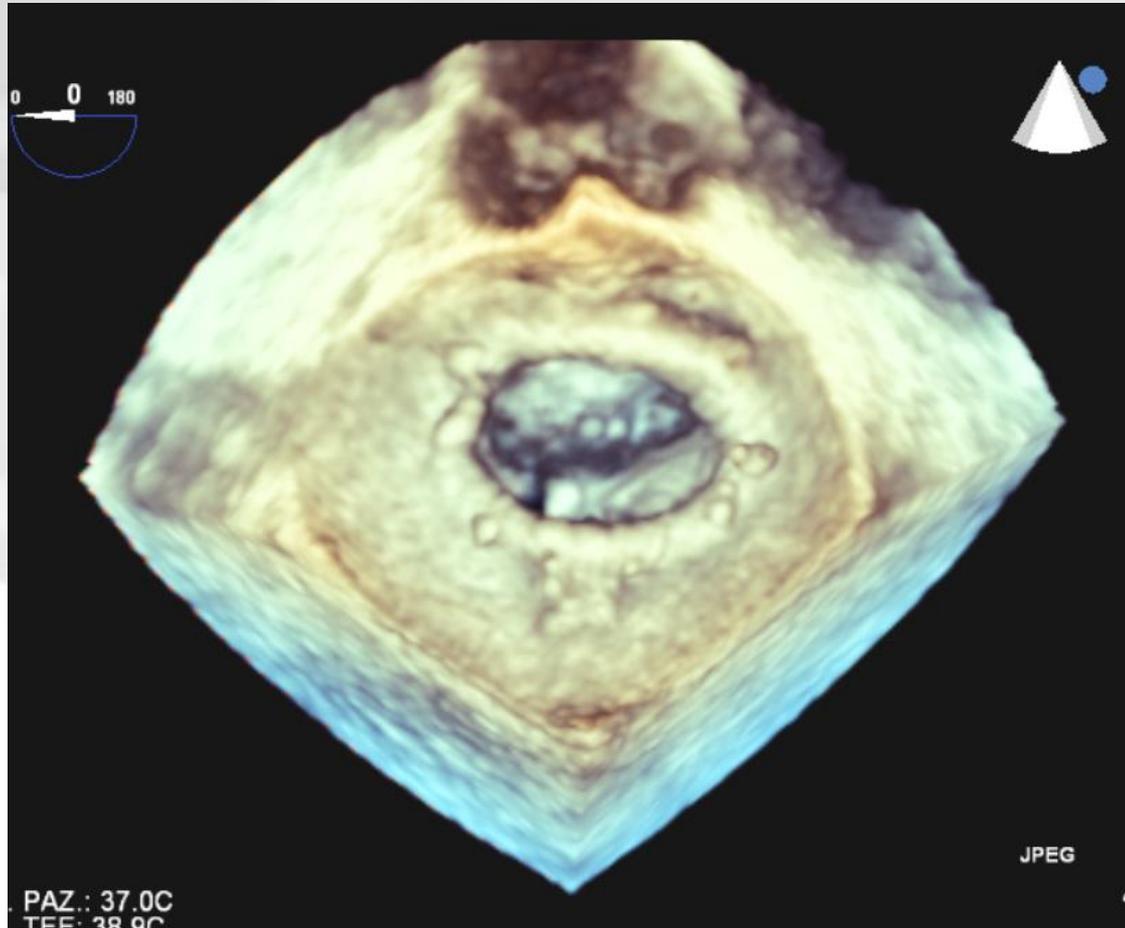
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE pre-operatorio



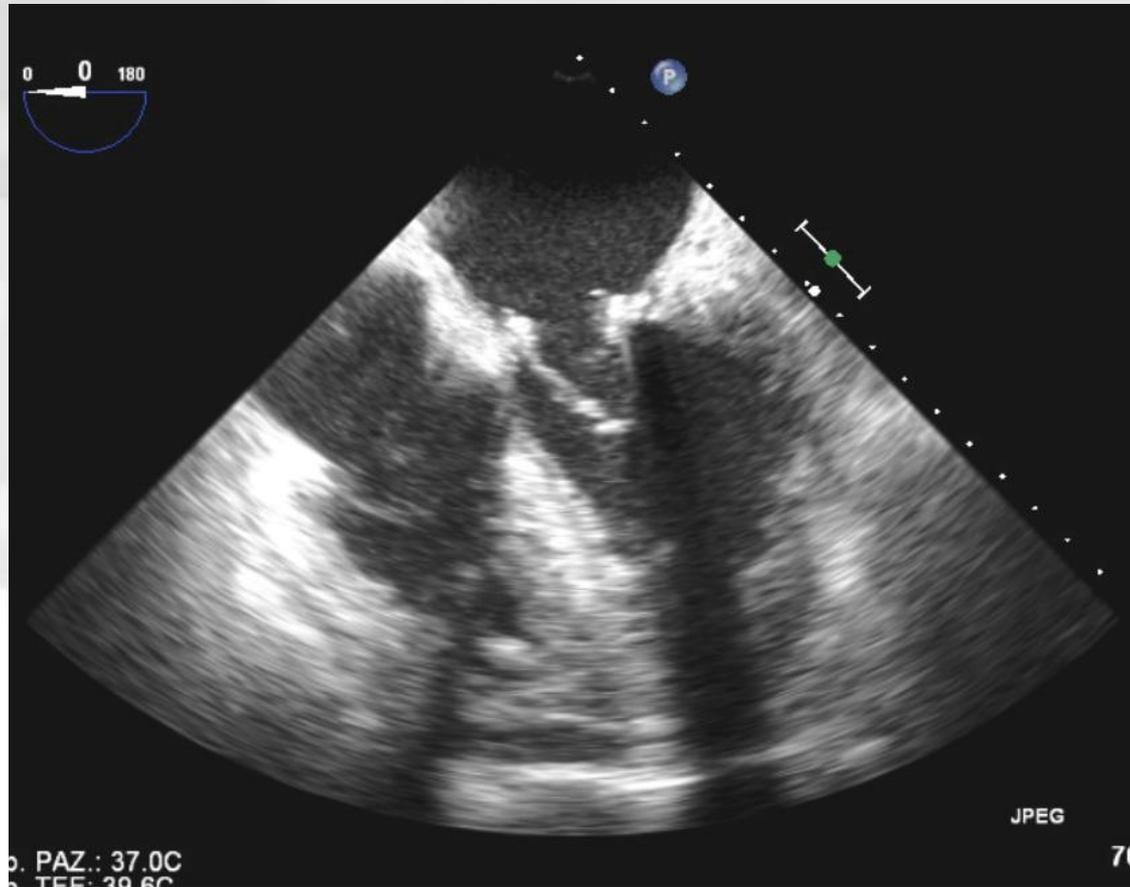
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE pre-operatorio 3D



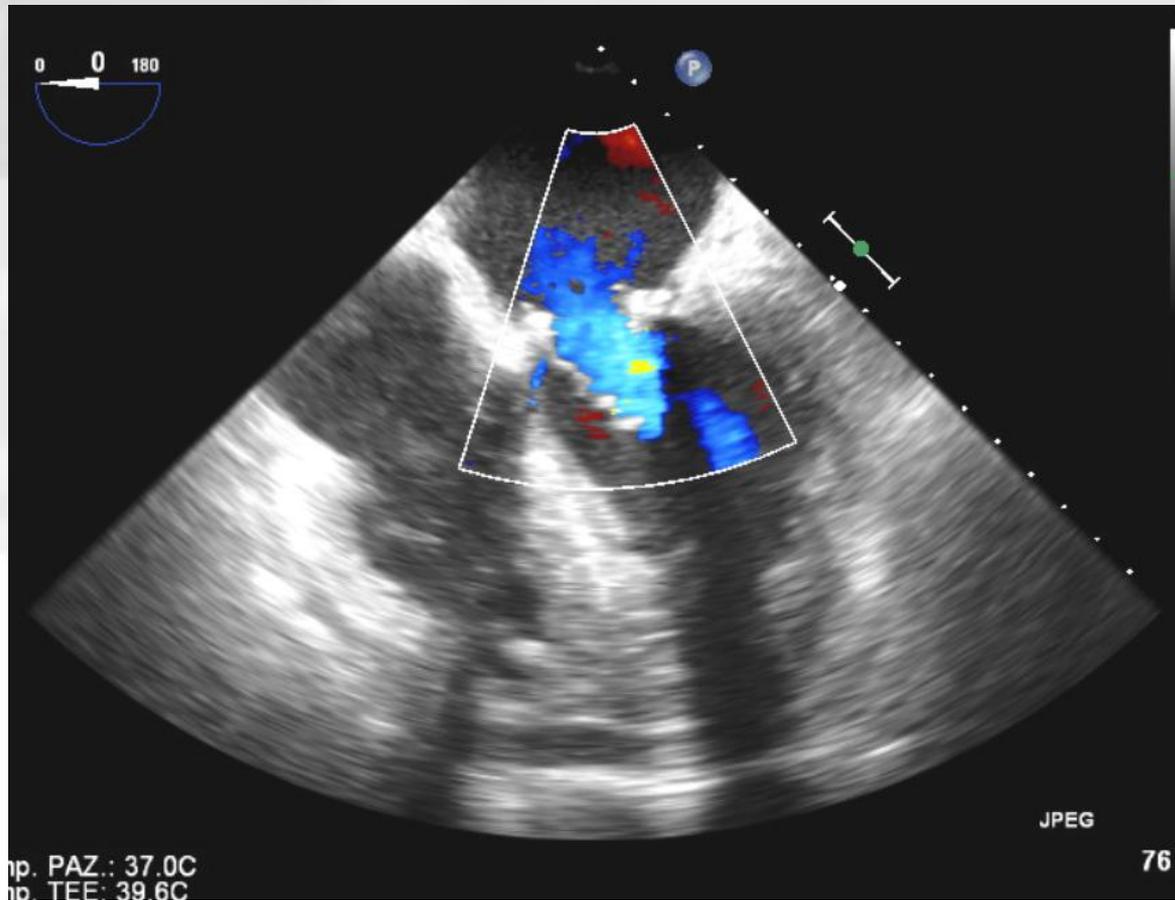
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio



CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio



CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio 3D



CHIRURGIA RIPARATIVA DELLA MITRALE

Caso n.2

DONNA, 72 ANNI, FAP

Novembre 2005: MVRep (edge-to-edge) + TVRep + ablazione FA

→ sintomatica per astenia

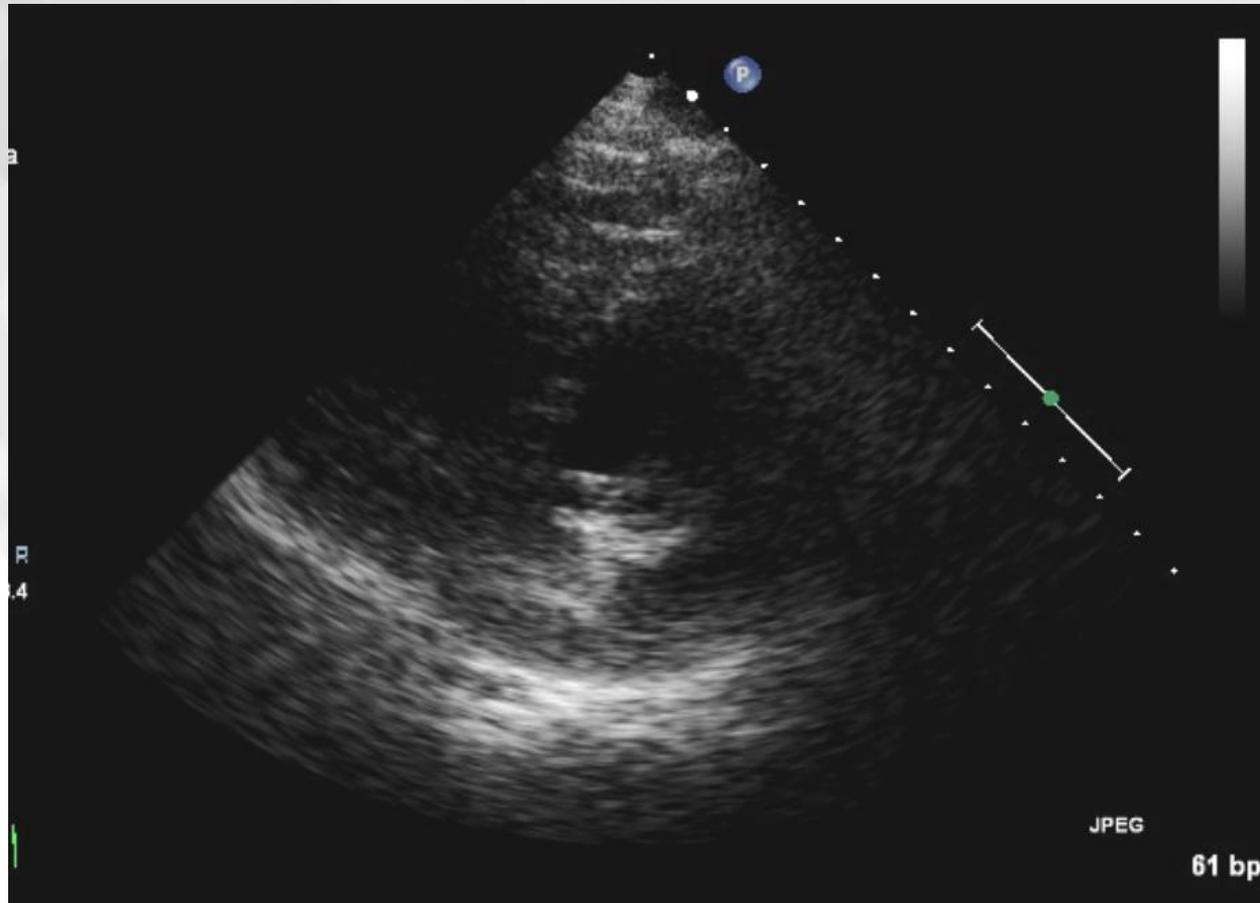
Marzo 2009: TTE → IM moderato-severa

Aprile 2009: Redo MVRep → sutura cleft P3 + annuloplastica (McCarthy n. 30)



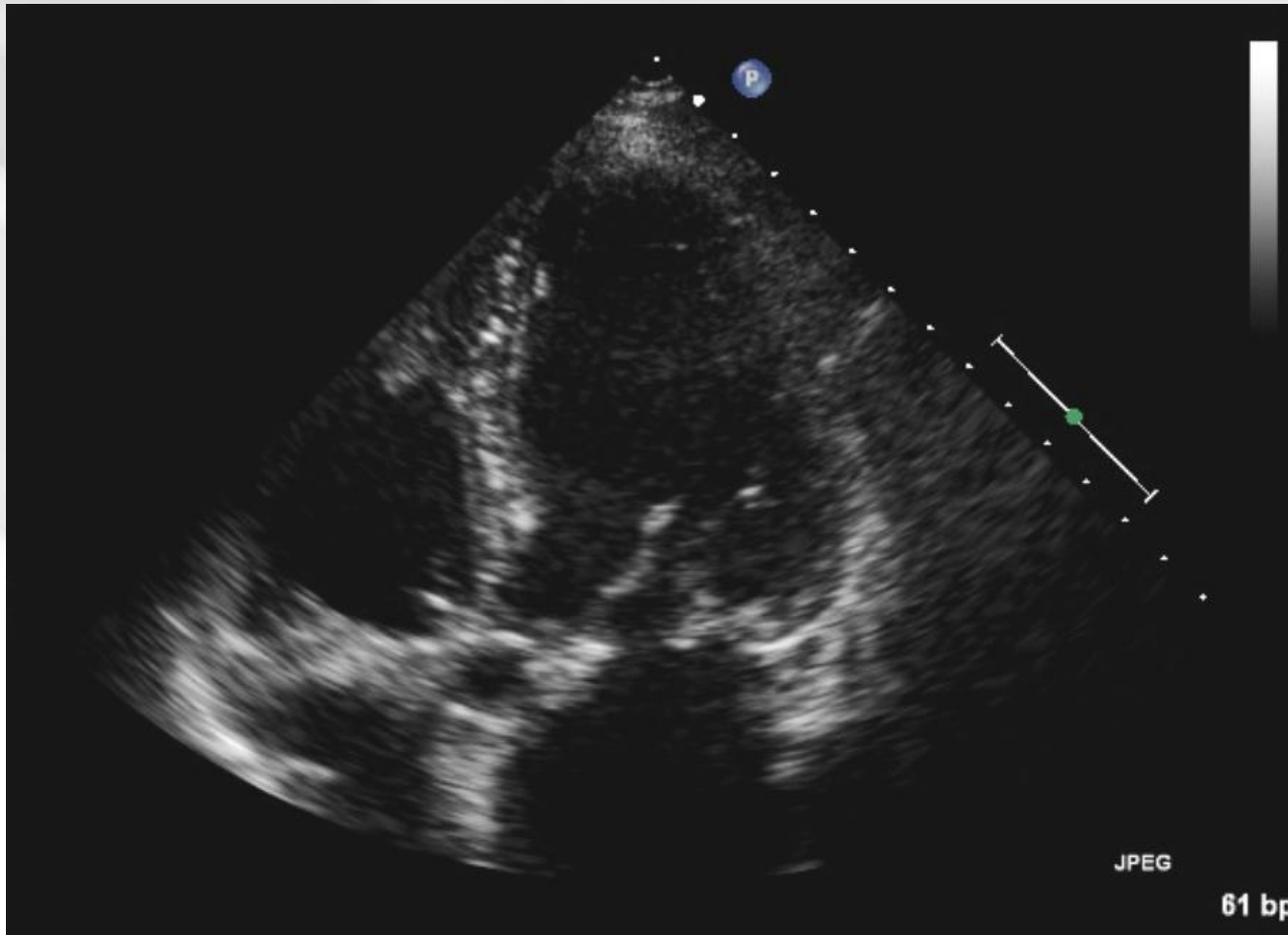
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE pre-operatorio



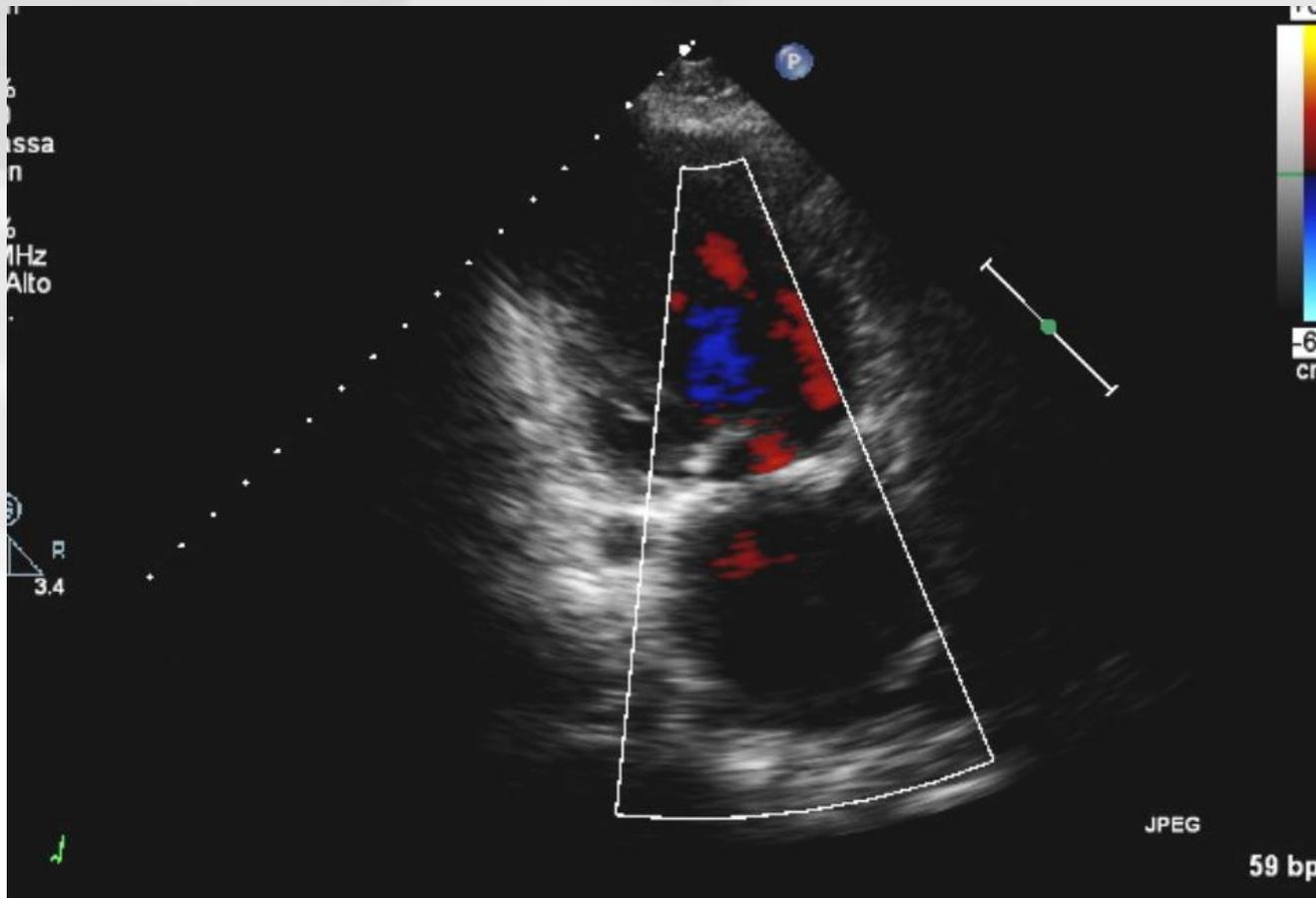
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE pre-operatorio



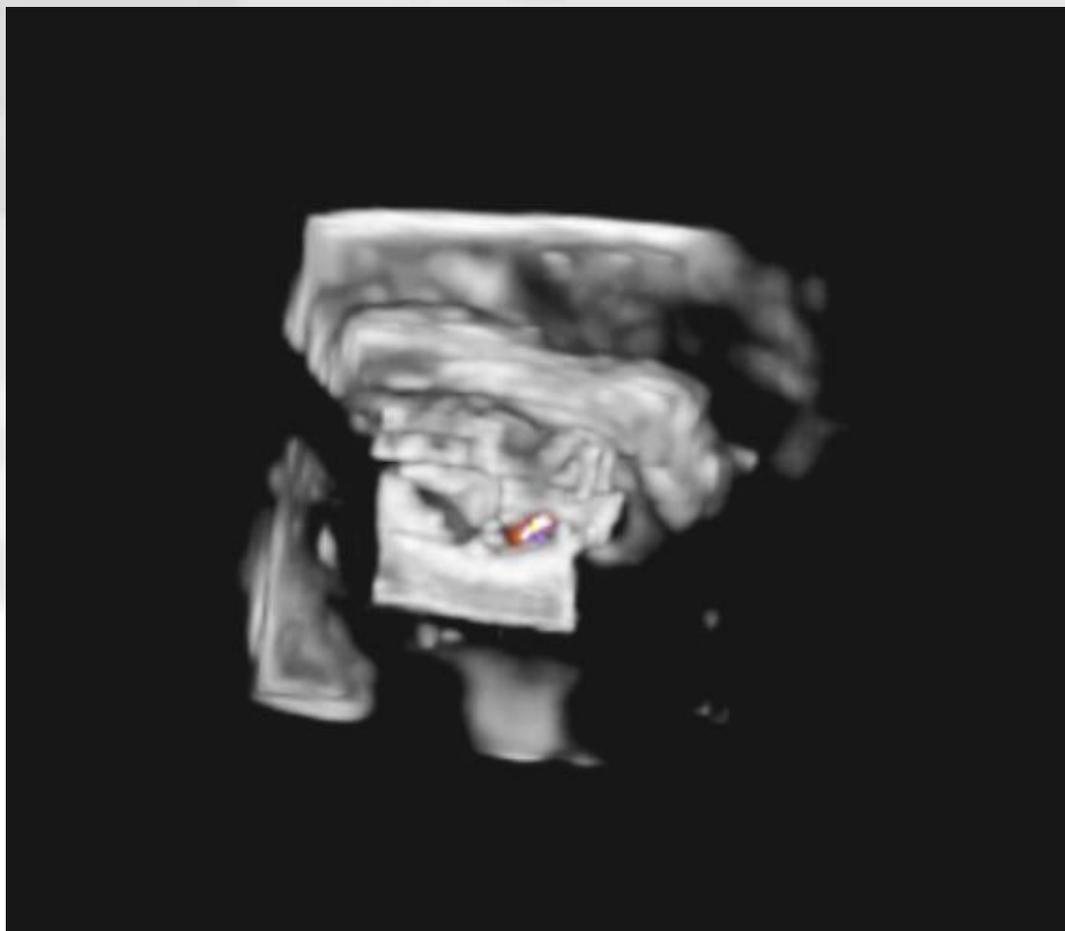
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE pre-operatorio



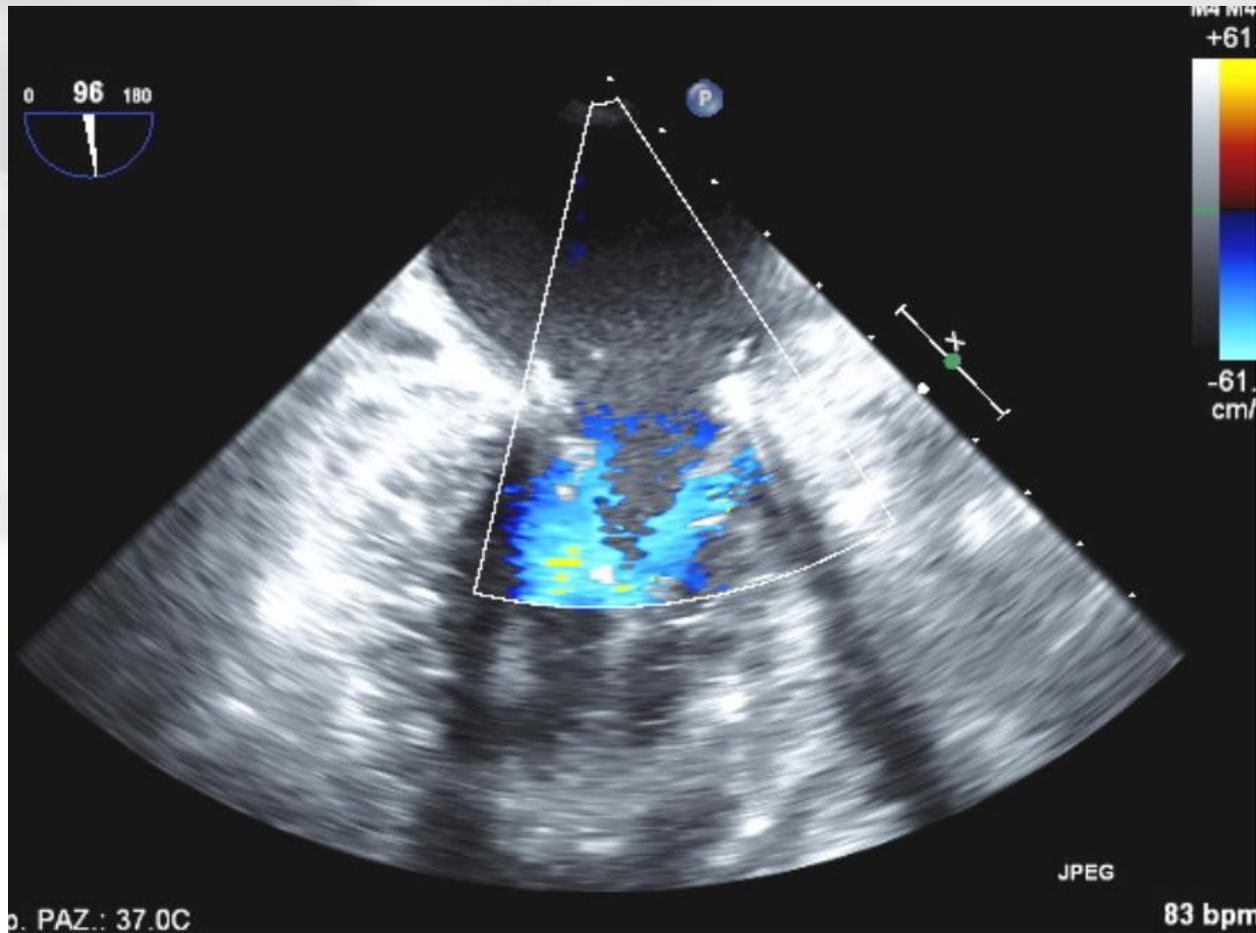
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE pre-operatorio 3D



CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio



CHIRURGIA RIPARATIVA DELLA MITRALE

Caso n.3

UOMO, 54 ANNI, RAA IN ETÀ GIOVANILE

**Novembre 2010: AVR (Magna Edwards 27) + MVRep
→ febbre e tosse stizzosa**

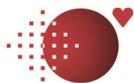
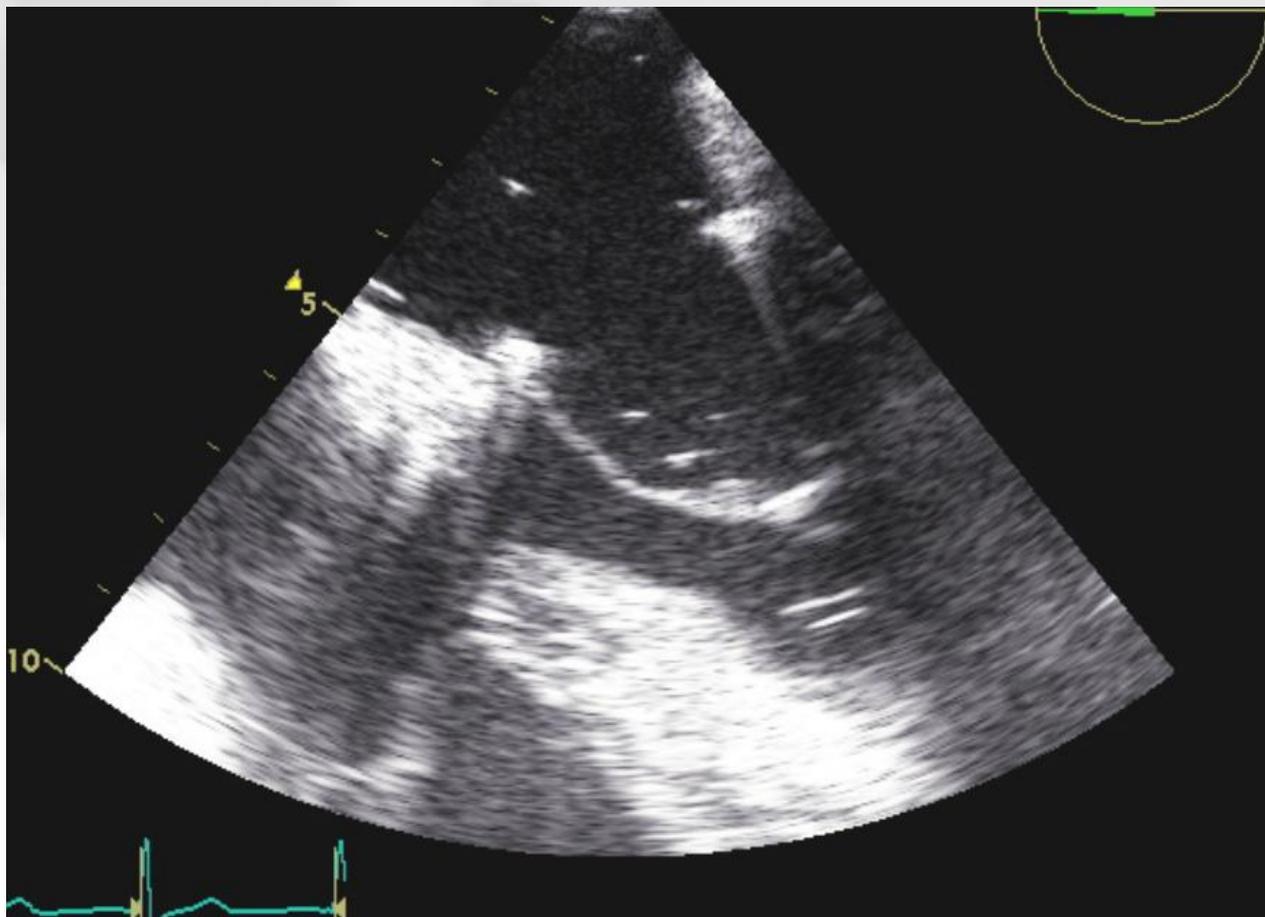
**Dicembre 2011: TEE vegetazioni mitraliche IM
moderato-severa → atb terapia sec. emocolture**

**Marzo 2012: Redo MVRep → Non vegetazioni →
Posizionamento di corde artificiali P2 +
Annuloplastica (Physio Ring 34) +**



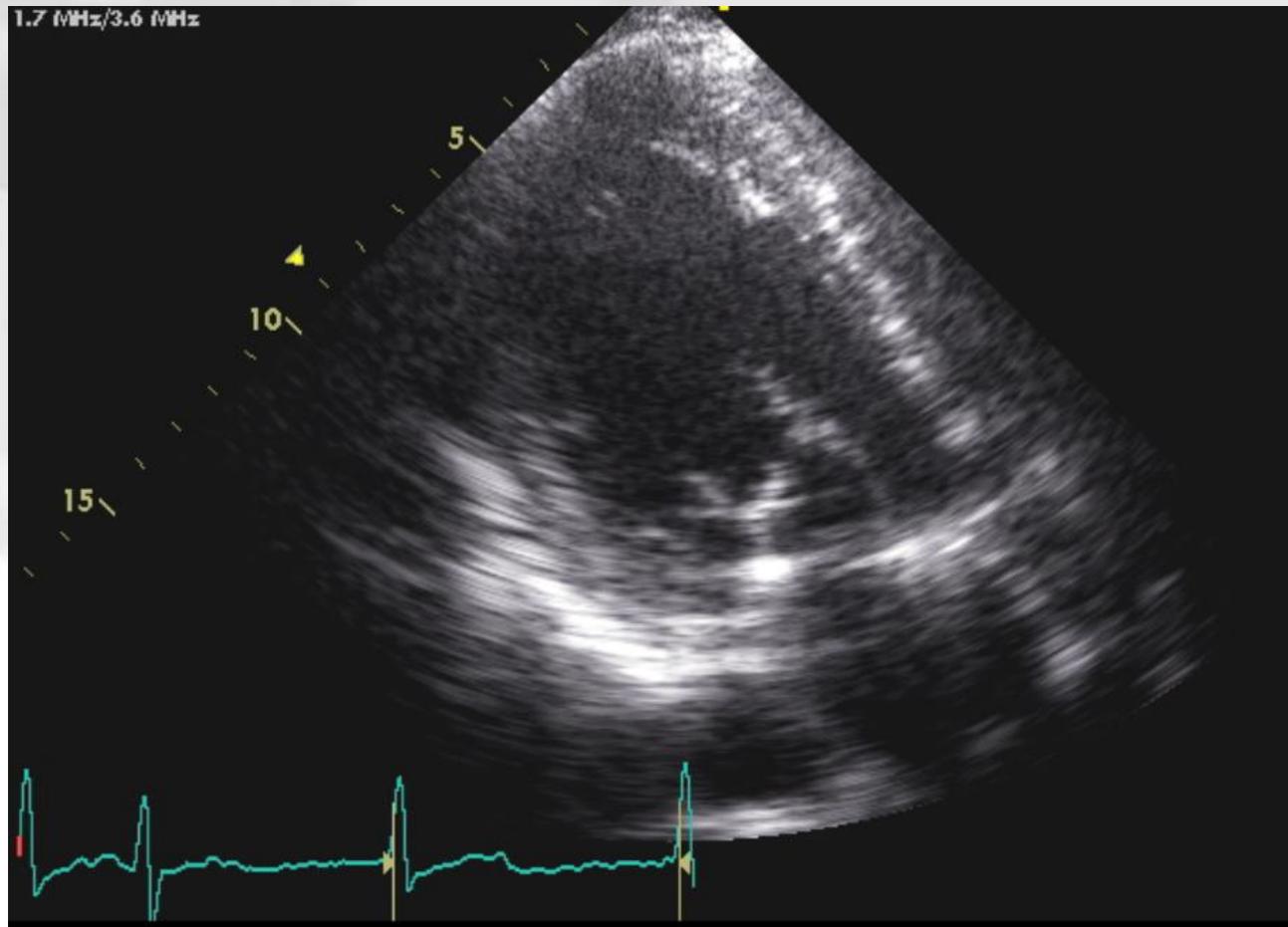
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio (1)



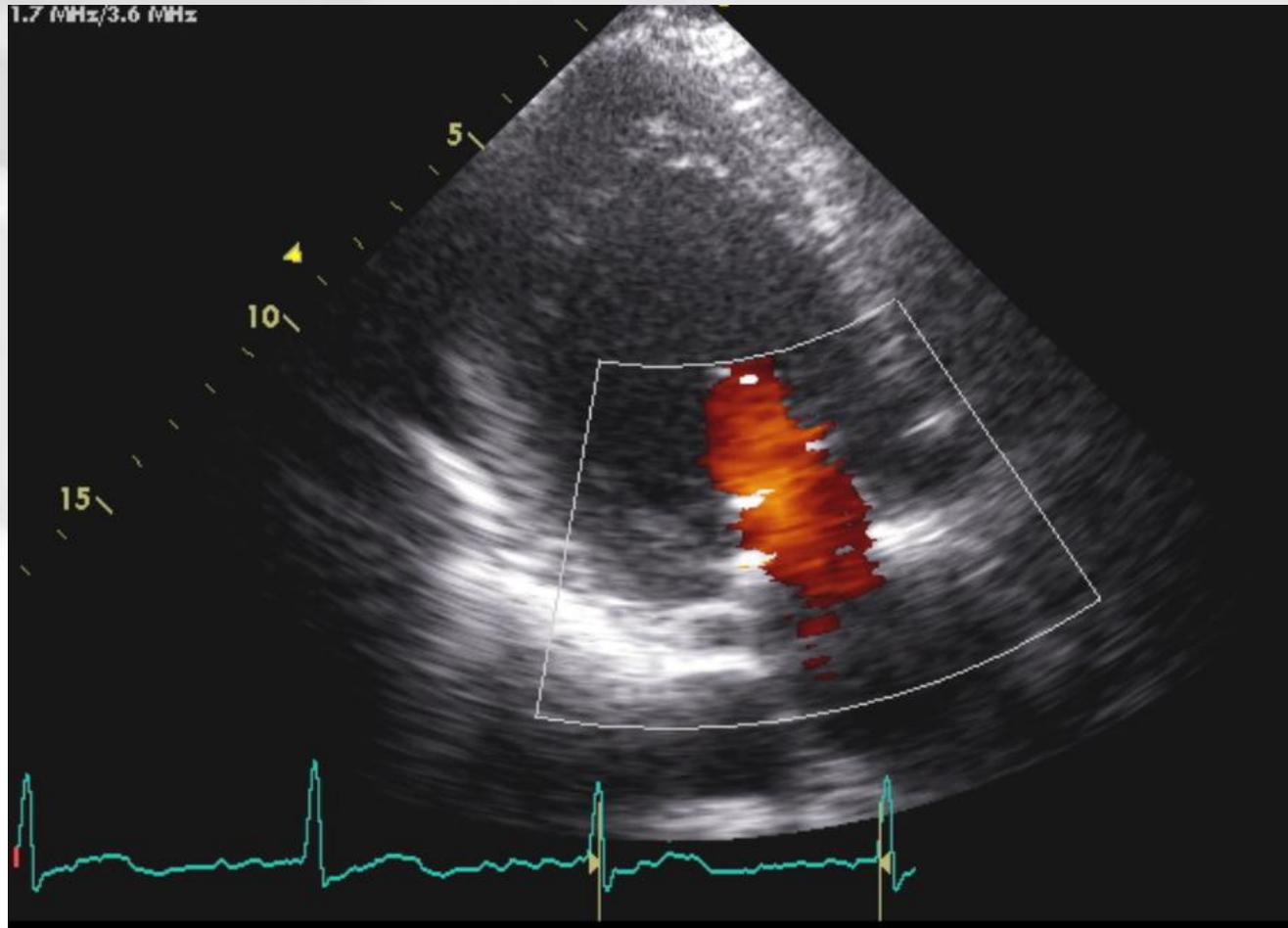
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE post-operatorio (1)



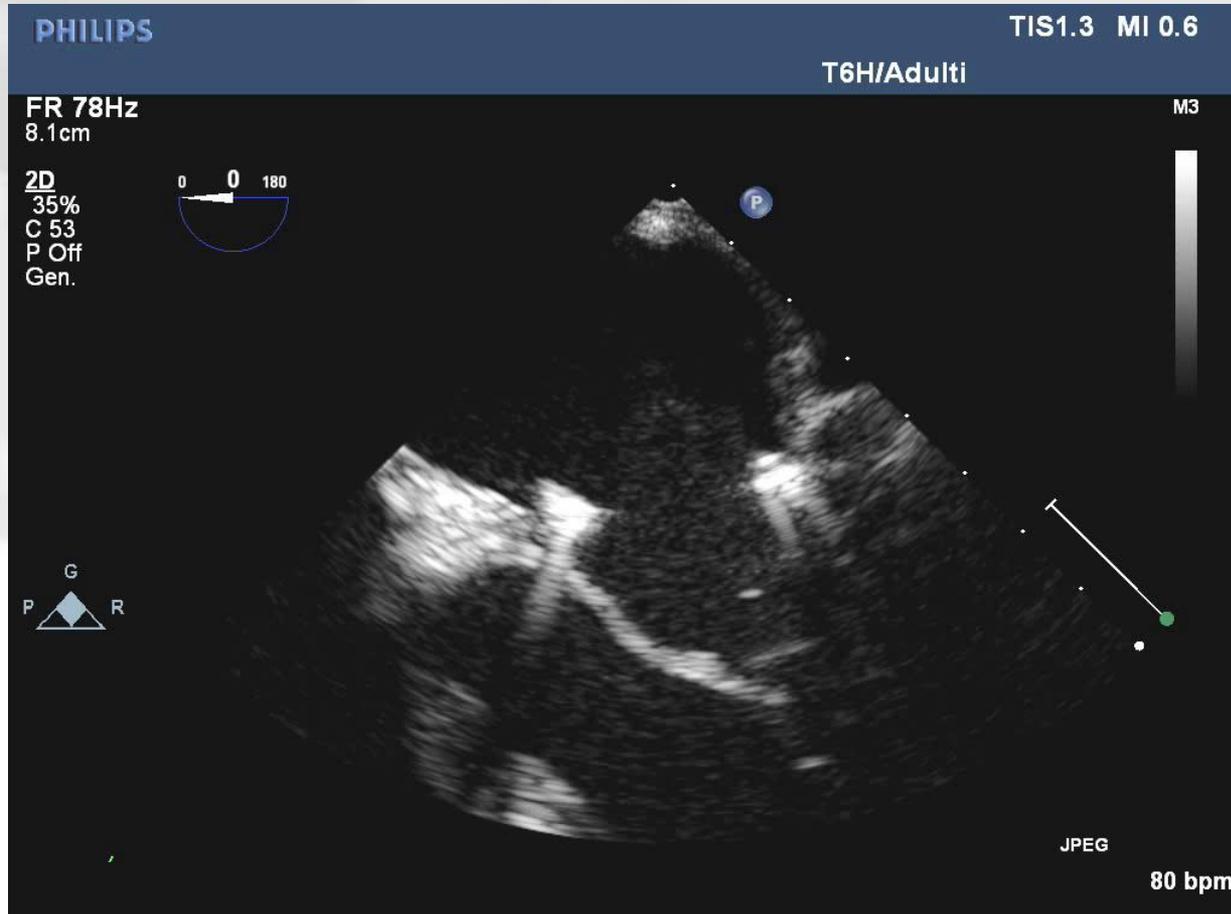
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE post-operatorio (1)



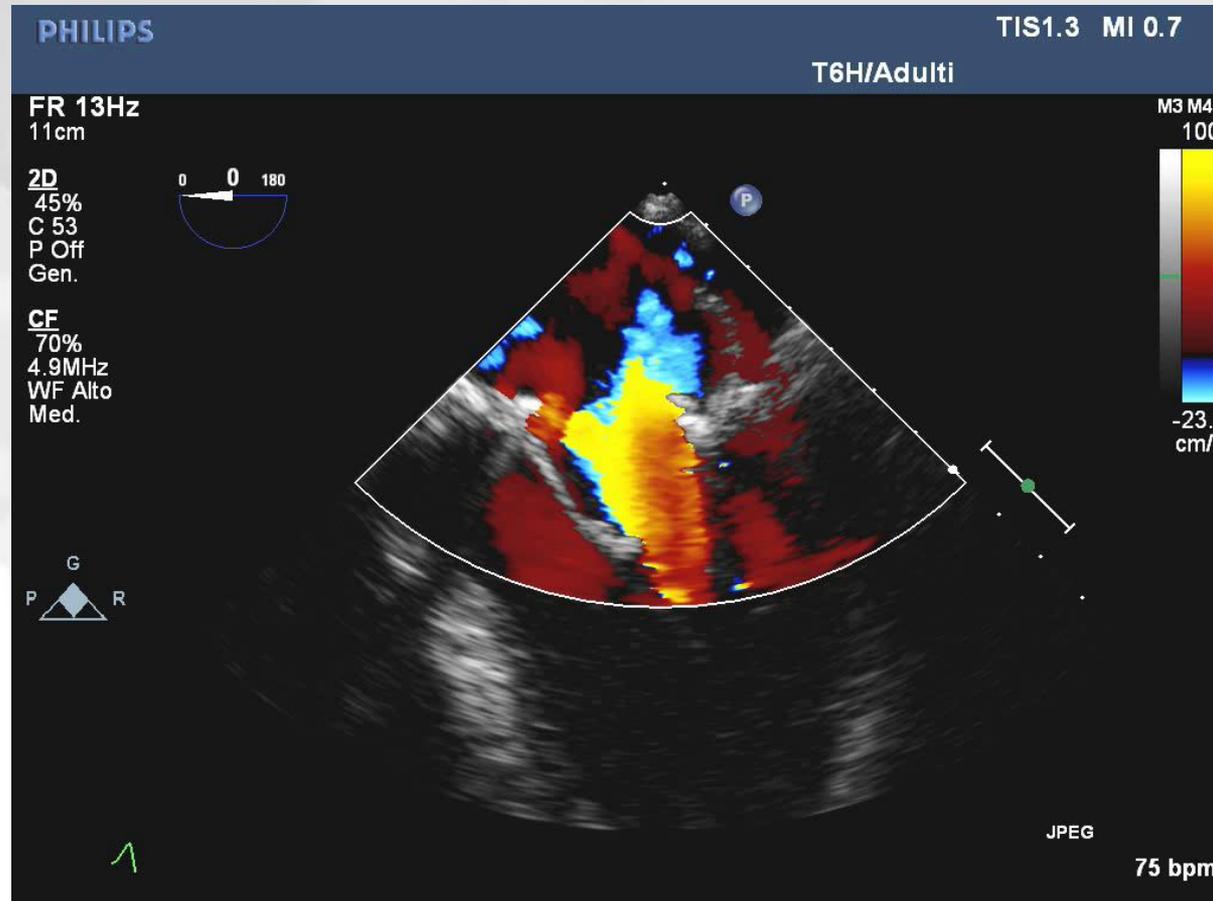
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio (1)



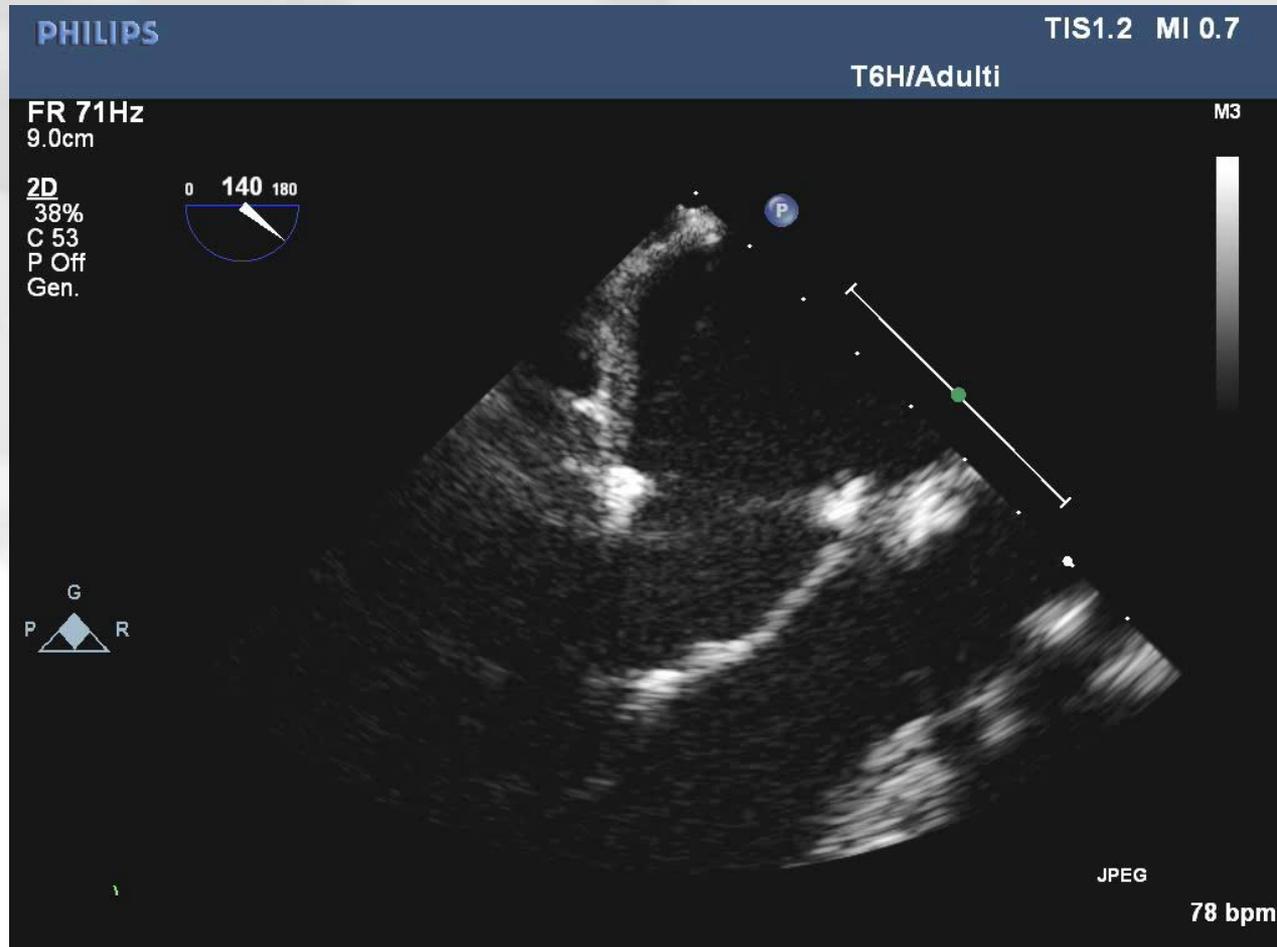
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio (1)



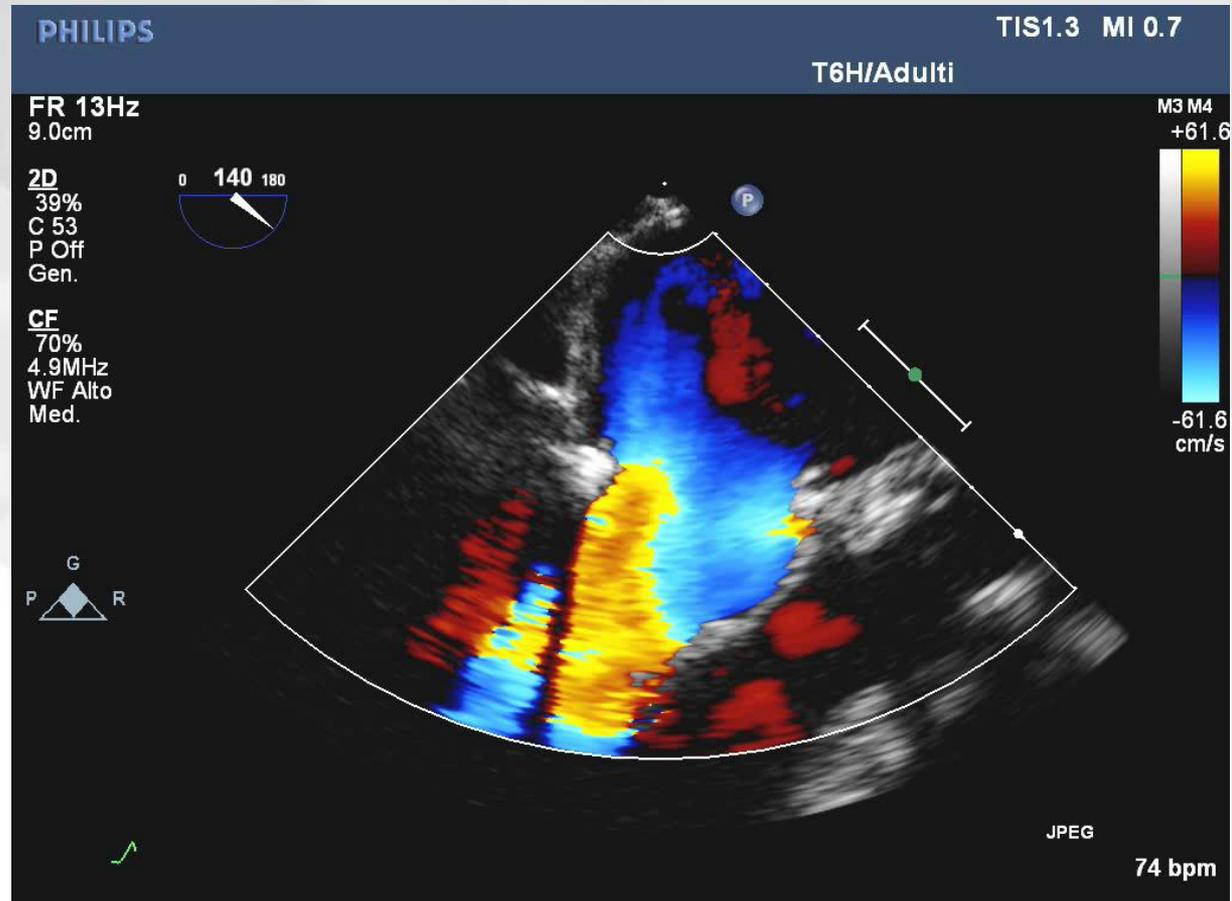
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio (1)



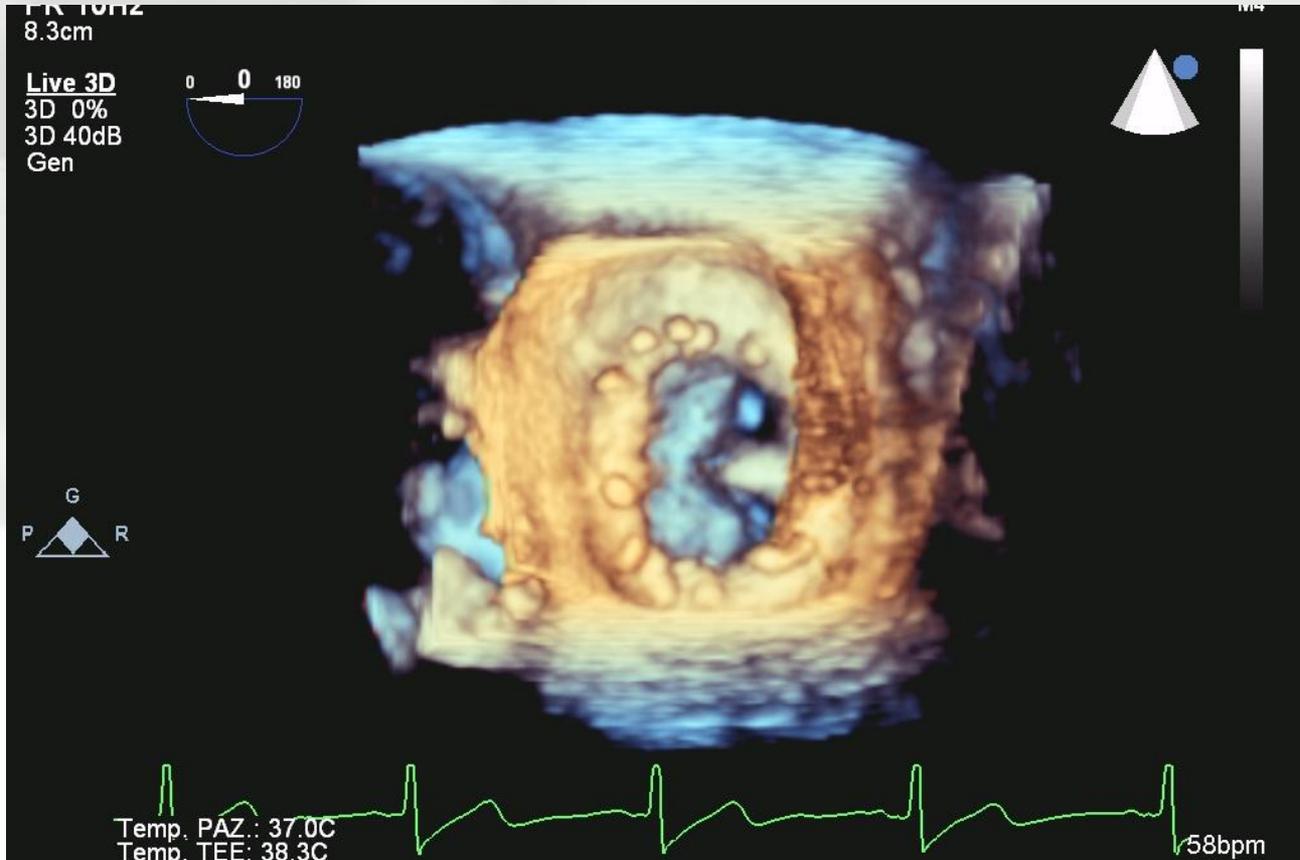
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio (1)



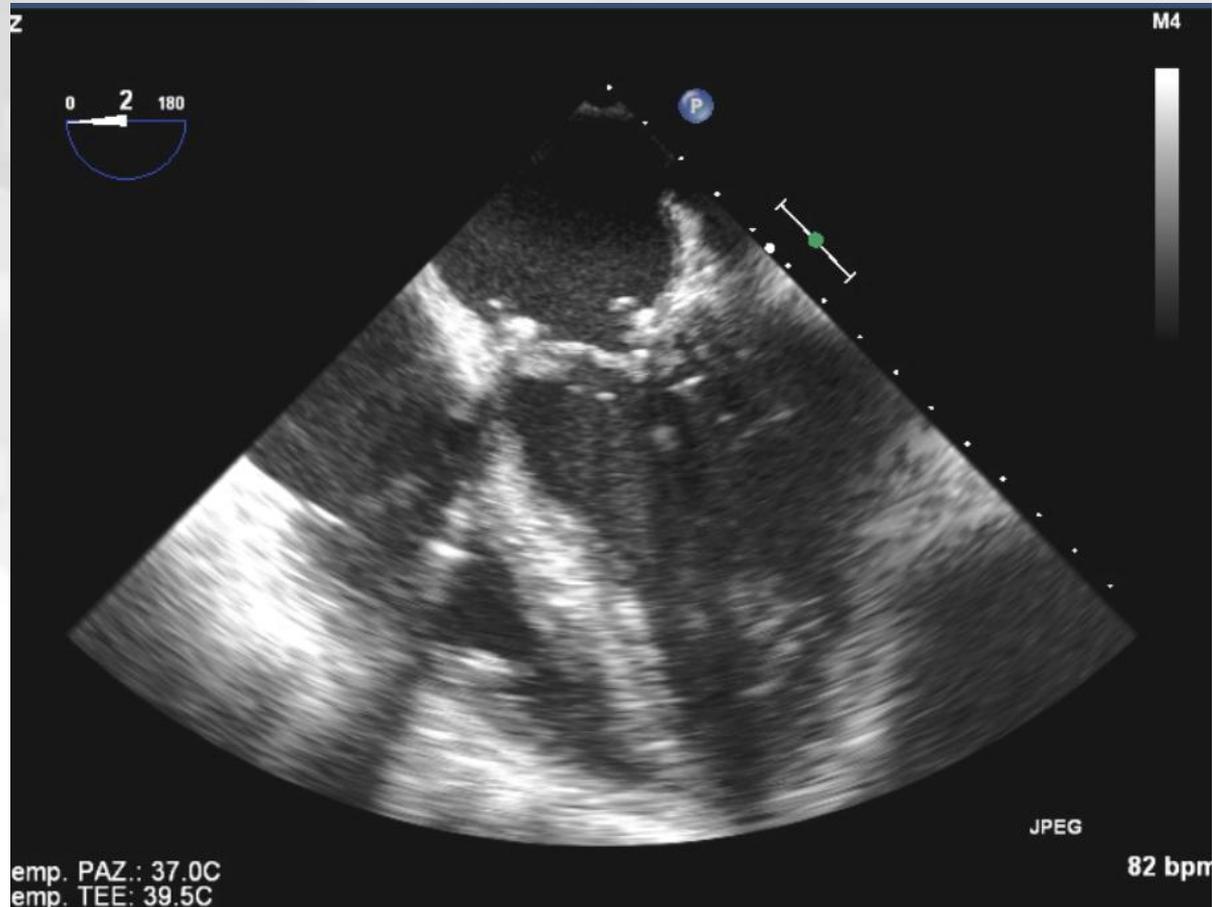
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE pre-operatorio 3D (2)



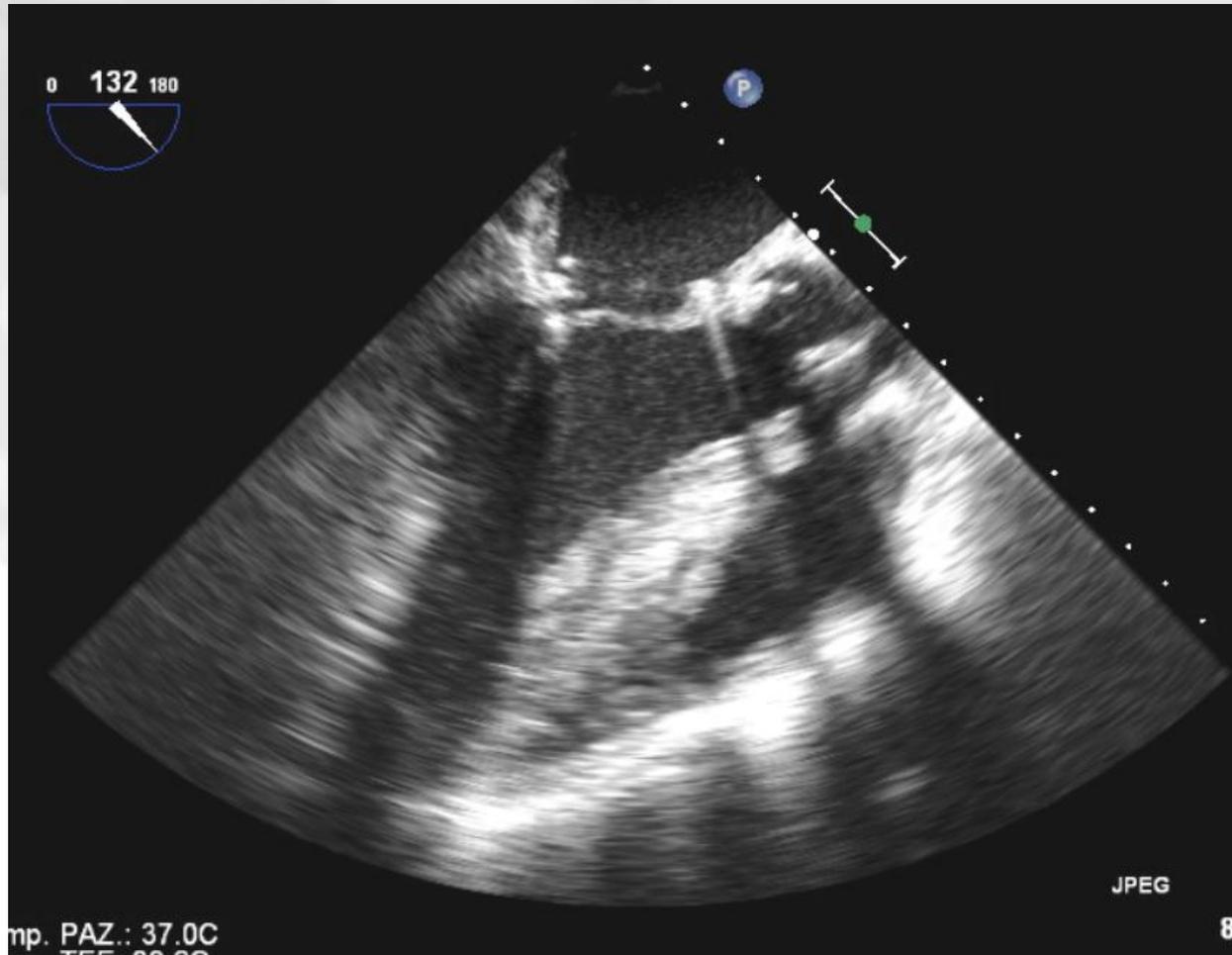
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio (2)



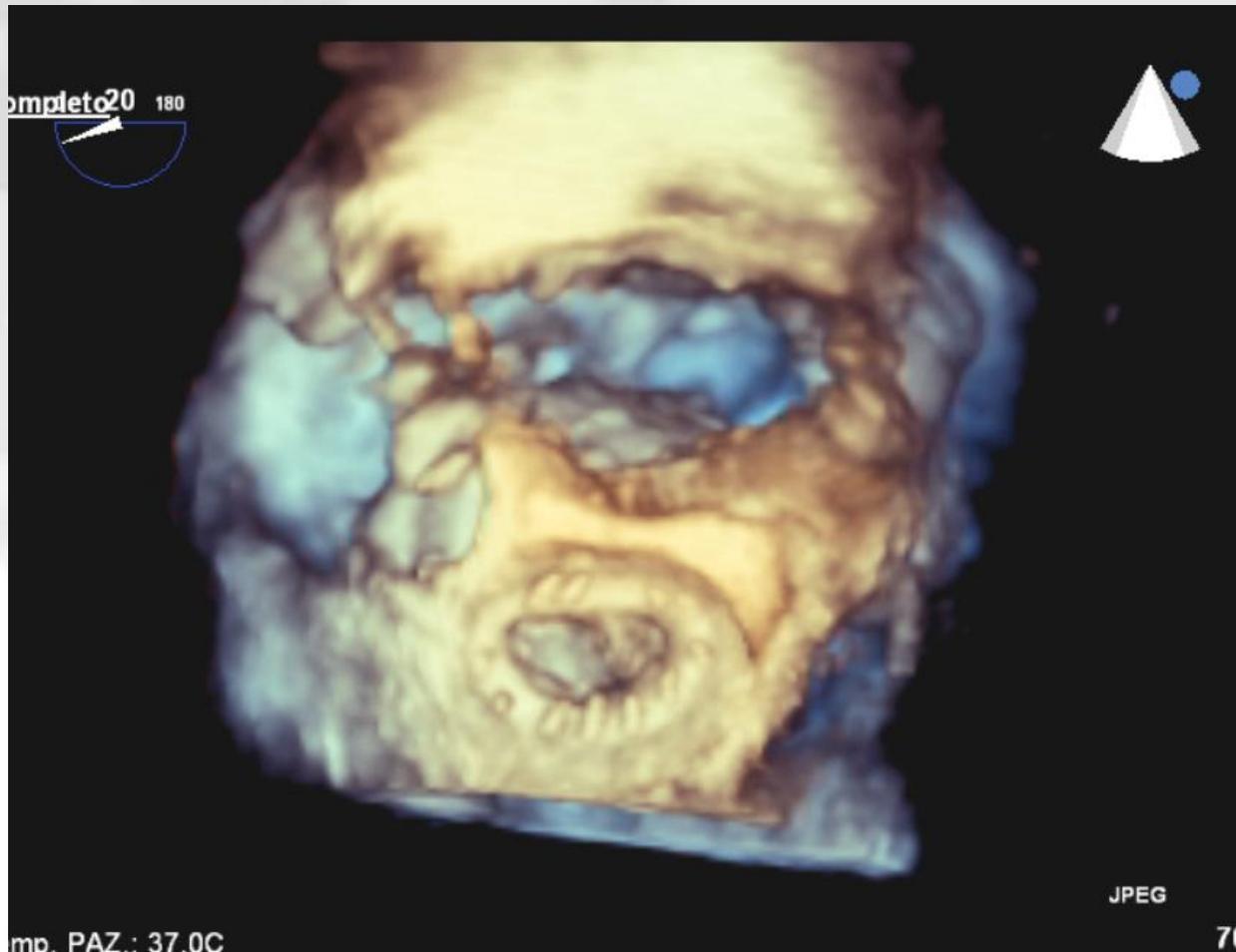
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio (2)



CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio 3D (2)



CHIRURGIA RIPARATIVA DELLA MITRALE

Caso n.4

UOMO, 60 ANNI, RAA INFANTILE, FAP

1996: Intervento di Bentall (Sorin n. 27)

2010: CVE x FAP → TEE → IM severa

**Luglio 2011: MVRep → resezione P3 + annuloplastica
(Cosgrove n. 28)**

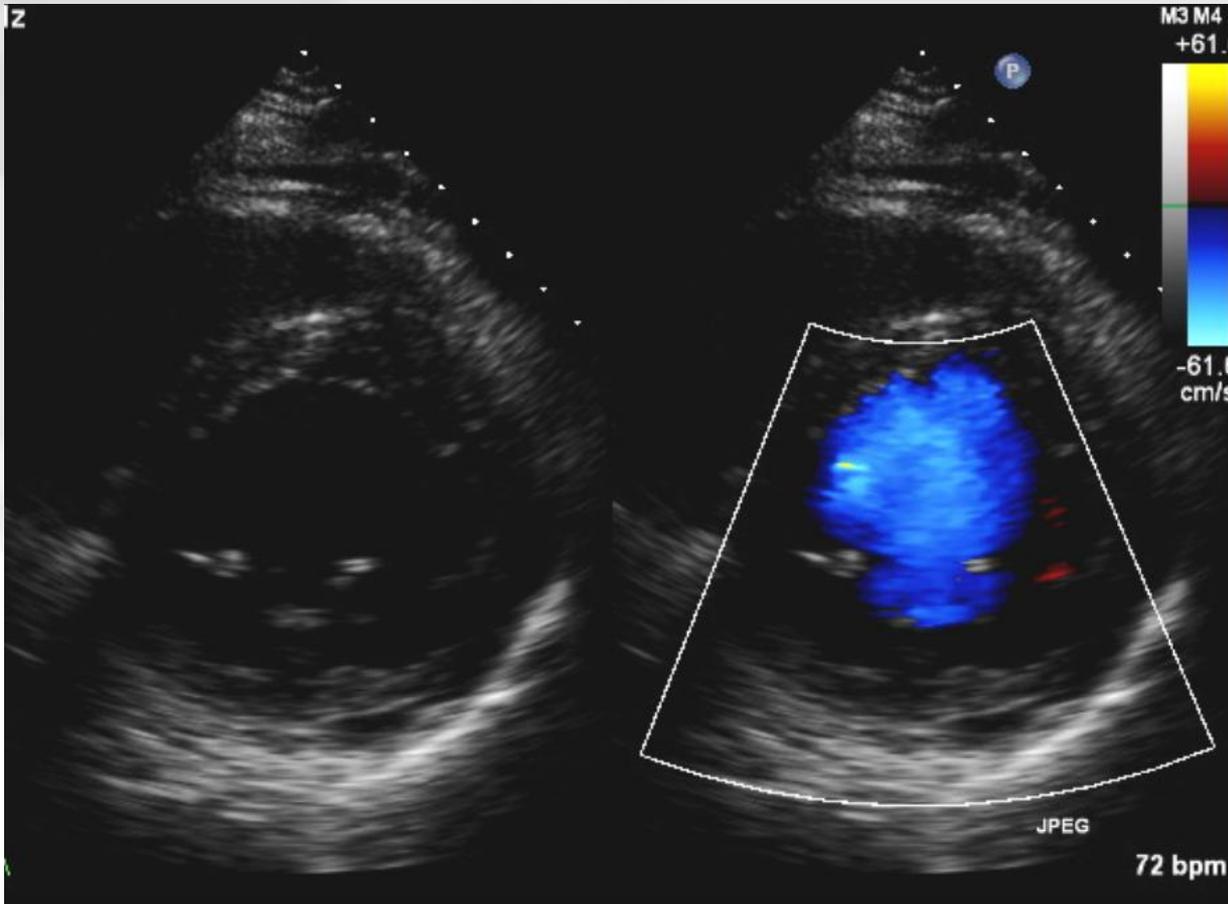
→ CVE x FAP → TEE → IM moderato-severa

Marzo 2012: Redo MVRep (Physio 30)



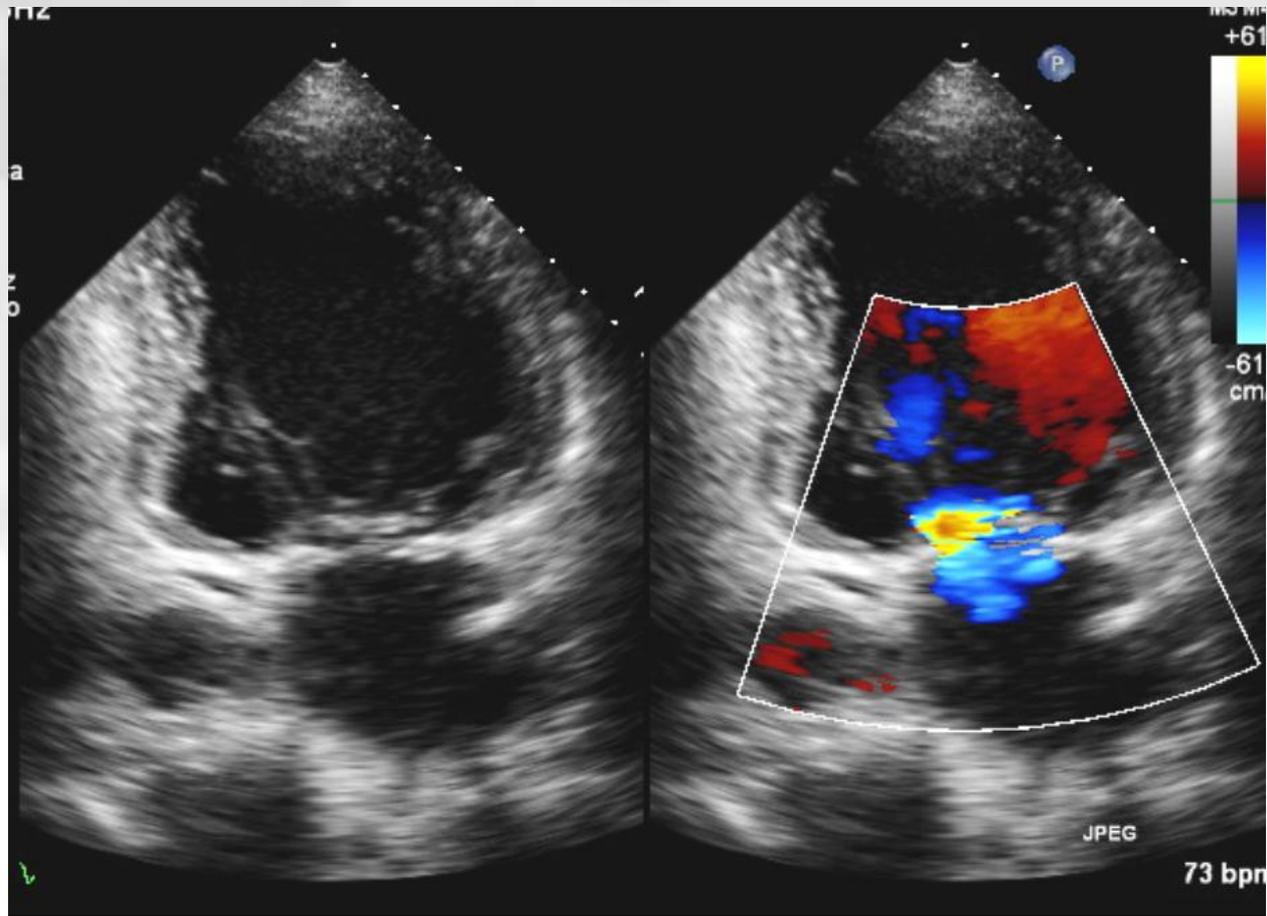
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE pre-operatorio



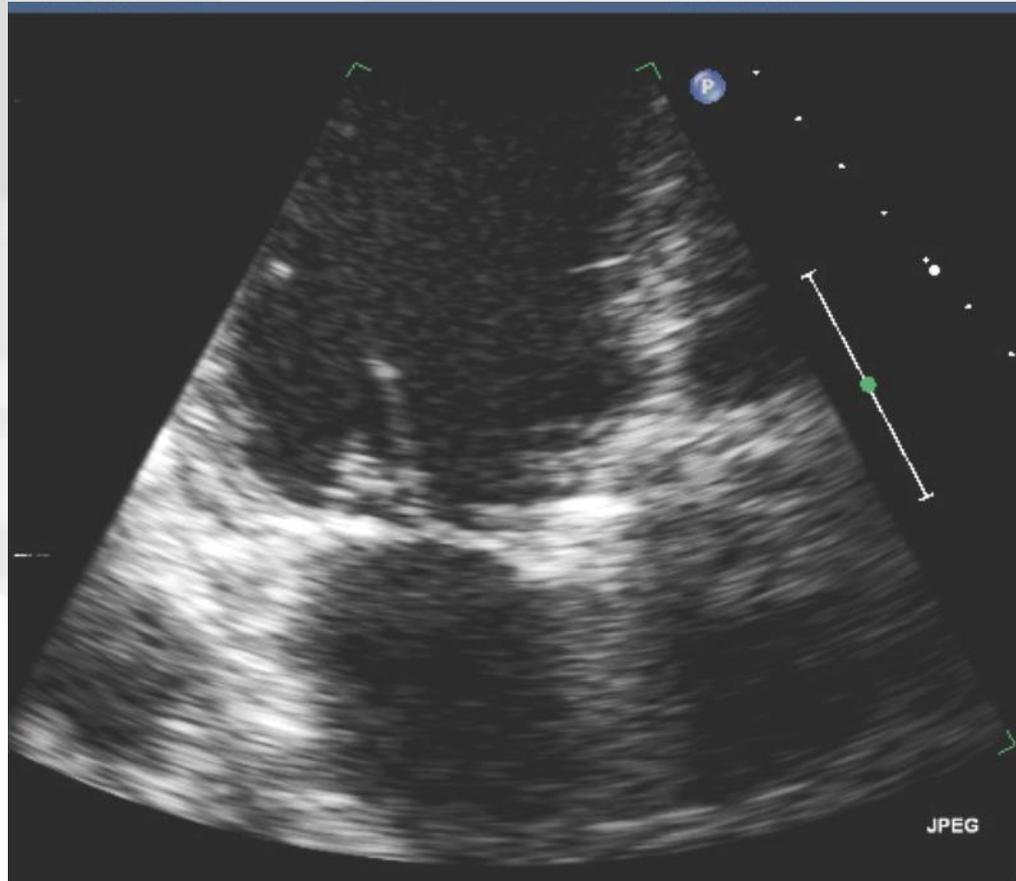
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE pre-operatorio



CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE pre-operatorio



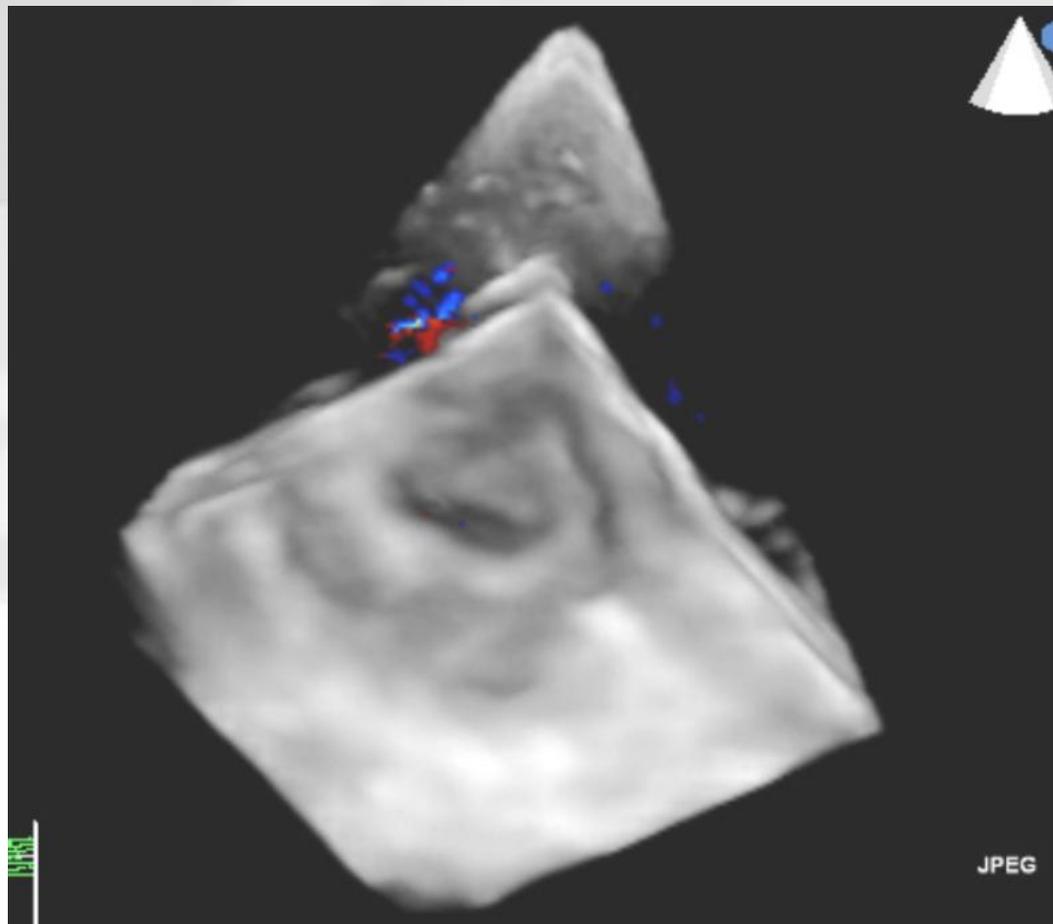
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE pre-operatorio 3D



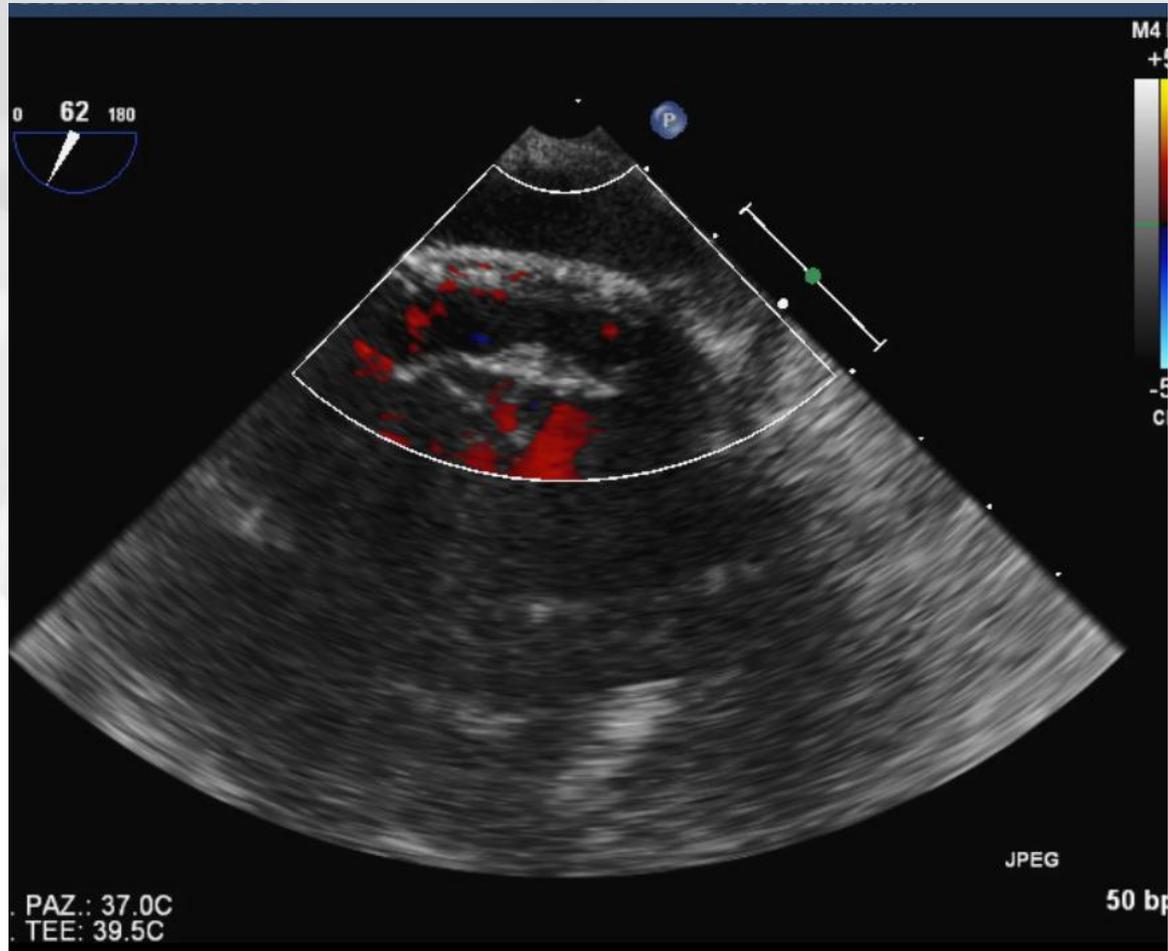
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE pre-operatorio 3D



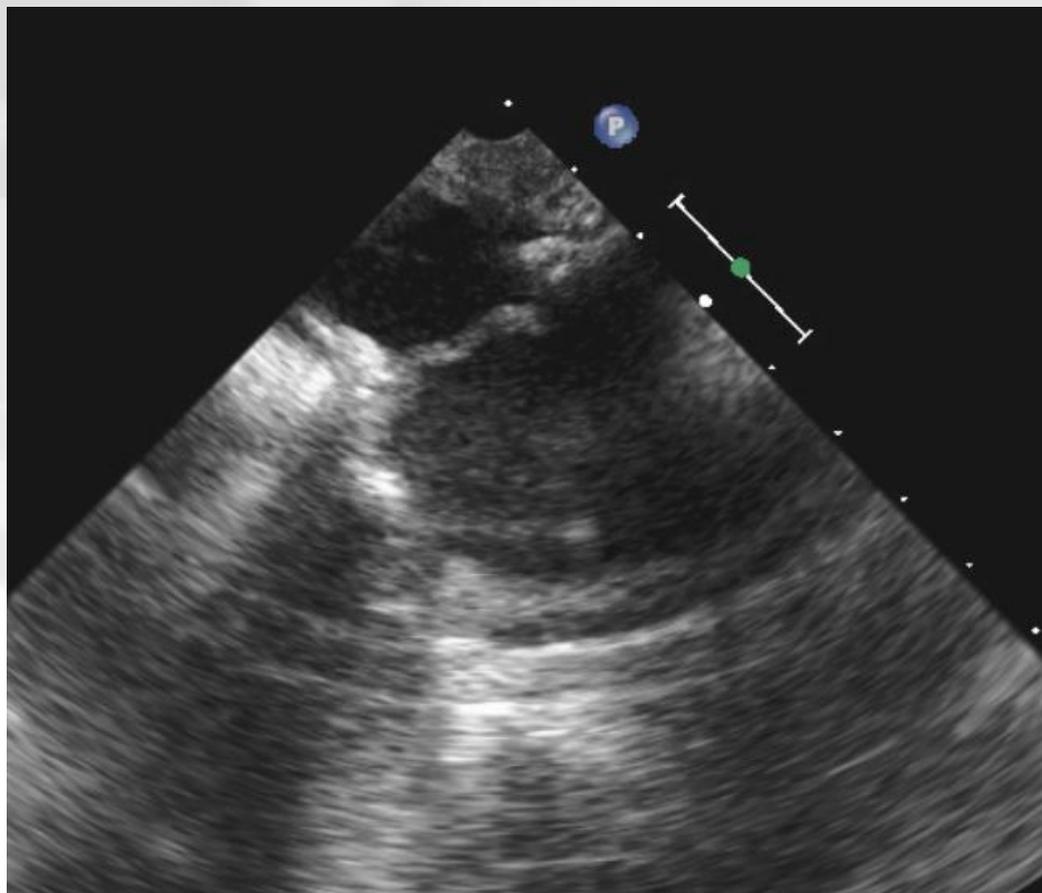
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE pre-operatorio



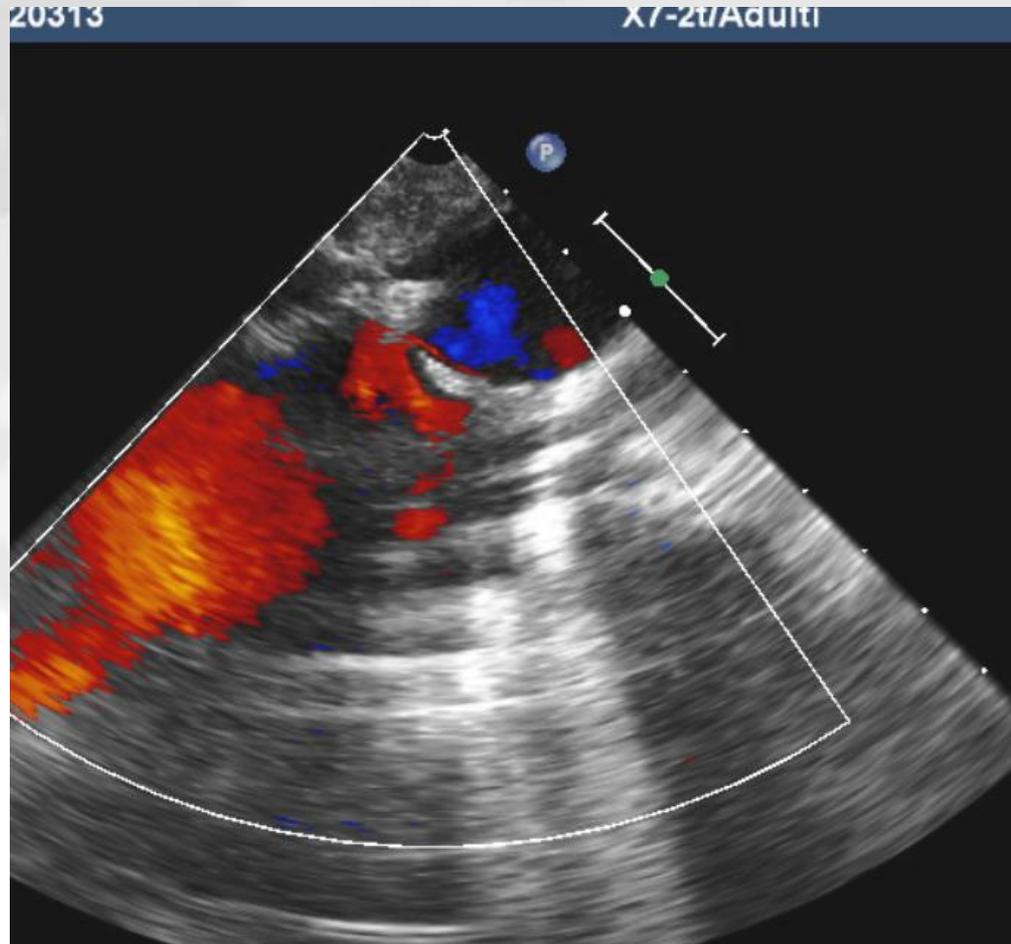
CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio



CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TEE post-operatorio



CHIRURGIA RIPARATIVA DELLA MITRALE

Eco TTE post-operatorio

