

Leaks paravalvolari

Cenni di riparazione chirurgica

...di cosa stiamo parlando?

LEAKs PARAVOLARI:

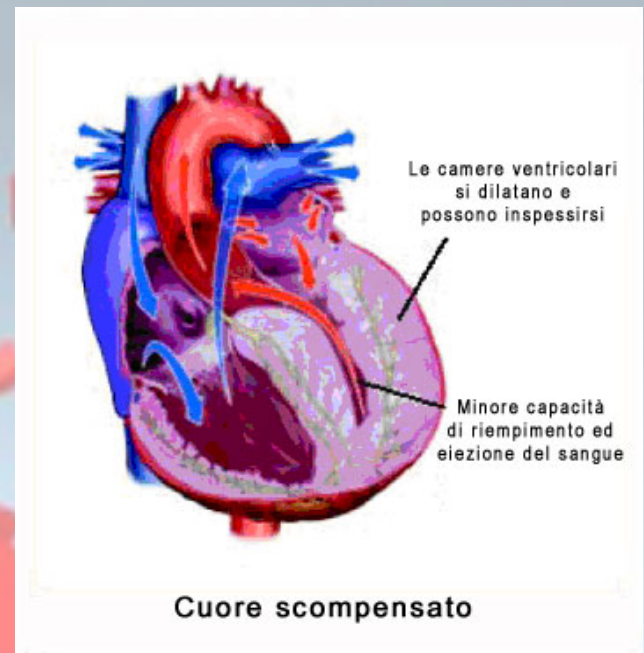
- **Comunicazione anomala tra camere cardiache adiacenti ad una valvola protesica**
- **Complicanza relativamente poco comune, ma...**

...attenzione alle conseguenze!!



© Can Stock Photo

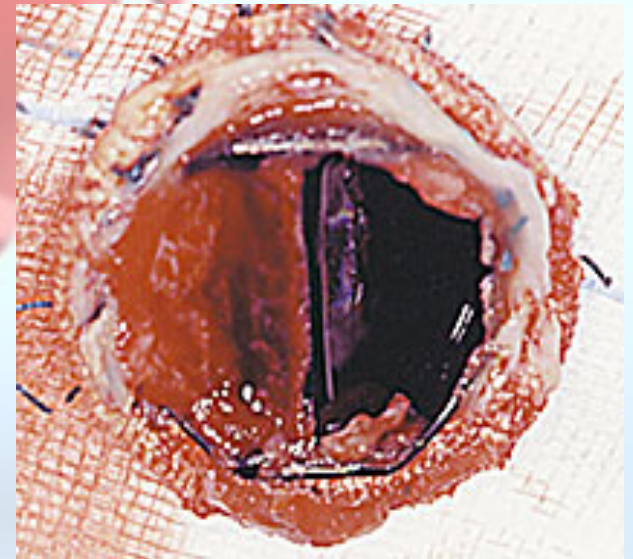
- **Scompenso cardiaco**



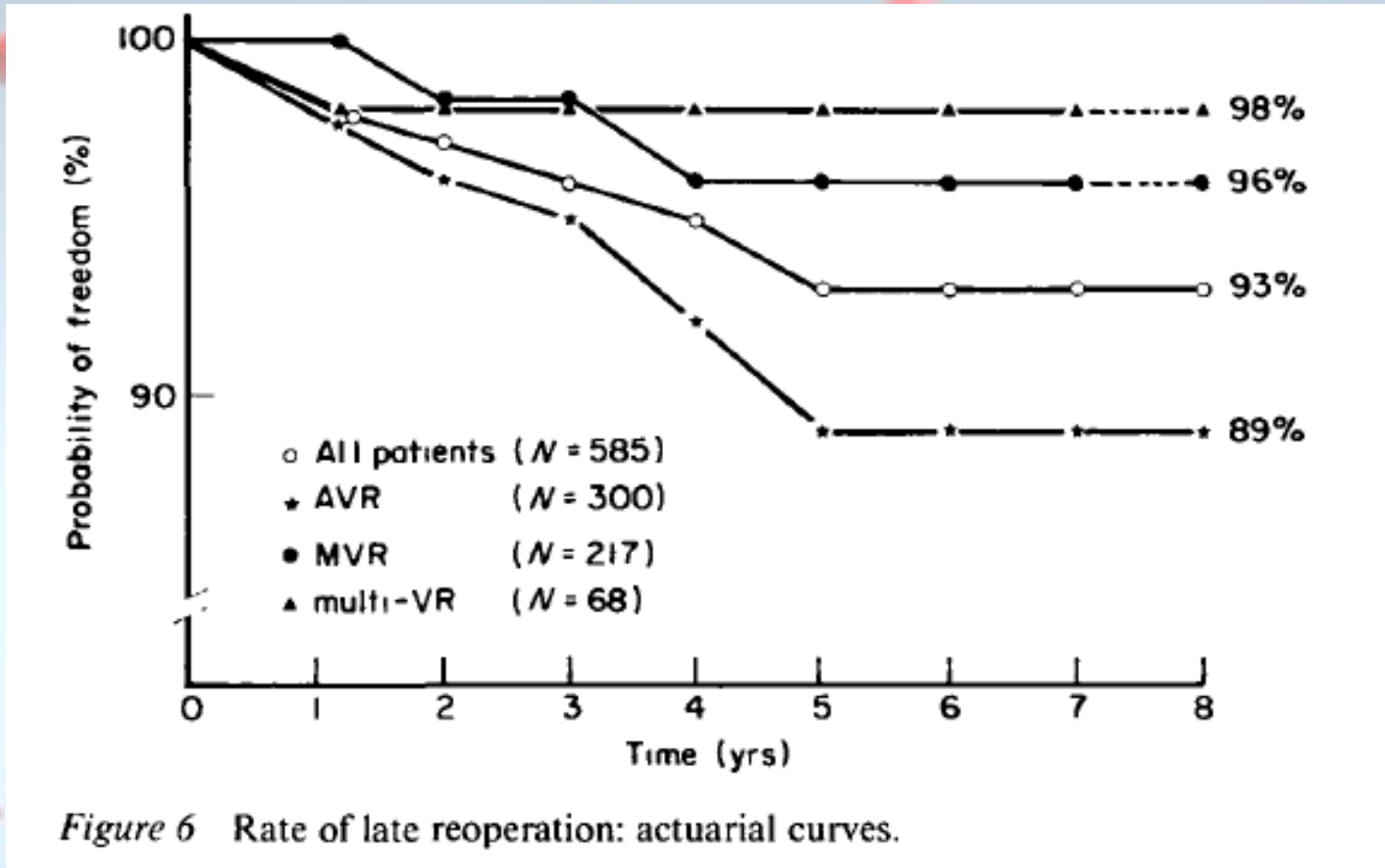
Endocardite infettiva



Anemia emolitica



Ognuna di queste complicanze può portare al re-intervento (riparazione del leak o sostituzione valvolare)



Un po' di numeri...

PREVALENZA:

CARDIOVASCULAR MEDICINE

Prevalence and clinical significance of incidental paraprosthetic valvar regurgitation: a prospective study using transoesophageal echocardiography

A Ionescu, A G Fraser, E G Butchart

Heart 2003;**89**:1316-1321

✓ 2-10% su valvola aortica

✓ 7-17% su valvola mitrale

Table 1 Prevalence of paraprosthetic jets at the early transoesophageal echocardiographic study by valve type and position

Prosthesis type	Paraprosthetic jets		Total
	Absent	Present	
Aortic			
Carpentier-Edwards	34	2 (6%)	36
Porcine	8	0	8
Medtronic Hall	74	1 (1%)	75
St Jude	105	11 (10%)	116
Ultracor	33	2 (6%)	35
Total	254	16 (6%)	270
Mitral			
Medtronic Hall	25	12 (32%)	37
St Jude	43	17 (28%)	60
Ultracor	10	9 (47%)	19
Total	78	38 (33%)	116

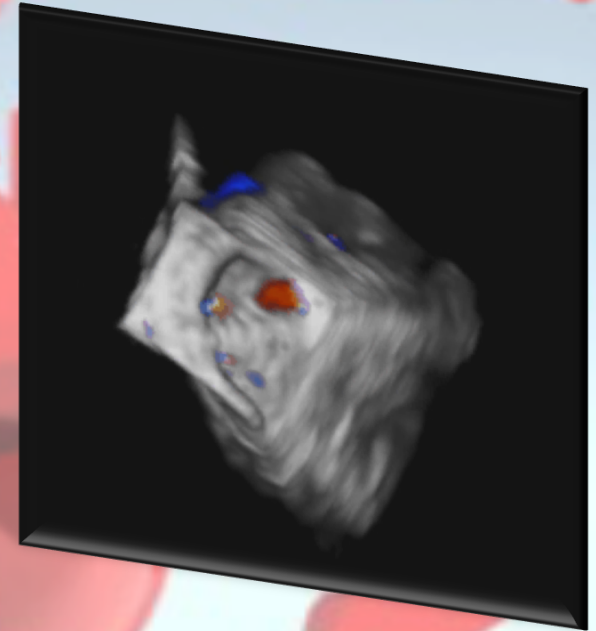
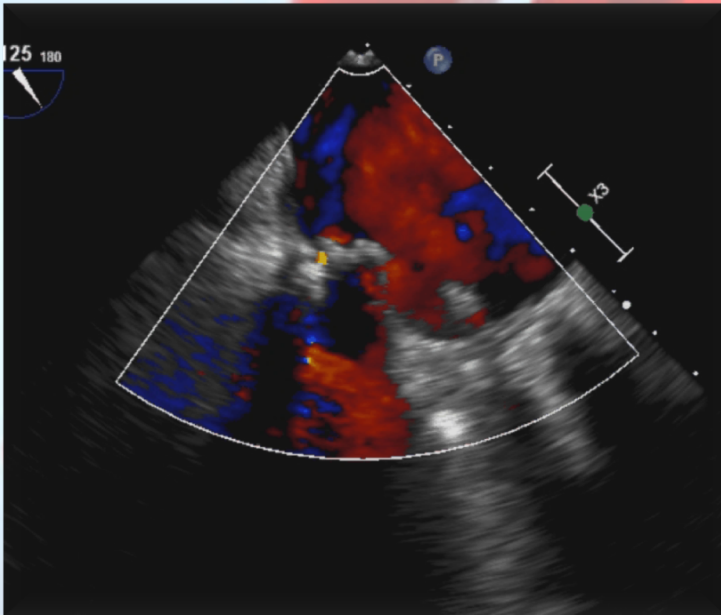
COME



STRATEGIE PER RICONOSCERE LA PRESENZA DI LEAK

1. Eco3D intraoperatorio

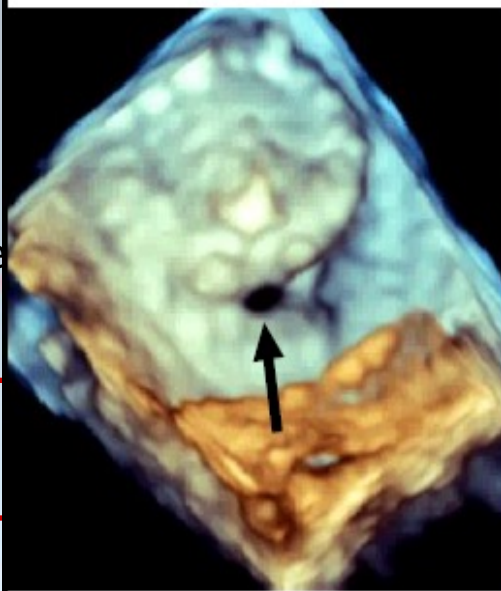
2. Eco2D TE o TT



1. Localizzazione

2. Dime

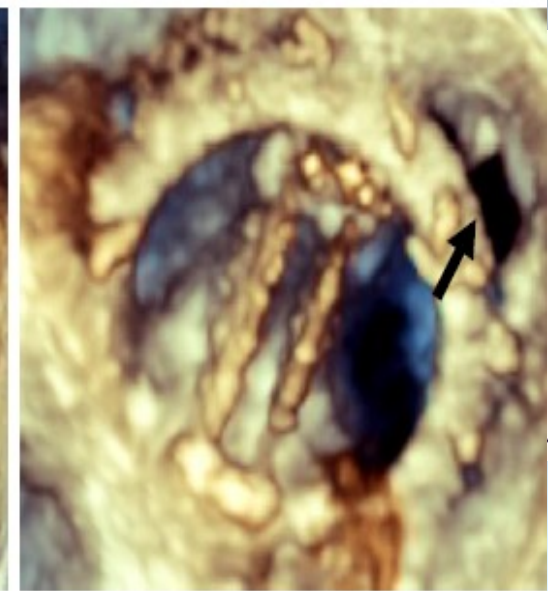
3. For



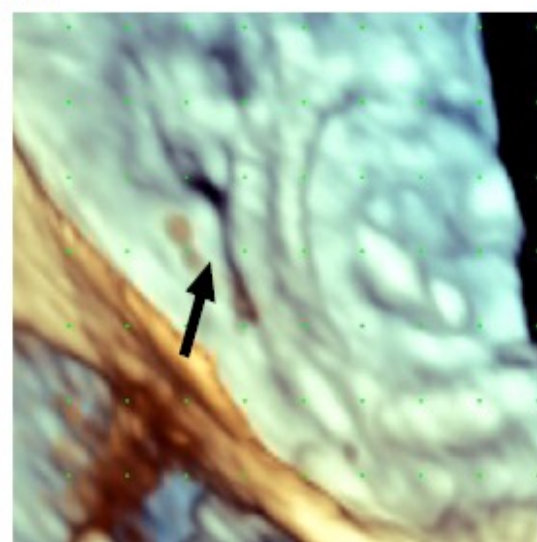
Round



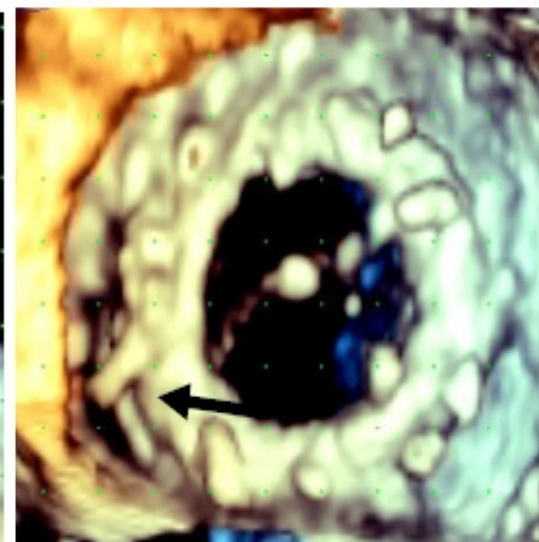
oval



crescentic



Slit-like



tunnel shaped PVL.

Crescentic cutting edge

Il riconoscimento più precoce è garantito dall'esame clinico del paziente!



MAI sottovalutare l'importanza di
una buona auscultazione
cardiaca...

...e del colloquio clinico con il
paziente!



QUANDO



La presenza di un leak può essere riconosciuta:

- ❖ Precocemente con l'ecoTE in sala operatoria → in questo caso il chirurgo può rapidamente intervenire con una revisione della procedura di sostituzione valvolare
- ❖ Tardivamente → in questo caso è necessaria una corretta valutazione dell'entità e della morfologia del rigurgito per stabilire in che modo intervenire per la sua correzione



TERAPIA MEDICA
VS
TERAPIA CHIRURGICA
VS

TRATTAMENTO PERCUTANEO



PERCHE'

Incompleta apposizione dell'anello protesico all'annulus valvolare



1. Calcificazioni annulari
2. Pregressa infezione valvolare
3. Forma e dimensioni della protesi impiantata
4. Tecniche di sutura chirurgiche

Effect of Valve Suture Technique on Incidence of Paraprosthetic Regurgitation and 10-Year Survival

Sukumaran K. Nair, FRCS (C Th), Gauraang Bhatnagar, MBBS, Oswaldo Valencia, MD, and Venkatachalam Chandrasekaran, FRCS (C Th)

Department of Cardiothoracic Surgery, St George's Hospital NHS Trust, London, United Kingdom

Table 3. Incidence, Relative Risk, and Management of Paraprosthetic Regurgitation After Mitral Valve Replacement

Continuous Suture Technique

After excision of the diseased valve and thorough decalcification of the annulus, the annulus was sized and an appropriate-sized prosthesis used for implantation. None of the patients required enlargement of the aortic root for valve insertion. Continuous sutures were placed between the sewing ring of the prosthesis and the valve annulus, in both aortic and mitral positions using 2-0 Prolene (Ethicon, Somerville, NJ). Depending on the annular size and other technical aspects that emerged during the operation, the surgeon used two to four similar sutures with knots tied between them, hence the term semicontinuous. The valve was then parachuted down to the annulus, and the sutures were tied.

Interrupted Technique

Interrupted 2-0 Ethibond (Ethicon) polytetrafluoroethylene (Teflon) -buttressed sutures were used to suture the prosthesis-sewing ring to the annulus. All the patients had Teflon-buttresses positioned in the ventricular aspect of the annulus.

AVR – aortic valve replacement; CI – confidence interval; IN – interrupted technique; MVR – mitral valve replacement; PPR – periprosthetic regurgitation; SC – semicontinuous technique.



STRATEGIE TERAPEUTICHE



Cosa dicono le linee guida?

Management of haemolysis and paravalvular leak

Blood tests for haemolysis should be part of routine follow-up. Haptoglobin measurement is too sensitive and lactate dehydrogenase, although non-specific, is better related to the severity of haemolysis. The diagnosis of haemolytic anaemia requires TEE to detect a paravalvular leak (PVL). Only limited data are available regarding therapeutic options. There is a consensus to recommend reoperation if PVL is related to endocarditis or if PVL causes haemolysis needing repeated blood transfusions or leading to severe symptoms (Recommendation class I, Level of evidence C). In patients with haemolytic anaemia and PVL, where surgery is contraindicated, or those unwilling to undergo re-operation, medical therapy includes iron supplementation, beta-blockers, and erythropoietin if haemolysis is severe.^{210,211} Percutaneous closure of PVL has only been the subject of isolated case reports and could not be considered so far as a validated alternative to surgery.



European Heart Journal (2012) 33, 2451–2496
doi:10.1093/eurheartj/ehs109

ESC/EACTS GUIDELINES 

Guidelines on the management of valvular heart disease (version 2012)

The Joint Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

Dati relativamente scarsi relativi alle opzioni terapeutiche

- **Il reintervento è raccomandato in caso di leak associato a**
 - **Endocardite infettiva**
 - **Emolisi importante con necessità di emotrasfusioni**
 - **Sintomatologia severa**

Recommendation class I, Level of evidence C



STRATEGIE TERAPEUTICHE

Cosa dicono le linee guida?

2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

Prosthetic Valve Regurgitation

Class I

1. Surgery is recommended for operable patients with mechanical heart valves with intractable hemolysis or HF due to severe prosthetic or paraprosthetic regurgitation.

(Level of Evidence: B)

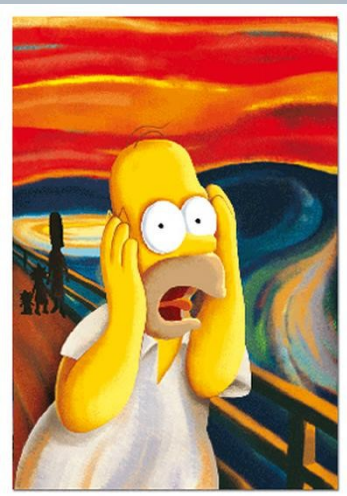
Class IIa

1. Surgery is reasonable for operable patients with severe symptomatic or asymptomatic bioprosthetic regurgitation.

(Level of Evidence C)

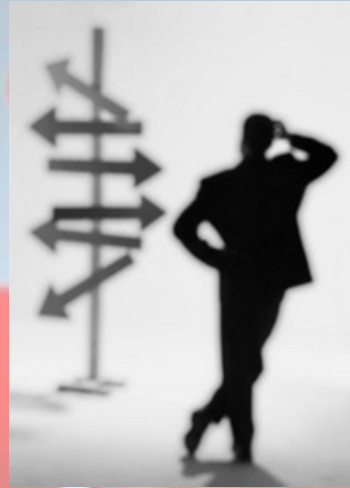
2. **Percutaneous repair** of paravalvular regurgitation is reasonable in patients with prosthetic heart valves and intractable hemolysis or NYHA class III/IV HF who are at high risk for surgery and have anatomic features suitable for catheter-based therapy when performed in centers with expertise in the procedure.

(Level of Evidence B)



MANCANO LINEE GUIDA ITALIANE!!!

Quale opzione terapeutica scegliere?



CHIRURGIA



**RIPARAZIONE
PERCUTANEA**



Figura 1. Fotografia del Amplatzer vascular Plug II.



L'AVANZAMENTO DELLE TECNICHE PERCUTANEE

Three-dimensional echocardiography-guided repair of severe paravalvular regurgitation in a bioprosthetic and mechanical mitral valve

Amer M. Johri^{1*}, Kibar Yared¹, Ronen Durst¹, Roberto J. Cubeddu², Igor F. Palacios², Michael H. Picard¹, and Jonathan Passeri¹

Transapical Repair of Mitral Valve Paravalvular Leakage Using 3-D Transesophageal Guidance

Martin J. Swaans,^{*} MD, Martijn C. Post, MD, PhD, and Jurien M. ten Berg, MD, PhD

Repair of paravalvular prosthetic mitral valve leaks with septal occluder devices in severely high-risk patients: a word of caution

Craig R. Smith^{*}, Sotiris C. Stamou, William M. Merhi and Robert L. Hooker





RISULTATI

%

Review of surgical prosthetic paravalvular leaks: diagnosis and catheter-based closure

Author	Year	Location of PVL	Device	Number of patients	Number of defects	Technical success (%)
Hourihan et al. [9]	1992	Aortic valve	Double-umbrella Rashkind	4	4	75
Moore et al. [10]	2000	Mitral valve	Coils	1	1	100
Eisenhauer et al. [11]	2001	Mitral valve	Vascular occlusion device	1	1	100
Kort et al. [12]	2004	Mitral valve	Amplatzer duct occluder	1	1	100
Webb et al. [13]	2005	Aortic valve	Amplatzer duct occluder	1	1	100
Pate et al. [2]	2006	Mitral + aortic valve	Amplatzer duct occluder, Amplatzer septal occluder, coils	10	10	70
Hildick-Smith et al. [14]	2007	Aortic valve	Amplatzer mVSD occluder	1	1	100
Momplaisir and Matthews [15]	2007	Mitral valve	Amplatzer septal occluder	1	1	100
Shapira et al. [16]	2007	Mitral + aortic valve	Amplatzer occluder-various	11	13	85
Sorajja et al. [17]	2007	Mitral + aortic valve	Amplatzer septal occluder and Amplatzer duct occluder	16	19	89
Cortes et al. [18]	2008	Mitral valve	Amplatzer duct occluder	27	27	63
Kuehl et al. [19]	2009	Mitral valve	Amplatzer duct occluder	1	1	100
Hammerstingl et al. [20]	2009	Mitral valve	Amplatzer Vascular Plug III	1	1	100
Hammerstingl et al. [21]	2009	Aortic valve	Amplatzer Vascular Plug III	1	1	100
Kursaklioglu et al. [22]	2010	Mitral valve	Amplatzer duct occluder	1	1	100
Nietlispach et al. [23]	2010	Mitral + aortic valve	Amplatzer Vascular Plug III	5	5	100
Bogunovic et al. [24]	2011	Mitral valve	Amplatzer Vascular Plug III	1	1	100

TRATTAMENTO CHIRURGICO: ARGOMENTO COMPLESSO (1)

I re-interventi sono tecnicamente più complessi, rispetto al primo intervento chirurgico, a causa di:

- 1. aderenze attorno al cuore,*
- 2. possibile aggravamento di altre concomitanti patologie cardiache,*
- 3. eventuali comorbidità del paziente.*

Table 49–1.

Risk Factors for Reoperative Valve Surgery

Advanced age

Impaired ejection fraction (EF), congestive heart failure (CHF), or advanced preoperative functional class (NYHA)

Urgency of operation or unstable status preoperatively

Preoperative shock

Concomitant coronary artery bypass graft (CABG) or the presence of previous bypass grafts

Prosthetic valve endocarditis

Surgery for perivalvular leaks, valve thrombosis, or prosthetic dysfunction

Renal dysfunction

Chronic obstructive pulmonary disease (COPD)



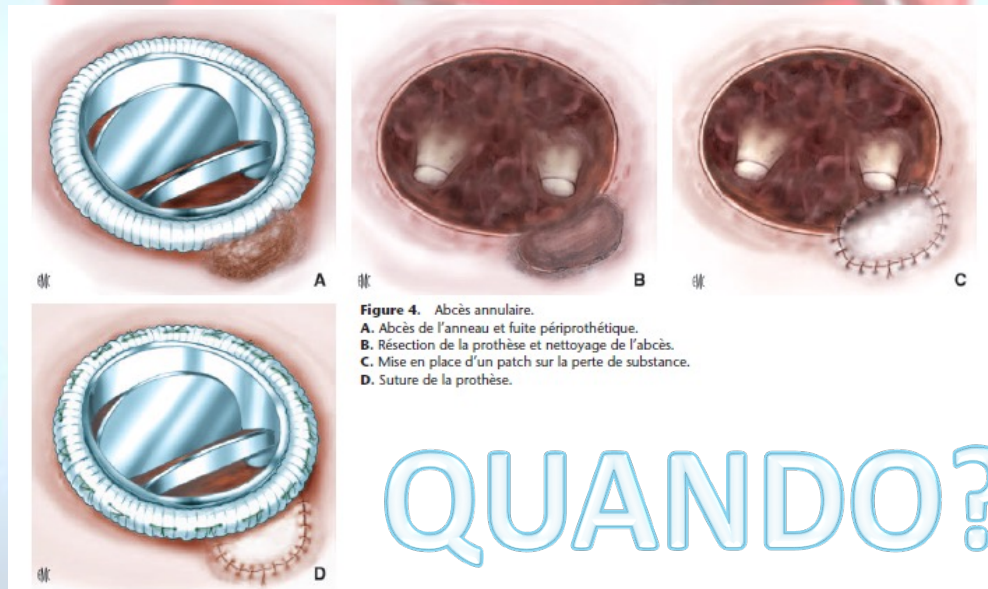
TRATTAMENTO CHIRURGICO: ARGOMENTO COMPLESSO (2)

❑ Riparazione del leak

- In genere: suture interrotte (Tycron 2-0) su pledgets

❑ Sostituzione della protesi

- Se la riparazione completa del leak non è possibile



QUANDO?!



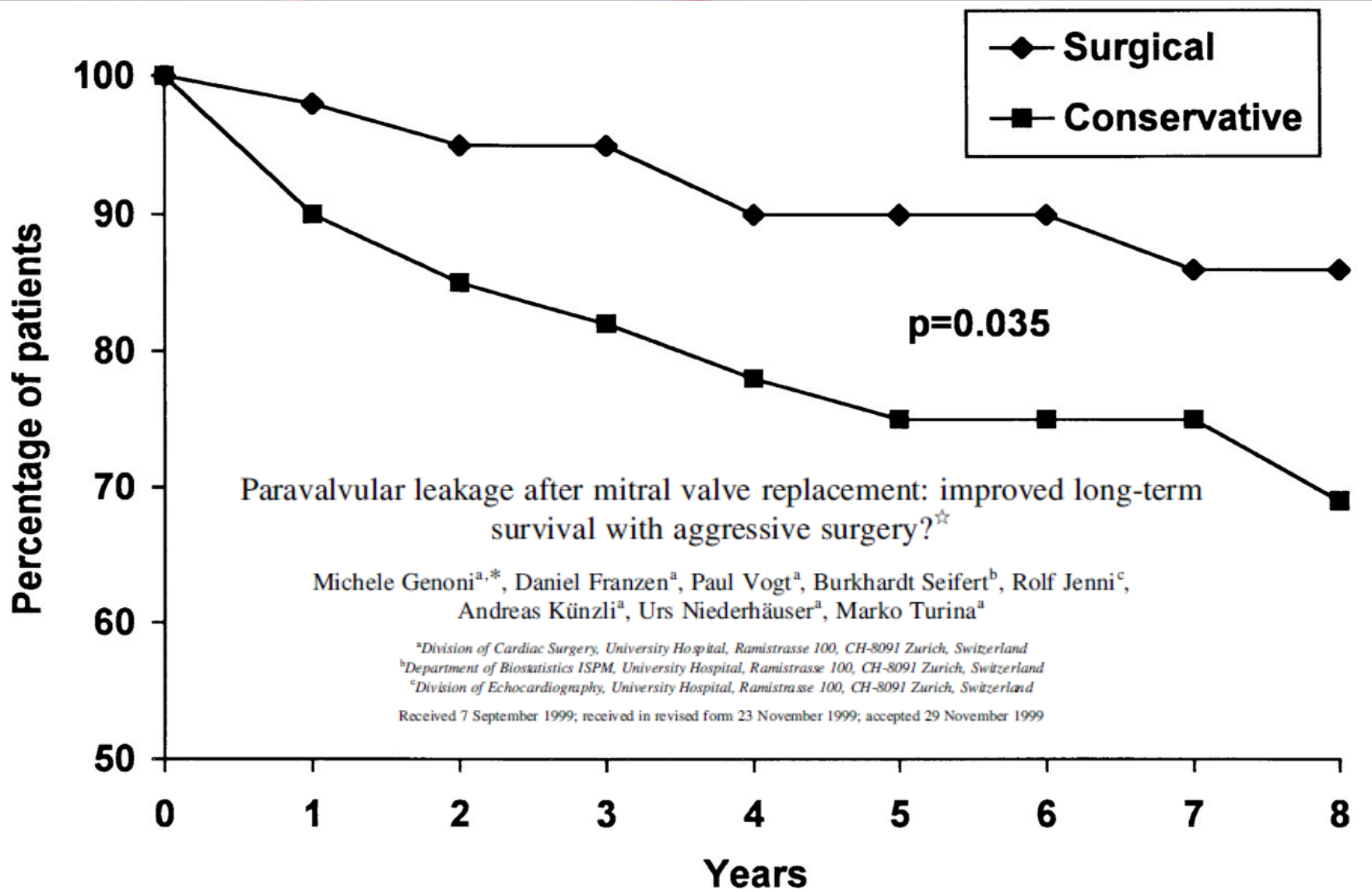


Table 3
Incidence of sympt

Paravalvular leakage after mitral valve replacement: improved long-term survival with aggressive surgery?[☆]

Michele Genoni^{a,*}, Daniel Franzen^a, Paul Vogt^a, Burkhardt Seifert^b, Rolf Jenni^c,
Andreas Künzli^a, Urs Niederhäuser^a, Marko Turina^a

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^cDivision of Echocardiography, University Hospital, Ramistrasse 100, CH-8091 Zurich, Switzerland

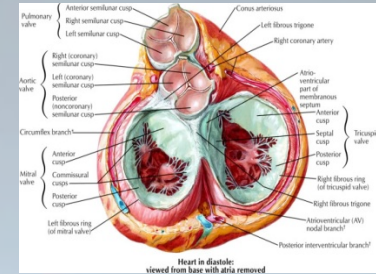
Received 7 September 1999; received in revised form 23 November 1999; accepted 29 November 1999

NYHA class III/IV

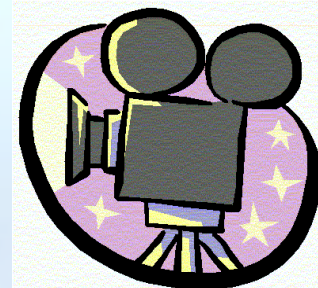
	Follow-up	At diagnosis	At diagnosis	Follow-up	P-value
Vertigo	34	50 (0.001)	56	68	0.16
Miglioramento di dispnea, vertigini, astenia ed ematocrito dopo terapia chirurgica					
Fatigue	45	64 (0.001)	69	79	0.15
Haematocrit	42	31 (0.001)	37	34	0.29
Transfusion	6	6	15	15	0.05

^a Figures in parentheses represent *P*-value.

PER LA MITRALE...



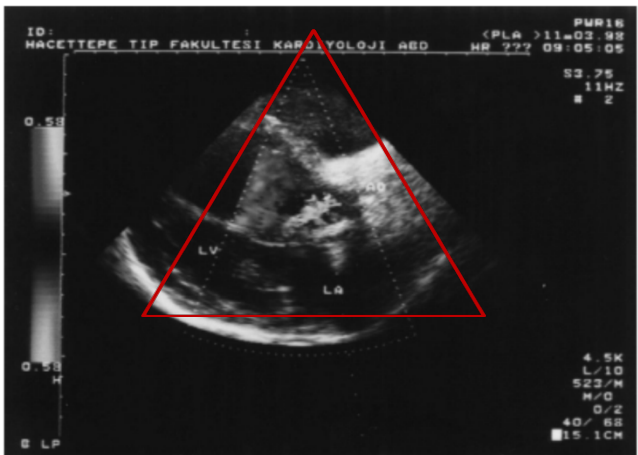
Lack of endothelial coverage



E PER L'AORTA (1)?

Possibilità intraoperatorie:

- Punti transmurali (attraverso l'aorta ascendente in caso di localizzazione del difetto sulla cusvide non coronarica),
- Applicazione di patch sull'area del leak,
- Raramente posizionamento di un singolo punto ad U evertente su pledget;
- Homograft, in caso di difficoltosa realizzazione delle suture in presenza di tessuto friabile o infetto.



An alternative repair technique for aortic periprosthetic leakage

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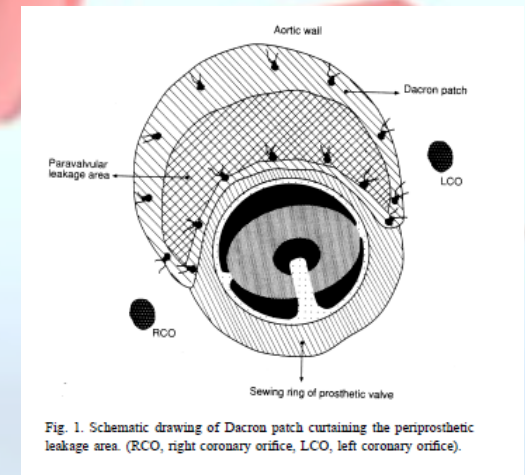
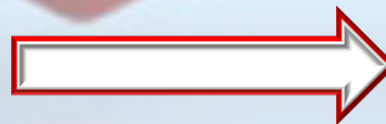


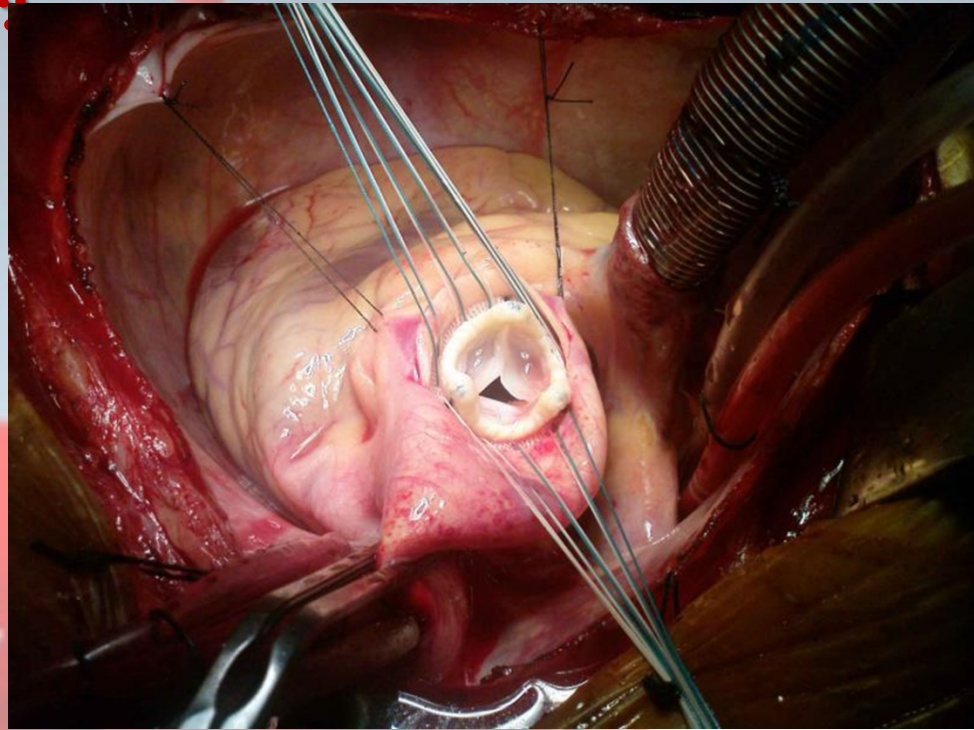
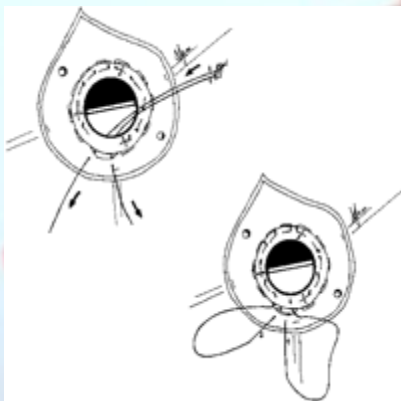
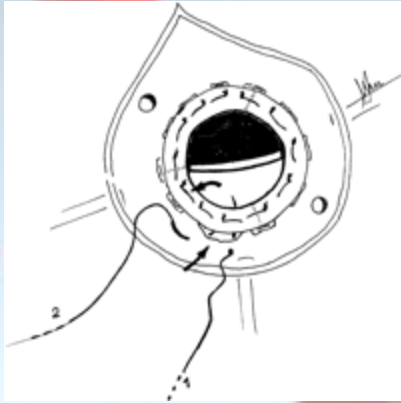
Fig. 1. Schematic drawing of Dacron patch curtailment the periprosthetic leakage area. (RCO, right coronary orifice, LCO, left coronary orifice).

Riparazione con Patch



E PER L'AORTA (2)

Nuove tecniche



La tecnica richiede **punti intrecciati 2-0 su doppio ago**. **Ogni ago** è passato **attraverso l'annulus aortico dall'alto verso il basso**, poi **in direzione del ventricolo** e quindi nuovamente e delicatamente attraverso la protesi (Fig. 1). Dopo aver passato il **primo** ed il **secondo punto di sutura**, entrambi vengono **fissati su pledgets** (Fig. 2). Questo assicura che le suture siano saldamente ancorate al tessuto sottovalvolare. I restanti punti di sutura sono passati attraverso l'anello della protesi valvolare.

Questa tecnica chirurgica non è valida per protesi meccaniche di piccolo diametro (17 e 19 mm).

Ma quando è necessario procedere alla sostituzione della protesi?

SU PROTESI BIOLOGICA!!



POSSIBILI INDICAZIONI ALLA RIMOZIONE DELLA PROTESI:

A. Leak associato a trombosi della protesi

EARLY THROMBOSIS OF BIOPROSTHETIC VALVES

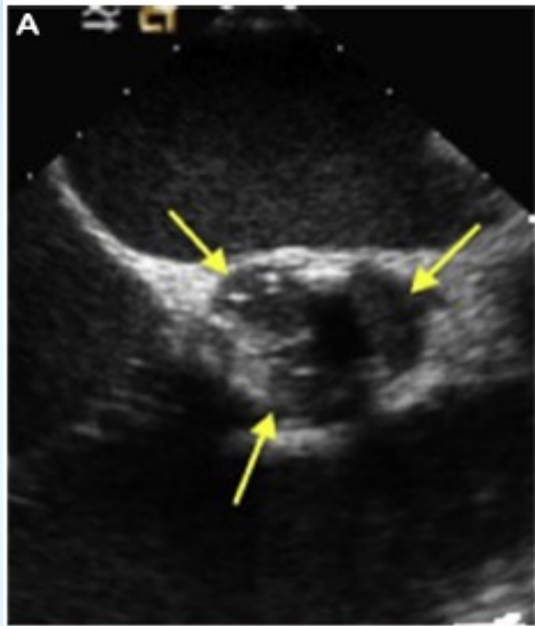
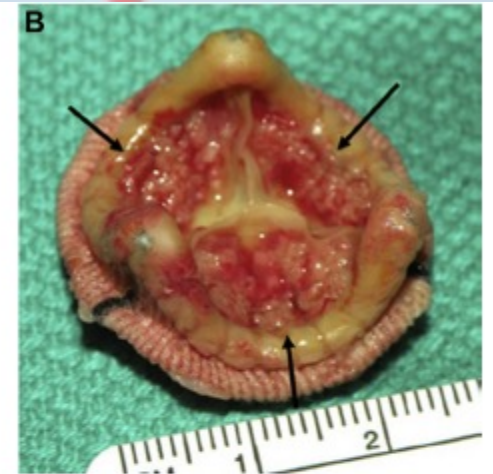


Figure 2 Transesophageal echocardiographic short-axis view with zoom of the aortic valve (**A**) showing echodensities on non-flow surface of the valve (yellow arrows), confirmed as thrombi on the explanted valve (**B**, black arrows). The flow side of the valve was unremarkable (**C**). Culture of the valve grew *P acnes*, illustrating that a thrombosed valve may also be infected.



B. Leak associato a panno endocarditico sulla protesi

EARLY BIOPROSTHETIC VALVE FAILURE RELATED TO PANNUS

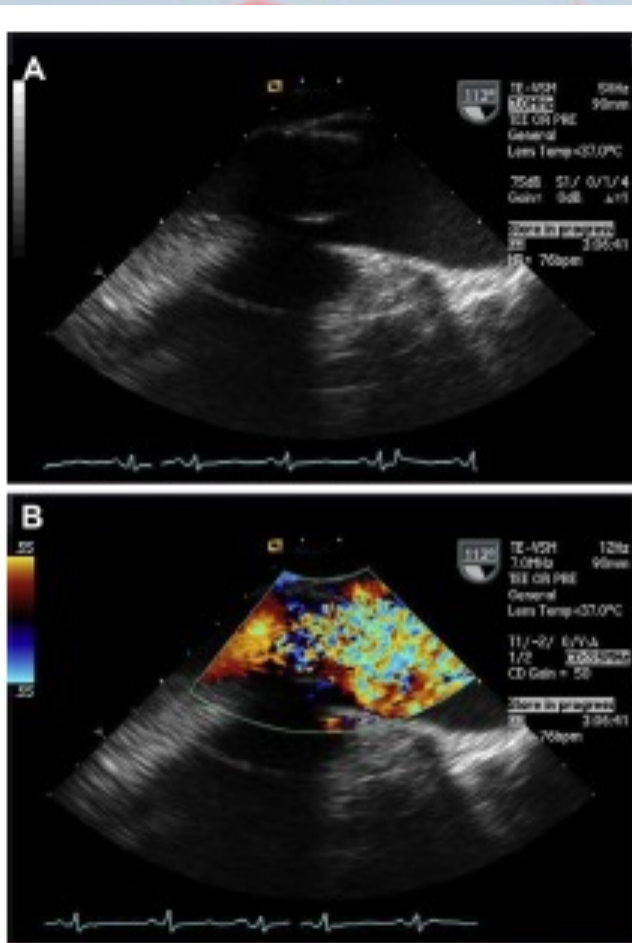
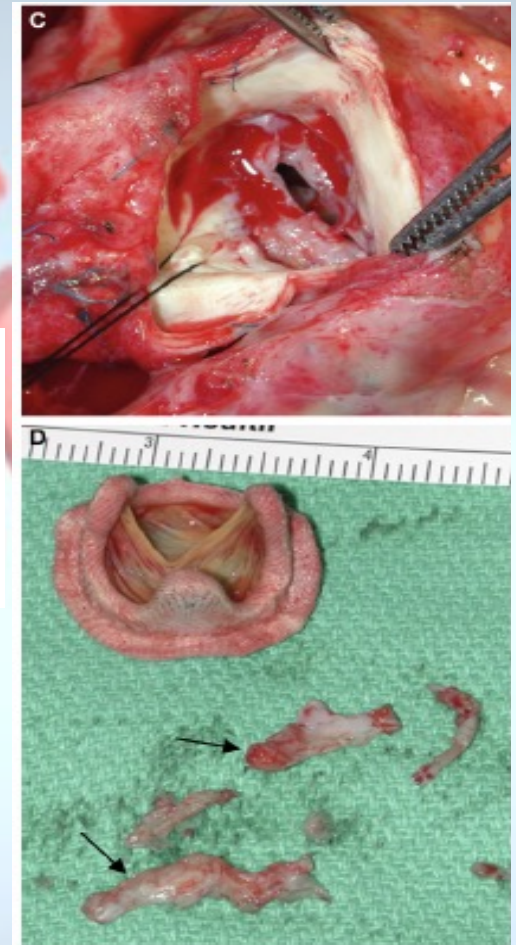


Figure 4 Transesophageal echocardiographic long-axis view with zoom of the aortic valve showing a dilated ascending aorta but no obvious leaflet abnormalities (A). Significant color flow acceleration across the bioprosthetic aortic valve is seen (B). After aortotomy and removal of the bioprosthesis, extensive



C. Leak dovuto a deterioramento strutturale della protesi

EARLY FAILURE FROM SVD

Il deterioramento protesico può essere dovuto a:

1) Calcificazioni o fissurazioni

VALVOLE BIOLOGICHE

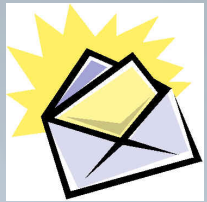
2) Rigurgiti singoli o multipli, centrali o paravalvolari

Table 1 Clinical features, echocardiographic findings, and management considerations for early bioprosthetic valve failure due to thrombosis, pannus, and SVD

	Thrombosis	Pannus	SVD	
			Calcification	Primary perforation
Possible risk factors	<ol style="list-style-type: none">1. Very early before sewing ring has endothelialized2. Lack of anticoagulation3. History of atrial fibrillation4. History of thromboembolic events	<ol style="list-style-type: none">1. Younger age (? immune response)2. Concomitant PPM	<ol style="list-style-type: none">1. Younger age (? immune response and/or hemodynamic stress on valve)2. Mitral as opposed to aortic position3. Diabetes mellitus4. Renal dysfunction5. Abnormal calcium-phosphate metabolism6. Concomitant PPM	None
Potential echocardiographic findings	<ol style="list-style-type: none">1. Stenotic valve with echodensities on nonflow surface of valve (flow surface is usually normal)2. Stenotic valve with a large mass obstructing flow	<ol style="list-style-type: none">1. Stenotic valve with normal-appearing leaflets; visualization of subvalvular pannus may be difficult because of shadowing from bioprosthesis2. Regurgitation from restriction of leaflet(s), difficult to visualize echodensities or leaflet thickening3. Echodensities may be more apparent with a large amount of pannus or if there is an admixture of pannus and thrombus	<ol style="list-style-type: none">1. Stenotic valve with bright echodensities on leaflets or obstruction from extrinsic calcification.2. Regurgitation from a leaflet tear	<ol style="list-style-type: none">1. Eccentric regurgitation without echodensities on leaflets
Management considerations	<ol style="list-style-type: none">1. Infective endocarditis can coexist2. Anticoagulation3. Consider aortic allograft	<ol style="list-style-type: none">1. Consider mechanical prosthesis, especially in a younger patient	<ol style="list-style-type: none">1. Consider mechanical prosthesis, especially in a younger patient	<ol style="list-style-type: none">1. Must exclude endocarditis

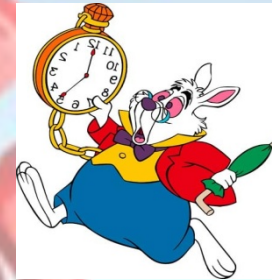


CONCLUSIONI



Take home messages

- **Riconoscimento precoce del leak**



- **Valutazione accurata dei rischi e benefici del trattamento medico, chirurgico, o percutaneo**





**GRAZIE
PER
L'ATTENZIONE!**

Marco Zanobini MD PhD