

Leaks paravalvolari

Cenni di riparazione chirurgica

...di cosa stiamo parlando?

LEAKs PARAVOLVOLARI:

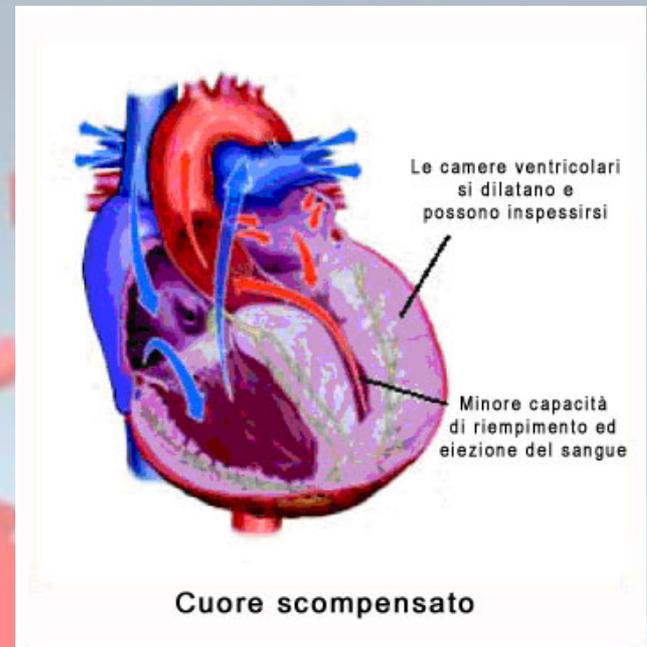
- Comunicazione anomala tra camere cardiache adiacenti ad una valvola protesica
- Complicanza relativamente poco comune, ma...

...attenzione alle conseguenze!!



© Can Stock Photo

- **Scompenso cardiaco**



Endocardite infettiva



Anemia emolitica



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 |

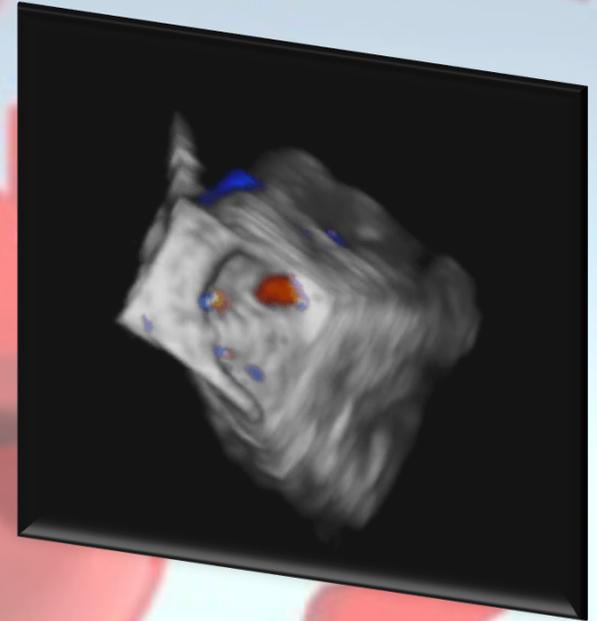
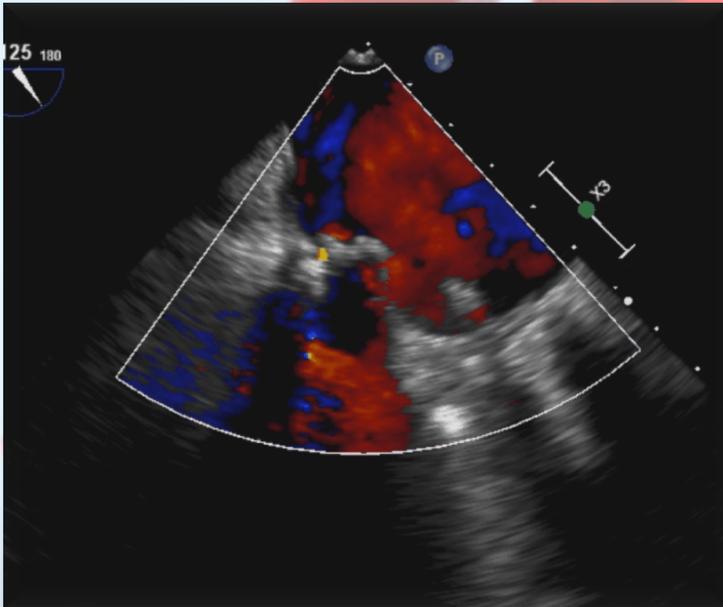
COME



STRATEGIE PER RICONOSCERE LA PRESENZA DI LEAK

1. Eco3D intraoperatorio

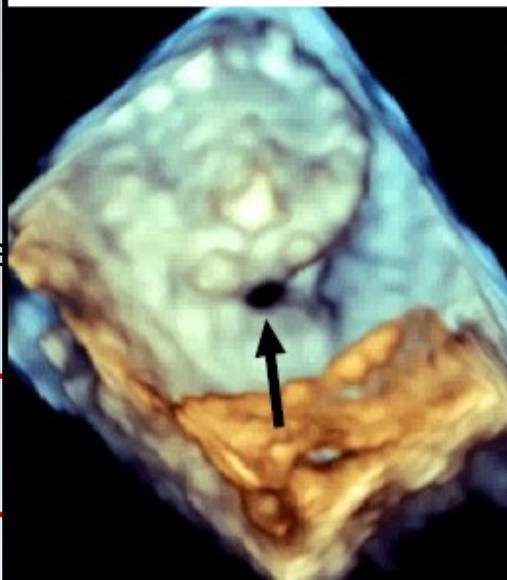
2. Eco2/3D TTE o TEE



1. Localizzazione

2. Dimensione

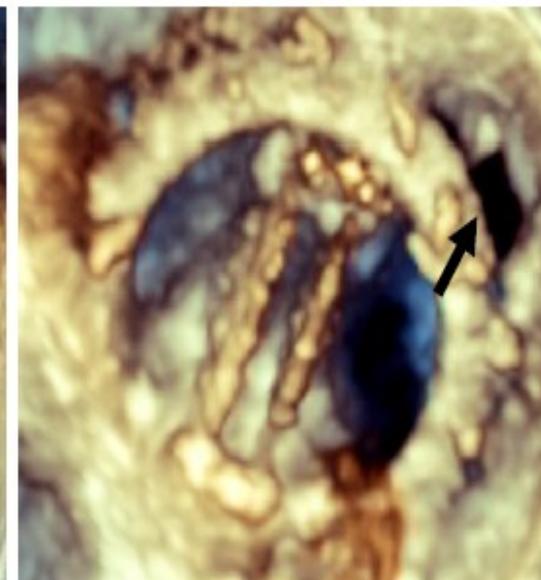
3. Forma



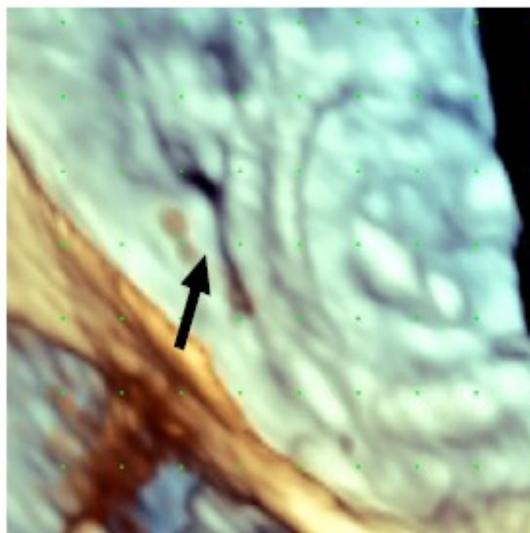
Round



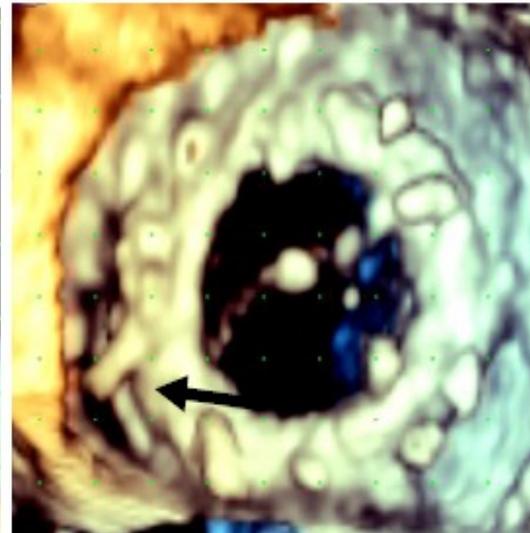
oval



crescentic



Slit-like



tunnel shaped PVL.

Crescentic cutting edge

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)

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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



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 mandatorio in caso di leak associato a**
 - **Endocardite infettiva**
 - **Ampio leak/distacco parziale**
 - **Protesi biologica con iniziali segni di degenerazione**



STRATEGIE TERAPEUTICHE

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

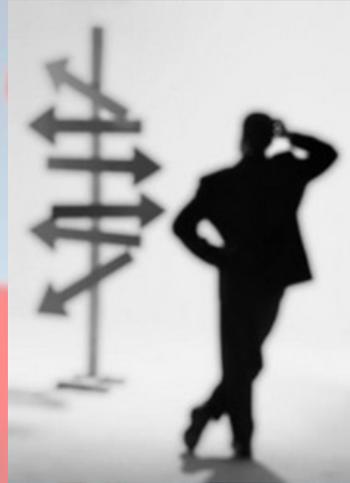
1. Surgery is reasonable for operable patients with severe symptomatic or asymptomatic bioprosthetic regurgitation.

(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)

Quale opzione terapeutica scegliere?



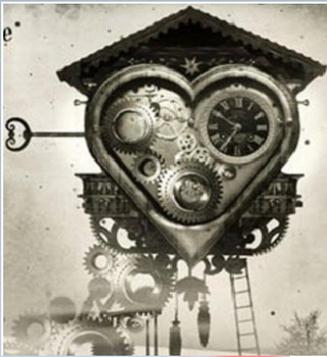
CHIRURGIA



**RIPARAZIONE
PERCUTANEA**



Figura 1. Fotografia del Amplatzer vascolare 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)



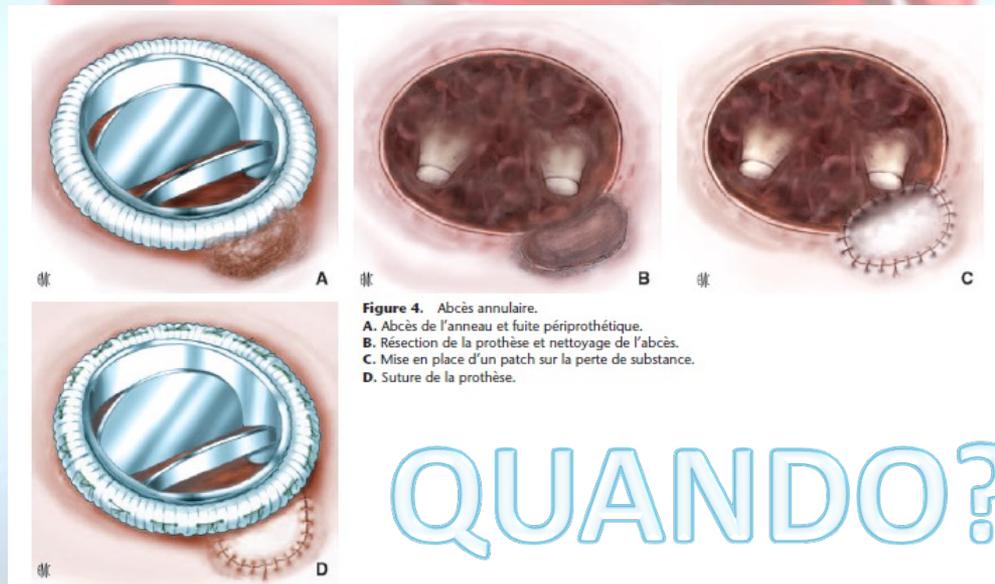
TRATTAMENTO CHIRURGICO: ARGOMENTO COMPLESSO (2)

❑ Riparazione del leak

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

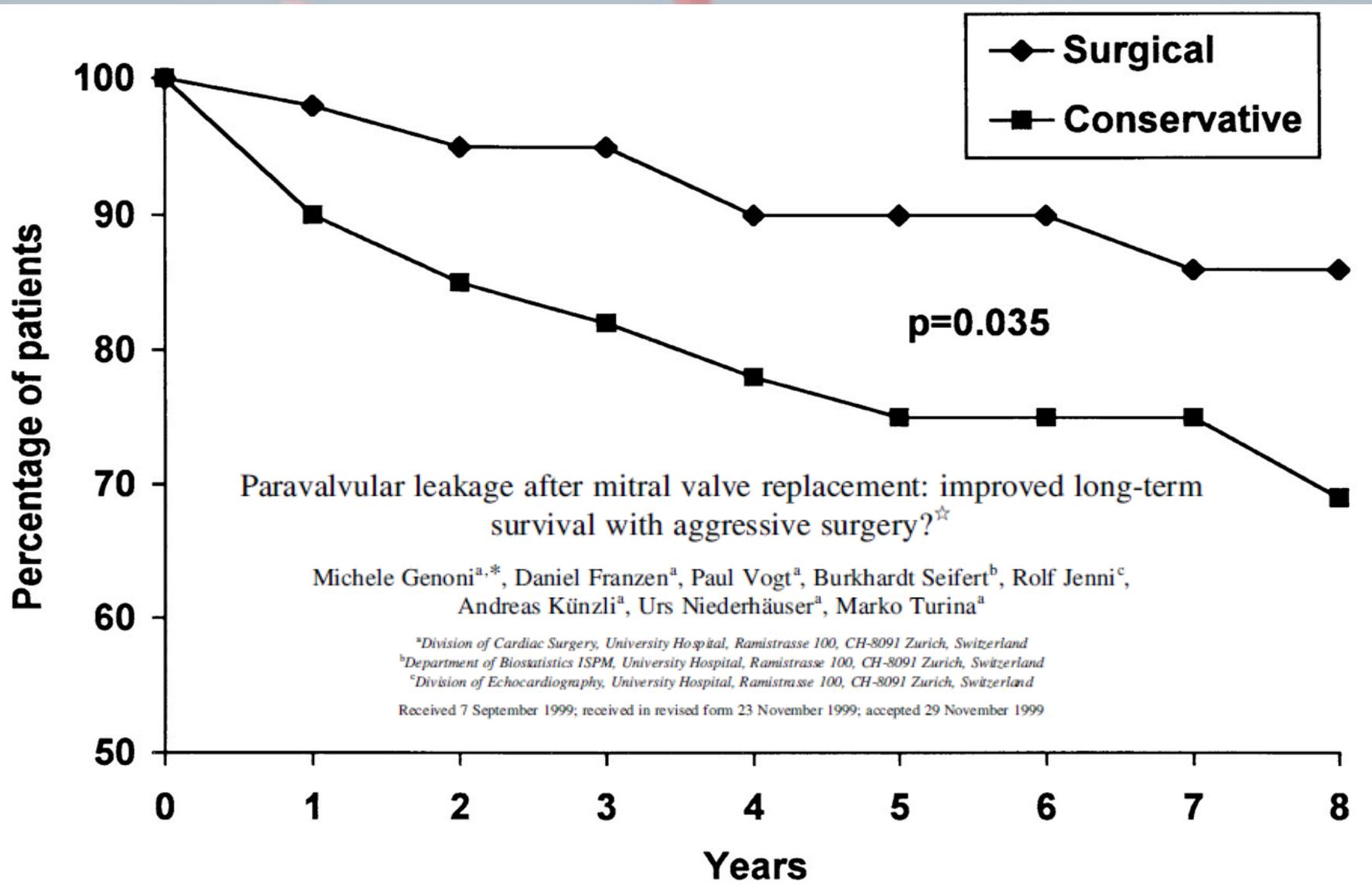
❑ Sostituzione della protesi

- Se la riparazione completa del leak non è possibile



QUANDO?!

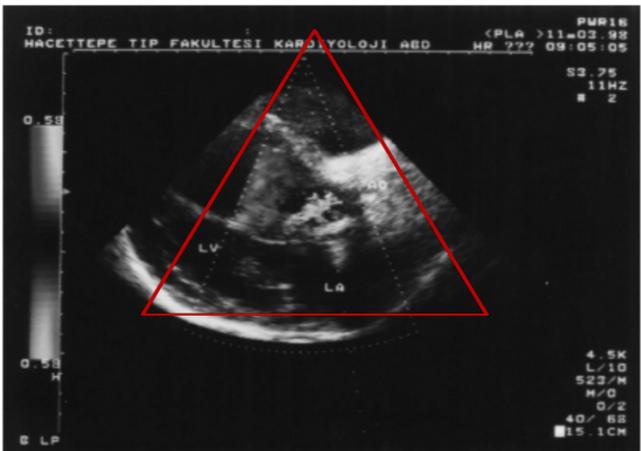




E PER L'AORTA (1)?

Possibilità intraoperatorie:

- **Punti transmurali** (attraverso l'aorta ascendente **in caso di localizzazione del difetto sulla cuspidè 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 tessuti friabile o infetto .

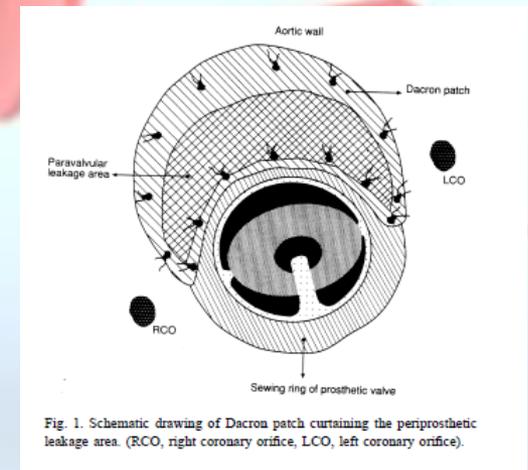


An alternative repair technique for aortic periprosthetic leakage

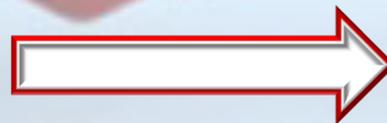
Ünsal Ersoy*, İlhan Paşaoğlu, Mustafa Yılmaz, Şanser Ateş

Department of Thoracic and Cardiovascular Surgery, Hacettepe University Medical Faculty,
TR-06100 Sıhhiye, Ankara, Turkey

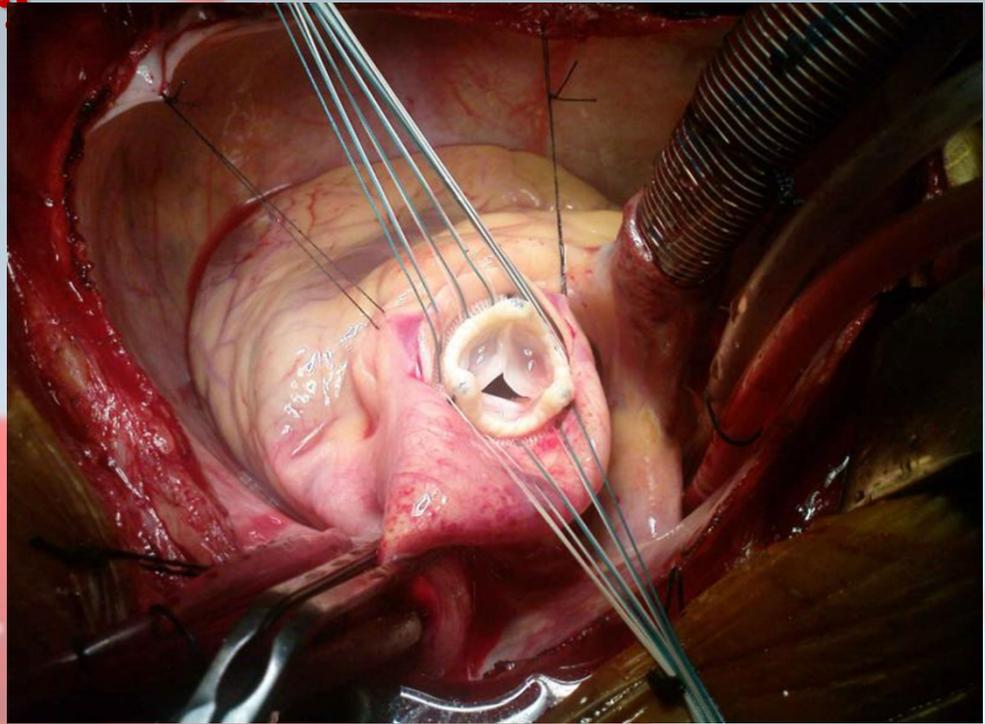
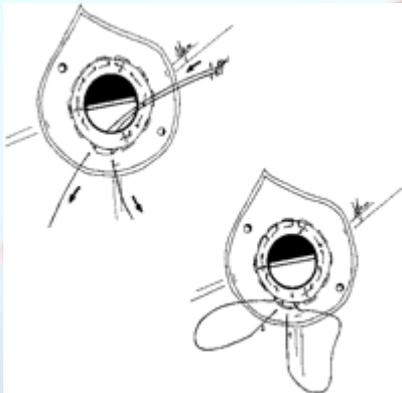
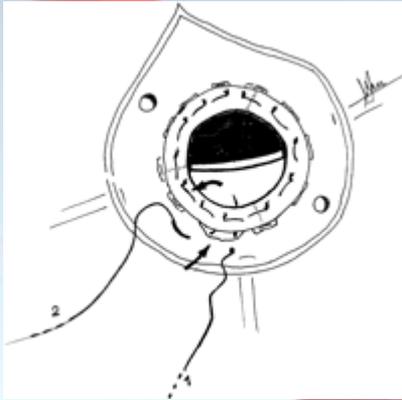
Received 28 September 1998; received in revised form 23 November 1998; accepted 1 December 1998



Riparazione con Patch



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

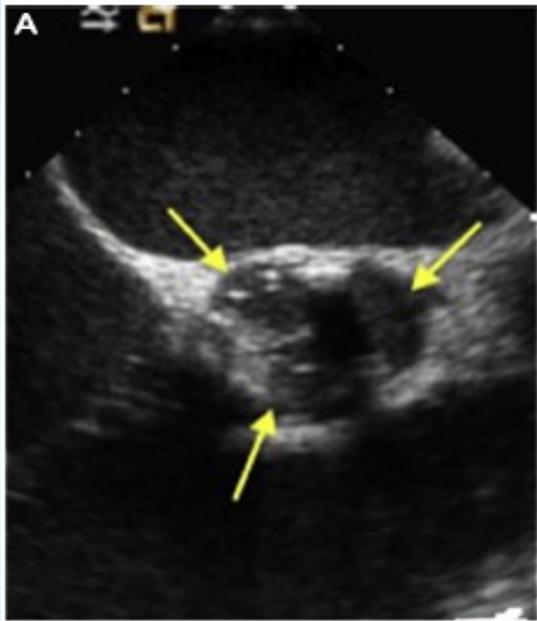
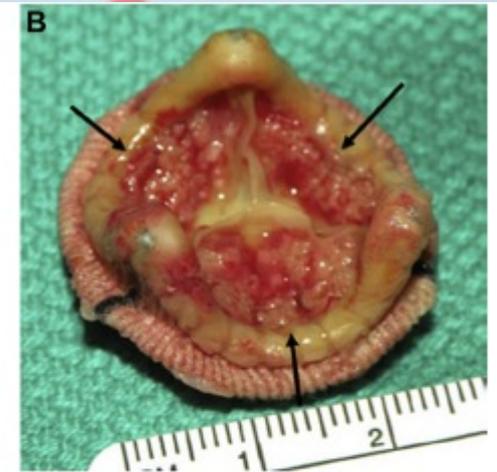


Figure 2 Transesophageal echocardiographic short-axis view with zoom of the aortic valve (**A**) showing echodensities on non-flow surface of the valve (yellow arrows), confirmed as thrombi on the explanted valve (**B**, black arrows). The flow side of the valve was unremarkable (**C**). Culture of the 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

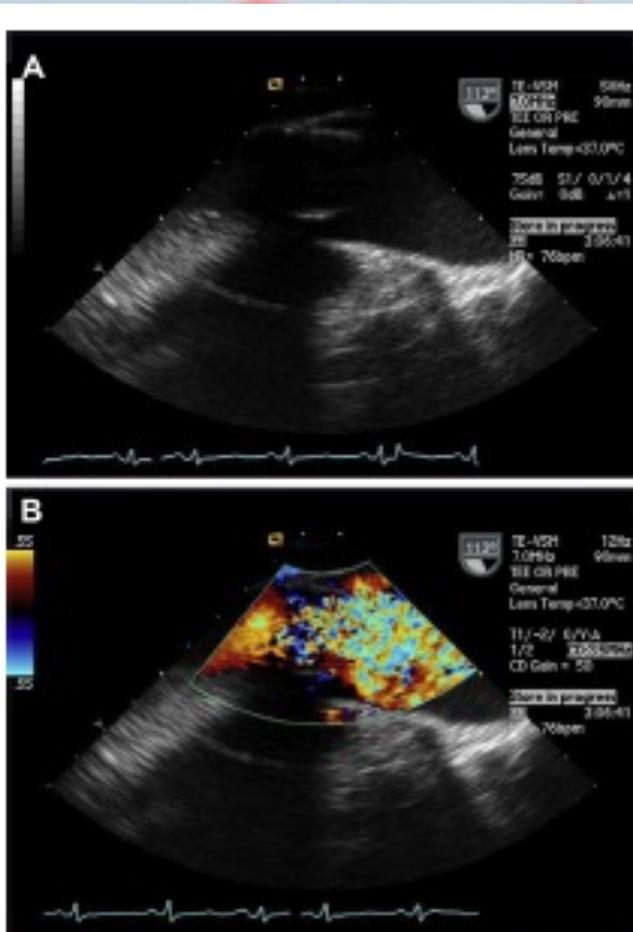


Figure 4 Transesophageal echocardiographic long-axis view with zoom of the aortic valve showing a dilated ascending aorta but no obvious leaflet abnormalities (A). Significant color flow acceleration across the bioprosthetic aortic valve is seen (B). After aortotomy and removal of the bioprosthesis,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

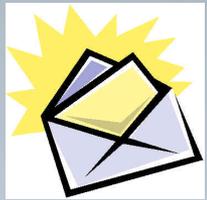
2) Rigurgiti singoli o multipli, centrali o paravalvolari

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 endothelialized 2. Lack of anticoagulation 3. History of atrial fibrillation 4. 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 position 3. Diabetes mellitus 4. Renal dysfunction 5. Abnormal calcium-phosphate metabolism 6. 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 bioprosthesis 2. Regurgitation from restriction of leaflet(s), difficult to visualize echodensities or leaflet thickening 3. 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 coexist 2. Anticoagulation 3. 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 |



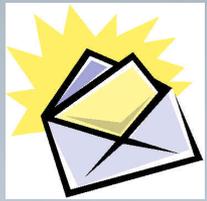
CONCLUSIONI



Take home messages

- Riconoscimento precoce del leak.
- Molti sono i leaks rilevati al TEE intraop: distinguere i minori da quelli importanti!
- REINTERVENTO CHIRURGICO MANDATORIO SE:
 - Endocardite
 - Ampi distacchi/leaks
 - In presenza di bioprotesi con segni di degenerazione
- Valutazione accurata dei rischi e benefici del trattamento chirurgico o percutaneo





CONCLUSIONI

Take home messages

- La direzione da prendere: scelta percutanea!
- Creazione di centri ad elevata esperienza (> 50 casi)
- ESPERIENZA Monzino (TAVI-Mitraclip etc etc)
- Lavoro in team:
- Bioingegneri/cardiologi:
ecocardiografisti/cardiocirurghi/emodinamisti/anestesisti
- Supporto delle industrie biomedicali



**GRAZIE
PER
L'ATTENZIONE!**

Marco Zanobini MD PhD