

SURGICAL OPTIONS WITH AN INFECTED PROSTHESIS

What do we say, what do we do!

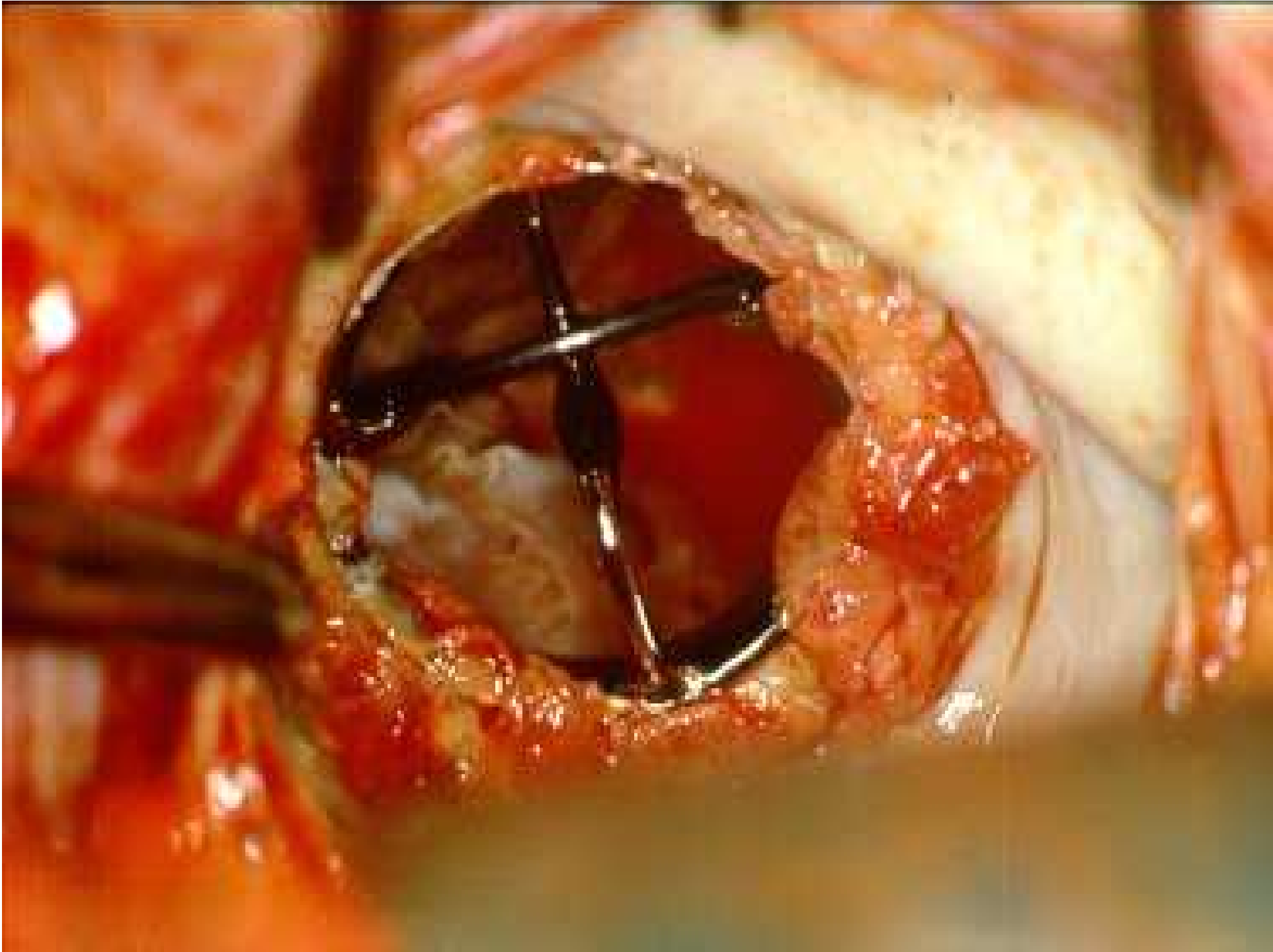
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ESC - 2005

Prosthetic Valve Endocarditis

Case history

- 68-year old male
- Nov/04 – MVR - MH 27mm
- Now severe CCF – NYHA class IV
- AV regurgitation III/IV
- Smoker, mildly purulent cough
- Treated w/ Vancomycin + Gentamycin
- Diagnosis: PVE by Staph epidermidis



Prosthetic Valve Endocarditis

DEFINITION

Classical

- Early onset < 60 days after VR
- Late-onset > 60 days

Current

- Infection involving an implanted prosthetic device within 12 months of VR is considered a nosocomial infection and more likely to be acquired at the time of operation (Center for Disease Control and Prevention)

Prosthetic Valve Endocarditis

BACTERIOLOGY

Early onset

- methicillin-resistant *Staphylococcus epidermidis*
- gram-negative bacilli,
- fungi
- other HACEK-group organisms (nosocomial infection)

Late-onset

- *Streptococcus viridans*
- *Staphylococcus epidermidis*
- Gram - bacilli

Prosthetic Valve Endocarditis

INCIDENCE

- It occurs at a rate of 0.2% - 1.4% per patient-year. (3% at 5 years and 5% at 10 years).
- It is considerably more common in the aortic valve
- The incidence is decreasing
- The incidence in annuloplasty rings (0.2%) is significantly lower than in mechanical (1.6%) and bioprosthetic valves (1.1%).
- Recurrent endocarditis developed in 22.5% of patients operated on for native valve endocarditis (NVE).

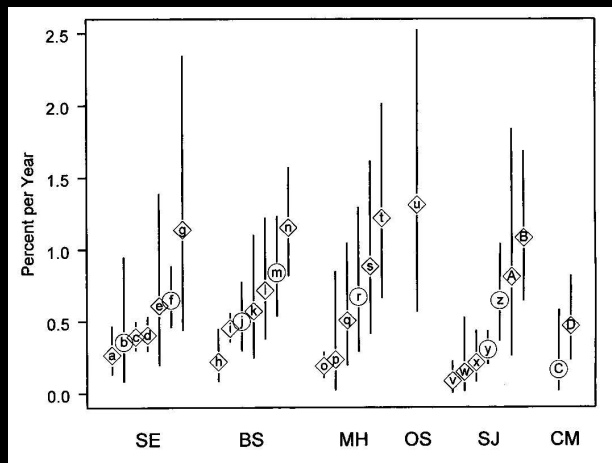
Prosthetic Valve Endocarditis

- Centered largely on the aortic valve, but similar principles apply to the mitral valve

Prosthetic Valve Endocarditis

PVE RATES FOR AVR

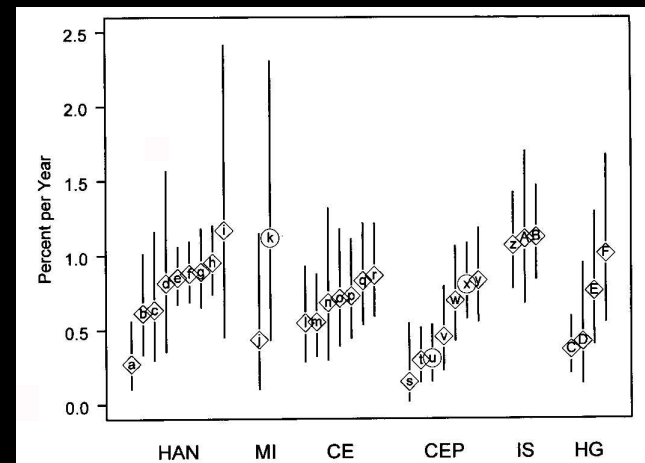
Mechanical



average rate
= 0.39%/yr

Vlessis, Grunkemeier et al

Biological



average rate
= 0.75%/yr

JHVD 1997; 6:443-465

Prosthetic Valve Endocarditis

Eur J Cardiothorac Surg 1998;14:156-164

Thirty-day mortality and long-term survival following surgery for prosthetic endocarditis: a study from the UK heart valve registry

Maria-Benedicta Edwards, Chandana P. Ratnatunga, Caroline J. Dore, Kenneth M. Taylor

Prosthetic Valve Endocarditis

Methods: 322 patients who had undergone single mechanical /bioprosthetic **valve** replacement for PVE from 1986 -1996.

Results: 30-day mortality was 63 (19.9%). One, 5 and 10 year survival rates were 67.1%, 55.0% and 37.6%, respectively. Age and explanting of infected bioprosthesis and replacement by mechanical valve determined long-term survival. Freedom from reoperation for PVE was 88.4, 87.3 and 87.3% at 1, 5 and 10 years, respectively. Explanting of bioprosthesis and replacement by mechanical valve and reoperation within 60 days of native valve replacement were determinants of reoperation for PVE.

Conclusion: Operation for PVE carries a high 30-day mortality and reduced long-term survival. **There is** no evidence that type of prosthesis used for re-reoperation determines survival or freedom from re-reoperation.

DO PATIENTS WITH
PROSTHETIC VALVE
ENDOCARDITIS
BENEFIT FROM EARLY
SURGERY ?

Prosthetic Valve Endocarditis

WHAT WE SAY

Prosthetic Valve Endocarditis

ESC GUIDELINES

Complications where surgery should be considered during active PVE

- Early PVE
- Hemodynamically significant PV malfunction
- Evidence of peri-valvular extension
- Persistent infection after 7-10 days of adequate antibiotic therapy
- Recurrent emboli despite appropriate antibiotic therapy
- Infections with microorganisms with poor response to antibiotic treatment
- Obstructive vegetations

Prosthetic Valve Endocarditis

OXFORD JOURNALS

EUROPEAN HEART JOURNAL

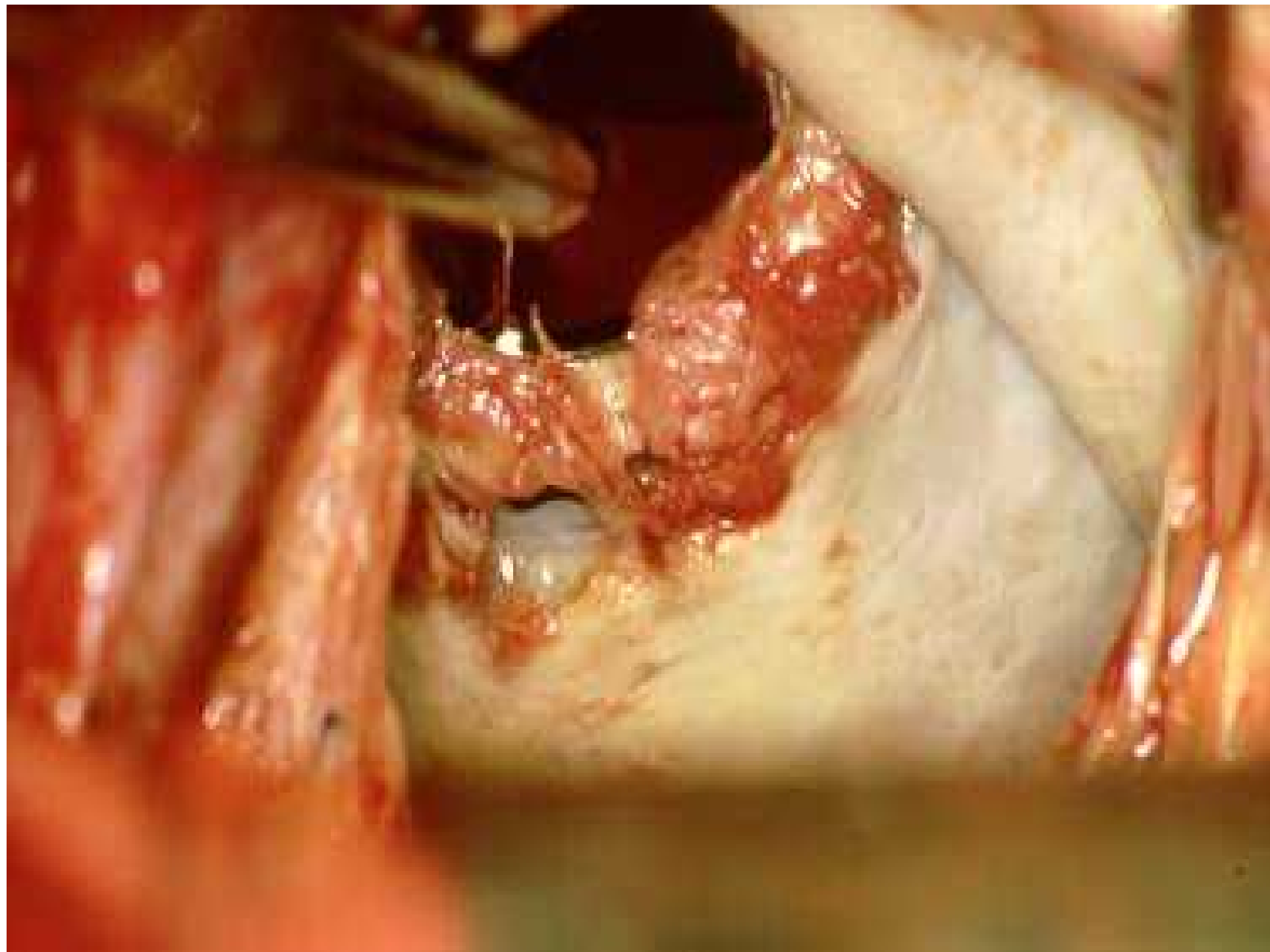
European Heart Journal Advance Access published online on August 15, 2005

European Heart Journal, doi:10.1093/eurheartj/ehi426

Special ESC article

Recommendations for the management of patients after heart valve surgery

Eric G. Butchart^{1*}, Christa Gohlke-Bärwolf, Manuel J. Antunes, Pilar Tornos, Raffaele De Caterina, Bertrand Cormier, Bernard Prendergast, Bernard Iung, Hans Bjornstad, Catherine Leport, Roger J.C. Hall, Alec Vahanian, and on behalf of the Working Groups on Valvular Heart Disease, Thrombosis, and Cardiac Rehabilitation and Exercise Physiology, European Society of Cardiology



Prosthetic Valve Endocarditis

Empirical antibiotic treatment (before results of the blood cultures)

Type of PVE	Standard regimen	Alternative regimen
Early PVE	Vancomycin 1g/12h i.v. + Gentamicin 1mg/Kg/8h i.v. + Rifampicin 300 mg/8 h p.o	Teicoplanin 12 mg/12h (3 doses) and then /24h i.v.. + Gentamicin 1mg/Kg/8h i.v. + Rifampicin 300 mg/8h p.o
Late PVE	Vancomycin 1g/12h i.v. + Gentamicin 1mg/Kg/8h i.v. + Rifampicin 300 mg/8h p.o	Cloxacilin 2g/4h i.v. + Ampicillin 2g/4h i.v. + Gentamicin 1mg/Kg/8h i.v

Prosthetic Valve Endocarditis

Valve is going to need surgery,
anyway. So,
why wait?

Prosthetic Valve Endocarditis

BUT...

Prosthetic Valve Endocarditis

Although urgent surgery has improved the outlook for some patient groups, early mortality did not decrease significantly....

Verheul et al. Am J Cardiol 1993;72:682-7

Prosthetic Valve Endocarditis

AND

Significant advances in antifailure therapy
occurred in recent times!

Prosthetic Valve Endocarditis

J Thorac Cardiovasc Surg 1996;111:198-210

SURGICAL TREATMENT OF PROSTHETIC VALVE ENDOCARDITIS

**Bruce W. Lytle, Brian P. Priest, Paul C. Taylor, Floyd D. Loop,
Shelley K. Sapp, Robert W. Stewart, Patrick M. McCarthy, Derek
Muehrcke, Delos M. Cosgrove, III,**

Prosthetic Valve Endocarditis

From 1975 through 1992... 146 patients for the treatment of PVE. ... *early* (<1 year after operation) in 46 cases and *active* in 103 cases. The extent of the infection was prosthesis only in 66 patients, anulus in 46, and cardiac invasion in 34.... There were 19 (13%) in-hospital deaths. Univariate analyses demonstrated trends toward increasing risk for patients with active endocarditis and extension of infection beyond the prosthesis; **the only variables with a significant association with increased in-hospital mortality were ... and culture of organisms from the surgical specimen. ... with late death.** Nineteen patients needed at least one further operation; reoperation-free survival was 75% at 5 and 50% at 10 postoperative years. Fever in the immediate preoperative period was the only factor associated with decreased late reoperation-free survival

Prosthetic Valve Endocarditis

CONCERN

RECURRENT
INFECTION

Prosthetic Valve Endocarditis

Results of surgery for prosthetic valve endocarditis

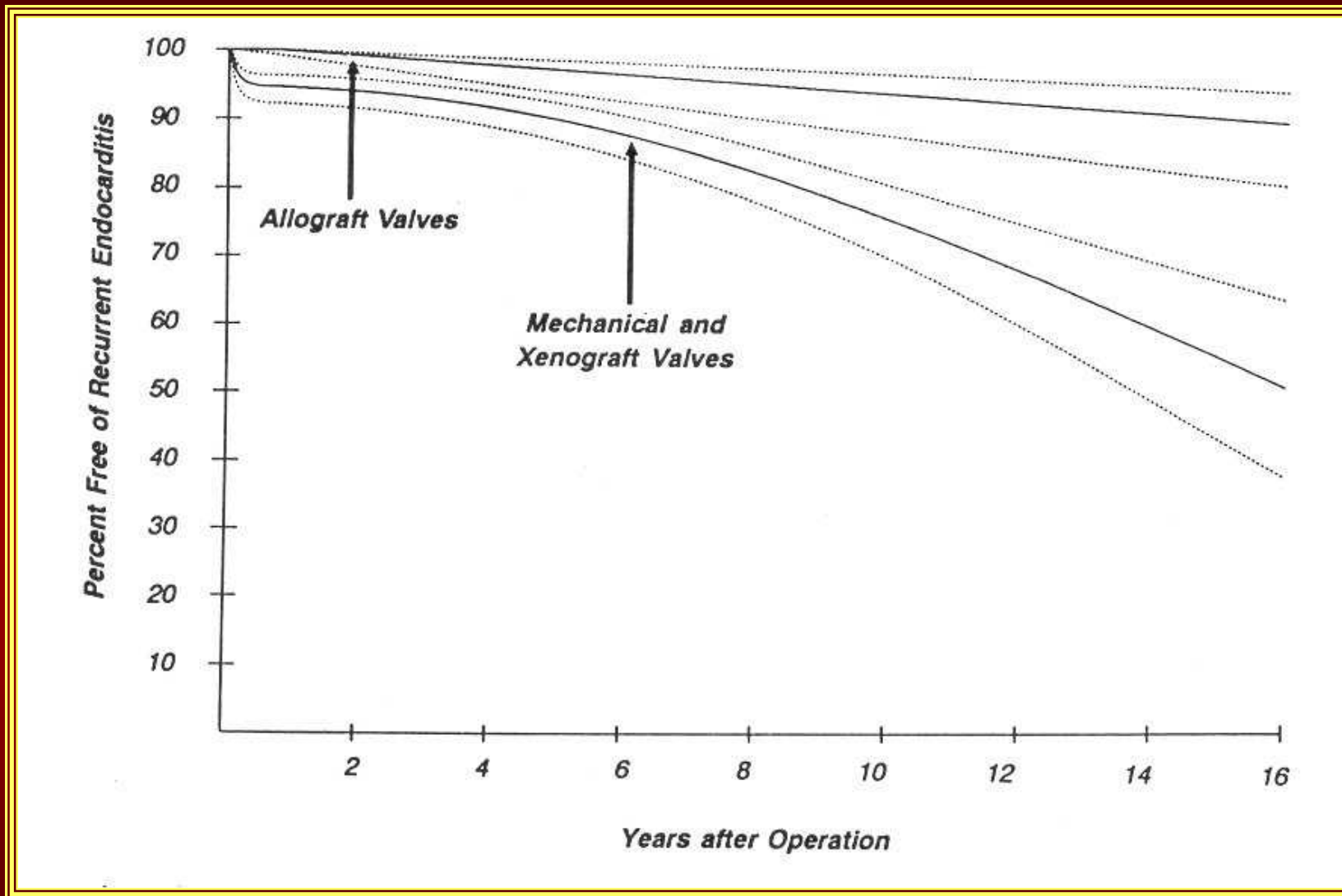
Author	Year	Nº of cases	Early mortality (%)	Late survival (%) 5Y 10Y 15Y	Recurrence (%)	Survival free from reoperation for recurrence at 10Y (%)
Lyttle	1996	146	13	82 60		50
Edwards	1998	322	19.9	55 38		87
Delay	2000	27	0	55(7A)	18.5	
Alexiou	2000	35	16.6		61 17.1	
Moon	2001	97	29		41 2.5±0.7%/pat.year	
Romano	2004	95	24.2	64 34 34		59

Prosthetic Valve Endocarditis

QUESTION

WHICH
PROSTHESIS ?





McGiffin et al. *J Thorac Cardiovasc Surg* 1992;104:511-20

Prosthetic Valve Endocarditis

General consensus clearly tends toward using biological material rather than prosthetic devices for surgical repair in the presence of infection

- homografts may confer a slight advantage in terms of reinfection, but
 - deteriorate progressively (reoperation required)
 - severe adhesions make reoperations challenging.
 - an irregular base for the proximal suture line can distort and render insufficient a homograft.

Prosthetic Valve Endocarditis

Ann Thorac Surg 2002;74:S1781-S1785

Replacing the ascending aorta and aortic valve for acute prosthetic valve endocarditis: is using prosthetic material contraindicated?

Christian Hagl, Jan D. Galla, Steven L. Lansman, Daniel Fink, Carol A. Bodian, David Spielvogel, Randall B. Griepp

Prosthetic Valve Endocarditis

PATIENTS: Twenty-eight patients (55 ± 14 years; 22 male) underwent a Bentall procedure for acute prosthetic valve endocarditis between 1988 and 2000. Complete annuloaortic dehiscence occurred in 71%, and in 57%, an abscess was found. Causative organisms were identified in 25 of 28 patients: *Staph. epidermidis* (9), *Staph. aureus* (7), *Strep. viridans* (6), *Pseudomonas* (2), and *Legionella* (1).

RESULTS: Hospital mortality was 11%. During follow-up (median, 44.5 months; 1 patient died of recurrent endocarditis at 4 months).

CONCLUSIONS: These results indicate that prosthetic root replacement may be superior to use of a homograft for acute aortic prosthetic valve endocarditis, with only a 4% incidence of recurrent endocarditis and reoperation.

Prosthetic Valve Endocarditis

J Thorac Cardiovasc Surg 2004;127:1416-1420

Replacement of the aortic root for acute prosthetic valve endocarditis: Prosthetic composite versus aortic allograft root replacement

Rainer G. Leyh, Karsten Knobloch, Christian Hagl, Arjang Ruhparwar, Stefan Fischer, Theo Kofidis, Axel Haverich

Prosthetic Valve Endocarditis

METHODS: From 1991 through 2001, 29 patients with prosthetic aortic valve endocarditis combined with aortic root destruction underwent reoperation at our institution. Sixteen patients received aortic root replacement with a cryopreserved aortic root allograft (group A) and 13 with a prosthetic composite graft (group B).

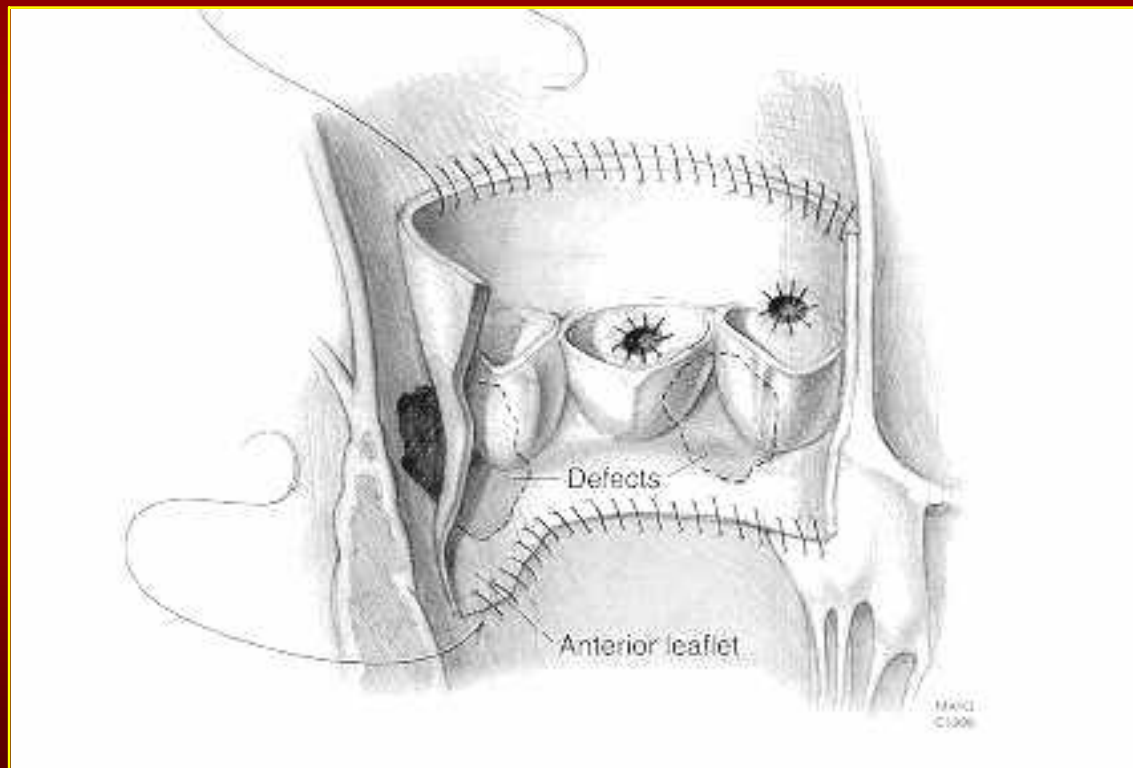
RESULTS: Hospital mortality was 18.5%. Survival at 1 and 5 years was $81\% \pm 10\%$ and $81\% \pm 10\%$ in group A and $85\% \pm 10\%$ and $85\% \pm 10\%$ in group B, respectively. No patient underwent reoperation for recurrent prosthetic aortic valve endocarditis.

CONCLUSIONS: excellent long-term results can be achieved regardless of the material used for aortic root replacement in patients with prosthetic aortic valve endocarditis.

Prosthetic Valve Endocarditis

- In prosthetic valve endocarditis, extension of the infection beyond the valve annulus occurs in 56% to 100% of patients
- Progression of periannular infection with creation of superficial endocardial defects can inflict substantial damage, and abscesses can create fistulas, resulting in intracardiac shunts or in ventriculo-aortic dehiscence.

Prosthetic Valve Endocarditis



Prosthetic Valve Endocarditis

Ann Thorac Surg 2002;74:650-659

Aortic root replacement with cryopreserved allograft for prosthetic valve endocarditis

**Joseph F. Sabik, Bruce W. Lytle, Eugene H. Blackstone, Antonino
G.M. Marullo, Gosta B. Pettersson, Delos M. Cosgrove**

Prosthetic Valve Endocarditis

Methods. From 1988 through 2000, 103 patients with aortic PVE underwent root replacement with a cryopreserved aortic allograft. Abscesses were present in 78%, and aorto-ventricular discontinuity in 40%. Among the 92 patients with positive cultures, 52 had staphylococcal organisms, 20 had streptococcal, 6 had fungal, 4 had gram-negative, and 6 had enterococcal organisms. Mean follow-up was 4.3 ± 2.9 years.

Results. Hospital mortality was 3.9%. Permanent pacemakers were required in 31 patients. Survival at 1 year, 2 years, 5 years, and 10 years was 90%, 86%, 73%, and 56%. Four patients underwent reoperation for recurrent PVE of the allograft (95% freedom from recurrent PVE at 2 years).

Conclusions. A strategy of radical debridement and aortic root replacement with a cryopreserved aortic allograft for aortic PVE is safe, effective, and recommended.

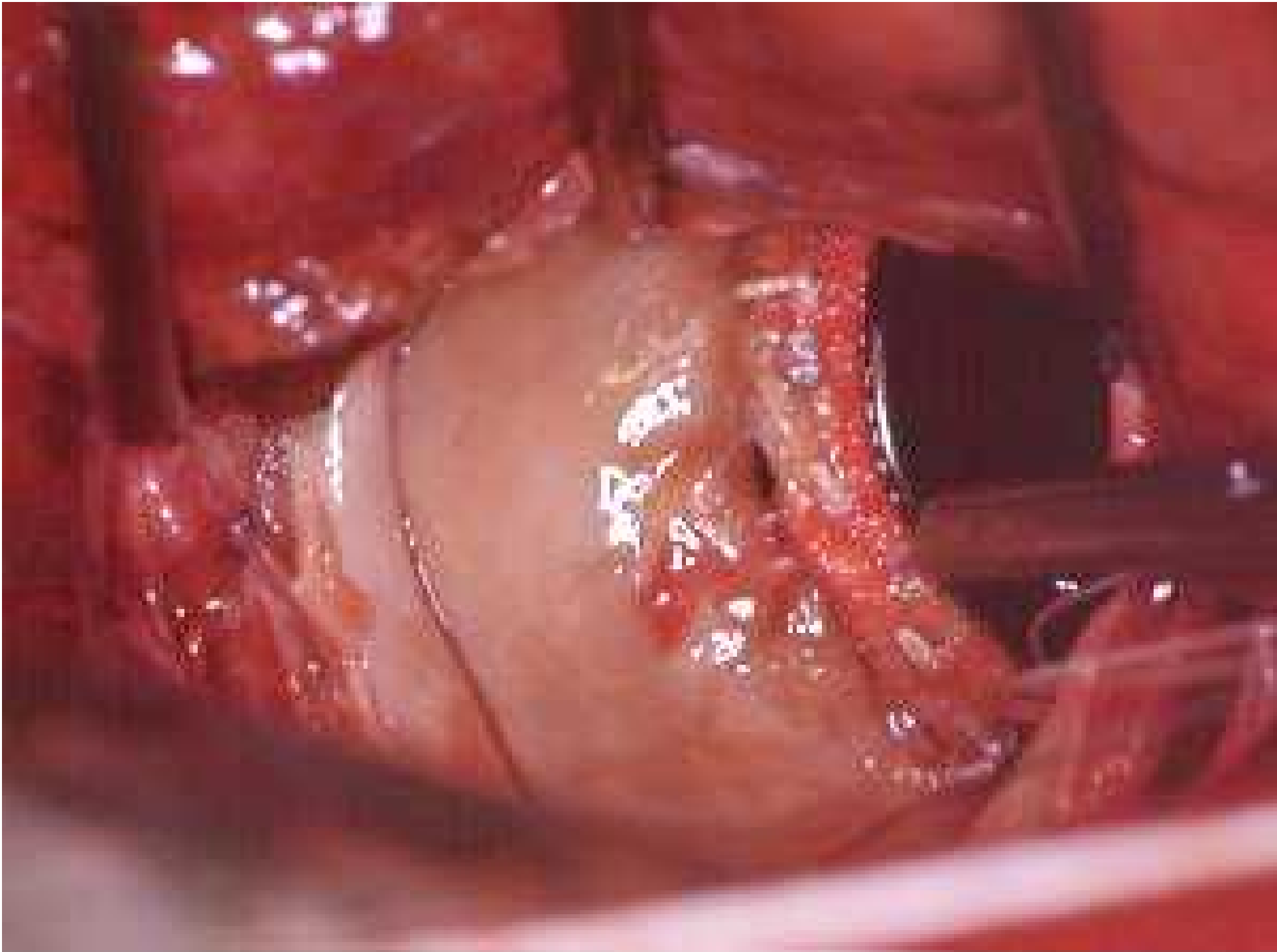
Prosthetic Valve Endocarditis

General Principles

- Removal of the infected prosthesis from the infected site
- Complete excision of necrotic tissue and debridement of nonviable tissues
- Adequate antibiotic coverage.

Prosthetic Valve Endocarditis

WHAT WE DO

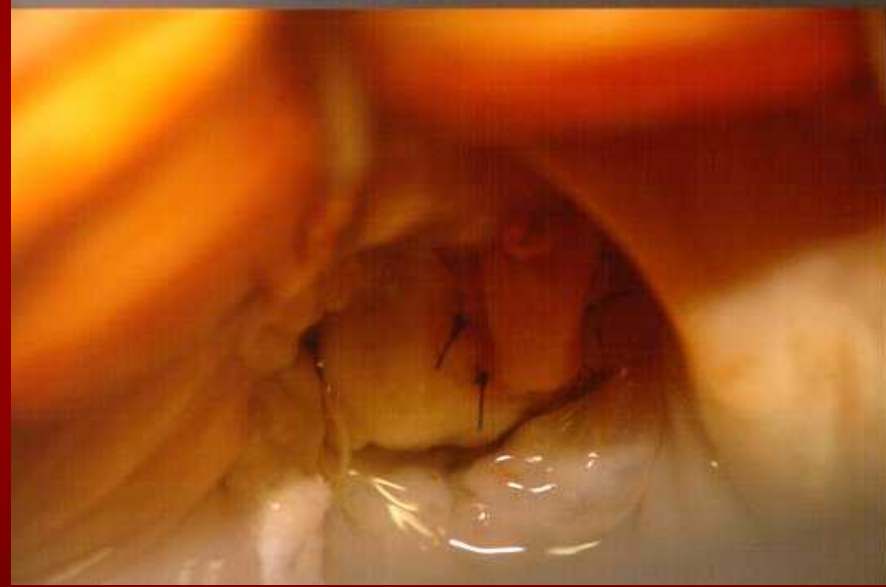


Prosthetic Valve Endocarditis

General Principles

- Surgery may be delayed in many cases, to attempt sterilization/control of the infection
- Most abscesses are “clean”
- Replacement by a homograft does not require “extensive” debridement
- Repair of the mitral valve may be possible

Prosthetic Valve Endocarditis



Prosthetic Valve Endocarditis

Coimbra

Demographic data

Period		1995-2004
N° patients		35
Age (yrs)	mean	50.9±13.4
	limits	26-71
Pathology	early PVE	4 (11.4%)
	late PVE	31 (88.6%)
Surgery	elective	27 (77.1%)
	urgent/emerg	8 (22.9%)

Prosthetic Valve Endocarditis

Coimbra

Results

Early mortality	2 (5.7%)
cardiac, 1	
n/ cardiac, 1	
Inotropes (>24h)	5 (14.3%)
IABP	1 (2.9%)
A-V block	3 (8.6%)
Reop (haemorrhage)	2 (5.7%)
ARF	5 (14.3%)
Recurrent PVE	0

Prosthetic Valve Endocarditis

Ann Thorac Surg 2001;72:39-43

Recurrent infective endocarditis: a multivariate analysis of 21 years of experience

Attilio Renzulli, Antonio Carozza, GianPaolo Romano, Marisa De Feo, Alessandro Della Corte, Rosario Gregorio, Maurizio Cotrufo

Prosthetic Valve Endocarditis

- *Methods.* Between January 1979 and May 2000, 308 consecutive valve replacement procedures for infective endocarditis
- *Results.* Recurrent endocarditis developed in 58 cases (22.5%). Variables predicting recurrence were prosthetic endocarditis ($p = 0.00001$), positive valve culture ($p = 0.0039$), and persistence of fever at the seventh postoperative day ($p = 0.000001$).
- *Conclusions.* Correct protocols of antibiotic therapy guided by microbiology may reduce the incidence of recurrent endocarditis to allow for surgery on sterile tissues and to prevent prosthetic infection.

Conclusion:

**the presence of an
active infection
is not
an indication to
immediate surgery**

Prosthetic Valve Endocarditis

ABSOLUTE INDICATIONS

for immediate surgery

- Heart failure refractory to medical therapy
- Impossibility to control infection
- Infection by
 - fungus with bulky vegetations
 - Gram -
- Signs of extension - A-V block
- Extra-cardiac complications (?)

Prosthetic Valve Endocarditis

IF NO HEART FAILURE

- No justification for immediate surgery
- Residual prosthetic dysfunction will be assessed after cure of the infection
- If necessary, surgery can be performed on an elective basis
- If infection is controlled, surgery may not be required at all

Prosthetic Valve Endocarditis

Case history

- MVR – SJM 27mm
- Ao clamp 62

• Patient died on 8th postop day,
with uncontrollable sepsis

- Hb 10.5, WBC 15,500; Creat 3.8
- Resected 36h. Low CO, High dose
Phenylephrine

DO PATIENTS WITH
PROSTHETIC VALVE
ENDOCARDITIS
BENEFIT FROM EARLY
SURGERY ?

Sometimes they do !

BUT

Not always !

Prosthetic Valve Endocarditis



Let me make it quite clear:

**I am not afraid
to operate on a patient with
active prosthetic valve
endocarditis!**

Prosthetic Valve Endocarditis

HOWEVER...

(Conclusion)

- There is usually nothing to loose by waiting
- Treat CHF aggressively. If it persists, operate
- Monitor patient closely and reconsider options, if warranted
- If medical therapy successful, consider elective surgery later
- Use homograft in all cases

Prosthetic Valve Endocarditis

Ann Thorac Surg 2005;80:1151-1158

Review

Prosthetic Valve Endocarditis

Balakrishnan Mahesh, Gianni Angelini, Massimo Caputo, Xu Yu Jin, Alan Bryan,

Cardiothoracic Center, Bristol Royal Infirmary, Bristol
Cardiothoracic Center, John Radcliffe Hospital, Oxford
Heart Science Center, Harefield Hospital, Middlesex,
United Kingdom

Prosthetic Valve Endocarditis

- Broad-spectrum antibiotics started on suspicion of PVE, tailored subsequently to suit the sensitivity of the organisms, constitute the first line of treatment, and may reduce systemic embolization by shrinking existing vegetations and preventing formation of new ones
- In cases of culture negative, presumed bacterial endocarditis, broad-spectrum antibiotics need to be continued for 6 weeks

Prosthetic Valve Endocarditis



Thank you

Prosthetic Valve Endocarditis

Ann Thorac Surg 2002;74:S1754-S1757

Reoperative cryopreserved root and ascending aorta replacement for acute aortic prosthetic valve endocarditis

Bruce W. Lytle, Joseph F. Sabik, Eugene H. Blackstone, Lars G. Svensson, Gosta B. Pettersson, Delos M. Cosgrove

Prosthetic Valve Endocarditis

METHODS: From 1988 - 2000, 27 patients with aortic valve PVE after previous ascending aortic replacement (aortic root replacement in 13, aortic valve replacement with a supracoronary graft in 14) underwent reoperation for aortic root replacement with a cryopreserved aortic allograft and prolonged intravenous antibiotic therapy.

RESULTS: One patient (3.7%) died in-hospital....survival at 1, 2, 5, and 7.5 years was 92%, 88%, 70%, and 56%, respectively. One patient underwent reoperation for recurrent PVE 8 months after operation.

CONCLUSIONS: Radical debridement of infected prosthetic material and tissue, and allograft aortic root and ascending aorta replacement appears to achieve a low hospital mortality and a high degree of freedom from recurrent infection

Prosthetic Valve Endocarditis

Antibiotic regime for streptococcal and enterococcal PVE

Microorganism	Standard regimen*
<i>S viridans</i> sensitive to penicillin, <i>S bovis</i> , Other streptococci with penicillin CMI < 0.1 mg/l	Penicillin G 2 million units iv/4 h x 6 weeks + Gentamicin 1mg/Kg/8h iv x 2 weeks
Streptococci with intermediate sensitivity to penicillin (CMI between 0.1-0.5 mg/l)	Penicillin G 3 million units iv/4h x 6 weeks + Gentamicin 1g/Kg/8h iv x 4 weeks
<i>Streptococcus spp</i> with CMI > 0.5 mg/l, <i>Enterococcus spp</i> , <i>Abiotrophia spp</i>	Penicillin 4 million units /4h iv x 6 weeks or ampicillin 2g/4h iv x 6 weeks + Gentamicin 1 mg/Kg/8h iv x 6 weeks

Prosthetic Valve Endocarditis

Antibiotic regime for staphylococcal PVE

Microorganism	Standard regimen
Methicillin sensitive	Cloxacillin 2g/4h iv x 6 weeks + Rifampicin 300 mg/8h iv x 6 weeks + Gentamicin 1mg/Kg/8h iv x 2 weeks
Methicillin resistant (MRSA)	Vancomycin 15 mg/Kg/12 h iv x 6 weeks + Rifampicin 300 mg/8h vo x 6 weeks + Gentamicin 1mg/Kg/8h iv x 2 weeks