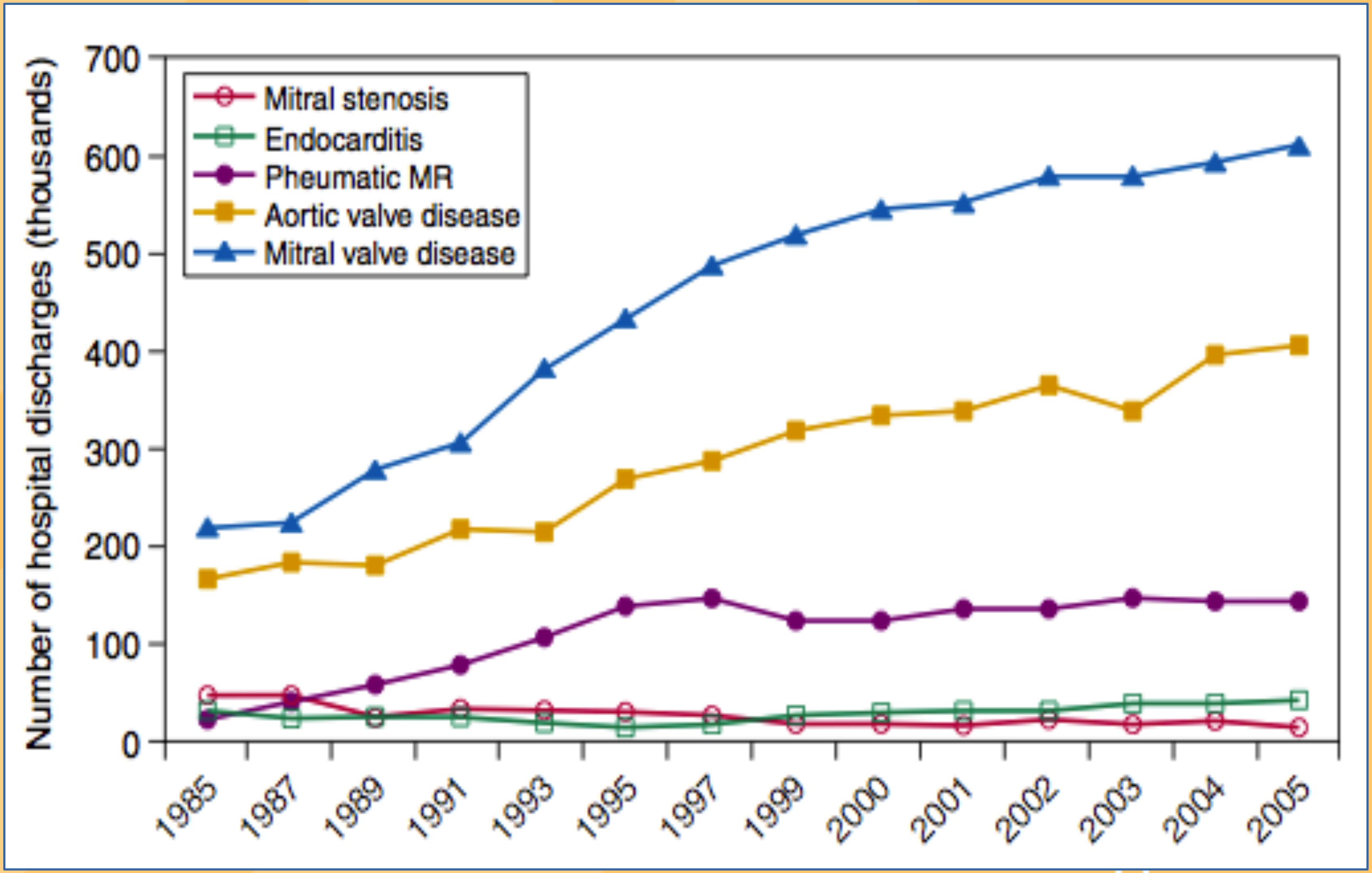
La sostituzione valvolare aortica con minitoracotomia. Indicazioni e tecnica.

I vantaggi di evitare la sternotomia controbilanciano le difficoltà tecniche e le complicazioni che talora si presentano col miniapproccio?

dr. Marco Solinas
Direttore UOC Cardiochirurgia
Ospedale del Cuore – Fondazione Toscana “G. Monasterio”
Massa

EcoCardioChirurgia®
Eco-RM-TC Chirurgia-Interventistica

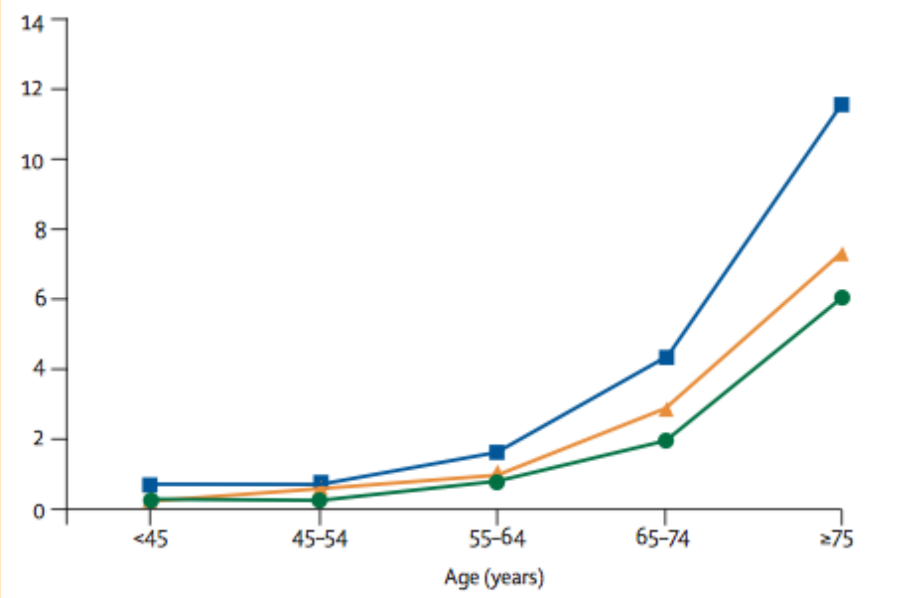
CURRENT TRENDS IN VALVULAR HEART

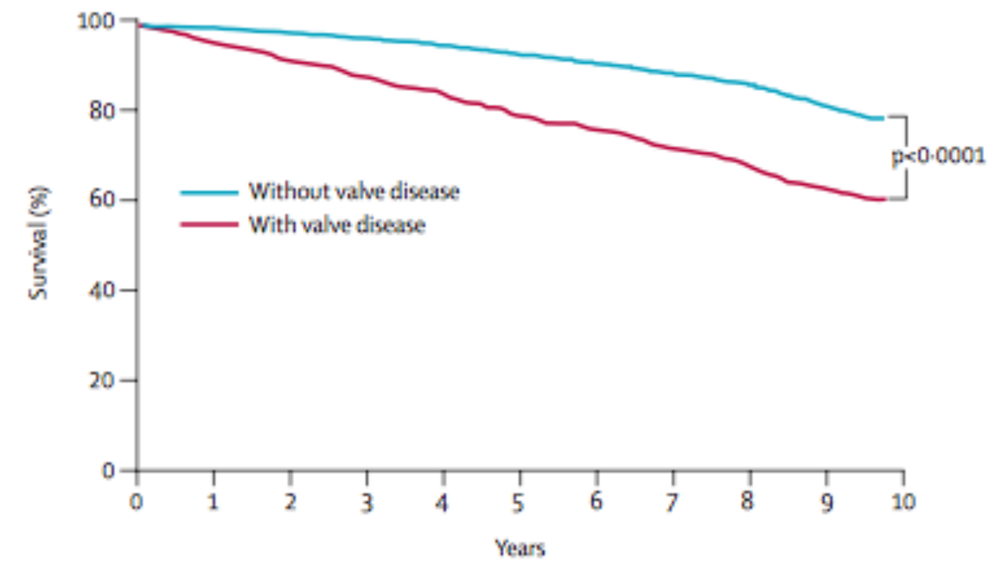


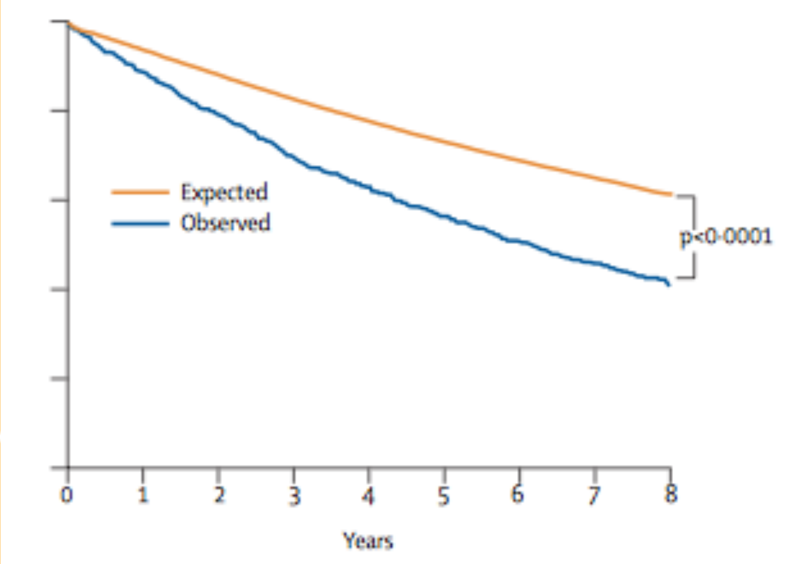
National Center for Health Statistics: National Hospital Discharge Survey

Burden of valvular heart diseases: a population-based study

Vuyisile T Nkomo, Julius M Gardin, Thomas N Skelton, John S Gottdiener, Christopher G Scott, Maurice Enriquez-Sarano

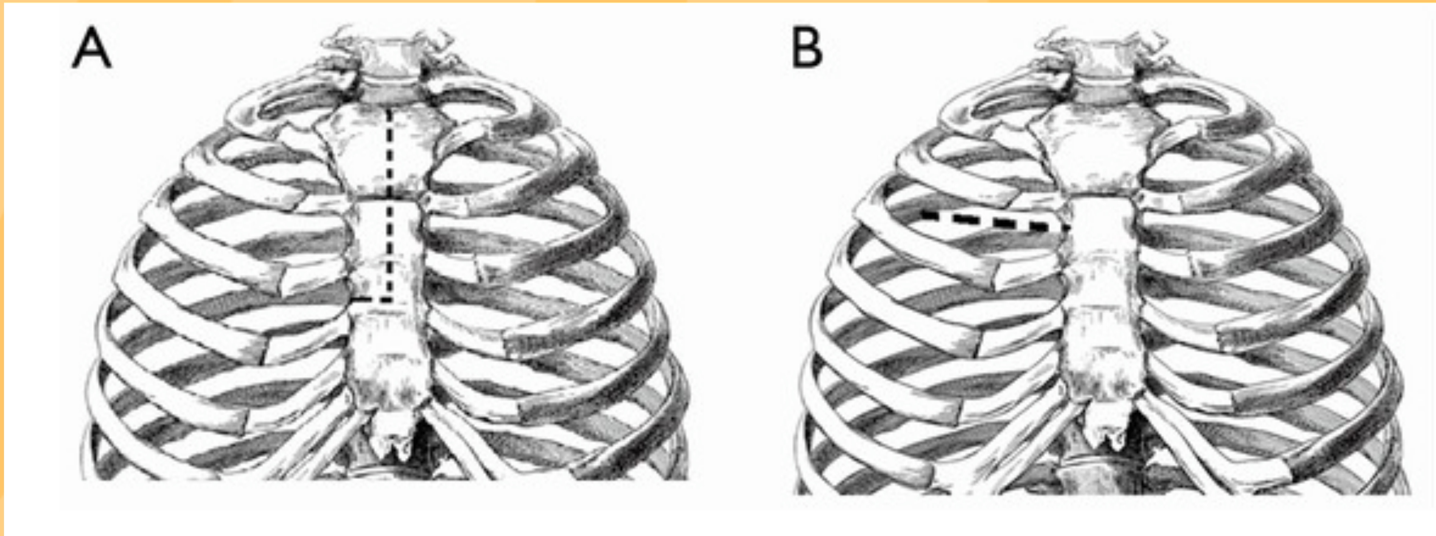


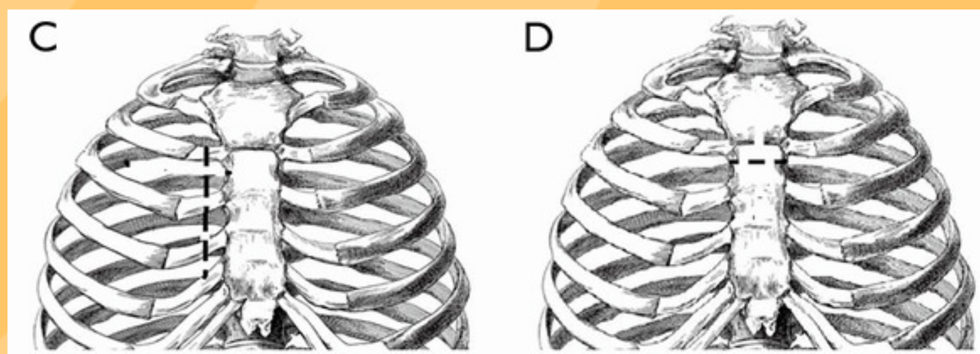




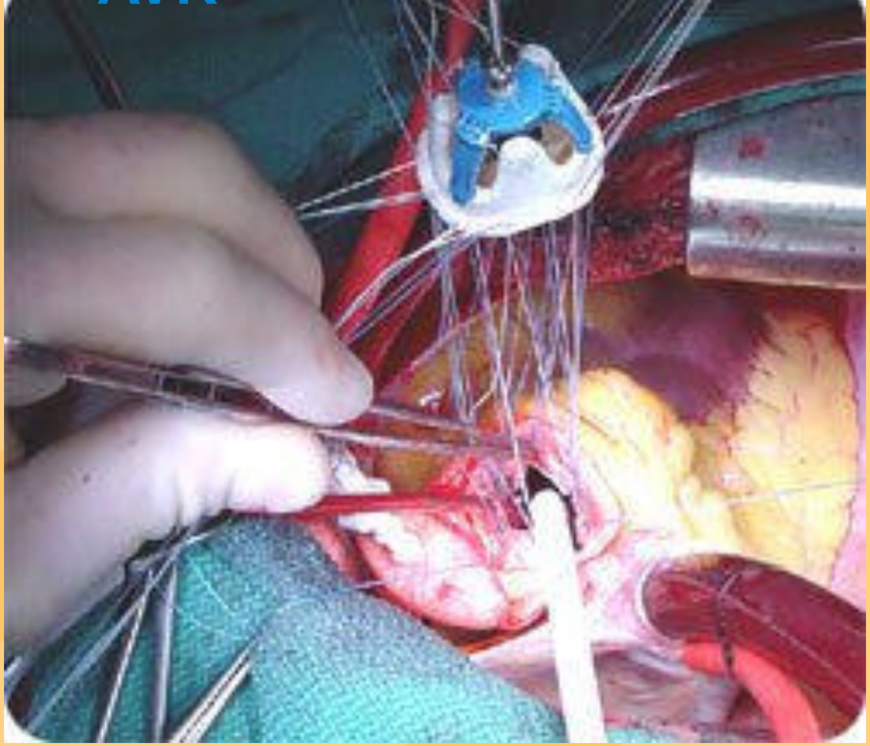
Nkomo et al. Lancet 2006

MINIMALLY INVASIVE APPROACHES TO THE AORTIC VALVE

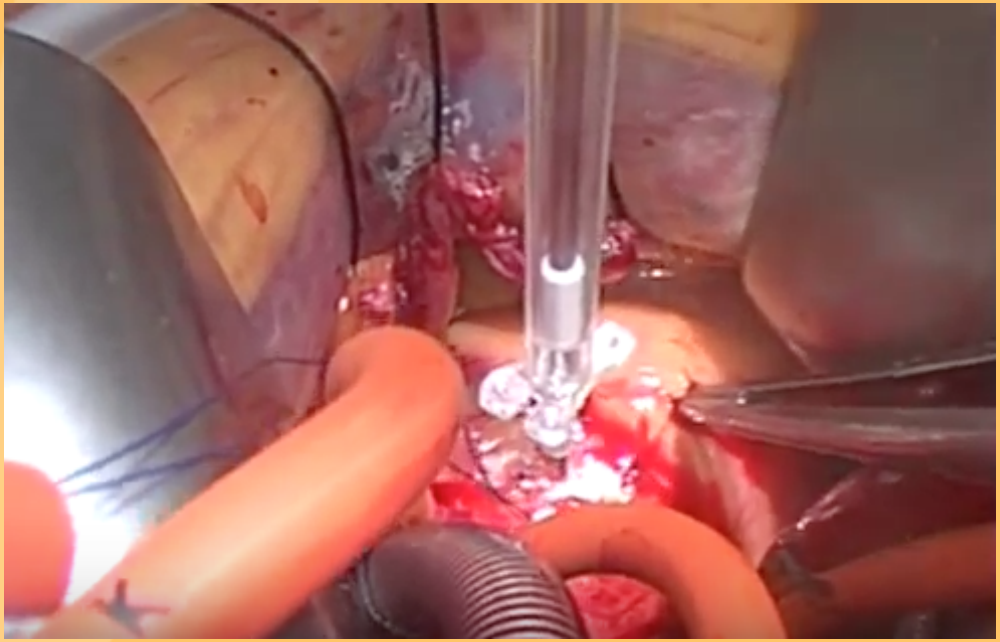




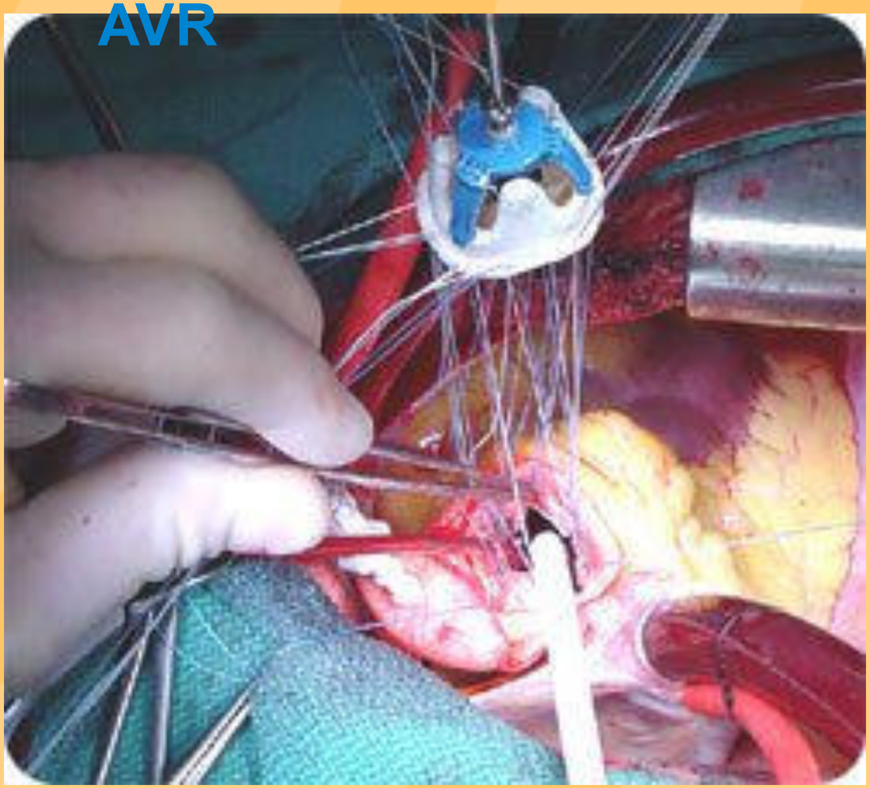
FULL STERNOTOMY
AVR



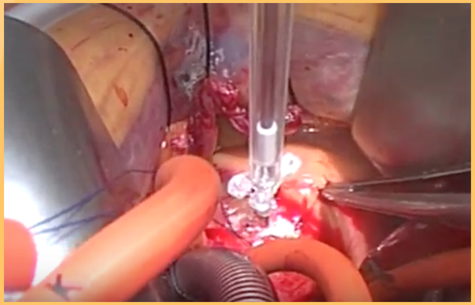
MIVS
AVR



FULL STERNOTOMY AVR

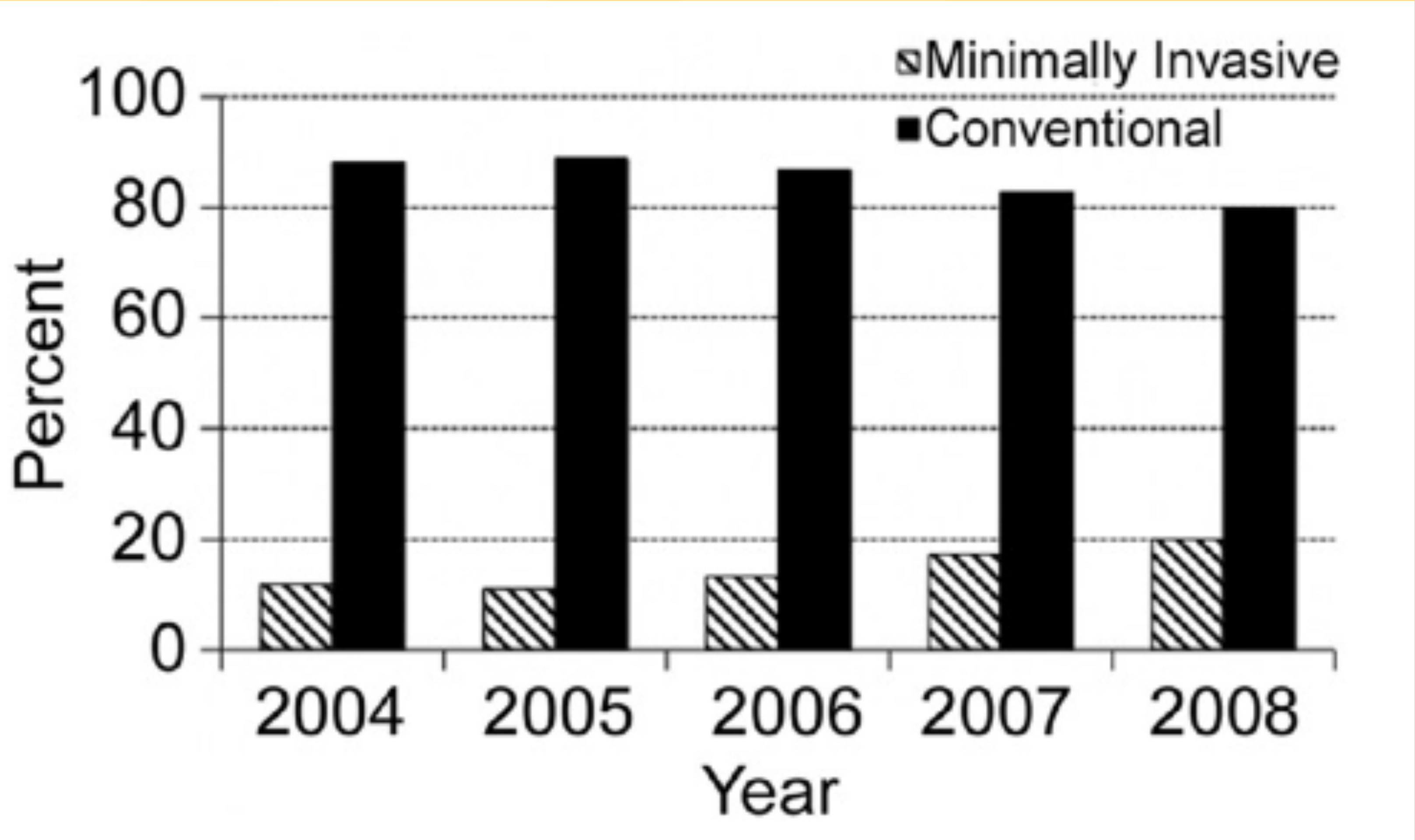


MIVS AVR



This field is 10 times smaller Than Full Sternotomy

Minimally Invasive Cardiac Operations – Trends from STS database



Gammie et al. Ann Thorac Surg 2010

Law of Conservation of Pain
(As applied to Minimally Invasive Surgery)

Pain is neither created or destroyed, it is Transferred from the *Patient* to the *Surgeon*

Michael Argenziano, M.D.

CHALLENGES IN MIAVR

- **Technically complex**
  - Decreased visualization
  - Narrow Space

- **Longer learning curve**
- **Longer Cross-Clamping time**
- **Longer Cardiopulmonary bypass time**

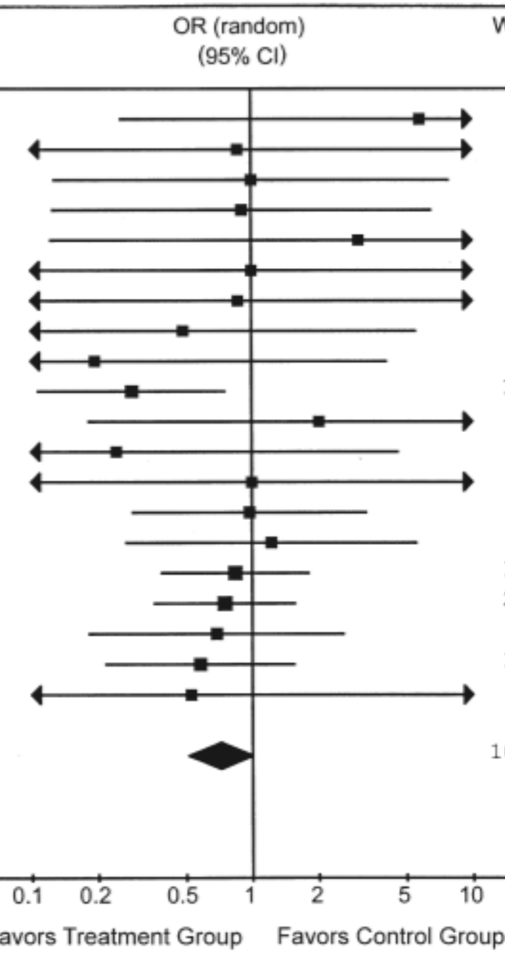
Minimal Access Aortic Valve Replacement: Is It Worth It?

Study or Subcategory	MAG (n/N)	CG (n/N)	Weight (%)	OR (random) (95% CI)
Bridgewater et al[28]	2/14	0/14	1.14	5.80 (0.25 - 132.56)
Frazier et al[14]	1/16	1/14	1.35	0.87 (0.05 - 15.28)
Aris et al[3]	2/20	2/20	2.61	1.00 (0.13 - 7.89)
Liu et al[12]	2/86	2/78	2.83	0.90 (0.12 - 6.58)
Machler et al[5]	1/60	0/60	1.07	3.05 (0.12 - 76.39)
Szwerc et al[17]	1/50	1/50	1.42	1.00 (0.06 - 16.44)
Lee et al[10]	1/46	1/40	1.42	0.87 (0.05 - 14.32)
Bonacci et al[4]	1/40	2/40	1.87	0.49 (0.04 - 5.60)
Detter et al[21]	0/70	2/70	1.19	0.19 (0.01 - 4.12)
Doll et al[9]	5/176	24/258	11.52	0.29 (0.11 - 0.76)
Masiello et al[13]	2/100	1/100	1.91	2.02 (0.18 - 22.65)
Corbi et al[18]	0/30	4/70	1.28	0.24 (0.01 - 4.64)
Farhat et al[24]	1/50	1/50	1.42	1.00 (0.06 - 16.44)
Stamou et al[26]	3/56	25/455	7.35	0.97 (0.28 - 3.33)
De Smet et al[23]	4/100	3/91	4.79	1.22 (0.27 - 5.61)
Mihaljevic et al[25]	12/526	14/516	18.28	0.84 (0.38 - 1.83)
Sharony et al[16]	13/233	17/233	20.02	0.75 (0.36 - 1.58)
Vanoverbeke et al[8]	5/174	4/97	6.22	0.69 (0.18 - 2.62)
Bakir et al[7]	6/232	12/274	11.23	0.58 (0.21 - 1.57)
Leshnower et al[27]	0/22	1/36	1.06	0.53 (0.02 - 13.48)
Total (95% CI)	2101	2566	100.00	0.72 (0.51 - 1.00)

Total events: 62 MAG, 117 CG

Test for heterogeneity: $\chi^2 = 9.30$; $df = 19$; $p = 0.97$; $I^2 = 0$

Test for overall effect: $Z = 1.94$; $p = 0.05$



Murtuza B et al Ann Thorac Surg 2008;83:1121-31

A typical MiAVR report...

Ministernotomy versus conventional sternotomy for aortic valve replacement: matched propensity score analysis of 808 patients[†]

Nobuyuki Furukawa[a,c,*], Oliver Kuss[b,c], Anas Aboud[a], Michael Schönbrodt[a], Andre Renner[a], Kavous Hakim Meibodi[a], Tobias Becker[a], Amin Zittermann[a], Jan F. Gummert[a] and Jochen Börgermann[a]

July 2009–July 2012: 984 patients isolated AVR

Conventional AVR 548 patients (55.7%)

Hemisternotomy AVR 436 (44.3%)

Propensity matched = 404 patients each group

Furukawa N, et al. Eur J Cardiothorac Surg. 2014;46:221–6

Ministernotomy versus conventional sternotomy for aortic valve replacement: matched propensity score analysis of 808 patients[†]

Nobuyuki Furukawa*, Oliver Kuss, Anas Aboud, Michael Schönbrodt, Andre Renner, Kavous Hakim Meibodi, Tobias Becker, Amin Zittermann, Jan F. Gummert and Jochen Börgermann

Variable	All patients (n = 984)		
	MIC (n = 436)	Sternotomy (n = 548)	z-difference
Age [years] (SD)	68 (12)	70 (11)	3.22
Female gender (%)	42	48	1.89
BMI [kg/m^2] (SD)	27 (5)	28 (5)	3.50
LVEF (%) (SD)	60 (10)	58 (12)	−3.36
Hypertension (%)	67	75	−2.91
Diabetes mellitus (%)	17	23	−2.63
COPD (%)	7	12	−2.53
Renal insufficiency (%)	1	2	−1.63
Stroke (%)	2	2	−0.67
PAOD (%)	3	6	−1.76
CVD (%)	4	4	0.71
At least one previous cardiac surgery (%)	0	1	−1.73
NYHA class (%)			
I	13	8	−3.29
II	41	38	
III	44	49	
IV	2	5	
EuroSCORE (%) (SD)	6 (5)	9 (10)	7.10
German aortic valve score (SD)	2 (2)	3 (4)	4.73

Furukawa N, et al. Eur J Cardiothorac Surg. 2014;46:221–6

Ministernotomy versus conventional sternotomy for aortic valve replacement: matched propensity score analysis of 808 patients†

Nobuyuki Furukawa[a,*], Oliver Kuss[b,c], Anas Aboud[a], Michael Schönbrodt[a], Andre Renner[a], Kavous Hakim Meibodi[a], Tobias Becker[a], Amin Zittermann[a], Jan F. Gummert[a] and Jochen Börgermann[a]

Table 2: Primary end points, categorical and continuous outcomes in the propensity score-matched sample and after multivariate adjustment for the propensity score

Categorical outcomes	Propensity score-matched sample (*n* = 808)				Multivariate adjustment for the propensity score (*n* = 984)	
	MIC (*n* = 404)	Sternotomy (*n* = 404)	OR [95% CI]	*P*-value	OR [95% CI]	*P*-value
Mortality [*n* (%)]	4 (1)	4 (1)	1.00 [0.25–4.00]	1.00	1.07 [0.29–3.97]	0.92
Stroke [*n* (%)]	4 (1)	5 (1)	0.80 [0.22–2.98]	0.74	0.74 [0.21–2.57]	0.64
Mortality or stroke [*n* (%)]	8 (2)	9 (2)	0.89 [0.34–2.30]	0.81	0.89 [0.36–2.21]	0.80
Perioperative myocardial infarction [*n* (%)]	2 (0)	1 (0)	2.00 [0.18–22.06]	0.57	3.16 [0.24–42.3]	0.39
LOS [*n* (%)]	9 (2)	10 (3)	0.90 [0.37–2.22]	0.82	0.91 [0.39–2.15]	0.83
Postoperative IABP [*n* (%)]	5 (1)	5 (1)	1.00 [0.29–3.45]	1.00	1.17 [0.35–3.89]	0.80
New-onset dialysis [*n* (%)]	11 (3)	9 (2)	1.25 [0.49–3.17]	0.17	0.89 [0.41–1.93]	0.77
Re-exploration for bleeding [*n* (%)]	23 (6)	26 (6)	0.88 [0.50–1.56]	0.66	0.84 [0.48–1.47]	0.55
Operative time [min] (SD)	162 (33)	155 (34)	6.2 [1.6–10.8]	0.0083	5.8 [1.3–10.4]	0.012
Cross-clamp time [min] (SD)	59 (14)	54 (17)	4.1 [2.0–6.2]	0.00020	4.3 [2.2–6.5]	0.000069
CPB time [min] (SD)	79 (20)	80 (24)	−0.5 [−3.5–2.6]	0.769	0.0 [−3.0–3.0]	0.99
Duration of artificial ventilation [h] (SD)	17 (67)	19 (80)	−1.8 [−12.0–8.4]	0.73	0.1 [−10.8–10.9]	0.99
Duration of hospitalization [day] (SD)	14 (7.3)	14 (6)	−0.1 [−1.1–0.8]	0.77	−0.2 [−1.2–0.9]	0.77
Valve size [mm] (SD)	24 (2)	23 (2)	0.4 [0.1–0.6]	0.0054	0.4 [0.1–0.6]	0.0061

MD: mean difference; OR: odds ratio; CPB: cardiopulmonary bypass; LOS: low-output syndrome; IABP: intra-aortic balloon pump; MIC: minimally invasive approach.

Furukawa N, et al. Eur J Cardiothorac Surg. 2014;46:221–6

Minimal invasive aortic valve replacement surgery is associated with improved survival: a propensity-matched comparison[†]

Denis R. Merk[a,*], Sven Lehmann[a,*], David M. Holzhey[a], Pascal Dohmen[a], Pascal Candolfi[b], Martin Misfeld[a], Friedrich W. Mohr[a] and Michael A. Borger[a,*]

- 2,051 consecutive patients 2003-2012
- Isolated bioprosthetic AVR (479 MIS, 1572 FS)
- Propensity matched: 477 MIS, 477 FS
- Mean age 67.8 ± 11.2 vs 70.4 ± 9.4 years
- LES both groups 6.6%

Merk DR, et al. Eur J Cardiothorac Surg. 2015;47:11–7

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<u>XC significantly longer MIS:</u>
59.4 ± 16.0 vs 56.9 ± 14.6 mins

<u>CPB: no difference (p=0.641)</u>
82.2 ± 21.7 vs 81.0 ± 19.9 mins

<u>Operative time: MIS longer (p<0.001)</u>
156.3 ± 33.4 vs 145.1 ± 30.5 mins

<u>MIS better outcomes in:</u>

Mortality: **0.4**% vs 2.3% (p=0.013)

IABP insertion: **0.4**% vs 2.1(p=0.021)

FS better outcomes in:

- Less transfusion
- Less re-exploration
- Less post op delirium

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MIS better survival at:

5 years – 89.3 ± 2.4% vs 81.8 ± 2.2%

8 years – 77.7 ± 4.7% vs 72.8 ± 3.1%

Merk DR, et al. Eur J Cardiothorac Surg. 2015;47:11–7

A Meta-Analysis of Minimally Invasive Versus Conventional Sternotomy for Aortic Valve Replacement

Kevin Phan, BS(Adv), Ashleigh Xie, Marco Di Eusanio, MD, PhD, and Tristan D. Yan, MBBS, PhD

The Collaborative Research (CORE) Group, Macquarie University, Sydney, New South Wales, Australia; Cardiovascular Surgery Department, Sant'Orsola-Malpighi Hospital, Bologna University, Bologna, Italy; and Department of Cardiothoracic Surgery, Royal Prince Alfred Hospital, Sydney Medical School, University of Sydney, Sydney, New South Wales, Australia

Records identified: 959 studies
After screening/duplicates: 50 studies
Study era: 1998-2013

Incisions included

J, L, T mini-sternotomy/UHS
Anterior right thoracotomy (ART)
Parasternal thoracotomy
Port access AVR

Total patient number: 12,786

FS AVR 7624 patients (60%)
MIAVR 5162 patients (40%)

Phan et al. Ann Thorac Surg 2014;98:1499–511

Phan et al. - Meta-analysis Mini AVR

MIAVR FS AVR	
Neurology/CVA	*No difference*
Respiratory failure	*No difference*
Reoperation for bleeding	*No difference*
Atrial fibrillation	*No difference*
Pacemaker	*No difference*
Sternal infection	*No difference*

	MISAVR vs. FS AVR	p Value
X Clamp time	*MIAVR: +8.09 mins*	*0.00001*
CPB time	*MIAVR: +8.16 mins*	*0.00001*
Operation time	*MIAVR: +8.97 mins*	*0.00001*

Phan et al. Ann Thorac Surg 2014;98:1499–511

Phan et al. - Meta-analysis Mini AVR

	MIAVR	FS AVR	RR/WMD	p Value
Mortality	*1.9%*	*3.3%*	*0.74*	*0.02*
Renal failure	*2.5%*	*4.2%*	*0.72*	*0.04*
Transfusion	*36.0%*	*52.4%*	*0.77*	*0.001*
Intubation	*MIAVR: – 4.05 hours (–5.87 to –2.23)*	*0.0001*		
ITU stay	*MIAVR: – 0.60 days (–0.95 to –0.25)*	*0.0007*		
Hospital stay	*MIAVR: – 1.34 days (–1.73 to –0.95)*	*0.00001*		
Pain score	*MIAVR: – 0.87 (–1.43 to –0.31)*	*0.002*		

Phan et al. Ann Thorac Surg 2014;98:1499–511

Reoperative aortic valve replacement in the octogenarians—minimally invasive technique in the era of transcatheter valve replacement

Tsuyoshi Kaneko, MD, Dan Loberman, MD, Igor Gosev, MD, Fadi Rassam, BS, Siobhan McGurk, BS, Marzia Leacche, MD, and Lawrence Cohn, MD

TABLE 1. Preoperative patient characteristics

Characteristic	Re-AVR at >80 y (n = 105)	Full sternotomy (n = 54)	Minimally invasive (n = 51)	*P* value
Age (y)	82.8 ± 3.8	82.4 ± 4.6	83.3 ± 2.7	≤.270
Female gender	40.0 (42)	50.0 (27)	29.4 (15)	≤.046
Diabetes	33.3 (35)	20.4 (11)	31.4 (16)	≤.264
Hypercholesterolemia	84.8 (89)	87.0 (47)	82.4 (42)	≤.592
Hypertension	83.8 (88)	81.5 (44)	86.3 (44)	≤.600
Renal failure	4.8 (5)	7.4 (4)	2.0 (1)	≤.364
Preoperative creatinine	1.2 ± 0.4	1.3 ± 0.5	1.2 ± 0.3	≤.510
Preoperative hematocrit (%)	36.2 ± 4.0	36.3 ± 4.3	36.0 ± 3.9	≤.768
CVA	10.5 (11)	11.1 (6)	9.8 (5)	≤1.000
NYHA class III-IV	62.9 (66)	63.0 (34)	62.7 (32)	≤1.000
Ejection fraction (%)	55.0 (50-60)	57.0 (55-65)	55.0 (50-60)	≤.701
Previous CABG	85.7 (90)	79.6 (43)	92.2 (47)	≤.094
Previous valve surgery	26.7 (28)	27.8 (15)	25.5 (13)	≤.828

Data presented as mean ± standard deviation, n (%), or median (interquartile range). *Re-AVR*, Reoperative aortic valve replacement; *CVA*, cerebrovascular accident; *NYHA*, New York Heart Association; *CABG*, coronary artery bypass grafting.

Kaneko T, et al. J Thorac Cardiovasc Surg. 2014;147:155–62

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Tsuyoshi Kaneko, MD, Dan Loberman, MD, Igor Gosev, MD, Fadi Rassam, BS, Siobhan McGurk, BS, Marzia Leacche, MD, and Lawrence Cohn, MD

Characteristic	Re-AVR at >80 y (n = 105)	Full sternotomy (n = 54)	Minimally invasive (n = 51)	P value
Etiology				
Stenosis	81.9 (86)	85.2 (46)	78.4 (40)	≤.450
Insufficiency	6.7 (7)	7.4 (4)	5.9 (3)	≤1.000
Stenosis and insufficiency	11.4 (12)	7.4 (4)	15.7 (8)	≤.223
Cannulation strategy				
Aorta directly	31.4 (33)	50 (27)	11.8 (6)	≤.001
Axillary artery	48.6 (51)	31.5 (17)	66.6 (34)	≤.001
Femoral artery	20.0 (21)	18.5 (10)	21.6 (11)	≤.809
Direct RA cannulation	18.1 (19)	29.6 (16)	5.9 (3)	≤.002
Femoral vein	81.9 (86)	70.4 (38)	94.1 (48)	≤.002
CP strategy				
Antegrade CP	46.7 (49)	22.2 (12)	72.5 (37)	≤.001
Antegrade and retrograde CP	53.3 (56)	77.8 (42)	27.4 (14)	≤.001
Perfusion time (min)	139 (116-167)	142 (115-165)	139 (125-180)	≤.936
Crossclamp time (min)	73 (61-94)	75 (63-93)	73 (62-92)	≤.240
Transfused in OR	62.9 (66)	70.4 (38)	54.9 (28)	≤.111
PRBC units per patient	3 (2-4)	3 (2-4)	2 (2-3)	≤.321

Data presented as n (%) or median (interquartile range). *Re-AVR*, Reoperative aortic valve replacement; *RA*, right atrial; *CP*, cardioplegia; *OR*, operating room; *PRBC*, packed red blood cell.

Kaneko T, et al. J Thorac Cardiovasc Surg. 2014;147:155–62

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Outcome	Re-AVR at >80 y (n = 105)	Full sternotomy (n = 54)	Minimally invasive (n = 51)	*P* value
Reoperation for bleeding	5.7 (6)	3.7 (2)	7.8 (4)	≤.428
Permanent stroke	3.8 (4)	1.9 (1)	5.9 (3)	≤.354
New-onset renal failure	3.8 (4)	7.4 (4)	0.0 (0)	≤.118
New-onset AF	21.0 (22)	28.7 (15)	15.7 (8)	≤.161
HIT	3.8 (4)	3.7 (2)	3.9 (2)	≤1.000
Infectious complications	30.5 (32)	33.3 (18)	27.5 (14)	≤.533
UTI	26.7 (28)	27.8 (15)	25.5 (13)	≤.828
Pneumonia	5.7 (6)	3.7 (2)	7.8 (4)	≤.428
Postoperative endocarditis	1.0 (1)	1.9 (1)	0.0 (0)	≤1.000
Bacteremia and/or sepsis	2.0 (2)	1.9 (1)	2.0 (1)	≤1.000
Transfused postoperatively	61.0 (64)	59.3 (32)	62.7 (32)	≤.307
RBC units per patient	3.0 (2-4)	3.0 (1-4)	3.0 (2-4)	≤.233
FFP transfusion	39.0 (41)	48.1 (26)	29.8 (15)	≤.071
Platelet transfusion	38.1 (40)	40.7 (22)	35.3 (18)	≤.688
Ventilation time (h)	11.2 (7-20)	10.8 (7.1-19.8)	13.1 (7.2-22.9)	≤.617
ICU stay (h)	73.0 (42-121)	73.0 (45-121)	73.0 (33-129)	≤.860
Postoperative LOS (d)	8.0 (7-12)	8.0 (7-12)	9.0 (7-15)	≤.108
Operative mortality (%)	6.7 (7)	9.3 (5)	3.9 (2)	≤.438

Data presented as n (%) or median (interquartile range), or median (n). *Re-AVR*, Reoperative aortic valve replacement; *AF*, atrial fibrillation; *HIT*, heparin-induced thrombocytopenia; *UTI*, urinary tract infection; *RBC*, red blood cell; *FFP*, fresh frozen plasma; *ICU*, intensive care unit; *LOS*, length of stay.

Kaneko T, et al. J Thorac Cardiovasc Surg. 2014;147:155–62

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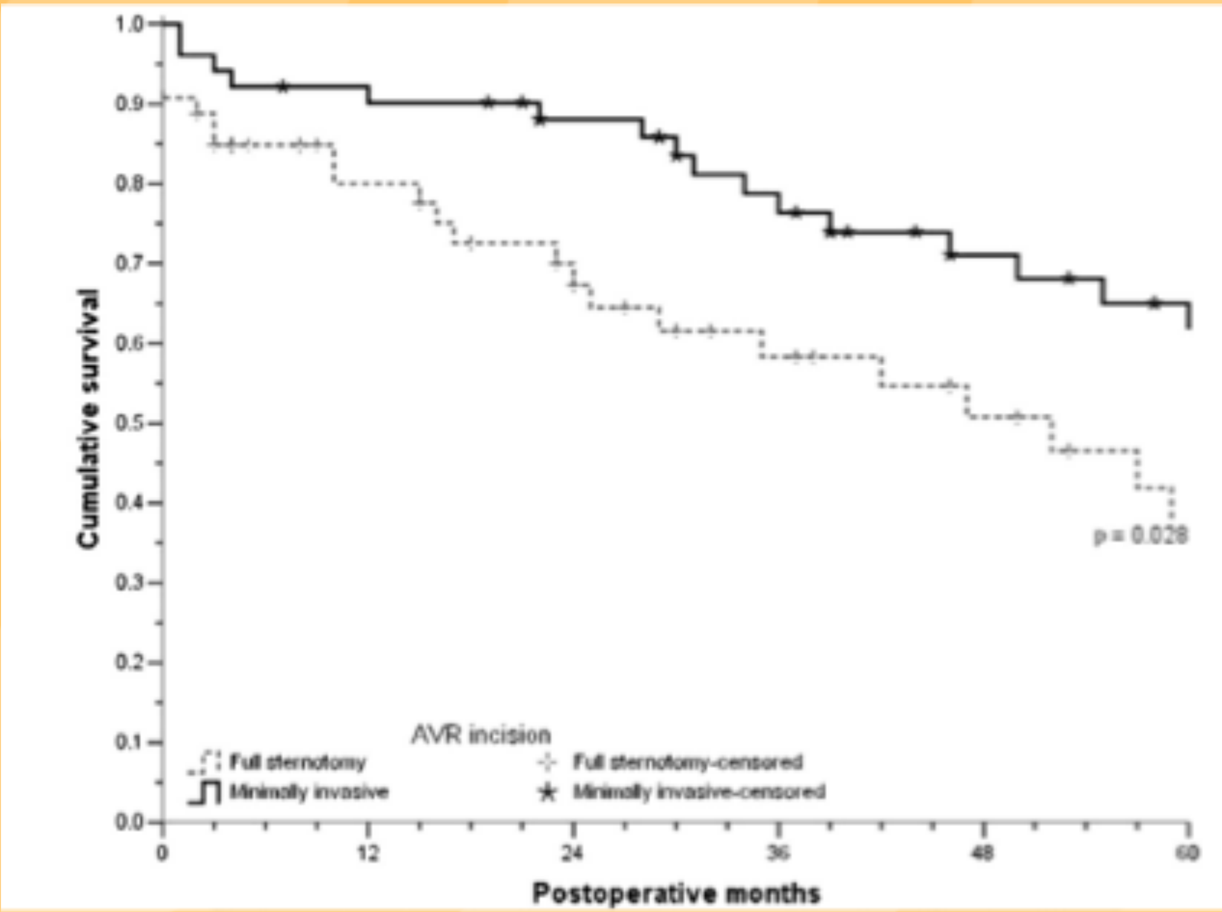

Survival		
	FS	*MIS*
1 year (p<0.05)	*79%*	*92%*
5 year (p<0.05)	*38%*	*65%*
Median survival	*52.0 months*	*81.2 months*

Kaneko T, et al. J Thorac Cardiovasc Surg. 2014;147:155–62

Outcomes of Minimally Invasive Valve Surgery Versus Standard Sternotomy in Obese Patients Undergoing Isolated Valve Surgery

Orlando Santana, MD, Javier Reyna, MD, Robert Grana, MD, Mauricio Buendia, MD, Gervasio A. Lamas, MD, and Joseph Lamelas, MD

- 160 consecutive obese patients (BMI >30)
- 2005–2010
- Compared with matched patients from the same era (full sternotomy)

Santana O et al. Ann Thorac Surg. 2011;91:406–10

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Variables	Minimally Invasive (n = 64)	Median Sternotomy (n = 96)	*p* Value
Age (mean)	69.4 ± 11	64.7 ± 11.5	0.015
Gender (males, %)	35 (54)	54 (56)	0.845
Body mass index (mean)	34.8 ± 5.3	34.9 ± 4.8	0.207
Hypertension (%)	60 (93.7)	88 (91.6)	0.624
Peripheral vascular disease (%)	5 (7.81)	16 (16.6)	0.104
Cerebrovascular accident (%)	3 (4.68)	17 (17.7)	0.015
Previous coronary intervention (%)	23 (35.9)	24 (25)	0.137
Congestive heart failure (%)	21 (32.8)	51 (53.1)	0.011
Endocarditis (%)	4 (6.25)	11 (11.4)	0.268
Ejection fraction	0.541 ± 0.125	0.501 ± 0.144	0.178
Coronary artery disease (%)	34 (53.1)	47 (48.9)	0.606
Chronic obstructive pulmonary disease (%)	26 (40.6)	34 (35.4)	0.505
Diabetes mellitus (%)	25 (39)	35 (36.5)	0.77
Preoperative creatinine (mg/dL)	1.22 ± 0.5	1.20 ± 0.7	0.895

Variables	Minimally Invasive (n = 64)	Median Sternotomy (n = 96)	*p* Value
Composite complications (%)	15 (23.4)	49 (51)	0.034
Renal failure (%)	0	6 (6.25)	0.041
Prolonged intubation (%)	12 (18.7)	33 (34.3)	0.049
Reintubation (%)	3 (4.68)	15 (15.6)	0.032
Deep wound infection (%)	0	4 (4.1)	0.098
Bleeding requiring reoperation (%)	1 (1.56)	2 (2.08)	0.812
Stroke (%)	1 (1.56)	0	0.219
In-hospital death (%)	0	8 (8.3%)	0.041
Use of blood products (PRBCs, FFP, platelets) (%)	15 (23.4)	48 (50)	0.001
Sepsis (%)	1 (1.56)	6 (6.25)	0.156
Pneumonia (%)	0	1 (1.04)	0.413
Intensive care unit readmission (%)	1 (1.56)	5 (5.20)	0.234
Hospital length of stay (days, IQR)	7.7 (5–9)	11.7 (7–15)	<0.001

Santana O et al. Ann Thorac Surg. 2011;91:406–10

Cross Clamp Time Effect – Towards Reduction in Perioperative Mortality

Aortic Cross-Clamp Time, New Prostheses, and Outcome in Aortic Valve Replacement

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Background and aim of the study: A number of sutureless bioprosthetic aortic valves have been recently introduced in clinical practice, their main advantage being a reduction in the aortic cross-clamp time (AXCT). The study aim was to investigate if AXCT was a determinant of cardiovascular morbidity in patients undergoing surgical aortic valve replacement (AVR) to treat aortic valve stenosis, and to identify any subset of patients who might benefit from a reduction in AXCT.
Methods: A retrospective analysis was conducted of 979 consecutive patients with aortic valve stenosis who underwent surgical AVR. The AXCT was analyzed as an independent predictor of severe cardiovascular morbidity, defined as the presence of a low cardiac output, stroke, acute kidney injury, or operative mortality. Subgroups of patients who benefited more from a reduction in AXCT were investigated.
Results: The AXCT was an independent predictor of severe cardiovascular morbidity, with an increased risk of 1.4% per 1 min increase. Patients with a left ventricular ejection fraction ≤40%, and also diabetic patients, showed the most relevant clinical benefits induced by a reduction in AXCT.
Conclusion: In selected patient populations at high risk of systolic dysfunction, the use of sutureless aortic valve bioprostheses may be considered. However, the routine use of such bioprostheses should be pondered within a cost-benefit analysis.

The Journal of Heart Valve Disease 2012;21:732-739

Cross-clamp time is an independent predictor of mortality and morbidity in low- and high-risk cardiac patients

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ARTICLE INFO

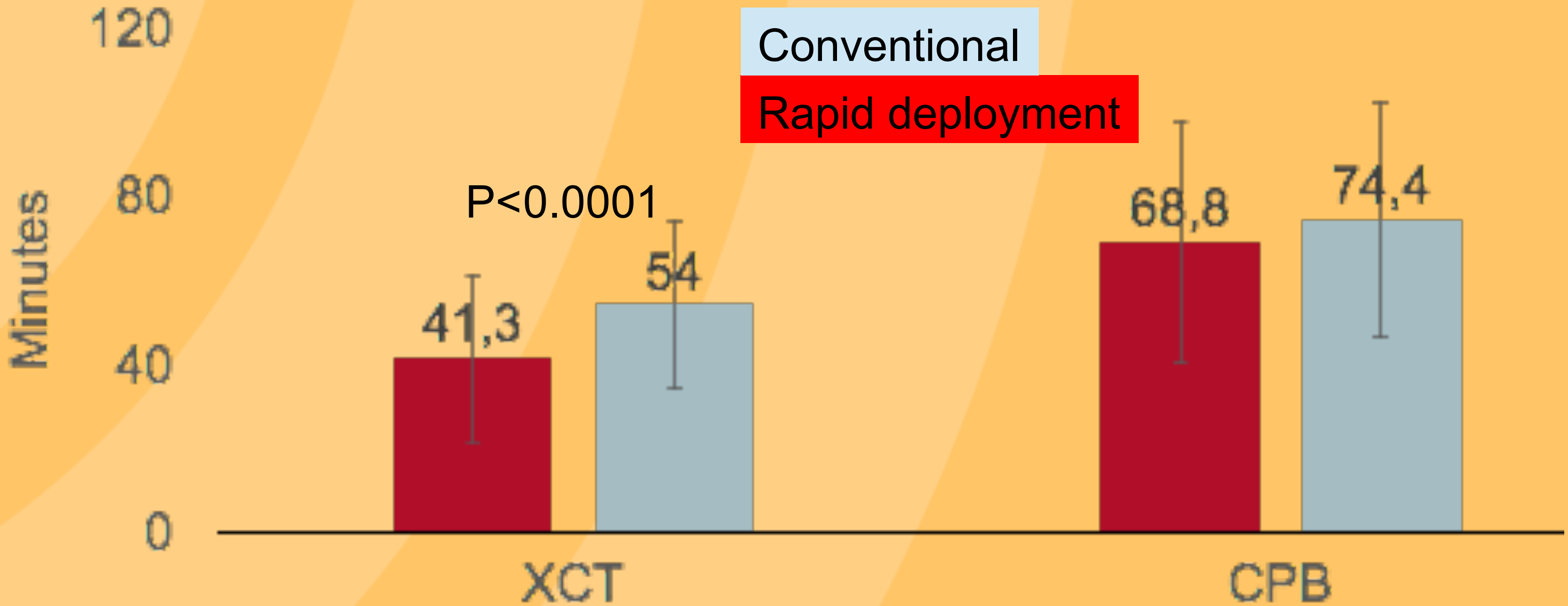
Article history:
Received 19 May 2010
Received in revised form
18 September 2010
Accepted 13 October 2010
Available online 20 October 2010

Keywords:
Aortic cross-clamp
Mortality
Morbidity

ABSTRACT

Objectives: We sought to assess the effects of aortic cross-clamp time (XCL) on outcome following cardiac surgery in low- and high-risk patients.
Methods: This is a retrospective review of prospectively collected departmental data of all patients who underwent cardiac surgery over 8-year period. Our cohort consisted of 3799 consecutive patients subdivided into low-risk (Euro SCORE < 6, $n = 2691$, 71%) and high-risk (Euro SCORE ≥ 6, $n = 1108$, 29%). Each class was further stratified into three groups based on their corresponding XCL time. Group 1 (XCL ≤ 60 min), group 2 (XCL > 60 but ≤ 90 min) and group 3 (XCL >90 min). Postoperative morbidity and in-hospital mortality were analysed.
Results: Univariate analysis showed the following to be significantly associated with increased XCL time in both low- and high-risk patients: low cardiac output, prolonged ventilation time, renal complications, prolonged hospital stay, blood transfusion and increased mortality ($p < 0.05$). By using multiple logistic regression, aortic XCL time >60 min was independent risk factor for low cardiac output, prolonged ventilation, renal complication, blood transfusion, mortality and prolonged hospital stay in both groups. By using XCL time as a continuous variable, an incremental increase of 1 min interval in XCL time was associated with a 2% increase in mortality in both groups.
Conclusion: Prolonged cross-clamp time significantly correlates with major post-operative morbidity and mortality in both low- and high-risk patients. This effect increases with increasing XCL time. Prior knowledge on this effect can help in preventing some of these complications.

A Randomized Multicenter Trial of Minimally Invasive Rapid Deployment Versus Conventional Full Sternotomy Aortic Valve Replacement



	MIS RDAVR (n=46)	FS AVR (n=48)	p-value
Cross-clamp time (XCT)	***41.3 ± 20.3***	***54.0 ± 20.3***	***<.0001***
Cardiopulmonary bypass time (CPB)	***68.8 ± 29.0***	***74.4 ± 28.4***	***0.208***
Skin-to-skin time	***141.9 ± 46.1***	***146.4 ± 48.4***	***0.591***

Borger MA et al. Ann Thorac Surg. 2015;99:17–25

Right anterior minithoracotomy for aortic valve replacement: 10-year experience of a single center

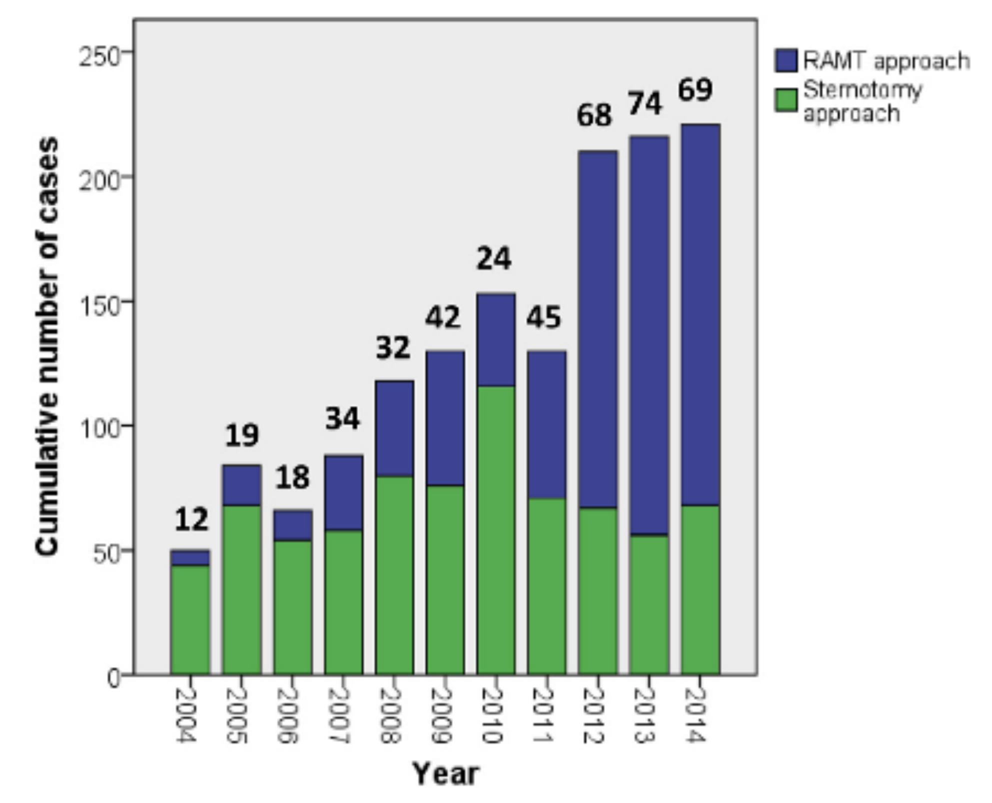
ABSTRACT

Objective: Minimally invasive aortic valve replacement (AVR) has been associated with several better outcomes over the standard full sternotomy approach. We revised our 10-year experience with right anterior minithoracotomy (RAMT) for AVR.

Methods: Between 2004 and 2014, a total of 593 patients (310 men; median age: 73.8 years) underwent AVR via RAMT. Preoperatively, a mixed valve lesion was diagnosed in 55 (9.3%) patients; and pure aortic regurgitation in 86 (14.5%). Mean logistic EuroSCORE I (European system for cardiac operative risk evaluation) was 7.4 (median: 5.76).

Results: In 302 (50.9%) patients, a sutureless or rapidly implantable biological prosthesis was used; in 23 (3.9%), a mechanical prosthesis; and in the remainder, a conventional biological prosthesis. A total of 113 (19.1%) patients had a small aortic annulus (≤21 mm). Operative times averaged 80 (median: 74) minutes of crossclamping time, and 117 (107) minutes of perfusion time; these were significantly shorter with a sutureless prostheses, compared with a sutured prostheses: perfusion 99 versus 134 minutes, $P < .0005$; aortic crossclamping time: 64 versus 97 minutes, $P < .0005$. The mean (median) assisted ventilation time was 9.8 (6) hours; intensive care unit stay was 1.5 (1) days; hospital length of stay was 6.6 (6) days. Overall in-hospital mortality was 9 deaths (1.5%). At 31.5 months mean follow-up time (1531 cumulative patient-years), 94.8% survival was observed.

Conclusions: Minimally invasive AVR is a safe procedure, with low perioperative morbidity, and low rates of reoperation and death at late follow-up. Excellent outcomes can be achieved with minimally invasive AVR via right anterior minithoracotomy. Sutureless prostheses facilitate minimally invasive AVR and are associated with reduced operative times. (J Thorac Cardiovasc Surg 2015;150:548-56)



Variable	Overall study population (n = 593)	Isolated AVR (n = 541)	Isolated AVR with sutured prostheses (n = 258)	Isolated AVR with sutureless prostheses (n = 283)
CPB time (min)	107 (86-135)	104 (84-129)	121 (103.5-147.5)	88 (77-107)
ACC time (min)	74 (55-96)	71 (54-92)	87 (75-109)	55 (47-68)

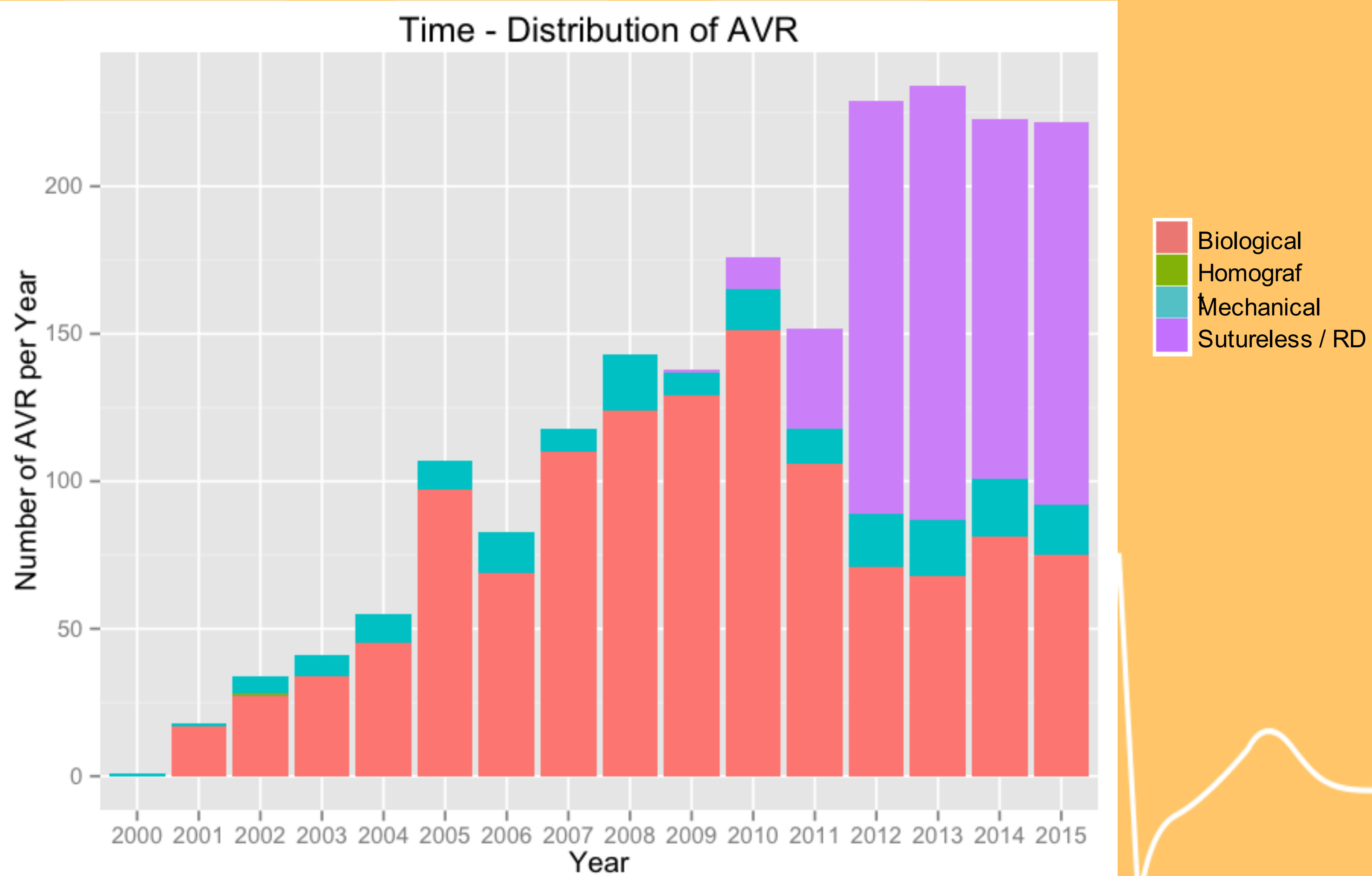
Massa experience – Glauber M, Solinas M et al. Thorac Cardiovasc Surg 2015;150:548-56

Right anterior minithoracotomy for aortic valve replacement: 10-year experience of a single center

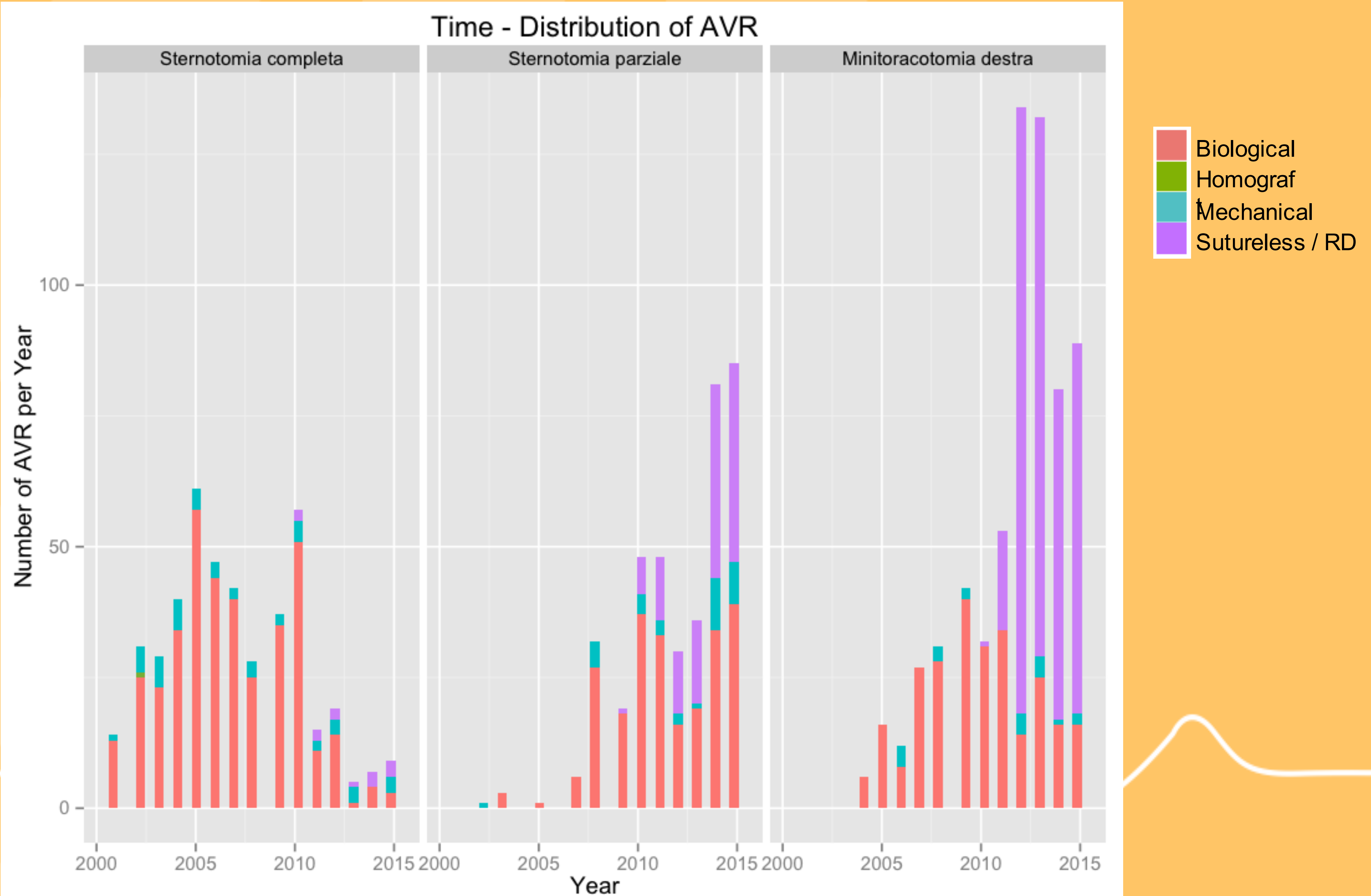
Variable	Overall cohort (n = 593)	Sutureless subgroup (n = 302)	Sutured subgroup (n = 291)	*P* value
ICU length of stay (d)	1 (1-1)	1 (1-1) (70 cases > median)	1 (1-1) (44 cases > median)	.011
Prolonged ICU stay	53 (8.9)	34 (11.3)	19 (6.6)	.046*
Assisted ventilation time (h)	6 (5-9)	6 (4-8)	7 (5-9)	.004
Prolonged ventilation support	22 (3.7)	9 (3.0)	13 (4.5)	.33
Hospital length of stay (d)	6 (6-7)	6 (6-8)	6 (6-7)	.027
In-hospital mortality	9 (1.5)	4 (1.3)	5 (1.7)	.75
Reopening for bleeding or cardiac tamponade	30 (5.1)	17 (5.6)	13 (4.5)	.53
Perioperative acute myocardial infarction	9 (1.5)	3 (1.0)	6 (2.1)	.33
Infective complications	19 (3.2)	9 (3.0)	10 (3.4)	.75
Sepsis	1 (0.17)	1 (0.3)	0	>.99
Wound dehiscence or infection	3 (0.51)	1 (0.3)	2 (0.7)	.62
Stroke	10 (1.7)	6 (2.0)	4 (1.4)	.75
Transient ischemic attack	6 (1.0)	3 (1.0)	3 (1.0)	>.99
Pulmonary complications/respiratory dysfunction	65 (11.0)	36 (11.9)	29 (10.0)	.46
Pneumonia	7 (1.2)	1 (0.3)	6 (2.1)	.064
	7/65 (10.8)	1/36 (2.8)	6/29 (20.7)	.039
Pleural effusion requiring puncture	16 (2.7)	11 (3.6)	5 (1.7)	.15
Perioperative acute kidney injury	23 (3.9)	13 (4.3)	10 (3.4)	.59
New-onset CVVH/hemofiltration support	2 (0.34)	1 (0.3)	1 (0.3)	>.99
Complete AV block; requested PM implant	19 (3.2)	14 (4.6)	5 (1.7)	.045*
New-onset atrial fibrillation or flutter	151 (25.5)	78 (25.8)	73 (25.2)	.86
Gastrointestinal complications	8 (1.3)	7 (2.3)	1 (0.3)	.069

Massa experience – Glauber M, Solinas M et al. Thorac Cardiovasc Surg 2015;150:548-56

Fifteen years of Aortic Valve Replacement – Massa Experience



… an ongoing experience
Fifteen years of isolated Aortic Valve Replacement



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Main reasons for MiAVR

- Cosmetics
- Reduce morbidity/mortality in treated patients
- High risk group
- Reduce pain
- Speed of recovery

SOME CONSIDERATIONS

"MIS AVR is no better than full sternotomy"

The literature shows it is just as good as FS and advantageous in higher risk settings

MIS AVR is non-inferior to FS

All of these concepts have been challenged. The MiAVR approach, has more favorable prognosis and less morbility.

"If it's just as good doc, why do you propose to":

- Make a big hole in my chest?
- Give me more blood?
- Cause me more pain?
- Slow my recovery?