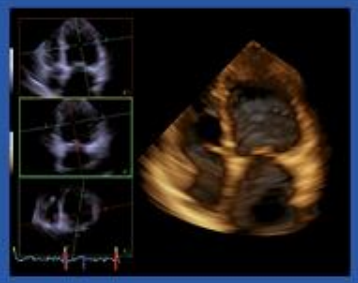


EuroValve

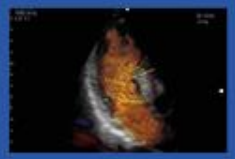
November 8-9, 2013

Bicuspid Aortic Valve

Follow-up after intervention: how and when

Arturo Evangelista



www.eurovalvecongress.com

Faculty Disclosure

Arturo Evangelista

I have **no financial relationships** to disclose.

Bicuspid Aortic Valve
Follow-up after intervention: how and when

- Aortic valve
- Left ventricle function
- Ascending aorta

Follow-up of the valve after intervention: how and when

- Aortic valve replacement
  - Mechanical prosthesis
  - Biological prosthesis
- Ross procedure
- Aortic valve repair
- Conservative valve management

Aortic valve prosthesis follow-up

- Doppler echocardiography should be obtained in all patients within **3 months post-surgery.**
- Follow-up visits of asymptomatic patients without complications or new murmurs can be held at yearly intervals and **without Doppler echocardiography**
- TTE should be performed if any **new symptoms** occur after valve replacement or if complications are suspected.
- **Yearly TTE** is recommended after **the fifth year** in patients with **bioprostheses**

Valve Configuration Determines Long-Term Results After Repair of the Bicuspid Aortic Valve

Diana Aicher, MD; Takashi Kunihara, MD; Omar Abou Issa, MD; Brigitte Brittner, MD; Stefan Gräber, MD; Hans-Joachim Schäfers, MD

Conclusions—Reconstruction of bicuspid aortic valve can be performed reproducibly with good early results. Recurrence and progression of regurgitation, however, may occur, depending primarily on anatomic features of the valve. (*Circulation*. 2011;123:178-185.)

N = 316 patients
Reintervention 12% a los 5 a,
19% a los 10 a.

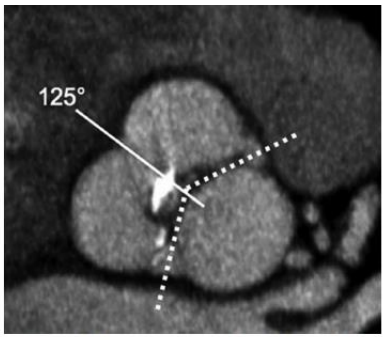


Figure 1. BAV with a commissural orientation of 125°.

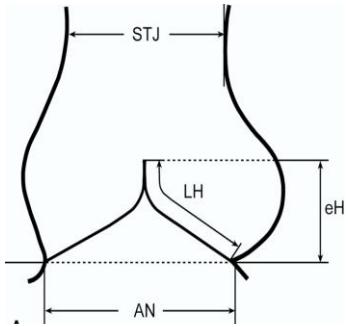
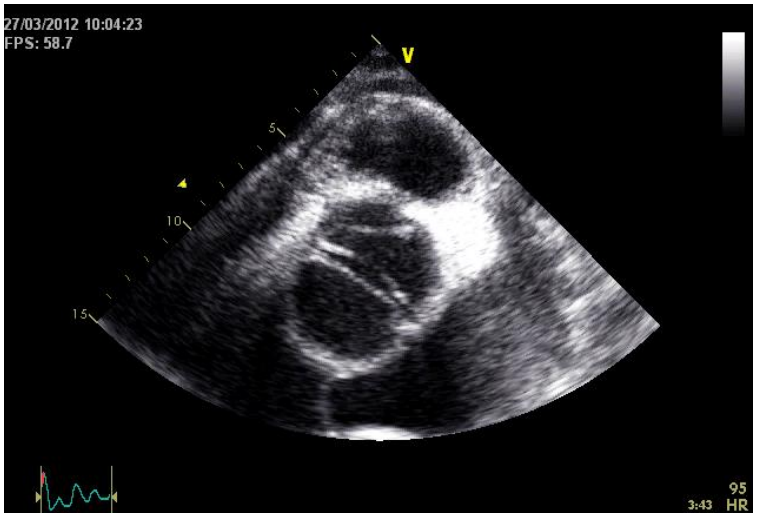
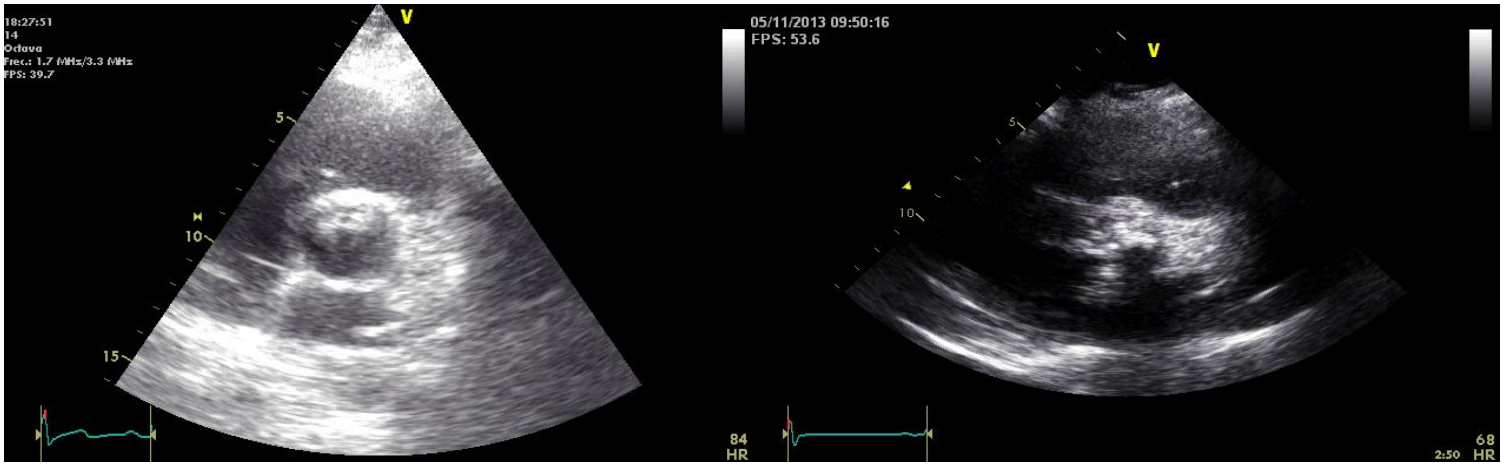


Table 2. Results of Multivariable Analysis of Predictors for Reoperation

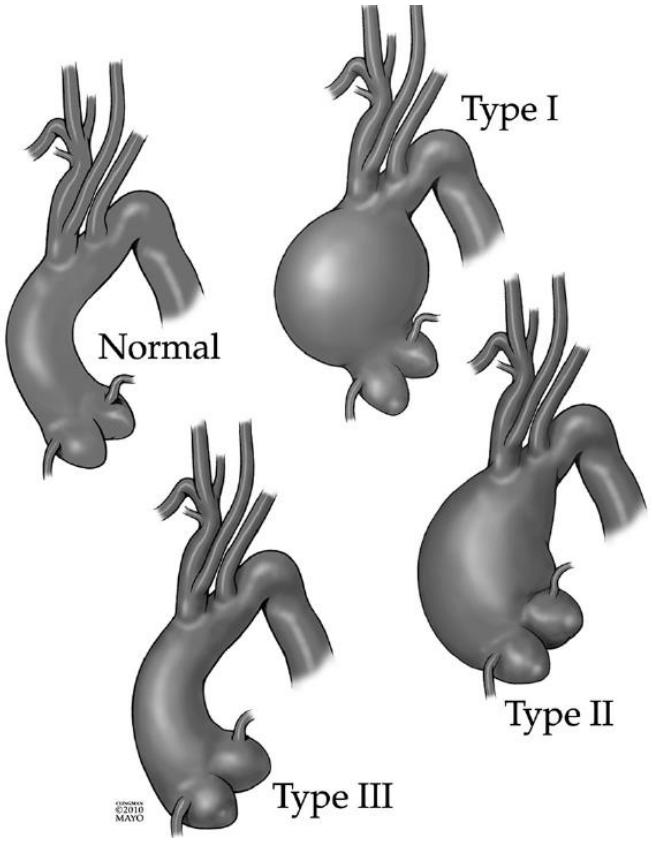
	HR	95% Confidence Interval	*P*
Age	0.955	0.928–0.982	0.001
eH	0.740	0.612–0.894	0.002
AVD	1.302	1.076–1.575	0.007
Commissural orientation	0.961	0.938–0.985	0.002
Pericardial patch	5.175	2.100–12.753	0.000
Subcommissural plication	0.699	0.299–1.633	0.408
Root repair	2.354	0.770–7.192	0.133

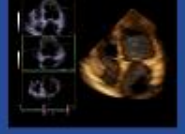
Follow-up of aortic valve repair
“ The valve”

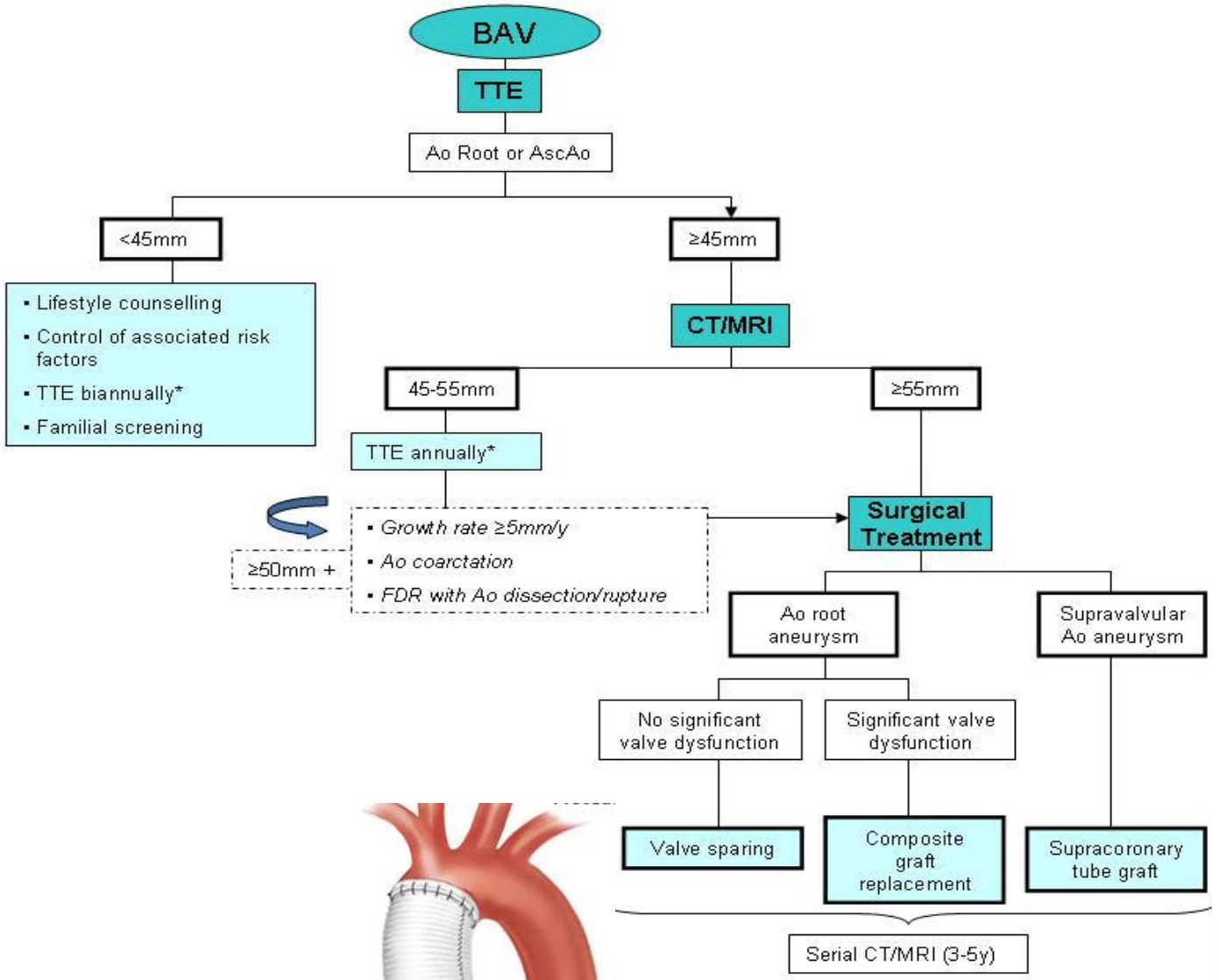




Follow-up after intervention: how and when
"The Ascending Aorta"






BAV
TTE
Ao Root or AscAo
<45mm
≥45mm
• Lifestyle counselling
• Control of associated risk factors
• TTE biannually*
• Familial screening
CT/MRI
45-55mm
≥55mm
TTE annually*
≥50mm +
• Growth rate ≥5mm/y
• Ao coarctation
• FDR with Ao dissection/rupture
Surgical Treatment
Ao root aneurysm
Supravalvular Ao aneurysm
No significant valve dysfunction
Significant valve dysfunction
Valve sparing
Composite graft replacement
Supracoronary tube graft
Serial CT/MRI (3-5y)

Long-Term Survival After the Bentall Procedure in 206 Patients With Bicuspid Aortic Valve

Christian D. Etz, MD, Tobias M. Homann, MD, Daniel Silovitz, MS, David Spielvogel, MD, Carol A. Bodian, DrPh, Maximilian Luehr, MD, Gabriele DiLuozzo, MD, Konstadinos A. Plestis, MD, and Randall B. Griepp, MD

Departments of Cardiothoracic Surgery and Anesthesiology, Mount Sinai School of Medicine, New York, New York

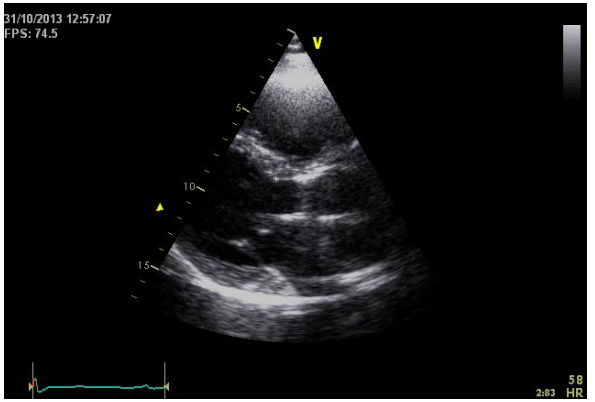
Background. The recognition that patients with a bicuspid aortic valve (BAV) are at risk for aorta-related death (rupture or dissection) has favored composite aortic root replacement in BAV patients who undergo aortic valve replacement for valve dysfunction as well as in asymptomatic BAV patients with significant aortic root dilatation. We report the results of Bentall operations in 206 BAV patients during an 18-year interval.

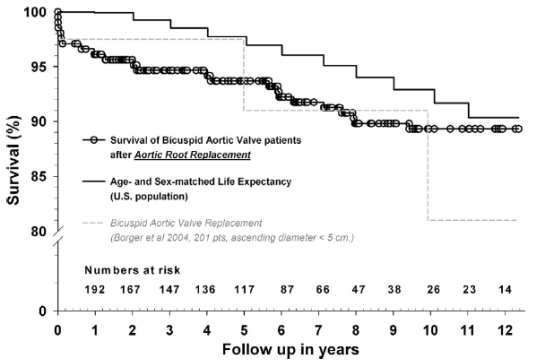
Methods. Two hundred six BAV patients (mean, 53 ± 14 years, 84% male) underwent composite aortic root replacement between September 1987 and May 2005. One hundred nine patients (53%) presented with aortic regurgitation, 24 patients (12%) presented with aortic stenosis, and 55 patients (26%) presented with combined aortic stenosis and aortic regurgitation. Median preoperative aortic diameter was 5.5 cm (range, 3 to 9 cm). Twenty-two patients (11%) underwent urgent or emergent procedures; 11 had acute type A dissection (5%). Sixty-one percent had a mechanical valve Bentall prosthesis; in 39%, a biologic valve was implanted. Thirty-two percent had concomitant procedures.

Results. Overall hospital mortality was 2.9% (n = 6), and stroke rate was 1.9% (n = 4). Risk factors for adverse outcome (death or stroke), which occurred in 4.8% (n = 10), were presence of clot or atheroma ($p = 0.02$) and age older than 65 years ($p = 0.05$). During a mean follow-up of 5.9 years (1,200 patient-years; range, 5 to 18 patient-years), no patient required ascending aortic reoperation. Long-term survival was 93% after 5 years and 89% after 10 years. Discharged patients enjoyed survival equivalent to a normal age- and sex-matched population and superior to survival reported for a series of patients with aortic valve replacement alone.

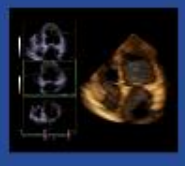
Conclusions. In patients with BAV, the Bentall procedure has an operative mortality no worse than that for aortic valve replacement, with superior long-term survival and a lower rate of aortic reoperation.

(Ann Thorac Surg 2007;84:1186–94)





- Data from the Society of Thoracic Surgeons database showed that root replacement increases operative risk by a factor of 2.8 compared to AVR.
- The widespread adoption of an aggresive attitude toward roor replacement may create more problems than it solves.



EuroValve

Should the ascending aorta be replaced more frequently in patients with bicuspid aortic valve disease?

Michael A. Borger, MD, PhD[a,b]
Mark Preston, BSc[a,b]
Joan Ivanov, RN, PhD[a,b]
Paul W. M. Fedak, MD, PhD[a,b]
Piroze Davierwala, MD[a,b]
Susan Armstrong, MSc[ab]
Tirone E. David, MD[a,b]

Objective: The optimal diameter at which replacement of the ascending aorta should be performed in patients with bicuspid aortic valve disease is not known.

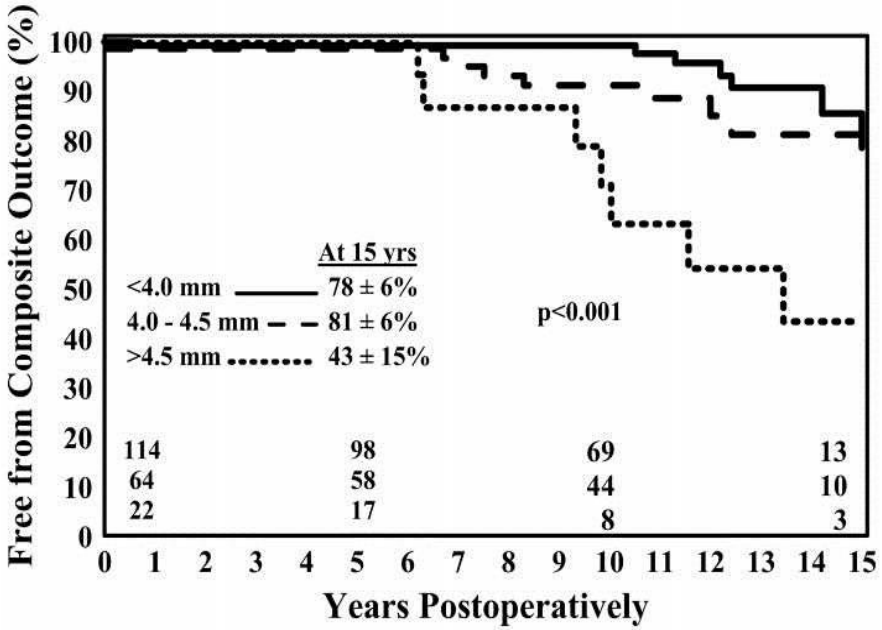
Methods: We reviewed all patients with bicuspid aortic valves undergoing aortic valve replacement at our institution from 1979 through 1993 (n = 201). Patients undergoing concomitant replacement of the ascending aorta were excluded.

Results: Follow-up was obtained on 98% of patients and was 10.3 ± 3.8 (mean ± SD) years. The average patient age was 56 ± 15 years, and 76% were male. The ascending aorta was normal (<4.0 cm) in 115 (57%) patients, mildly dilated (4.0-4.4 cm) in 64 (32%) patients, and moderately dilated (4.5-4.9 cm) in 22 (11%) patients. All patients with bicuspid aortic valves with marked dilation (>5.0 cm) underwent replacement of the ascending aorta and were therefore excluded. Fifteen-year survival was 67%. During follow-up, 44 patients required reoperation, predominantly for aortic valve prosthesis failure. Twenty-two patients had long-term complications related to the ascending aorta: 18 required an operative procedure to replace the ascending aorta (for aortic aneurysm), 1 had aortic dissection, and 3 experienced sudden cardiac death. Fifteen-year freedom from ascending aorta–related complications was 86%, 81%, and 43% in patients with an aortic diameter of less than 4.0 cm, 4.0 to 4.4 cm, and 4.5 to 4.9 cm, respectively ($P < .001$).

Conclusions: Patients undergoing operations for bicuspid aortic valve disease should be considered for concomitant replacement of the ascending aorta if the diameter is 4.5 cm or greater.

From the Division of Cardiovascular Surgery, Toronto General Hospital, University Health Network, and the Department of Surgery, University of Toronto, Toronto, Ontario, Canada.

Read at the Eighty-fourth Annual Meeting



201 BAV followed 10 y after replacement. 9% required aotic replacement, 61 of them underwent simultaeous replacement of an aortic bioprostesis for structural valve deterioration

EuroValve

Aortic Complications After Bicuspid Aortic Valve Replacement: Long-Term Results

Claudio F. Russo, MD, Simone Mazzetti, MD, Andrea Garatti, MD, Elena Ribera, MD, Angela Milazzo, MD, Giuseppe Bruschi, Marco Lanfranconi, MD, Tiziano Colombo, MD, and Ettore Vitali, MD

Division of Cardiovascular Surgery and Division of Cardiology, Echocardiography Service, Niguarda Hospital, Milan, Italy

Background. Bicuspid aortic valve (BAV) is a risk factor for aortic dissection and aneurysm. We studied patients with BAV and tricuspid aortic valve (TAV) to evaluate long-term changes in the ascending aorta after aortic valve replacement (AVR).

Patients and Methods. One hundred consecutive patients were allocated into two groups according to the presence of BAV (group A, 50 patients) or TAV (group B, 50 patients). Mean age was 51 ± 12 years in group A, and 50 ± years 12 in group B. No patients had hypertension or Marfan's syndrome. Until July 2001, mean follow-up was 234 ± 47 months in group A and 241 ± 43 months in group B.

Results. Five patients (10%, CL 5.7 to 13.9) in group A suffered late acute aortic dissection. Acute aortic dissection (5 vs 0, $p = 0.0001$) and sudden death (7 vs 0, $p = 0.0001$) occurred more frequently in patients with BAV. All survivors were assessed by echocardiogram. The mean diameter of the ascending aorta was 48.4 mm in group A and 36.8 mm in group B. Three patients in group A were operated on because of ascending aorta aneurysm more than 6 cm in diameter.

Conclusions. As a result of our experience, we recommend a policy of prophylactic replacement of even a seemingly normal and definitely a mildly enlarged ascending aorta in cases of BAV at the moment of AVR, and consideration of a similar approach for any other cardiac surgical procedure in patients with BAV.

(Ann Thorac Surg 2002;74:S1773–6)

Long-Term Risk of Aortic Events Following Aortic Valve Replacement in Patients With Bicuspid Aortic Valves

Stephen H. McKellar, MD, MSc[a,d], Hector I. Michelena, MD[b], Zhuo Li, MS[c], Hartzell V. Schaff, MD[a], and Thoralf M. Sundt III, MD[a,*]

1,286 BAV with AVR
Follow-up: 12y

13 AD (1%)
11 Aortic Replacement (1%)
127Aortic enlargement (10%)

Aortic complications:
Coronary bypass
Aorta enlargement
Tobacco

Aortic dilation did not predict mortality

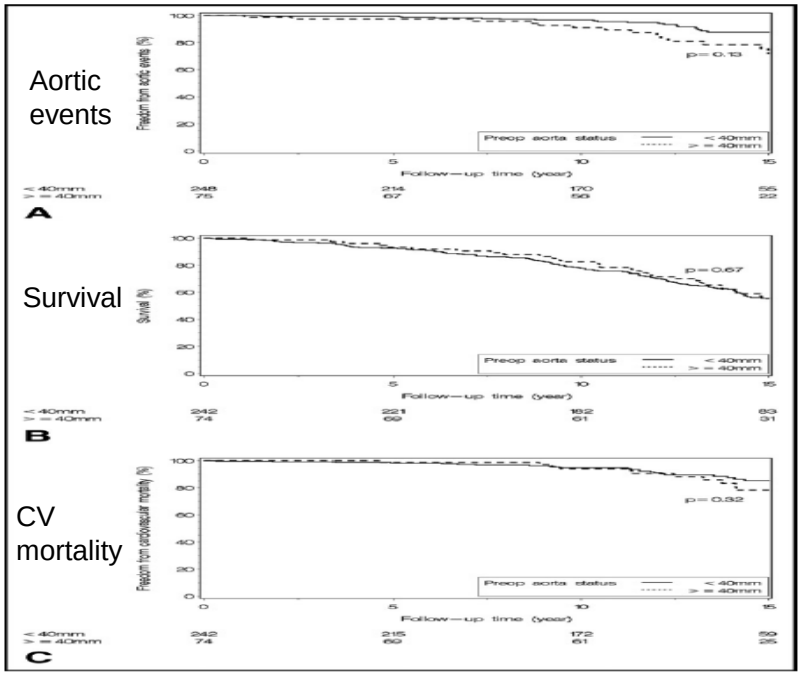


Figure 4. Kaplan-Meier estimates at 15-year follow-up for subset of patients (n = 323) with quantitative aortic measurements at AVR. (A) Freedom from aortic events. (B) Overall survival. (C) Cardiovascular survival.

Risk Factors Associated With Reoperation and Mortality in 252 Patients After Aortic Valve Replacement for Congenitally Bicuspid Aortic Valve Disease

Sorel Goland, MD, Lawrence S. C. Czer, MD, Michele A. De Robertis, RN, James Mirocha, MS, Robert M. Kass, MD, Gregory P. Fontana, MD, Wen Chang, MD, and Alfredo Trento, MD

Divisions of Cardiology and Cardiothoracic Surgery, Cedars-Sinai Medical Center, Los Angeles, California

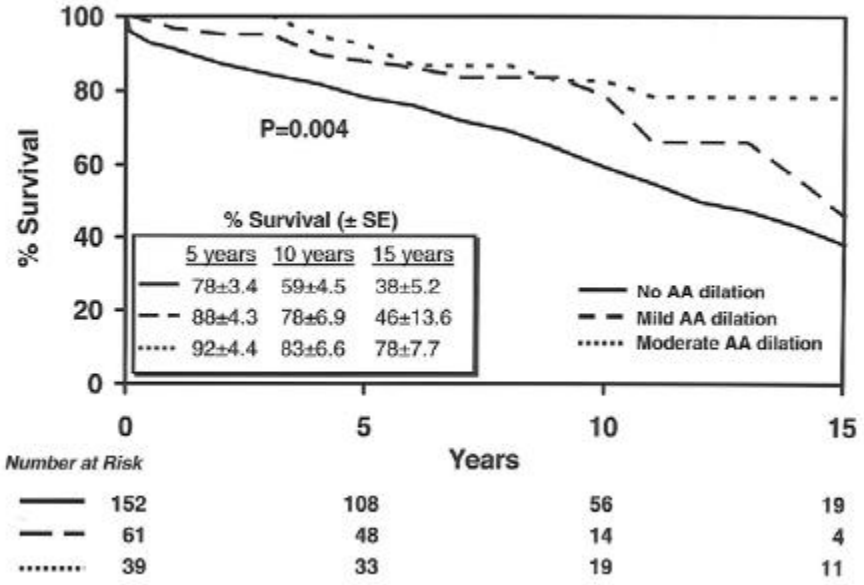


Table 4. Predictors of Survival in 252 Patients Undergoing Aortic Valve Replacement for Bicuspid Aortic Valve Disease Using the Cox Regression Model

Variable	Hazard Ratio	95% CI	χ^2	*p* Value
CAD	2.18	1.40–3.39	11.97	<0.001
Age	1.05	1.03–1.08	20.89	<0.001
Surgery decade	0.65	0.47–0.88	7.46	0.006
LVEF ≤ 0.40	0.98	0.97–0.99	5.49	0.019

CAD = coronary artery disease; CI = confidence interval; LVEF = left ventricular ejection fraction.

EuroValve

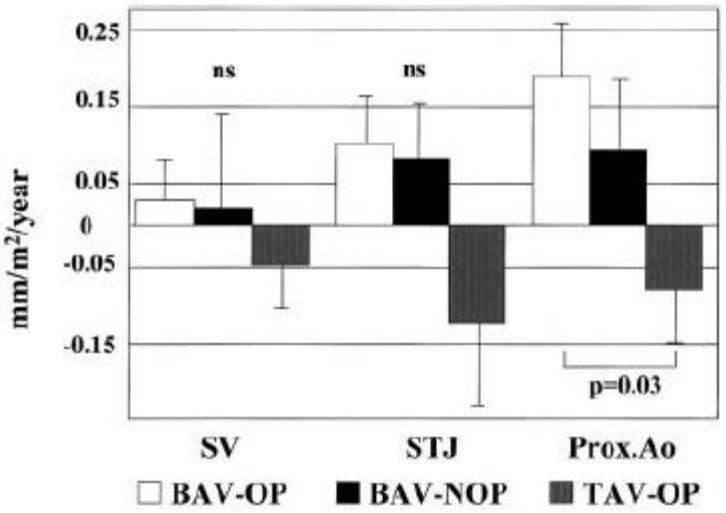
Failure to Prevent Progressive Dilation of Ascending Aorta by Aortic Valve Replacement in Patients With Bicuspid Aortic Valve: Comparison With Tricuspid Aortic Valve

Hisayo Yasuda, MD; Satoshi Nakatani, MD, PhD; Marie Stugaard, MD, PhD; Yuko Tsujita-Kuroda, MD, PhD; Ko Bando, MD, PhD; Junjiro Kobayashi, MD, PhD; Masakazu Yamagishi, MD, PhD; Masafumi Kitakaze, MD, PhD; Soichiro Kitamura, MD, PhD; Kunio Miyatake, MD, PhD

Background—Patients with bicuspid aortic valve (BAV) have been frequently complicated with ascending aortic dilation possibly because of hemodynamic burdens by aortic stenosis (AS) or regurgitation (AR) or congenital fragility of the aortic wall.

Methods and Results—To clarify if the aortic dilation could be prevented by aortic valve replacement (AVR) in BAV patients, we studied 13 BAV (8 AR dominant, 5 AS dominant) and 14 tricuspid aortic valve (TAV) patients (7 AR, 7 AS) by echocardiography before and after AVR (9.7±4.8 years). We also studied 18 BAV (11 AR, 7 AS) without AVR. Diameters of the sinuses of Valsalva, sinotubular junction and the proximal aorta were measured. The annual dilation rate was calculated by dividing changes of diameters during the follow-up period by the body surface area and the observation interval. We found that aortic dilation in BAV patients tended to be faster than that in TAV patients, although a significant difference was found only at the proximal aorta (0.18±0.08 versus −0.08±0.08 mm/(m^2/year), P=0.03). BAV patients with and without AVR showed similar progressive dilation. AR dominant group showed tendency of more progressive dilation than AS dominant group in BAV, although it did not reach statistical significance. TAV patients did not show further aortic dilation after AVR.

Conclusions—AVR could not prevent progressive aortic dilation in BAV. Since the aorta did not dilate in TAV, progressive aortic dilation in BAV seems mainly due to the fragility of the aortic wall rather than hemodynamic factors.
(*Circulation*. 2003;108[suppl II]:II-291-II-294.)



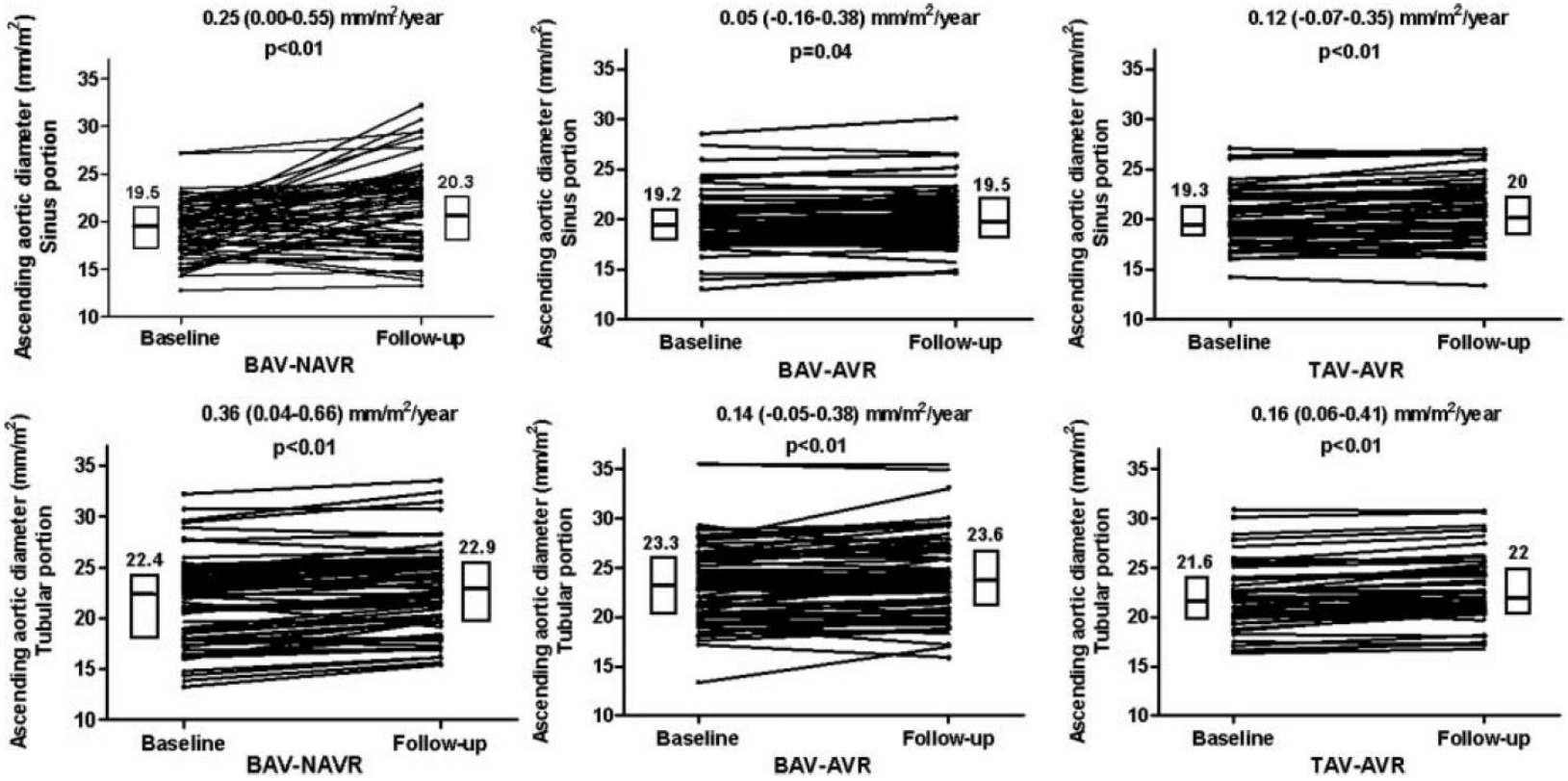
EuroValve

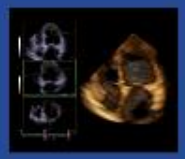
ORIGINAL ARTICLE

Aortopathy and bicuspid aortic valve: haemodynamic burden is main contributor to aortic dilatation

Yong-Giun Kim,[1] Byung Joo Sun,[1] Gyung-Min Park,[1] Seungbong Han,[2] Dae-Hee Kim,[1] Jong-Min Song,[1] Duk-Hyun Kang,[1] Jae-Kwan Song[1]

Heart 2012,98:1822-27





EuroValve

European Journal of Cardio-Thoracic Surgery Advance Access published March 30, 2012

European Journal of Cardio-Thoracic Surgery 0 (2012) 1–7
doi:10.1093/ejcts/ezs137

ORIGINAL ARTICLE

Risk of late aortic events after an isolated aortic valve replacement for bicuspid aortic valve stenosis with concomitant ascending aortic dilation†

Evaldas Girdauskas[a,*], Kushtrim Disha[a], Heinrich H. Raisin[a], Maria-Anna Secknus[b], Michael A. Borger[c] and Thomas Kuntze[a]

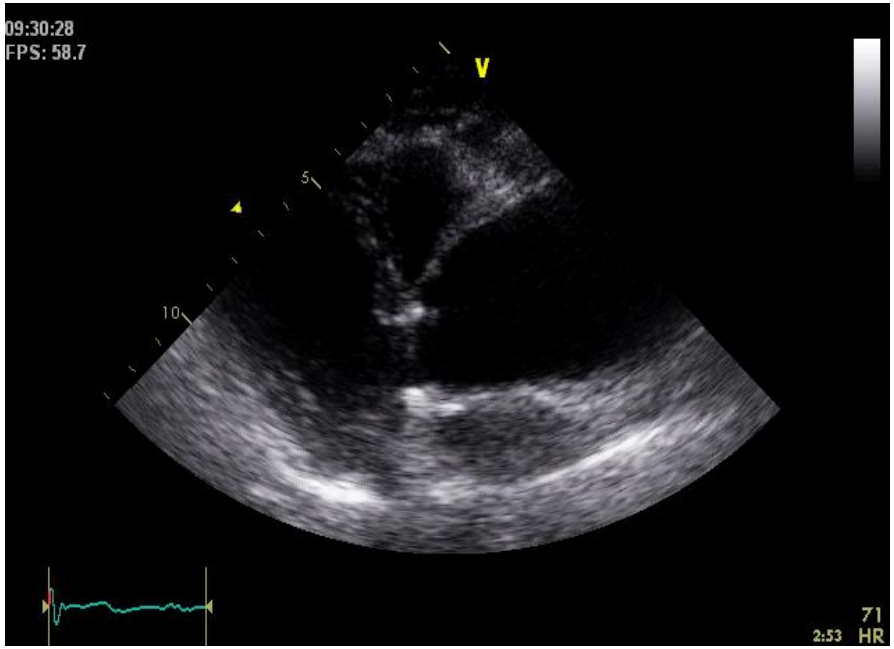
Abstract

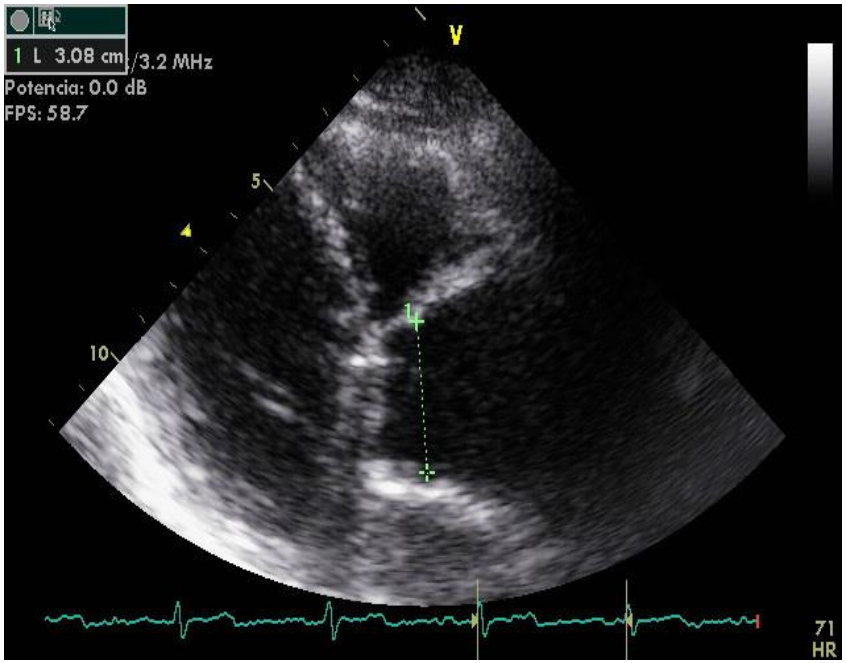
OBJECTIVES: The optimal surgical treatment of patients with bicuspid aortic valve (BAV) disease and ascending aortic aneurysm is controversial. The aim of this study was to evaluate the risk of late aortic events after an isolated aortic valve replacement (AVR) for BAV stenosis with concomitant mild-to-moderate proximal aortic dilation.

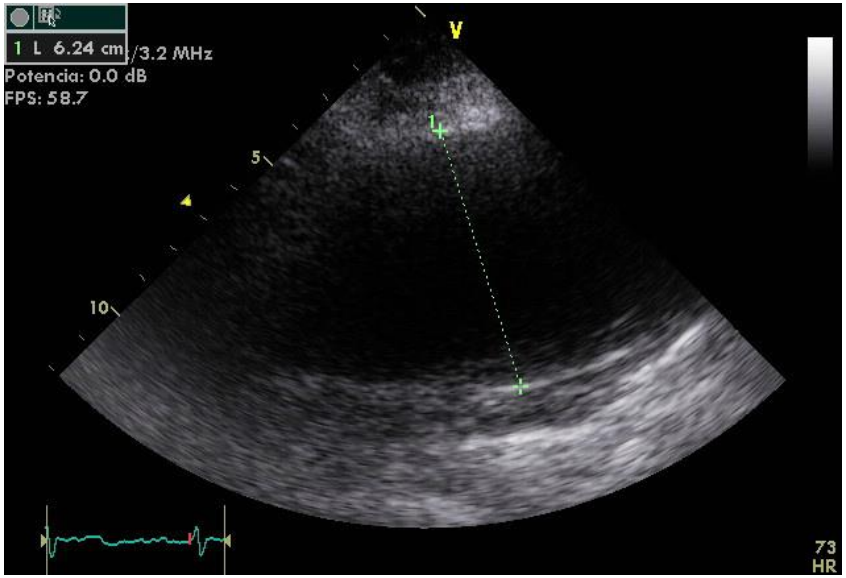
METHODS: A review of our institutional BAV database identified a subgroup of 153 consecutive BAV patients (mean age 54.2 ± 10.5 years, 73% men) with BAV stenosis and concomitant ascending aortic dilation of 40–50 mm who underwent an isolated AVR from 1995 to 2000. All cases of simultaneous aortic surgery (i.e. ascending aorta with a diameter of >50 mm) were excluded. The follow-up (1759 patient-years) was 100% complete. The mean follow-up was 11.5 ± 3.2 years. Adverse aortic events were defined as the need for proximal aortic surgery, the occurrence of aortic dissection/rupture or sudden death during the follow-up.

RESULTS: Actuarial survival rates of our study population were 86 and 78% at 10 and 15 years, respectively. Ascending aortic surgery was required in five patients (3%) for progressive ascending aortic aneurysm. Freedom from aortic interventions at 10 and 15 years was 97 and 94%, respectively. No documented aortic dissection or rupture occurred. Freedom from adverse aortic events was 95% at 10 years and 93% at 15 years postoperatively. In a separate group of patients presenting with aortic insufficiency (i.e. root phenotype), freedom from adverse aortic events was significantly lower (88 and 70% at 10 and 15 years, $P = 0.009$).

CONCLUSIONS: BAV patients with aortic valve stenosis and concomitant mild-to-moderate ascending aortic dilation are at a considerably low risk of adverse aortic events at 15 years after an isolated AVR. The BAV phenotype should be considered when determining the risk of subsequent adverse aortic events and the need for concomitant aortic replacement.


09:30:28
FPS: 58.7
V
5
10
71
2:53
HR


1 L 3.08 cm
/3.2 MHz
Potencia: 0.0 dB
FPS: 58.7
V
5
10
1
71
HR


1 L 6.24 cm
/3.2 MHz
Potencia: 0.0 dB
FPS: 58.7
V
5
10
1
73
HR

EuroValve

Fate of nonreplaced sinuses of Valsalva in bicuspid aortic valve disease

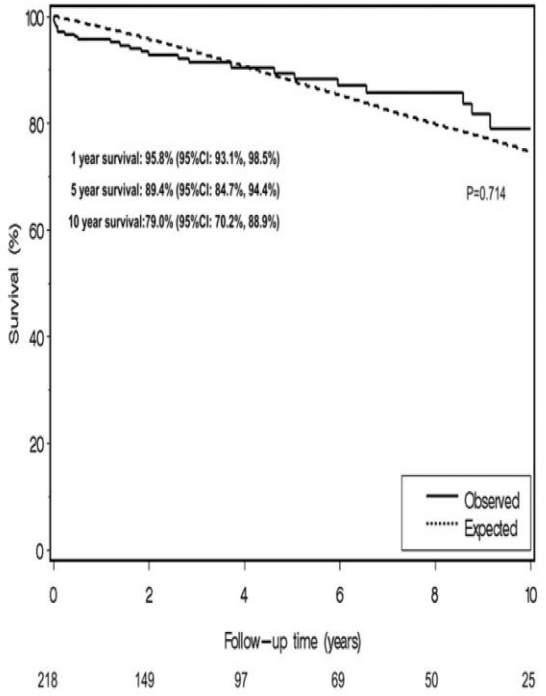
Chan B. Park, MD,[a,b] Kevin L. Greason, MD,[a] Rakesh M. Suri, MD,[a] Hector I. Michelena, MD,[c] Hartzell V. Schaff, MD,[a] and Thoralf M. Sundt III, MD[a]

Objective: There is growing consensus that the ascending aorta should be replaced at the time of aortic valve replacement for bicuspid aortic valve even if it is only moderately dilated; the natural history of nonreplaced sinuses of Valsalva is less clear.

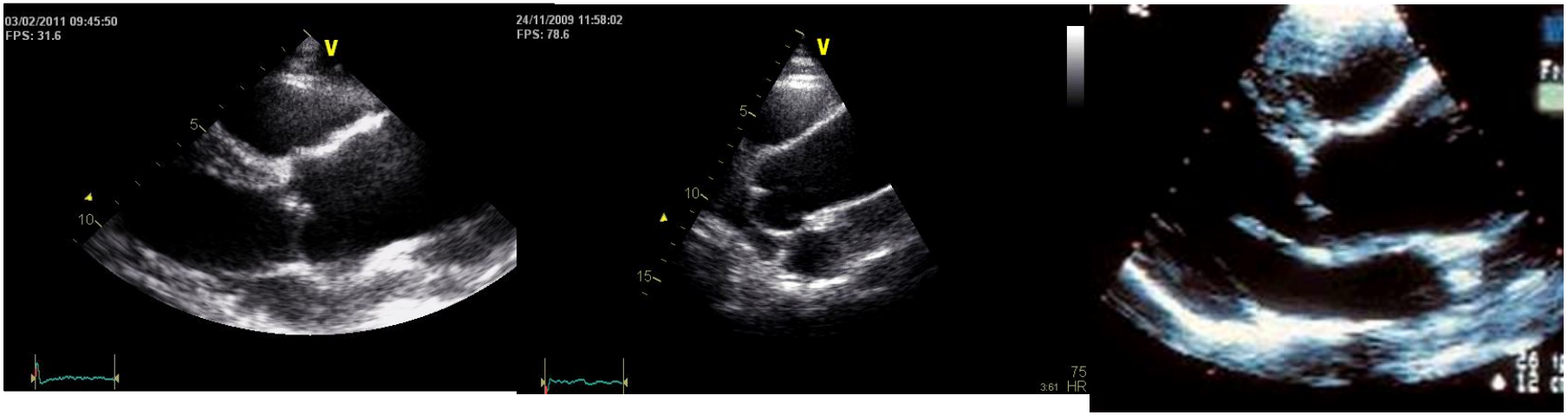
Methods: We identified patients without defined connective tissue disorder undergoing primary aortic valve replacement for bicuspid aortic valve and separate repair of the ascending aorta without root replacement at the Mayo Clinic between January 1, 1988, and December 31, 2007.

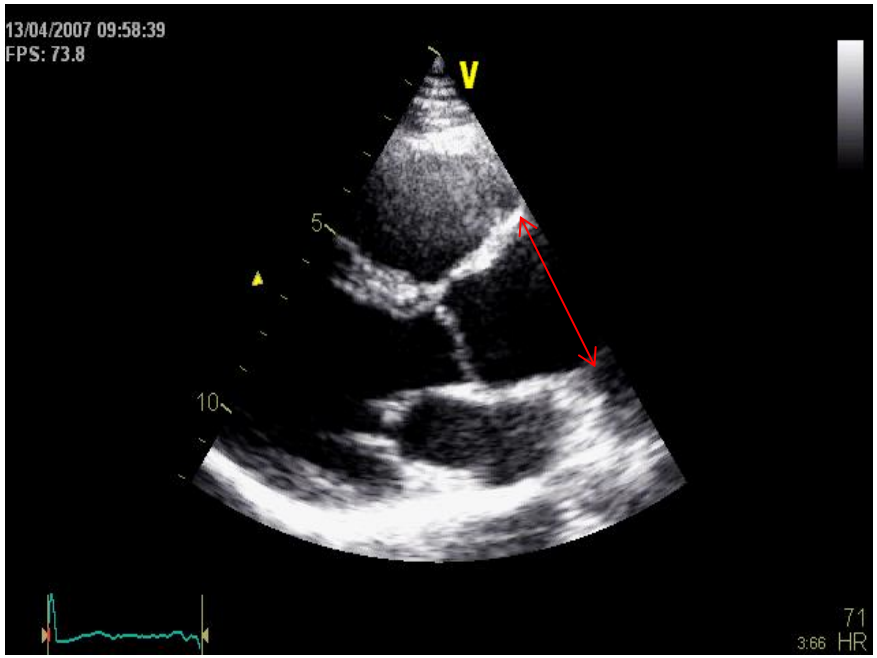
Results: Among 218 patients, 65 underwent ascending aortoplasty and 153 underwent separate graft replacement of the ascending aorta. Of the latter group, 15 also had graft replacement of the noncoronary sinus. The mean age at operation was 62 ± 13 years. Valvular dysfunction was predominantly stenosis in 151 patients (70%), regurgitation in 54 patients (25%), and mixed in 12 patients (5%). At a follow-up of up to 17 years (median, 3.3 years; range, 0–17 years), 10 patients (5%) had undergone late reoperation, of whom 1 had replacement of the ascending aorta and 1 had replacement of the root for significant dilatation of the sinuses. Both patients had originally undergone aortoplasty. No other patient required root surgery. One-, 5-, and 10-year freedom from reoperation for any cause were 97.6%, 94.9%, and 85.5%, respectively.

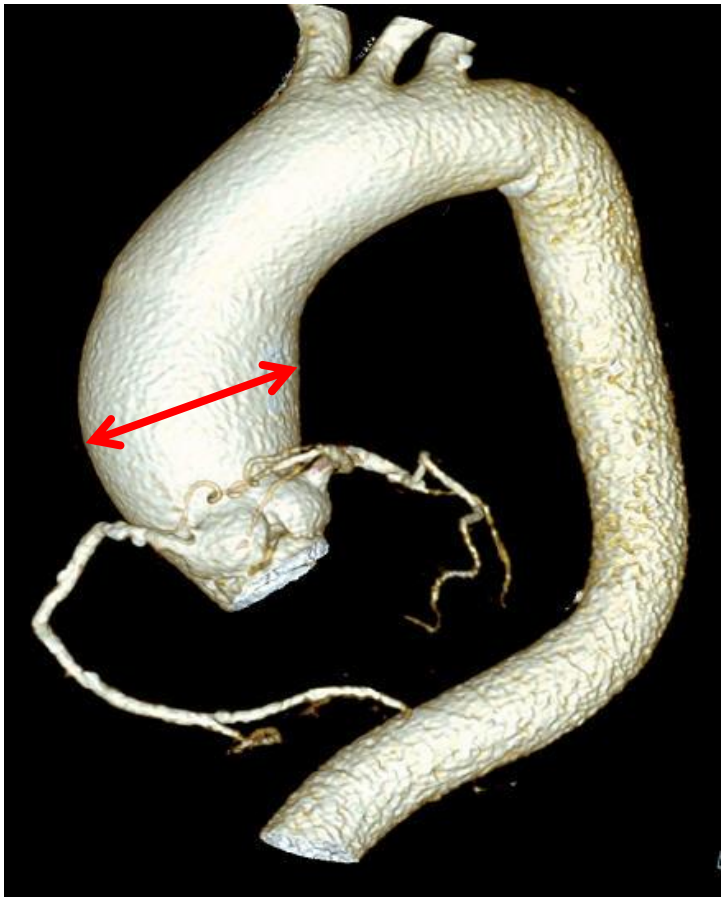
Conclusions: Although progressive ascending aortic dilatation after aortic valve replacement for bicuspid aortic valve is well documented, progressive dilatation of nonreplaced sinuses is not evident. Separate valve and graft repair remains a reasonable surgical option in the setting of aortic valve replacement for bicuspid aortic valve with ascending aortic dilatation provided the sinuses of Valsalva are not significantly enlarged. (J Thorac Cardiovasc Surg 2011;142:278-84)



Follow-up after intervention: how and when
" The Ascending Aorta Dilatation"




13/04/2007 09:58:39
FPS: 73.8
V
5
10
71
3:66 HR



Bicuspid Aortic Valve
Follow-up after intervention: how and when

After valvular surgery

- Aortic valve replacement
  - TTE < 3 months
    - Mechanical : if symptoms or LV dysfunction are present.
    - Biological : annually after the 5th y
- Aortic valve repair
  - T TE < 3 months and annually

Ascending aorta follow-up

- Ascending aorta 40-45mm TTE biannually

AA ≥ 45mm annually TTE (CT/MRI)

AA ≥ 50mm annually TTE and CT/MRI

After ascending aorta surgery

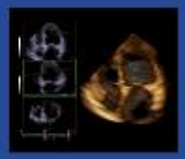
- Supracoronary tube graft CT/MRI < 3 months (?) and valve follow-up
- Bentall or David procedures (perioperative TEE)

TTE < 3 months y annually

CT/MRI < 3 months and at 3 years of follow-up

Follow-up after intervention: how and when

- Patients who undergo AVR for BAV require long term surveillance of the aortic root and ascending aorta by TTE.
- If the ascending aorta is not adequately visualized or the aortic root is not symmetrical, CT or MRI is recommended.
- When the aorta diameter is > 45mm by TTE a CT/MRI may be very useful to improve aorta enlargement measurement accuracy and for surgical indication.



EuroValve

Bicuspid Aortic Valve
Follow-up after intervention: how and when

- A 54-y-old man diagnosed of severe aortic stenosis due to BAV with tubular ascending aorta of 44mm. Mechanical valvular prosthesis was implanted.

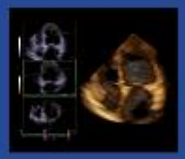
  What imaging follow-up do you recommend?

  1.- TTE every 3 y

  2.- MRI every 6 months

  3.- TTE yearly and CT/MRI every 3 y

  4.- TEE every year.



EuroValve