



The 31st Annual Meeting of the Association of Thoracic and Cardiovascular Surgeons of Asia (ATCSA) in conjunction with
The 2023 Workshop of International Society of Minimally Invasive Cardiac Surgery (ISMICS) &
The 9th Scientific Conference of Thoracic and Cardiovascular Surgery of Viet Nam (ATCSVN)

Ho Chi Minh City
16.-18. November 2023



Minimally Invasive Root Replacement

Martin Misfeld

HERZZENTRUM
LEIPZIG

University Department for Cardiac Surgery, Leipzig Heart Center
Department of Cardiothoracic Surgery, Royal Prince Alfred Hospital, Sydney



Co-Director of Research, Institute of Academic Surgery, RPAH
The Baird Institute of Applied Heart and Lung Surgical Research
Honorary Professor, Sydney Medical School, University of Sydney





Disclosures: none





„There is no reason not to perform aortic root procedures through a minimally invasive approach, if the surgeon feels comfortable with the procedure itself!“





Technical considerations >>> Dealing with limited access



- Modify sternotomy
- Modify cannulation strategy
- Modify X-clamp
- Modify LA- / LV-venting
- Use specific instruments



Indications

Dilemma!



Patient who may benefit the most from MIS >>> most difficult to operate!





Case Report





Technique

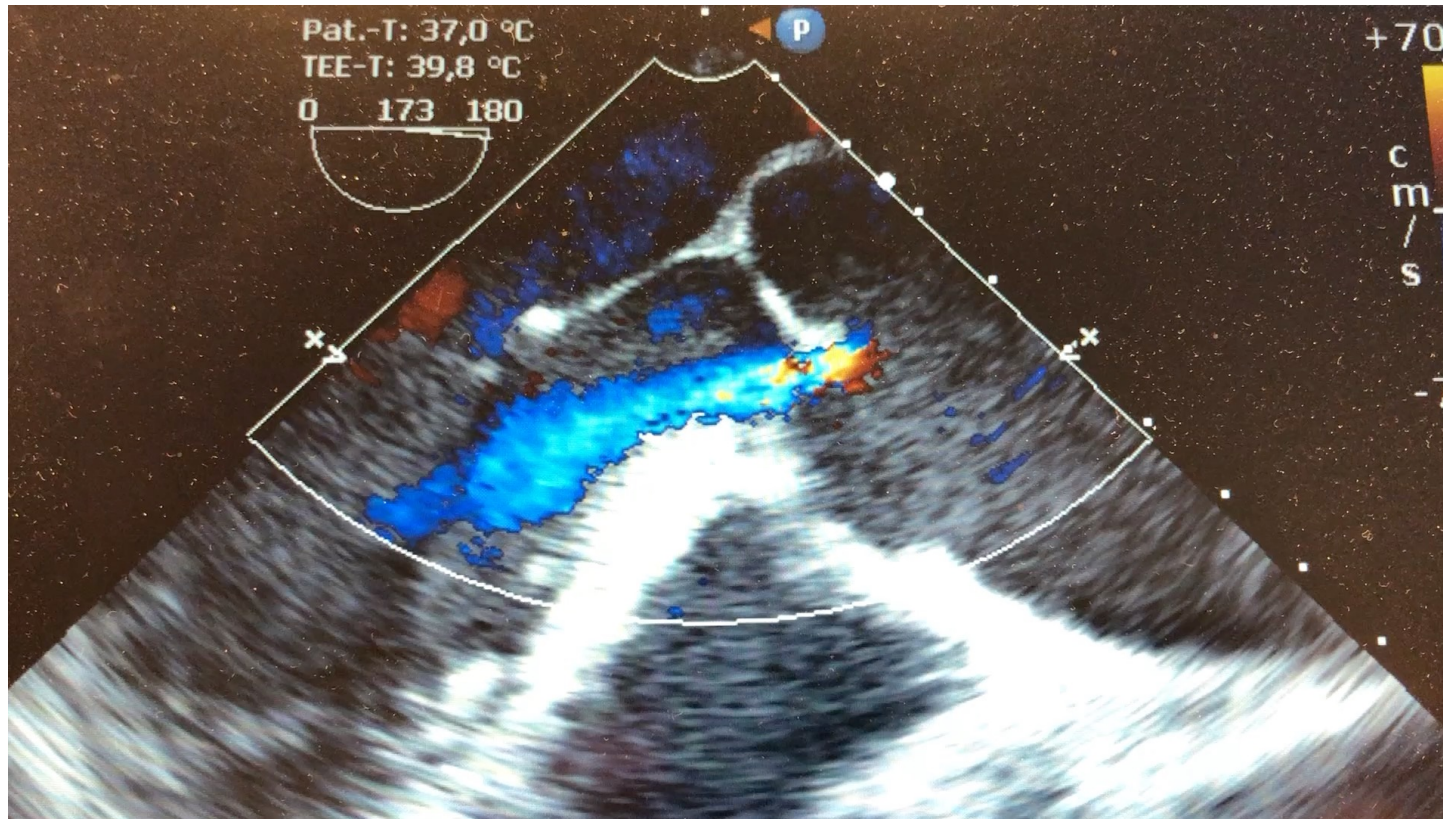
Patient history

- 73-year-old female patient
- Ascending aneurysm (54mm) with AR II°
- TR II°
- MR I-II°
- LV-EF 64%
- HLP
- CKI Std. II



Technique

Pre-OP echo





Operative Technique

- David procedure: 26mm Unigraft Sinusprosthesis
(Aesculap/BBraun, Tuttlingen, Germany)

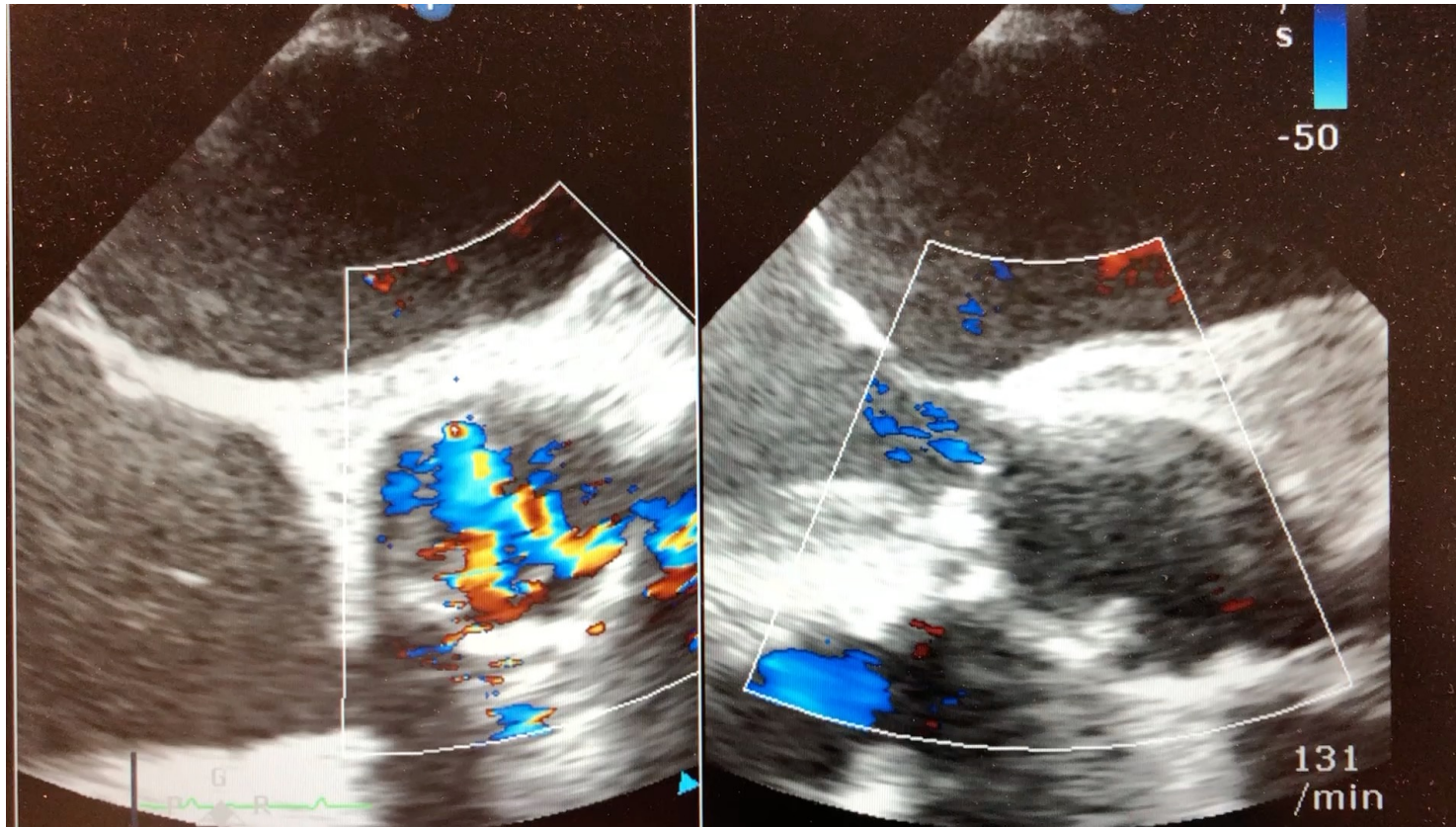
- Partial arch replacement: 26 mm Vascutek prosthesis
(Vascutek/Teruma, Inchinnan, UK)





Technique

Post-OP echo



Results

Featured Article

Minimally invasive valve sparing aortic root replacement (David procedure) is safe

Malakh Shrestha, Heike Krueger, Julia Umminger, Nurbol Koigeldiyev, Erik Beckmann, Axel Haverich, Andreas Martens

Division of Cardiothoracic, Transplantation and Vascular Surgery, Hannover Medical School, Hannover, Germany

Correspondence to: Prof. Dr. Malakh Shrestha, Division of Cardio-thoracic, Transplantation and Vascular Surgery, Hannover Medical School, Carl-Neuberg-Str. 1, 30625 Hannover, Germany. Email: shrestha.malakh.lal@mh-hannover.de.

Objective: Even though minimally invasive cardiac surgery may reduce morbidity, this approach is not routinely performed for aortic root replacements. The purpose of this pilot study was to assess the safety and feasibility of valve sparing aortic root replacement via an upper mini-sternotomy up to the 3rd intercostal space.

Methods: Between April 2011 and March 2014, 26 patients (22 males, age 47.6±13 years) underwent elective minimally invasive aortic valve sparing root replacement (David procedure, group A). Twelve patients underwent additional leaflet repair. Concomitant procedures were: four proximal aortic arch replacements and one coronary artery bypass grafting (CABG) to the proximal right coronary artery (RCA). During the same time period, 14 patients (ten males, age 64.2±9.5 years) underwent elective David procedure via median full sternotomy (group B). Concomitant procedures included six proximal aortic arch replacements. Although the patient cohorts were small, the results of these two groups were compared.

Results: In group A, there were no intra-operative conversions to full sternotomy. The aortic cross-clamp and cardiopulmonary bypass (CPB) times were 115.6±30.3 and 175.8±41.9 min, respectively. One patient was re-opened (via same access) due to post-operative bleeding. The post-operative ventilation time and hospital stay were 0.5±0.3 and 10.4±6.8 days, respectively. There was no 30-day mortality. The patient questionnaire showed that the convalescence time was approximately two weeks. In group B: the cross-clamp and CPB times were 114.1±19.9 and 163.0±24.5 min, respectively. One patient was re-opened (7.1%) due to post-operative bleeding. The post-operative ventilation time and hospital stay were 0.6±0.7 and 14.2±16.7 days, respectively. There was no 30-day mortality.

Conclusions: Minimally invasive valve sparing aortic root replacement can be safely performed in selected patients. The results are comparable to those operated via a full sternotomy. The key to success is a 'step by step' technique of moving from minimally invasive aortic valve replacements (AVR) to more demanding aortic root replacements. Meticulous hemostasis & attention to surgical details is of utmost importance to prevent perioperative complications.

- 26 pts Mini-David procedure
- vs.
- 14 pts David via full sternotomy

- 4 pts + partial arch
- 1 pt + CABG (RCA)
- mean age 64.2 +/-9.5 years

Results

Minimally invasive valve sparing aortic root replacement (David procedure) is safe

Malakh Shrestha, Heike Krueger, Julia Unminger, Nurbol Koigeldiyev, Erik Beckmann, Axel Haverich, Andreas Martens

Division of Cardiothoracic, Transplantation and Vascular Surgery, Hannover Medical School, Hannover, Germany
Correspondence to: Prof. Dr. Malakh Shrestha, Division of Cardiothoracic, Transplantation and Vascular Surgery, Hannover Medical School, Carl-Neuberg-Str. 1, 30627 Hannover, Germany. Email: shrestha.malakh@mh-hannover.de

Objective: Even though minimally invasive cardiac surgery may reduce morbidity, this approach is not routinely performed for aortic root replacement. The purpose of this pilot study was to assess the safety and feasibility of valve sparing aortic root replacement via an upper mini-sternotomy up to the 1st intercostal space.

Methods: Between April 2011 and March 2014, 26 patients (27 males, age 47.6±13 years) underwent elective minimally invasive aortic valve sparing root replacement (David procedure; group A). Twelve patients underwent additional leaflet repair. Concomitant procedures were: four proximal aortic arch replacement and one coronary artery bypass grafting (CABG) to the proximal right coronary artery (RCA). During the same time period, 14 patients (16 males, age 64.2±9.5 years) underwent elective David procedure via median full sternotomy (group B). Concomitant procedures included six proximal aortic arch replacement. Although the patient cohorts were small, the results of these two groups were compared.

Results: In group A, there were no intra-operative conversions to full sternotomy. The aortic cross-clamp and cardiopulmonary bypass (CPB) times were 115.6±30.3 and 175.8±41.9 min, respectively. One patient was re-operated (via same access) due to post-operative bleeding. The post-operative ventilation time and hospital stay were 6.2±0.3 and 10.6±0.8 days, respectively. There was no 30-day mortality. The patient questionnaire showed that the convalescence time was approximately two weeks. In group B, the cross-clamp and CPB times were 114.1±19.9 and 163.0±24.5 min, respectively. One patient was re-operated (7.1%) due to post-operative bleeding. The post-operative ventilation time and hospital stay were 6.6±0.7 and 14.3±1.6 days, respectively. There was no 30-day mortality.

Conclusions: Minimally invasive valve sparing aortic root replacement can be safely performed in selected patients. The results are comparable to those operated via a full sternotomy. The key to success is a "step by step" technique of moving from minimally invasive aortic valve replacement (AVR) to more demanding aortic root replacement. Meta-analytic homogeneity is essential to surgical details to avoid important to prevent postoperative complications.

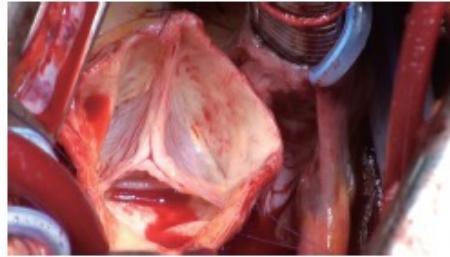


Figure 2 Inspection of the aortic valve showing three leaflets.

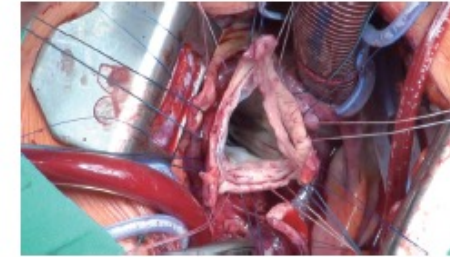


Figure 4 Twelve subvalvular Ethibond sutures placed to anchor the Dacron Prosthesis.

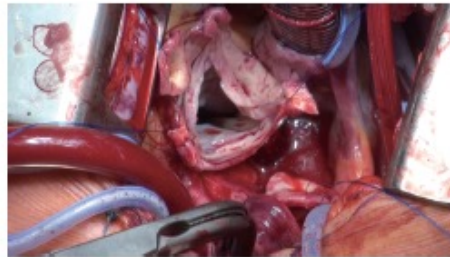


Figure 3 Mobilised aortic root with both ostia cut out as buttons.

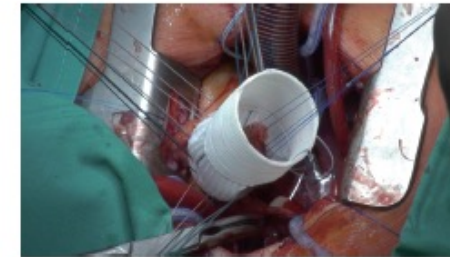


Figure 5 Dacron prosthesis being fixed with aortic valve inside it.

Table 2 Intra-operative data		
Parameter	Minimally invasive (n=26)	Full sternotomy (n=14)
Aortic cross-clamp time (minutes)	115.6±30.3	114.1±19.9
CPB time (minutes)	175.8±41.9	163±24.5

Re-thoracotomy for bleeding (n, %)	1 (3.2%)	1 (7.1%)
Stroke (n, %)	0 (0%)	0 (0%)
Acute renal failure; temp dialysis (n, %)	0 (0%)	0 (0%)
In hospital mortality (n, %)	0 (0%)	0 (0%)



Results

Successful Use of Sternal-Sparing Minimally Invasive Surgery for Proximal Ascending Aortic Pathology



Joseph Lamelas, MD, Peter C. Chen, MD, Gabriel Loor, MD, and Angelo LaPietra, MD

Department of Cardiothoracic Surgery, Baylor College of Medicine, CHI St. Luke's Health—Baylor St. Luke's Medical Center, Houston, Texas; Division of Cardiovascular Surgery, Texas Heart Institute, Houston, Texas; and Division of Cardiac Surgery, Mount Sinai Heart Institute, Miami Beach, Florida

Background. A sternal-sparing approach to surgery of the proximal aorta could decrease postoperative morbidity.

Methods. To determine the potential benefits of using a minimally invasive right thoracotomy approach for the treatment of ascending aortic pathology, we retrospectively reviewed our experience in patients who required circulatory arrest for the treatment of ascending aortic pathology (with or without aortic valve involvement) between January 2009 and November 2014 (N = 177). We compared baseline characteristics, intraoperative characteristics, and postoperative clinical outcomes between those who underwent a sternotomy (n = 103) and those who underwent a minimally invasive right thoracotomy approach (n = 74). All surgical procedures were performed by a single surgeon. Propensity score matching was performed to account for baseline differences between groups.

Results. More patients in the minimally invasive group had bicuspid aortic valve, degenerative aortic

valve, or aortic insufficiency than in the sternotomy group, but other baseline characteristics were similar between groups. No strokes occurred. In the unmatched cohort, 30-day mortality was 2.7% for the minimally invasive group compared with 1.9% for the sternotomy group ($p = 1.00$). In the propensity score-matched cohort, 30-day mortality was 3.2% for both groups; circulatory arrest times were longer in the minimally invasive group than in the sternotomy group ($p < 0.0001$), but the minimally invasive group had fewer red blood cell transfusions, shorter ventilation times, and shorter intensive care unit and hospital length of stay.

Conclusions. A sternal-sparing approach to surgery of the proximal aorta is safe when performed by an experienced surgeon and conserves hospital resources.

(Ann Thorac Surg 2018;106:742–9)
© 2018 by The Society of Thoracic Surgeons

- 74 pts with sternal-sparing MIS
- vs.
- 103 pts with full sternotomy
- Propensity score matching



Results

Successful Use of Sternal-Sparing Minimally Invasive Surgery for Proximal Ascending Aortic Pathology

Joseph Lamelas, MD, Peter C. Chen, MD, Gabriel Loor, MD, and Angelo LaPietra, MD
Department of Cardiothoracic Surgery, Baylor College of Medicine, CHI St. Luke's Health—Baylor St. Luke's Medical Center, Houston, Texas; Division of Cardiovascular Surgery, Texas Heart Institute, Houston, Texas; and Division of Cardiac Surgery, Mount Sinai Heart Institute, Miami Beach, Florida

Background. A sternal-sparing approach to surgery of the proximal aorta could decrease postoperative morbidity.

Methods. To determine the potential benefits of using a minimally invasive right thoracotomy approach for the treatment of ascending aortic pathology, we retrospectively reviewed our experience in patients who required circulatory arrest for the treatment of ascending aortic pathology (with or without aortic valve involvement) between January 2009 and November 2014 (N = 177). We compared baseline characteristics, intraoperative characteristics, and postoperative clinical outcomes between those who underwent a sternotomy (n = 103) and those who underwent a minimally invasive right thoracotomy approach (n = 74). All surgical procedures were performed by a single surgeon. Propensity score matching was performed to account for baseline differences between groups.

Results. More patients in the minimally invasive group had bicuspid aortic valve, degenerative aortic

valve, or aortic insufficiency than in the sternotomy group, but other baseline characteristics were similar between groups. No strokes occurred. In the unmatched cohort, 30-day mortality was 2.7% for the minimally invasive group compared with 1.9% for the sternotomy group (p = 1.00). In the propensity score-matched cohort, 30-day mortality was 3.2% for both groups; circulatory arrest times were longer in the minimally invasive group than in the sternotomy group (p < 0.0001), but the minimally invasive group had fewer red blood cell transfusions, shorter ventilation times, and shorter intensive care unit and hospital length of stay.

Conclusions. A sternal-sparing approach to surgery of the proximal aorta is safe when performed by an experienced surgeon and conserves hospital resources.

(Ann Thorac Surg 2018;106:742-9)
© 2018 by The Society of Thoracic Surgeons

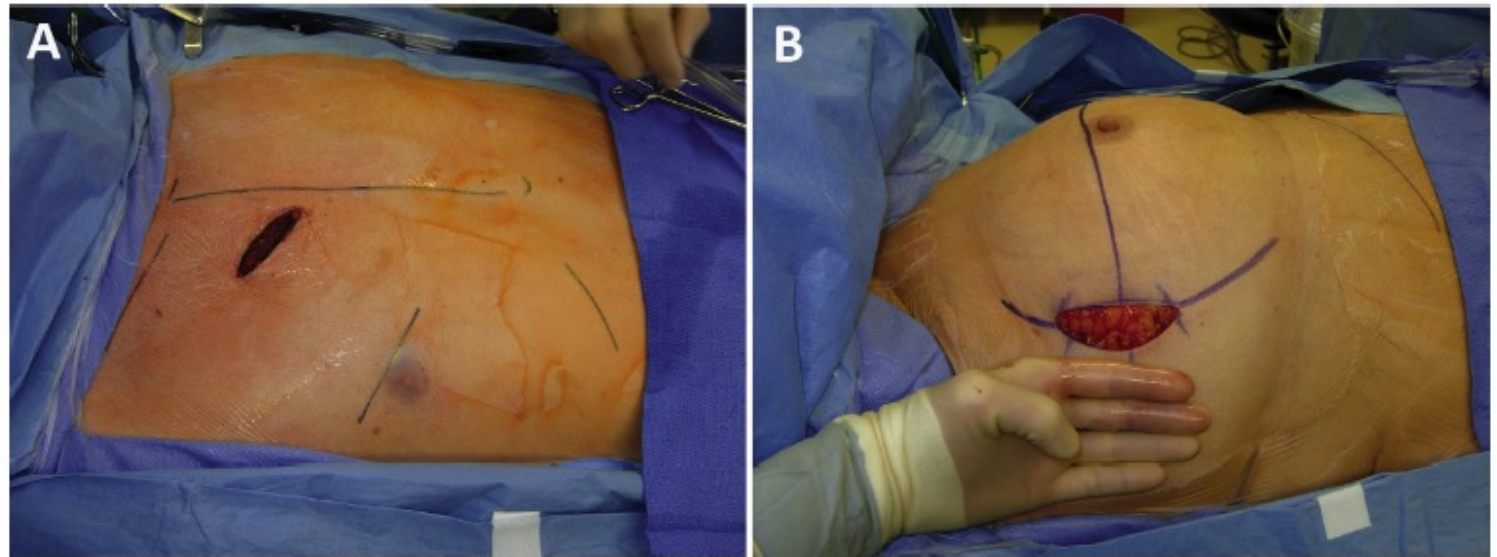


Fig 1. (A, B) Images showing a sternal-sparing minimally invasive mini right thoracotomy incision in 2 patients.

Results

Successful Use of Sternal-Sparing Minimally Invasive Surgery for Proximal Ascending Aortic Pathology

Joseph Lamelas, MD, Peter C. Chen, MD, Gabriel Loor, MD, and Angelo LaPietra, MD
 Department of Cardiothoracic Surgery, Baylor College of Medicine, CHH St. Luke's Health—Baylor St. Luke's Medical Center, Houston, Texas; Division of Cardiovascular Surgery, Texas Heart Institute, Houston, Texas; and Division of Cardiac Surgery, Mount Sinai Heart Institute, Miami Beach, Florida

Background. A sternal-sparing approach to surgery of the proximal aorta could decrease postoperative morbidity.

Methods. To determine the potential benefits of using a minimally invasive right thoracotomy approach for the treatment of ascending aortic pathology, we retrospectively reviewed our experience in patients who required circulatory arrest for the treatment of ascending aortic pathology (with or without aortic valve involvement) between January 2009 and November 2014 (N = 173). We compared baseline characteristics, intraoperative characteristics, and postoperative clinical outcomes between those who underwent a sternotomy (n = 103) and those who underwent a minimally invasive right thoracotomy approach (n = 74). All surgical procedures were performed by a single surgeon. Propensity score matching was performed to account for baseline differences between groups.

Results. More patients in the minimally invasive group had bicuspid aortic valve, degenerative aortic

valve, or aortic insufficiency than in the sternotomy group, but other baseline characteristics were similar between groups. No strokes occurred. In the unmatched cohort, 30-day mortality was 2.7% for the minimally invasive group compared with 1.9% for the sternotomy group (p = 1.00). In the propensity score-matched cohort, 30-day mortality was 2.2% for both groups; circulatory arrest times were longer in the minimally invasive group than in the sternotomy group (p < 0.0001), but the minimally invasive group had fewer red blood cell transfusions, shorter ventilation times, and shorter intensive care unit and hospital length of stay.

Conclusions. A sternal-sparing approach to surgery of the proximal aorta is safe when performed by an experienced surgeon and conserves hospital resources.

(Ann Thorac Surg 2018;106:742-9)
 © 2018 by The Society of Thoracic Surgeons

Table 2. Intraoperative Characteristics and Postoperative Outcomes

Operative Variable	Minimally Invasive (n = 74)	Sternotomy (n = 103)	p Value
Aortic cross-clamp time, minutes	141.0 (113.0–164.0)	128.0 (97.00–154.0)	0.008
Cardiopulmonary bypass time, minutes	183.0 (153.0–205.0)	178.0 (145.0–204.0)	0.49
Hypothermic circulatory arrest time, minutes	37.00 (33.00–43.00)	25.00 (20.00–35.00)	<0.0001
Sepsis	0 (0.0)	3 (2.9)	0.27
Reoperation for bleeding	0 (0.0)	5 (4.9)	0.08
Cerebrovascular accident	0 (0.0)	1 (1.0)	1.00
Renal failure	1 (1.4)	4 (3.9)	0.40
Development of atrial fibrillation	15 (20.3)	34 (33.0)	0.09
Hospital length of stay, days	5.00 (4.00–7.00)	7.00 (6.00–11.00)	<0.0001
30-day mortality	2 (2.7)	2 (1.9)	1.00



Results

Successful Use of Sternal-Sparing Minimally Invasive Surgery for Proximal Ascending Aortic Pathology

Joseph Lamelas, MD, Peter C. Chen, MD, Gabriel Loor, MD, and Angelo LaPietra, MD

Department of Cardiothoracic Surgery, Baylor College of Medicine, CHI St. Luke's Health—Raylor St. Luke's Medical Center, Houston, Texas; Division of Cardiovascular Surgery, Texas Heart Institute, Houston, Texas; and Division of Cardiac Surgery, Mount Sinai Heart Institute, Miami Beach, Florida

Background. A sternal-sparing approach to surgery of the proximal aorta could decrease postoperative morbidity.

Methods. To determine the potential benefits of using a minimally invasive right thoracotomy approach for the treatment of ascending aortic pathology, we retrospectively reviewed our experience in patients who required circulatory arrest for the treatment of ascending aortic pathology (with or without aortic valve involvement) between January 2009 and November 2014 (N = 177). We compared baseline characteristics, intraoperative characteristics, and postoperative clinical outcomes between those who underwent a sternotomy (n = 103) and those who underwent a minimally invasive right thoracotomy approach (n = 74). All surgical procedures were performed by a single surgeon. Propensity score matching was performed to account for baseline differences between groups.

Results. More patients in the minimally invasive group had bicuspid aortic valve, degenerative aortic

valve, or aortic insufficiency than in the sternotomy group, but other baseline characteristics were similar between groups. No strokes occurred. In the unmatched cohort, 30-day mortality was 2.7% for the minimally invasive group compared with 1.9% for the sternotomy group (p = 1.00). In the propensity score-matched cohort, 30-day mortality was 3.2% for both groups; circulatory arrest times were longer in the minimally invasive group than in the sternotomy group (p < 0.0001), but the minimally invasive group had fewer red blood cell transfusions, shorter ventilation times, and shorter intensive care unit and hospital length of stay.

Conclusions. A sternal-sparing approach to surgery of the proximal aorta is safe when performed by an experienced surgeon and conserves hospital resources.

(Ann Thorac Surg 2018;106:742-9)
© 2018 by The Society of Thoracic Surgeons

Table 4. Operative Results and Postoperative Outcomes in the Propensity Score–Matched Cohort

Operative Variable	Minimally Invasive (n = 63)	Sternotomy (n = 63)	p Value
Aortic cross-clamp time, minutes	141.0 (113.0–163.0)	132.0 (96.00–155.0)	0.057
Cardiopulmonary bypass time, minutes	178.0 (153.0–205.0)	177.0 (150.0–201.0)	0.72
Hypothermic circulatory arrest time, minutes	38.00 (33.00–43.00)	24.00 (19.00–30.00)	<0.0001
Number of units of packed red blood cells transfused	1.00 (0.00–3.00)	3.00 (2.00–5.00)	<0.0001
Ventilation time, hours	10.07 (3.83–18.22)	15.92 (7.10–21.75)	0.01
Prolonged intubation	10 (15.9)	13 (20.6)	0.65
Intensive care unit length of stay, hours	29.01 (22.44–70.37)	48.10 (39.55–90.35)	0.002
Intensive care unit readmission	2 (3.2)	2 (3.2)	1.00
Sepsis	0 (0.0)	2 (3.2)	0.50
Reoperation for bleeding	0 (0.0)	3 (4.8)	0.24
Cerebrovascular accident	0 (0.0)	0 (0.0)	n/a
Renal failure	1 (1.6)	4 (6.3)	0.36
Development of atrial fibrillation	14 (22.2)	22 (34.9)	0.17
Hospital length of stay, days	6.00 (4.00–7.00)	7.00 (6.00–11.00)	0.0008
30-day mortality	2 (3.2)	2 (3.2)	1.00

Data are presented as median (interquartile range) or n (%).



Results

European Journal of Cardio-Thoracic Surgery 53 (2018) 1258–1263
doi:10.1093/ejcts/ezx489 Advance Access publication 16 January 2018

ORIGINAL ARTICLE

Cite this article as: Monsefi N, Risteski P, Miskovic A, Zierer A, Moritz A. Propensity-matched comparison between minimally invasive and conventional sternotomy in aortic valve resuspension. Eur J Cardiothorac Surg 2018;53:1258–63.

Propensity-matched comparison between minimally invasive and conventional sternotomy in aortic valve resuspension[†]

Nadejda Monsefi^{a,*}, Petar Risteski^a, Aleksandra Miskovic^a, Andreas Zierer^b and Anton Moritz^a

^a Department of Thoracic and Cardiovascular Surgery, University Hospital Frankfurt am Main, Frankfurt am Main, Germany

^b Department of Thoracic and Cardiovascular Surgery, Kepler University Hospital, Linz, Austria

* Corresponding author. Department of Thoracic and Cardiovascular Surgery, University Hospital Frankfurt am Main, Theodor-Stern-Kai 7, 60590 Frankfurt am Main, Germany. Tel: +49-69-63015850; fax: +49-69 63015849; e-mail: nadi037@aol.com (N. Monsefi).

Received 12 September 2017; received in revised form 26 November 2017; accepted 2 December 2017

Abstract

OBJECTIVES: The aim of the study was to compare the results of David procedure through conventional or minimally invasive approach.

METHODS: A propensity-matched comparison in patients undergoing a minimally invasive (partial upper sternotomy, $n = 103$) or complete sternotomy ($n = 103$) David procedure from 1991 to 2016 was performed. Patients were 57 ± 14 years old on average in both groups. The David technique was modified by generating a neosinus ($P < 0.01$) in 99 (96%) patients (minimally invasive group) and in 42 (41%) patients (complete sternotomy group), respectively. The average follow-up time was 3 ± 2 years (minimally invasive group) and 8 ± 4 years (complete sternotomy group).

RESULTS: There was only 1 in-hospital death (in the full sternotomy group, $P = 0.5$). The applied quantity of packed red blood cells (pRBC) was significantly higher in the complete sternotomy group (3.4 ± 4 vs 1 ± 0.5 , $P < 0.01$). There were no late deaths in the minimally invasive group but 14 died during a longer follow-up period in the full sternotomy group ($P < 0.01$). Freedom from reoperation or aortic valve insufficiency $\geq 2^\circ$ was 95% vs 93% (minimally invasive versus complete sternotomy group) at 5 years and 95% vs 79% at 10 years ($P < 0.01$).

CONCLUSIONS: The minimally invasive aortic valve reimplantation procedure for selected patients with aortic root aneurysm and aortic valve incompetence is a durable procedure with minor valve-related morbidity and mortality at the mid-term follow-up. The intra- and perioperative application of pRBC was significantly lower in the minimally invasive group. However, comparison of long-term follow-up data in both groups is necessary to evaluate valve function.

- 103 pts with upper partial sternotomy
- vs.
- 103 pts with full sternotomy
- David procedures
- mean age 57 ± 14 years



Results

European Journal of Cardio-Thoracic Surgery 53(10)1258-1263
doi:10.1093/ejcts/ezw489 Advance Access publication 16 January 2018

Cite this article as: Moriseff M, Ritzke P, Mikolaj A, Ziere A, Mawla A. Propensity-matched comparison between minimally invasive and conventional sternotomy in aortic valve replacement. *Eur J Cardiothorac Surg* 2018;53:1258-63.

Propensity-matched comparison between minimally invasive and conventional sternotomy in aortic valve resuspension*

Nadžđa Moriseff¹*, Petar Ritzke², Aleksandra Mikolaj¹, Andreas Ziere³ and Anton Moritz⁴

¹ Department of Thoracic and Cardiovascular Surgery, University Hospital Frankfurt am Main, Frankfurt am Main, Germany
² Department of Thoracic and Cardiovascular Surgery, Leipzig University Hospital, Leipzig, Germany
³ Corresponding Author, Department of Thoracic and Cardiovascular Surgery, University Hospital Frankfurt am Main, Theodor Stern-Kai 7, 60596 Frankfurt am Main, Germany. Tel: +49-69-6317033; fax: +49-69-6317034; e-mail: nadzda@thorax.uni-frankfurt.de
 Received 11 September 2017; received in revised form 26 November 2017; accepted 6 December 2017

Abstract

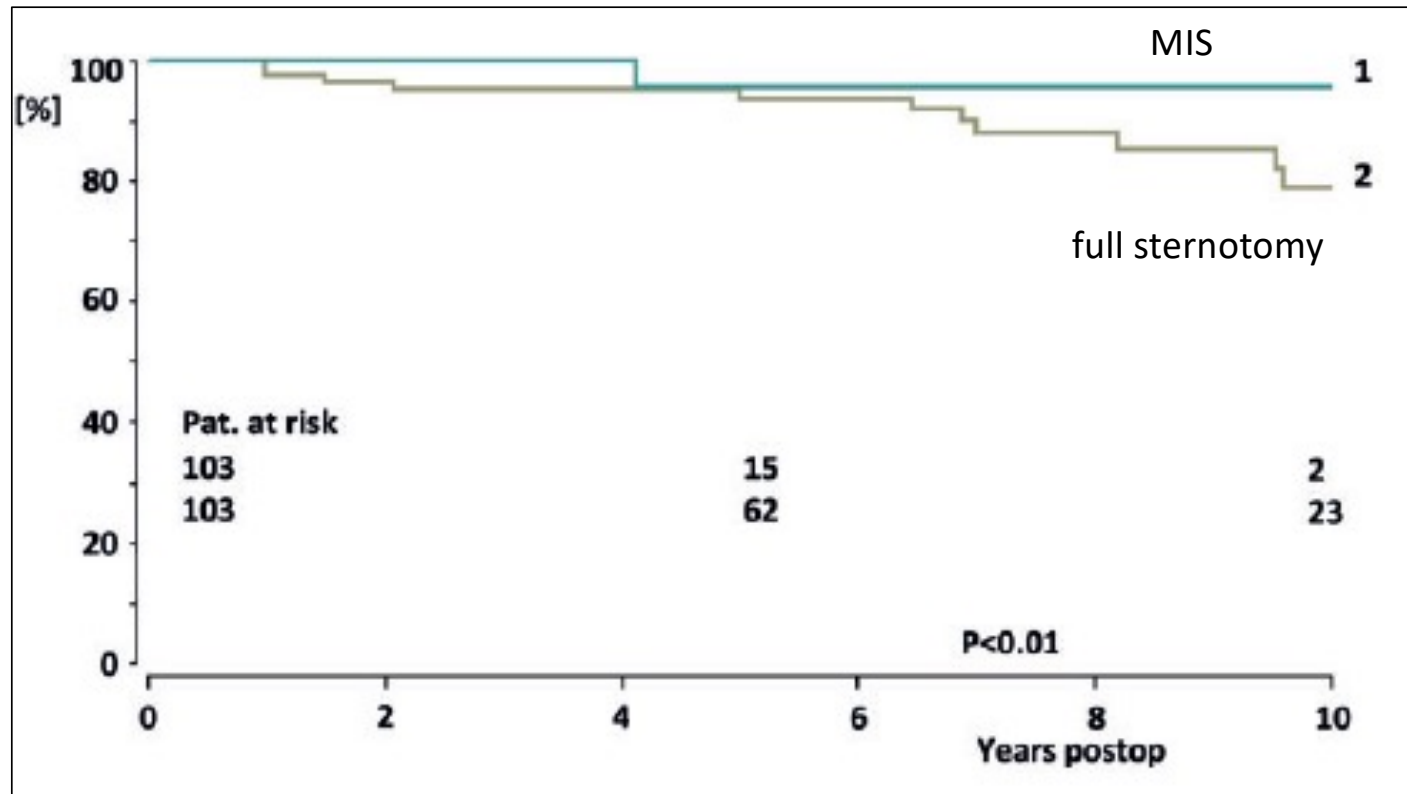
OBJECTIVES: The aim of the study was to compare the results of David procedure through conventional or minimally invasive approach.

METHODS: A propensity-matched comparison in patients undergoing a minimally invasive (partial upper sternotomy, n = 103) or complete sternotomy (n = 103) David procedure from 1995 to 2016 was performed. Patients were 57 ± 14 years old on average in both groups. The David technique was modified by generating a regurgitant (P < 0.01) in 99.06% patients (minimally invasive group) and in 42 (41% patients) complete sternotomy group, respectively. The average follow-up time was 3 ± 2 years (minimally invasive group) and 3 ± 4 years (complete sternotomy group).

RESULTS: There was only 1 in-hospital death in the full sternotomy group (P = 0.03). The applied quantity of packed red blood cells (pRBC) was significantly higher in the complete sternotomy group (14 ± 4 vs. 1 ± 0.5, P < 0.01). There were no late deaths in the minimally invasive group, but 1 died during a longer follow-up period in the full sternotomy group (P < 0.01). Freedom from reoperation or aortic valve insufficiency (2°) was 95% vs. 93% (minimally invasive versus complete sternotomy group) at 5 years and 95% vs. 79% at 10 years (P < 0.01).

CONCLUSIONS: The minimally invasive aortic valve resuspension procedure for selected patients with aortic root aneurysm and aortic valve incompetence is a feasible procedure with lower valve-related morbidity and mortality at the mid-term follow-up. The intra- and postoperative application of pRBC was significantly lower in the minimally invasive group. However, comparison of long-term follow-up data in both groups is necessary to evaluate valve function.

Freedom from reoperations or AR \geq II°



Results > Meta-analyses

Heart, Lung and Circulation (2018) xx, 1–11
1443-9506/04/\$36.00
<https://doi.org/10.1016/j.hlc.2018.10.023>

ORIGINAL ARTICLE

Minimally Invasive Versus Conventional Aortic Root Replacement – A Systematic Review and Meta-Analysis[☆]

Amer Harky, MBChB MRCS^{a*},
Jeffrey S.K. Chan^c, Chris H.M. W

^aDepartment of Vascular Surgery, Countess of Chester Hospital
^bDepartment of Cardiothoracic Surgery, Golden Jubilee National
^cFaculty of Medicine, The Chinese University of Hong Kong, S
^dManchester Royal Infirmary, Manchester, United Kingdom

Minimally Invasive Approaches to Surgical Aortic Valve Replacement: A Meta-Analysis

Check for updates

Carolyn Chang, BS, Sajjad Raza, MD, Salah E. Alta
Umesh M. Sharma, MD, MBA, Aisha Zia, MD, Mu
Mandy Neudecker, MS, Alan H. Markowitz, MD, J
Salil V. Deo, MD

School of Medicine, Case Western Reserve University, Cleveland, Ohio; Divi
University Hospitals Cleveland Medical Center, Cleveland, Ohio; Department
Jordan; Community Division of Hospital Medicine, Mayo Clinic Health Syst
Institute, Cleveland Clinic, Cleveland, Ohio; Division of Internal Medicine, C
Librarian, Core Library, University Hospitals Cleveland Medical Center, Cle

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

Minimally invasive aortic valve replacement (AVR) is increasingly used as an alternative to conventional AVR, despite limited randomized evidence available. To assess the evidence base, a systematic search identified 50 comparative studies with a total of 12,786 patients. A meta-analysis demonstrated that minimally invasive AVR is associated with reduced transfusion incidence, intensive care stay, hospitalization, and renal failure, and has a

mortality rate that is comparable to conventional AVR. The evidence quality was mostly very low. Given the inadequate statistical power and heterogeneity of available studies, prospective randomized trials are needed to assess the benefits and risks of minimally invasive AVR approaches.

(Ann Thorac Surg 2014;98:1499–511)
© 2014 by The Society of Thoracic Surgeons



Results

	Number of studies	Number of pts	Results
Phan K, et al. ATS 2014 MIS vs. full	50	12,786	MIS: ↓ transfusion, ↓ hospital length of stay, ↓ renal failure, ↓ mortality, ↑ ICU stay, = mortality
Harky A, et al. Heart Lung Circ 2018 MIS vs. full	8	2,700	↓ mortality, ↓ transfusion, ↓ ICU stay, ↓ clamp time, = OR time, = stroke, = bleeding
Chang C, et al. ATS 2018 MIS vs. RAT vs. full		> 10,000	MIS vs. RAT: = mortality, = stroke MIS/RAT vs. full: ↓ hospital stay

bias!!!



Results

> [Thorac Cardiovasc Surg.](#) 2023 Apr 11. doi: 10.1055/a-2041-3695. Online ahead of print.

Minimally Invasive versus Conventional Aortic Root Surgery: Results of an Intermediate-Volume Center

Mahmoud Elghannam¹, Dritan Useini¹, Vadim Moustafine¹, Matthias Bechtel¹,
Hamid Naraghi¹, Justus T Strauch¹, Peter Lukas Haldenwang¹

> [J Card Surg.](#) 2022 Dec;37(12):4732-4739. doi: 10.1111/jocs.17142. Epub 2022 Nov 15.

Comparison of minimally invasive versus conventional thoracic aortic operations: Early and midterm results in a series of 624 patients

Paolo Berretta¹, Giulia Chiuselli², Michele Galeazzi^{1,3}, Riccardo Codecasa², Jacopo Alfonsi¹,
Lucio Braconi², Olimpia Bifulco^{1,3}, Fabio Rapisarda², Pietro Giorgio Malvindi¹,
Massimo Bonacchi², Pierluigi Stefano², Marco Di Eusanio¹

Comparative Study > [J Card Surg.](#) 2020 Jul;35(7):1484-1491. doi: 10.1111/jocs.14628.

Epub 2020 May 22.

Minimally invasive aortic root surgery: Midterm results in a 2-year follow-up

Mahmoud Elghannam¹, Yazan Aljabery¹, Hamid Naraghi¹, Vadim Moustafine¹,
Matthias Bechte¹, Justus Strauch¹, Peter Haldenwang¹

> [Multimed Man Cardiothorac Surg.](#) 2022 Apr 5:2022. doi: 10.1510/mmcts.2022.016.

The Bio-Bentall procedure with concomitant hemiarch replacement through a right anterolateral minithoracotomy

Anastasiia Karadzha¹, Alexander Bogachev-Prokophiev¹, Ravil Sharifulin¹, Mikhail Ovcharov¹,
Alexey Pivkin¹, Alexander Afanasyev¹

> [Front Cardiovasc Med.](#) 2022 Mar 2:9:841472. doi: 10.3389/fcvm.2022.841472. eCollection 2022.

Mini-Invasive Bentall Procedure Performed via a Right Anterior Thoracotomy Approach With a Costochondral Cartilage Sparing

Qiang Ji¹, YuLin Wang¹, FangYu Liu¹, Ye Yang¹, Jun Li¹, XiaoNing Sun¹, ZhaoHua Yang¹,
Sun Pan¹, Hao Lai¹, ChunSheng Wang^{1,2}

> [J Thorac Dis.](#) 2021 Apr;13(4):2233-2241. doi: 10.21037/jtd-20-3254.

Mini-access open arch repair

Shi A Kim¹, Won Kyung Pyo¹, You Jung Ok¹, Ho Jin Kim¹, Joon Bum Kim¹

> [J Chest Surg.](#) 2021 Dec 5;54(6):554-557. doi: 10.5090/jcs.21.036.

Mini-Bentall Surgery: The Right Thoracotomy Approach

Manish Jawarkar¹, Pratik Manek¹, Vivek Wadhawa¹, Chirag Doshi¹



Results

C. Dettler
T. Deuse
D. H. Boehm
H. Reichenspurner
B. Reichart

Midterm Results and Quality of Life after Minimally Invasive vs. Conventional Aortic Valve Replacement

Abstract

Background: This study compares early and mid-term results as well as the quality of life (QoL) between the minimally invasive and conventional aortic valve replacement (AVR). **Methods:** Between 7/97 and 4/01, 70 patients (mean age 64.3 ± 1.3 years) underwent minimally invasive AVR (group M) through an L-shaped ministernotomy. The results were compared to those of 70 conventional AVR (group C) patients during the same period. Patients were equally matched according to age, sex, ejection fraction, valvular lesion, and valve prosthesis. In groups M and C, follow-up was 98.5% and 95.4% complete and averaged 34.0 ± 10.3 and 33.1 ± 12.9 months, respectively. **Results:** There were no hospital deaths in group M but two deaths in group C ($p = n.s.$). Conversion to full sternotomy was necessary in two group M patients. Cross-clamping time (71 ± 15 min vs. 58 ± 18 min), cardiopulmonary bypass time (105 ± 22 min vs. 84 ± 24 min), and

time of surgery (228 ± 45 min vs. 184 ± 48 min) were significantly longer in group M. No statistically significant differences between the two groups for postoperative ventilation time, transfusion rate, ICU stay or length of hospital stay were recorded. At the end of follow-up, 98.5% vs. 96.9% of the patients were free of thromboembolism ($p = n.s.$), 100.0% vs. 96.9% were free of endocarditis ($p = n.s.$), and 98.5% vs. 100.0% were free of reoperation ($p = n.s.$) in group M compared to group C. Survival was 97.0% vs. 91.9% ($p = n.s.$). No differences in any of the 8 QoL categories, in patient satisfaction with the operative result or in judgment of the cosmetic aspect were noted among groups. **Conclusions:** This study has failed to show any advantage of minimally invasive AVR in early or midterm follow-up.

Key words

Minimally invasive - aortic valve surgery - quality of life

Original Cardiovascular

337

Table 2 Intraoperative data

Variable	Partial sternotomy	Total sternotomy	p
Surgery time (min)	228 ± 45	184 ± 48	<0.001
CPB time (min)	105 ± 22	84 ± 24	<0.001
Cross-clamping time (min)	71 ± 15	58 ± 18	<0.001
Aortic prosthesis (n)	n. s.		
– Xenograft	40	36	
– Mechanical prosthesis	30	34	
Prosthesis diameter (mm)	22.1 ± 1.9	22.5 ± 2.3	n. s.

CPB, Cardiopulmonary bypass

Table 5 Follow-up

Variable	Partial sternotomy	Total sternotomy	p
Follow-up of survivors	67/68 (98.5%)	62/65 (95.4%)	n. s.
Follow-up time (months)	34.0 ± 10.3	33.1 ± 12.9	n. s.
Dyspnea on exertion	25.4%	21.0%	n. s.
Freedom of thromboembolism	98.5%	96.9%	n. s.
Freedom of endocarditis	100.0%	96.9%	n. s.
Freedom of redo-operation	98.5%	100%	n. s.
Midterm mortality	2 (2.9%)	3 (4.3%)	n. s.



Conclusions - Minimally invasive root replacement



- Patients selection is the key!
- Operative setup and technique may have to be modified
- Equal clinical results to full sternotomy
- *No clear advantage compared to full sternotomy!*



Leipzig Heart Center



martinmisfeld@yahoo.com

