Minimally Invasive Mitral Valve Surgery: When & Why?

Alireza A. Ghavidel MD
Professor of Cardiac Surgery
Rajaie cardiovascular Medical & Research Center, Tehran

Nothing for declare

Minimally invasive mitral surgery

- Is this type of surgery safe?
- Why should I change from conventional surgery to mini approaches?
- What are the indications and contra-indications of this minimally invasive approach?
- Are all mitral valve patients' good candidates for this approach?
- Dedicated team to enhance safety efficacy and reproducibility

A Good procedure?

Minimally Invasive Valve Surgery

All valve patients are potential candidates

Same indications

- Myxomatous or Degenerative Disease
- Ischemic
- Rheumatic

Same techniques

- Leaflet Resection
- Gortex Cord Reconstruction
- Annuloplasty Band

Same Prosthesis

Valve or ring

- Tissue valve/ mechanical
- Rigid/ flexible

Different Technologies

Thoracoscopic

Robotic

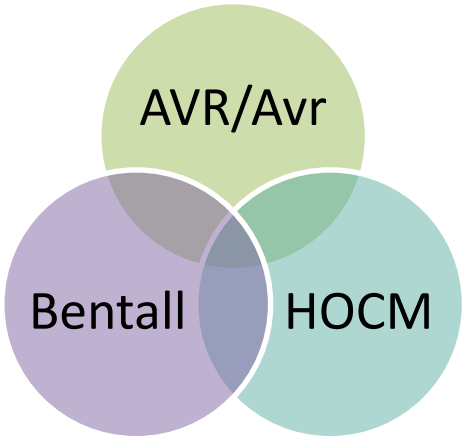
Direct Vision

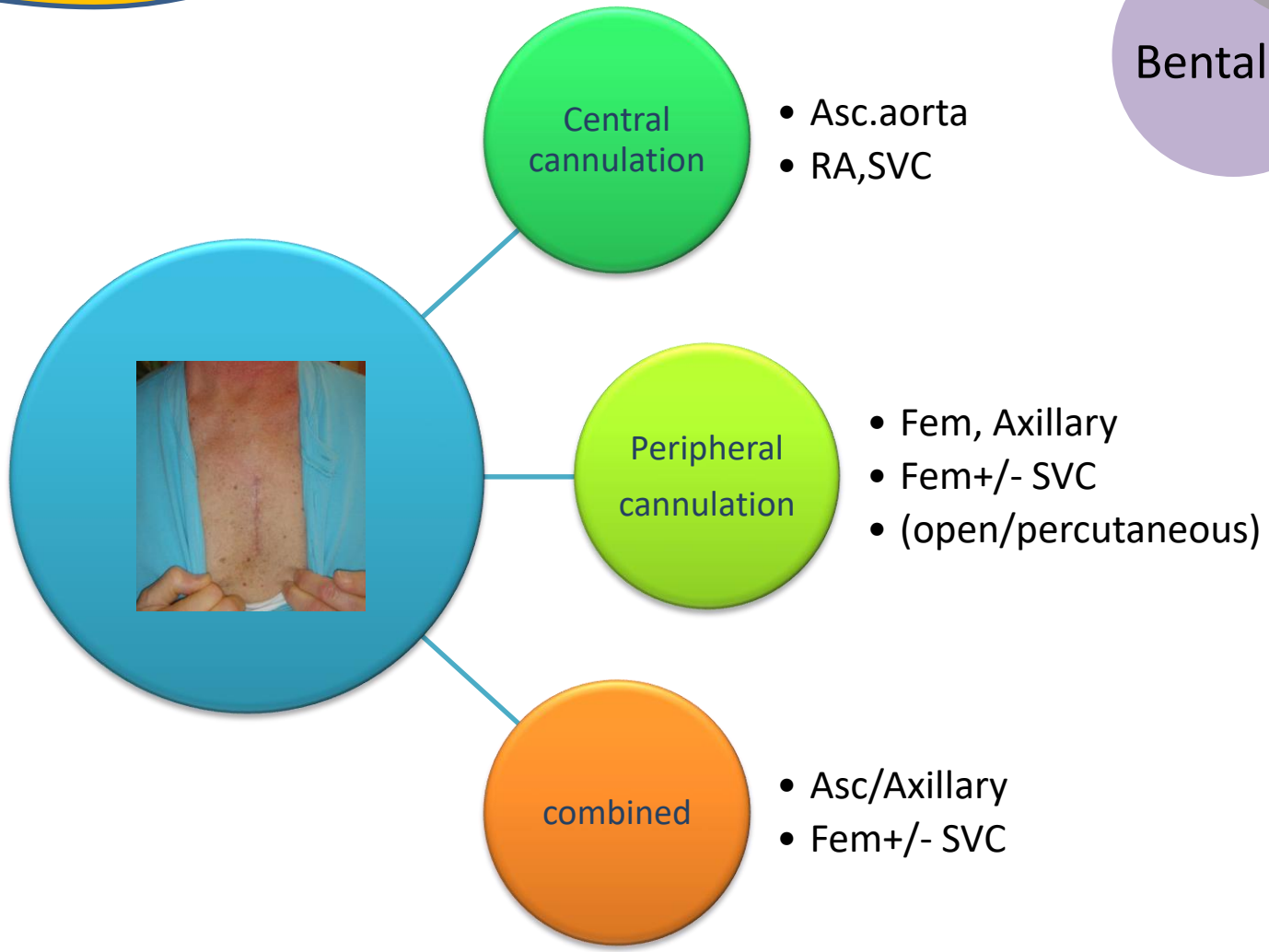
Same Operation

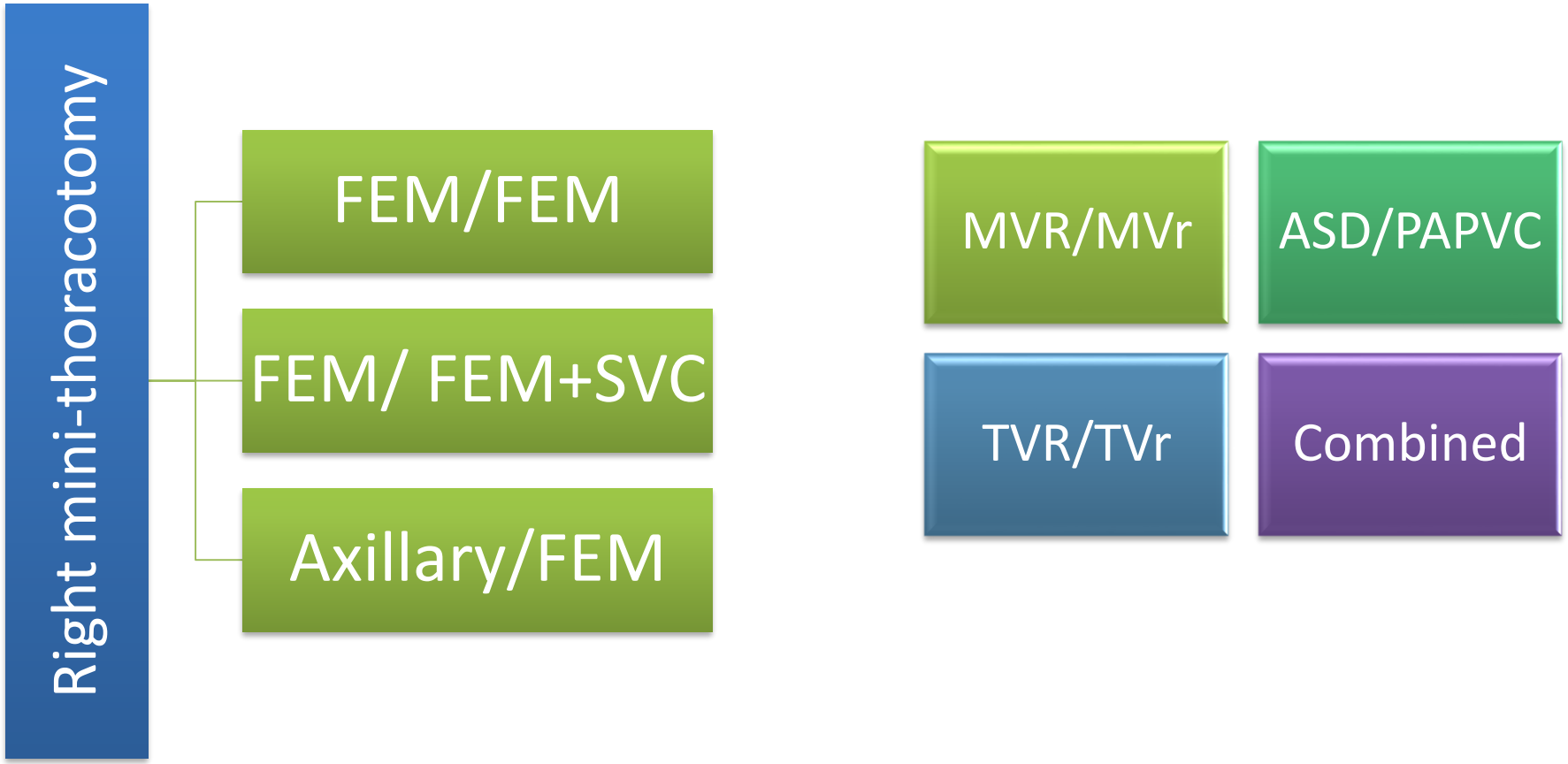
Different Tools

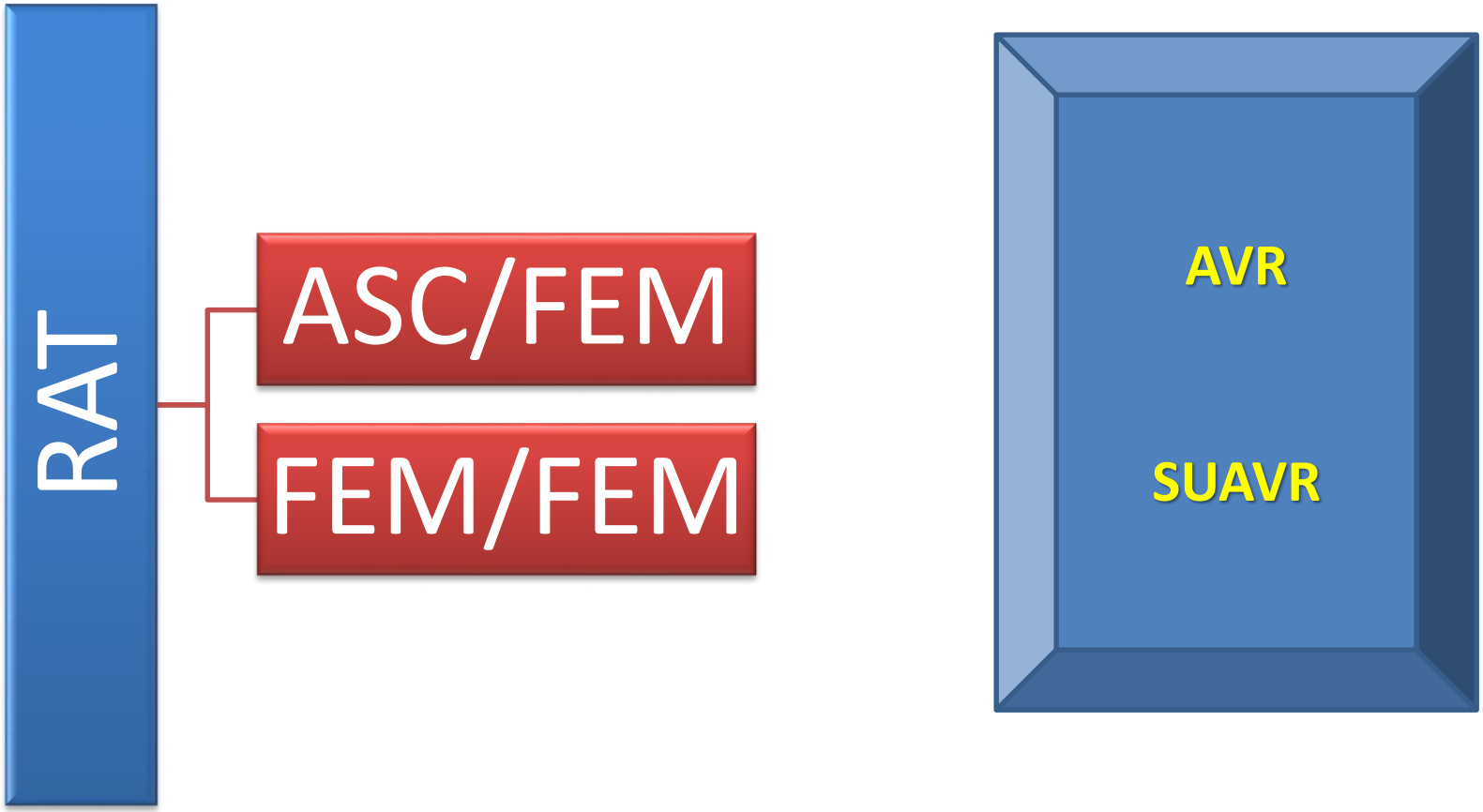
Different surgical approaches

Mini-sternotomy

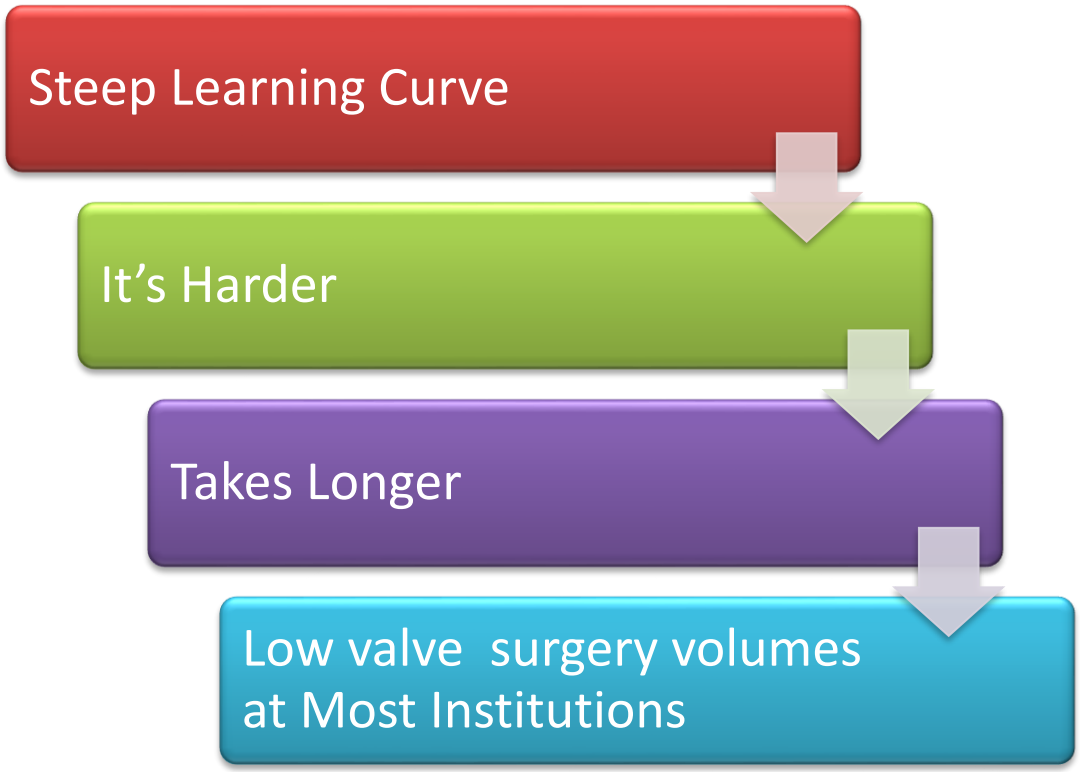





Right mini-thoracotomy
FEM/FEM
FEM/ FEM+SVC
Axillary/FEM
MVR/MVr
ASD/PAPVC
TVR/TVr
Combined


RAT
ASC/FEM
FEM/FEM
AVR
SUAVR

Why do Few Surgeons Perform Minimally Invasive Surgery?



Minimally Invasive Versus Conventional Open Mitral Valve Surgery

A Meta-Analysis and Systematic Review

Davy C. H. Cheng, MD, Janet Martin, PharmD, MSc (HTA&M),*† Avtar Lal, MD, PhD,* Anno Diegeler, MD, PhD,‡ Thierry A. Folliguet, MD,§ L. Wiley Nifong, MD,‖ Patrick Perier, MD,‡ Ehud Raanani, MD,¶ J. Michael Smith, MD,# Joerg Seeburger, MD,** and Volkmar Falk, MD††*

Innovations • Volume 6, Number 2, March/April 2011

35 studies
2 RCT

Decrease	Bleeding,
	Blood product transfusion,
	Atrial fibrillation,
	Sternal wound infection,
	Ventilation time,
	ICU stay,
	Hospital length of stay,
	Time to return to normal activity

Increase

- Cross-clamp, CPB, and procedure time
- Aortic dissection or aortic injury,
- phrenic nerve palsy,
- Groin infections/complications,
- Risk of stroke,

Ann Cardiothorac Surg 2013;2(6):693-703

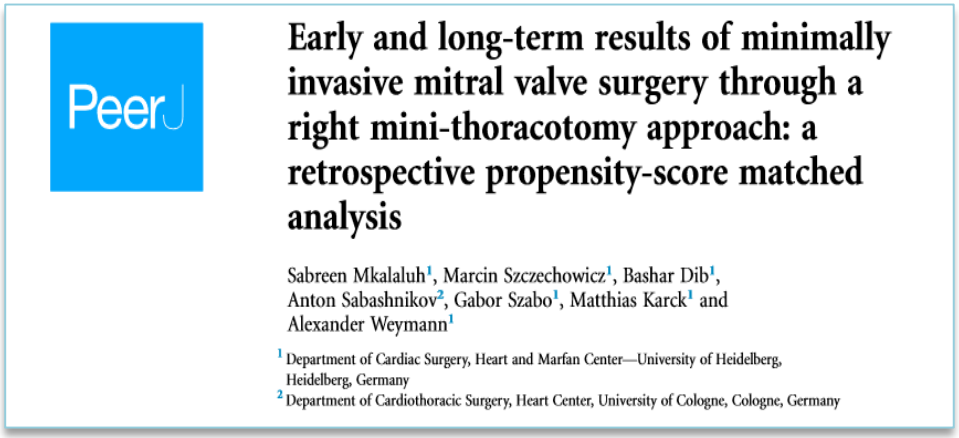
Systematic Review

A meta-analysis of minimally invasive versus conventional mitral valve repair for patients with degenerative mitral disease

Christopher Cao[1], Sunil Gupta[1], David Chandrakumar[1], Thomas A. Nienaber[1], Praveen Indraratna[1], Su C. Ang[1], Kevin Phan[1,2], Tristan D. Yan[1,2]

[1]The Collaborative Research (CORE) Group, Macquarie University, Sydney, Australia; [2]The Royal Prince Alfred Hospital, Sydney University, Sydney, Australia

no significant differences between the two surgical techniques in regards to clinical outcomes



PeerJ

Early and long-term results of minimally invasive mitral valve surgery through a right mini-thoracotomy approach: a retrospective propensity-score matched analysis

Sabreen Mkalaluh[1], Marcin Szczechowicz[1], Bashar Dib[1], Anton Sabashnikov[2], Gabor Szabo[1], Matthias Karck[1] and Alexander Weymann[1]

[1] Department of Cardiac Surgery, Heart and Marfan Center—University of Heidelberg, Heidelberg, Germany
[2] Department of Cardiothoracic Surgery, Heart Center, University of Cologne, Cologne, Germany

Mkalaluh et al. (2018), PeerJ, DOI 10.771

Between 2000 and 2016, a total of 669 isolated mitral valve procedures

Despite **prolonged** cardiopulmonary bypass and cross-clamping times, the minimally invasive MVS may be considered a **safe** approach that is equivalent to standard median sternotomy with **lower** early mortality and **superior** long-term survival

The Minithoracotomy Approach: A Safe and Effective Alternative for Heart Valve Surgery

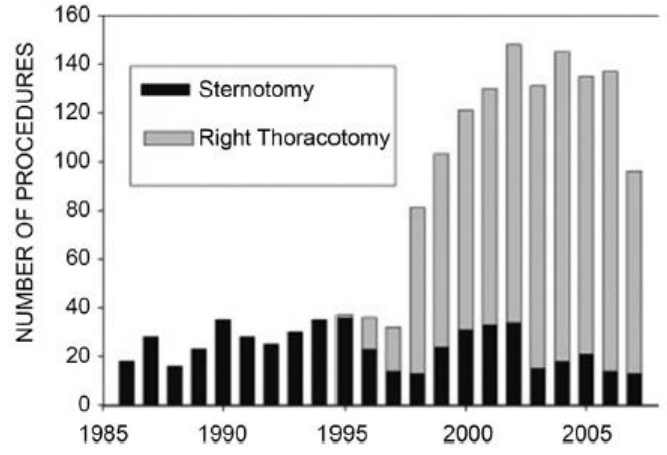
Giovanni Mariscalco, MD, PhD, and Francesco Musumeci, MD

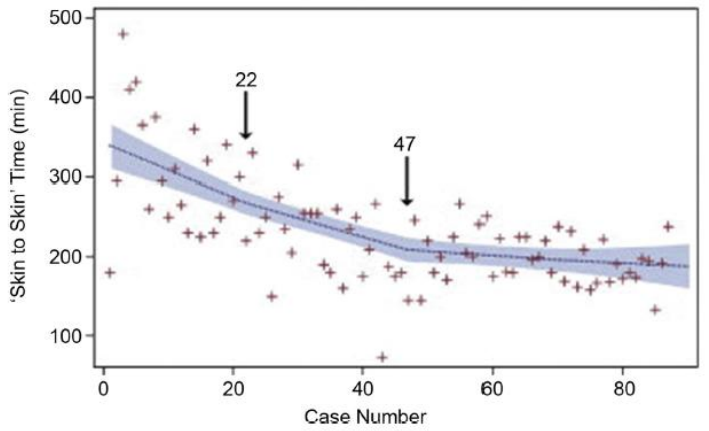
Department of Heart and Vessels, Cardiac Surgery Unit, Varese University Hospital, Varese; and Department of Cardiac Surgery and Transplantation, S. Camillo Hospital, Rome, Italy

Despite criticisms over the last d g associated with reduced morbidity through right anterior min benefits include less pain, faster excellent short-term and long- nd better cosmetic results. As a a feasible and popular alter asingly used as a routine approach proach. The rapid developme aortic and mitral valve surgery. niques have led to MT valve s effective, and durable. Minithor (Ann Thorac Surg 2014;97:356–64) strated to be a valid cost-effective and cost-saving strategy

© 2014 by The Society of Thoracic Surgeons

No differences in Mortality or MACCE





Featured Article

Ann Cardiothorac Surg 2013;2(6):744-750

Minimally invasive mitral valve surgery: "The Leipzig experience"

Piroze M. Davierwala, Joerg Seeburger, Bettina Pfannmueller, Jens Garbade, Martin Misfeld, Michael A. Borger, Friedrich W. Mohr

Department of Cardiac Surgery, Heart Center, University of Leipzig, Leipzig, Germany

Corresponding to: Dr. Piroze M. Davierwala. Herzzentrum Leipzig, Struempellstraße 39, 04289 Leipzig, Germany. Email: pirarm@hotmail.com.

Minimally invasive MVr can be performed safely and effectively with very few perioperative complications.

The **early and long-term outcomes** in these patients are acceptable

Minimally invasive mitral valve surgery provides excellent outcomes without increased cost: A multi-institutional analysis

Emily A. Downs, MD[1], **Lily Johnston, MD, MPH**[1], **Damien J. LaPar, MD, MSc**[1], **Ravi K. Ghanta, MD**[1], **Irving L. Kron, MD**[1], **Alan M. Speir, MD**[2], **Clifford E. Fonner, BA**[3], **John A. Kern, MD**[1], and **Gorav Ailawadi, MD**[1]

[1]University of Virginia, Department of Surgery, Division of Thoracic and Cardiovascular Surgery, P.O. Box 800679, Charlottesville, VA 22908

[2]Cardiovascular and Thoracic Associates, Inova Heart and Vascular Institute, 2921 Telestar Court, Falls Church, VA 22042

[3]Virginia Cardiac Surgery Quality Initiative, Charlottesville, VA

Ann Thorac Surg. 2016 July ; 102(1): 14–21. doi:10.1016/j.athoracsur.2016.01.084.

In summary, minimally invasive mitral surgery in select patients can provide superior outcomes without increased cost

Compared to conventional sternotomy, mini-MVR in the **"real world"** demonstrated no differences in major morbidity, but was associated with shorter length of stay and fewer transfusion

Minimally invasive mitral valve surgery is associated with excellent resource utilization, cost, and outcomes

Robert B. Hawkins, MD, MSc, J. Hunter Mehaffey, MD, MSc, Samuel M. Kessel, BSBME, Jolian J. Dahl, MD, Irving L. Kron, MD, John A. Kern, MD, Leora T. Yarboro, MD, and Gorav Ailawadi, MD

J Thoracic Cardiovasc Surg 2018:156:611-6

Conclusions: In a real-world cohort, mini-MVR continues to demonstrate excellent results with a favorable resource utilization profile. Greater surgical and implant costs with mini-MVR are offset by decreased transfusions and ancillary needs leading to equivalent overall hospital cost. (J Thorac Cardiovasc Surg 2018;156:611-6)

Excellent results , same Cost

Qiu *et al. Journal of Cardiothoracic Surgery* (2018) 13:29
https://doi.org/10.1186/s13019-018-0719-4

Journal of
Cardiothoracic Surgery

RESEARCH ARTICLE Open Access

Does full sternotomy have more significant impact than the cardiopulmonary bypass time in patients of mitral valve surgery?

Zhibing Qiu, Xin Chen*, Yueyue Xu, Fuhua Huang, Liqiong Xiao, Ting Yang and Li Yin

1120 isolated MV surgery

(Continued from previous page)

Conclusion: Within that portion of the spectrum of mitral valve surgery in which propensity matching was possible, minimally invasive mitral valve surgery has cosmetic, blood product use, and respiratory advantages over conventional surgery, and no apparent detriments. However, minimally invasive mitral valve surgery required a slightly longer cardiopulmonary bypass time and cross-clamp time. Minimally invasive mitral valve surgery represents a safe and effective surgical technique that we believe should be used more routinely in the surgical management of mitral valve disease. MIMVS provides equally durable midterm results as the standard sternotomy approach.

Keywords: Minimally invasive, Mitral valve surgery, Sternotomy

doi:10.1510/icvts.2008.180182

INTERACTIVE CARDIOVASCULAR AND THORACIC SURGERY

Interactive CardioVascular and Thoracic Surgery 7 (2008) 678-683

www.icvts.org

Best evidence topic - Valves

Is a port-access mitral valve repair superior to the sternotomy approach in accelerating postoperative recovery?

Lydia Richardson[a,*], Michael Richardson[b], Steven Hunter[c]

[a]*Medical Student, Brighton and Sussex Medical School, Brighton, East Sussex, UK*
[b]*General Practitioner, Hadleigh House Surgery, The Kirkway, Broadstone, Dorset, UK*
[c]*Department of Cardiothoracic Surgery, James Cook University Hospital, Middlesbrough, UK*

Received 18 March 2008; received in revised form 27 March 2008; accepted 31 March 2008

13
Non-radomozed studies

Quality of Life After Early Mitral Valve Repair Using Conventional and Robotic Approaches

Rakesh M. Suri, MD, DPhil, Ryan M. Antiel, MA, Harold M. Burkhart, MD, Marianne Huebner, PhD, Zhuo Li, MS, David T. Eton, PhD, Tali Topilsky, PhD, Maurice E. Sarano, MD, and Hartzell V. Schaff, MD

Division of Cardiovascular Surgery, Mayo Medical School, Division of Biomedical Statistics and Informatics, Division of Health Care Policy and Research, Department of Health Sciences Research, and Division of Cardiovascular Diseases, Mayo Clinic, Rochester, Minnesota

Background. Early mitral valve (MV) repair of degenerative mitral regurgitation is associated with superior clinical outcomes compared with prosthetic replacement and restores normal life expectancy, even in those without symptoms. Although current guidelines recommend prompt referral for effective MV repair in those with severe mitral regurgitation, some are reluctant to pursue early correction due to the perception that short-term quality of life (QOL) may be adversely affected by the operation.

Methods. Between January 2008 and November 2009, 202 patients underwent conventional transsternotomy or minimally invasive port-access robot-assisted MV repair, with or without patent foramen ovale closure or left Maze, and were mailed a postsurgical QOL survey.

Results. Unadjusted QOL scores for patients undergoing MV repair were excellent early after the operation using both approaches. Robotic repair was associated with slightly improved scores on the Duke Activity Status Index, the Short Form-12 Item Health Survey Physical domain, and the Linear Analogue Self-Assessment frequency of chest pain and fatigue indices during the first postoperative year; however, differences between treatment groups became indistinguishable after 1 year. Robotic repair patients returned to work slightly

Conclusions. Functional QOL outcomes within the first 2 years after early MV repair are excellent using open and robotic platforms. A robotic approach may be associated with slightly improved early QOL and return to employment-based activities. These results may have implications regarding future evolution of clinical guidelines and economic health care policy.

(Ann Thorac Surg 2012;93:761–9)

© 2012 by The Society of Thoracic Surgeons

Giuseppe Speziale, MD,[a] Giuseppe Nasso, MD,[a] Giampiero Esposito, MD,[b] Massimiliano Conte, MD,[b] Ernesto Greco, MD,[c] Khalil Fattouch, MD,[d] Flavio Fiore, MD,[a] Mauro Del Giglio, MD,[e] Roberto Coppola, MD,[a] and Luigi Tavazzi, MD[e]

Objective: The results of mitral repair for complex Barlow valves are adequate and support earlier intervention. It is unknown whether these results are reproducible in the context of minimally invasive surgery via right minithoracotomy.

Methods: We randomized patients with Barlow mitral disease (bileaflet prolapse) to have conventional open repair via median sternotomy (MS group) or minimally invasive (MI group) repair. Repair was done using polytetrafluoroethylene chordal reimplantation for both leaflets. In the MI group, we adopted right minithora-

The minimally invasive technique can be proposed for complex mitral disease and early referral of these patients can be encouraged

Conclusions: Our data indicate that the optimal standard-of-care results of mitral repair for complex disease (Barlow) are reproducible in the minimally invasive settings through right minithoracotomy and direct vision. The minimally invasive technique can be proposed for complex mitral disease and early referral of these patients can be encouraged. (J Thorac Cardiovasc Surg 2011;142:77-83)

Late outcome

One thousand minimally invasive mitral valve operations: Early outcomes, late outcomes, and echocardiographic follow-up

R. Scott McClure, MD, SM, FRCSC, Leonidas V. Athanasopoulos, MD, PhD, Siobhan McGurk, MSc, Michael J. Davidson, MD, Gregory S. Couper, MD, and Lawrence H. Cohn, MD

Objective: The present study assessed the clinical and echocardiographic outcomes for 1000 patients undergoing minimally invasive mitral valve surgery.

Methods: The Brigham Cardiac Valve database was reviewed. From August 1996 to November 2011, 1000 patients had undergone minimally invasive mitral valve surgery (median follow-up, 7 years). Data on the surgical approach, complications, reoperations, and late survival were tabulated. Late echocardiographic data on the recurrence of mitral regurgitation after mitral repair in myxomatous disease were also collected. Survival, freedom from reoperation and recurrent mitral regurgitation (grade $\geq$ 3+) were evaluated with life tables and Kaplan-Meier analyses.

Results: The mean patient age was 57 years. Of the 1000 patients, 41% were women. Myxomatous degenerative disease was the predominant pathologic entity (86%). A lower hemisternotomy was the predominant surgical approach (75%). Mitral repair was performed in 923 patients and replacement in 77. Eight operative deaths (0.8%) occurred. A total of 44 patients with failed mitral repairs underwent reoperation, with 1 mitral valve replaced again on the same operative day for atrioventricular groove disruption. Nine failed repairs were repaired again (9/44 [20%]). A total of 106 late deaths occurred. The overall survival at 15 years was 79% $\pm$ 3%. Freedom from reoperation at 15 years was 90% $\pm$ 3% for repairs and 100% for replacements. Late echocardiograms were acquired for 615 of 815 eligible mitral repair patients with myxomatous disease (75%). Freedom from recurrent mitral regurgitation (grade $\geq$ 3+) at 1, 5, and 10 years was 99% $\pm$ 1%, 87% $\pm$ 2%, and 69% $\pm$ 4%, respectively.

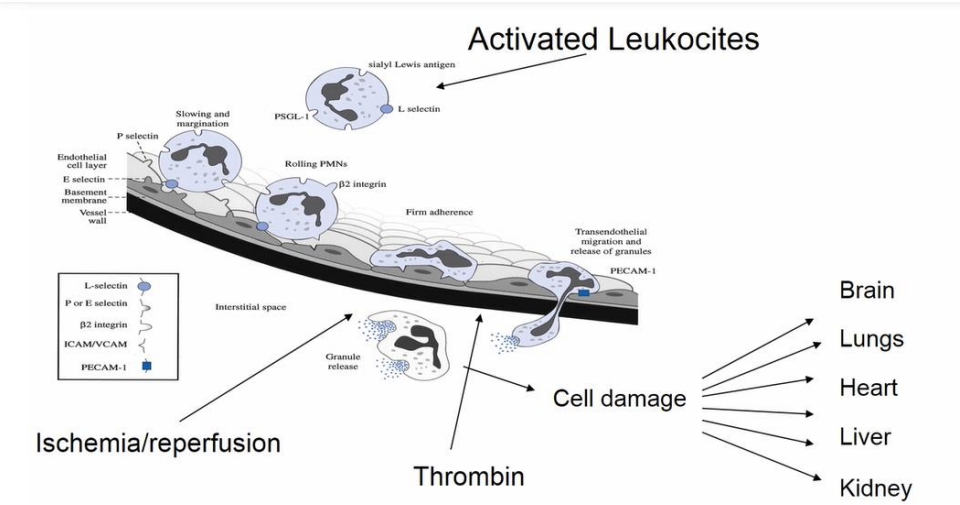
Conclusions: Minimally invasive mitral valve surgery is effective, with excellent late results. The durability of minimally invasive mitral valve repair compared favorably with conventional full sternotomy methods at late follow-up. (J Thorac Cardiovasc Surg 2013;145:1199-206)

- **Effective, with excellent late results**
- **Durability is comparable**

Minimally Invasive Heart Valve Surgery

Influence on Coagulation and Inflammatory Response.

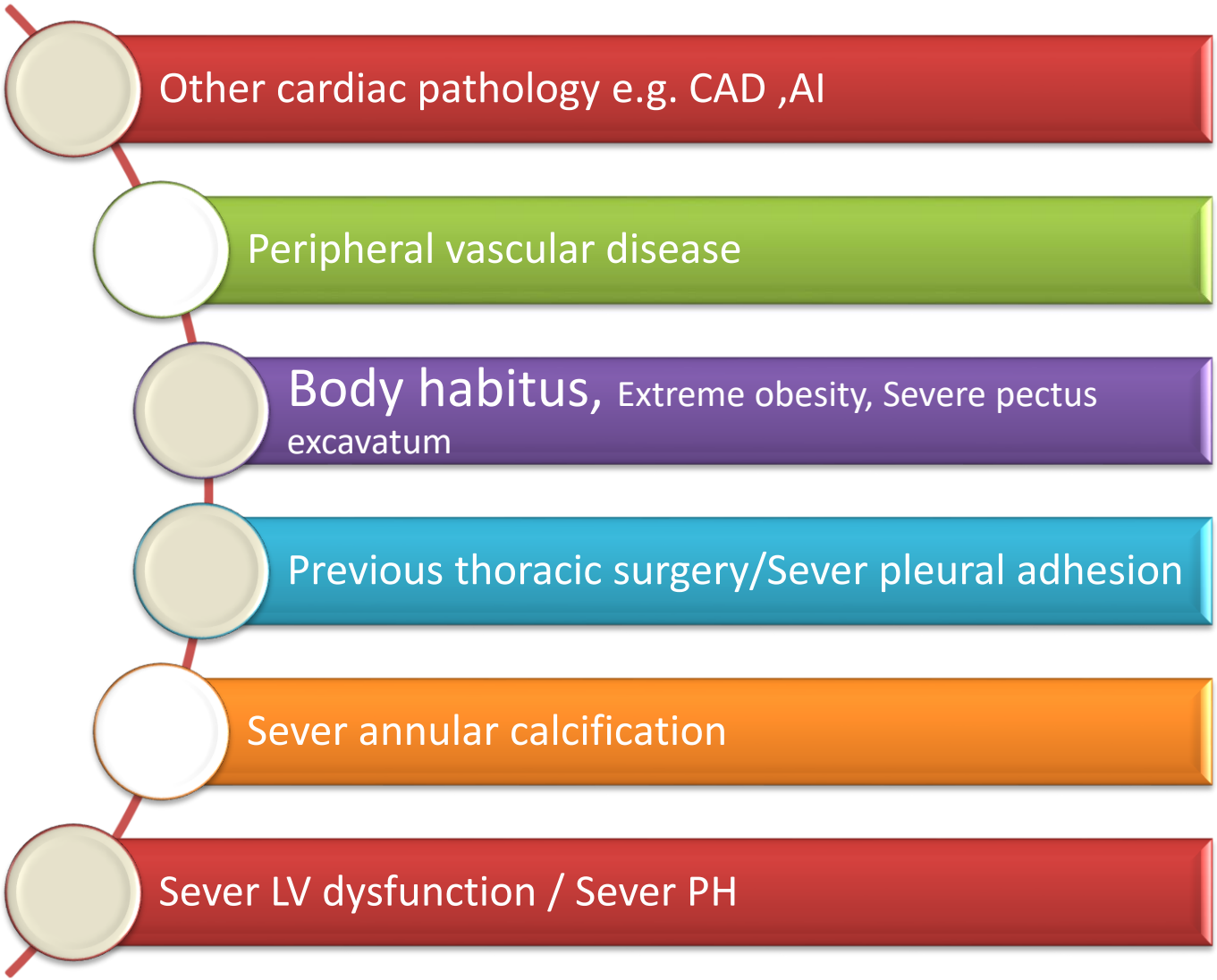
Domenico Paparella, MD* ° ; Crescenzia Rotunno, BsC ° ; Piero Guida, PhD; Mattia Travascia, MD ° ; Micaela De Palo, MD ° ; Giosuè Lionetti, MD ° ; Alessandro Carrozzo, MD ° ; Nicola Marraudino, MD ° .



- Minimally invasive heart valve surgery, despite longer aortic cross-clamp and CPB times, is associated with **lower** inflammatory damage and coagulation system impairment.

- This data suggest a **preminent role of surgical trauma** in triggering inflammatory response and coagulopathy over cardiopulmonary bypass.

Relative Contraindications



Minimally Invasive Mitral Valve Surgery I
Patient Selection, Evaluation, and Planning

Gorav Ailawadi, MD, Arvind K. Agnihotri, MD,† John R. Mehall, MD,‡ J. Alan Wolfe, MD,§ Brian W. Hummel, MD,|| Trevor M. Fayers, FRACS,¶ R. Saeid Farivar, MD, PhD,# Eugene A. Grossi, MD,** T. Sloane Guy, MD,†† W. Clark Hargrove, MD,‡‡ Junaid H. Khan, MD,§§ Eric J. Lehr, MD, PhD,|||| S. Chris Malaisrie, MD,¶¶ Douglas A. Murphy, MD,## Evelio Rodriguez, MD,*** William H. Ryan, MD,††† Arash Salemi, MD,‡‡‡ Romualdo J. Segurola Jr, MD,§§§ Richard J. Shemin, MD,|||||| J. Michael Smith, MD,¶¶¶ Robert L. Smith, MD,††† Paul W. Weldner, MD,### Scott M. Goldman, MD,**** Clifton T. P. Lewis, MD,†††† and Glenn R. Barnhart, MD||||*

(*Innovations* 2016;11: 243–250)

TABLE 2. Comorbidities of Concern for MIMVR Patient Selection

Comorbidity	Potential Complication
Morbid obesity	Compromised exposure
Significant lung disease	Postoperative respiratory failure
Peripheral vascular disease	Malperfusion and possible arterial injury
Advanced renal dysfunction	Postoperative renal failure
Advanced liver disease	Postoperative hepatic failure
Previous right thoracotomy	Compromised exposure; lung injury
Significant pulmonary hypertension	Inadequate postoperative RV function
Severe LV dysfunction	Inadequate postoperative LV function

Comparative effectiveness of minimally invasive versus traditional sternotomy mitral valve surgery in elderly patients

Alexander Iribarne, MD, MS,[a] Rachel Easterwood, BA,[a] Mark J. Russo, MD, MS,[b] Edward Y. Chan, MD,[a] Craig R. Smith, MD,[a] and Michael Argenziano, MD[a]

(J Thorac Cardiovasc Surg 2012;143:S86-90)

1005
Patients
>70 yrs

- **Similar**
  - Mortality
  - Morbidity
- **Advantage**
  - Shorter stay
  - Better recovery

Higher CPB time

Incidence of postoperative acute kidney injury in patients with chronic kidney disease undergoing minimally invasive valve surgery

Gerson D. Valdez, MD,[a] Christos G. Mihos, DO,[a] Orlando Santana, MD,[a] Todd B. Heimowitz, DO,[a] Robert Goldszer, MD,[b] Gervasio A. Lamas, MD,[a] and Joseph Lamelas, MD[c]

(J Thorac Cardiovasc Surg2013;146:1488-93)

In patients with CKD undergoing isolated valve surgery, minimally invasive valve surgery is associated with **reduced postoperative complications** and lower resource use

Minimally Invasive Mitral Valve Surgery Can Be Performed With Optimal Outcomes in the Presence of Left Ventricular Dysfunction

Pavan Atluri, MD, Y. Joseph Woo, MD, Andrew B. Goldstone, MD, Jeanne Fox, NP, Michael A. Acker, MD, Wilson Y. Szeto, MD, and W. Clark Hargrove, MD

Division of Cardiovascular Surgery, Department of Surgery, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania

Background. Minimally invasive approaches to mitral valve repair have demonstrated equivalent technical outcomes and more rapid recovery when compared with traditional sternotomy. These techniques have been widely accepted for mitral insufficiency and stenosis. The utilization of minimally invasive techniques in the presence of left ventricular (LV) dysfunction has been controversial. We

Results. Patients with LV dysfunction were able to undergo mitral valve surgery with minimal mortality (2.1% vs 1.7%, $p = 0.7$) and morbidity, that was comparable with patients with normal ventricular function. Postoperative recovery was only slightly longer compared with patients with normal LV function as noted by time to extubation (6.0 vs 7.0 hours, $p = 0.005$)

Conclusions. Minimally invasive, port-access, mitral valve surgery can be safely performed with minimal morbidity and mortality in the presence of cardiomyopathy. This approach may be considered in patients with isolated mitral valve pathology and LV dysfunction in an experienced center.

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

Columbia University Division of Cardiology, Miami Beach; and the Division of Cardiac Surgery, Mount Sinai Heart Institute, Miami Beach, Florida

Background. We hypothesize that composite in-hospital surgical complications are lower in obese patients who undergo minimally invasive valve surgery for aortic and (or) mitral valve disease, when compared with the standard median sternotomy approach.

Methods. We retrospectively reviewed 2,288 heart operations done at our institution between January 3, 2005 and January 10, 2010, and identified 160 consecutive obese patients, defined as patients with a body mass

omy group ($p = 0.015$). Composite postoperative complications occurred in 15 (23.49%) versus 49 (51.0%) patients ($p = 0.034$) in the minimally invasive group versus median sternotomy, respectively. The difference was driven by a lower incidence of acute renal failure (0 vs 6 patients [6.25%], $p = 0.041$), prolonged intubation (12 [18.7%] vs 33 [34.3%], $p = 0.049$), reintubation (3 [4.68%] vs 15 [15.6%], $p = 0.032$), deep wound infections (0 vs 4 [4.1%], $p = 0.098$), and death (0 vs 8 [8.3%], $p = 0.041$),

Minimally invasive surgery for isolated valve lesions in obese patients has a lower morbidity and mortality when compared with the standard median sternotomy approach.

European Journal of Cardio-Thoracic Surgery 42 (2012) 648–652
doi:10.1093/ejcts/ezs098 Advance Access publication 3 May 2012

ORIGINAL ARTICLE

Outcomes of minimally invasive valve surgery in patients with chronic obstructive pulmonary disease

Orlando Santana[a,*], Javier Reyna[a], Alexandre M. Benjo[a], Gervasio A. Lamas[a] and Joseph Lamelas[b]

[a] Columbia University Division of Cardiology, Mount Sinai Heart Institute, Miami Beach, FL, USA
[b] Department of Cardiac Surgery, Mount Sinai Heart Institute, Miami Beach, FL, USA

* Corresponding author. Echocardiography Laboratory, Mount Sinai Heart Institute, 4300 Alton Road, Miami Beach, FL 33140, USA. Tel: +1-305-6742168; fax: +1-305-6742368; e-mail: osantana@msmc.com (O. Santana).

Received 23 November 2011; received in revised form 17 January 2012; accepted 27 January 2012

Abstract

OBJECTIVES: We hypothesize that minimally invasive valve surgery in patients with chronic obstructive pulmonary disease (COPD) is superior to the conventional median sternotomy approach.

METHODS: We retrospectively reviewed 2846 consecutive surgery performed at our institution between January 2005 and September 2010, and identified 165 patients with COPD who underwent isolated valve surgery. In-hospital mortality, composite complication rates, intensive care unit and total hospital length of stay of those who had undergone a minimally invasive approach were compared with a cohort that underwent a standard median sternotomy approach.

RESULTS: Of the 165 patients, 100 underwent a minimally invasive approach and 65 had a median sternotomy. Baseline characteristics did not differ between the two groups. The mean age was 71 ± 11 years for the [illegible]edian sternotomy group, ($P = 0.31$). In-hospital mortality was 1 (1%) in the minimally [illegible]group, $P = 0.14$. Composite postoperative complications were significantly reduced in [illegible]2). The median intensive care unit length of stay was 47 h (IQR 40–70) versus 73 h (IQ[illegible]gth of stay was 6 days (IQR 5–9) versus 9 days (IQR 7–13), $P < 0.001$, for the minimally invasive and the median sternotomy groups, respectively.

CONCLUSIONS: Minimally invasive valve surgery in patients with COPD is associated with excellent short-term results, and thus should be considered an option in these patients.

Excellent short term results

Who are eligible?

Learning Minimally Invasive Mitral Valve Surgery

A Cumulative Sum Sequential Probability Analysis of 3895 Operations From a Single High-Volume Center

David M. Holzhey, MD, PhD; Joerg Seeburger, MD; Martin Misfeld, MD, PhD; Michael A. Borger, MD, PhD; Friedrich W. Mohr, MD, PhD

Circulation. 2013;128:483–491

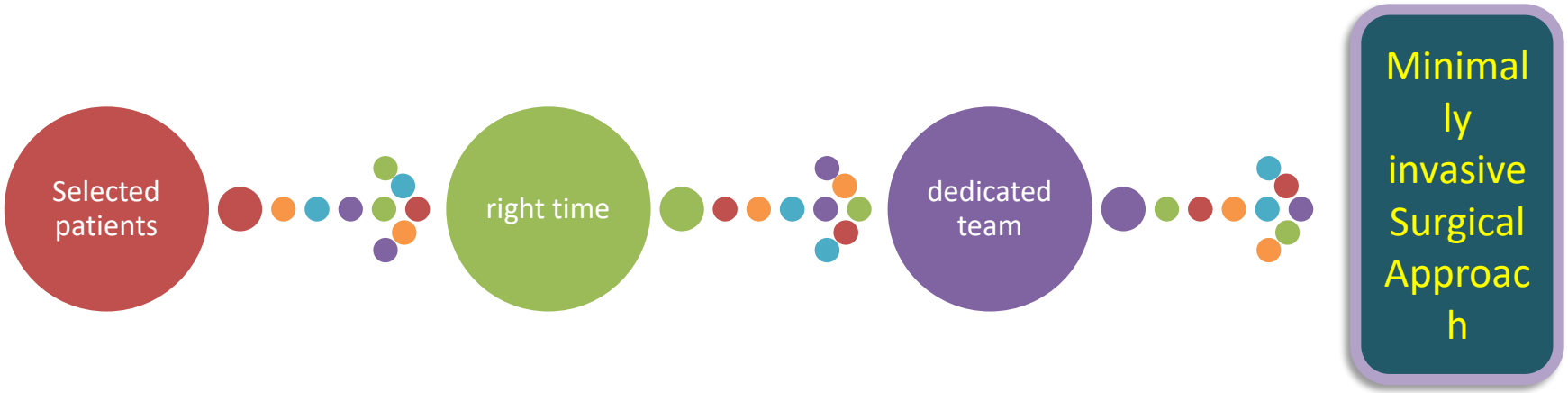
A true learning curve exists for minimally invasive surgery

Marked variation exists between individual surgeons

Typical number of operations to overcome the learning curve was between 75 and 125.

>1 such operation per week was necessary to maintain good results

When?

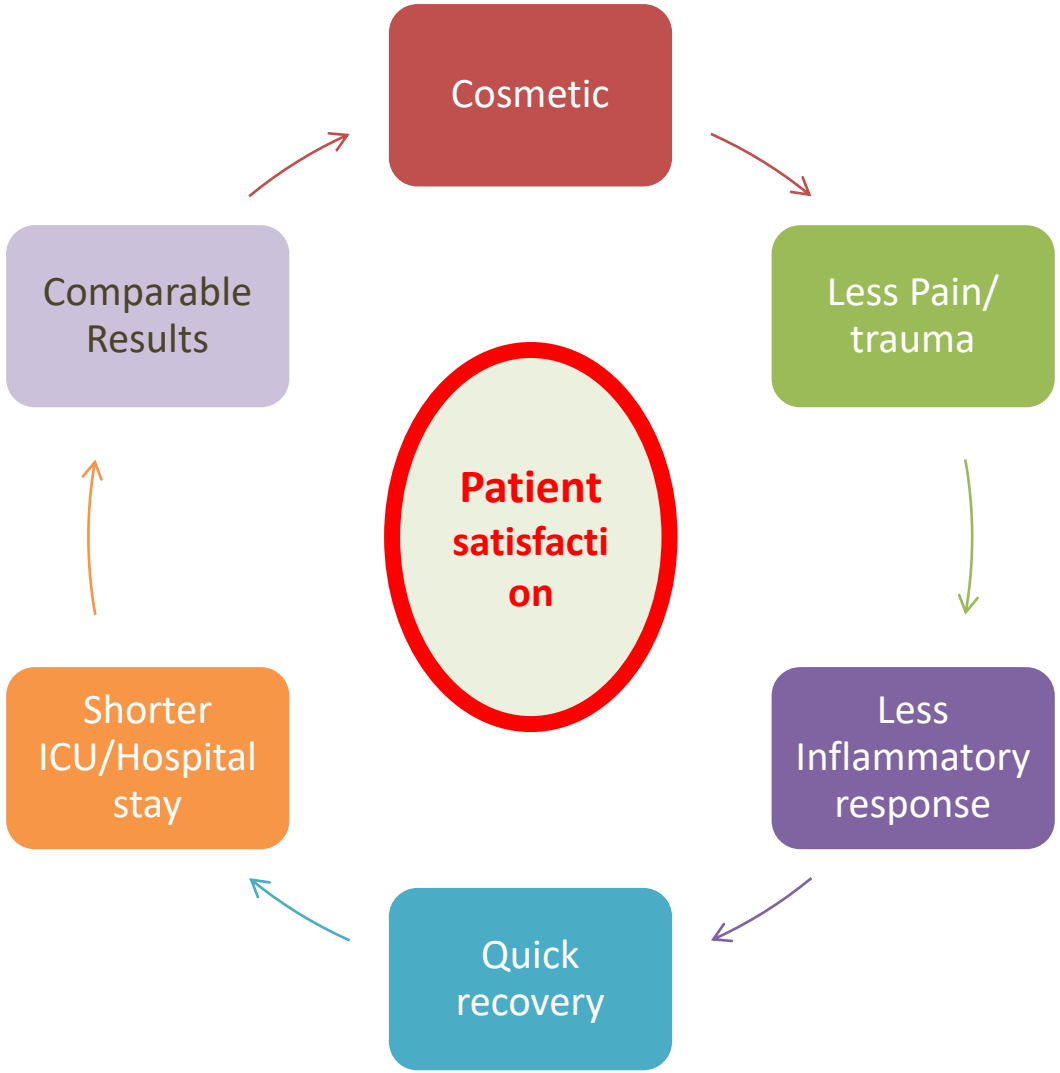

Selected patients
right time
dedicated team
Minimally invasive Surgical Approach

Why should I change from conventional surgery to mini approaches?

Why?

scientific evolution and innovations are ever growing

Why?


Cosmetic
Less Pain/ trauma
Less Inflammatory response
Quick recovery
Shorter ICU/Hospital stay
Comparable Results
Patient satisfacti on