Minimally Invasive Aortic Valve Surgery yields excellent results especially in the elderly.

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Introduction: We investigated if minimally invasive aortic valve replacement (MIC-AVR) has the potential

a)to become the standard approach for AVR and

b) to be an alternative for percutaneous aortic valve replacement (PAVR) in high risk patients.

Methods:

From 04/2009 to 01/2010 15 patients older than 75 years (mean age 80±3 years, range 76 to 87 years) who underwent AVR via upper partial J-sternotomy, were enrolled in the present study (Table 1).

Table1

Demographic characteristics of study population

No of patients	**15**		
Age	**Mean**	**Min**	**Max**
	80 ± 3	**76**	**87**
Male/female	**6/9**		
LVEF	**54**		
COPD	**4/15 (26.6%)**		
Diabetes mellitus	**5/15 (33.3%)**		
Renal insufficiency	**1**		
C.A.D.†	**4**		
Peripheral vascular disease	**4/15 (26.6%)**		
NYHA Class	**2.93**		
Previous stroke	**-**		
Arrhythmia	**4/15 (26.6%)**		
EuroScore predicted risk For mortality	**12.768**	**6.73**	**18,05**
Aortic valve pathology	**Stenosis = 12**		
Mean peak gradient	**93 mmHg**		

†C.A.D. = diffuse coronary artery disease without any indication for surgical treatment or status post percutaneous transluminal coronary angioplasty;
Pulmonary edema = episode of edema 1 week before the operation

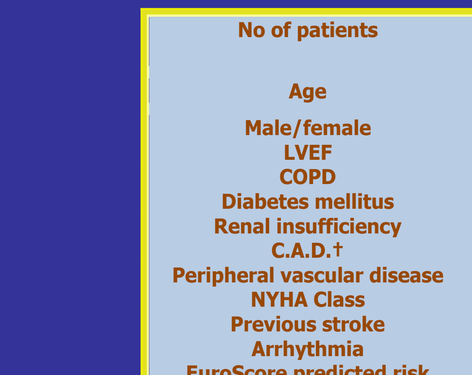
The operative technique was similar in all patients.
It is performed through a 6 cm vertical midline incision over the upper part of the sternum, starting at the level of the manubriosternal angle. The sternotomy is performed with the standard saw up to the level of the second or third intercostal space. The sternotomy is then continued into the right second or third intercostal space using a narrow blade oscillating saw (J-shaped sternotomy).
Canulation sites were ascending aorta and right atrium. Myocardial protection was obtained by antegrade cold crystalloid cardioplegia and mild hypothermia (mean: 33±1°C).
The surgical field is kept dry by a trans-aortic suction vent in the bottom of the left ventricle.

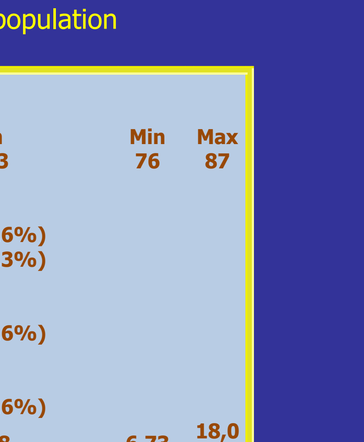
The heart almost always recovers spontaneous sinus rhythm. If the heart goes into ventricular fibrillation, cardioversion using external defibrillator pads placed prior to surgery is required.

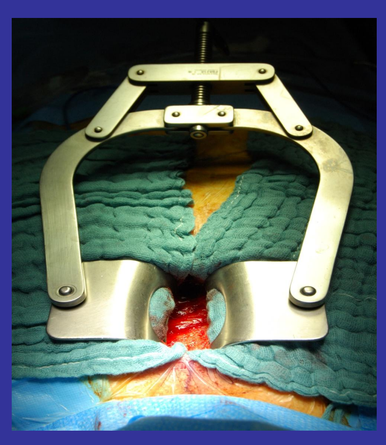
The heart is de-aired using TEE guidance. In the absence of the ability to reach in and agitate the heart, a combination of thoracic CO2 insufflation, ventricular filling, ventilation, and operation-table positioning is used to completely de-air the left heart.

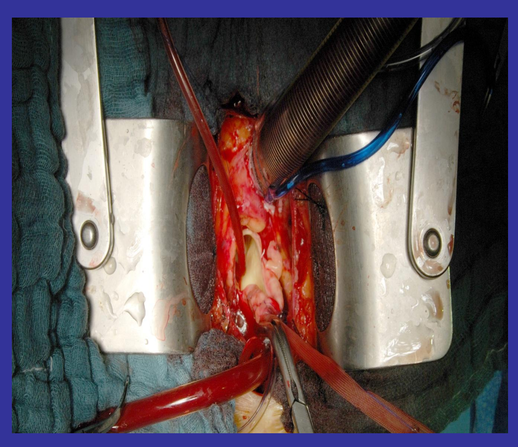
- **There was no conversion to a conventional approach via a complete median sternotomy**.
- All patients received biological aortic valves.
- No paravalvular leak requiring additional repair was found with the use of intraoperative TEE.

Postoperative course including ICU-stay, neurological and other secondary complications, mortality, etc. were recorded and evaluated.









Results:
Mean aortic cross clamp time was 70±14 minutes and mean cardiopulmonary bypass time was 90±15 minutes (Table 2). Only 1 patient needed re-exploration for bleeding.
Duration of ventilation was 14±10 hours and median ICU-Stay was 2 days. None of our patients had a major or permanent cerebrovascular event. Only 1 patient had prolonged (>24 hours) ventilation and 3 had atelectasis after extubation that resolved with physiotherapy. All patients were mobilized at the regular ward and the need for painkillers was almost none after the 4th postoperative day.
Median total hospital length of stay was 8 days.
We had zero sternal wound complications.
Operative as well as 30-day mortality were zero (Table 3).

Table 2

Operative outcomes	
Operative time (min)	**148.26**
CPB time (min)	**90.33**
Cross clamp time (min)	**70.33**
Conversion to full Sternotomy	**0**

Table 3

Hospital course	
Ventilation time (h) †	**14.33**
ICU stay (d)	**2.46**
Hospital stay (d)	**8**
Re- exploration	**1 (6.66%)**
Atelectasis‡	**3 (20%)**
Pleural effusions°	**4 (26.6%)**
Low output syndrome	**0**
MI	**0**
Atrial fibrillation	**3 (20%)**
Stroke	**0**
Deep sternal wound infection	**0**
Dialysis	**0**
Thirty-day mortality	**0**

† One patient had prolonged ventilation time 48h otherwise the Max ventilation time was 20 hours
‡ They resolved only with physiotherapy
° They didn't need any intervention

Conclusions: Our data show that MIC-AVR can be safely established as standard approach for aortic valve surgery yielding excellent results even in the elderly. Avoiding full sternotomy contributes to better stability of the sternum which is associated with less postoperative pain. Better stability improves patients' respiratory function and contributes to shorter duration of ventilation, better pulmonary toilet, and early mobilization in the early postoperative period.

As perioperative morbidity and mortality is very low even in high risk patients, MIC-AVR should be considered in these patients, specifically, as long as PAVR is not yet established as routine procedure.