THE EVOLUTION OF CARDIAC SURGERY OVER THE LAST THREE DECADES

TREVOR FAYERS
Director of Medical and Cardiac Surgical Services
Holy Spirit Northside Private Hospital
Brisbane
Australia
Learning Curve
Spectrum of surgery

- Coronary artery bypass grafts
- Valve surgery (aortic, mitral, tricuspid and pulmonary)
- Atrial fibrillation surgery
- Combination of the above
- Congenital surgery
Robotic Cardiac Procedures

- Mitral and Tricuspid valve repairs/replacements
- Cardiac tumors
- Concomitant (or stand alone) Cox-Maze ablation for AF (close left atrial appendage)
- Coronary artery bypass grafting
- Congenital defects (ASD, PAVD)
- HOCM (possibly some forms)
Patient-side Cart
Endowrist Instruments
The Holly Graft System
Coronary artery bypass surgery

• Conduits:
  • Vein
  • Artery
  • Synthetic
• Hybrid (stenting)
• Stent
15 year SVG patency = 30% vs 90% IMA

<table>
<thead>
<tr>
<th>Time</th>
<th>Mechanism</th>
<th>Effect on Vein</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARLY</td>
<td>SHEAR INDUCED</td>
<td>DILATATION</td>
</tr>
<tr>
<td>LATE</td>
<td>WALL TENSION</td>
<td>THICKENING + STIFFENING</td>
</tr>
</tbody>
</table>
Figure 2  Histologic changes observed in the internal mammary artery (IMA) graft as compared to the saphenous vein graft (SVG). A,B. Histologic sections showing IMA and SVG obtained from a 76-year-old man who underwent coronary artery bypass graft (CABG) surgery 2 years antemortem. IMA shows no or rare intimal smooth muscle cells (SMCs) whereas SVG exhibit moderate neointimal growth with few SMCs but rich in matrix which consists of proteoglycans and collagen; C,D. Histologic sections showing IMA and SVG obtained from a 69-year-old man who underwent CABG surgery 6 years antemortem. Note the absence of intimal thickening in IMA (C) versus the presence of moderate neointimal thickening in SVG from SMCs and proteoglycan-collagenous matrix at the site of anastomosis (arrow heads indicate suture sites) with left anterior descending artery (LAD) or left circumflex artery (LCX) (D); E,F. IMA graft and SVG from a 77-year-old woman who underwent CABG surgery 12 years antemortem. While the IMA shows minimal intimal thickening, SVG exhibits moderate to severe neointimal growth with proteoglycan-collagen matrix and angiogenesis (arrows). All sections were stained with Movat pentachrome.
10 years after CABG, an IMA to the LAD ↓ risk of:

- death (x1.6), MI (x1.4), angina (x1.25), redo surgery (x2)
- Patency rate of > 95% at 10 years (veins = 25% - 50%)

If it was not for the IMA there would be no CABG today !!
## ANGIOGRAPHIC PATENCY OF BILATERAL IMA

PREVIOUS ASSERTION: IMA has superior patency because it is used for the LAD territory while vein grafts are disadvantaged by being placed to other territories with less favourable run off.

### % PATENCY RATES FOR BOTH IMA TO LEFT SIDED CORONARIES

<table>
<thead>
<tr>
<th>STUDY</th>
<th>NOS (%)</th>
<th>TIME</th>
<th>LIMA</th>
<th>RIMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wendler (CIRC 2000)</td>
<td>172 (35%)</td>
<td>7 days</td>
<td>98</td>
<td>97</td>
</tr>
<tr>
<td>Endo (CIRC 2002)¹</td>
<td>1100 (98%)</td>
<td>7 days</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>Calafiore (JTCVS 2000)</td>
<td>295 (16%)</td>
<td>13 days</td>
<td>97</td>
<td>96</td>
</tr>
<tr>
<td>Calafiore (JTCVS 2002)</td>
<td>33 (22%)</td>
<td>3 years</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Glineur (CIRC 2008)</td>
<td>299 (99%)</td>
<td>6 months</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>Dion (EJCTS 2000)²</td>
<td>161 (32%)</td>
<td>7 years</td>
<td>97</td>
<td>96</td>
</tr>
<tr>
<td>Tatoulis (Curr Op Cardiol 2011)</td>
<td>2176</td>
<td>10 years</td>
<td>91-97</td>
<td></td>
</tr>
<tr>
<td>Tatoulis (Curr Op Cardiol 2011)</td>
<td>440</td>
<td>10 years</td>
<td>89-95</td>
<td></td>
</tr>
</tbody>
</table>

¹ = vein graft patency 92%; ² = vein graft patency 72%

Both IMA have similar patency when used to left sided coronaries.
**SURVIVAL BENEFIT WITH TWO IMA GRAFTS?**

Effect of arterial revascularisation on survival: a systematic review of studies comparing bilateral and single internal mammary arteries

David P Taggart, Roberto D’Amico, Douglas G Altman

Lancet 2001

04693 BIMA vs 11269 SIMA (from 7 databases)
OMatched for age, gender, LV function, DM
OHR for death with BIMA: 0.80 [ 95% CI=0.70 to 0.94]
ONNT of 13-16 (to prevent one death)

<10% of CABG in Europe and <5% in USA use BIMA !!!
Thirty-Year Follow-Up Defines Survival Benefit for Second Internal Mammary Artery in Propensity-Matched Groups

Paul A. Kurlansky, MD, Ernest A. Traad, MD, Malcolm J. Dorman, MD, David L. Galbut, MD, Melinda Zucker, BSN, and George Ebra, EdD

<table>
<thead>
<tr>
<th></th>
<th>SIMA</th>
<th>BIMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 yr survival</td>
<td>36%</td>
<td>54% (+18%)</td>
</tr>
<tr>
<td>25 yr survival</td>
<td>16%</td>
<td>29% (+13%)</td>
</tr>
</tbody>
</table>
Patency of RIMA to 20 years [Tatoulis et al Curr Op Cardiol 2011]
8,270 SIMA and 7,313 BIMA at mean 10-yr follow up: Yi et al 2013

**Study ID**

<table>
<thead>
<tr>
<th>Unmatched</th>
<th>Hazard ratio (95% CI)</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naunheim</td>
<td>0.75 (0.45,1.26)</td>
<td>1.2</td>
</tr>
<tr>
<td>Pick</td>
<td>0.82 (0.50,1.33)</td>
<td>1.3</td>
</tr>
<tr>
<td>Rankin</td>
<td>0.84 (0.70,1.00)</td>
<td>9.9</td>
</tr>
<tr>
<td>Bereklouw</td>
<td>0.65 (0.41,1.04)</td>
<td>1.5</td>
</tr>
<tr>
<td>Subtotal (I-squared 0 %, p=0.776)</td>
<td>0.81 (0.69,0.94)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quintile</th>
<th>Hazard ratio (95% CI)</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glineur</td>
<td>0.74 (0.58,0.95)</td>
<td>5.2</td>
</tr>
<tr>
<td>Stevens</td>
<td>0.74 (0.60,0.90)</td>
<td>7.7</td>
</tr>
<tr>
<td>Kurlansky</td>
<td>0.83 (0.77,0.91)</td>
<td>45.3</td>
</tr>
<tr>
<td>Subtotal (I-squared 0 %, p=0.448)</td>
<td>0.81 (0.75,0.87)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exact</th>
<th>Hazard ratio (95% CI)</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lytle</td>
<td>0.78 (0.69,0.88)</td>
<td>21.4</td>
</tr>
<tr>
<td>Grau</td>
<td>0.67 (0.54,0.84)</td>
<td>6.5</td>
</tr>
<tr>
<td>Subtotal (I-squared 24 %, p=0.251)</td>
<td>0.75 (0.65,0.85)</td>
<td></td>
</tr>
<tr>
<td>Overall (I-squared 0 %, p=0.731)</td>
<td>0.79 (0.75,0.84)</td>
<td></td>
</tr>
</tbody>
</table>

Weights are from random effects analysis.
Arterial Grafts Protect the Native Coronary Vessels From Atherosclerotic Disease Progression

Kamellia R. Dimitrova, MD, Darryl M. Hoffman, MD, Charles M. Geller, MD, Gabriela Dincheva, Wilson Ko, MD, and Robert F. Tranbaugh, MD

Division of Cardiac Surgery, Beth Israel Medical Center, New York, New York

**Background.** We sought to examine the effect of different conduits on the progression of atherosclerosis in previously revascularized coronary territories.

**Methods.** Between 1995 and 2010, 4,960 patients were discharged alive after primary isolated coronary artery bypass grafting (CABG) with a left internal thoracic artery (LITA) conduit and additional conduits as needed: radial artery (RA) or saphenous vein graft (SVG), or both. Seven hundred seventy-two patients had coronary angiography for recurrent symptoms an average of 5.5 ± 3.5 years after CABG (range, 0.1–16 years). Cumulative graft patency and disease progression in the native vessels was estimated by the Kaplan-Meier survival method. The log-rank test was used to assess differences of disease progression per territory between different types of conduits.

**Results.** Kaplan-Meier–estimated 1-, 5-, and 10-year overall disease progression in territories with patent LITAs was 0.01%, 6%, and 11%, respectively (log-rank test, $p = 0.157$); and with patent SVGs it was 3%, 19%, and 43%, respectively (log-rank test; $p < 0.0001$). Disease progression in grafted native coronary arteries in the anterior territory with patent LITA-to–left anterior descending (LAD) artery was 8%, and with patent RA grafts versus patent SVGs to the diagonal branches of LAD artery was 10% and 40%, respectively (log-rank test; $p < 0.0001$). Disease progression in grafted native coronary arteries to the lateral territory with a patent RA graft was 11% versus 50% with a patent SVG (log-rank test; $p < 0.0001$).

**Conclusions.** RA and LITA grafting has a strong protective effect against progression of native coronary artery disease in previously grafted vessels. Multiple arterial grafting may improve long-term survival by preventing progression of atherosclerosis in the native coronary vessels.

The **FLUENT** External Stent

**Mechanical Properties:**
- Cobalt Chromium Alloy
- Radial Elasticity (Kink and Crush resistant)
- Axial Plasticity (adjust from 3-6 cm to 10-22 cm)
- Maintains its in situ configuration without fixation

**Effects of Fluent Stent on Vein:**
- REDUCES diameter by around 10%
- REDUCES lumen irregularities and flow discrepancies
- REDUCES wall tension
- REDUCES size mismatch vs native coronary artery
- Prevents vein dilatation post implantation

**One minute to implant and no other change in technique needed**
Patient Angiogram 12 months: Two vein grafts
One with no stent and one with FLUENT External Stent
Patient OCT 12 months after FLUENT External Stent

Intimal Hyperplasia

Stent
CABG is best therapy... but has two limitations

1. DAMAGING EFFECTS OF CPB
   • Microemboli, Flow abnormalities, SIRS
   • Biochemical dysfunction in all organs
   • Overt morbidity in 15% (brain, kidney, lung)
   • CPB Mortality and morbidity age-related

   Solutions
   ① OBCABG
   ② NTAT (no touch)
   ③ MECC

2. Vein graft failure
   • SVG failure 20%-40% failure at 1 yr
   • 75% SVG blocked/diseased @ 10 yrs
   • Late mortality (25%@10yrs, 50%@15 yrs)
   • Recurrent angina: >50% @ 10 yrs
   • Reintervention in 1/3 by 12 yrs
   • Better results aspirin/stains?

   Solution
   Total Arterial grafting

What is MIVS?

Small skin incision (2 – 3 in)

Right Anterior Thoracotomy

Hemi-sternotomy

Lower (4th)  Upper (2nd)
Minimally Invasive Approach

Step 3
Need for Interventional Mitral Valve Repair?

**Patients Perspective**

- High quality minimally invasive mitral valve repair not yet standard of care
- Perioperative morbidity and mortality tend to be higher in surgery
- Patient demand for non surgical therapy
Mitral Valve Innovations

**MITRA CLIP**
- Introduced via a femoral venous approach
- Atrial trans-septal puncture to get access to the left atrium
- Clip opened and passed through the mitral valve in an antegrade fashion – leaflets trapped and deployed
Percutaneous Mitral Repair Approaches

- **Coronary sinus annuloplasty**
  - Edwards Monarc
  - Cardiac Dimensions Carillon
  - Viacor Shape Changing Rods
  - St. Jude Annulus Reshaping

- **Direct annuloplasty**
  - Mitralign Suture-Based Plication
  - Guided Delivery Anchor-Cinch Plication
  - QuantumCor RF Annulus Remodeling

- **Leaflet repair**
  - Edwards Mobius E2E System
  - Neochord

- **Chamber remodeling**
  - Myocor iCoapsys
  - Ample PS3

---

No proven efficacy in large patient numbers
Aortic Valve Replacement: Results TPCH Jan 2002-July 2010.

- Total patients: 965 isolated AVR
- Mortality: 30 day
  - 7 patients 0.7%
- Morbidity:
  - New AF: 28%
  - CNS: 1.5%
  - Infection: 2.5%
  - Renal failure: 2%
  - Re-exploration for bleeding: 5.5%
AORTIC VALVE REPLACEMENT IN OCTOGENARIANS: TPCH

• Jan 2002-July 2010:
  - Patients: 116
• Mortality: 1.7% (2 patients)
• Morbidity:
  - AF: 47%
  - CVA: 5.2%
  - MOSF: 1.7%
  - IABP: 1.7%
The Evolution of Cardiovascular Surgery in Elderly Patient: A Review of Current Options and Outcomes

Francesco Nicolini,1 Andrea Agostinelli,2 Antonella Vezzani,2 Tullio Manca,2 Filippo Benassi,2 Alberto Molardi,2 and Tiziano Gherli1

1 Unità di Cardiochirurgia, Dipartimento di Medicina Clinica e Sperimentale, Università degli Studi di Parma, Via A. Gramsci 14, 43126 Parma, Italy
2 Unità Operativa di Cardiochirurgia, Dipartimento Cardio-Nefro-Polmonare, Azienda Ospedaliero-Universitaria di Parma, Via A. Gramsci 14, 43126 Parma, Italy

Correspondence should be addressed to Francesco Nicolini; francesco.nicolini@unipr.it

Received 11 February 2014; Accepted 25 March 2014; Published 10 April 2014

Academic Editor: Namal Wijesinghe

Copyright © 2014 Francesco Nicolini et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Due to the increase in average life expectancy and the higher incidence of cardiovascular disease with advancing age, more elderly patients present for cardiac surgery nowadays. Advances in pre- and postoperative care have led to the possibility that an increasing number of elderly patients can be operated on safely and with a satisfactory outcome. Currently, coronary artery bypass surgery, aortic and mitral valve surgery, and major surgery of the aorta are performed in elderly patients. The data available show that most cardiac surgical procedures can be performed in elderly patients with a satisfactory outcome. Nevertheless, the risk for these patients is only acceptable in the absence of comorbidities. In particular, renal dysfunction, cerebrovascular disease, and poor clinical state are associated with a worse outcome in elderly patients. Careful patient selection, flawless surgery, meticulous hemostasis, perfect anesthesia, and adequate myocardial protection are basic requirements for the success of cardiac surgery in elderly patients. The care of elderly cardiac surgical patients can be improved only through the strict collaboration of geriatricians, anesthesiologists, cardiologists, and cardiac surgeons, in order to obtain a tailored treatment for each individual patient.
Surgery

Does quality of life improve in octogenarians following cardiac surgery? A systematic review

Udo Abah¹, Mike Dunne¹, Andrew Cook², Stephen Hoole¹, Carol Brayne³, Luke Vale⁴, Stephen Large¹

Conclusions Overall there appears to be an improvement in quality of life in the majority of elderly patients following cardiac surgery, however there was a minority in whom quality of life declined (8–19%). There is an urgent need to validate these data and if correct to develop a robust prediction tool to identify these patients before surgery. Such a tool could guide informed consent, policy development and resource allocation.
Peripheral Perfusion Enables MIVS

- **Standard perfusion**
  - Technically difficult with MIVS
  - Clutters the wound

- **Peripheral perfusion**
  - Easier to establish
  - Uncluttered wound
  - Smallest possible incision
  - Safe when used appropriately
Direct vs. Peripheral Cannulation

Sternal Division
Central Cannulation

No Sternal Division
Peripheral Cannulation
INTUITY Valve and Delivery System

- Designed to facilitate MIS
- Built on proven valve technology + innovation from TAVI experience
- Balloon-expandable frame
- Sub-annular fixation
- Complete size range – 19 to 27mm

Exclusively for Investigational Use. To be used by Qualified Investigators only.
CAUTION: Not available for use in the United States or Canada.
**Perceval S: Designed Around a Proven Valve**

Bovine Pericardium Valve
- double sheet design with
  - >20 yrs of experience
- tissue fixation
- detoxification treatment

Anchoring Device
- Self expandable alloy
- Double ring geometry
- Special designed struts
- Carbofilm coated

PERCEVAL S project
Team approach ...

Cardiovascular Medicine

Cardiac Surgery specialization

Cardiology

Interventional
Angiology
Electrophysiology
Pediatric Cardiology
Radiology

merged skill sets for complex pts.
TAVI

• Majority of percutaneous aortic valves are delivered via a **transfemoral approach**
  • Smaller sized sheaths – 14 Fr and getting smaller
  • Clever technology
    • loading the valve in the aorta
    • E sheath
## Percutaneous Valves

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aortic + Mitral</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>H</td>
<td>I</td>
<td>J</td>
<td>K</td>
<td>L</td>
</tr>
</tbody>
</table>

| **Aortic only** |

---

Table showing different types of percutaneous valves for aortic and mitral pathways.
Edwards SAPIEN THV
23 and 26 mm valves

RetroFlex
22 and 24 F sheaths

Ascendra
24 and 26 F sheaths
THV Device Design Considerations

Reduced Profile

24f

22f

18f

7f
Transradial Valve Replacement?
The Dream of Metal Leaflet Valve
Durable and No Anticoagulation?

Enhanced Endothelialization

- eNitinol improves rapidity of endothelialization
- Endothelial Cells Preferentially Follow Metal surface
- Endothelial Cells Completely Cover Membranes
- Low Shear/High Shear Studies currently underway

10 Days
Nanotechnology >> Thin Film eNitinol™ Membrane PercValve™ Monolithic Structures

Heart Valve

Venous Valve

10 Fr

4.8 Fr
Transaortic and Transapical Approach

• Reasons for this approach
  • Poor calibre, diseased or tortuous ileofemoral system.
Transaortic and Transapical Approach

• Acutely angulated aortic annulus
• Significant arch atheroma, dissection or thrombus
• AAA or previous aortoiliofemoral surgery that makes femoral access difficult.
Transapical Technique

Anterolateral minithoracotomy with entry into the thoracic cavity.

Pericardium opened with exposure of the left ventricle.
Transapical technique

- Good deep bites in the apex with good sized felt pledgetts

Transapical Technique

Once you have your wire across the valve go straight to the ascendra delivery cannula

Balloon dilation of the valve with rapid ventricular pacing with the appropriate Sapien valve prepared

Sapien valve positioned across the annulus and with rapid ventricular pacing – the valve is deployed
Hemisternotomy Transaortic Technique

- **Technique**
  - 4 cm skin incision
  - Retrosternal dissection with finger especially in redo cases to allow the innominate vein to fall away
  - Upper ministernotomy with extension into the right 2\textsuperscript{nd} intercostal space
  - Double pledgetted 3/0 prolene purse strings
Transaortic technique

The Ascendra introducer sheath is introduced into the aorta.

The native valve is ballooned under rapid ventricular pacing.

The sapien valve is the passed across the aortic valve and under rapid ventricular pacing is deployed.
Potential Pitfalls

• Coronary Occlusion
• Annular rupture
• Leaflet overhang
• Paravalvular leak
• Valve embolism and migration
• Stroke
• Early valve degeneration
Review Article

A Review of Most Relevant Complications of Transcatheter Aortic Valve Implantation

Siyamek Neragi-Miandoab and Robert E. Michler

Department of Cardiovascular and Thoracic Surgery, Montefiore Medical Center, Albert Einstein College of Medicine, 3400 Bainbridge Avenue, MAP 5, New York, NY 10467, USA
Is paravalvular AR important?

Figure Legend:
Impact of Paravalvular Leak on 2-Year All-Cause Mortality
CONFERENCE COVERAGE

TAVR degeneration estimated at 50% after 8 years

Publish date: June 1, 2016

Author(s): Bruce Jancin

Key clinical point: The first study to examine transcatheter aortic bioprosthesis valve performance beyond 5 years has found a 50% rate of valve degeneration 8 years post TAVR.

Major finding: A sharp increase in the incidence of degeneration of these early-generation valves occurred 5-7 years post TAVR.

Data source: This retrospective study featured serial home echocardiography in 378 patients who underwent TAVR 5-14 years ago at two pioneering centers for the procedure.
Review Article

Cognitive Outcomes following Transcatheter Aortic Valve Implantation: A Systematic Review

Ka Sing Paris Lai,¹² Nathan Herrmann,¹³ Mahwesh Saleem,¹⁴ and Krista L. Lanctôt¹³⁴

¹Neuropsychopharmacology Research Group, Sunnybrook Health Sciences Centre, Toronto, ON, Canada M4N 3M5
²Faculty of Medicine, University of Toronto, Toronto, ON, Canada M5S 1A8
³Department of Psychiatry, University of Toronto, Toronto, ON, Canada M5T 1R8
⁴Department of Pharmacology and Toxicology, University of Toronto, Toronto, ON, Canada M5S 1A8
Increased Risk of Cerebral Embolization After Implantation of a Balloon-Expandable Aortic Valve Without Prior Balloon Valvuloplasty

Klaudija Bijukic, MD\*; Timo Haselbach, MD\textsuperscript{†}; Julian Witt, MD\textsuperscript{‡}; Korff Krause, MD\textsuperscript{‡}; Lorenz Hansen, MD\textsuperscript{†}; Ralf Gehrckens, MD\textsuperscript{§}; Friedrich-Christian Rieß, MD, PhD\textsuperscript{‡}; Joachim Schofer, MD, PhD\textsuperscript{\textsuperscript{‡,i}}

[+] Author Information

ORIGINAL ARTICLE

Transcatheter Aortic-Valve Implantation for Aortic Stenosis in Patients Who Cannot Undergo Surgery

Martin B. Leon, M.D., Craig R. Smith, M.D., Michael Mack, M.D., D. Craig Miller, M.D., Jeffrey W. Moses, M.D., Lars G. Svensson, M.D., Ph.D., E. Murat Tuzcu, M.D., John G. Webb, M.D., Gregory P. Fontana, M.D., Raj R. Makkar, M.D., David L. Brown, M.D., Peter C. Block, M.D., Robert A. Guyton, M.D., Augusto D. Pichard, M.D., Joseph E. Bavaria, M.D., Howard C. Herrmann, M.D., Pamela S. Douglas, M.D., John L. Peterson, M.D., Jodi J. Akin, M.S., William N. Anderson, Ph.D., Duolao Wang, Ph.D., and Stuart Pocock, Ph.D., for the PARTNER Trial Investigators*

Transcatheter or Surgical Aortic-Valve Replacement in Intermediate-Risk Patients


The main results from the PARTNER 2 cohort A randomized trial involving intermediate-risk patients can be summarized as follows. First, TAVR, performed in experienced centers, with the use of a lower-profile, next-generation device, was noninferior to surgery with respect to outcomes at 2 years (death from any cause or disabling stroke). Second, bioprosthetic-valve gradients were lower and the areas were greater with the SAPIEN XT valve, as compared with surgical valves, whereas the incidence of paravalvular aortic regurgitation was higher after TAVR than after surgery. Third, several benefits with regard to secondary end points were associated with TAVR, including lower risks of bleeding events, acute kidney injury, and new-onset atrial fibrillation, as well as more rapid early recovery that resulted in shorter durations of stay in the ICU and hospital.
Long-Term Outcomes After Transcatheter Aortic Valve Implantation in High-Risk Patients With Severe Aortic Stenosis

The U.K. TAVI (United Kingdom Transcatheter Aortic Valve Implantation) Registry

Results  Survival at 30 days was 92.9%, and it was 78.6% and 73.7% at 1 year and 2 years, respectively. There was a marked attrition in survival between 30 days and 1 year. In a univariate model, survival was significantly adversely affected by renal dysfunction, the presence of coronary artery disease, and a nontransfemoral approach; whereas left ventricular function (ejection fraction <30%), the presence of moderate/severe aortic regurgitation, and chronic obstructive pulmonary disease remained the only independent predictors of mortality in the multivariate model.

Conclusions  Midterm to long-term survival after TAVI was encouraging in this high-risk patient population, although a substantial proportion of patients died within the first year.
Figure Legend:

Images of Various SHV With Fluoroscopic Images for Stented Valves

All stentless valves and a few stented valves are not radio-opaque. (A to M) The fluoroscopic image is shown on the right. (A) Perimount 2700. (B) Perimount. (C) Magna. (D) CE porcine. (E) CE S.A.V. (F) Mosaic. (G) Hancock II. (H) Epic. (I) Epic Supra. (J) Trifecta. (K) Mitroflow. (L) Soprano. (M) Aspire. (N) Prima root. (O) Freestyle root. (P) Toronto SPV root. CE = Carpentier-Edwards; S.A.V. = SupraAnnular porcine valve; SHV = surgical heart valves.
Percutaneous Mitral Valve options

• Increasingly the percutaneous valve technology has moved to other areas from pulmonary, mitral and tricuspid

• Mitral valve replacement
  • Failed Mitral bioprosthesis
    • mitral valve in valve
  • Failed mitral valve repair with annuloplasty ring
    • mitral valve in ring
Percutaneous Valve

Valve in Valve or Valve in ring

- Due to the distensible nature of the mitral annulus, deployment of a percutaneous valve in the same fashion as aortic valves is not possible or safe
- However TAVI valve in previous failed bioprosthesis or failed repair with a ring is feasible
Valve in Valve App

- Available at the App Store
- Search Valve in Valve
- Useful for the TAVI advocate
Percutaneous Mitral Valve Options (Native Valve)

- Total Valve replacement
- Experimental In man trials
  - A few different valves are currently under trial
Cardiac Surgery under attack?

...mission accomplished