# Transcatheter Aortic Valve Implantation – Anaesthetic Prespectives

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# Aortic Stenosis

- Prevalence increase with age
- Aortic sclerosis affected ¼ and aortic stenosis 2% of general population of age > 65; but 48% and 4% for age > 85, respectively
  - » Cardiovascular Ultrasound 2006;4:27
- Causes:
  - Degenerative calcified aortic valve disease (commonest)
  - Congenital aortic stenosis
  - Rheumatic valve disease
- Severe AS – if left untreated, incidence of sudden death 10-15% per year and a survival of 2-3 years

# Severe Aortic Stenosis

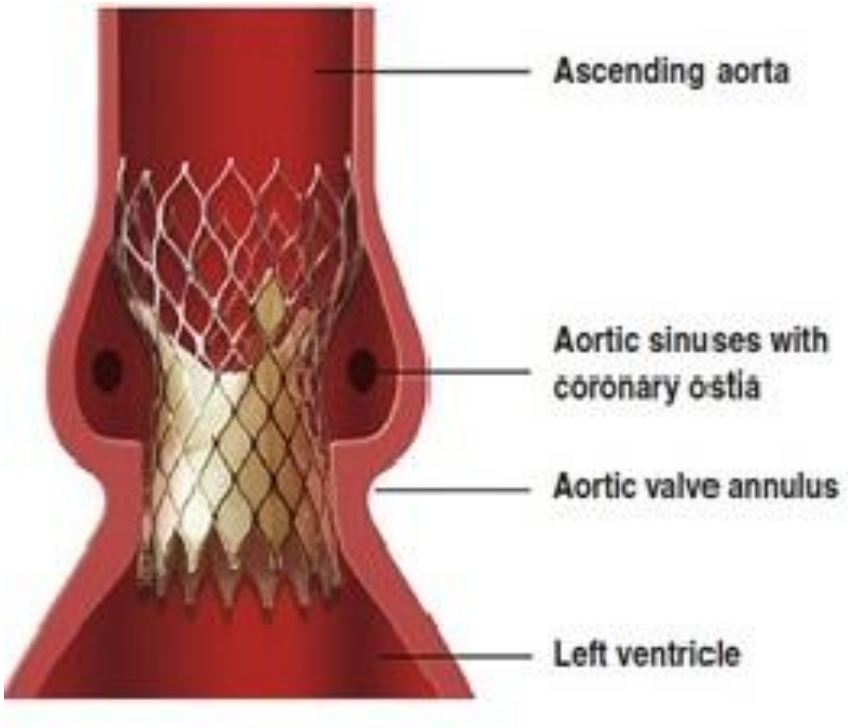
- Severe AS – area < 1cm$^2$, mean gradient > 40-50 mmHg, symptomatic
- Treatment for severe symptomatic AS
  - Medical treatment and balloon valvuloplasty – poor evidence
    - Circulation 1994;99(2):642-50.
  - Gold standard – surgical valve replacement
  - Transcatheter aortic valve implantation (TAVI) – emerging new technique

# Transcatheter aortic valve implantation

- Suitable for patients who are considered to be high risk for surgery
- National Institute of Health and Care Excellence (NICE), 2012
  - Evidence for the efficacy of TAVI is sufficient to recommend for those unsuitable for surgery
  - Insufficient evidence to support it for those who are considered suitable for surgery

# TAVI Procedure

- Approaches
  - Trans-femoral
  - Trans-apical
  - Trans-aortic
  - Trans-axillary



# Outcome of TAVI

- Follow up of 663 patients
- Intra-procedural mortality 0.9%
- 30-days  and 1 –year mortality 5.4% and 15.0%, respectively
- Clinical and haemodynamic benefits were sustained after 1 year
    - Circulation 2011;123:299-308

# Predictors on Outcome of TAVI

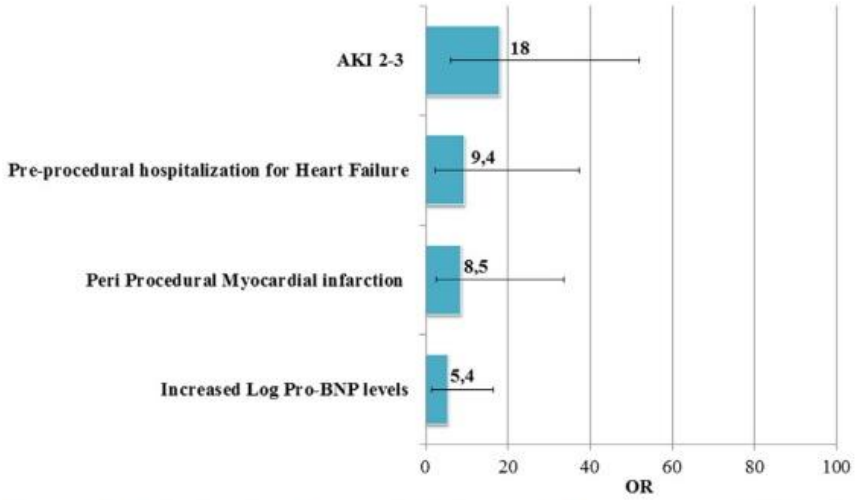



Figure 2. Independent predictors of 30-day mortality at 1 year with OR >5.

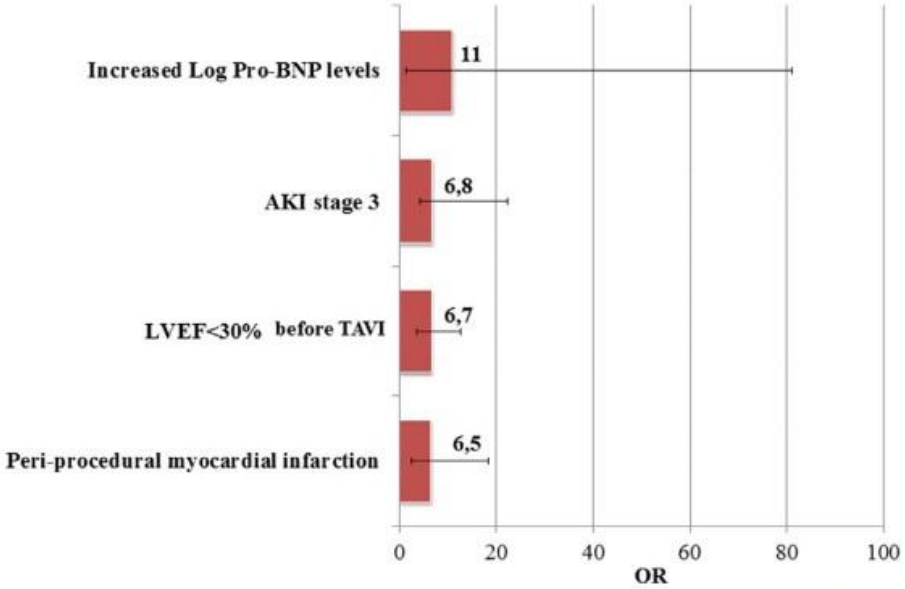


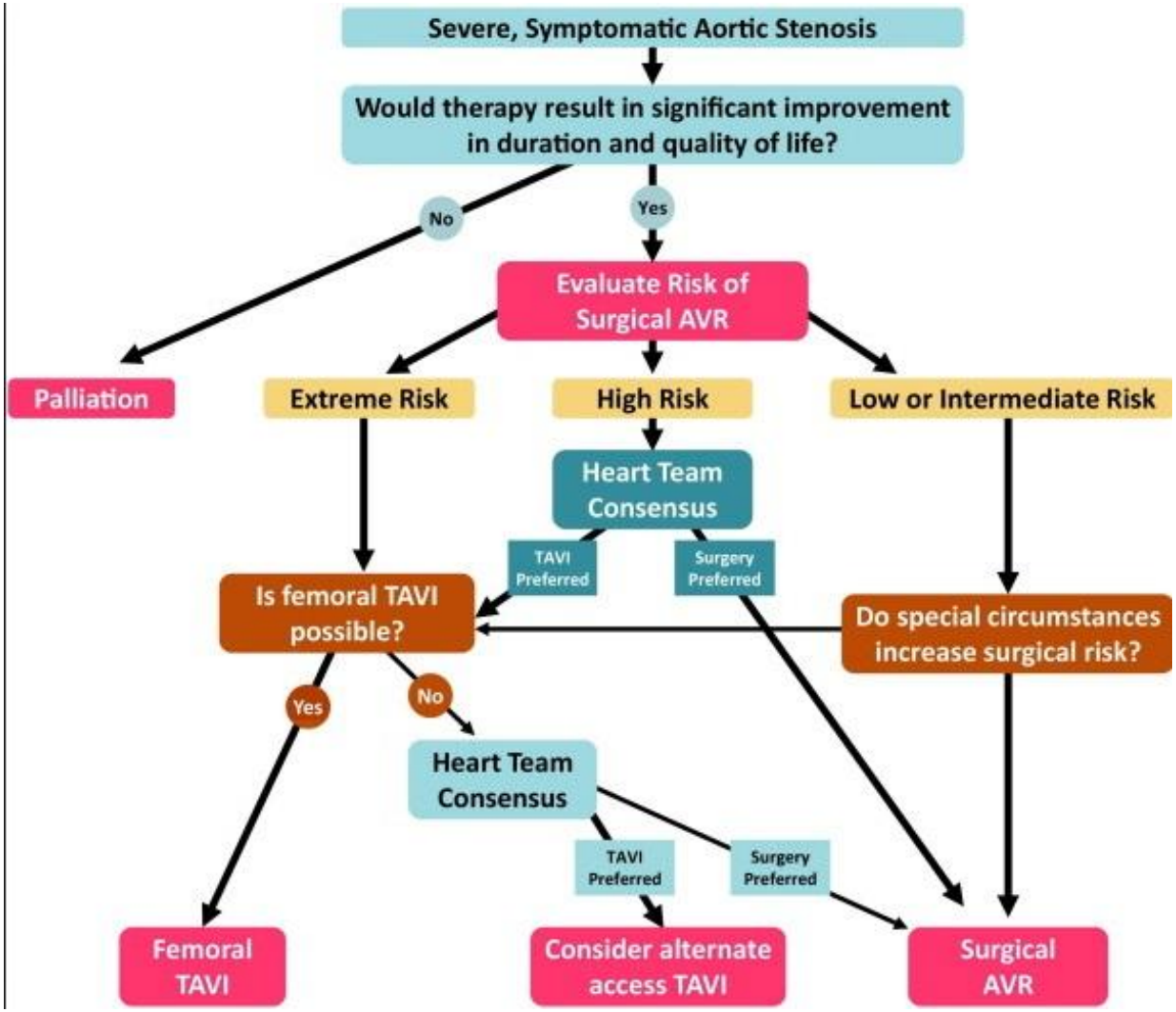

Figure 3. Independent predictors of all-cause mortality at midterm follow-up with OR >5.

- Acute kidney injury
- Heart failure with LVEF < 30%
- Post-procedural myocardial infarction
- Raised Brain Natriuretic Peptide (BNP)

# Challenges for Anaesthesiologists

- Elderly patients with multiple comorbidities and “unsuitable for surgery”
- Unfamiliar procedure location
- To provide suitable/safe patient condition and environment for the procedure
- Significant morbidities associated with TAVI
- Post-procedure care

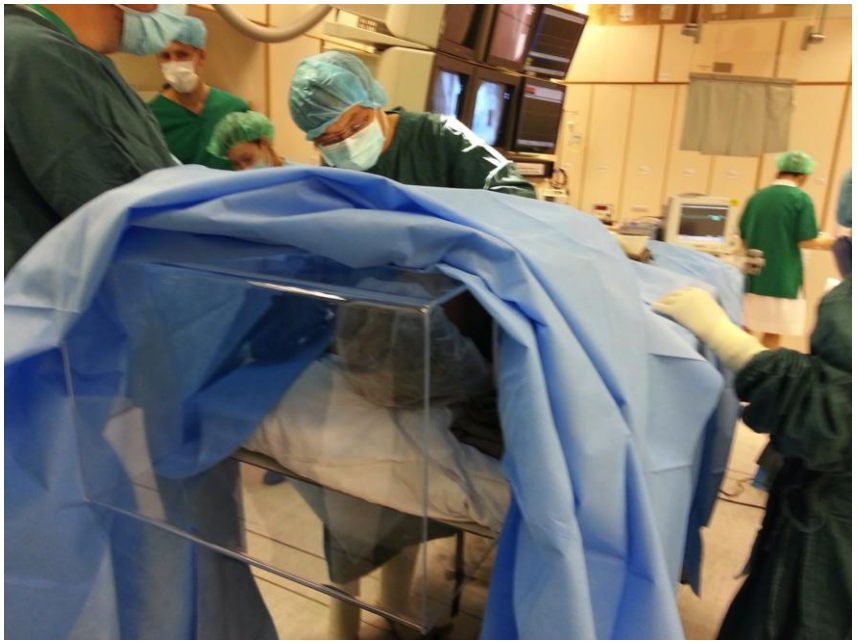
# Evaluation of Patients for TAVI



# Pre-Operative Evaluation

- Routine workup as for all surgical patients
- EuroScore
- Cardiac – coronary artery disease and to consider PCI if indicated
- Respiratory – presence of chronic lung disease
- Oesophageal disease – reflux and suitability for TEE
- Airway – difficult mask ventilation/intubation and presence of obstructive sleep apnoea
- Pre-medication – N-acetylcysteine and avoid sedative pre-med

# Access of Airway



# Procedure Location

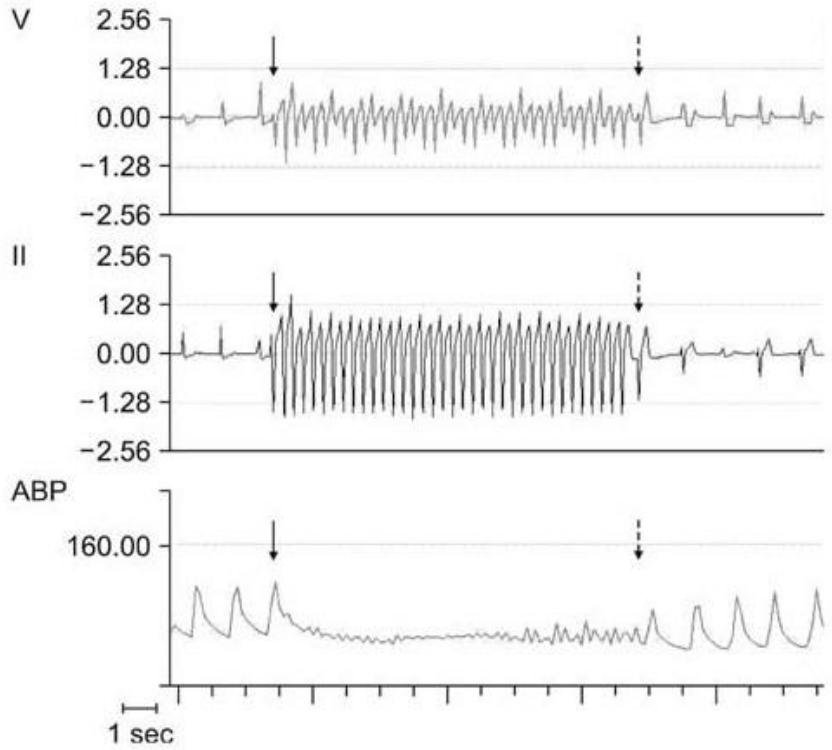
- Cardiac Cath Lab
  - Initial place for TAVI
  - Nightmare for anaesthetists and surgeons
  - Remote from OT with inadequate space, equipment, monitoring, personnel, drugs, surgical instruments …

# Procedure Location

- Hybrid theatre
  - Within OT complex
  - Anaesthetic machine, equipment, monitoring , personnel, drugs, surgical instruments …. readily available
  - Nightmare for cardiologists ….

# Haemodynamic Challenge

- During balloon valvuloplasty and deployment of stent, temporary cessation of cardiac output is achieved with RV pacing for about 10 sec
- Potential failure to recover, cardiovascular collapse afterwards



# Potential Complications with TAVI

- Vascular complication
  - Occur at femoral vascular access with retroperitoneal bleed
- Cardiac complications
  - Myocardial ischaemia/infarct from occlusion of coronary ostia or embolism
  - High grade AV block required PPM up to 15%
  - Peri-valvular leak with severe AR 5%
  - Rarely, cardiac tamponade from cardiac perforation
- Neurological complications
  - Silent embolism up to 73% with stroke 4.5%
- Acute kidney injury
  - AKI 6% with 1.8% requiring temporary renal replacement

# Anaesthetic Management

# General Anaesthesia

- Commonest technique - GA with endotracheal intubation and controlled ventilation
  - Protected airway allows TEE during procedure which can identify pericardial effusion quickly
  - Provide a motionless field for procedure
  - Patient comfort
  - Easier for haemodynamic management

# GA vs Local anaesthetic

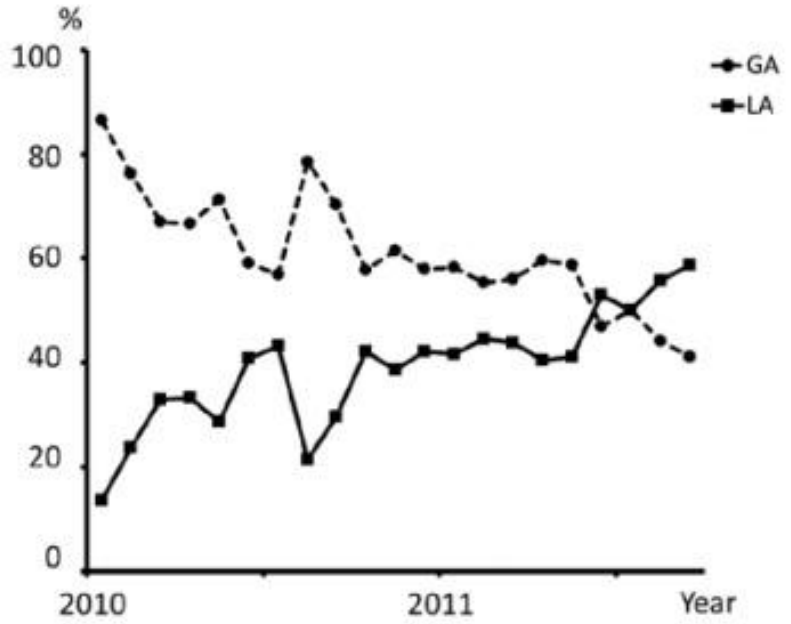
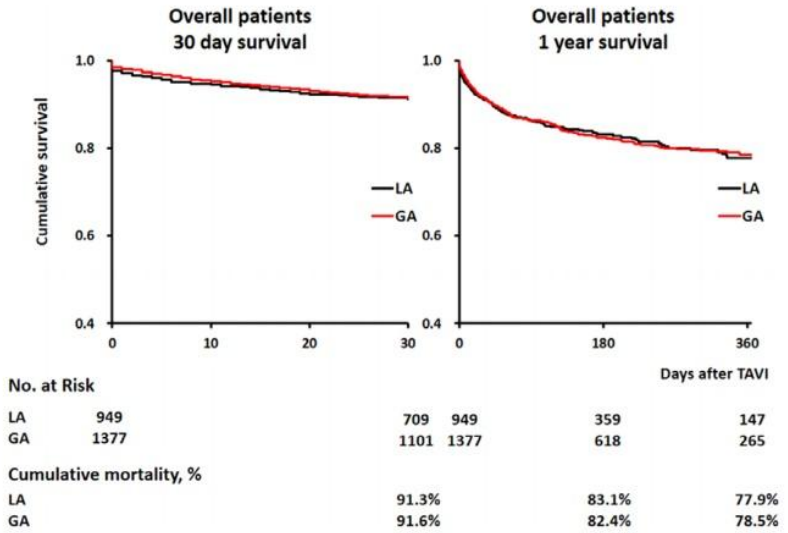
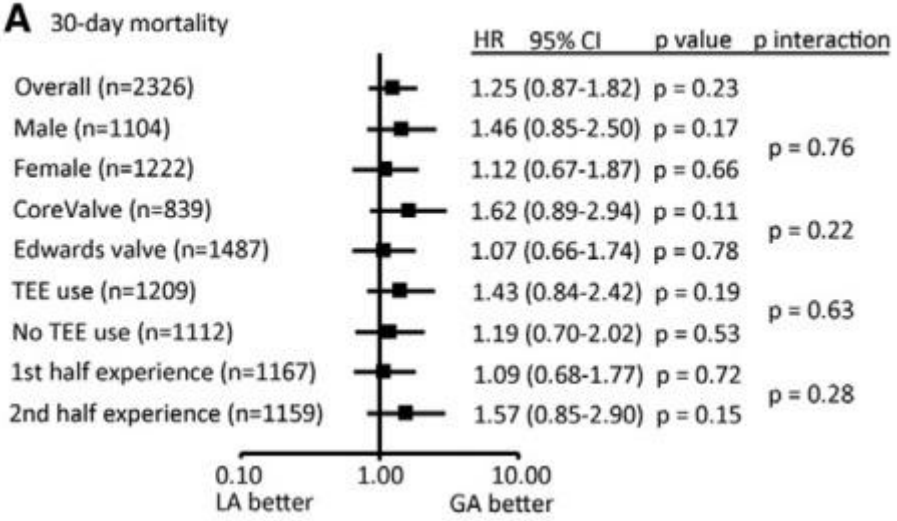



**Figure 1.** Percentages of local anesthesia (LA) and general anesthesia (GA) in all transfemoral transcatheter aortic valve implantation (TF-TAVI) procedures. The monthly percentages of LA and GA were calculated as the number of cases in each group divided by the total number of TF-TAVI cases.

# GA vs LA




- No significant difference between GA vs LA in 30-day, 1 year morality
- Higher incidence of post-procedural aortic regurgitation

Circu Cardiovasc Intervention 2014; 7:602-610

# LA with Sedation

- Advantages
  - Avoid haemodynamic instability during induction/emergence of general anaesthesia
  - Early detection of neurological complications
  - Shorter procedure and recovery time
- Sedative
  - Target-controlled infusion of propofol
  - Dexmedetomidine (a central acting α2 agonist)
  - Fentanyl/midazolam
- LA – local infiltration and ilioinguinal nerve block

# Patient Selection for LA

- Cooperative and motivated
- Airway – not difficult intubation/mask ventilation, no OSA and risk of aspiration
- No orthopnoea and free of musculoskeletal disease that prevent patients from lie still
- TEE not required during procedure (although it is possible for patient to tolerate TEE with propofol sedation)

# TEE with Non-invasive ventilation

# Post-Operative Care

- Significant morbidities, such as stroke, AV block and cardiac tamponade may develop
- Need close monitor at high dependency area or ICU
- Ventilatory support, especially after GA, may require as elderly and frail patients are common

# Multidisciplinary Approach for TAVI

- Interventional Cardiologist
- Cardiac surgeon
- Echocardiologist
- Anaesthesiologist
- Perfusionist

# Summary

- TAVI emergence as a promising technique for patients with severe AS previously not suitable for surgery
- Remain a challenge to anaesthesiologists, due to medically ill patients, procedure location, significant morbidities after procedure
- Although GA remains commonest, LA with sedation has been shown to have no difference in outcome, except AR
- Need careful patient selection for LA
- Multidisciplinary approach for managing patients for TAVI is needed

# THANK YOU