Comparison of *Monitored Anesthesia Care* versus *General Anesthesia* for Transcatheter Aortic Valve Replacement

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Objectives

• Anesthesia consideration and selection criteria for MAC vs GETA for TAVI patients

• Discuss possible complications of TAVRs done under MAC

• Literature review of outcomes for TAVRs performed under MAC vs GETA
Transcatheter Aortic Valve Replacement

• Over 400,000 TAVRs have been performed worldwide

• First performed in Paris on April 16, 2002

• Was initially intended for non-surgical candidates; now FDA has approved intermediate risk candidates

• Studies are now being done to look at TAVR for low risk patients
TAVR Trends

![TAVR Trends Graph](image)
Newest Generation Valves

Edwards - Sapien 3

Medtronic - CoreValve Evolut-R
Anesthetic Considerations for TAVR

- Oxygenation + Ventilation
- Monitoring – Arterial Line
- IV Access – Central Line?
- Echocardiography
GETA vs MAC Criteria (Continued)

MAC
Patients not requiring general anesthesia

General Anesthesia
1) Difficult airway
2) Diffuse aortoiliac arteriosclerotic disease requiring surgical cutdown
3) Morbid Obesity
4) Severe OSA
5) Inability to follow commands
6) Inability to lie supine
7) Need for TEE assessment

Fig. 1. Schematic diagram displaying exclusion and inclusion criteria.
Advantages of General Anesthesia

• Secured Airway with paralyzed patient

• Unlimited time for cardiologists to perform TAVR

• Allows for TEE Placement and Guidance

• Allows for quick conversion to surgical AVR, if necessary
Disadvantages of General Anesthesia

• Hemodynamic Fluctuations

• Increased risk of certain airway complications (prolonged intubation, pneumonia etc.)

• Prolongation of procedure time and ICU/length of stay
Evolution of Monitored Anesthesia Care (MAC)

• Operator improvement ➔ Shorter duration procedures

• Technological advancements
  • Lower profile delivery systems
  • Retrievable/recapturable valves
  • Less paravalvular leak ➔ less need for immediate echocardiography

• Minimalistic Approach
## Evolution of MAC (Continued)

<table>
<thead>
<tr>
<th>GETA – Previous Steps</th>
<th>MAC – Evolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pre-induction A-line</td>
<td>• No pre-induction A-line required</td>
</tr>
<tr>
<td>• Induction/Intubation</td>
<td>• No induction/intubation</td>
</tr>
<tr>
<td>• Central Line</td>
<td>• No central line (if no PPM)</td>
</tr>
<tr>
<td>• Foley Catheter</td>
<td>• No Foley</td>
</tr>
</tbody>
</table>
Advantages of MAC for TAVR

• Less Hemodynamic Instability

• Avoidance of Intubation and Mechanical Ventilation

• Shorter operating room time and faster recovery times

• Ability to monitor for neurologic complications

• Less risk of postoperative delirium
Disadvantages of MAC for TAVR

• Unsecured Airway
  ➢ Increased risk of aspiration
  ➢ Hypoxemia, Hypercapnia → Pulmonary Hypertension

• Must be prepared for immediate conversion to GETA
  ➢ Conversion rates range from 2%-17%
  ➢ Usually secondary to cardiac instability and/or hypotension
GETA vs MAC:
Which is better?
MAC vs GETA Comparison - Outcomes

Local versus general anesthesia for transcatheter aortic valve implantation (TAVR) – systematic review and meta-analysis

Official Count

MAC – 1

GETA - 0
Clinical Outcomes and Safety of Transfemoral Aortic Valve Implantation Under General Versus Local Anesthesia

Subanalysis of the French Aortic National

Atsushi Oguri, MD et al. August, 2014
Oguri, A. et al. – Analysis of FRANCE2

- Data from 2326 patients in FRANCE2 Registry Reviewed (January, 2010 – October, 2011)
  - GETA – 1377 patients, MAC – 949 patients
  - Initially, GETA was used in 86% of cases vs 14% using MAC
  - By the final month, GETA was used in 41% vs 59% using MAC
Oguri, A. et. al. - Findings

• TEE guidance needed more often in GETA vs MAC (76.3% v 16.9%, p < 0.001)

• Device success and 30 day mortality was similar between the groups

• Incidence of post-procedure AI > mild was higher in MAC vs GETA (19.1% vs 15.0%, p = 0.015)
Official Count

MAC – 1

GETA - 1
MAC vs GETA Comparison - Outcomes

General or Local Anesthesia for TAVI? A Systematic Review of the Literature and Meta-Analysis

Maas, EH et al. - 2016
• 10 studies including 5919 patients from January 1, 2002 – February 15, 2015 were reviewed

• Outcome parameters were:
  a. 30 day mortality
  b. Length of hospital stay
  c. Procedure duration
  d. Use of adrenergic support
  e. Safety Endpoints (stroke, AKI, AMI, etc.)
Maas et. al. – Meta-Analysis

• MAC – Shorter procedure time and hospital length of stay

• No statistically significant difference in other factors

• Statistically significant increase in paravalvular leak ≥ mild
  \( RR 1.31, \ p < 0.006 \)

• Statistically significant increase in need for implantation of PPM
  \( RR 1.23, \ p = 0.02 \)
Official Count

MAC – 1.5

GETA - 2
Comparison of MAC vs GETA for TAVR - Outcomes

Impact of Anesthesia Type on Outcomes of Transcatheter Aortic Valve Implantation (from the Multicenter ADVANCE Study)

Official Count

MAC – 1.5

GETA – 2

(No Change)
Comparison of MAC vs GETA for TAVR - Outcomes

Monitored Anesthesia Care Versus General Anesthesia: Experience With the Medtronic CoreValve

Christopher Palermo, DO, MPH et al. 2016
Palermo et al – MAC vs GETA Study

• N = 65 (GETA – 21, MAC – 44)

• No significant differences in:
  a. 30 day mortality
  b. ICU/Hospital Stay
  c. Complication Rates

• Conversion Rate from MAC to GEN - 2.3% (1 patient out of 44)
Official Count

MAC – 1.5

GETA – 2

(No change)
Comparison of clinical outcomes with the utilization of monitored anesthesia care vs. general anesthesia in patients undergoing transcatheter aortic valve replacement

Study Endpoints

- 30-day mortality
- 1 year mortality
- Rates and reasons for failure of MAC
- Post-procedural hospital and intensive care unit length-of-stays.
Official Count

MAC – 2

GETA - 2
Comparison of MAC vs GETA for TAVR - Outcomes

Outcome After General Anesthesia Versus Monitored Anesthesia Care in Transfemoral Transcatheter Aortic Valve Replacement – Analysis of OBSERVANT Trial

Paola D’Errigo, MStat, et al. - 2016
D’Errigo et. al. – Observational Study

• Multi-center, retrospective observation study with 1494 patients

• Findings: No difference between GETA and MAC for:
  a. 30 day mortality
  b. 3 year survival rate
  c. Paravalvular leak
  d. Permanent Pacemaker requirement
Official Count

MAC - 2

GETA – 2

(No Change)
## Summary of Studies

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Study Type</th>
<th>N</th>
<th>Results</th>
<th>Conversion Rate</th>
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</thead>
<tbody>
<tr>
<td>2014</td>
<td>Froelich</td>
<td>Review and Meta Analysis</td>
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<td>Retrospective</td>
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<td>12%</td>
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<tr>
<td>2016</td>
<td>D’Errigo</td>
<td>Observational</td>
<td>1494</td>
<td></td>
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<tr>
<td>2016</td>
<td>Palermo</td>
<td>Retrospective</td>
<td>65</td>
<td></td>
<td>2.3%</td>
</tr>
</tbody>
</table>
Conversion from MAC to GETA

Comparison of clinical outcomes with the utilization of monitored anesthesia care vs. general anesthesia in patients undergoing transcatheter aortic valve replacement

Sarkis Kiramijyan, MD et. al. - 2016
Reasons for Failure of Monitored Anesthesia in 56 of 467 (12%) patients and conversion to General Anesthesia

- Cardiac Arrhythmia/Hypotension/Cardiac Arrest: 37.5%
- Respiratory Complication: 16.1%
- Conversion of Access to Cutdown/Retroperitoneal: 16.1%
- Procedural Complication: LV or Annular Rupture/Aortic Dissection/Vascular Complication: 16.1%
- Laryngeal/Glottic Trauma by TEE: 7.1%
- Patient Agitation with MAC: 7.1%
Keys to Success for TAVR with MAC

• Patient Selection Criteria

• Candid discussion with patient regarding risks, benefits and alternatives of MAC vs GETA – Managing Expectations

• Coordination with Operator
Conclusions

• No randomized studies exist to compare GETA vs MAC for TAVR

• There is no difference in outcome between MAC vs GETA for TAVR

• MAC should be considered for select patients based on comorbidities and hospital practices

• A cardiac anesthesiologist must be present in case of emergent need for conversion to GETA
THANK YOU FOR YOUR TIME!