Comparative Effectiveness of Left Atrial Appendage Occlusion Among Patients with Atrial Fibrillation Undergoing Concomitant Cardiac Surgery: A Report from the Society of Thoracic Surgeons Adult Cardiac Surgery Database

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Co-authors

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Background

- The left atrial appendage (LAA) is implicated as the site of thrombus formation in 90% of thromboembolic (TE) events among patients with non-rheumatic atrial fibrillation (AF).
- Although systemic oral anticoagulation reduces the risk of TEs, as few as half of all eligible patients take these medications.
- The LAA can be surgically occluded at the time of cardiac surgery (S-LAAO) although there are limited data supporting the effectiveness of this procedure.

Objective

• To perform a large comparative effectiveness analysis of S-LAAO in a contemporary, nationally representative cohort of Medicare beneficiaries with AF who underwent cardiac surgery in the United States

• Primary outcome
  – Re-hospitalization for thromboembolism (ischemic stroke, TIA, systemic embolism) at 1 year

• Secondary outcomes
  – Hemorrhagic stroke, all-cause mortality, and a composite endpoint consisting of all-cause mortality, thromboembolism, and hemorrhagic stroke
Methods – Data Sources

• Society of Thoracic Surgeons (STS) Adult Cardiac Surgery Database from 2011-2012
  – >1,000 participating institutions
  – ~90% of CT surgical programs in the US

• A validated deterministic linkage process allowed for ascertainment of longitudinal data on morbidity and mortality for those with fee-for-service Medicare

Methods

- **Inclusions**
  - ≥65 years linked to Medicare claims
  - AF or atrial flutter
  - First time cardiac surgery
  - Operations
    - CABG
    - Mitral valve surgery ± CABG
    - Aortic valve surgery ± CABG
  - ≥6 months of follow-up after discharge

- **Exclusions**
  - Missing data on S-LAAO, primary surgical procedure, or discharge anticoagulation
  - Cardiogenic shock
  - Off pump operations
  - Operations for endocarditis, combined aortic and mitral disease, congenital heart disease, transplant, ventricular assist device implantation
Statistical Methods

- Inverse probability weighted Cox proportional hazards models or Fine-Gray models
  - 29 variables were used for adjustment
- Exploratory secondary analyses with stratification by discharge anticoagulation
Results

- 10,524 patients met study criteria
- Median age 76, interquartile range (IQR) 71-81
- 39% female
- Median CHA$_2$DS$_2$-VASc 4, IQR 3-5
- Primary operation
  - 30% mitral valve procedure ± CABG (n=3,162)
  - 35% aortic valve procedure ± CABG (n=3,635)
  - 35% isolated CABG (n=3,726)
- 37% underwent S-LAAO (n=3,892)
## Baseline Characteristics by Treatment

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<th>Characteristic</th>
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<th>S-LAAO N=3,892</th>
<th>P-Value</th>
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<tbody>
<tr>
<td>Age, years</td>
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<td>Female, %</td>
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Thromboembolism

Unadjusted
HR 0.63, CI 0.47-0.84, p=0.0016

Adjusted
HR 0.62, CI 0.46-0.83, p=0.001
All-cause mortality

7.0% vs. 10.8%

Unadjusted
HR 0.63,
CI 0.55-0.73,
p<0.0001

Adjusted
HR 0.85,
CI 0.74-0.97,
p=0.015
Hemorrhagic Stroke

Unadjusted
HR 0.70,
CI 0.29-1.69,
p=0.43

Adjusted
HR 0.64,
CI 0.26-1.56,
p=0.33

0.2% vs. 0.3%
TE, Hemorrhagic Stroke, or Death

Unadjusted
HR 0.63, CI 0.55-0.71, p<0.0001

Adjusted
HR 0.70, CI 0.70-0.90, p=0.0002

8.7% vs. 13.5%
Outcomes by Discharge Anticoagulation

No Anticoagulation (n=3,848)

- TE: HR 0.29, 95% CI 0.14-0.60, P-value 0.0009
- Death: HR 1.06, 95% CI 0.87-1.30, P-value 0.55
- Hemorrhagic Stroke: HR 0.13, 95% CI 0.10-3.36, P-value 0.22
- Composite: HR 0.91, 95% CI 0.75-1.10, P-value 0.33

Anticoagulation (n=6,676)

- TE: HR 1.04, 95% CI 0.76-1.42, P-value 0.80
- Death: HR 0.88, 95% CI 0.74-1.05, P-value 0.15
- Hemorrhagic Stroke: HR 0.32, 95% CI 0.09-1.17, P-value 0.08
- Composite: HR 0.89, 95% CI 0.77-1.04, P-value 0.15
Results Summary

• S-LAAO was associated with a 38% lower risk of thromboembolism and 15% lower risk of all-cause mortality

• Exploratory analyses suggest that the association between S-LAAO and a lower rate of thromboembolism is strongest among those discharged without oral anticoagulation
Limitations

- Retrospective, non-randomized study design
- Endpoints determined by ICD-9 codes
- No data on method or completeness of S-LAAO
- Discharge anticoagulation status may not be predictive of long term anticoagulant use
Conclusions

• In a nationally representative cohort of older patients with AF undergoing cardiac surgery, S-LAAO was associated with lower rates of thromboembolism and all-cause mortality

• Although randomized trial data are needed, these data support the use of S-LAAO among patients with AF undergoing cardiac surgery
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