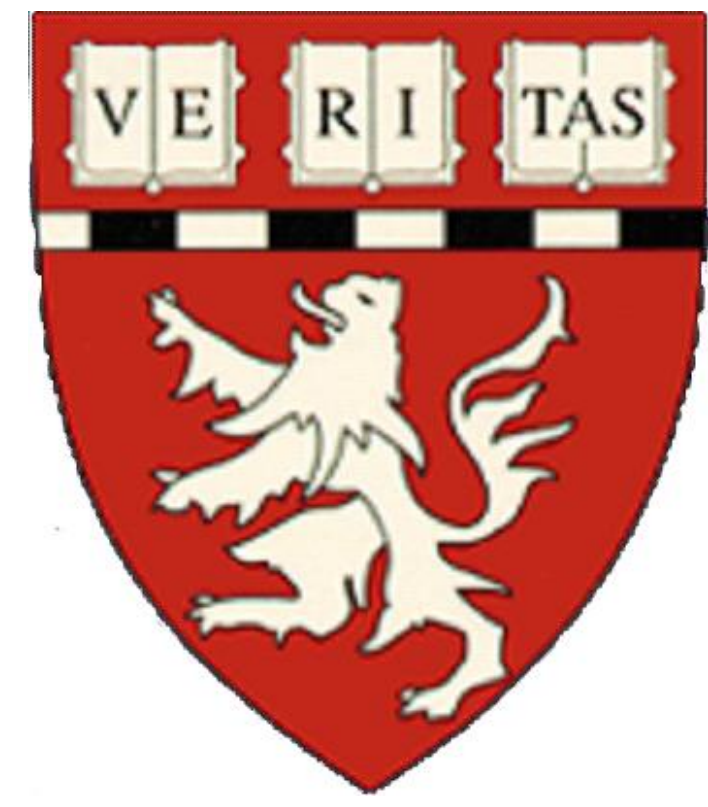




# Stroke Patterns and Implications for Ventricular Functional Remodeling in Left Ventricular Assist Systems



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## Background

- Ischemic stroke complications can be frequently encountered in patients with left ventricular assist systems (LVAS)
- A large proportion of these strokes affect the right hemisphere and can involve the neuro-cardiac axis, including the left insular region which is involved with parasympathetic stimulation to the heart
- Although animal studies demonstrate improvement in cardiac function with unopposed left insular stimulation, no human data exists

## Objectives

- Describe the stroke patterns commonly seen in patients with LVAS
- Determine effect of strokes with underlying cardiac function
- Assess whether stroke patters that enable an increase in left insular stimulation are associated with improved cardiac function in patients with LVAS
- Assess whether patient-specific characteristics portend a higher likelihood of cardiac function improvement in LVAS patients with right insular infarcts

## Methods

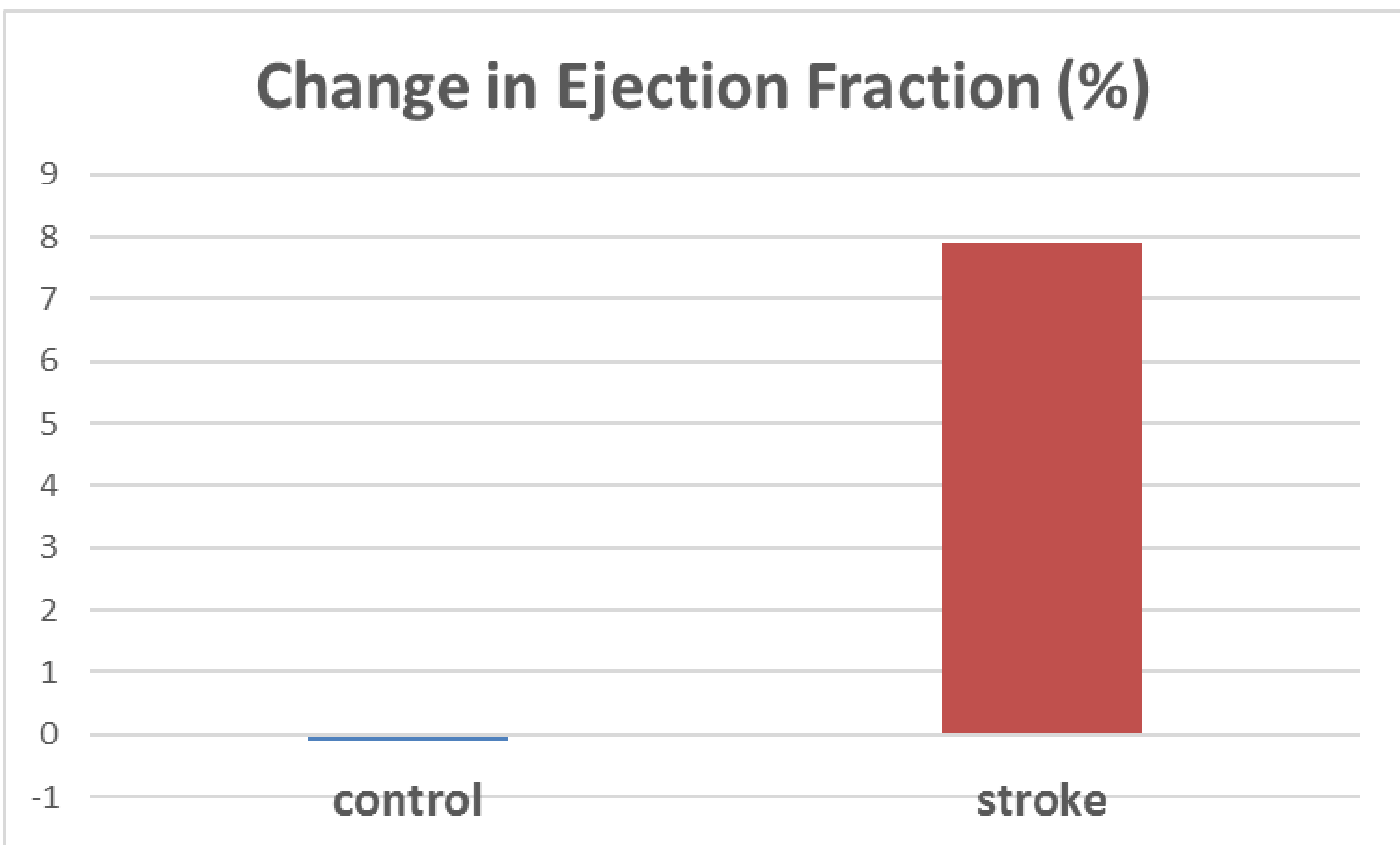
- A multi-center retrospective study of all patients undergoing LVAS implantation between May 2008 and September 2016 were performed
- Patients were divided into subsets based on stroke and further stratified based on stroke patterns
  - Stroke patterns included locations affecting the right insular territory (enabling unopposed left insular activity) versus other territories
- Primary study end-point was to evaluate the change of left ventricular ejection fraction (LVEF) among patients with right insular infarcts compared to those without over a 6 month period; patients that did not experience a stroke in this region were used as controls

**Table 1:** Clinical demographic comparison among patients without stroke (control) and patients with right sided stroke affecting the insular cortical region.

	Control (no stroke)	Right sided stroke	p-value
n	97	14	
Age LVAS implant (y)	54.5	54.3	0.95
Male (n)	77 (79.4%)	12 (85.7%)	0.58
Destination therapy (n)	27 (27.8%)	3 (21.4%)	0.62
Ischemic etiology (n)	35 (36.1%)	4 (28.6%)	0.59
Diabetes mellitus (n)	38 (39.2%)	8 (57.1%)	0.21
Body mass index (kg/m2)	26.4	26.4	0.97
Prior CV surgery (n)	26 (26.8%)	4 (28.6%)	0.89
Chronic kidney disease (n)	23 (23.7%)	3 (21.4%)	0.85
Peripheral vascular disease (n)	10 (10.3%)	0	0.21
INTERMACS score	2.4 (mean, 2)	2.4 (median, 2)	0.92
Prior history stroke (n)	9 (9.3%)	0	0.24
History smoking (n)	44 (45.3%)	2 (14.3%)	0.027
Living (n)	85 (87.6%)	12 (85.7%)	0.84
Transplanted (n)	33 (34%)	8 (57%)	0.095

**Table 2:** Comparison of ejection fraction and cardiac pharmacotherapies surrounding LVAS implantation among patient subsets.

	Control (no stroke)	Right sided stroke	p-value
EF prior to LVAS (%)	18.5	16.8	0.42
EF post LVAS (%)	20.9	20.4	0.79
EF 6 months post LVAS (%)	20.8	24.2	0.16
ACE/ARB post LVAS (n)	41 (42.2%)	7 (50%)	0.59
Beta blockade post LVAS (n)	49 (50.5%)	10 (71.4%)	0.15
Aldosterone antagonist post LVAD (n)	29 (29.9%)	9 (64.3%)	0.0081



**Figure 1.** 6 month difference in ejection fraction following stroke versus controls. ( $p=0.0029$ )

## Results

- A total of 111 patients were included, of which 14 (12.6%) had a stroke affecting the right insular region and 97 (87.4%) did not and were included in the control subset
- Three (3.1%) of patients had strokes affecting other regions and were excluded from the study
- Clinical demographics were similar among both patient subsets with no differences in comorbidity burden and mean LVEF post-LVAS was also similar in both subsets (20.9% in right insular stroke subset vs 20.4% in no stroke subset;  $p=0.79$ )
- In the control subset, no change in LVEF was noted over a 6-month period (mean change -0.1%, SD 7.3%), while patients with right insular territory strokes had an increase in LVEF of 8% (SD, 15%;  $p=0.0015$ )
- The vast majority of patients in the right insular territory subset demonstrated at least a 20% improvement in LVEF ( $n=10$ , 71.4%)

## Conclusions

- Strokes affecting the right insular region are common among patients with LVAD
- Our observations suggest that a right sided ischemic stroke in the insular territory is associated with significant improvement in left ventricular functional remodeling
- This pathway may influence ventricular function due to unopposed activation of the left insular cortex, which is associated with pathways that enhance cardiac function through parasympathetic stimulation
- These novel findings may open avenues for exploration in the field of myocardial recovery

## Disclosures

- Mandeep Mehra, MD is a national co-primary investigator in the MOMENTUM-3 trial; none of the other authors have any disclosures, financial or other, to make in regard to this study