DISPARITY-AF

Sex-Based Disparities in the Electrophysiological Substrate for Atrial Fibrillation and Its Impact on Clinical Outcomes

- **Study Design:** Prospective, single-center, investigator-initiated observational cohort study
- **Sponsor/Funding:** Unfunded, Investigator-Initiated
- **Site:** Shamir Medical Center, Tel Aviv University, Israel
- **Principal Investigator:** Anat Milman, MD PhD
- **Co-Investigators:** Elad Anter, MD; Maxime Zabern, MD; Michael Barkagan, MD; Dor Yadin, PhD; Ofir Mitz, BA
- **Sample Size:** 100 consecutive patients (Target: ~50 Females, ~50 Males)
- **Clinical Setting:** First-time AF ablation for Paroxysmal (PAF) or Persistent AF (PerAF)

TABLE OF CONTENTS

1. List of Abbreviations
2. Synopsis
3. Background and Rationale
4. Study Objectives
5. Study Population
6. Study Procedures
    6.1 Pre-Procedural Management
    6.2 Standard PVI Ablation Phase
    6.3 Biatrial Repolarization Mapping Phase (Observational)
7. Follow-Up and Monitoring
    7.1 Acute Safety Follow-Up
    7.2 Clinical Follow-Up and Rhythm Monitoring
    7.3 Post-Procedure Antiarrhythmic Drug Management
    7.4 Repeat (Redo) Ablation Procedures
8. Statistical Considerations
9. Ethical Considerations (Helsinki)
10. Study Governance and Safety Oversight
11. Study Monitoring and Data Protection
12. Appendix A: Schedule of Assessments
13. Appendix B: Study Flowchart and Measurement Sites
14. Appendix C: Adverse Event (AE) / Serious Adverse Event (SAE) Form
15. Appendix D: Procedural Case Report Form
16. Appendix E: Follow-up Case Report Form

1. LIST OF ABBREVIATIONS

- **AAD** – Antiarrhythmic Drug
- **AERP** – Atrial Effective Refractory Period
- **AF** – Atrial Fibrillation
- **AT** – Atrial Tachycardia
- **CRF** – Case Report Form
- **CS** – Coronary Sinus
- **CTI** – Cavotricuspid Isthmus
- **DCCV** – Direct Current Cardioversion
- **LA** – Left Atrium
- **LAA** – Left Atrial Appendage
- **LAT** – Local Activation Time
- **LPV** – Left Pulmonary Vein
- **PAF** – Paroxysmal Atrial Fibrillation
- **PerAF** – Persistent Atrial Fibrillation
- **PES** – Programmed Electrical Stimulation
- **PFA** – Pulsed Field Ablation
- **PVI** – Pulmonary Vein Isolation
- **PWI** – Posterior Wall Isolation
- **RA** – Right Atrium
- **RAA** – Right Atrial Appendage
- **RFA** – Radiofrequency Ablation
- **RPV** – Right Pulmonary Vein
- **SRG** – Steep Repolarization Gradient
- **SVC** – Superior Vena Cava
- **WACA** – Wide Area Circumferential Ablation

2. SYNOPSIS

DISPARITY-AF is a prospective, single-center, observational registry designed to characterize the sex-based disparities in the electrophysiological substrate driving Atrial Fibrillation (AF). While standard Pulmonary Vein Isolation (PVI) is the cornerstone of AF ablation, women consistently experience lower long-term success rates. This study tests the hypothesis that women harbor a significantly higher burden of unmapped, extra-pulmonary vein (extra-PV) AF initiation sites compared to men.

In 100 consecutive patients undergoing first-time PVI, comprehensive biatrial repolarization mapping will be performed using programmed electrical stimulation (PES) to measure the atrial effective refractory period (AERP) in multiple atrial sites immediately after successful PVI. All mapping systems and multielectrode catheters utilized in this study are clinically approved and used routinely in our center. Identified steep repolarization gradients (SRGs) and AF initiation sites will be documented but not ablated. Patients will undergo intensive 1-year clinical follow-up to test the secondary hypothesis that patients with untreated extra-PV SRG/AF initiation sites have a significantly higher rate of AF recurrence.

3. BACKGROUND AND RATIONALE

The Clinical Gender Gap in AF Ablation

Catheter ablation for AF has evolved almost exclusively around the empiric anatomic strategy of PVI. While standard PVI is effective for many patients, real-world outcomes demonstrate a persistent gender disparity. Women undergoing AF ablation experience significantly lower long-term rhythm success rates and a higher baseline burden of debilitating symptoms compared with men. Because women have historically been underrepresented in AF clinical trials, current standard-of-care strategies and guideline recommendations are largely derived from predominantly male populations.

The Mechanistic Gap: Unmapped Extra-PV Substrate and Empiric Lesions

Recent electrophysiological observations suggest that AF initiation arises from spatially discrete atrial regions characterized by SRGs. Preliminary data indicate that the anatomical distribution of this substrate may differ substantially between sexes, with women exhibiting a higher prevalence of extra–PV targets, particularly within the right atrium (RA).

However, the precise anatomical distribution of these extra-PV initiation sites in men and women remains poorly defined. As a result, empiric lesion sets—such as posterior wall isolation (PWI) are often performed during ablation procedures in an attempt to improve outcomes. These empiric anatomical approaches, however, have not demonstrated consistent or reproducible clinical benefit, likely because they do not target the patient-specific mechanisms responsible for AF initiation.

Because standard first-time ablation procedures focus primarily on isolating the pulmonary veins, potential extra-PV initiation sites are typically neither systematically mapped nor treated.

Study Rationale

The DISPARITY-AF study is designed to systematically map biatrial repolarization gradients in a treatment-naïve cohort undergoing first-time AF ablation. By prospectively characterizing the distribution of SRGs and AF initiation sites in both atria, the study aims to define sex-based differences in AF substrate and evaluate whether untreated extra-PV targets are associated with long-term arrhythmia recurrence.

4. STUDY OBJECTIVES

Primary Objective:

To characterize and compare the spatial distribution and frequency of extra-PV SRGs and AF initiation sites between men and women in both atria following standard PVI:

Primary endpoints:

1. Presence of ≥1 extra-PV SRG

2. Number of SRGs per patient
3. Anatomical distribution (RA vs LA)
4. Presence of AF initiation site during PES

Secondary Objective:

To assess the clinical outcome at 1 year (freedom from AF/AT) to evaluate the hypothesis that patients with documented, untreated extra-PV SRGs and AF initiation sites have higher recurrence rates following standard PVI alone.

Recurrence will be defined as any documented AF, atrial tachycardia, or atrial flutter lasting ≥30 seconds occurring after the 2-month blanking period.

5. STUDY POPULATION

Inclusion Criteria:

- Age between 18 and 80 years.
- Male or Female sex (aiming for balanced, consecutive enrolment of ~50 per group).
- Symptomatic paroxysmal or persistent AF indicated for a first-time catheter ablation.
- Ability to provide written informed consent.

Exclusion Criteria:

- Prior catheter ablation for AF or surgical MAZE.
- Long-standing persistent AF (>12 months).
- Presence of intracardiac thrombus or contraindication to systemic anticoagulation.
- Pregnant women and patients not able to provide an informed consent

6. STUDY PROCEDURES

6.1 Pre-Procedural Management

1. Class I and Class III antiarrhythmic drugs will be discontinued at least 3 days prior to the procedure, with amiodarone discontinued at least 2 weeks prior when feasible. Beta blockers and Calcium channel blockers are allowed.
2. Oral anticoagulation will be maintained uninterrupted according to guideline-based practice.
3. Intracardiac thrombus will be excluded by transesophageal echocardiography, cardiac CT or intracardiac echocardiography prior to the procedure, according to institutional practice.

6.2 Standard PVI Ablation Phase

All patients will undergo a standard-of-care PVI. Pulmonary vein isolation will be performed using commercially approved systems (Radiofrequency Ablation [RFA] or Pulsed Field Ablation [PFA]) per the operator's clinical discretion. Entrance block will be confirmed in all PVs. No empiric extra-PV ablation (e.g., lines or posterior wall isolation) will be performed.

6.3 Biatrial Repolarization Mapping Phase (Observational)

Following successful PVI, the patient will undergo the following bi-atrial mapping procedure. Mapping will be performed during coronary sinus pacing at a fixed cycle length of 600 ms. If the patient presents in AF, external cardioversion will be performed at the beginning of the procedure to restore sinus rhythm prior to mapping. Both the left and right atria will be mapped; the order of chamber mapping will be at the operator’s discretion. An anatomical shell, bipolar voltage map, and activation map will be created simultaneously using a high-density multipolar mapping catheter. All mapping systems and multielectrode mapping catheters utilized during this phase are clinically approved and routinely used in our center for standard-of-care procedures.

- **Mapping Systems:** Operators may utilize any contemporary 3D electroanatomical mapping system, including the CARTO 3 system (Johnson & Johnson), EnSite X (Abbott), or the Affera system (Medtronic), paired with their respective compatible high-density multielectrode mapping catheters.
- **Repolarization Mapping Density and Regional Distribution:** Repolarization mapping will be systematically performed in both the Left Atrium (LA) and RA by measuring the AERP using PES. Mapping will be conducted using high-density point acquisition, with interpolation

between points strictly limited to 10 mm. To guarantee comprehensive and standardized biatrial coverage, AERP will be measured at the following specific anatomical sites:

Left Atrium (LA):

- 8–10 points in the posterior wall from roof to floor, including the border zone of the wide area circumferential ablation (WACA).
- 3 points along the left pulmonary vein (LPV) ridge.
- 2 points on the ridge side of the left atrial appendage (LAA).
- 3 points along the anterior aspect of the LAA.
- 3 points along the septal aspect of the right pulmonary vein (RPV) WACA.

Right Atrium (RA):

- 2 points in the superior vena cava (SVC).
- 2–3 points on the lateral aspect of the right atrial appendage (RAA).
- 2–3 points on the septal aspect of the RAA.
- At least 1 point each at the fossa ovalis and the coronary sinus (CS) ostium.
- 5–6 points along the lateral wall, anterior to the crista terminalis.
- Cavotricuspid isthmus (CTI) area.

- **Pacing Protocol:** The PES protocol consists of a drive train of 6–8 S1 stimuli delivered at a cycle length of 600 ms, followed by a single extrastimulus (S2) delivered from the same electrode. The S1–S2 coupling interval will be progressively shortened in 10 ms decrements until failure of local capture. AERP is defined as the longest S1–S2 coupling interval at which the S2 fails to capture the local atrial myocardium.
- **Electroanatomical Visualization:** The repolarization map will be constructed on the electroanatomical mapping system using directly measured AERP values and displayed on the atrial anatomical shell using a local activation time (LAT) color-coded scale. AERP values will be visualized as continuous color gradients across the mapped surface, with shorter AERP values represented at one end of the color spectrum and longer AERP values at the opposite end, according to the native display conventions of the respective mapping platform. When using the Affera system, AERP values will be tagged at the specific

measurement sites because color-coded visualization of repolarization values is not currently available.

- **Documentation & Tagging ONLY:** Any identified SRGs (defined as an absolute difference in AERP of 50 ms between two directly measured mapping points separated by 10 mm) will be recorded. During progressive shortening of the S1–S2 interval, AF may be induced. All AF initiation events (sustained 3 seconds) occurring during AERP mapping will be explicitly documented and spatially tagged on the electroanatomical map. Any induced AF episodes will be promptly terminated by cardioversion if sustained or hemodynamically significant, according to standard electrophysiology laboratory practice. Importantly, these extra-PV targets will NOT be ablated.

7. FOLLOW-UP AND MONITORING

7.1 Acute Safety Follow-Up

Because the investigational component of this study consists solely of additional electrophysiological mapping time using commercially approved technologies within a standard-of-care procedure, an independent Data Safety Monitoring Board (DSMB) will not be established. Instead, a designated Medical Monitor will oversee safety reporting throughout the study.

The Medical Monitor will be a senior cardiologist with expertise in cardiac procedures who is not involved in the conduct of the study and has no direct role in patient enrollment, procedures, or data analysis. The Medical Monitor will independently review all reported safety events.

All acute procedural complications and safety events will be reviewed by the Medical Monitor within 72 hours of notification.

Adverse Event (AE) and Serious Adverse Event (SAE) forms will be completed by the research coordinator in collaboration with the procedural operator and documented in the study Case Report Form (CRF; Appendix C).

If serious adverse events directly attributable to the repolarization mapping protocol occur in ≥2 of the first 10 enrolled patients, study enrollment will be temporarily paused, and an ad-hoc safety review will be conducted by the Medical Monitor and study leadership to determine whether protocol modification or study termination is necessary.

Definitions

AE

An AE is any unfavorable and unintended medical occurrence in a study participant undergoing the procedure, whether or not it is considered related to the study protocol.

SAE

An SAE is any adverse event that results in one or more of the following outcomes:

- Death
- Life-threatening event
- Stroke/TIA
- Persistent or significant disability or incapacity
- Unplanned hospitalization or prolongation of hospitalization
- Any important medical event that may jeopardize the patient or require medical or surgical intervention to prevent one of the outcomes listed above

For the purposes of this study, the following procedural complications will be classified and reported as SAEs:

- Pericardial effusion or cardiac tamponade
- Stroke/TIA
- Phrenic nerve injury
- Vascular access complications requiring intervention
- Esophageal injury
- Heart failure exacerbation requiring treatment
- Prolonged hospitalization (>24 hours beyond the expected post-procedural course)
- Any other serious adverse event related to the procedure

Safety Follow-Up Period

Formal protocol-mandated safety follow-up will extend through 7 days after the procedure or until hospital discharge, whichever occurs later.

All AEs and SAEs occurring during this period will be documented in the CRF and reviewed by the Medical Monitor.

7.2 Clinical Follow-Up and Rhythm Monitoring

Long-term follow-up will occur as part of routine clinical care but will follow a structured monitoring schedule to ensure consistent capture of the study's exploratory clinical outcomes.

Clinic Visits:

Patients will be evaluated at the following time points after the ablation procedure:

- 1 month ±14 days
- 3 months ±30 days
- 6 months ±30 days
- 9 months ±30 days
- 12 months ±30 days
- 18 months ±30 days
- 24 months ±30 days
- 36 months ±30 days

Visits may be conducted in person or via telemedicine, depending on clinical circumstances.

During these visits, the following information will be collected:

- Symptoms suggestive of arrhythmia recurrence
- Medication use, including antiarrhythmic drugs and anticoagulation
- Interval hospitalizations or cardiovascular events
- Standard ECG documentation when available

Rhythm Monitoring:

To systematically detect symptomatic and asymptomatic arrhythmia recurrence, patients will undergo scheduled ambulatory rhythm monitoring during follow-up.

48-hour Holter monitors will be performed at:

- 3 months ±30 days
- 6 months ±30 days
- 12 months ±30 days
    - 18 months ±30 days
    - 24 months ±30 days
    - 36 months ±30 days

Additional rhythm monitoring (Holter, event monitor, or ECG) may be performed at the treating physician's discretion if symptoms suggest arrhythmia recurrence.
Recurrence of atrial arrhythmia will be defined as documented AF or atrial tachycardia lasting ≥30 seconds after the standard 2-month blanking period.

AFEQT Questionnaire:
Patients will complete the Atrial Fibrillation Effect on Quality-of-Life (AFEQT) questionnaire prior to the procedure,at the 12-month follow-up visit, and at the 36-months follow-up visit.

7.3 Post-Procedure Antiarrhythmic Drug Management

The use of AADs following the ablation procedure will be at the discretion of the treating electrophysiologist and managing physician, in accordance with routine clinical practice.
Continuation, initiation, or discontinuation of AAD therapy during follow-up will not be dictated by the study protocol. All AAD use will be prospectively documented, including drug type, dosing, changes, discontinuation, and replacement. This information will be incorporated into the clinical database and considered in exploratory analyses of arrhythmia recurrence.

7.4 Repeat (Redo) Ablation Procedures

If patients experience recurrent atrial arrhythmia and undergo a repeat ablation procedure during the follow-up period, the following protocol is recommended:
• PVI status will be assessed at the beginning of the procedure to determine reconnection.
• Biatrial repolarization mapping, using the same methodology as performed during the index procedure, should be performed whenever feasible. This repeat mapping will allow evaluation of

the temporal stability of repolarization gradients and AF initiation sites identified during the initial procedure.

The ablation strategy during redo procedures will be entirely at the operator's discretion, including the decision to ablate AF initiation sites, regions with SRG, and other clinically relevant substrates. All mapping findings and ablation targets during redo procedures will be documented in the study database.

In the event that a redo ablation is performed during the predefined follow-up period, the follow-up period will be reset. A new 36 months follow-up period will commence from the date of the redo ablation procedure. This follow-up period reset may occur only once per patient; no subsequent reset will be permitted in the event of any additional redo ablation procedure.

8. STATISTICAL CONSIDERATIONS

- **Sample Size:** A cohort of 100 consecutive patients (~50 males, ~50 females) will be enrolled. This investigator-initiated sample is exploratory and intended to estimate sex-based substrate differences and to provide preliminary effect size estimates for associations with 1-year arrhythmia recurrence. The study is not powered for definitive hypothesis testing but is designed to generate estimates that will inform the design and power calculations of future larger studies.
- **Data Management:** All clinical, procedural, and mapping data will be collected prospectively using a dedicated Case Report Form (CRF) provided in appendix D and E.
- **Analysis:** Differences in the prevalence of SRGs and AF initiation sites between sexes will be analyzed using Chi-square or Fisher's exact tests.
  - The association between untreated substrate and 1-year AF recurrence will be analyzed using Cox proportional hazards regression (time-to-first recurrence) adjusting for AF type and sex.
  - Multivariable Cox regression models will adjust for clinically relevant covariates including age, AF type, and left atrial size.
  - Continuous variables will be compared using t-tests or Mann-Whitney tests depending on distribution.
- **Study Duration**

Enrollment is expected to occur over approximately 12–18 months. Each participant will be followed for 12 months after the index ablation procedure. The total study duration is expected to be approximately 3 years, including enrollment, follow-up, and data analysis.

9. ETHICAL CONSIDERATIONS

The study will be conducted in accordance with the Declaration of Helsinki, Good Clinical Practice (ICH-GCP) guidelines, and applicable local regulatory requirements.

The investigational component of the study consists solely of additional electrophysiological mapping performed using clinically approved electroanatomical mapping systems and catheters during a standard-of-care AF ablation procedure.

Risks: The additional repolarization mapping phase is expected to add approximately 15 minutes of procedural time. The mapping is performed entirely using electroanatomical navigation systems and therefore does not require additional fluoroscopy or radiation exposure. Potential risks are those inherent to standard catheter ablation procedures and include, but are not limited to:

- cardiac tamponade
- stroke or transient ischemic attack
- vascular complications
- phrenic nerve injury

No additional ablation lesions will be delivered as part of the research protocol.

Benefits: Although the mapping data will not alter the intra-procedural ablation strategy during the index procedure, participants may benefit from the structured and intensive follow-up protocol, which includes scheduled clinic visits and systematic rhythm monitoring. This monitoring may facilitate early detection and management of arrhythmia recurrence.

10. STUDY GOVERNANCE AND SAFETY OVERSIGHT

An independent Data Safety Monitoring Board will not be established for this investigator-initiated observational study due to the limited sample size and the fact that the investigational component

consists solely of additional electrophysiological mapping using commercially approved technologies within a standard-of-care ablation procedure.

Safety oversight will be performed by a designated Medical Monitor, who will review all reported acute procedural complications (e.g., cardiac tamponade, stroke or transient ischemic attack, and vascular complications requiring intervention) within 72 hours of occurrence.

If two or more unexpected severe adverse events potentially attributable to the repolarization mapping protocol occur within the first ten enrolled patients, study enrollment will be temporarily paused and an ad-hoc safety review will be conducted to determine whether protocol modifications are required before enrollment resumes.

Safety events and protocol adherence will be monitored throughout the study.

Study Registration: the study will be registered in a public clinical trials registry (e.g., ClinicalTrials.gov) prior to enrollment of the first patient, in accordance with International Committee of Medical Journal Editors (ICMJE) requirements.

11. STUDY MONITORING AND DATA PROTECTION

Study Monitoring

The study will be conducted in accordance with ICH-GCP principles and applicable institutional policies. Monitoring will be performed using a risk-based approach appropriate for an investigator-initiated observational study. Monitoring activities may include on-site or remote review of study documentation.

Monitoring will verify:

- IRB / Ethics Committee approval
- informed consent documentation
- patient eligibility
- accuracy of key study variables
- documentation of adverse events
- protocol compliance

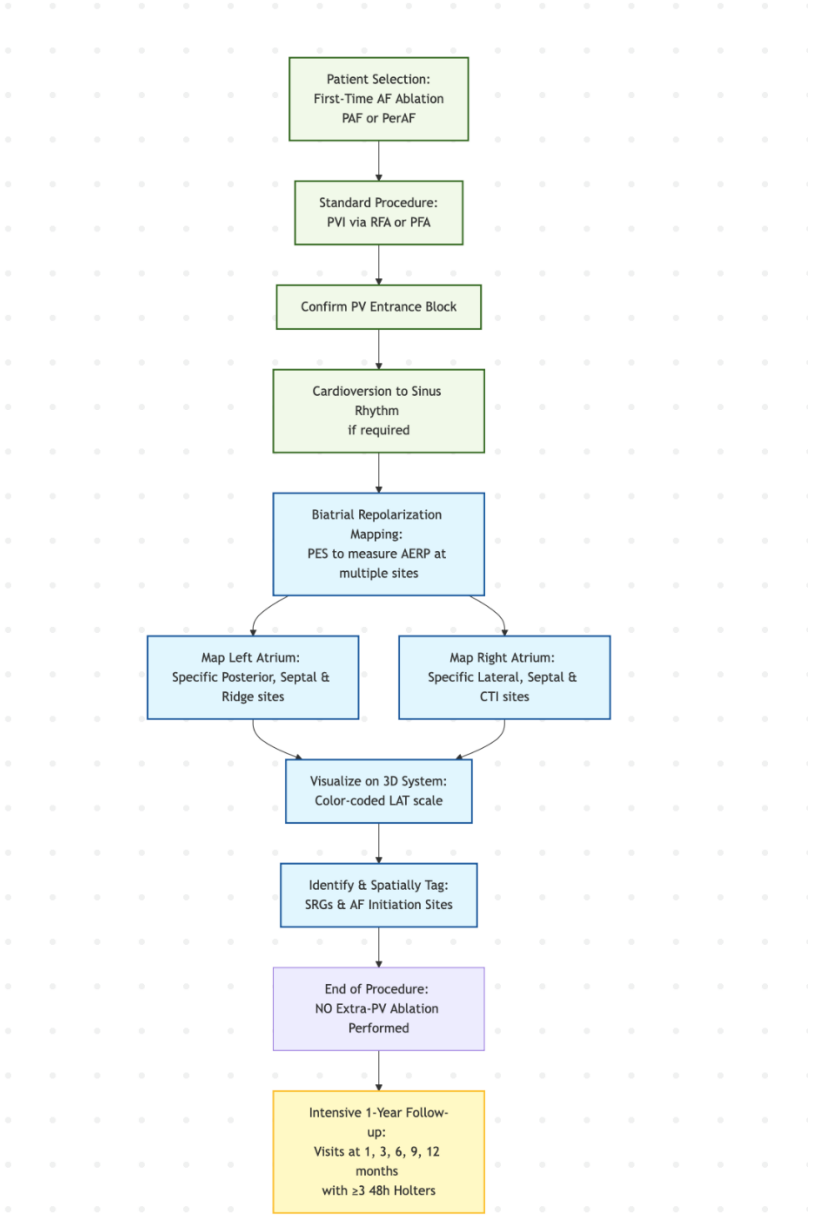
Data Protection

All patient data will be collected and stored in a pseudonymized format using a unique study identification number. Directly identifiable patient information will remain securely stored at the study site and will not be transferred outside the institution. Study data will be stored in secure institutional systems and handled in accordance with applicable data protection regulations, including GDPR where applicable. Study data will be retained for at least 10 years after study completion, or longer if required by institutional or national regulations. Access to the study database will be limited to study investigators and authorized research personnel.

12. APPENDIX A- Schedule of Assessments

Study Activity	Screening / Pre-Procedure	Procedure Day	Post-Procedure / Discharge	1 Month	3 Months	6 Months	9 Months	12 Months	18 Months	24 Months	36 Months
Informed consent	----------X----------										
Eligibility confirmation	X	X									
Demographics and medical history	X										
AF classification (PAF / PerAF)	X										
Baseline medications	X		X	X	X	X	X	X	X	X	X
Standard PVI		X									
Biatrial repolarization mapping		X									
Procedural safety assessment		X	X								
Adverse event assessment			X	X	X	X	X	X	X	X	X
ECG			X	X	X	X	X	X	X	X	X
AAD documentation			X	X	X	X	X	X	X	X	X
48-hour Holter					X	X		X	X	X	X
Arrhythmia recurrence assessment				X	X	X	X	X	X	X	X
Documentation of redo ablation (if applicable)					X	X	X	X	X	X	X

13. APPENDIX B- Study Flowchart & Measurement Sites



14. Appendix C – AE / SAE Form

Field	Description / Options
Study ID	
Hopital MRN	
Event number	
Event classification	☐ AE ☐ SAE
SAE Category	
SAE type	☐ Pericardial effusion / tamponade ☐ Stroke / TIA ☐ Vascular complication requiring intervention ☐ Phrenic nerve injury ☐ Esophageal injury ☐ Heart failure exacerbation requiring treatment ☐ Prolonged hospitalization (>24h) ☐ Other (specify)
Event description	
Date of onset	
Date of resolution	
Severity	☐ Mild ☐ Moderate ☐ Severe
Seriousness criteria	☐ Death ☐ Life-threatening event ☐ Prolonged hospitalization ☐ Persistent disability ☐ Medically significant event
Relationship to procedure	☐ Related to procedure ☐ Possibly related to study mapping protocol ☐ Unrelated
Action taken	☐ Observation ☐ Medication ☐ Intervention ☐ Hospitalization ☐ Other
Outcome	☐ Resolved ☐ Ongoing ☐ Resolved with sequelae ☐ Death
Reported to Medical Mon	☐ Yes ☐ No
Date reported	
Investigator signature	

15. Appendix D – Procedural CRF

1. Patient Identification

Variable	Entry
Study ID	_____
Hospital MRN	_____
Procedure Date	____ / ____ / _____
Operator 1 Operator 2	_____ _____

2. Demographics and AF history

Variable	Entry
Age	_____ years
Sex	☐ Male ☐ Female
Ethnicity	☐ Ashkenazi ☐ Sephardi ☐ Arab ☐ Ethiopian ☐ Asian ☐ Other: _____
Height	_____ cm
Weight	_____ kg
BMI	_____ kg/m²
AF Type	☐ Paroxysmal ☐ Persistent
Year AF Diagnosed	_____
Average AF Episodes / Month	☐ ≤1 ☐ 1-3 ☐ 3-5 ☐ >5
Longest AF Episode	_____
Prior DCCV	☐ Yes ☐ No
OSA	☐ Yes ☐ No

3. CHA_2DS_2-VASc SCORE

Risk Factor	Points	Present
Congestive Heart Failure	1	☐
Hypertension	1	☐
Age ≥75	2	☐
Diabetes Mellitus	1	☐
Stroke / TIA	2	☐
Vascular Disease	1	☐
Age 65–74	1	☐
Female Sex	1	☐

Risk Factor	Points	Present
Total CHA_2DS_2-VASc Score	=	

4. ECHOCARDIOGRAPHY

Variable	Entry
Date of Echo	____ / ____ / _____
LVEF (%)	_____
LA Diameter (mm)	_____
LA Volume (ml)	_____
RA Enlargement	☐ None ☐ Mild ☐ Moderate ☐ Severe
Mitral Regurgitation	☐ None ☐ Mild ☐ Moderate ☐ Severe

5. ANTIARRHYTHMIC DRUG HISTORY

Drug	Ever used	Current Tx	Failure	Stopped D/T side effects	Dose	Last dose
Beta-blocker	☐	☐	☐	☐	_____	_____
Flecainide	☐	☐	☐	☐	_____	_____
Propafenone	☐	☐	☐	☐	_____	_____
Amiodarone	☐	☐	☐	☐	_____	_____
Dronedarone	☐	☐	☐	☐	_____	_____
Sotalol	☐	☐	☐	☐	_____	_____
Other: _____	☐	☐	☐	☐	_____	_____

6. PROCEDURE DETAILS

Variable	Entry
Mapping System	☐ CARTO ☐ EnSite ☐ Affera ☐ Other: _____
Mapping Catheter	☐ Pentaray ☐ Octaray ☐ HD Grid ☐ Sphere-9 ☐ Other: _____

Variable	Entry
Ablation Energy	□ RF □ PFA
Chamber Mapped First	□ LA □ RA
Procedure Time (Skin-to-Skin)	_____ minutes

7. LEFT ATRIUM REPOLARIZATION MAPPING

Mapping Characteristics

Variable	Entry
LA Mapping Time	_____ minutes
Total LA AERP Sites	_____
Presence of low voltage areas (<0.5mV for >10mm^2)	□ Yes □ No

AERP Measurements

Variable	Entry
Shortest AERP (LA)	_____ ms
Longest AERP (LA)	_____ ms
AERP Dispersion (longest-shortest)	_____ ms

SRG / AF Initiation

Variable	Entry
SRG Present	□ Yes □ No
Number of SRG Sites	_____
AF Initiation Observed	□ Yes □ No
Number of AF Initiation Sites	_____

LEFT ATRIAL SITE DOCUMENTATION

LA site #	Location code (1-8)	SRG	SRG value (ms)	Shortest AERP (ms)	longest AERP (ms)	AF initiation	#AF initiations
1	___	□	__	_____	___	□	___
2	___	□	__	_____	___	□	___
3	___	□	__	_____	___	□	___
4	___	□	__	_____	___	□	___
5	___	□	__	_____	___	□	___

8. RIGHT ATRIUM REPOLARIZATION MAPPING

Mapping Characteristics

Variable	Entry
RA Mapping Time	_____ minutes
Total RA AERP Sites	_____
Presence of low voltage areas (<0.5mV for >10mm^2)	□ Yes □ No

AERP Measurements

Variable	Entry
Shortest AERP (LA)	_____ ms
Longest AERP (LA)	_____ ms
AERP Dispersion (longest-shortest)	_____ ms

SRG / AF Initiation

Variable	Entry
SRG Present	□ Yes □ No

Variable	Entry
Number of SRG Sites	_____
AF Initiation Observed	□ Yes □ No
Number of AF Initiation Sites	_____

RIGHT ATRIAL SITE DOCUMENTATION

RA site #	Location code (9-15)	SRG	SRG value (ms)	Shortest AERP (ms)	longest AERP (ms)	AF initiation	#AF initiations
1	___	□	___	_____	___	□	___
2	___	□	___	_____	___	□	___
3	___	□	___	_____	___	□	___
4	___	□	___	_____	___	□	___
5	___	□	___	_____	___	□	___

9. ABLATION LESIONS

Lesion	Performed
PVI Only	□
Presence of organized arrhythmia?	□ Yes □ No
CTI Line	□
Posterior Wall Isolation	□
Roof line	□
Mitral Line	□
Other _____	□

10. ACUTE PROCEDURAL COMPLICATIONS (completed at hospital discharge)

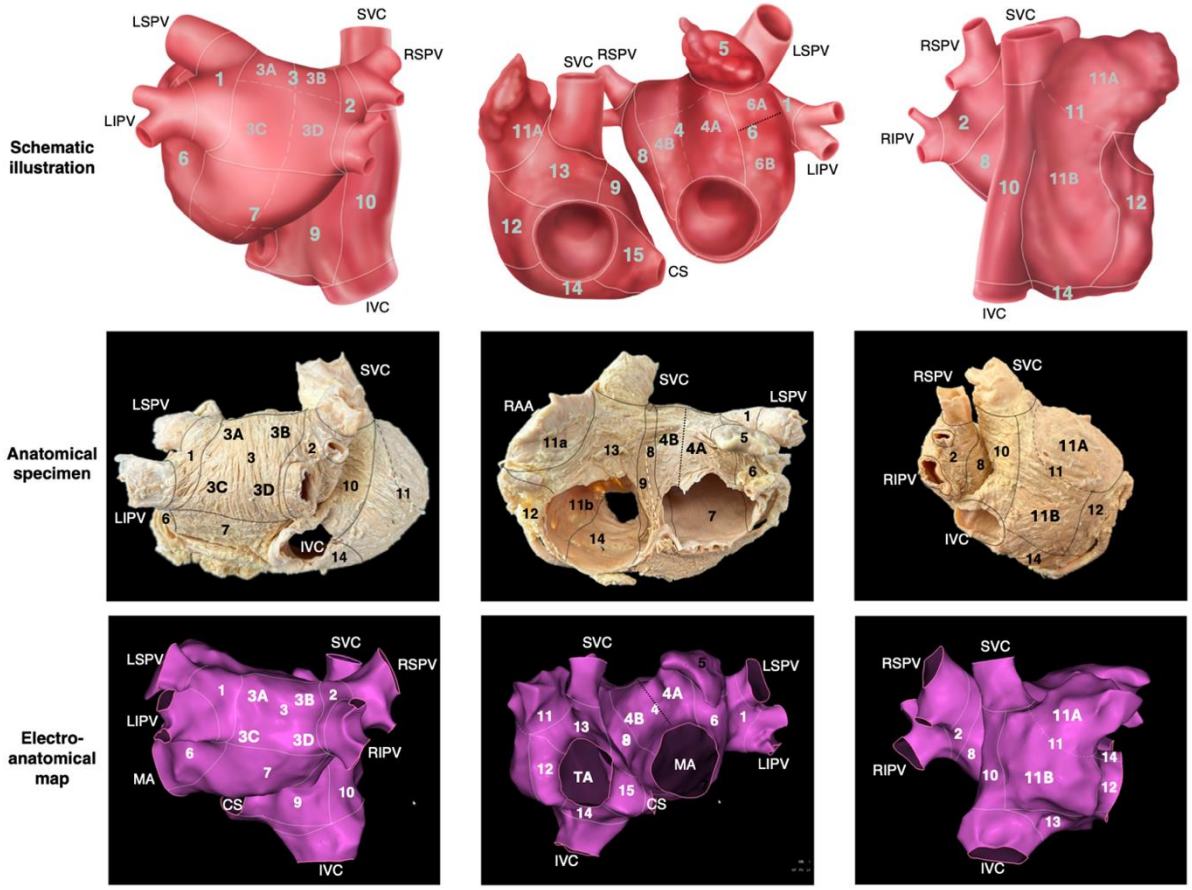
Complication	Present
None	☐
Pericardial Effusion / Tamponade	☐
Stroke / TIA	☐
Vascular Complication requiring intervention	☐
Phrenic Nerve Injury	☐
Other: _____	☐

11. OPERATOR CONFIRMATION

Operator Signature	_____
Date	____ / ____ / _____

Left Atrium (1-8)	Right Atrium (9-15)
1- LPV circumference (anterior + posterior)	9- Postero-septum (SVC-IVC)
2- RSP circumference (anterior + posterior)	10- Posterior (SVC-IVC)
3- Posterior (3A- LU; 3B- RU; 3C-LI; 3D-RL)	11- 11A- RAA proper; 11B- post.-lat. wall
4- Anterior (4A- ant.-lat. (base LAA; 4B- ant.)	12- Antero-lateral to tricuspid valve
5- LAA proper	13- Antero-septum (RAA to tricuspid annulus)
6- Ridge (6A – upper/base LAA; 6B - lower)	14- CTI
7- Posterior floor (inferior PV to CS)	15- CS ostium
8- Septum (RSPV/roof to mitral annulus)	

15-segment bi-atrial model defining standardized atrial regions



16. Appendix E: FOLLOW-UP CRF

SECTION 1: VISIT INFORMATION

Variable	Data Entry
Study ID	_____
Hospital MRN	_____
Follow-Up Visit	☐ 1 Month ☐ 3 Months ☐ 6 Months ☐ 9 Months ☐ 12 Months
Type of Visit	☐ In person ☐ Virtual
Visit Date	_____
Date of Index Ablation	_____
Repeat Ablation	☐ No ☐ Yes
Evaluator	_____

SECTION 2: WELL-BEING, SYMPTOMS & QUALITY OF LIFE

Variable	Data Entry
Overall Health Compared to Pre-Ablation	☐ Much Improved ☐ Improved ☐ No Change ☐ Worse
AF-related Symptoms Since Last Visit	☐ None ☐ Mild ☐ Moderate ☐ Severe
Palpitations	☐ None ☐ Rare ☐ Occasional ☐ Frequent
Dyspnea	☐ None ☐ Mild ☐ Moderate ☐ Severe
Fatigue	☐ None ☐ Mild ☐ Moderate ☐ Severe
Exercise Tolerance	☐ Normal ☐ Mild Limitation ☐ Moderate Limitation ☐ Severe Limitation
NYHA Functional Class	☐ I ☐ II ☐ III ☐ IV
AFEQT Questionnaire Completed	☐ Yes ☐ No
AFEQT Global Score	_____

SECTION 3: RHYTHM STATUS & RECURRENCE

Arrhythmia ≥30 sec beyond blanking period of 2 months from last procedure

Variable	Data Entry
Documented Atrial Arrhythmia Since Last Visit	☐ Yes ☐ No
If Yes - Type of Arrhythmia	☐ AF ☐ AT ☐ Typical Flutter ☐ Atypical Flutter
Date of First Recurrence	_____
Mode of Detection	☐ ECG ☐ Holter ☐ Pacemaker ☐Smart watch/Cardia
Number of Episodes	☐ 1 ☐ 1-3 ☐ 3-5 ☐ >5
Longest Episode Duration	_____
Symptomatic During Episode	☐ Yes ☐ No

SECTION 4: TYPE OF RHYTHM MONITORING

Arrhythmia ≥30 sec beyond blanking period of 2 months from last procedure

Variable	**Data Entry**
Holter	☐ Yes ☐ No
Date of Holter	_____
Holter Duration	☐ 24-hour ☐ 48-hour ☐ Other: _____
Holter Result	☐ No Arrhythmia ☐ AF ☐ AT ☐ Typical Flutter ☐ Atypical Flutter
ECG	☐ Yes ☐ No
Date of ECG	_____
ECG Result	☐ No Arrhythmia ☐ AF ☐ AT ☐ Typical Flutter ☐ Atypical Flutter

SECTION 5: CLINICAL EVENTS SINCE LAST VISIT

Variable	Data Entry
Hospitalization	☐Yes ☐No
If Yes – Reason	☐Arrhythmia ☐Heart Failure ☐Other CV ☐Non-cardiac
ER Visit	☐Yes ☐No
DCCV Performed	☐Yes ☐No

SECTION 6: MEDICATION STATUS

Variable	Data Entry
Currently on AAD?	☐ Yes ☐ No
If Yes – AAD Used	☐ Flecainide ☐ Propafenone ☐ Amiodarone ☐ Dronedarone ☐ Other
AAD Change Since Last Visit	☐ Started ☐ Stopped ☐ Dose Change ☐ No Change
On Oral Anticoagulation?	☐ Yes ☐ No
Type of Anticoagulation	☐ DOAC ☐ Warfarin

SECTION 7: ADVERSE EVENTS & INTERVENTIONS

Variable	Data Entry
Stroke / TIA Since Last Visit	☐ Yes ☐ No
Major Bleeding	☐ Yes ☐ No
Other Serious Adverse Event	☐ Yes ☐ No
If Yes – Specify	_____

SECTION 8: REDO PROCEDURE DETAILS

(Complete only once, during the first follow-up visit after the reco procedure)

Variable	Data Entry
Repeat ablation performed	☐ Yes ☐ No
Date of redo procedure	_____
Primary indication for redo procedure	☐ AF recurrence ☐ AT ☐ Typical flutter ☐ Atypical flutter ☐ Other
Chronic PVI	☐ Yes ☐ No If no: Reconnection at: ☐ LSPV ☐ LIPV ☐ RSPV ☐ RIPV
SRG or AF initiation sites	☐ Yes ☐ No
If Yes – Sites numbers of SRG / AF initiation sites	
If Yes – Does the SRG/AF initiation sites similar to the one documeted in the index procedure	☐ Yes ☐ Partially Yes ☐ No
SRG / AF initiation sites targeted	☐ Yes ☐ No
Other organized AT identified	☐ Yes ☐ No
If Yes – Type	☐ AT ☐ Typical flutter ☐ Atypical flutter
Lesion sets performed	☐ PV re-isolation ☐ SRG/AF initiation ☐ Other lesions
If linear lesions performed – Location	☐ Roof line ☐ Mitral isthmus ☐ CTI ☐ Other

Form Completed By: _____ Date: _____

Signature: _____