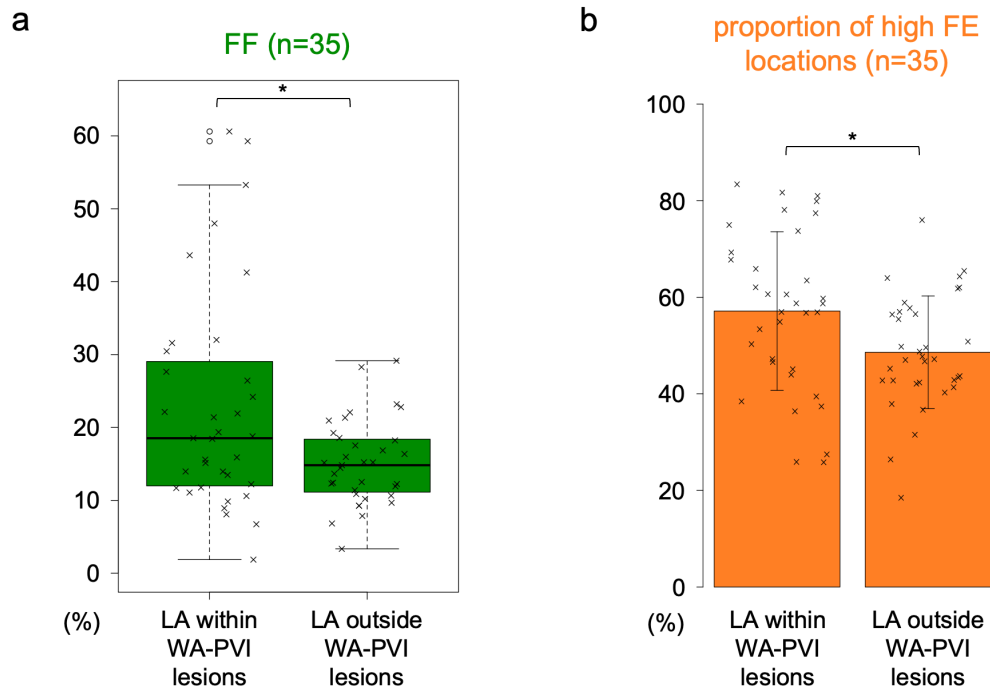


Supplementary Material

Supplementary Figures

- Supplementary Figure 1. Substrate features of regions within WA-PVI
- Supplementary Figure 2. Examples of reentry phase singularity trajectories
- Supplementary Figure 3. Additional examples of DTs and ablation lesions
- Supplementary Figure 4. A DT with no LA-LR elimination via PVI and PWI

STROBE Statement—Checklist



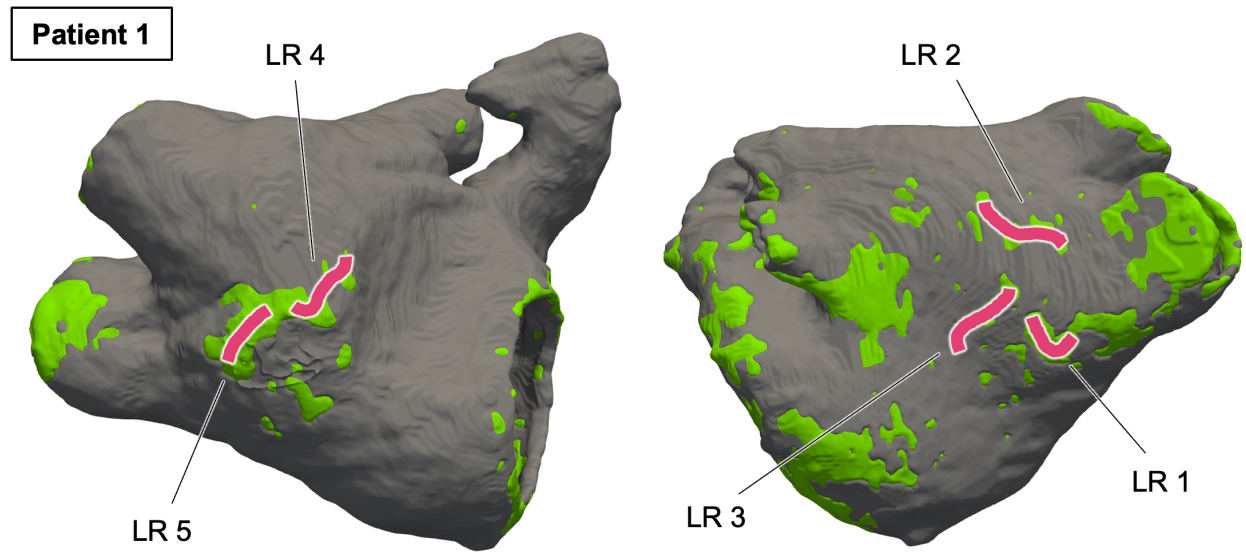
Supplementary Figure 1. Substrate features of regions within WA-PVI

a: Comparison of LA FF in regions within WA-PVI lesions and those outside WA-PVI lesions.

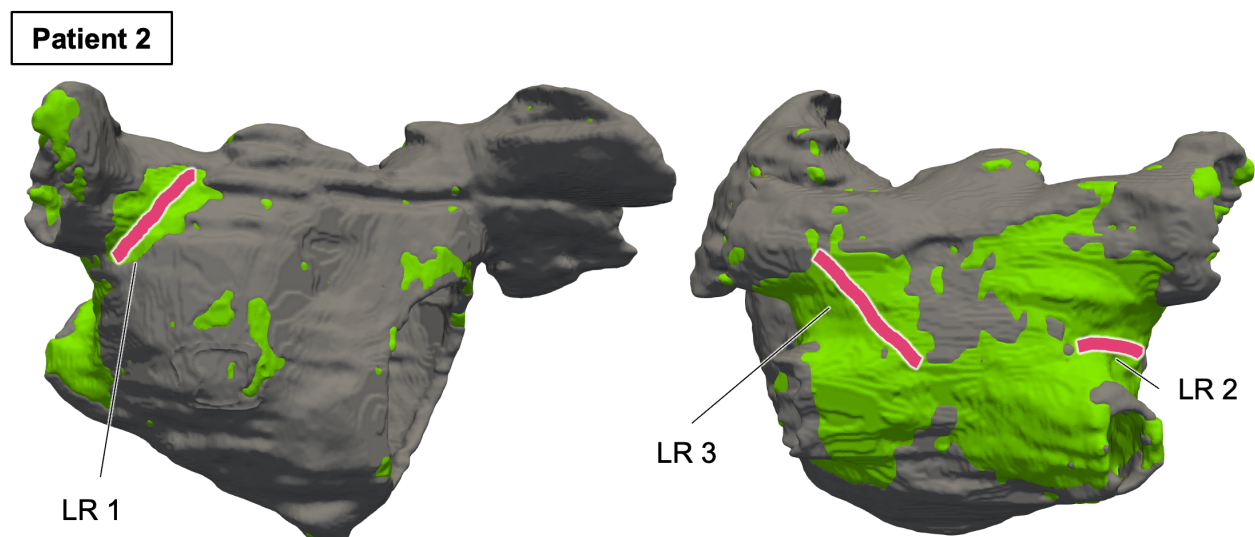
b: Comparison of proportion of high FE locations (higher than the median local FE values of the LA regions for all DTs) between LA regions within WA-PVI lesions and those outside WA-PVI lesions.

DT=digital twin; FE=fibrosis entropy; FF=fibrosis fraction; LA=left atrial; WA-PVI=wide antral pulmonary vein isolation.

a



b

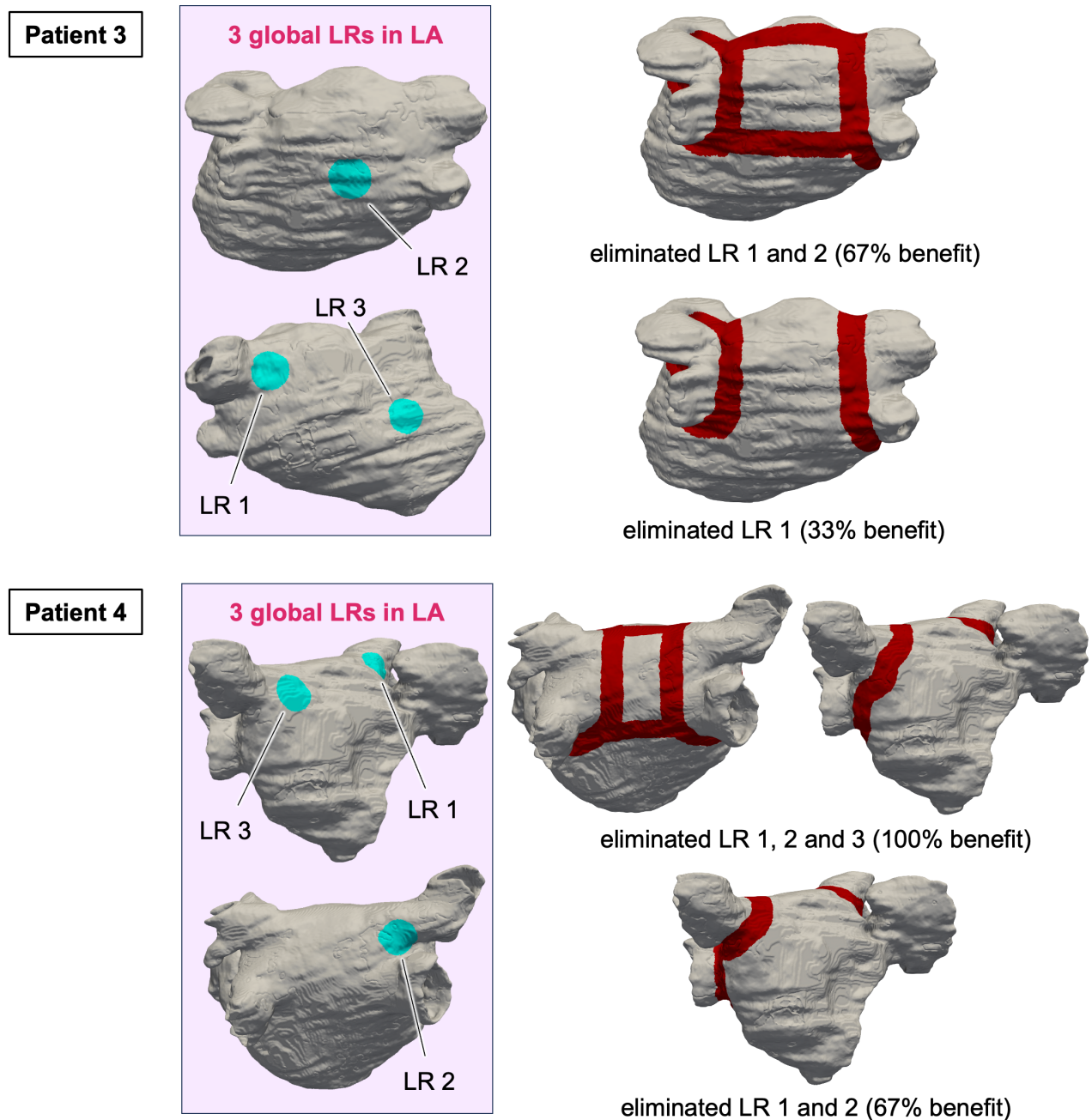


Supplementary Figure 2. Examples of reentry phase singularity trajectories

a: Trajectory of reentry phase singularity in Patient 1 shown in Figure 3 (magenta line).

b: Trajectory of reentry phase singularity in Patient 2 shown in Figure 3 (magenta line).

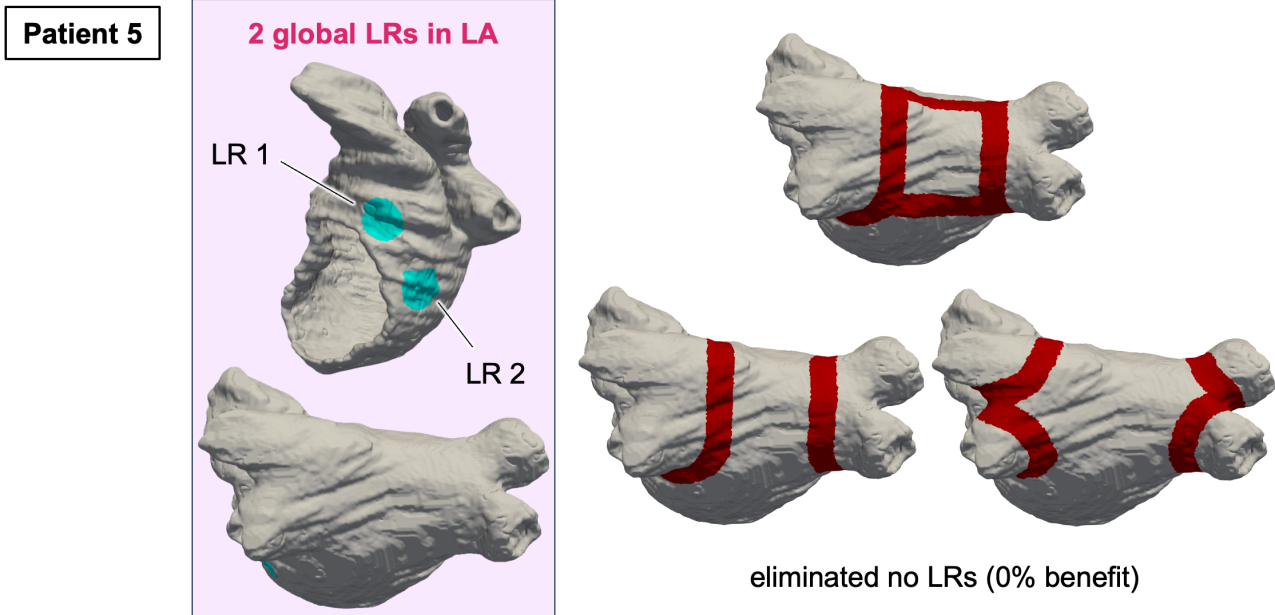
LR=location of reentry.



Supplementary Figure 3. Additional examples of DTs and ablation lesions

(top) A DT of a patient who would benefit from PWI (over WA-PVI) in decreasing LA arrhythmogenesis. Shown are the patient's DT with LA-LR distribution (light-blue dots) and virtual ablation (red lines) representing PWI+PVI and WA-PVI lesions. (bottom) A patient for whom added PWI in the DT was not beneficial over WA-PVI, but WA-PVI provided added benefit over IO-PVI in eliminating LA-LRs. Shown are the patient's DT incorporating fibrosis with LA-LR distribution (light-blue dots) and virtual ablation (red lines) representing PWI+PVI, WA-PVI, and IO-PVI lesions.

DT=digital twin; IO-PVI=individual ostial PVI; LA=left atrium; LR=location of reentry; PVI=pulmonary vein isolation; PWI=LA posterior wall isolation; WA-PVI=wide antral PVI.



Supplementary Figure 4. A DT with no LA-LR elimination via PVI and PWI

Both PVI and PWI were unable to eliminate any LA arrhythmogenesis in this DT.

Shown are the patient's DT with LA-LR distribution (light-blue dots) and virtual ablation (red lines) representing PWI+PVI, WA-PVI, and IO-PVI lesions.

DT=digital twin; IO-PVI=individual ostial PVI; LA=left atrium; LR=location of reentry; PVI=pulmonary vein isolation; PWI=LA posterior wall isolation; WA-PVI=wide antral PVI.

STROBE Statement—Checklist of items that should be included in reports of *cohort studies*

	Item No.	Recommendation	Reported on Page No.
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1,2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3–5
Objectives	3	State specific objectives, including any prespecified hypotheses	3–5
Methods			
Study design	4	Present key elements of study design early in the paper	19,20
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	19,20
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	19,20
		(b) For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	22,23,25–28
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	20–28
Bias	9	Describe any efforts to address potential sources of bias	20
Study size	10	Explain how the study size was arrived at	19,20
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	22,23,25–28
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	28,29
		(b) Describe any methods used to examine subgroups and interactions	N/A
		(c) Explain how missing data were addressed	N/A
		(d) If applicable, explain how loss to follow-up was addressed	N/A
		(e) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5,6
		(b) Give reasons for non-participation at each stage	5,6
		(c) Consider use of a flow diagram	5,6,20
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5,6,19,20
		(b) Indicate number of participants with missing data for each variable of interest	5,6,10
		(c) Summarise follow-up time (eg, average and total amount)	N/A

Outcome data	15*	Report numbers of outcome events or summary measures over time	N/A
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	6–12
		(b) Report category boundaries when continuous variables were categorized	N/A
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	12,13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	18,19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13–18
Generalisability	21	Discuss the generalisability (external validity) of the study results	16–18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	30

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at <http://www.strobe-statement.org>.