PLACE 2026
PLATFORM OF LABORATORIES FOR ADVANCES IN CARDIAC EXPERIENCE

CONGRESSO
ROMA, 25 - 27 Giugno 2026

TACHICARDIE VENTRICOLARI

Radioablazione Stereotassica delle Aritmie

Corrado Carbucicchio

CENTRO CARDIOLOGICO MONZINO - IRCCS

STEREOTACTIC ARRHYTHMIA RADIOABLATION

- is a ”non-invasive” form of treatment provided by Photons delivery guided by multimodal (electro + anatomical + functional) characterization of the arrhythmogenic substrate

- no spatial and anatomical limitations to energy delivery (“no contact”), in a “free” 3-D model, predefining treatment features (shape and volume) and adsorbed dose (target and OaR);

- no complexities and risks intrinsic to conventional interventional / surgical procedures

MAIN MECHANISMS OF ACTION

- Apoptosis starting from the 2nd month, leading to progressive cellular death, variably preceded by microvascular changes; coexists diffuse interstitial inflammation

- Lesion stabilization between the 3rd and 9th mo, for intermediate therapeutic doses (25-30Gy)

- Early effects under *investigation (reprogramming of cardiac conduction by Na+ and connexin Cx43 upregulation*)

STOPSTORM.eu consortium

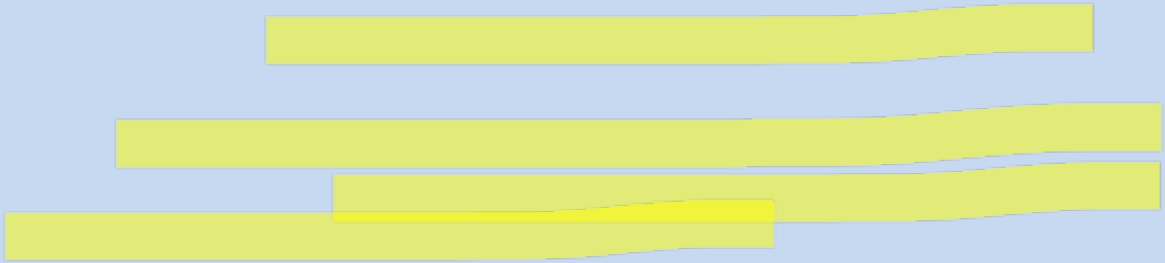
Cases inclusion into the registry

STOPSTORM: >50 participating centers

➢ Target: 217 patients in the harmonized cohort ⇒ **>300 by October 2025 !**

➢ Total treatments (all centers): 102 retrospective / 177 harmonized

STOPSTORM



Eur Heart J 2026: Apr 20: ehag 338 (ahead of print)

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Multimodal (electro + anatomical + functional) characterization of the arrhythmogenic substrate

Potential candidates, in presence of…

Mechanic valvular prostheses

Epicardial substrate with prior surgery (limits and risks for a percutaneous access)

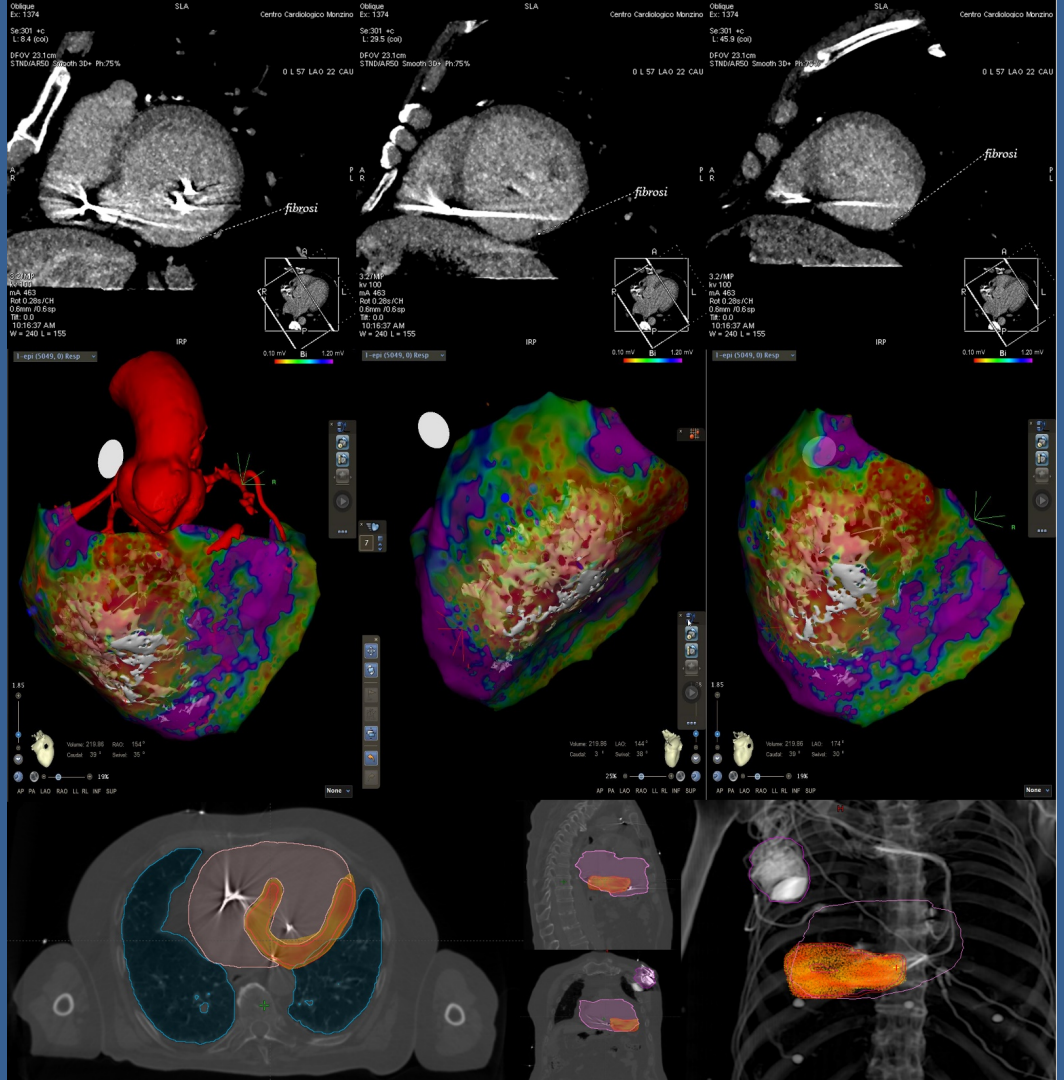
Ventricular / atrial thrombus

Specific high procedural / anaesthesiological risk with regard to pt. characteristics (ex. : pts. not suitable for ECMO)

Specific contraindications to endocardial and/or epicardial catheter ablation

Midwall septal scar, complex scar or specific location hindering RF efficacy, based on imaging and/or EAM

<2% of pts. undergoing VT “ablation” in SHD !


Oblique
Ex: 1374
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12/15 pts. presented a reduction >85% of the arrhythmia burden (n° of ATP + DC shock per month)

Total of patients (n)	19
Number of patients with ≥ 1 post-procedural CT	13
Mean follow-up lenght (months)	10.6
Post-procedure CAD-RADS 2.0 progression (n)	0/13
Max pre-procedure PCAT RCA (HU)	-68.3
Max post-procedure PCAT RCA (HU)	-71.8
Mean pre-procedure PCAT RCA (HU)	-86.6
Mean post-procedure PCAT RCA (HU)	-84.9
Post-procedure aortic or mitral valve disease progression (n)	0/13
Post-procedure de novo pericardial effusion (n)	5/13
Post-procedure mild pericardial effusion (n)	2/13
Post-procedure moderate pericardial effusion (n)	2/13
Post-procedure severe pericardial effusion (n)	1/13
Post-procedure de novo pleural effusion (n)	0
Number of patients with normal lung attenuation at baseline	7/13
Number of patients with normal lung attenuation post-procedure	3/13
Post-procedure de novo reticular abnormalities (n)	3/13
Post-procedure de novo consolidations (n)	2/13
Post-procedure de novo consolidations & traction bronchiectasis (n)	5/13

CURRENT EVIDENCES

STAR is an experimental form of therapy reserved to selected patients with refractory VTs

Outcomes over the mid-term are generally favorable suggesting a wider use of STAR in a more ordinary range of indications, but the risk of adverse effects should not be neglected

Several effects of STAR on the myocardial substrate (further investigation needed)

GREY ZONES

STAR is not targeted directly to the arrhythmogenic substrate:

the treatment plan is conceived based on a multimodal assessment, but eventually cCT imaging is the platform integrating all informations that guides energy application

i.e.: clear shift from EP (substrate) to imaging (scar / fibrosis)… !

<u>Specific issues may deserve attention:</u>

target definition (OaR!) and energy delivery (OaR!!)

optimal doses (efficacy without adversities) /

reasonable constraints based on acute and long-term adverse effects)

persistence of therapeutic action over the long-term (lack of data)

RADIATE-VT clinical trial

• Cardiac **RADI**oablation versus repeat catheter **A**blation:

a pivotal randomized clinical **T**rial **E**valuating safety and efficacy for patients with high-risk refractory **V**entricular **T**achycardia

Study Design

Up to 380 participants with high-risk, refractory ventricular tachycardia (VT) will be enrolled at up to 30 sites.

Participants will be randomized 1:1 between 2 treatment arms:

- Repeat standard-of-care catheter ablation
- Cardiac radioablation with Varian's CRA system

Eligibility criteria

Patients with refractory VT who meet the following criteria may be eligible:

- Ischemic and/or nonischemic cardiomyopathy
- Recurrent sustained monomorphic VT
- LVEF ≤ 49%
- Previously underwent a catheter ablation for VT
- Have failed or are intolerant to amiodarone
- Have an implantable cardioverter-defibrillator (ICD)
- Medically and technically a candidate for catheter ablation

Outcomes measures

The primary objective of the RADIATE-VT clinical trial is to demonstrate that treatment with Varian's CRA system is safer than and as effective as catheter ablation in participants with high-risk refractory VT.

The secondary objectives are to compare quality of life and VT burden reduction between the two treatments.

Innovative GATing approach in PROton therapy for Ventricular Tachycardia (i-GATE PRO VT)

First-in-Human clinical investigation focusing on

Proton Stereotactic Arrhythmia Radiotherapy

delivered with CardioKit (investigational gating system) to treat refractory VTs *(STRAMI-Like Pts)*

CardioKit system combines cardiac and respiratory gating to improve targeting accuracy during proton STAR.

i-GATE PRO VT

Prospective, single-arm, open-label, single center, interventional feasibility and safety study

Primary endpoint: safety and feasibility of using CardioKit system cardio-respiratory Dual Gating (DG)

Secondary endpoint: clinical efficacy in terms of reduction of VT events and change in quality of life

Thank you !

corrado.carbucicchio@ccfm.it

ESC European Society of Cardiology

Europace (2024) **26**, euae108
https://doi.org/10.1093/europace/euae108

EHRA DOCUMENT

EHRA European Heart Rhythm Association

Pre- and post-procedural cardiac imaging (computed tomography and magnetic resonance imaging) in electrophysiology: a clinical consensus statement of the European Heart Rhythm Association and European Association of Cardiovascular Imaging of the European Society of Cardiology

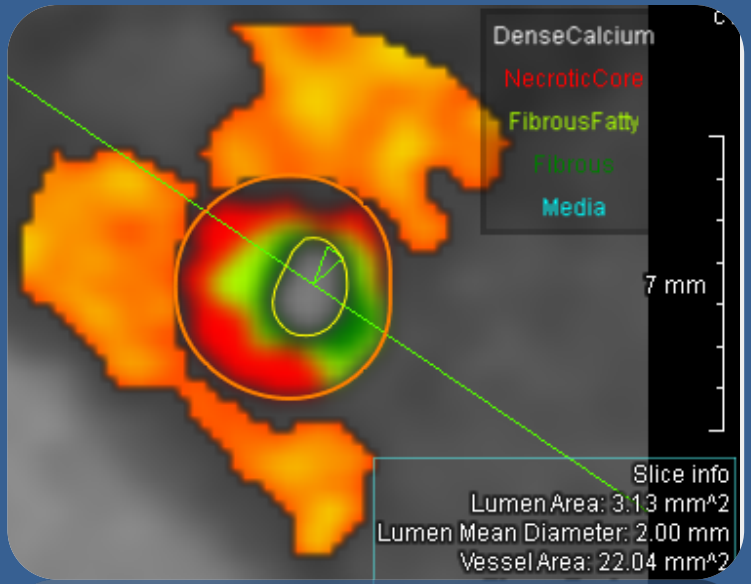
Thomas Deneke [1]*, Valentina Kutyifa [2], Gerhard Hindricks [3], Philipp Sommer [4], Katja Zeppenfeld [5], Corrado Carbuccichio [6], Helmut Pürerfellner [7], Frank R. Heinzel [8], Vassil B. Traykov [9], Marta De Riva[5], Gianluca Pontone [10,11], Lukas Lehmkuhl [12], and Kristina Haugaa [13]

FAI as an imaging biomaker to measure coronary inflammation by CCT

Fat Attenuation Index (**FAI**) is an **AI-enhanced algorithm** that quantifies a **weighted measure** of **attenuation gradients** within **concentric 1 mm-layers** of **PVAT**, **reflecting** the **changes** in **lipid accumulation** and **adipocyte size around inflamed coronary arteries**.

Adipose tissue is typically defined to range from **- 190 to - 30 HU**.

The **biological changes** due to **inflammatory signals coming from** the **vascular wall** generate an **attenuation shift** to a **less negative range (towards –30 HU)**.



VASCULAR INFLAMMATION = Gradual shift in the **balance between** the **lipid** and **aqueous phase** in the **adipose tissue around** the **inflamed artery**

I-GATE PRO VT Trial

Innovative GATing approach in PROton therapy for Ventricular Tachycardia. Evaluates the safety and feasibility of using CardioKit Dual Gating with IBA's ProteusONE

Eligibility
- Ischemic and/or nonischemic cardiomyopathy
- Recurrent sustained VT refractory to maximal pharmacological therapy
- contraindication to conventional ablation
- Have an ICD
- LVEF ≥ 20%
- Age ≥ 50 years

13 subjects

Centers:
- Centro Cardiologico Monzino IRCCS, Milan, I
- Istituto Europeo di Oncologia (IEO), Milan, I

Data Safety Monitoring Board:
Dr. Phillip Cuculich
Dr. Clifford Robinson

Co-primary endpoints:
Feasibility: device and procedure success combined with a patients' and users' device acceptance questionnaires
Safety: incidence of CTCAE v6.0 grade ≥3 Adverse Events related or probably related to the Proton STAR procedure or CardioKit system, evaluated at 90 days post-procedure

ARTICLE

https://doi.org/10.1038/s41467-021-25730-0 OPEN

Cardiac radiotherapy induces electrical conduction reprogramming in the absence of transmural fibrosis

David M. Zhang[1,2], Rachita Navara[1,2], Tiankai Yin[2], Jeffrey Szymanski[3], Uri Goldsztejn[2,4], Camryn Kenkel[2,4], Adam Lang[5], Cedric Mpoy[3], Catherine E. Lipovsky[2,6], Yun Qiao[2,4], Stephanie Hicks[2], Gang Li[2,4], Kaitlin M. S. Moore[1,2], Carmen Bergom[1,3], Buck E. Rogers[3], Clifford G. Robinson[1,2,3], Phillip S. Cuculich[1,2,3], Julie K. Schwarz[1,3] & Stacey L. Rentschler[1,2,4,6]✉

Cardiac radiotherapy (RT) may be effective in treating heart failure (HF) patients with refractory ventricular tachycardia (VT). The previously proposed mechanism of radiation-induced fibrosis does not explain the rapidity and magnitude with which VT reduction occurs clinically. Here, we demonstrate in hearts from RT patients that radiation does not achieve transmural fibrosis within the timeframe of VT reduction. Electrophysiologic assessment of irradiated murine hearts reveals a persistent supraphysiologic electrical phenotype, mediated by increases in $Na_V1.5$ and Cx43. By sequencing and transgenic approaches, we identify Notch signaling as a mechanistic contributor to $Na_V1.5$ upregulation after RT. Clinically, RT was associated with increased $Na_V1.5$ expression in 1 of 1 explanted heart. On electrocardiogram (ECG), post-RT QRS durations were shortened in 13 of 19 patients and lengthened in 5 patients. Collectively, this study provides evidence for radiation-induced reprogramming of cardiac conduction as a potential treatment strategy for arrhythmia management in VT patients.

Estimation of Cardiac and Coronary Toxicity

Mean follow-up lenght (months)	10.6
Post-procedure CAD-RADS 2.0 progression (n)	0/13
Max pre-procedure PCAT RCA (HU)	-68.3
Max post-procedure PCAT RCA (HU)	-71.8
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