

Efficacy and safety of stereotactic radiotherapy for recurrent ventricular tachycardias in patients with structural heart disease - the Czech experience

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A Czech footprint in a history of Stereotactic Arrhythmia Radiotherapy

2014

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Cardiac Radiosurgery for Malignant Ventricular Tachycardia

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CLINICAL RESEARCH

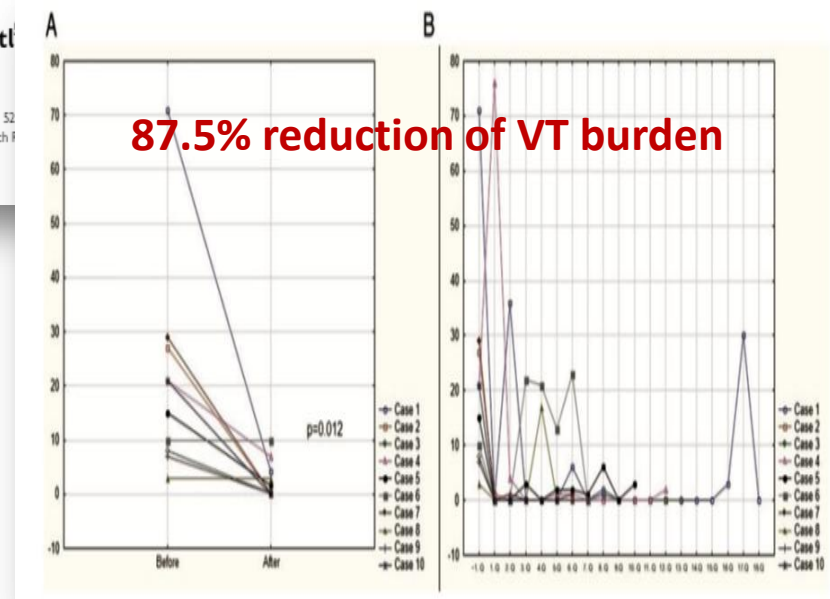
Stereotactic radiosurgery for ablation of ventricular tachycardia

Radek Neuwirth¹, Jakub Cvek^{2*}, Lukas Knybel², Otakar Jiravsky³, Lukas Molenda², Michal Kodaj³, Martin Fiala¹, Petr Peichl⁴, David Feltl¹, Jaroslav Januška³, Jan Hecko³, and Josef Kautzner⁴

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10 pts
1.6 RFA for VT before STAR
Cyber knife 25 Gy
FU 28 months



Neuwirth R., 2019	10	CK	23±5	28 (median)	1x progression of mitral regurgitation	-
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Our observational study

JACC EP 4/2024

ORIGINAL RESEARCH

IF 8

Efficacy and Safety of Stereotactic Radiotherapy in Patients With Recurrent Ventricular Tachycardias

The Czech Experience

Jana Hašková, MD,^{a,b} Dan Wichterle, MD, PhD,^{a,c} Josef Kautzner, MD, PhD,^{a,b} Marek Šramko, MD, PhD,^a Petr Peichl, MD, PhD,^a Lukáš Knybel PEng, PhD,^d Otakar Jiravský, MD,^{e,f} Radek Neuwirth, MD,^{e,f} Jakub Cvek, MD, PEng, PhD^d

ABSTRACT

BACKGROUND Stereotactic arrhythmia radiotherapy (STAR) has been proposed recently in patients with refractory ventricular tachycardia (VT).

OBJECTIVES The purpose of this study was to describe the efficacy and safety of STAR in the Czech Republic.

METHODS VT patients were recruited in 2 expert centers after at least 1 previously failed catheter ablation (CA). A precise strategy of target volume determination and CA was used in 17 patients treated from December 2018 until June 2022 (EFFICACY cohort). This group, together with an earlier series of 19 patients with less-defined treatment strategies, composed the SAFETY cohort (n = 36). A dose of 25 Gy was delivered.

RESULTS In the EFFICACY cohort, the burden of implantable cardioverter-defibrillator therapies decreased, and this drop reached significance for direct current shocks (1.9 ± 3.2 vs 0.1 ± 0.2 per month; $P = 0.03$). Eight patients (47%) underwent repeated CA for recurrences of VT during 13.7 ± 11.6 months. In the SAFETY cohort (32 procedures, follow-up >6 months), 8 patients (25%) presented with a progression of mitral valve regurgitation, and 3 (9%) required intervention (median follow-up of 33.5 months). Two cases of esophagitis (6%) were seen with 1 death caused by the esophago-pericardial fistula (3%). A total of 18 patients (50%) died during the median follow-up of 26.9 months.

CONCLUSIONS Although STAR may not be very effective in preventing VT recurrences after failed CA in an expert center, it can still modify the arrhythmogenic substrate, and when used with additional CA, reduce the number of implantable cardioverter-defibrillator shocks. Potentially serious side effects require close follow-up.

The largest cohort from Czech Republic- 2 centres



Recruitment into the both cohorts: January 2014 until June 2022

EFFICACY Cohort: **17** pts
SAFETY Cohort: **39** cases in **36** pts



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Original Research
Ventricular Arrhythmias - Radiotherapy

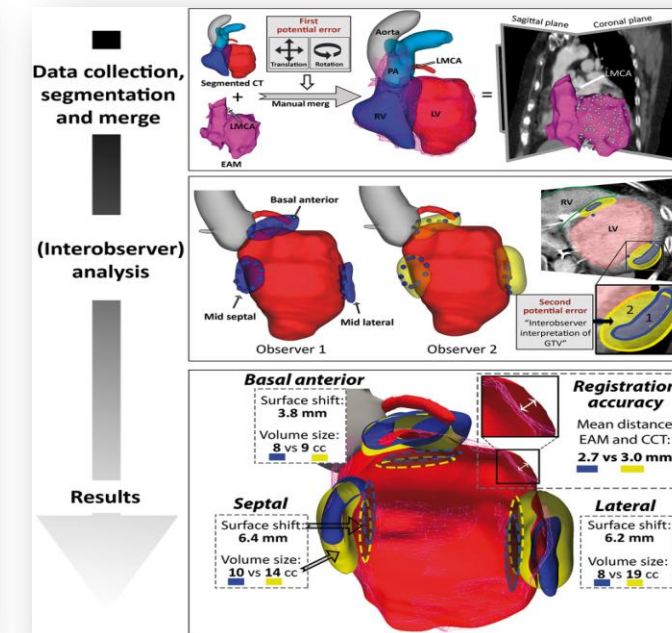
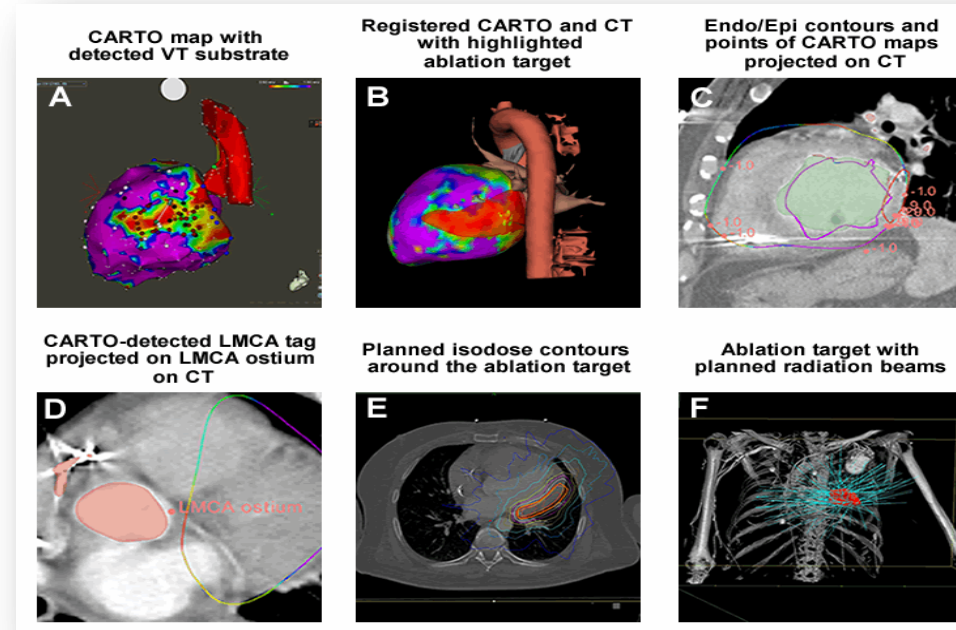
Efficacy and Safety of Stereotactic Radiotherapy in Patients With Recurrent Ventricular Tachycardias: The Czech Experience

Jana Hašková MD^{a,b}, Dan Wichterle MD, PhD^{a,c}, Josef Kautzner MD, PhD^{a,b}, Marek Šramko MD, PhD^a, Petr Peichl MD, PhD^a, Lukáš Knybel PEng PhD^d, Otakar Jiravský MD^{e,f}, Radek Neuwirth MD^{a,f}, Jakub Cvek MD, PEng, PhD^d

Co-registration system

We developed strategy of precise co-registration of electroanatomic map with planning CT (MERGE)

Co-registration using 3 fiducial points provides reproducible results



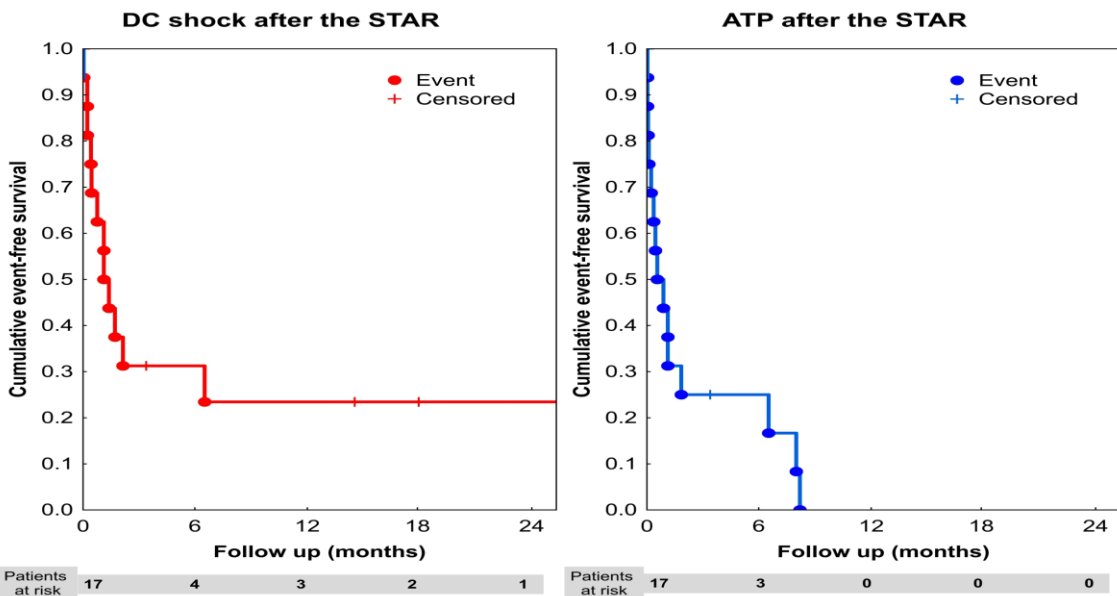
RESULTS

EFFICACY COHORT 17 pts (2 females, age 64.5±10.9 years)

ICM 5, DCM 10, fibroma 1, HCM 1
 2.2 endo RFA, epi 10/17, 2 SBRT
 NYHA 2.2, 13 amiodarone, 3 sotalol
 25 Gy SBRT, PTV 45.2±17.8 mL
 FU 13.9±11.4 months

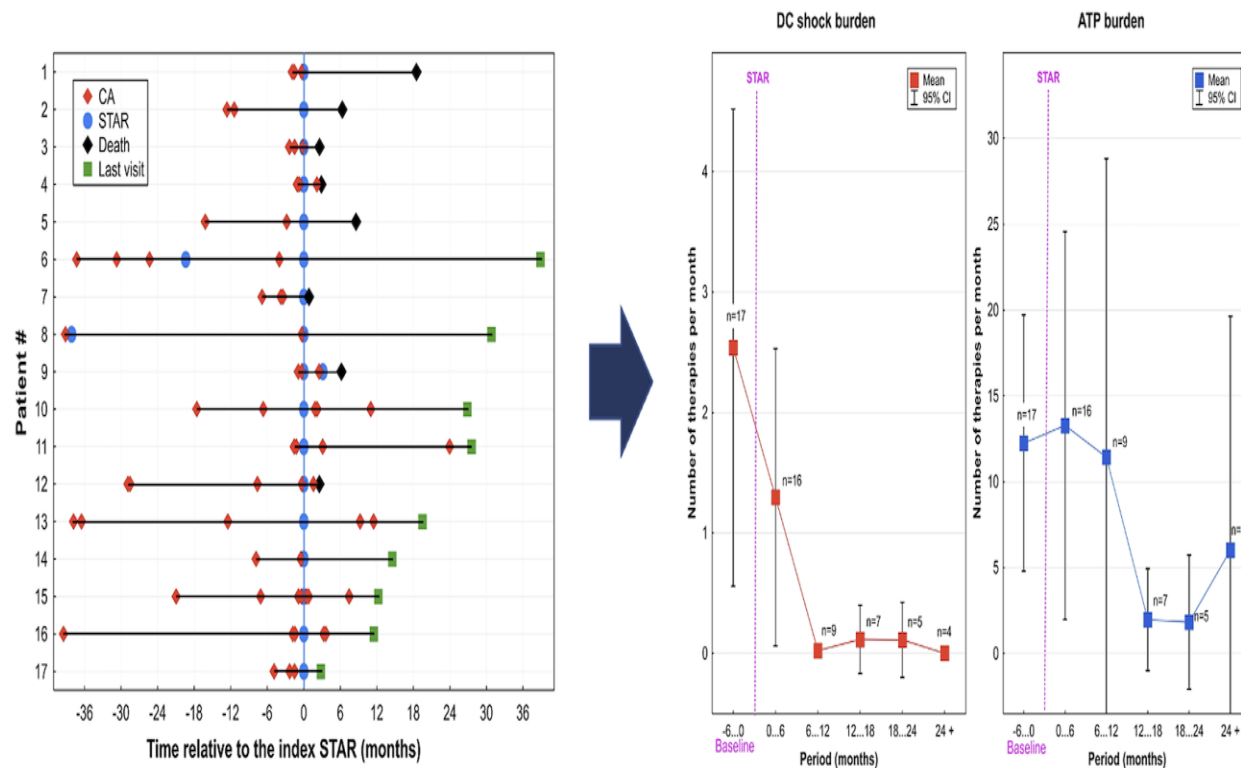
At 1 year follow-up:
 47% mortality
 67% re-do RFA

ICD ATP statistically non-significant drop
 ICD shock statistically significant drop



The result of 83 procedures: **50 before SBRT, 17 SBRT and 16 re-ablations during FU** :4.9 procedures per patient

EFFICACY COHORT (n=17)



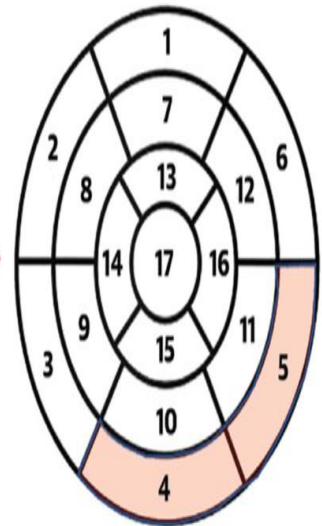
RESULTS

SAFETY COHORT

32 pts with 6 months FU/39 procedures

Safety Cohort (n = 39; 32 with follow-up >6 months)

12% adverse events grade IV-V
Common Terminology Criteria for Adverse Events (CTCAE)



LV segments
(American Heart Association nomenclature)

STAR at segment #4 or #5 (10 patients)

- Progression of mitral regurgitation (50%)
- Mitral valve intervention (30%)
- Esophago-pericardial fistula (10%)

9% significant progression of Mitral Regurgitation. Mitral Valve Replacement
6% Esophagitis
1 death esophago-pericardial fistula with bleeding

12 %
adverse events grade IV-V (CTCAE)

EP CASE EXPRESS doi:10.1093/europace/euab326

Oesophagopericardial fistula as a late complication of stereotactic radiotherapy for recurrent ventricular tachycardia

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Severe adverse effects of stereotactic body radiotherapy (SBRT) for recurrent ventricular tachycardias (VTs) have not been reported. We describe the late complication of SBRT (25 Gy, CyberKnife, Accuray) in a 67-year-old patient with previous arterial coronary revascularization, including gastroepiploic artery, and subsequent recurrent VTs despite catheter ablation. He developed radiation oesophagitis 18 days after SBRT, which resolved on antilucer therapy, and 6 months later was admitted for severe symptomatic ulcer. Despite intensive treatment, he died because of bleeding oesophagopericardial fistula. Post-mortem macroscopic picture shows the myocardial substrate in the inferior wall (black arrows) and adjacent oesophagopericardial fistula through the parietal pericardium (open arrows). Inset depicts radiosurgical treatment plan with coloured isodose lines.

Our case illustrates that SBRT may be complicated even in a long-term course, and oesophagopericardial fistula could be one of the potential complications. Therefore, the risk/benefit of SBRT for VT should be always carefully considered, and long-term follow-up is advisable.

The full-length version of this report can be viewed at: <https://www.escardio.org/Education/E-Learning/Clinical-cases/Electrophysiology>.

SUMMARY

Radiotherapy is a less invasive strategy for the management of refractory VT

Clinical studies documented rather modest efficacy

Synergic effect of SBRT and CA for VT reduction

The long-term safety remains unknown

We observed delayed side effects it may limit the use

Current experience does not support the view that STAR could become the first-line therapy for VT (but trials are ongoing)

Thank You for Your attention