Epicardial Ablation for Brugada Syndrome
When is it Appropriate?

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Patients at sufficient risk to deserve protection

- Type I ECG
- Previous cardiac arrest
- Previous cardiogenic syncope
- Asymptomatics inducible with a relatively non-aggressive protocol
Programmed Ventricular Stimulation for Risk Stratification in the Brugada Syndrome: A Pooled Analysis
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Conclusions—In Brugada syndrome patients, arrhythmias induced with PVS are associated with future ventricular arrhythmia risk. Induction with fewer extrastimuli is associated with higher risk. However, clinical risk factors are important determinants of arrhythmia risk, and lack of induction does not necessarily portend low ventricular arrhythmia risk particularly in patients with high-risk clinical features.
Appropriate ICD therapies
Reduction in the median number of ICD shocks before and after Quinidine administration

Total number of shocks n= 203
Total number of shocks n= 41

P<0.001
Epicardial ablation eliminates ventricular arrhythmias in an experimental model of Brugada syndrome

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A.
One tissue from a canine heart

- Epicardial tissue
- Transmural tissue

Tissue preparations

(N= 9)

(N= 8)

B.
The earliest activation

ECG

Epi 1

Epi 2

RFCA site

PVC-QRS onset

Coupling Interval: 51 ms

335 ms

0—200 ms (msec)

- 17 arterially perfused canine RV preparations
- Pinacidil (5 μM) and pilscaine (5 μM) → BS model
- RFCA earliest activation site of PVCs in EPI or ENDO
RFCA:
AP heterogeneity still present
Disconnection of areas with long (EPI1) and short AP (EPI2) eliminated arrhythmia
- 9 patients were treated
- In 7/9 pts no VT/VF was inducible
- In 5/9 pts BrS pattern disappeared immediately after the procedure
- In 3/9 pts BrS pattern disappears during FUP
- In 8/9 patients no VT/VF recurrences occurred
Electrical Substrate Elimination in 135 Consecutive Patients With Brugada Syndrome

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Background—There is emerging evidence that localization and elimination of abnormal electric activity in the epicardial right ventricular outflow tract may be beneficial in patients with Brugada syndrome.

Methods and Results—A total of 135 symptomatic Brugada syndrome patients having implantable cardiac defibrillator were enrolled: 63 (group 1) having documented ventricular tachycardia (VT)/ventricular fibrillation (VF) and Brugada syndrome–related symptoms, and 72 (group 2) having inducible VT/VF without ECG documentation at the time of symptoms. About 27 patients of group 1 experienced multiple implantable cardiac defibrillator shocks for recurrent VT/VF episodes. Three-dimensional maps before and after ajmaline determined the arrhythmogenic electrophysiological substrate (AES) as characterized by prolonged fragmented ventricular potentials. Primary end point was identification and elimination of AES leading to ECG pattern normalization and VT/VF noninducibility. Extensive areas of AES were found in the right ventricle epicardium, which were wider in group 1 (P=0.007). AES increased after ajmaline in both groups (P<0.001) and was larger in men (P=0.008). The increase of type-1 ST-segment elevation correlated with AES expansion (r=0.682, P<0.001). Radiofrequency ablation eliminated AES leading to ECG normalization and VT/VF noninducibility in all patients. During a median follow-up of 10 months, the ECG remained normal even after ajmaline in all except 2 patients who underwent a repeated effective procedure for recurrent VF.

Conclusions—In Brugada syndrome, AES is commonly located in the right ventricle epicardium and ajmaline exposes its extent and distribution, which is correlated with the degree of coved ST-elevation. AES elimination by radiofrequency ablation results in ECG normalization and VT/VF noninducibility. Substrate-based ablation is effective in potentially eliminating the arrhythmic consequences of this genetic disease.

Clinical Trial Registration—URL: https://clinicaltrials.gov. Unique identifier: NCT02641431.
(Circ Arrhythm Electrophysiol. 2017;10:e005053. DOI: 10.1161/CIRCEP.117.005053.)
BASAL - Bipolar endo and epicardial map.

0.5-1.5 mV window
Post Flecainide Epicardial Mapping
Potential Duration Map (PDM)

Electrograms with longer duration, low voltage and late or consistent and discrete component are shown in purple color.
Automatic Potential Duration Annotation

Automatic detection
Red Calipers
Onset  Offset
Color-code Map Potential Duration Map (PDM)
ST Elevation during RF delivery

RF Start

V2 progressively lose the down-sloped shape

After few RF application V1 starts to change morphology as well
After RF

After Flecainide (150 mg)
Electrical storm
Basal

SCD and Electrical storm

Flecainide

Ajmaline
Electrogram duration

Basal

Flecainide

Ajmaline
EP Test performed 2 years before after a syncope...

RV apex Stimulation inducible VF. ICD implanted, NSVT recorded
Drug and EP Challenge post Ablation

PRE ABLATION
Ajmaline 1 mg/kg

POST ABLATION
Ajmaline 1 mg/kg
Asymptomatic, family history of sudden death at young age, inducible at EP testing
ECG pre ablation and 6 months post ablation
Ajmaline Test pre ablation and 6 months post ablation

AJMALINE 1 mg/Kg

I
II
III
aVR
aVL
aVF
V1 II ic
V2 II ic
V1 III ic
V2 III ic
V1 IV ic
V2 IV ic

AJMALINE 1 mg/Kg
EP test pre ablation and 6 months post ablation
• Epicardial ablation in Brugada syndrome
  • reduces arrhythmias during early and mid-term follow-up

• When is it appropriate?
  • Electrical storm or documented appropriate shocks
• Epicardial ablation in Brugada syndrome

  • Normalizes ECG

  • Normalizes drug test

  • Prevents inducibility
• Epicardial ablation in Brugada syndrome

• When is it appropriate?
  • Patients at high risk of presenting ventricular arrhythmias
    • Type I ECG and
      • Sudden death
      • Cardiogenic syncope

• When might it be appropriate?
  • Patients at sufficient risk to deserve protection with an ICD
    • Type I ECG, asymptomatic and inducible
CONCLUSIONS

• Epicardial ablation in Brugada syndrome

• If in 5 years from now, ablated patients continue to have a normal ECG, a negative drug test, remain non-inducible at EP testing and have had no events documented by the ICD,

  • shall we have to replace ICD’s?

  • should we have to consider epicardial ablation as the first-line therapy in patients without previous cardiac arrest?