

Chapter 24

An Atypical Roof Dependent AFL



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Abstract A case of valvular heart disease presented with frequent episodes of palpitations and atypical AFL in ECG, EPS was done and entrainment study showed that the isthmus of the arrhythmia was in LA roof and ablation in that area resulted in termination of the arrhythmia.

Introduction

Patient was a 58 y/o man, with moderate MS and moderate MR, presented with frequent episodes of palpitations, not responsive to medical treatment, and candidate for ablation.

ECG showed a narrow QRS tachycardia with 2:1 AV association and AFL appearance and positive F waves in the inferior leads and V1 and positive F waves in V6 also. EPS was done using a halo catheter in RA, one quadripolar catheter in RV, and A decapolar catheter in CS.

EPS demonstrated a narrow QRS tachycardia with 2:1 AV conduction; CS activation was distal to proximal, arrhythmia CL was about 250 ms.

EPS

Using halo catheter in RA there was evidence of early septal activation in RA and fusion of wavefronts in the RA lateral wall. RA mapping should <50% of tachycardia cycle length.

Entrainment mapping in multiple sites of RA resulted in post-pacing interval more than 30 ms, all of findings were in favor of left side atrial macro reentrant

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tachycardia and there was a distal to proximal CS activity; all of above findings were in favor of left side AFL.

After septostomy, entrainment mapping of the multiple sites in LA was done. CS proximal and distal entrainment showed manifest fusion and $PPI-TCL > 30$ ms, so perimetral reentry was ruled out and other sites in LA were mapped and entrainment was done in other sites.

In 3D mapping using the Navx velocity system, there was the presence of areas of early activation adjacent to late regions.

During mapping of the LA roof there were low voltage areas and entrainment study in the roof demonstrated concealed fusion with very short $PPI-TCL$ difference so, RFA was done using irrigated tip catheter with power 20 W and target temperature 43°C and resulted in tachycardia cycle length prolongation and termination of the arrhythmia (Figs. 24.1 and 24.2).

Roof line RFA (radiofrequency ablation) from left to right superior pulmonary veins was completed and pacing in the anterior and posterior walls showed bidirectional block and no evidence of conduction recurrence after 30 min.

Discussion

Macroreentrant circuits not dependent on the cavotricuspid isthmus are called atypical atrial flutter. Atypical flutter in contrast with typical AFL mostly occurs in organic heart disease [1–3].

In the ECG, in focal atrial tachycardia P wave durations are shorter and isoelectric interval are longer than macroreentrant atrial tachycardia.



Fig. 24.1 Entrainment maneuver in LA roof, terminated the arrhythmia in favor of protected isthmus site of arrhythmia

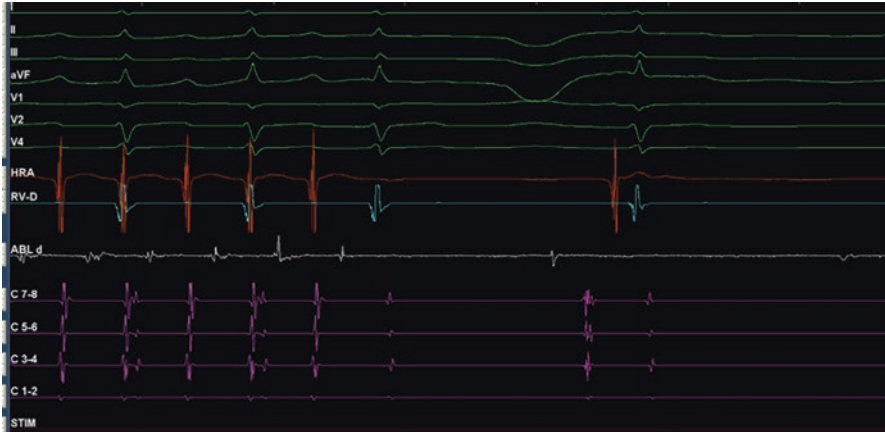


Fig. 24.2 Termination of the arrhythmia with ablation

Flutter waves arising from RA are predominantly negative in V1, but broad positive F waves in V1 without any isoelectric or negative initial component arise from LA mostly [4].

In circuit entrainment, from anterior and posterior LA demonstrates roof dependent LA reentry. Distal to proximal CS activity is strongly in favor of LA reentry, although proximal to distal CS activity may be seen in both RA and LA macroreentrant tachycardia.

Mostly, in roof dependent LA macroreentry Chevron and reverse Chevron patterns occur.

Chevron pattern occurs when LA activation is done via descending a wavefront from posterior walls then propagating in both septal and lateral dimensions [5].

The reverse chevron occurs when wavefronts descend the anterior LA wall and then propagate to the posterior LA wall.

In this patient, although there was a roof dependent AFL absence of Chevron or reverse Chevron pattern may be due to accelerated conduction via Bachmann's bundle.

According to the concealed entrainment in the LA roof and successful ablation in that area, the mechanism of the arrhythmia was strongly considered to be roof dependent AFL.

There are multiple variants of non-isthmus-dependent AFL such as upper loop reentry, right atrial free wall reentry, and dual loop reentry in the right atrium and perimitral annulus reentry, roof dependent reentry and periseptal reentry in the left atrium.

In addition, lesion tachycardia can occur on each side of atrial fibrosis following atriotomy or after Maze surgery [6].

So the first step for an approach to such arrhythmia is to confirm the mechanism of the arrhythmia that is reentry or not. Then entrainment maneuvers should be done in CTI for rule/out of typical AFL.

Then entrainment mapping in lateral septal sides in RA and proximal and distal CS, then anterior and posterior LA, could demonstrate the position of the reentrant circuit [7].

Electroanatomical mapping with mapping of the >90% of the tachycardia cycle length, could be helpful. A hallmark of macroreentrant arrhythmia in 3D mapping is the presence of the areas that earliest meets the latest [8, 9].

It should be noted that very low voltage areas can be the critical components of the tachycardia circuits. RFA with irrigated tip catheter and impedance drop of 10 Ω could be more effective than nonirrigated tip areas [10].

References

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