

Radiofrequency Ablation for the Treatment of Atrial Fibrillation—Brief Report Update

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Considerable advances have been made in both the understanding of and the curative treatment for atrial arrhythmias over the last decade. Radiofrequency ablation of typical right atrial flutter and focal atrial tachycardia using standard catheters is commonplace and is associated with success rates of over 95%. Recently developed 3-D mapping systems have furthered our understanding of the complex circuits responsible for atypical atrial flutters within the right and left atrium and successful ablation of these previously incurable arrhythmias is now routinely achieved. With the seminal discovery of pulmonary vein triggers and fixed left atrial circuits that are critical for the genesis and perpetuation of atrial fibrillation, ablation techniques have been developed which are associated with cure rates of over 75% for both paroxysmal and persistent forms of atrial fibrillation.

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Atrial Fibrillation

Atrial fibrillation (AF) is the commonest sustained arrhythmia in clinical practice. The mechanisms responsible for AF have been under active research for many years, however, the current working hypothesis suggests that AF develops because of an interplay between factors responsible for *initiating* AF (triggering atrial ectopic beats primarily arising from pulmonary veins) and factors responsible for *sustaining* AF (such as parasympathetic—sympathetic tone imbalance, increased left atrial mass and high frequency rotors or waves which may revolve around left atrial scars or the pulmonary vein ostia).

In the late 1990s Michel Haissaguerre and co-workers from Bordeaux identified several patients with paroxysmal AF in whom AF was initiated by atrial ectopic beats originating from the region of the pulmonary veins. Focal RF ablation within the pulmonary veins at the site of the triggering atrial ectopic beat was successful in preventing further episodes of AF in a proportion of patients. This landmark observation has spawned an intense research effort directed at a hitherto unstudied area of arrhythmology and has led to continuously evolving techniques aimed at curing AF.

The first pulmonary vein ablation techniques involved mapping and ablating the sites of earliest activation at the beginning of an episode of AF. This *focal approach* relied on an episode of AF developing during the ablation pro-

cedure (which was not common). Subsequent techniques have been modified to electrically isolate each pulmonary vein from the body of the left atrium so as to prevent all potential initiating pulmonary vein triggers from all pulmonary veins reaching the left atrium. This technique does not rely on AF developing during the procedure and assumes that most AF episodes develop as a consequence of pulmonary vein triggers. This *segmental ablation* technique involves the application of RF energy at the ostia of each of the three to six pulmonary veins at specific sites where electrical connections exist between the left atrium and the pulmonary veins. These electrical connections can be identified using circular catheters that are deployed at the ostia of each pulmonary vein.

Developed in parallel with the segmental technique by Carlo Pappone from Milan, the *circumferential ablation approach* involves the construction of ablation circles proximal to the pulmonary vein ostia. A 3-D mapping system is required to perform this type of ablation in order to register ablation points and to ensure that complete circle is created. This technique involves the ablation of a greater volume of left atrial tissue and probably achieves its effect through electrical isolation of the pulmonary veins, modification of left atrial substrate and partial vagal denervation.

General Indications for and Technique of AF Ablation

Atrial fibrillation ablation is being increasingly performed but should still be considered to be in a state of evolution.

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