

Update on Atrial Fibrillation

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Atrial fibrillation (AF), the most prevalent cardiac arrhythmia, is categorized into 4 different groups on the basis of the duration of the arrhythmia episodes. If AF terminates spontaneously or with intervention within 7 days from onset, it is *paroxysmal AF*; AF of more than 7 days in duration is *persistent AF*; continuous AF of more than one year's duration is *longstanding persistent AF*; and *permanent AF* is the condition that ensues when the patient and his or her physician mutually decide not to pursue the restoration or maintenance of sinus rhythm by any means.¹

Atrial fibrillation is the single most important cause of ischemic stroke, and patients with AF are 5 times more likely to have a stroke than are those without the condition.² At least 90% of blood clots responsible for stroke in patients with AF originate from the left atrial appendage (LAA).³ Catheter ablation has proved an effective treatment for AF, resulting in approximately a 54% success rate in paroxysmal and a 42% in nonparoxysmal types of AF, after a single procedure and at long-term follow-up evaluation.⁴ In this review, we evaluate the possible role of contact force (CF) technology and LAA exclusion to improve the AF ablation outcome.

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CARTO SMARTTOUCH Technology

The CARTO® THERMOCOOL SMART TOUCH® Catheter (Biosense Webster, Inc., a Johnson & Johnson company; Diamond Bar, Calif) is the first therapeutic catheter approved in the United States that has the capability of direct and real-time measurement of CF during the catheter ablation procedure, for the treatment of drug-resistant paroxysmal AF, sustained monomorphic ischemic ventricular tachycardia, or type I atrial flutter.⁵ The paroxysmal-AF catheter ablation trial with a CF-sensing catheter (SMART-AF Trial) was a multicenter (performed at 21 sites in the U.S.), prospective, nonrandomized study that enrolled 172 patients who had histories of at least 3 symptomatic episodes of paroxysmal AF within the previous 6 months, and of at least one antiarrhythmic drug failure. Trial results indicated the safety and increasing success rate of the paroxysmal-AF ablation procedure with use of the THERMOCOOL SMART TOUCH catheter.²

Among the 172 enrolled patients, 161 (mean age, 58.3 ± 10.93 yr) began the procedure with catheter insertion; radiofrequency ablation was performed in 160 of these patients, and 117 patients continued the 12-month follow-up protocol, to be evaluated for effectiveness.⁵ The overall success rate of catheter ablation was 74% at the one-year follow-up evaluation of patients, vs a 66% success rate at one year when performed out of the selected range. The success rate increased to 81% when consistent and stable application of CF was achieved (a targeted range was maintained ≥80% of the time). The SMART-AF trial results showed that the use of CF therapy leads to an improved success rate of AF ablation procedures for patients undergoing catheter ablation.⁵

TactiCath Quartz Ablation Catheter

The TactiCath™ Quartz CF ablation catheter (St. Jude Medical, Inc.; St. Paul, Minn) has improved the efficiency and effectiveness of ablation therapies by providing real-time estimation of the amount of pressure that a catheter tip exerts on heart tissue.⁶ A robust and compelling set of clinical studies then showed the potential of CF in ablation.⁷⁻¹⁰ Data from the TOUCh+ for CATHeter Ablation (TOCCATA) and Efficacy Study on Atrial Fibrillation Percutaneous Catheter Ablation with Contact Force Support (EFFICAS I) trials revealed that a high percentage of pulmonary vein (PV) isolation lesions were ineffective, after a low CF (<10 g) had been applied. The data showed

that contiguous lesions created in accordance with the CF guidelines identified in EFFICAS I (CF >10 g and force-time integral [FTI, area under the real-time CF curve] >400, gs) resulted in superior ablation outcomes, with durable PV isolation of up to 98% at 3 months via invasive follow-up (isolation or reconnection of each vein was evaluated via diagnostic catheter). Several other study investigators subsequently showed the importance of FTI as a determinant for ablation success or for a reduction of procedure time. The EFFICAS II⁹ study confirmed that maintaining adequate CF levels (target CF, 20 g; and minimum FTI, 400 gs) resulted in improving PV-isolation durability at 3 months' follow-up evaluation—an 85% success rate in EFFICAS II, compared with 71% in EFFICAS I. In the TactiCath Contact Force Ablation Catheter Study for Atrial Fibrillation (TOCCASTAR), 85.5% of the patients who had an AF ablation with optimal CF parameters were free of AF after 12 months, whereas the success rate was 67.7% among patients who had an AF ablation without optimal CF.¹⁰

The aMAZE Trial

The results of Left Atrial Appendage Ligation and Ablation for Persistent Atrial Fibrillation study (the LAALA-AF Registry)¹¹ and other independent studies¹² have introduced the possible role of the LARIAT[®] Suture Delivery Device (SentreHEART, Inc.; Redwood City, Calif) ligation in decreasing the burden of arrhythmia in patients who have AF. Lakkireddy and colleagues¹¹ observed that the atrial arrhythmia burden decreased from 81% to 47% three months after the LAA ligation. In Afzal and associates' study,¹² significant reductions in AF burden were reported in patients with known AF triggers inside the LAA (n=9) at 3-month (52% ± 35%) and 12-month (42% ± 19%) follow-up evaluations, in comparison with the respective baseline figures (84% ± 31%; *P* < 0.0001). The LAA Ligation Adjunctive to PVI for Persistent or Longstanding Persistent Atrial Fibrillation (aMAZE) Trial to Evaluate LARIAT Ligation of the Left Atrial Appendage¹³ is designed to evaluate the success rate of AF ablation with and without concomitant LAA exclusion.

The aMAZE Trial is a prospective, multicenter, randomized (2:1), controlled study that will be conducted among patients, 18 to 80 years of age, with documented persistent or longstanding persistent AF (<3 yr of continuous AF) scheduled for catheter ablation. This study will be done in 2 stages: in stage 1 (Limited Early Stage), up to 175 subjects will be recruited at approximately 15 sites, and for stage 2 (Pivotal Stage), as many as 600 subjects will be enrolled at up to 50 sites. All patients from both stages will be included in the primary analysis.¹³

Conclusion

Force-sensing improves the efficacy of PV isolation when ablation is performed at optimal CF. Multiple

investigators have shown the clinical benefits of mechanical and electrical isolation of the LAA with the LARIAT. The aMAZE trial investigators will study the importance of adjunctive electrical isolation of LAA in persistent AF.

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