[MUSIC PLAYING]

PAUL A FRIEDMAN: We'll do about 1,000 complex oblations a year. And so we have a lot of experience in seeing all the ranges and nuance of variations of arrhythmia.

With the advances in mapping systems, we can now treat a lot of rhythms that before were, frankly, thought to be untreatable. And now they have a very high cure rate.

FRED KUSUMOTO: We have these sophisticated mapping systems that allow us to locate the catheter in space and also evaluate these complex electrograms and use specialized algorithms to identify the specific cause of these arrhythmias.

PAUL A FRIEDMAN: Our strategy has been to map, and remap, and take our time to make sure we identify all the arrhythmogenic substrate so that we can effectively eliminate the arrhythmia and minimize recurrences.

KOMANDOOR SRIVATHSAN: When we create a line, we want to make sure this line of block is enduring and doesn't start conducting just at the end of the procedure or soon after the procedure.

PAUL A FRIEDMAN: So we use a number of mechanisms to ensure that an ablation is complete. Typically, once we do a line of block, we'll paste on both sides of the line of block. We'll often give medications to try to provoke recurrent conduction.

KOMANDOOR SRIVATHSAN: One way of assessing is simply giving it enough time, like 30 minute waiting time rather than immediately saying that the line is blocked. What is blocked now at zero minute could be conducting at 30 minutes.

Number two, we also stress with chemicals such as isoprenaline or adenosine to make sure that the line of block is solid and enduring. So giving it enough time and testing with chemicals certainly makes sure the outcomes are much better, the line of block is much more durable, and that repeat procedures are substantially lower.

PAUL A FRIEDMAN: When the arrhythmia comes from intracardiac chambers, papillary muscles, and other structures, those don't show up on mapping systems. And so you have to use intracardiac echocardiography. You have to recognize that it's coming from there. And a number of technical challenges-- catheter stability, maintaining the catheter in the position in the moving heart when the structure itself is like a pyramid off the base of the musculature is challenging. And we've done a number of those.

FRED KUSUMOTO: The patient who comes to the Mayo Clinic often is complex for multiple reasons. Often they've had congenital heart disease, perhaps they've had prior heart surgery, perhaps they've had multiple ablations previously.

PAUL A FRIEDMAN: You have the challenge of the original arrhythmogenic substrate. On top of that, you have scars that were left from the other ablation. And so that can make the mapping, the identification of the abnormal regions, more challenging.

KOMANDOOR SRIVATHSAN: All the access sites have been previously used. So we had to go through scar tissue right to the groin, and across the septum-- which is scarred-- and then find this localization of these arrhythmias, previously scarred, partially scarred areas.

PAUL A FRIEDMAN: The success rate for patients who have paroxysmal atrial fibrillation-- meaning the arrhythmia starts and stops on its own-- is approximately 80%, 80% to 85%, such that current guidelines suggest it can be considered as first line treatment for patients with atrial fibrillation.

FRED KUSUMOTO: Atrial fibrillation is the most common arrhythmia that we take care of in the electrophysiology laboratory through the ablative procedure. Atrial fribrillation is a complex arrhythmia. Instead of having one site that is the cause of the arrhythmia, oftentimes it's multiple sites. It's critical to identify those sites initially to minimize the likelihood of having to do repeat procedures.

PAUL A FRIEDMAN: We do a fair number of oblations in patients with a significant number of co-morbidities, especially patients with depressed ventricular function of ventricular or atrial and ventricular arrhythmias.

KOMANDOOR SRIVATHSAN: Many of these patients are hemodynamically unstable. We have the capability of supporting their hemodynamics while we perform the oblations.

PAUL A FRIEDMAN: So we've had some cases where when you induce the arrhythmia to map it the blood pressure plummets. And in that case, we've been able to do ablations with left ventricular assist devices in place to maintain blood flow while we're doing critical mapping.

We also see a lot of patients with left ventricular assist devices. We'll put in a number of those ourselves. And those patients have scar on the heart muscle. And that's a special kind of expertise in the sense that you have to take care to make sure your ablation catheter doesn't enter the left ventricular pump.

FRED KUSUMOTO: Unfortunately, patients with defibrillators who are suffering from multiple ventricular arrhythmias have become much more common. When the patient receives therapy with shocks, that has been shown to reduce their quality of life and actually contribute to death. For that reason, it's critical to identify these patients who are at risk for having ventricular arrhythmias with their defibrillator and do procedures so that these ventricular arrhythmias don't occur.

PAUL A FRIEDMAN: Areas that can be hard to reach in the heart are substrate that's on the outside of the heart. In that scenario, we perform percutaneous epicardial access, meaning we put a needle-- a Tuohy needle, which is blunt at the tip-- through the subxiphoid n region into the pericardial space. We put a sheath on the outside of the heart to allow us to map in a patient without having to do open heart surgery.

KOMANDOOR SRIVATHSAN: We're also utilizing several of the newer mapping systems. We also have our own patents which are being filed to see whether new systems can be generated or actually existing systems can be modified to suit the nature of the arrhythmia that is constantly evolving.

PAUL A FRIEDMAN: We're very interested in preventing arrhythmias and in detecting them early. We have been involved in the development of monitoring systems, wearable patches that people can-- like an ECG Band-Aid, put it on your chest, talks to a cell phone, transmits wirelessly-- to detect arrhythmias early on. The goal there is to detect disease early and to intervene. And that intervention can be lifestyle modification. The really long term to prevent disease involves educating all of us.

KOMANDOOR SRIVATHSAN: So this has been one of the mainstay of Mayo Clinic right from the Mayo brothers' days. We always share our knowledge and we don't keep it within ourselves.