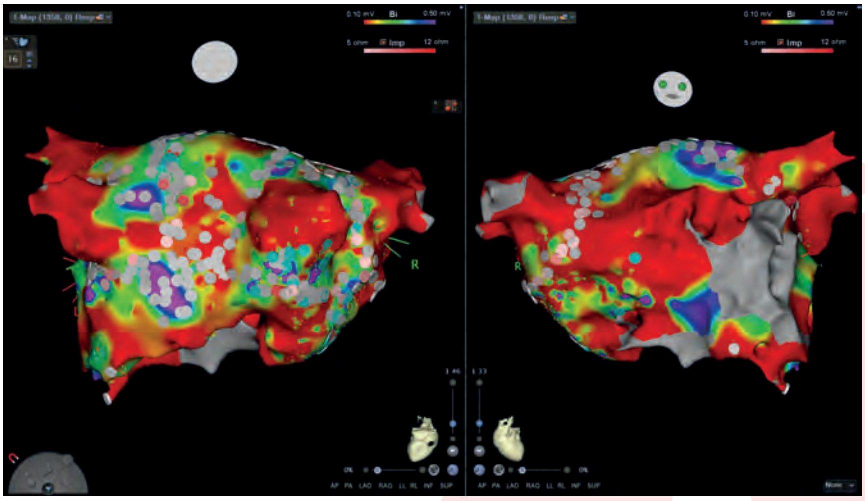
TOBB ETU HOSPITAL

CARDIOLOGY

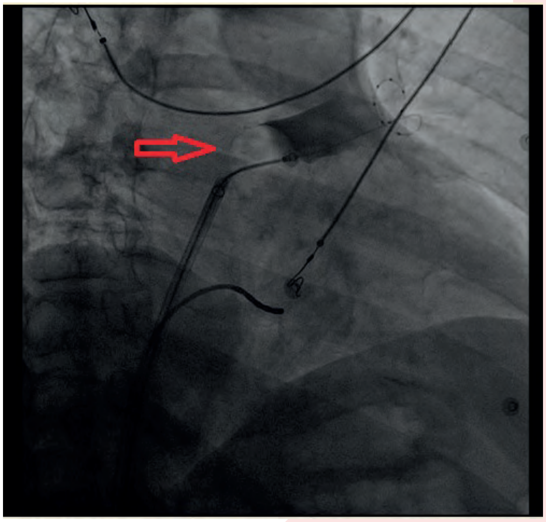
Arrhytmia treatment using 3-D Electroanatomic Mapping systems



At the present time, three electroanatomic mapping systems are in clinical use worldwide: (1) CARTOTM (Biosence Webster, Diamond Bar, CA, United States); (2) EnSite NavxTM (St. Jude Medical, St. Paul, MN, United States); and (3) RhytmiaTM Boston Scientific, Cambridge, MA; United States). These systems use electromagnetic or impedance-based catheter location methods, or a hybrid of both.

We are currently using CARTO-3TM system to diagnose and treat arrhytmias at our clinic. The CARTOTM mapping system consists of an ultralow magnetic field emitter, a magnetic field generator locator pad, an external reference patch, a deflectable 7 Fr quadripolar mapping-ablation catheter with a 4- or 8- mm tip and proximal 2-mm ring electrodes, location sensors inside the mapping-ablation catheter tip electrode, a reference catheter, a data processing unit, and a graphic display unit to generate the electroanatomic model of the chamber of the heart being mapped. The CARTOTM mapping system uses a triangulation algorith similar to that used by a global positioning system (GPS). The magnetic fied emitter, mounted under the operating table, consists of three coils that generate a low intensity magnetic field that is a very small fraction of the magnetic field intensity inside a magnetic resonance imaging (MRI) machine.

Mapping is performed in two steps. Inıtially the magnetic mapping permits precise localization of the catheter with the sensor. This is associated with the current ratio of the electrode closest to the sensor. As the catheter with the sensor moves around a chamber, multple locations are acquired and stored by the system. The system integrates the current-based points with their respective magnetic locations, resulting in a calibrated current-based field that permits accurate visualization of other catheters and their locations. Since each electrode emits a unique frequency, individual electrode locations are distinct, even when they are close to each other.
Fast Anatomical MappinTM (FAM) is a feature that permits rapid creation of anatomical maps by movement of a sensor-based catheter throughout the cardiac chamber.
Using CARTO-3TM operator can accurretly diagnose the diseased myocardium which causes the clinical arryhtmia and ablate it. Using 3-D mapping systems also decreases the



CRYOABLATION

If a gas is compressed at high pressure and then is allowed to expand suddenly in region of low pressure, the temperature of the gas decreases. This phenomenon is known as the Joule-Thomson   effect. Compression of the das decreases inter-molecular distances and , a a result, the forces of attraction between the molecules become appreciable. During expansion, gas molecules move far away from each other, but energy is required to counteract the intermolecular attracti-on forces. Heat energy of the molecules move far away from each other, but energy is required to counteract the intermolecular attraction forces. Heat energy of the molecules of the gas is utilized fort his purpose, a process that results in reduction of gas temperature. use of the floroscopy which is a huge improvement both for opertor and patient.

For intravascular cryoablation, a precooled, compressed liquid refigerant (nitrous oxide) is delivered under constant pressure from the console to the tip of the ablation catheter. Decompressioun and expansion of the liquefied nitrous oxide as it passes into the expansion chamber absorbs heat from the surrounding tissue, thereby cooling the surface.

The degree of permanent cellular damage at these tissue temperatures is direcly reated to duration of freezing and rapid extreme freezing (tissue temperatures colder than -50oC results in intracellular ice formation and near instantaneous permanent tissue injury.

We are currently using (Arctic Front AdvanceTM with Medtronic cryoablation system , Medtronic, Minneapolis, MN; United States) for focal ablation of atrial fibrilation via isolation of pulmonary veins (PV) . These steerable catheters come with 4-, 6-, or 8-mm-long-tip electrodes and have three additional proximal ring electrodes for EP recordings as well as a proximal thermocouple. This cryoballoon catheter is specifically designed for PV isolation.

Catheter-based cryoablation has specific advantages over RF (radio-frequency) catheter ablation, including greater safety as a result of greater catheter stability, reduced risk of systemic embolization, low propensity for thrombus formation and endothelial disruption, and preservaion of ultrastructural tissue integrity.

Cryothermal energy ablation can be considered an ideal and safer energy source for PV isolation, and the incidence of PV stenosis and thromboembolic events is expected to be dramatically reduced compared with RF ablation.

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CARDIAC IMPLANTABLE ELECTRICAL DEVICES (CIEDs)

These devices deliver therapeutic electrical stimuli to the desired cardiac chamber. An applied stimulus produces an electrical field that is proportional to the spatial derivative of the applied voltage. This resultant field interacts with intrinsic cardiac electrical activity. The response of the heart is mediated by the passive and active properties of cell membranes, by direct intracellular electrical effects.

Electrical therapy for cardiac arrhytmias includes low-voltage (1 to 5 V) pacing stimuli (pulses) and high voltage (500-1400V) stimuli (shocks). Pacemakers deliver paving pulses to treat bradycardia. Implantable cardioverter defibrillators (ICDs) deliver shocks to defibrillate ventricular fibrilation or to cardiovert ventricular tachycardia (VT). They also deliver pacing pulses to treat bradycardia or sequences of rapid pacing oulces to treat VT. Cardiac resynchronization therapy (CRT) pacemakers (CRT-P) or ICDs (CRT-D) also provide electrical therapy for heart failure in the form of pacing pulces that resynchronize the ventricular contraction sequence.