APHRS Asia Pacific Heart Rhythm Society

News
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A Message from the President

Young-Hoon Kim, M.D.
President, APHRS

Dear Colleagues,

Since its launch in 2008, the APHRS has made remarkable growth, emerging as one of the world's top three heart rhythm societies. I would like to express my sincere appreciation to the leaders and members of the APHRS, as well as to our sponsoring companies for their faithful and dedicated support; such cooperation is what makes it possible for the APHRS to gain today's status. The APHRS initially started humble by sharing an office in Tokyo, Japan with the Japanese HRS, and it was officially registered in Singapore this year, thanks to Dr. Teo's and all board members' effort. I believe this is a significant event of APHRS in development.

It is true that there is a huge gap between Asia-Pacific countries in terms of research and treatment in arrhythmia; the goal of the APHRS is to improve the scientific and clinical level of arrhythmia in the Asia-Pacific region as a whole by helping advanced countries in this field take one more step forward towards the world's leading level, and by assisting undeveloped countries in building a diverse array of relevant infrastructures.

To achieve the goal, partnership and cooperation with the HRS and the EHRA are tremendously significant; at this particular moment in time, collaboration with arrhythmia societies worldwide is deemed to be more critical than ever to the successful hosting of an annual APHRS Scientific Session. It is safe to say that the number of heart rhythm societies and meetings has been growing increasingly with some regions seeing supply exceeding demand. That means our energy, resources, and support from sponsoring companies will be exhausted unless more enriching and educational societies and programs are chosen to be further developed. We always have to remember that every one of us bears the responsibility for evolving our society all together. In addition, we need to co-produce practice guidelines or consensus documents, carry out a nationwide campaign, operate a study and training program for professional and young investigators, and to increase cooperation in global cohort research for major arrhythmia diseases such as atrial fibrillation and sudden cardiac death.

Furthermore, the importance of academic interaction through the Journal of Arrhythmia, the official journal for both the JHRS and the APHRS, can't be more highlighted. JOA has been available through the pubmed search since 2015; many papers included in JOA have been frequently searched. Given this situation, it is our firm belief that JOA will be registered as SCI in a very near future. The APHRS would like to encourage its members to submit their remarkable papers to its official journal so that JOA can be made known to people around them. The fact that the APHRS has a great official journal can be a solid foundation for long-term growth.

Our effort will be continued until arrhythmia diseases are cured by expanding co-research in this sphere through the APHRS, creating a productive educational program, and by raising awareness of arrhythmia on a regional level.

I would like to extend my deepest gratitude to Dr. Jon Kalman and other key members of the Australian Heart Rhythm Society for their hard work and dedication to making APHRS 2015 happen in Melbourne. And I strongly believe that led by Dr. Wee-Siong Teo, new president, and supported by your active participation, the APHRS will go one step further in 2016.

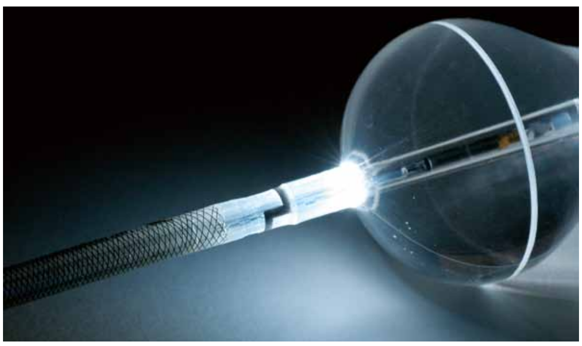
HeartLight®: The Endoscopically Guided Laser Ablation System

Boris Schmidt, M.D.

Cardioangiologisches Centrum Bethanien

Pulmonary vein isolation (PVI) has become the gold standard treatment for paroxysmal atrial fibrillation (PAF). Recently, PVI has also been shown to be as effective as and possibly safer than more aggressive strategies such as complex fractionated atrial electrogram ablation and left atrial linear lesion ablation in patients with persistent atrial fibrillation (PSAF).[1] One of the major challenges with PVI has been the inability of physicians to create durable electrical isolation of the pulmonary veins with currently available technologies. The number one reason for post-ablation recurrence of atrial fibrillation (AF) is electrical reconnection of an area that has previously been treated. Even after their second recurrence more than 90% of PAF and PSAF patients had at least one reconducting pulmonary vein (PV).[2]

The endoscopically guided laser ablation system, also known as the HeartLight® system, is the newest addition to the options available for PVI. It offers the unique capability of being able to visualize the tissue at the antrum of the PV through its internal micro-endoscope. This compliant balloon ablation device is also able to adapt to wide variation in vein architecture and is able to deliver titrated energy based on anatomical considerations. The HeartLight system is CE approved, has been in limited commercial distribution in Europe since 2011 and has been used in approximately 3000 cases. More recently, a multi-center, randomized US-FDA trial has been completed comparing laser ablation to radio frequency ablation in PAF patients. Many EU studies have also been completed, first evaluating safety and feasibility and then exploring issues of long term efficacy, durability of isolation, as well as comparisons of the HeartLight technique to existing approaches.



Technology Description

The HeartLight system consists of a 12F balloon catheter, a 12F inner diameter steerable sheath, a re-usable endoscope and the HeartLight Console.

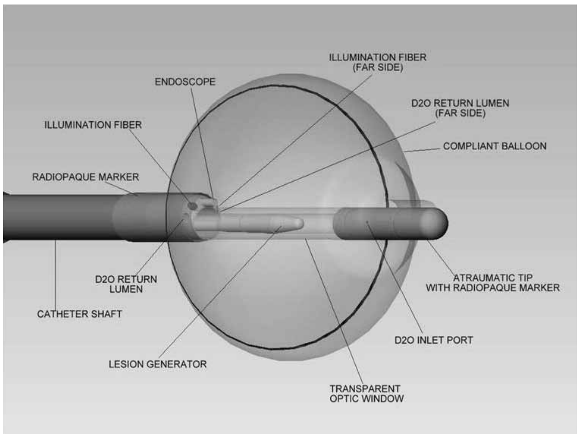
The HeartLight catheter is an internally irrigated closed system containing six lumens: two for fluid (inlet and return port); two for the illumination fibers (one on each side of the central lumen); one for the laser fiber to deliver therapeutic energy; and one for the endoscope, which sits at the proximal end of the balloon looking forward at a wide angle. The balloon is made from a compliant polyurethane material. Fluid is pumped continuously through the balloon and changing the pump speed allows the user to dynamically tailor the size of the balloon to fit with the patient's anatomy.

The HeartLight system uses Deuterium Oxide (D_2O) fluid rather than standard saline. This is due to the fact that laser energy is absorbed into H_2O very well, but not into D_2O. In this way, there is a very efficient transfer of heat from the laser fiber to the tissue with no energy loss in the fluid of the balloon.

The HeartLight Procedure

The procedure is similar to the approach used in other left sided ablation techniques in that a transseptal puncture is made using the tools of choice for the electrophysiologist. Once access to the left atrium has been achieved, the CardioFocus sheath is exchanged over a guidewire placed in the left superior pulmonary vein.

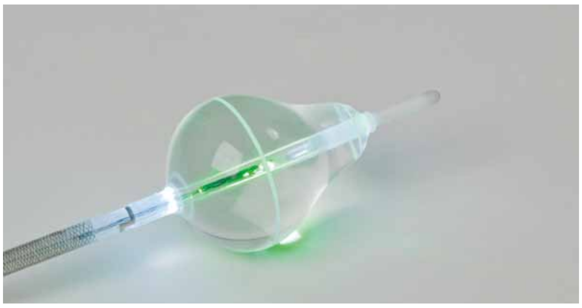
The HeartLight catheter is prepared by flushing it with D_2O, loading the endoscope and inserting it into the deflectable sheath. The HeartLight system is then advanced through the vasculature and introduced into the left atrium. Once in the left atrium, the balloon is directed to the PV ostium and inflated; the light source illuminates the areas of contact around the balloon and the endoscope allows full color, beat by beat viewing of the tissue where blood has been displaced.



The HeartLight console performs a variety of functions. It brings white light illumination within the heart and generates aiming beams similar to a laser pointer to show exactly where lesions will be placed on the tissue. The aiming beams are both green and red as blood and tissue have different optical properties. Once the area for treatment has been identified, the console can deliver 980nm laser energy when a footswitch is activated; power between 5.5W and 12W can be delivered. The possible energy doses are quite low in comparison to RF systems: 5.5W for 30 seconds; 7W for 30 seconds; 8.5W for 20 seconds; 8.5W for 30 seconds; 10W for 20 seconds; and 12W for 20 seconds. The capacity to titrate energy dependent upon the anatomical location within the heart is a benefit of this approach and insures that only appropriate amounts of energy will be used.

The console's LightTrack® software feature takes a snapshot at each energy delivery position. The split screen mode allows the user to see the previous location and the next energy delivery position superimposed so that overlapping and contiguous lesion sets can be assured.

All clinically significant veins are treated and then the veins are mapped to confirm electrical isolation using standard circular mapping catheters.



Safety Considerations

To optimize procedural safety, esophageal temperature monitoring is recommended throughout the procedure to minimize the risk of thermal injury to the esophagus. Phrenic Nerve Injury (PNI) has also been associated with balloon based PVI technologies.[3] The HeartLight system has a 2-3% PNI complication rate according to recent data published by Sediva *et al.*[4] In order to minimize PNI, the phrenic nerve is paced via a multipolar mapping catheter positioned in the superior vena cava until the diaphragm is captured. Diaphragmatic capture is closely monitored and ablation is immediately discontinued if weakening or loss of capture is detected.

Preclinical Studies

Endoscopic balloon based ablation was first described in 2004 by Reddy *et al.*[5] *In-vivo* porcine studies were conducted to evaluate the feasibility of the system, manipulation of the catheter within the pericardial space, visualization of the anatomical structures and delivery of laser lesions to the ventricular myocardium. The first generation catheter delivered a full 360° circumferential laser lesion and was the first to utilize and endoscope inside of the balloon to allow for the possibility of visualizing endocardial tissue. Additional *in vivo* studies led to the prescribed and current dosing strategies as well as the evolution of the catheter to the current compliant balloon and 30° laser arc.

Clinical Studies

Early European experience with the HeartLight catheter has been described in several clinical publications.

Dukkipati *et al.* published a multi-center study assessing the durability of PV isolation as demonstrated through a remapping protocol after a mean of 105 days post index procedure[6]. The effectiveness of PV isolation was tested in addition to performing evaluations of safety and effectiveness in the long term follow-up. Durable electrical PV isolation was confirmed in 162/189 of PVs (86%). High rates of acute PV isolation were found (98.6-98.8%) and the one year single procedure success rate (71.2%) was determined to be comparable to use of other known conventional ablation technologies.

Schmidt *et al.* assessed the feasibility of PV isolation when solely guided by endoscopic visualization of the PVs without reference to electrical signals.[7] In 137 veins identified and treated, 96 (70%) were acutely isolated by visual guidance alone. An additional 38 veins were isolated subsequently using the balloon via gap mapping with a circular mapping catheter placed distal to the balloon in the pulmonary vein. Ultimately, 134 of 137 (98%) of PVs were acutely isolated with the use of the HeartLight system. After a mean follow up of 266 days, 27 of 35 (77%) patients remained AF free off of all anti-arrhythmic drugs.

Recent publications by Bordignon *et al.*[8] and Metzner *et al.*[9] report on the safety and efficacy of various dosing strategies to optimize energy delivery to potentially increase acute and long term success rates while maintaining procedural safety. The higher dose used by Metzner *et al.* (8.5-10W) resulted in a 90% isolation rate after the first circumferential ablation attempt. Bordignon *et al.* reported an 89% success rate of first time isolation using higher energy levels (8.5-12W) without any difference in procedural safety. Additionally, the long term success rate (median follow up 311 days) of the patients treated with the high dose protocol resulted in 83% freedom of AF vs. 60% in the lower dose group.

Sediva *et al.* published 4 year data including 194 patients (63 females, mean age 61 years).[10] Acute procedural results demonstrated 99.2% of all veins targeted were acutely isolated and 95.3% of these veins were isolated on the first attempt. Mean procedure time was 226 min while mean fluoroscopy time was 20.4 min. At one year follow up, 130 of 158 PAF patients (82.3%) and 9 of 12 of PSAF patients (75%) were AF free. At 4 years, 24 of 32 (75%) of PAF patients have remained free of AF. The acute procedural complications included phrenic nerve injury in four patients (2.06%), tamponade or pericardial effusion in one patient (0.51%), stroke or transient ischemic attack in one patient (0.514%), and vascular injury in six patients (3.09%). There were no reports of PV stenosis or esophageal fistula, consistent with worldwide experience.

The Pivotal Clinical Study of the CardioFocus Endoscopic Ablation System – Adaptive Contact (EAS-AC) or HEARTLIGHT® for the Treatment of Symptomatic Atrial Fibrillation was recently presented during the 2015 Heart Rhythm Late Breaking Clinical Trial Session in Boston, MA, USA. Dr. Vivek Reddy, Principal Investigator, New York, NY, revealed that the trial, which randomized CardioFocus' HeartLight® Endoscopic Ablation System one-to-one versus the Biosense Webster Thermocool® catheter, met both primary efficacy and safety endpoints and demonstrated a low learning curve for physicians using the HeartLight® System.[11]

Trial results show that when performing a single ablation procedure using the HeartLight® System, the majority of patients experienced freedom from paroxysmal AF at 12 months. Moreover, the primary safety endpoint and the primary efficacy endpoint of freedom from AF at 12 months were satisfied for the pre-specified non-inferiority test as per the study design. The study protocol permitted investigators to perform only a single pulmonary vein isolation (PVI) procedure using HeartLight. Investigators were able to use the control arm device for both PVI and other left atrial targets, with up to two control arm procedures allowed.

The FDA has not had the opportunity to fully review the study data, evaluate the adjudication of the safety and effectiveness assessments or conduct an independent confirmation of the analyses and endpoint calculations and so the results are to be considered preliminary.

A multi-center clinical trial comparing irrigated radio-frequency (RF) ablation to HeartLight completed enrollment In August, 2015 in a persistent AF population. One hundred and fifty (150) persistent AF patients were enrolled in six European centers with one year follow up expected to be complete by August 2016.

Worldwide Registry

PVI with the HeartLight System has been performed in over 3000 cases worldwide. Registry data from 406 procedures and 19 centers was presented in 2012 at the Heart Rhythm Society meeting.[12] Acute procedural metrics included a mean procedure time of 180±58 min with an ablation time of 61±17min. The average fluoroscopy time was 29±19 min. Acute PV isolation rate without the use of an additional catheter was 98.1%. Subsequently, the worldwide registry has been reviewed to include over 1700 patients with an average procedure time of 133 min and an average fluoroscopy time of 25 min.

Procedural Ease and Economics

Perrotta *et al.* published results of 150 consecutive patients who were divided into tertiles (T) in order to assess the acute and long term efficacy as well as procedural dynamics with respect to the learning curve.[13] Using visual guidance only, 497 of 583 PVs (85%) were acutely isolated on the first attempt. Visually guided PVI rates increased from 73% to 91% with more experience; total procedure and fluoroscopy time significantly declined with experience. All major acute procedural complications occurred in the first T.

The experience from CCB in Frankfurt and from the USA pivotal trial have shown that there is a short learning curve and that during the learning phase, clinical results are at least as good as an RF approach. It can be seen, therefore, that with experience, results become even better with above 80% single procedure success expected. It is also shown that both procedure time and fluoroscopy time will also decrease with experience.

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ECG Quiz

The model commentary will be provided in the next issue No.23

Dr. Swee-Chong Seow

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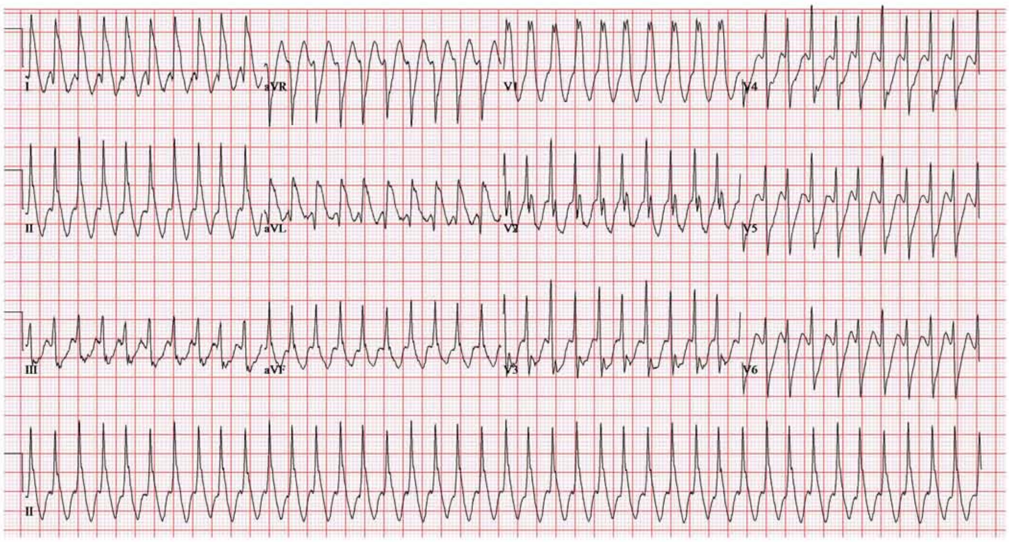
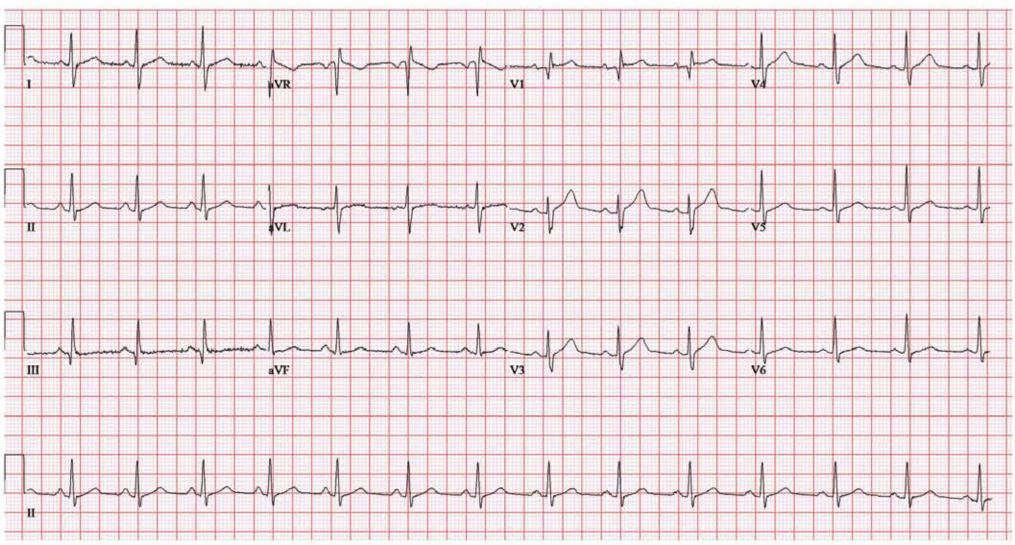
Department of Cardiology
National University Hospital, Singapore



A 40 year old male with hypertension, hyperlipidaemia and fatty liver presents with a sudden onset of palpitations. Upon arrival, his pulse was 240/min, blood pressure 105/70mmHg (12 lead ECG above) .IV adenosine 6mg and 12mg were given with no effect. Blood pressure dropped to systolic 70mmHg. He was cardioverted electrically. His ECG post-cardioversion is shown below.



What is the presenting rhythm?

a. Ischaemic (Scar) Left Ventricular Tachycardia
b. Idiopathic Fascicular Ventricular Tachycardia (upper septal variant)
c. Supraventricular tachycardia with aberrancy
d. Antidromic atrioventricular re-entrant tachycardia

EP Image: Multiple Types of Right Atrial Flutter in Congenital Heart Disease

Shih-Lin Chang, M.D., PhD., Shih-Ann Chen, M.D.

Division of Cardiology, Department of Internal Medicine, Taipei Veterans General Hospital, Taipei, Taiwan; Department of Medicine, National Yang-Ming University School of Medicine, Taipei, Taiwan

Case Presentation

A 41-year-old female patient has a history of surgical repair of tetralogy of fallot for 20 years and received radiofrequency (RF) ablation of typical atrial flutter (AFL). Because of recurrent incessant AFL, she was referred to our center for second RF ablation. During the electrophysiological study, 4 types of sustained AFL were induced sequentially: typical AFL with counter clockwise rotation, upper loop reentry (ULR) flutter, right atrial (RA) free wall flutter and superior vena cava (SVC) AFL (Figure 1). These reentry circuits were identified by the activation mapping (Figure 2) and entrainment maneuvers.

Typical AFL was terminated by successful RF ablation of cavotricuspid isthmus (CTI) with bi-directional block. ULR flutter was induced and upper crista terminalis ablation was performed to terminate flutter. RA free wall flutter was then induced and a linear ablation from the low part of anterior free wall near tricuspid annulus to free wall scar successfully terminated RA free wall flutter. Then SVC AFL was induced, and a linear ablation from upper part of anterior free wall near tricuspid annulus to SVC basal scar terminated the tachycardia successfully. After ablation, the inducibility test with high current, rapid atrial pacing, and isoproterenal infusion did not induce any tachyarrhythmia.

Marcoreentry tachycardia is known as a late complication after the surgical repair of congenital heart disease. A strategy combining electroanatomic and entrainment mapping is helpful to identify the reentry circuit.[1] Electroanatomic mapping during AFL can present the activation wave front and also the different anatomic obstacles, such as conduction block lines and scar area, which provides a more precise description of reentry circuit than conventional mapping.

Reference

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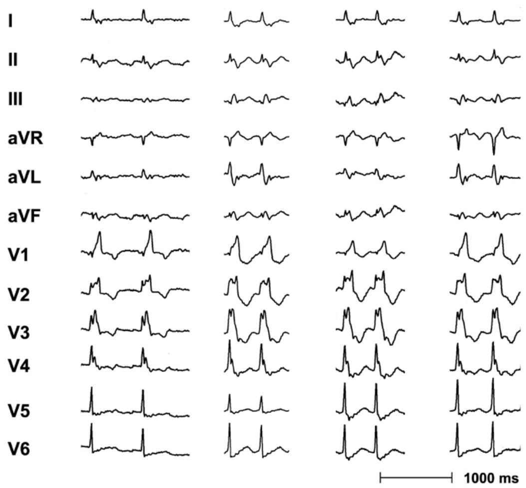

Figure 1

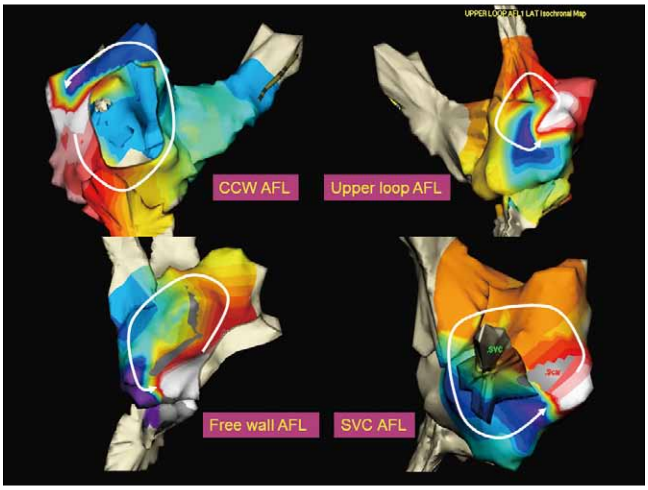

Figure 2

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Introduction of Saitama Medical University, International Medical Center

Ritsushi Kato, MD, PhD

Professor of Cardiology, Director of EP Services,
Saitama Medical University, International Medical Center

Hospital Overview & Access

The International Medical Center at Saitama Medical University was established in April 2007 as a third hospital within the larger university campus. Our institute is located at Hidaka Campus in Hidaka City in the Saitama Prefecture (see Figure 1). Hidaka is in the western part of Saitama Prefecture, and a short one-and-a-half hour drive by car from the center of Tokyo. Although Hidaka city is small and has only 60,000 people, there are several sizeable cities in the surrounding area such as Kawagoe, Sayama, Sakado, and Higashimatsuyama, with a total population exceeding 10,000 additional residents.

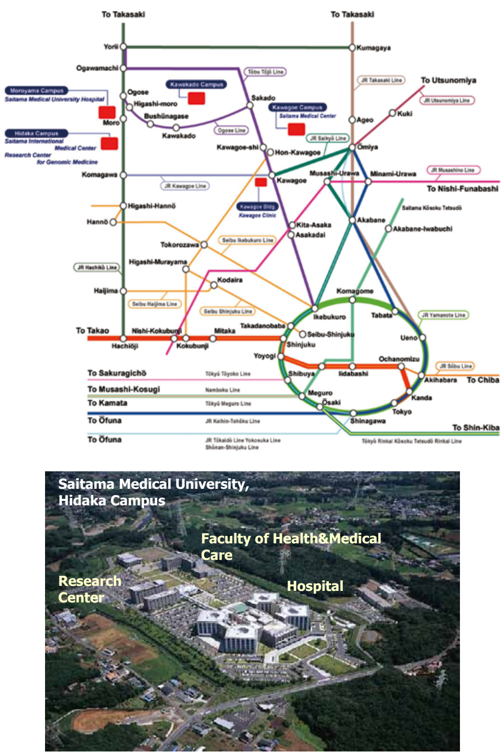


Figure 1. Location of Hidaka and picture of Hidaka campus

Hospital Information

Address: 1397-1 Yamane, Hidaka, Saitama 350-1298 Japan
TEL: 81-42-984-4111
No. of beds: 700
No. of staff: 1700 (physicians: 290)

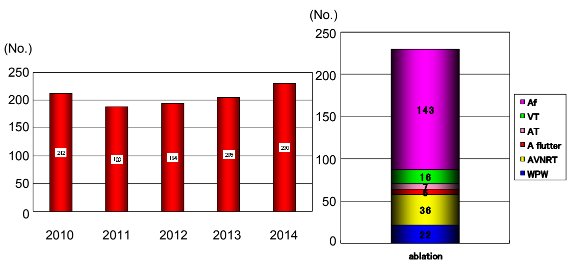
This hospital consists of an emergency center which covers emergency medical care in Saitama's west district, in addition to having dedicated heart, stroke, and cancer centers. The department of cardiology is an integral part of the heart center, with a committed team of 30 doctors and 80-100 beds for in-hospital patients. These medical professionals are routinely occupied with the earnest focus necessary to manage the medical needs of around 100 in-hospital patients with a variety of different cardiovascular diseases. Our facility never turns away acute heart failure patients that cross the threshold of the emergency facility at Saitama Medical University. Fortunately, we have a good structure of support provided by our facility's cardiac surgeons, who annually perform approximately 500 cardiovascular surgeries - which includes heart transplants and TAVI.

Electrophysiology Laboratory

Physicians in the EP department are responsible for treating patients with a variety of different kinds of arrhythmias. Our team was established by Professor Kazuo Matsumoto (Figure 2), a former director of EP services who has four full-time and three part-time doctors currently in his group, and five ME engineers. Additionally, our facility has 2 catheter laboratories, and one of them is a hybrid operating room for device implantation or lead extraction. Our medical group undertook its first case of catheter ablation in 1990, underscoring our long and studied history with ablation procedures. Most recently, we have been performing around 200 cases per year, whereas atrial fibrillation accounts for about 60 percent of the total ablation cases, which is similar to Japan's overall trend (Figure 3). The ablation procedure typically used by our group is characterized by its preferentially used cryo-balloon ablation method for paroxysmal atrial fibrillation, which began last year. Thus far, there have been about 50 cases where we have used this procedure, with good initial results bordering on 90%. We have the capacity to use both the CARTO system and the Ensite - NaVX system for mapping out the more complex arrhythmias, and we can choose either one of the 2 mapping systems depending on the

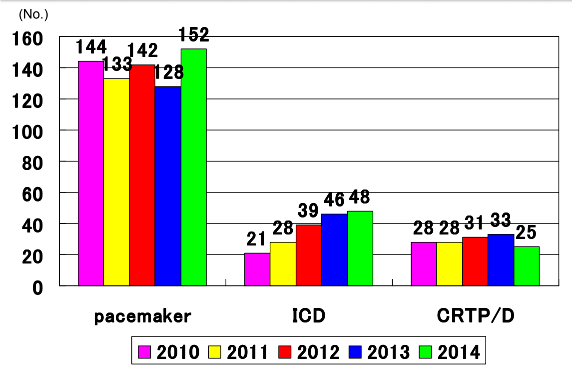
Figure 2. *Picture of EP staff*
Kazuo Matsumoto is at the front row 2nd doctor from right
Author is at the front row, 2nd doctor from left

Catheter ablation



Indication of ablation 2014

Device implantation



characteristics of tachycardia. Professor Naokata Sumitomo also joined our hospital as a director of pediatric cardiology, and has been performing active ablation to treat complex arrhythmia in congenital heart disease patients since March 2014.

Device therapy is also an important part of those medical services we provide, in that we treat approximately 50 cases of PM clinic in a week, including remote monitoring. For bradycardia, life-threatening tachyarrhythmia and heart failure, for example, we opted to use almost an equal number (200-250 in a year) of device therapy treatments as ablation therapy (Figure 3). For the past few years, we have generally implanted full body MRI conditional devices for de novo implant case. Additionally, we performed 5-10 cases a year of the lead extraction using the laser sheath from 2009.

Our current research interest has been focused on the hemodynamic effect of Af ablation and the influence of ICD/CRT in elderly patients. We have published numerous papers and presented these issues in several meetings in the last couple of years.

We are a medical institution that tries to comprehensively respond to the broad array of challenges and expectations related to arrhythmia presented by patients and neighborhood doctors, looking to solidify our position as a key hospital for arrythmia in the western part of Saitama. In addition, our facility has welcomed a number of doctors, other medical professionals and students domestically and from abroad to observe the medical excellence provided. In particular, we have established a close relationship with Turkey. To date, we have welcomed four Turkish doctors for EP training, who now are playing important roles as medical providers in their home country.

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APHRS Asia Pacific Heart Rhythm Society

ECG Commentary Related to the Quiz in the No. 21 Issue

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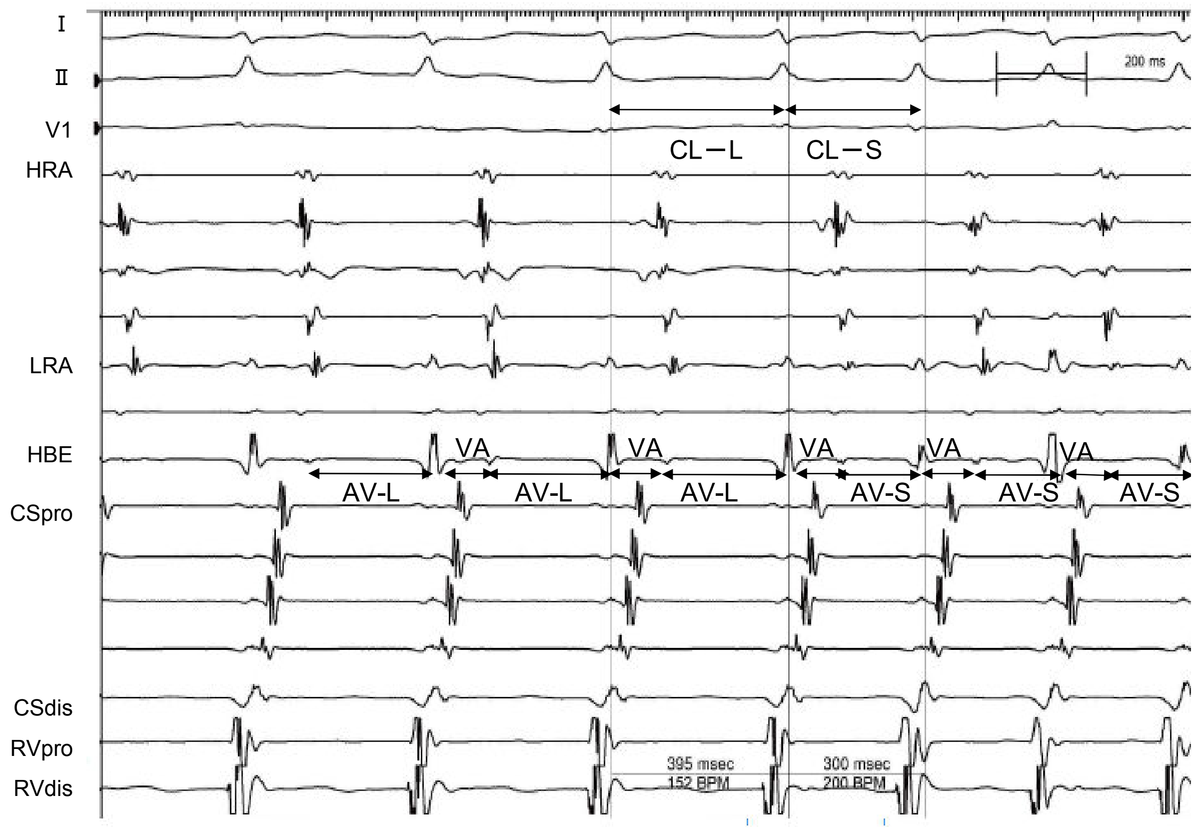
Answer:

2. Anterograde reentrant tract change from slow pathway to fast pathway

ECG Commentary:

SVT was induced by programmed atrial stimulation and eccentric atrial activation was observed, suggesting left lateral accessory pathway. During tachycardia, sudden onset cycle length change was demonstrated. If "dual accessory pathway" or "reentrant tract change from AVRT to AVNRT" happened,the retrograde atrial sequence during tachycardia must change, but the sequence was not changed. And if you take a look the interval of AV and VA interval, the AV interval was shortened (AV-L to AV-S), not VA interval (VA), and QRS width did not change, so shortening of the CL depended on the shortening of AV interval. And the retrograde Atrial exit site was the left lateral which was less likely the atrial exit site of retrograde AV node. And the characteristics VA conduction by ventricular stimulation was not like AV node (not shown). Recording His electrogram is essential whenever we analyze tachycardia, Unfortunately we could not record His-electrogram during tachycardia. However, AV interval consists of AH and HV conduction, and changes of interval happens more often in AH than HV. In this case RF energies were applied targeting left lateral accessory pathway, which was abolished. After ablation of accessory pathway, "AV jump-up" phenomenon was still observed by programmed atrial stimulation and suggesting dual nodal property for the CL changes during tachycardia.

In conclusions. the diagnosis was WPW syndrome with the left accessory pathway, showed ortho-dromic atrioventricular reentrant tachycardia and the change of CL possibly depending on the dual AV node conduction. It si not always easy to get perfect recordings in clinical situations, we sometimes have to interpret somehow the data that we have. Fortunately the AV node was not critical for this tachycardia.



CL: Cycle length, AV-L: Atrioventricular conduction interval-long, AV-S: Atrioventricular conduction interval- short, VA: Vetriculoatrial conduction time, HRA: High Right Atrium, LoRA: Lower Right Atrium, CSpro: proximal Coronary Sinus, CSdis: distal Coronary Sinus, RV: Right Ventricle

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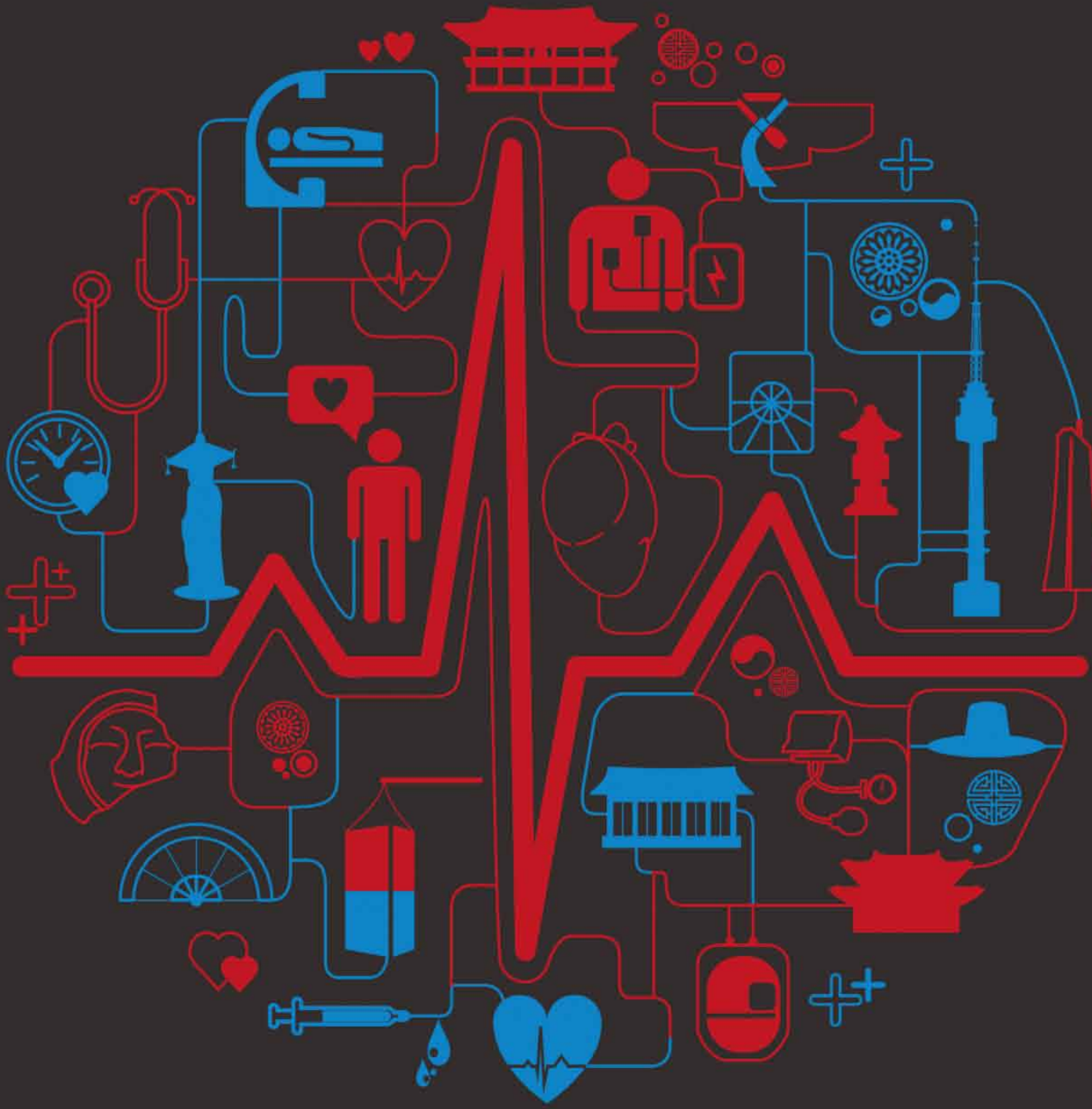

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