Difficult Electrophysiology Explained
A Case Review

疑难心脏电生理图之解读
——病例分析

帖 建 Ph. D. 编著

天津科技翻译出版公司

Difficult Electrophysiology Explained

A Case Review

疑难心脏电生理图之解读

病例分析

天津科技翻译出版公司

图书在版编目(CIP)数据

疑难心脏电生理图之解读：病例分析 / 帖建编著. —天津：天津科技翻译出版公司，2010.10

ISBN 978-7-5433-1970-7

Ⅰ. ①疑… Ⅱ. ①帖… Ⅲ. ①心脏-电生理学-图解 Ⅳ. ①R331.3-64

中国版本图书馆 CIP 数据核字(2010)第 194318 号

出　　版：天津科技翻译出版公司
出 版 人：刘　庆
地　　址：天津市南开区白堤路 244 号
邮政编码：300192
电　　话：022-87894896
传　　真：022-87895650
网　　址：www.tsttpc.com
印　　刷：唐山天意印刷有限责任公司
发　　行：全国新华书店
版本记录：889×1194　16 开本　11.25 印张　100 千字　配图 166 幅
2010 年 10 月第 1 版　2010 年 10 月第 1 次印刷
定价：48.00 元

前言

我所工作的医疗中心在过去5年中做了1000多电生理检查/射频消融病例，其中36例非常有趣，具有很高的教学价值。我仔细地研究了这些病例，然后给出了尽可能完美的病因机理解释，结集成本书。

在三维标测时代到来之前，电生理学家们完全依赖于传统简单标测电极和多导描记来分析患者临床心动过速背后的可能机理。尽管现代技术手段的进展已经使我们的诊断过程大为简化，但经常地，我们还是需要回过头来应用这些基本技能来对付那些最具挑战性的心动过速病例。这就是为什么很多医院和电生理住院医生总在寻找这类教学资料的原因。

虽然我已与一些医生和技师讨论过本书这些病例，但我深知仍然还有新想法和新诊断的余地。我衷心欢迎对本书的评论和批评。我记得在每年的北美电生理年会上都有一个由一些专家带来的高难病例的讨论聚会，我把这种特殊教学活动叫做“疑点化解聚会”。由此我在5年前开始了本书的写作。

我们已有很多很好的电生理教科书，因此在这里，我刻意避免重复那些书上的内容，以节省读者的宝贵时间。我肯定，通过阅读本书上的真实病例，读者会得到如何将基本电生理规则灵活运用到复杂临床图像中去的实践机会。

本书中有一些病例相对容易。为方便读者，我把它们标以“EZ”字样，计有例4,9,10,12,16,20,21,23,24,29,31,35。另有一些较难的病例标以“！”符号，计有例2,3,6,8,11,13,17,19,25,28,30。希望读者能从中得到乐趣。

在电生理领域，你永远需要运用逻辑思维的武器去对付广袤的未知世界。为了患者的利益，让我们用真实病例的经验来武装自己。

帖建 Ph.D.

2010年1月于美国

PREFACE

Among the more than 1000 EP/Ablation cases performed in my medical center in the past 5 years, there have been 36 cases which are really interesting, with big educational significance. I carefully reviewed them and tried to give the best possible explanations to what happens in each case. That is this book.

Before the 3D mapping era, electrophysiologists were completely dependent on the basic EP catheters and multiple channel recordings to analyze the possible reasons behind patients' clinical tachycardias. Although modern technology has greatly eased our diagnosis process, oftentimes, we still have to go back and apply these basic concepts when we face the most challenging tachycardia cases. That is why a lot of hospitals and EP fellows are constantly looking for this kind of educational material.

Even though I have already gone through discussions about these cases with some physicians and professionals, there is still vast room for new ideas and new diagnosis. I welcome all comments and criticisms. I remember during every year's NASPE meeting we have good discussions about interesting EP cases put forward by some big EP specialists. I call those EP educational sessions "puzzle-solving parties", and that is the reason I started to write this book 5 years ago.

We have a lot of good EP textbooks already, so here I purposefully avoid repeating the content of those books in order to save the readers' valuable time. I am sure that by going through these real cases, the readers will get a chance to practice how to flexibly apply the basic EP rules to complicated clinical pictures.

Some cases here are *relatively* easy. For the readers' convenience, I put the letters "EZ" next to those cases (Figures 4, 9, 10, 12, 16, 20, 21, 23, 24, 29, 31, 35), while the advanced cases contain an "!" by their names (Figures 2, 3, 6, 8, 11, 13, 17, 19, 25, 28, 30). I hope the readers can enjoy them.

EP is a field where you always need the weapon of logic thinking to handle a world of unknowns. For the patients' sake, let's arm ourselves with more real case experience.

Jian Tie, Ph.D
in U.S.A in Jan. 2010

关于英汉双语本的几点说明

本书最初用英文写成，现为方便国内读者，我将其译成中文，以英汉双语形式出版。

本书读者对象为中高级心脏电生理医生及相关技术人员。

心脏电生理作为独立学科出现仅是近 20 年的事情。在这之前，临床医生对复杂心律失常的诊断只是像猜谜一样，尤其对疑难室上性心动过速的诊断更是难上加难。那时我做住院医生，记得对此类患者我最多能做的仅仅是食道调搏。现在情形大变，心内电生理描记技术已发展到几近巅峰，但随之而来的新挑战却是如何分析这些电生理图。同样一位患者的描记图摆在面前，不同医生的分析却可能有天壤之别。不时看到同事之间为某一病例的鉴别诊断争得面红耳赤，直至长时间的相互讨论后才使某一诊断最终成为无懈可击。个中的难辛和乐趣只有深入进去才能体会到。

写作本书过程中使我不时想起当年演绎平面几何证明题，至今仍能感到其逻辑殿堂之庄严肃穆。虽然我们现在所从事的临床医学就整体而言属经验学科，但心脏电生理分析却绝对是医学领域中并不多见的需要最严谨的类似平面几何那样的逻辑分析的一块领地。有鉴于此，尽管在本书各例中我已做了最大程度的逻辑分析，但仍不敢说已到“最严谨”水平。故如读者在本书中发现任何分析不透或挂一漏万以偏概全诸种，敬请指正。我的联系方式如下：

E-mail:jiantie@gmail.com　Tel:001-512-217-5259

因为本书面对的是中高级人员，故在各图解读上只注重分析，并不在相关基础知识上着墨。我的写作原则是画龙点睛处只要一笔，不需赘述。

在本书所讨论的所有 36 例病例中，每例都包含数张电生理描记图。如第一例包含五张图，我把它们标为 Fig 1-1 至 Fig 1-5，按阿拉伯数字顺序排列直至 Fig 36-4(即第 36 例，包含四张图)。为给读者尝试自我解读的机会，我并未在每例的第一张图处标明最后诊断，而是仅逐层分析，故当读者读完每例所有各张图后，最后诊断自然就应水到渠成般涌出了。

一些英文电生理专用名词已成业内常规，且其中文译名冗长，如 PJRT，VVI 等，故在本书汉译部分就不再将其译成中文。

其他要说的各点已在前言中阐明，不再重复。愿以此书与电生理界同仁共勉。

帖建 Ph.D.

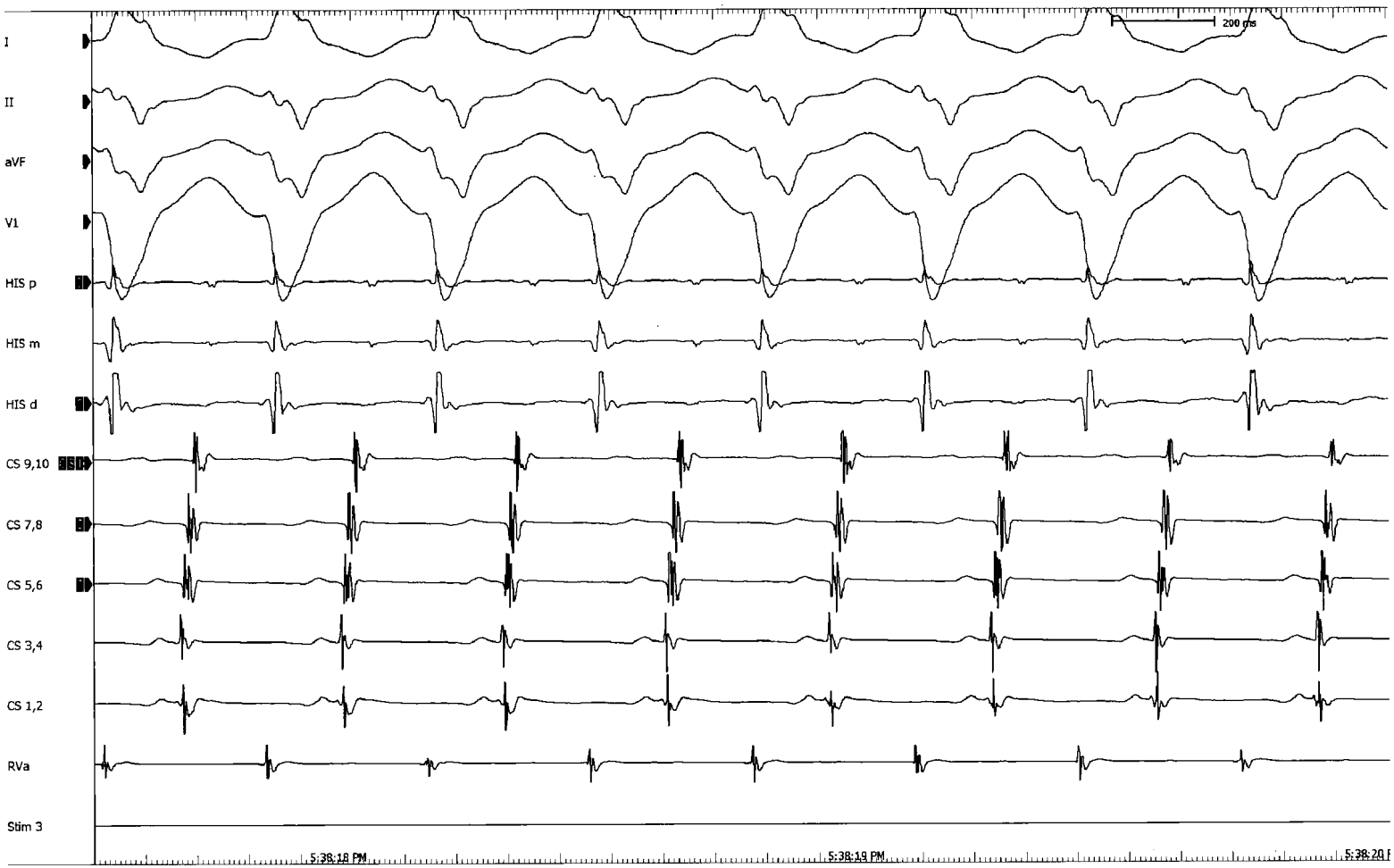
目 录

Figure 1-1

Looks like orthodromic AVRT via a septal accessory pathway (AP). But of course A-Tach is another possible diagnosis.

看起来像通过间隔旁道的顺向型 AVRT，当然 A-Tach 也是可能的。

Figure 1-2



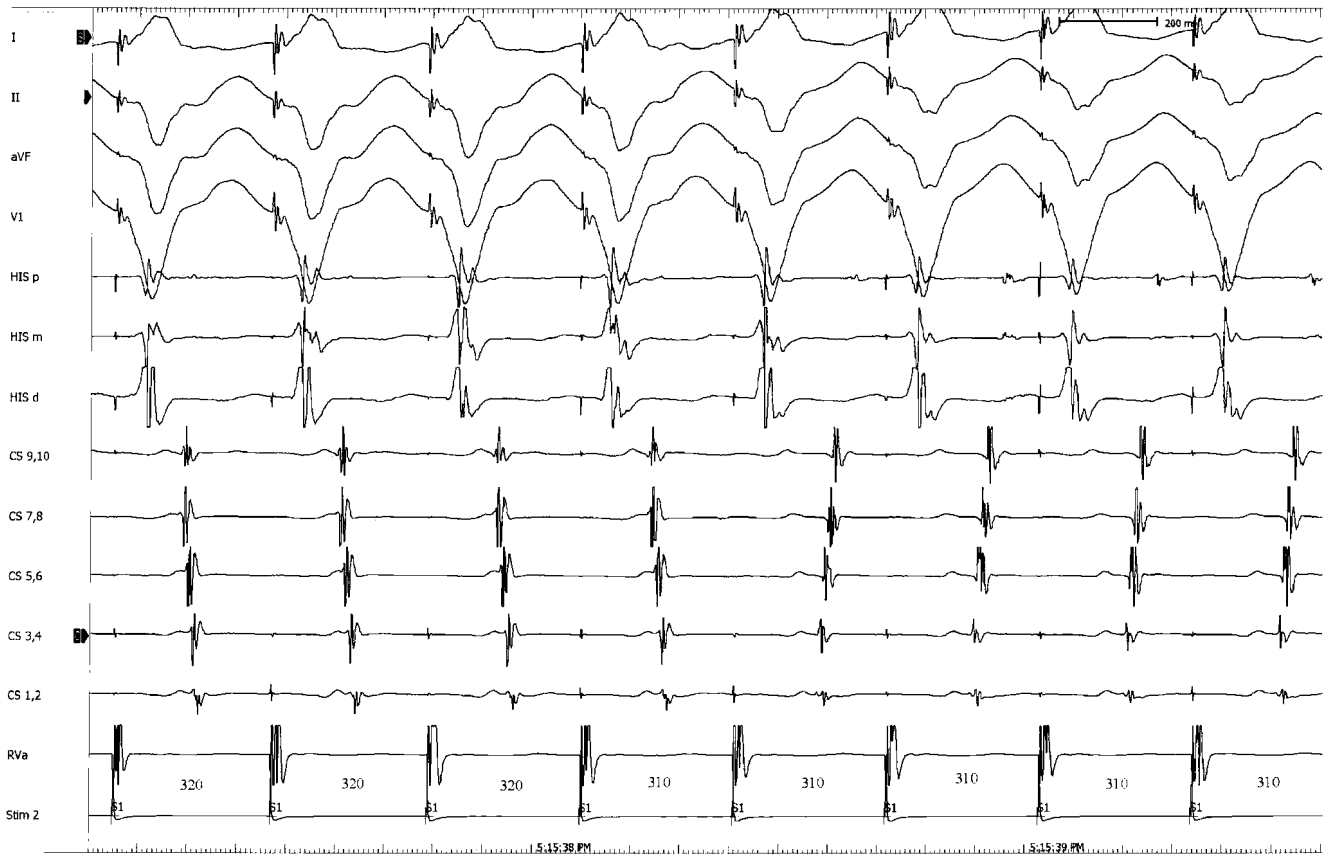
Is this a second orthodromic AVRT or is this just another manifestation of the first AVRT?

This should be a second AVRT because both the atrial sequence and the VA interval have changed. But of course, we need more direct evidence for the differential diagnosis.

这是第二种顺向型 AVRT,还是第一种 AVRT 的另一种表现?

这应当是第二种 AVRT,因为心房顺序和 VA 间期都改变了。当然我们还需要更多直接证据来做此鉴别诊断。

Figure 1-3



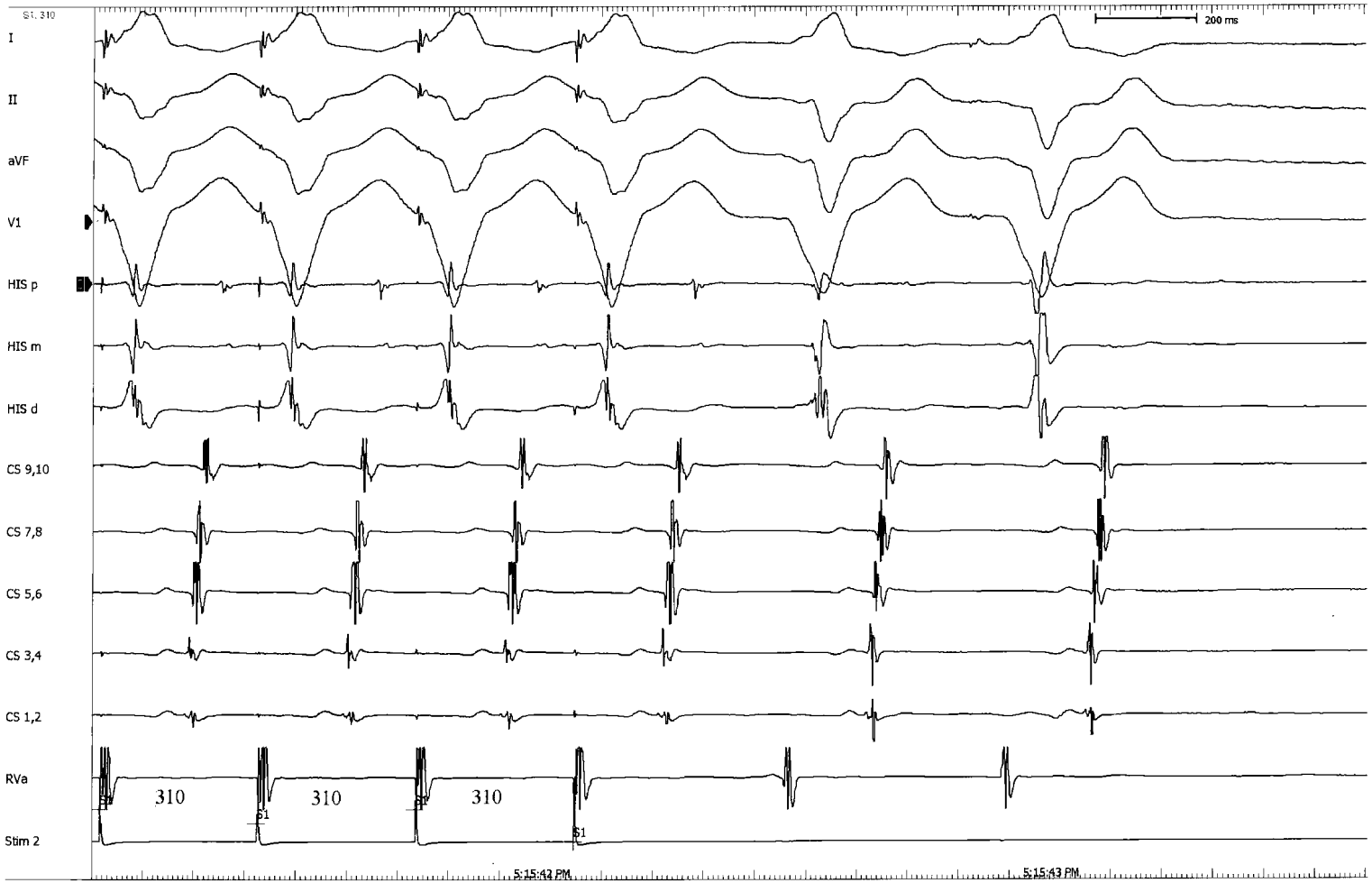
RV-pacing @ 320ms/310ms clearly shows the two types of retrograde conduction. The left half of the graph is via the septal AP, while the right half is via the left-sided AP. The reason for the switch is that the 310ms RV-pacing has reached the septal AP's ERP. Actually, this pacing maneuver has another purpose in the diagnosis. There is no elongated VA interval by pacing compared to either of the two tachycardias. So both tachycardias are not AVNRT.

Both of the atrial activations here are identical to those of the two tachycardias. So they are not ectopic activations. This is the direct evidence to rule out A-Tach.

320ms/310ms 右室起搏清楚显示两种逆行传导。此图左半部分是通过间隔旁道，右半部分是通过左侧旁道。这种转换的原因是 310ms 右室起搏达到了间隔旁道的不应期。实际上，这一电生理动作还有另一个诊断上的目的。那就是，与两种心动过速相比较，起搏后的 VA 间期都没有延长，所以那两种心动过速都不是 AVNRT。

这里的两种心房激动都与两种心动过速时的相同，所以那些心房激动不是异位激动。这是除外 A-Tach 的直接证据。

Figure 1-4



The RV- pacing definitely entrains the tachycardia.

右室起搏肯定拖带了这个心动过速。

Figure 1-5

The second type of tachycardia is definitely via a left-sided AP because LBBB makes the VA interval longer.

第二种心动过速肯定是通过左侧旁道，因为左束支传导阻滞使其 VA 间期延长。

Figure 2-1 (I)

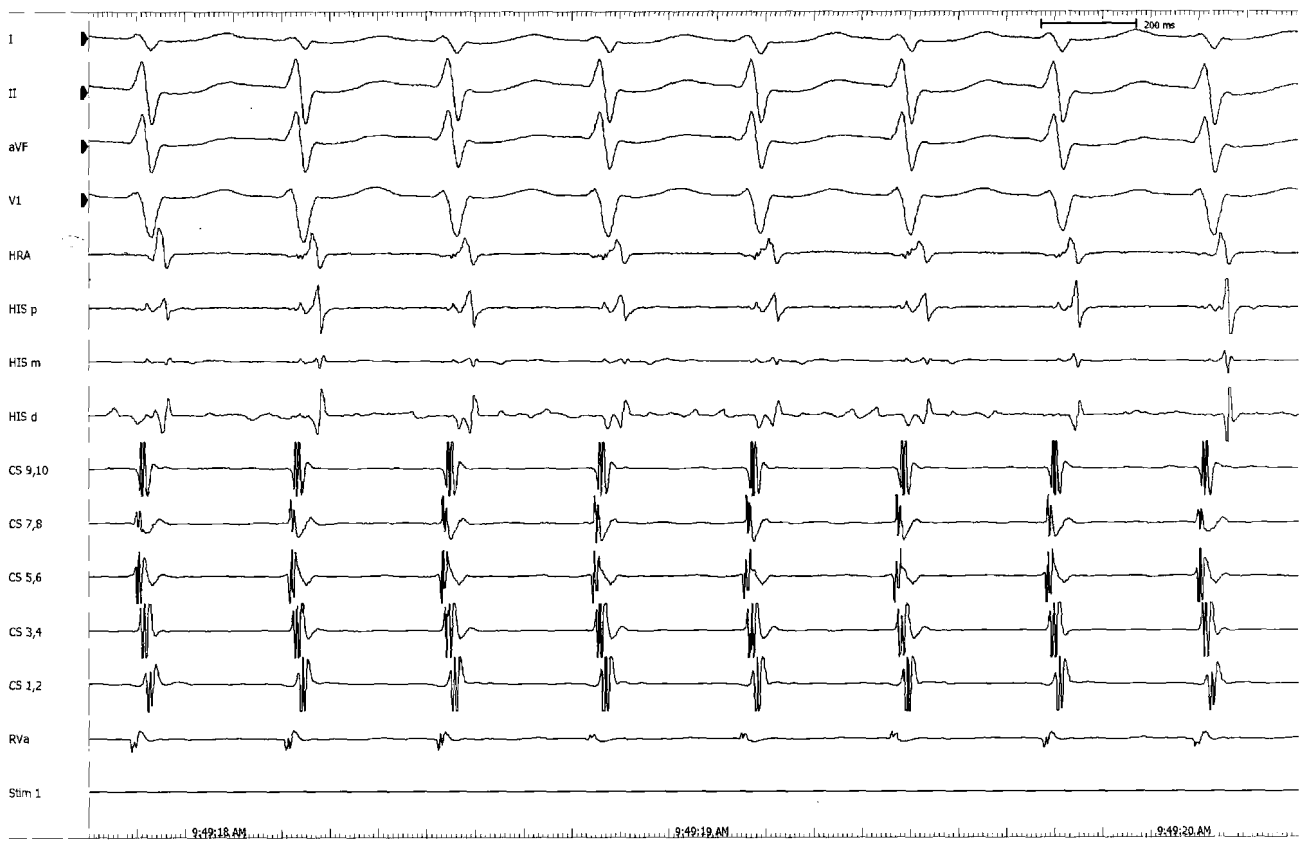
Looks like orthodromic AVRT.

But we need to rule out A-Tach first because it is always a possibility, as well as AVNRT, even though the "A" signal and "V" signal do not line up.

看起来像顺向型 AVRT。

但我们首先需要除外 A-Tach，因为它永远是可能的。同时也需除外 AVNRT，尽管此例心动过速的 A 信号与 V 信号并未在时间上重合在一起。

Figure 2-2



But this time the tachycardia looks like AVNRT. This is definitely not AVRT, though.

Here comes the problem. Does the patient have both AVRT and AVNRT or does he only have A-Tach (because A-Tach could look like either AVRT or AVNRT due to various RP intervals, but they are actually only a coincidence instead of any real VA relationship)? We cannot come to a conclusion based on these two pages alone. But notice that the atrial sequence does not change a bit between these two pages. The only thing that changes is the RP interval. So, sounds like A-Tach? Not really, because, besides other reasons, the PR interval is somewhat long for A-Tach. By the way, the faster tachycardia rate on this page is due to isuprel administration.

但这回此心动过速又像是 AVNRT,而肯定不是 AVRT 了。

这里就出现了问题。这位患者是既有 AVRT 又有 AVNRT,还是仅有 A-Tach(因为 A-Tach 的图形既可以酷似 AVRT 的,也可以像 AVNRT 的,这完全取决于不同的 RP 间期。而 RP 间期实际上只是心室激动和心房激动在时间上的一种巧合,并不代表任何真正的室房关系)? 仅凭这两页图我们还无法确立诊断。但是请注意在这两页中患者的心房信号顺序一点没变,改变的只是 RP 间期。这听起来像 A-Tach? 也不能肯定,因为(除其他理由外)PR 间期又显得太长了。顺便说一下,这页心动过速快于上页是因为应用了异丙肾上腺素。

Figure 2-3

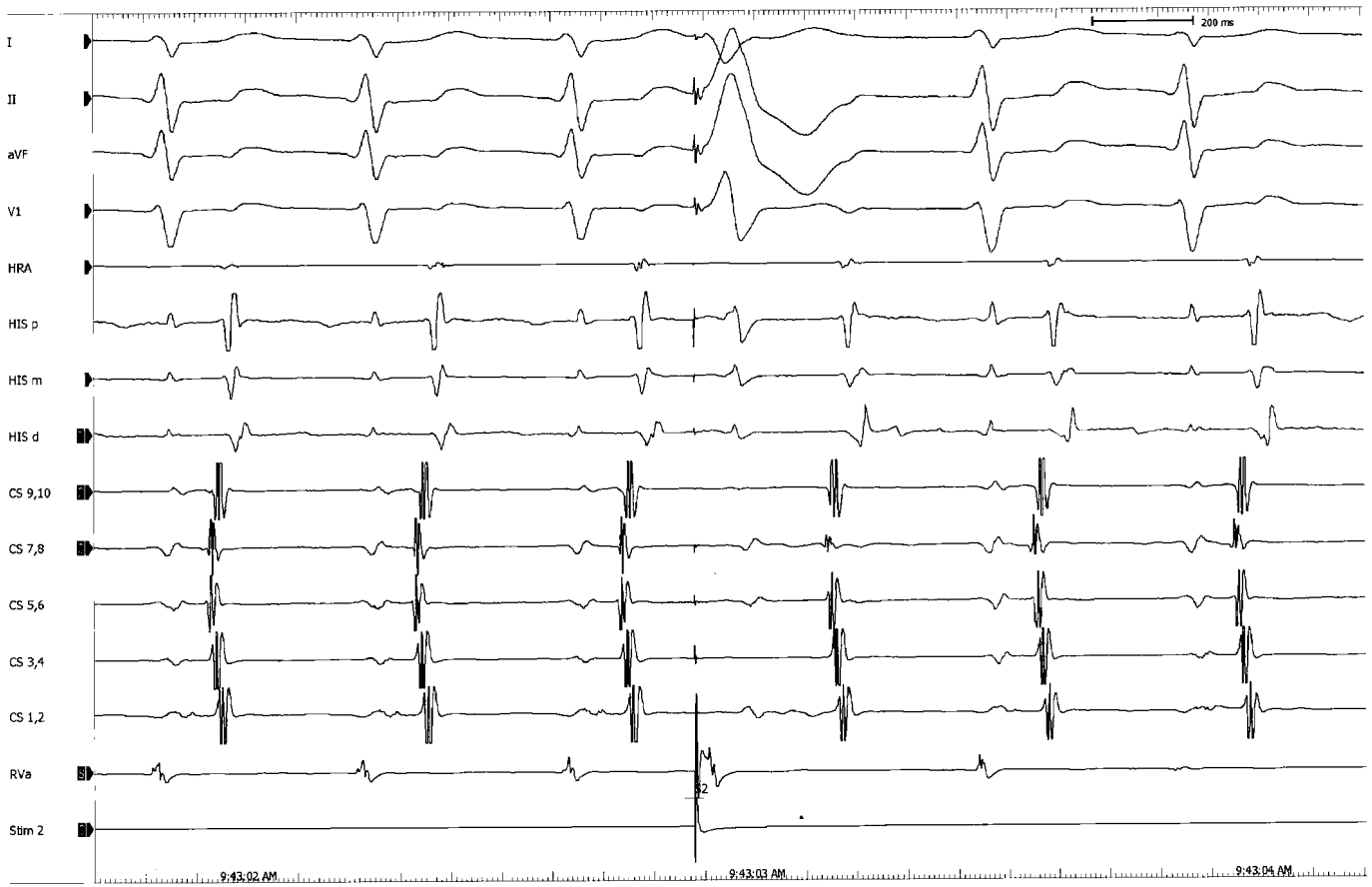
Can we rule out AVRT by this S2 RV-pacing maneuver?

Yes, very likely. This S2 is within the His ERP. If the patient has an accessory pathway (AP), this artificial electric activation would conduct via the AP to advance the atria. But we do not see any atrial preexcitation here. So the existence of an AP is not likely. But also remember this RV-S2 cannot completely rule out left-sided AP. Why? The rightsided activation might need extra time to travel from right heart to left heart before it could reach the AP. This extra time might compensate for the time saved by the faster conduction via AP,and might make the atrial activation look as if it were not advanced by the premature RV pacing.

通过单个程序右室起搏 S2,我们能除外 AVRT 吗?

应该能。该 S2 是在希氏束不应期之内给出的。如果患者确有旁道,S2 就应通过此旁道而预激心房。但是我们并未看到任何房性预激,故此旁道应该不存在。但同时也请记住,该右室 S2 并不能完全除外左侧旁道。为什么?来自右侧的激动在传至左侧旁道之前可能需要额外的时间来完成从右心向左心的传导。这额外时间将会抵消由左侧旁道快速逆传而节省的时间,而使心房看起来好像没有被提早的右室 S2 所预激。

Figure 2-4



How about this even earlier RV-S2?

This RV-S2 is a very early one, earlier than the destined His spike. It is before the AVN area was electrically activated and therefore before the area became refractory to any later stimuli. So this electric activation should not have any difficulty conducting retrogradely to the atria via AVN even though the AP is not available. But actually this very early S2 did not advance the atria either, just like the previous one. It pushes us to think that some event must be going on inside the AVN area, which makes the area "impenetrable" to any outside electric activations. If we imagine that this event is a robust AVNRT in which the reentry loop is too busy to leave any timing window open for any outsider to come in, everything can be explained. Thus, this patient's tachycardia is AVNRT.

这个更早的 RV-S2 说明了什么?

这个 RV-S2 是相当提早的，甚至早于希氏束电位时间，即 S2 出现在 AVN 被电激动进而呈现出不应期之前，所以这个 S2 理应通过 AVN 顺利逆传至心房，即使患者没有附加旁道。但实际上，这个极早的 S2，像上页那个稍晚的 S2 一样，也并未预激心房。这促使我们设想可能有其他的电活动正在房室结区进行，因而使该区变得不再对其他外来刺激起反应。如果我们想象这一电活动是一个强大的 AVNRT，它使结区的折返环忙于自己的电活动而未给任何其他外来刺激预留进入窗口，那一切疑问就迎刃而解了。该患者的心动过速是 AVNRT。