

Preface

Herewith is our new book of electrocardiography (ECG) tracings, all of which were collected on the shores of Lake Geneva, Switzerland. These 100 cases in no way comprise a new textbook or an ECG manual. By putting these 100 examples together, our intention is not to teach the basics of ECG. For this, many books are available, as well as plenty in your library, on the Internet, and on the shelves of your nearest university hospital library. The philosophy of this book is very different; it is based on the fact that most doctors use ECG in their medical practices to record tracings from their patients. Nevertheless, not many physicians have enough diversity of cases to stay sufficiently abreast of a wide variety of pathologies. Therefore, some lose proficiency in recognizing different ECG problems. The correct interpretation necessitates the knowledge we acquired first in medical school and relearned many times since – because we may have forgotten it many times. It also is very important to see real-life cases and to be exposed to many different problems. Thus, we came up with the idea of collecting 100 tracings from our clinical experience and sharing their interpretations with you, focusing on real-life cases. Of course, no book can present all possible ECG arrhythmias; therefore, we were obliged to make a selection among different problems. We limited ourselves to rhythm abnormalities because in this field, clinical ECG and Holter monitoring keep their unique value. In addition, the graphic limitation imposed by the page limit of this book obliged us to concentrate on problems that can be solved by a relatively short tracing.

Only a dependable diagnostic tool will allow a physician to make the correct diagnosis and consequently choose the correct treatment in case of an arrhythmia. However, that requires that the doctor feel comfortable when confronted with the interpretation of the ECG tracing. In presenting these tracings, we deliberately kept the cases as close to real life as possible. Thus, you will clearly feel that these tracings are indeed a collection from our practice and not hypothetical cases. Although the tracings might have been better presented with correct inscriptions and many diagrams, we refrained from including these because we believe presenting these arrhythmias in an atlas format might make the reader forget they can happen in ordinary life.

We have chosen to depict the tracings as we originally observed them, and we hope they will be of some help when in your practice, you have just recorded an ECG of a new patient. You will use your compass, or maybe only a piece of paper, to measure and compare the distances, and you will – we hope – react to these ECGs as you would on a daily basis. A big part of this collection is composed of tracings from Holter ECG recordings. This method, as well as the current use of event recorders, is very important and is the best available for arrhythmia diagnosis. Nevertheless, when interpreting ECG Holter recordings, please note that this method has some limitations. First, you must never forget that these tracings are obtained by two bipolar leads placed on the thorax. Because of this proximity, any movement of the chest or any difference in the projection of the heart during activities such as walking, running, or sleeping may modify their appearance. Therefore, very often the QRS complexes and the P waves are modified, even though there is a way to place the electrodes correctly. Very often in real life, you are obliged to place the leads where you can because of the thorax anatomy or just to be able to see QRS complexes or P waves of sufficient height. Because of the limitation of two or three leads, as well as their thoracic positioning, the frontal axis cannot be determined; therefore, not all the information from a standard 12-lead ECG can be gathered from a Holter recording. Moreover, we must keep in mind that correct ECG interpretation very often requires 12-lead clinical ECG, so interpretation of Holter monitoring should be applied with caution. Therefore, we cannot diagnose hypertrophies or ventricular dilatation or be certain about the type of bundle branch block, and so on.

Finally, Holter ECG may cause artifacts that may make the correct interpretation difficult or impossible. Before concluding that you are seeing a very peculiar arrhythmia, you must exclude any artifact. Likewise, before deciding that the phenomenon is an artifact, you should try to understand the mechanism, or even try to reproduce it.

Now, we would like to give you a few practical recommendations for a correct interpretation. First, it is important to determine the basic cardiac rhythm. On any tracing, you should first determine which of the following three situations is present:

1. The entire tracing is of sinus origin.
2. Some complexes are of sinus origin, but an arrhythmia also is present.
3. None of the complexes can be considered to be of sinus origin.

Therefore, it is of utmost importance to confirm or exclude sinus origin, to see how the sinus origin manifests itself at the atrial level and how it is conducted to the ventricular level. It therefore is also very important in the diagnosis of arrhythmias to determine the atrial activity as well as its origin: the ventricular complex may be the result of sinoatrial activity, ectopic atrial activity, or ectopic ventricular activity. Atrial activity or ventricular ectopic activity may appear prematurely, which is known as a premature beat. If the arrhythmic phenomenon occurs later, there must be a reason that prohibits the regular activity from manifesting itself. This situation usually requires the presence of either an escape complex or escape rhythm. This may be the result of a block at different levels, or a different arrhythmic phenomenon may be hidden or invisible and may remain blocked, producing this late phenomenon, as for instance with a blocked premature atrial beat.

An isolated abnormal phenomenon may be very difficult to interpret correctly, but once we see a repetition we may find logic in its appearance. This logic may become apparent by the frequency of appearances or its effect on the basic rhythm, as for example in the presence of a parasystole. When one or several wide QRS complexes occur, this abnormal phenomenon may be related to a rhythm frequency change, as for instance with frequency acceleration or deceleration during phase 3 or 4 blocks.

Sometimes to make a correct interpretation, you may only have to look at the distances of the previous complex and understand the phenomenon. In arrhythmias in which the atrial activity is not well seen or is seemingly absent, the presence of a regularity or irregularity may solve the problem. The irregularity may be completely irregular at the atrial level, as in atrial fibrillation, or regular at the atrial level but irregular at the ventricular level, as during an arrhythmia with fast atrial activity irregularly transmitted to the ventricles (e.g., in atrial flutter or atrial tachysystole). A regular irregularity in the presence of a slow heart rate should make us think of an irregular block at the sinoatrial level.

In case of an unusual bradycardia, one should consider a 2:1 atrioventricular block with hidden P waves in the previous T waves, an atrial blocked bigeminy, or a sinoatrial block.

After this brief introduction, we would like to let you discover the tracings, one by one, not necessarily in the order they are numbered, but in any order you like while turning the pages of our book.

For more explanation, we recommend for reference the *ECG Holter Guide to Electrocardiographic Interpretation* by Jan and Richard Adamec, published by Springer, and *The ECG in Emergency Decision Making*, second edition, by Hein Wellens and Mary Conover, published by Elsevier. These books will help you understand the different tracings; especially with regard to the difficult cases, we recommend you read them beforehand.

We wish you a pleasant adventure.

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Practical ECG Holter

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