SRAclinic®

Report

Identification from patients with atrial fibrillation or an increased risk for paroxysmal atrial fibrillation

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General information *SRAclinic®*

In clinical practice, it is important to get clear and structured informations for the difficult creation of the risk profile of a patient. In order to a quickly determine for the best individual treatment plan.

Especially in patients after cryptogenic stroke, it is to initiate an effective therapy particularly important to detect potential paroxysmal atrial fibrillation.

Our goal is to make this possible with the fully automated risk analysis *SRAclinic®*, with very little effort (especially compared to manual Holter analysis) over a long period.

In the study, Rizos, et. al. in Stroke[1] could be shown that this objective has been achieved with impressive results. The automated ECG monitoring during the stay of patients in the stroke unit about 40% more patients with paroxysmal AF detected as in the previous routine with 24 hour long-term ECG and monitoring. Compared to the 24 hours long-term ECG evaluation even an increase of 170%.

The success of *SRAclinic®* based firstly, that the maximum available recording time of the patient's ECG is used. Secondly, that the underlying algorithm patients automatically detected with existing fibrillation episodes with a similar quality as a cardiologist analyze. This leads to -in a very low application rate- a very high detection rate of patients with overt fibrillation episodes. The algorithm examines the ECG for any deviations in sinus rhythm, indicating that occurred in the past fibrillation episodes (PLOS One study[2]) and are recorded as a risk for paroxysmal atrial fibrillation in the report.

SRAclinic® is a web-based system that requires a two-channel digital Holter analysis. This sent via Internet to the central *SRAclinic®* Analysis Server. Automatically evaluated and documented the results of this risk analysis in a report as a PDF. This email sent via email as an attachment to the submitter.

Since *SRAclinic®* is primarily used in an environment of clinical intensive care, the use of the ECG data from the patient monitoring system offers. At present, there for connecting to the *SRAclinic®* application interfaces to systems of the manufacturers Dräger, Philips and Nihon Kohden. For users who do not have one of these two systems, the ECG recordings can be made with conventional Holter recorders.

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[1] *Timolaos Rizos, Janina Güntner, Ekkehart Jenetzky, Lars Marquardt, Christine Reichardt, Rüdiger Becker, Roland Reinhardt, Thomas Hepp, Paulus Kirchhof, Elena Aleynichenko, Peter Ringleb, Werner Hacke and Roland VeltkampContinuous Stroke Unit Electrocardiographic Monitoring Versus 24-Hour Holter Electrocardiography for Detection of Paroxysmal Atrial Fibrillation After Stroke.*
[2] *Schaefer JR, Leussler D, Rosin L, Pittrow D, Hepp T (2014) Improved Detection of Paroxysmal Atrial Fibrillation Utilizing a Software-Assisted Electrocardiogram Approach. PLOS ONE 9(2): e89328. doi:10.1371/journal.pone.0089328*

SRAclinic® Report combined with:

Monitoringsystem Dräger or Nihon Kohden
Once a day the transmission of reports is automatic. In this case the analyses comes from all patients, from the previous day. It must be a patient number and case number entered in each patient.

Monitoringsystem Philips
Once a day the transmission of reports from the selected patients is manually
The date of transmission of data can be free selected. The best time for the transmission is in the morning. The report from the selected patients can be obtained from the last 24 hours

Long-term ECG-Recorder
Long term ECG Recorder take up the ECG to 72 hours.
The Report for the recording time is create and was transmitted immediately after submission.

The following figure shows a typical report:

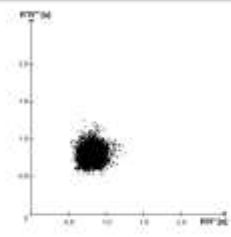## SRAclinic® Report

Screening for atrial fibrillation

1

Hospital

Stroke Unit
Main Street 6
12345 London

Report created on: 17.12.2015 at 10:11   **2**
Date of test: 17.11.2015

Patient's name	
Patient number	24746
Age / Sex	91 years / female **3**
Comment	

SRA-result **4**		
		No increased risk of paroxysmal atrial fibrillation Neither manifest atrial fibrillation nor an increased risk for paroxysmal atrial fibrillation were detected.
		Increased risk of paroxysmal atrial fibrillation An increased risk of paroxysmal atrial fibrillation was detected, whereas during the entire ECG recording no manifest atrial fibrillation occurred.
	X	**Suspected manifest atrial fibrillation** An arrhythmia was detected with typical signs of manifest atrial fibrillation. For validation a representative snippet has been added.
		Not analysable The analysis failed as a result of a poor signal quality, a low amplitude or morphological changes of the QRS complexes.
	64	Number of analysable hours **5**

Lorenz plot
(graphical representation of the heart rate dynamics)

- Only in case of suspected manifest atrial fibrillation

6

Atrial origin   Other origin

Hour: 19   Signal: 1   Start ECG Viewer   **7**

Created by apoplex medical technologies GmbH. 1.2.828.0.1.3660943.2.1101.1.173322267.354597027.32763.3.1, 1.2.828.0.1.3660943.2.1101.1.173322267.354597027.32763.2.1, 173322267.354597027.32762.8.0, 12:09

The **SRAclinic®** report is composed of the following areas:

1. **Address** – can be change in your personal area at the SRA platform.
2. **Date-information** – the day of screening as well as the day of report generation was indicated.
3. **Patient data**
   - In the field *patient name* the name of the patient can be filled in, but it is not available for the report generation because of data protection law.
   - In the field *patient number* the corresponding number is indicated
4. **Analysis result** – the result of the analysis is shown
5. **hours sections** – evaluable hour sections
6. **Lorenz plot** – The Lorenz plot from the hour with the highest risk level is shown here.
7. **Start ECG viewer** – By **SRAviewer®** can be accessed easily and quickly on all details of the original ECG recording. Particularly conspicuous segments from the Lorenz curve can be tracked back by clicking on the corresponding ECG data.

Results of *SRAclinic®*

The following results determined by *SRAclinic®*:

- ☐ **No risk for paroxysmal atrial fibrillation**
- ☐ **Increase risk for paroxysmal atrial fibrillation**
- ☐ **Signs of manifest atrial fibrillation**
- ☐ **Not analysable**

Interpretation of the risk levels

☐ **No risk for paroxysmal atrial fibrillation**

No episode of manifest atrial fibrillation and no increased risk for paroxysmal atrial fibrillation was detect.

☐ **Increase risk for paroxysmal atrial fibrillation**

An increased risk for paroxysmal atrial fibrillation was detected, altrough no fibrillation episodes occumed during the entire recording.

→ *In the evaluable ECG section no fibrillation episodes were detected. Durch die hohe Sensiviät der Analyse ist davon auszugehen, dass mit hoher Wahrscheinlichkeit keine Flimmerepisode vorhanden ist.*
→ *This result, how detects an increased risk for atrial fibrillation in absence from manifest atrial fibrillations, provides the diagnostician before the biggest challenge.*

The study results and existing literature show that a further search for paroxysmal AF will be much more successful than without preselection in this risk group. How much effort should be operated for advance (more SRA® investigations further long-term ECG, implantable loop recorder...), it also largely depends on many additional diagnostic parameters such as atrial size, mitral regurgitation, etc. from.

☐ **Signs of manifest atrial fibrillation**

An arrhythmia which has typical characteristics of manifest atrial fibrillation , was detected. A particularly representative ECG section is shown and used for validation.

→ *Despite a high specificity , a false positive result can not be excluded. The pictured ECG section has to be checked by a doctor.*

☐ **Not analysable**

It could be performed no analysis due to a bad signal quality , a low voltage or morphological changes of the QRS complex.

Instructions:

☐ **SRA**® based on the evaluation of the rhythm (RR intervals). Other evaluations like pathological QRS complexes, ST segment elevation, prolonged PR intervals, etc. are not performed.

5-minute ECG section:

If atrial fibrillation is detected, page 2 and 3 shows the ecg strip with the highest probability of atrial fibrillation.

There is great emphasis on a high sensitivity (even with short episodes). This can occur even false positive results. These are rare and relatively easy to evaluate with the 5 minute ECG section. Many users -especially cardiologists-, have confirmed this approach to be advantageous

The 5 minute ECG section is provided in a sufficient resolution and has a PDF reader without losses up to 400 % zoom.

Example for a 5-minute ECG-Stripe with atrial fibrillation
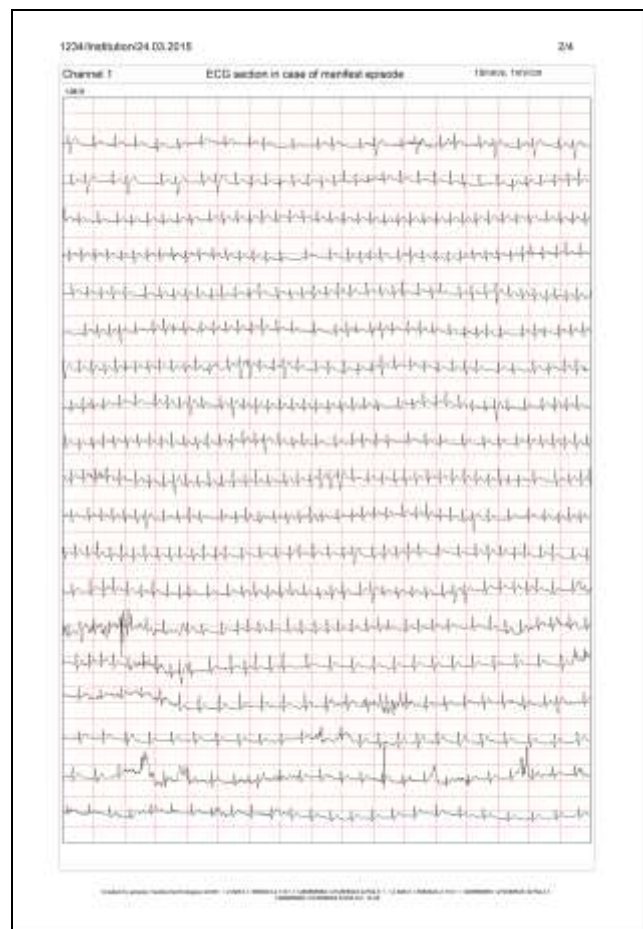
The individual Lorenz plot from each hour

- Lorenz plot from each hour from the left to the right and from the top to down.

- Below each Lorenz plot is the information about the corresponding hour and signal quality.

- Empty coordinate systems are a sign of not evaluable ECG data.

- Hours sections without contents at the end of the survey mean that ECG recording was stopped.
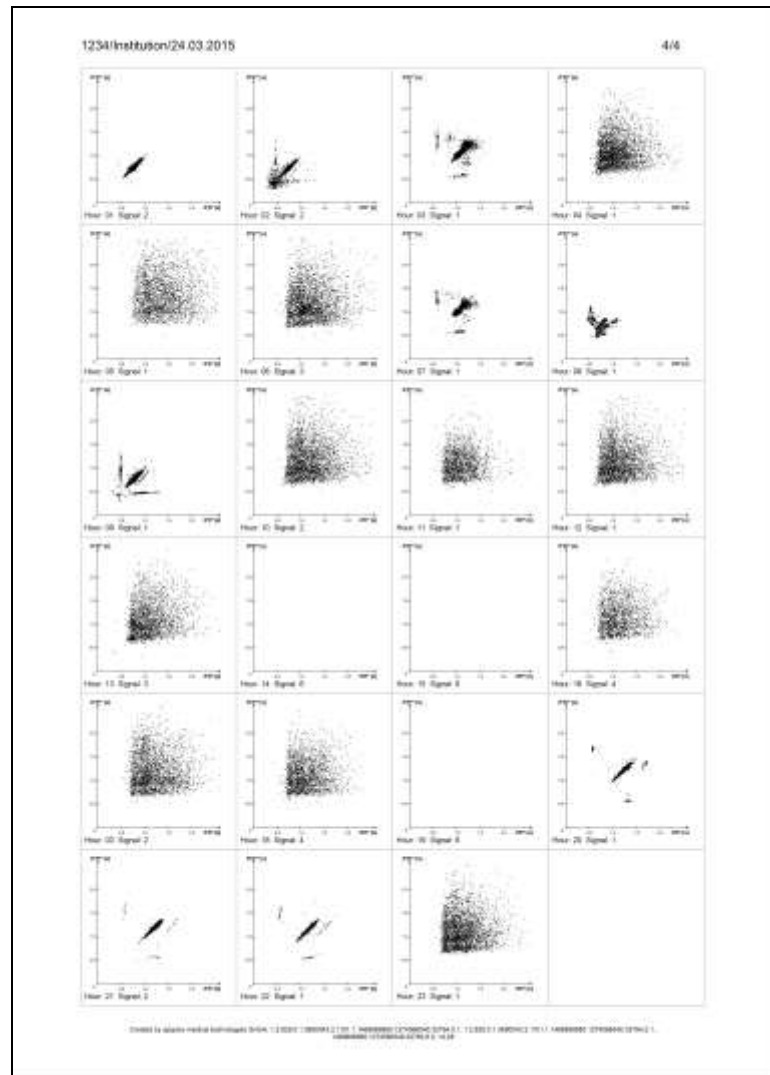
Management of *SRAclinic®* (WEB platform)

For access to the *SRAclinic®* Reports you can use the *SRA® platform*.
With a username and password via the homepage www.apoplexmedical.com you reach the platform. Here all the reports are saved in chronological order and can be called up to three months after evaluation.
The launch of *SRAviewers®* to assess the ECG recordings is possible from here.
On the platform is also the management of personal information (address, email, etc.) is possible. The installation of the communication software in the case of the use of conventional Holter recorder can be downloaded.
It is possible to access from any workstations (with Internet connection) on the data (password-protected).

Appendix

Recommended treatment path with *SRAclinic®*
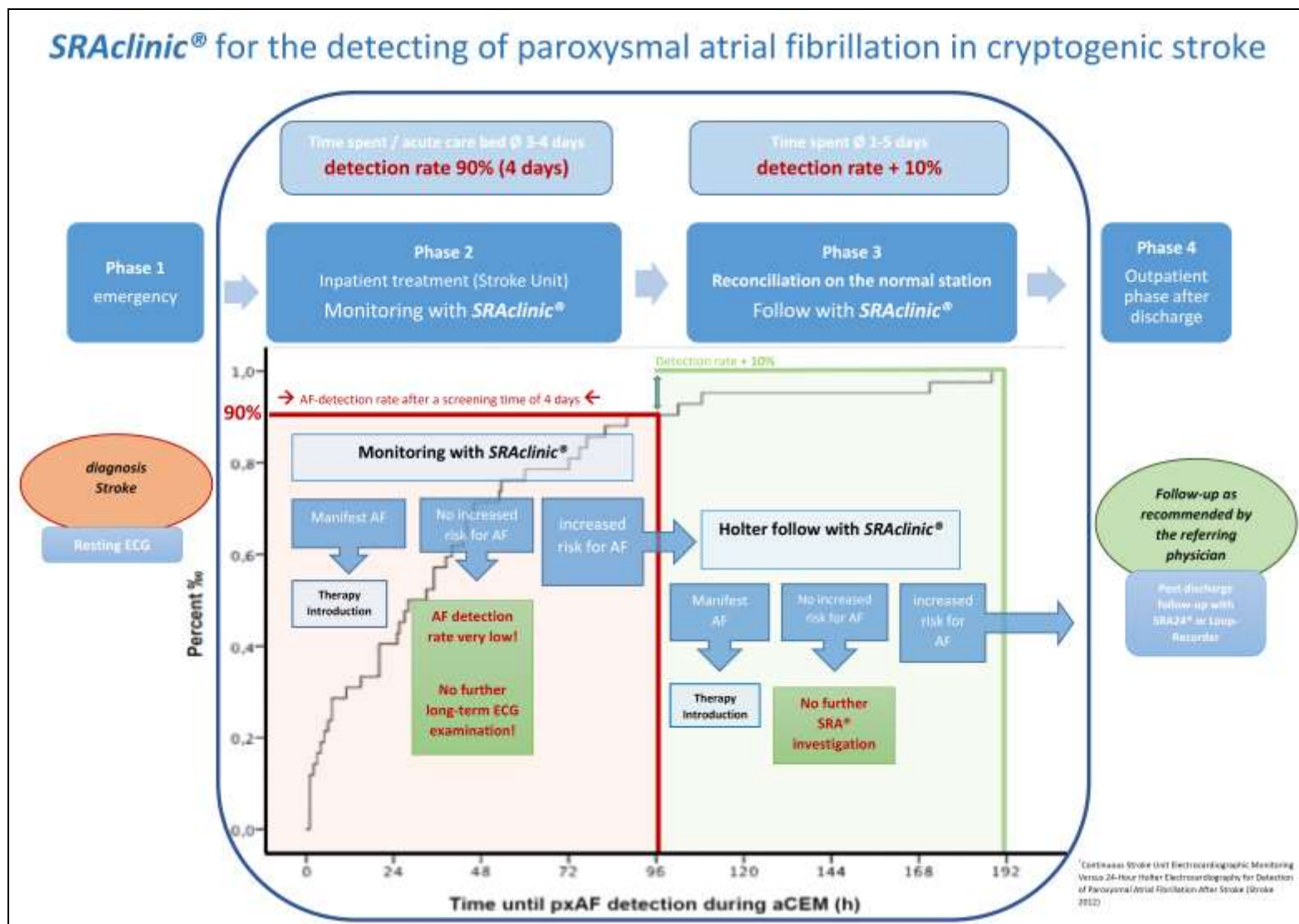
Lorenz curve

An excellent method to visualize the dynamics of the heart beat is the Lorenz curve, often called the Poincaré plot. Here, the time between two QRS complexes (RR interval) are presented in such a way that an interval is plotted against the next in a coordinate system. As in the following figure this may happen in two dimensions (x, y).

Example:
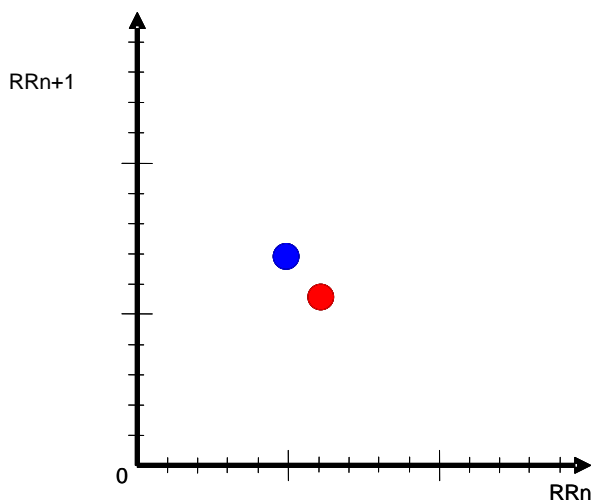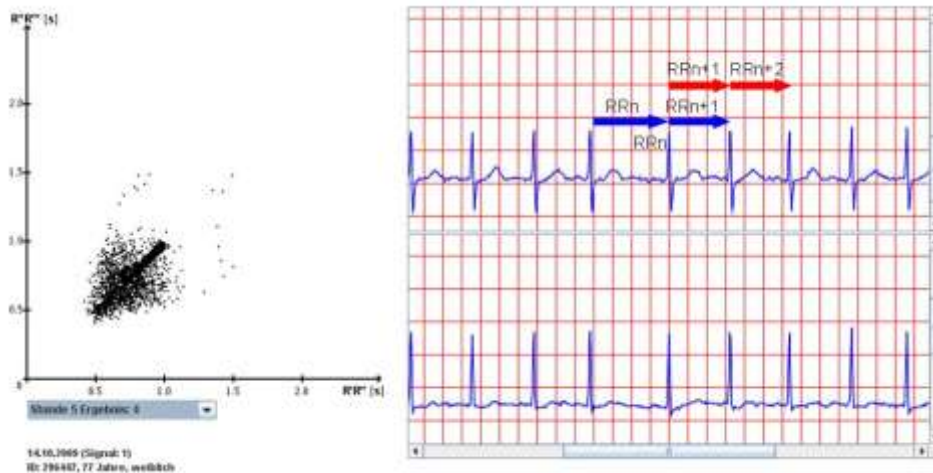
Please note:

- The analyze based on different mathematical parameters. Features of the Lorenz curve are just one part of it. Alone on the Lorenz curve you cannot be derived the analytical result.
- The Lorenz curve gives you the opportunity to visually obtain information about the heart rate variability.

Signal Quality

The signal quality have a decisive influence on the analysis. Please follow carefully the instructions for performing a good ECG recording.

The signal quality on the *SRAclinic*® report enables it to control recording quality
The following signal qualities are displayed:

- **1** - very good
- **2** - good
- **3** - satisfying
- **4** - sufficient – Please optionally repeat the recording.
- **6** - not evaluable

Instruction: *SRAclinic*® performed fully automatically and combined with a poor quality can lead to an erroneous detection from QRS complexes (R-Wave) and the detection from ventricular extrasytole (VES). This may influence the risk rating.
It may happen that *SRAclinic*® cannot always reliably distinguish between interference and VES. Disorders are expressed often in randomly distributed points in the Lorenz curve (Illustration 1). Missing R-Waves express themselves through more lobes with double spacing in the x and y directions (Illustration 2).
The detection of the VES is based on an examination of the morphology of the QRS complexes. For strongly widened QRS complexes and signs of overt fibrillation no VES detection is performed. Poor signal quality or doubts about the QRS detection you should check the R-wave detection on the ECG viewer for plausibility. If necessary, repeat recording.
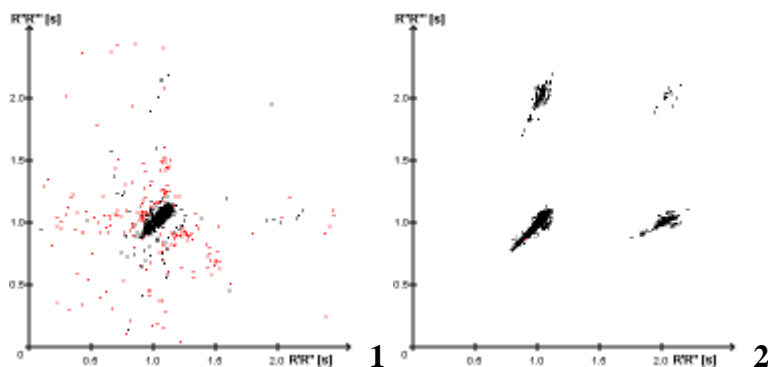
Instruction: If the signal does not have been evaluated, you get a hint in the report. Please repeat the recording.