Standardization of Phonocardiography

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For many years the cardiologists have tried to standardize their instruments for phonocardiography (Mannheimer, Leatham, Maass and Weber, Holldack, Luisada, Kleyn, Lian, etc.).

In modern phonocardiography much depends from the technique of recording because, not only the amplitude of heart sounds and murmurs, but also their timing is affected by the characteristics of the instrument.

In occasion of the European Congress of Cardiology in Stockholm these problems were discussed by cardiologists from various countries.

At the Third International Congress of Cardiology (Mexico City, 1962) the following sub-committees were founded:
1. Standardization of microphones: Dr. Dale Groom, Charleston, U.S.A.
2. Standardization of filters: Dr. Kleyn, 's-Gravenhage, Netherlands
3. Calibration: Dr. A. A. Luisada, Chicago, U.S.A.
4. Nomenclature: Dr. K. Holldack, Berlin, Germany
5. Recording system: Dr. Dalla Volta, Padova, Italy
6. Intracardiac phonocardiography; Dr. Yamakawa, Tokyo, Japan.

The sub-committees were asked to prepare suggestions for the standardization of the different topics to be presented at the Third European Congress of Cardiology (August, 1964, Prague).

It is to be hoped that, following a discussion of the interested cardiologists, the last difficulties will be ironed out, so that proposals acceptable to most phonocardiographers can be presented at the Fourth International Congress of Cardiology (New Delhi, 1966).

Standardization of Phonocardiographic Nomenclature

Discussions took place at the International Symposium of Phonocardiography (April 10, 1964, Leyden) and at the Third Asian-Pacific Congress of Cardiology (May 12, 13, 1964, Kyoto).

The latter was attended by cardiologists from Japan, India, the Philippines, South Africa, Australia, the U.S.A., and Europe. The results of the first session of the sub-committee for the standardization of nomenclature in Mexico City were submitted in writing to cardiologists of different countries all over the world. Their comments were used as the basis for the discussion.

The conclusions which were reached are the following.

The name of the method can be freely chosen. However, in addition to such name, it would be desirable to indicate briefly what type of vibration is recorded, from which organ it originates, and which derivative is recorded.

1) The method should be indicated as follows.

<table>
<thead>
<tr>
<th>Phonocardiogram</th>
<th>Pcg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphygmogram</td>
<td>Sg</td>
</tr>
<tr>
<td>Electrokymogram</td>
<td>Eky</td>
</tr>
</tbody>
</table>
2) The type of vibrations and the derivative should be indicated as follows.
   a) Displacement (or Elongation) D
      First Derivative of D \( \dot{D} \) (or V)
      Second Derivative of D \( \ddot{D} \) (or A)
   b) Pressure P
      First Derivative of P \( \dot{P} \)
      Second Derivative of P \( \ddot{P} \)

Any other kind of vibration could be indicated with the same method.
X
First Derivative of X \( \dot{X} \)
Second Derivative of X \( \ddot{X} \)

3) Phase of respiration
   Inspiratory apnea Insp
   Expiratory apnea Exp
   Regular respiration Resp

Site of Recording

4) To indicate whether the vibrations are recorded from without or within the
   heart.
   External Pcg Pcg
   Intracardiac Pcg I-Pcg

5) The site of recording on the thoracic wall should be indicated according to
   Duchosal's suggestion.
   Intercostal space First number (arabic numeral)
   Right, middle, or left side R, M, or L
   Number indicates cm.
   from median line of body to center of microphone
   Example: 2nd intercostal space, left side, 5 cm. from median line 2 L 5

6) To indicate which chamber produces the vibrations, the following symbols
   should be used:
   Left atrium L.A.
   Right atrium R.A.
   Left ventricle L.V.
   Right ventricle R.V.

   Also combinations of these symbols can be used:
   i.e. Left atrial intracardiac phonocardiogram LA I-Pcg
   or Right ventricular electrokymogram RV Eky

7) Recordings taken from vessels should be called sphygmograms or pulse tracings:
   the vessel from which it is taken should be indicated with the three first letters
   of the Latin name of the vessel.
Examples:
- Femoral Fem.  
- Carotid Car.  
- Brachial Bra.  
- Jugular Jug.  

Exceptions:
- Aortic Ao.  
- Pulmonic PA.  
  (but IIA and IIP when referring to aortic or pulmonary components of the second sound.)

8) **Denomination of events in the Pcg**:
   
   **First sound**
   - its components I
     - a b c .......
   
   **Second sound**
   - its components II
     - a b c .......
   - or IIA and IIP

The so-called *ejection sound* should not be included in the first sound because the I sound ends when ejection begins. The same considerations apply to the second sound, which terminates when ventricular filling begins. Therefore, the mitral and tricuspid opening snaps should not be included in the second sound.

- Third sound (normal or pathological) III
- Atrial sound (normal or pathological) IV
- Summation gallop III + IV (or $\frac{III}{IV}$)
- Ejection sound E
  - Aortic E Ao.
  - Pulmonic E PA
- Any right-sided sound R
- Any left-sided sound L
- Opening sound or snap OS (if one desires to indicate whether mitral or tricuspid: MOS or TOS)

- Click K
- Pericardial click K Per.
- Pericardial friction rub F Per.
- Systolic Syst.
- Diastolic Diast.
- Presystolic P
- Murmur M

Examples:
- Systolic murmur SM
- Diastolic murmur DM
- Presystolic murmur PM
- Proto- Proto
- Meso- Meso
Tele-
Crescendo murmur
Decrescendo murmur
Diamond-shaped murmur
Bandlike murmur

Tele
Cres. M
Decres. M
Cres. Decres. M
Band M

Considering the small space which is available on the tracing, it may be preferable to use these notations in the legend or text.

Suggestions for improvement of these proposals should be mailed to one of the authors and will be appreciated.