Author's response to reviews

Title: Phono-spectrographic analysis of heart murmurs in children

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Author's response to reviews:

Referee 2 Reviewer: Morton E Tavel

Dear Sir,

Thank you very much for your well-thought-out and instructive comments. Enclosed kindly find our responses to your comments:

Item 1. The scaling program for the spectrograms has now been explained in more detail in the article. At the initial stage of the study, before the collection of sounds, we developed a scaling program that, according to our opinion, was sufficient to illustrate the intensity of the sound at different frequencies. We considered the scaling to be optimal for this study.

Item 2. (Page 6, paragraph 1) The authors agree that pathological murmurs are more intensive at lower frequencies. Since the validation was only visual, we left this point out of the revised text. The lowest as well as the highest frequency of the murmurs were registered in an equal fashion. However, the lowest frequency was not used as additional criteria in the differentiation of sounds, since it was not considered to yield any additional information in the sound specification. If the murmur was clearly caused by turbulent flow, it contained more lower level components.

Item 3, Page 6, paragraph 2. True, the volume measurement was taken from the waveform display. This information has been added to the text.

Item 4. The specific filtration used to produce waveform display is now explained in the text.

Item 5, Page 8, paragraph 3: The "time" means the systolic interval, we have corrected it.

Item 6. The timing and the shape of the systolic murmurs, for instance in mild pulmonary stenosis, innocent pulmonary ejection murmur or vibratory murmur vary with respiration. We have not documented it, because our recording system was simple and we did not record respiration separately.

Item 7. The monotonic wave movement means harmonic waves.

Referee 1 Reviewer: Anders Jaussi

Dear Sir,

Thank you very much for your well-thought-out and instructive comments. Enclosed kindly find our responses to your comments:

1. General, paragraph one: In our opinion this method enables identification of problems that generally can be revealed with auscultation. It is no better nor worse method than auscultation of an experienced listener.

2. Methods: Randomization has been explained in more detail in the text. The data has been collected from
regular patient material without any pre-selection. The patient roster was not available in advance and every patient with a positive attitude towards the study were included.

Since we registered only sounds and neither the ECG nor respiration, the time used for the recording process was barely longer than a normal auscultation time. During the recording it was possible to both to listen to the sound and to follow the phono-spectrogram from the display screen. To register only the highest frequency and the duration of the murmur is not at all complicated. The murmurs of children are remarkably easier to distinguish than in adults. Generally can be stated that if the child allowed the doctor to do auscultation with an ordinary stethoscope without reservations, the recording was also successful.

3. It possible to make the software commercially available. Mr. Sakari Lukkarinen is the person to contact in this respect.

4. As such, the phono-spectrographic analysis of murmurs will not change ultrasound indication. Its importance lays in being an educational tool that could diminish the number of cardiologic consultations.

We have revised the contents of the article according to your comments.

Major Compulsory Revisions:

1. Randomization has been explained in more detail.
2. The educational aspects of the tool have been emphasized more in the text.

Minor Essential Revisions

1. The labels have been added to the figures and we have tried to find right terms like Hertz.
2. Adaptation of the ROC curves has been done.

Sincerely

Anna-Leena Noponen MD