Technical Note

A New Stethoscope Design with Unique Characteristics and Development in Medical Device

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ABSTRACT

As regards the significant role of stethoscopes in the diagnosis of congenital and adventitious heart diseases and prevention of irreparable complications of these diseases, the quality of hearing sound of these stethoscopes by a physician has a significant impact on the disease diagnosis. This device plays an important role in the early diagnosis of congenital heart and respiratory diseases and provides this feasibility since birth. Also, the importance of this device performance in the diagnosis of heart, cardiovascular and respiratory diseases at different age periods is not a secret. This new invented device, in comparison to a variety of available stethoscopes in the field of diagnosis, is capable of hearing the sound of a very high quality and cancelling the noise of sound that sometimes leads to wrong diagnosis or misdiagnosis. This new invented stethoscope is approved by cardiologists, lung and Infectious disease specialists as well as being registered under No. 78382 in Patent Islamic Republic of Iran.

Keywords

Stethoscope, Cardiovascular Diseases, Hearing, Invention, Noise

Introduction

In 1816 A.D., a French physician, Rene Laynk built a wooden stethoscope. It had a large mouth for standing on the ear and the part placing on the patient's chest was large [1].

Stethoscope is a device to strengthen weak and internal sounds of the body. A stethoscope has three main components: the first part is placed on patient's body and its diaphragm or bell shaped section converts vibrations of the body into sound vibrations and intensifies it slightly. Then, the sound enters tube or guide tubes and eventually through special earphones enters into the doctor's ears [2]. Stethoscopes are of different types. The diaphragm of the stethoscope (has more area) is normally used to listen to different sounds of the body. The part called bell virtu-

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ally has no curtain and is applied when the organ has the special bass sound and should be intensified by bell part [3]. In a normal case, listening to the heart is possible at 4 points at least (related to any of the heart valves). Natural sound of heart includes a first sound S1 like Poum and a second sound S2 like Taak. Normally, additional sound is not heard, and between the first and second parts caused by the natural closure of heart valves, silence is established. Any noises between these two sounds or changes in the intensity of them etc. are a sign of specific diseases. Abnormal heart sounds include murmurs and sounds S3, S4. Murmurs are auditable vibrations occurring as a result of abnormal blood flow through normal heart valve or normal blood flow through abnormal heart valve and turbulent flow. Such sounds according to their intensity, frequency, quality, time and location of their time to the expansion and contraction of the heart are defined (systolic and diastolic) and symptoms of particular disease [4].

Material and Methods

The new stethoscope like all medical stethoscopes has three main parts, including:

1: A set related to head (Headset) consisting of Ear tip entering into two ears and an Ear tube connected to the ear tips.

2: A set related to chest (Chest piece) consisting of a tunable diaphragm and a connecting rod like stem.

3: A seamless pipe (tubing) in order to connect two sets of head and chest.

But what distinguishes this stethoscope from others is DC-SHOCK equipment.

From the therapy viewpoint, this stethoscope is capable of DC-Shock. This part is equipped with a Capacitor of 2500 µV and 16 µf diminishes to about twice the normal state of the electro stethoscope due the security issues and weight increase.

The system of this electro-stethoscope receives the sounds of heart and lung with selective piezo and after passing through the buffer in the range of 20 to 200, 100 to 500 and 400 to 1100 filters out ambient sounds and is brought to the pre-amplifier then the sound output is received by two headphones.

This electro-stethoscope has an additional line-out output (without loss of sound intensity) for another examiner as well as to connect to other recorders. In addition, it has a memory of 4 GB for sound recording.

Results

After the practical use of this stethoscope by clinical professors of University of Medical Sciences, the following results are obtained showing the difference between this stethoscope and others.

From the educational viewpoint, this stethoscope is in such a way that training of all students with professor (both for audio during training as well as audio recording for repetition and students' practice) is possible.

From the diagnostic viewpoint, sometimes due to a weak sound of mechanical stethoscope, correct diagnosis can be difficult for physicians. Even electronic stethoscopes receive sound in the fre-

quency range of 20 to 1000 Hz at two intervals. The system of this electro-stethoscope receives the sounds of heart and lung with piezo selectively and after passing through the buffer in the range of 20 to 200, 100 to 500 and 400 to 1100 filters out ambient sounds and is brought to the pre-amplifier. Then the sound output is received by two headphones. From the therapy aspect of this stethoscope has the capability of DC Shock. This feature allows in the event of emergency, the physician can act to save the lives of patients in the shortest time without a full resuscitation set. (Figure 1)

Conclusion

According to all educational, diagnostic and treatment applications expressed about new stethoscopes, we can realize a significant difference of this stethoscope with others available in the medical field.

The introduction of this stethoscope to medical equipment market could be a source of wonderful developments in the diagnosis of cardiovascular diseases at all ages.

After numerous clinical surveys of patients by professors and medical students to use this stethoscope, better results were achieved in diagnosis. Because the advantage of simultaneous use of several students of this stethoscope, better training results were obtained compared to other stethoscopes.

According to the results, from the educational, diagnostic and even treatment viewpoint, this stethoscope is preferred to other available stethoscopes in medical field.

Conflict of Interest

None

Figure 1: A sample of a newly developed stethoscope

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