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Letter to the Editor

Ultrasound versus stethoscope in internal medicine: Do not skip steps☆

We read with interest the review by M.J Blans and F.H. Bosch entitled "Ultrasound in acute internal medicine; time to set a European standard?" published in the Journal [1]. We agree with the majority of assertions made by the authors of this paper. Nevertheless, we wish to recall the importance for clinicians of auscultation, in emergency situations and of course in internal medicine. Thus for us, auscultation is not always overused, especially in our world, where complementary examinations take place at the expense of the clinic. As we have written: the "Stethoscope: a still relevant tool and medical companion", particularly in the case where clinicians are well educated in its use [2]. If clinicians spend as much time training in auscultation, we are not persuaded that ultrasound offers a real advantage over the stethoscope, especially with digital stethoscope [3]!

The stethoscope and the semantic of auscultatory findings were invented > 200 years ago by the French Physician R.T. Laennec and over the years very few changes have been made to both the stethoscope itself and the way in which it is used. However more recently, we have seen advances in the techniques used to process auscultatory signals, as well as in the analysis and clarification of the resulting sounds [4]. The characterization of sounds through recording, analysis and auscultatory signal processing systems provides better sensitivity and specificity in several studies [5]. The availability of novel representations of the sounds, with phono- and spectrograms (Fig. 1), also opens interesting perspectives in the context of

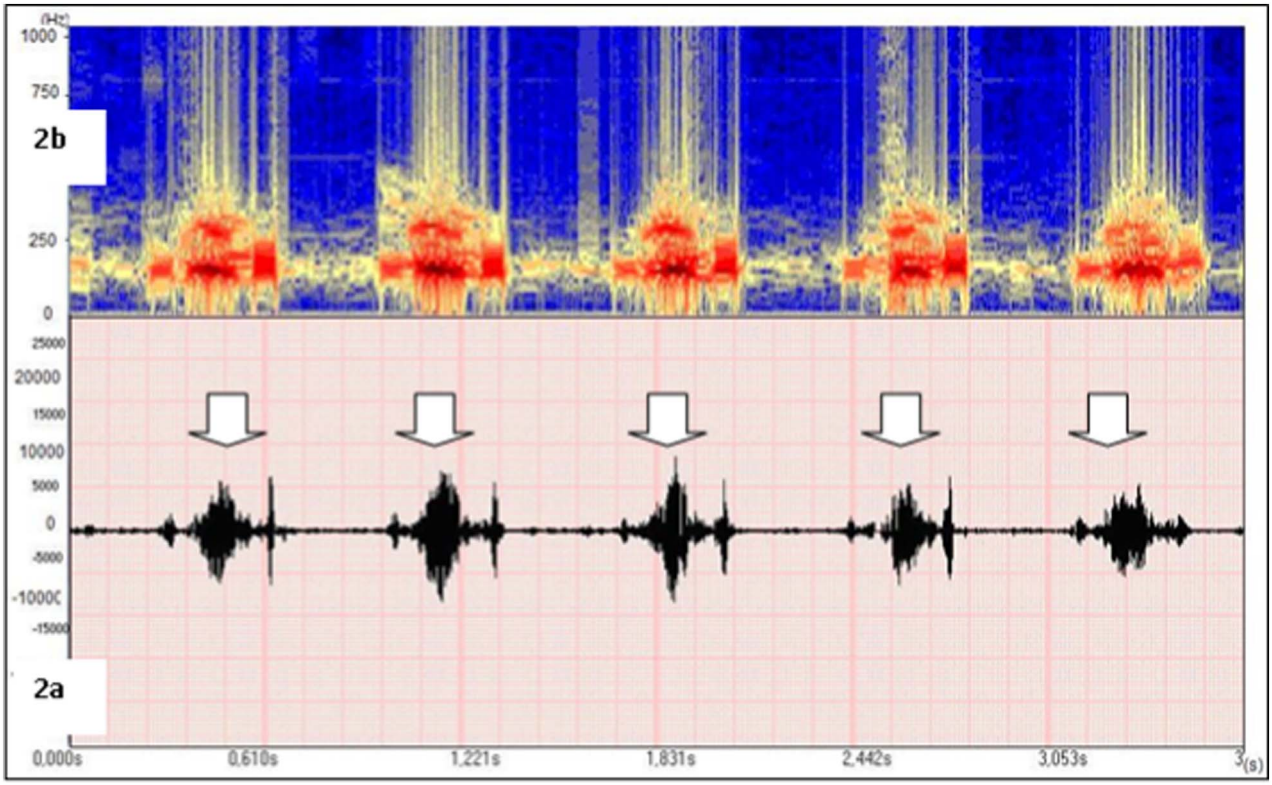

Fig. 1. Representation of a recording of a cardiac auscultation in an individual with aortic stenosis with a systolic ejection murmur (indicated by a white arrow) in the form of a phonocardiogram (2a) and a spectrogram (2b) [(*data collected in the ASAP project Analysis of Auscultatory and Pathological Sounds) developed by the French national agency for research (ANR 2006 - TLOG 21 04*)].

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Tables 1 and 2
Results of the use of new tools as phono- and spectrogram for visualizing sounds in 30 medical students.

	Day 0	Day 28 without	Day 28 with tools	Comparison between day 0 and day 28 with tools
"Good" diagnosis	45% (136)	64% (191)	80% (239)	$p < 0,01$
"Good" diagnosis in respiratory auscultation	51% (76)	61% (92)	70% (105)	$p = 0,058$
"Good" diagnosis in cardiac auscultation	40% (60)	66% (99)	89% (134)	$p < 0,009$

	All students ($n = 30$)	
	Without tools	With tools
% of "Good" diagnosis	64% (191)	80% (239)
% of "Good" diagnosis in respiratory auscultation:	61% (92)	70% (105)
- Normal respiratory auscultation	57% (17)	63% (19)
- Crackles (chronic bronchitis)	57% (17)	60% (18)
- Crackles (interstitial pneumonia)	53% (16)	70% (21)
- Wheeze sibilants (acute crisis of asthma)	70% (21)	83% (25)
- Stridor (lung carcinoma)	70% (21)	73% (22)
% of "Good" diagnosis in cardiac auscultation:	66% (99)	89% (134)
- Normal cardiac auscultation	73% (22)	93% (28)
- Aortic stenosis	60% (18)	100% (30)
- Aortic regurgitation (minimal murmur)	30% (30)	70% (21)
- Mitral stenosis	40% (12)	87% (26)
- Arrhythmia (auricular fibrillation)	57% (17)	97% (29)

diagnostic aids, but also in education and pedagogy. The recent developments of the new intelligent communicating system also offer new perspectives in the field of e-teaching [5].

We have previously documented the better diagnostic "performance" of digital stethoscope and new auscultatory signal visualization tools in a setting of heart and lung disease assessment [4]. We asked a cohort of medical graduate students ($n = 30$) to listen to 10 sounds in order to diagnose heart and lung pathology. They were then asked to check the appropriate box corresponding to the diagnosis relative to the sound they had just heard, as with an acoustic stethoscope (Day 0). The same exercise was conducted by adding the visual representation of the sound with phonopneumogram or phonocardiogram and spectrograms (Day 28). At Day 0, the correct response rate was 40 to 51%. In the second instance at Day28, the rate of correct diagnosis reached 70 to 89%. Tables 1 and 2 present the detail of these data. Analysis of this table shows that the improved performance (rate of correct diagnosis) is particularly significant for cardiac pathology. Thus in our experience, addition of visual representation of sounds has significant implications in terms of medical education, and also in term of decision-making, potential patient safety, and cost control.

Conventional auscultation is subjective and not easily shared. Modern medical technology allows us to optimize auscultatory findings, and hence achieve a correct diagnosis by physically characterizing sounds through recordings, visualization and automated analysis systems [3]. The development and availability of novel tools based on innovations in science and communications technology provide the clinician, but also the students, with an invaluable aid in order to achieve an objective diagnosis, as well as offering increased sensitivity and reproducibility of auscultatory findings. Such advances have not only led to the development and use of new intelligent communicating stethoscope systems, but they have also significantly contributed to the revival of telemedicine, particularly as a diagnostic and teaching aid, e-teaching and pedagogy. Thus to our opinion, Stethoscope is not becoming an outdated diagnostic tool.

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