Cylinder Mania in Valvulopathy Back to the Future

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I called the instrument a cylinder and experimented ways to build it […] Paris became a center of stetho-acoustic training [...] cylinder mania spread [...] patients from many countries preferred to be examined by those who were skilled with the cylinder[1].

Preamble

The progressive decreasing glamour of being an expert restricted the application of cardiac stethoscope auscultation in valvulopathy with excellence (CSAVE).

Brazil preserves groups of "Stethophyllus sp" (STH), rare specimens of cardiologists who form colonies of the CSAVE practice, in environments surrounded by technology all over the place. I am part of this group.

Let's make it clear: STH is not old-fashioned, CSAVE is not Jurassic, and the stethoscope is not a piece that is missing from the museum. Being a vassal of sovereign clinics, the members of STH believe in the permanence of the stethoscope and in the strong integrating power of the starting point of CSAVE, with the other findings from the multisensorial physical examination, scientific concepts and information from technology[2,3].

The members of STH accept that the golden age of the cylinder of Laënnec died with William Bart Osler, about 100 years ago[4]. But they understand that fidelity should persist. There is no reason to conjecture the fate of CSAVE in the face of Doppler echocardiography similarly, just because cardiac percussion was overcome by the x-ray.

Present from the Past

CSAVE is an important inheritance. A possible beginning for this patrimony was the prophecy by Robert Hooke (1653-1703): "I could clearly hear the human heart beat […], who knows, by the moving sounds of internal organs we may be able to discover the tasks performed in several offices and stores of the human body, and then we acknowledge that the instrument or machine is broken[5]."

Keywords

Heart Valve Diseases; Stethoscopes / utilization; Heart Auscultation / trends.

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About one century later, the invention of the stethoscope made it easier to observe that varieties of heart sounds were correlated with anatomic valve peculiarities found *post mortem*[6,7], and they influenced the way the doctor interacted with the patient[7].

Laënnec's cylinder became a symbol of the so called cognitive techniques[6]. And also of the doctor, since it was a personal object available 24 hours a day, every day. It is portable, light and malleable, and it does not require a special environment, exteriorizing the noisy sound source that the heart becomes due to the occurrence of valvulopathy. Besides, it is not related to guidelines for orientations of application. Books summarized the information, but they did not despise systematizations.

The lack of recent original communications about new heart sounds reveals the depletion of knowledge generation and has "nothing to add" to the semiology utility[8,9]. The first one took place after the conduction of studies about physiological bases, and there is no prediction of a brand new modality of valvulopathy followed by a yet unknown murmur. The second one is known as: "The starting point is the conduction of anamnesis and complete physical examinations, especially cardiac auscultation[10]."

Certain behaviors of clinical reasoning privation throughout anamnesis and physical examination were a result of known alterations in the act of being a doctor and, as a consequence, of being a cardiologist[11]. In the five generations that currently live together in Brazilian cardiology, it is not difficult to see wide variations in the construction of diagnostic hypotheses *pari passu* with each fact or collected data.

The hasty documentation, without the use of thought for further analysis, put to an end the concentration and selective focus on each heart sound, patient after patient. As a consequence, the learning curve and the maintenance of skills in propedeutics by hearing were highly immobilized. Besides, the "use manuals", detailed books about CSAVE, stopped being published decades ago due to the lack of demand, thus leading the knowledge to be restricted to professors and general cardiology books.

A pedagogic premise is cruel: it is impossible to teach what one has not learned. And the domino effect stands out among us: the broken Hippocratic transmission from expert professors, generation after generation of cardiologists. It is a universal phenomenon. In the United States, for instance, the decreasing proficiency in cardiac auscultation brought to light the highly potential damage in the expertise of bedside diagnosis[12]. However, it is not clear if the uneasiness has brought positive effects[8,13].

Explanations for the declining care with CSAVE involve some factors: time, not enough financial compensation and vision of the "outsourced" diagnostic skill for imaging tests, such as the Doppler echocardiography[8,13-15].

On the other hand, the technological enhancement of the stethoscope, with the objective of bringing progress to the act of teaching by means of the amplification, recording, reproduction, graphic visual and simultaneity of auscultators, is not available for the continuity of the learning process.

It is impossible to deny it, but CSAVE is encouraged by the interest to practice it. The "hearing training" supported in other data that are present in the heart physical examination reproduces what the older doctors did; by being integrated with other available methods, it is an advantage in relation to old school[14]. Therefore, CSAVE is the bedside guide for "dialogues" with complementary methods.

In the early XXI century, Brazil experiences non-increasing rheumatic heart disease in adolescents, and increasing aortic stenosis among the elderly in outpatient clinics of valvulopathy. The CSAVE provides observational standards to the several age groups. It is one of the reasons why CSAVE was careless and downgraded: a) explanation for data in the anamnesis; b) referral after positive diagnoses; c) alert for valvulopathy, which was unknown up until then. Besides, the lack of attention with heart sounds abbreviates the cozy and pro-therapeutic doctor-patient connection[9,15-17].

The STH

The STH may analyze diagnoses fast, completely, with high specificity, excellent cost-benefit relationship and personal satisfaction – for instance, the important insufficiency of the mitral valve caused by the rupture of the chordae tendineae. They do not need much propedeutic action to explain acute and severe heart failure, or to conjecture etiopathogenic therapy.

STH is not nostalgic. They see the benefit renewed in the propedeutic patrimony built by remarkable masters of semiotics[3], many of whom were immortalized as eponymous and transformed in metonymy (I auscultated Austin Flint, Rivero Carvallo disappeared, Gallavardin cleared it up).

STH emphasizes that CSAVE may have a relevant role in the application of innovations. In the 1980s, the appearance of a systolic murmur during a sequence of dilations in mitral valvuloplasty by a balloon cathether began to mark therapeutic conclusion, in order to avoid the development of acute mitral insufficiency with the desire to maximize the mitral valve area.

However, the STH recognizes that technological modernity dismisses certain stages of classic CSAVE, and it also eliminates them from teaching programs. It is the case of quantifying the period of time between the second sound and the mitral opening snap – 0.04-0.10 s –, as the level of left atrial hypertension and, *ipso facto*, the severity of mitral stenosis.

With this concept, and being aware of the limitations of capturing sounds and the silence of form morphologies, such as thrombi and vegetation, the STH works for the security of making a statement concerning rare dissociations of information. An example of this ethical commitment to "revise" technology is the reasoning about the chances of identifying if a discrete valvular regurgitation with Doppler, not auscultated by the doctor, is real or false positive.

An Essential Matter

It is worth to ask: STH, what is the current role of CSAVE in the diagnosis of valvular lesion in Brazil (by considering the use of a conventional stethoscope)?

The STH member who makes "valves", especially the one who associates teaching duties, will answer with a categorical 'indispensable'. Of course, he knows their numbers are not high in cardiology, but he will justify that, in order to give a solid nucleus to the diagnosis, CSAVE is not a complementary test or a superfluous one to admit options of application level. Technology is not an enemy of CSAVE, the only concern lies upon its poor use[18].

STH will take the time to be solidary and available for colleagues who might even be outside the island, however, who would respond similarly to them, talking about reasons for which they do not have the expertise or how they lost it due to lack of use. But they will be reductionist if the argument is the work overload, which sacrifices the effort of the cardiologist for CSAVE.

There are many devil's advocates outside the islands. They publicize that CSAVE defends the "excuses" caused by imprecisions with individual variations and acoustic window effects[15]; that it is a luxury for only a few, and a waste of time for many, and that there is more quality in quantitative and hemodynamic information in other methods[8,13].

Due to the opinions about downgrading the hierarchy of CSAVE, the STH reminds us that it is complex to attribute causes to a "non-auscultation" or a "weird auscultation", and that the unusual and the aphonic will not stop existing. It reinforces the motto of professionalism from STH: good auscultation, better diagnosis.

The subjectivism about veracity and falsehood of CSAVE may be criticizable; however, it has always accompanied the state of the art. The fact that CSAVE was originated by truly positive isolated cases is historical, and was developed based on the observance of the low chances of false negatives in small similar groups of patients; the references were necropsy, cardiac catheterism and phonomechanocardiography.

Obstacles to conjectures of randomized, double-blind and multicenter studies maintain the high observational focus on the islands – it is worth to remember that Austin Flint (1812-1886) became famous for observing two cases, and José Manuel Rivero Carvallo (1905-1993) reported 11 cases, being 10 positive ones.

A few studies, also because of etiopathogeny-variety biases and diverse patterns of reference as to level of severity[8,13,19], did not provide results for the construction of evidence. How to translate the murmur sensitivity of Austin Flint, ranging from 0-50% for moderate discrete aortic insufficiency, and from 52-100% for moderate to important aortic insufficiency?[19]

On the other hand, CSAVE presents high sensitivity and high specificity for the identification of asymptomatic patients with valvulopathy with the purposes of check-up, release for surgical procedures, admission for work and planning sports activities[20].

The routine that "pleases" STH rejuvenates CSAVE. Joviality, on the one hand, is a magnet for the iron will of youth towards good cardiology practices. The attraction has taken promising steps.

Perspectives

STH is hopeful. It has reasons to believe in the celebrations of the bi-centenary of the invention of the stethoscope, which will take place in 2016, besides registering a historical reverence to the period between two creative figures: the Breton doctor Réné Théophile Hyacinte Laënnec (1721-1826) and the cardiologist David Littmann (1906-1981), from Harvard Medical School. The STH predicts space to celebrate the fact that CSAVE has reconquered the young strength of being a doctor in Brazil.

We can retake something that has been taken from us, as taught by Lucius Anneus Seneca (4 BC-AD 65). In medicine, the Hippocratic atavism provides it. The STH feels the wind moving towards favorable directions, moving the perception that existing as a doctor requires studying, in order to extract alone the highest possible number of data from the patient. Young students in university or in postgraduate programs seize the opportunity of the optional internship and take part in the STH.

Between March, 2012, and December, 2013, for instance, the expressive number of 175 young people, among students and interns coming from 70% of the Brazilian states, attended *ad libitum* a busy university community of STH, for tertiary care to patients with valvulopathy.

It is known that motivation clears the senses, and that long lasting dedication elevates self-esteem. It became clear that such a combination had the ability to waken in the apprentices of STH, after each lesson learned by their own senses, the will to reach the maximum level of sound capture, to analyze the patient further, to go through focuses, to look for positions, to make maneuvers and to be eager to have a STH ear – master to discover what is inaudible or to clarify what has been auscultated.

Brazil has the advantages of prospecting and polishing the several semiotic jewels in valvulopathy "straight from the source", and not from cold mannequins with recorders. The real circumstances of each examination provoke facilitating points of reference, which reinforce retention and memory. Therefore, it is natural to accumulate sound quality to present the normality or the abnormality of cardiac rhythm, the opening (mitral opening snap, Austin Flint murmur) and the closure of valves (first and second sounds), ventricular filling (third and fourth sounds), atrioventricular flow, ejection and regurgitation (characteristic murmurs, snaps, Valsalva and Rivero-Carvallo maneuvers), atrial contraction (presystolic accentuation) and inflammation (pericardial friction, Carey Coombs murmur, continuous murmur in the fistula due to infectious endocarditis).

I wish each one of these young students – and many more – could become a multiplier. That their stethoscopes could work as a real metaphor of the art of medicine and science[18]. It is the Hippocratic contribution of STH for the rebirth of CSAVE in Brazil. It will be cylinder mania back to the future!

Author contributions

Conception and design of the research, Acquisition of data, Writing of the manuscript and Critical revision of the manuscript for intellectual content: Grinberg M.

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