

Value of the Cervical Auscultation in Patients Affected by Neurogenic Dysphagia

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SUMMARY

Introduction:

The cervical auscultation is an instrumental resource used in the functional clinical phonoaudiological approach of feeding and the pulmonary auscultation is a semiotic method for clinical exploitation of the thorax and the heart.

Objective:

To relate noises from cervical and pulmonary auscultations.

Method:

Prospective, clinical and experimental, quantitative and comparative study between the cervical and the pulmonary auscultations and sample composed by 19 adult patients with clinical diagnosis of oropharyngeal neurogenic dysphagia, after encephalic vascular accident, with mean age of 59.11 years. We established percentages for variables considering two evaluators. The statistical analysis confirms the presence of slight dysphagia in 66.67%; moderate dysphagia in 16.67% and severe dysphagia in 16.67%. In the cervical auscultation the presence of dry clicks occurred between 42.11% and 78.95% for the different evaluators, and we observed a higher frequency of alterations for evaluator 1. In the pulmonary auscultation the higher frequency was of normal vesicular respiration for both evaluators. We also verified a significant difference between the levels of dysphagia for the cervical and pulmonary auscultations variables, whose correlation shows a low concordance; and a significant discordance between the evaluators for the cervical auscultation and perfect concordance for the pulmonary auscultation.

Conclusion:

There is no relationship between the noises listened, even with the respiratory function as a base and with the evaluation region being close; but we confirm a relation between dysphagia and pulmonary auscultation, whose results set a frequency of 100% of alterations in the pulmonary auscultation in the dysphagia pictures, with moderate and severe affection levels.

Keywords:

auscultation, deglutition, deglutition disorders, breathing.

INTRODUCTION

The phonotherapeutic operation in hospitals is relatively recent and one of its contributions in this area is characterized by an early evaluation and a differential diagnosis for cases of dysphagia, in which its operation prevents, avoids and/or minimizes the patient's clinical complications.

Such contribution reaches the amplification of prognostic perspectives with internment time reduction and diminishing of new internment rates for aspiration pneumonia, by significantly enabling an improvement in the patient's quality of life (1-5).

Clinically, the oropharyngeal dysphagia may manifest by means of a number of symptoms such as: mastication disorder, difficulty to start deglutition, nasal regurgitation, diminished saliva control or coughing and/or choking during meals, breast pain, globus pharyngeus - sensation of food stuck in the throat, and may also present dehydration, weight loss, prolonged meal time, diminishing of appetite and aspiration pneumonia or any other pulmonary problems (1).

The deglutition disorder may be divided into three degrees, each with difficulties and specific demands, that is (6-7):

- light oropharyngeal dysphagia - present deglutition disorder, including spontaneous and effective coughing and/or clearing of the throat; light oral alterations with adequate compensations; there is need for specific guidance and slight modification on the diet;
- moderate oropharyngeal dysphagia - we verify weak or absent reflex coughing and the existence of significant risk of aspiration, in which there is need for complimentary oral feeding, by alternative way; the patient may be fed with some consistencies, by using specific techniques to reduce the aspiration potential and/or ease deglutition under supervision of the feeding process;
- severe oropharyngeal dysphagia - impossibility of oral feeding because of choking with difficult recovery; presence of cyanosis or bronchospasms; silent aspiration for two or more consistencies; the voluntary cough is ineffective and there is inability to start deglutition.

From the data obtained in the clinical exam it is possible to formulate precise hypotheses and indications for relevant complimentary exam per each case, such as the indication of instrumental evaluation or evaluation by other professionals.

The multidisciplinary team that assists the patient with dysphagia must be attentive to the detection and valuation of clinical signs because the earlier these are

identified the higher is the chance to revert the clinical complications, specially the pulmonary ones that may lead the patient to death (7).

The neurogenic dysphagia is caused by neurological diseases or traumas and is estimated at 50% of occurrence faced with encephalic vascular accidents (EVA) (8).

The neurological dysfunctions may affect the muscular action in charge of transporting the bolus from the oral cavity to the stomach. The dysphagia presents with changes in the oral and pharyngeal stages that are called neurogenic oropharyngeal dysphagia according to the literature (1-2, 7, 9-11).

The diagnosis evaluation of the deglutition disorders is made clinically and contains data from the cervical auscultation and wrist oxymetry, jointly or through deglutition videofluoroscopy and fibronasolaryngoscopy, considered to be a gold standard in addition to other radiological or endoscopic exams (5-6).

The different clinical selections and evaluation of the patient for diagnosis of dysphagia are continually and statistically analyzed and have variable rates of sensitivity (42% to 92%) and specificity (59% to 91%) as per data collected by RAMSEY and SMITHARD (12), who suggest the need for a more accurate verification.

The literature describes sensitivity data for WST of 85.5% (13), of 100% for GUSS (14) and of 91.3% for TORBSST (15). This demonstrate excellent outcomes, but we suggest that faced with doubts as for the degree of commitment of the deglutition disorder and/or because of the laryngotracheal aspiration possibility a verification be made through gold standard exams.

The cervical auscultation is one of the instrumental resources used in the functional phonoaudiologic clinic approach of feeding. It is defined as a subjective evaluation that is aimed to evaluate or listen to the deglutition sounds. For its performance, the stethoscope is placed on the thyroid cartilage, at its lateral position, and at first the air passage from breathing is listened and then the deglutition noises, that is to say, the noises from the transport of the bolus through the pharynx are listened (6).

Although the fact is controversial, the data from cervical auscultation has been used to correlate the deglutition noises, in the deglutition pharyngeal stage, while a method that may be evaluated in an objective manner is sought for its accomplishment.

The pulmonary auscultation is a semiotic method for clinical exploitation of the thorax and the heart. It must

be made in a quiet environment and demands a large concentration of the professional who is carrying it out, by placing the stethoscope in the region of the thorax, with a certain pressure, and having the patient breathing with medium amplitude (16).

Clinical data are researched that relates the occurrence of pneumonia before the pictures of dysphagia after EVA as being generally of high incidence (16-18).

As for the current aspects of insertion into phonoaudiology in hospital environment and allied to the need of establishing objective and scientific evaluations, we consider the need for relating the cervical auscultation, through the clinical evaluation of the deglutition noises, to the pulmonary auscultation noises, since both are carried out in a close corporal areas and have the respiratory function as an evaluation parameter.

METHOD

Our study has a transversal, population quantity nature and is comparative between the cervical and pulmonary auscultation.

For its accomplishment, we requested guidance and training by a physiotherapist for the assistant researcher to carry out the pulmonary auscultation of the patients and by a phonoaudiologist for the cervical auscultation.

This study was approved by the ethics committee in research of the Centro Universitário Metodista IPA with protocol under the number: 363, in 2007. The research participants were duly informed about the objectives of the study and signed a free and clarified authorization term.

The data collection was made in a population of 19 patients who had neurogenic oropharyngeal dysphagia, diagnosed at bedside through the phonoaudiologic evaluation for oropharyngeal dysphagia - protocol AFDN (19), aiming to analyze the orofacial issues and setting up the level of dysphagia of the patients who were interned at the Hospital Parque Belém (HPB), of Porto Alegre/RS, in the period from March 1 through May 15 2008.

Upon admission, the participants in the sample had the medical clinical diagnosis of EVA and phonoaudiological diagnosis of oropharyngeal dysphagia. The patients who had medical clinical diagnosis of other neuropathies and normal deglutition were excluded.

As from the sample selection the phonoaudiological evaluation was made by the assistant researcher through

the same protocol and complimented with data for collection of the pulmonary auscultation.

The pulmonary auscultation was made by asking the patient to keep on breathing normally, listening to his/her breathing sound and the result was assigned as from evaluator 1.

For cervical auscultation the patient was first prompted to breath normally and then to swallow the saliva. The data collected was assigned as from evaluator 1.

The data from evaluators 2 was copied from the records of the patients and regarded the notes by physiotherapy students (for pulmonary auscultation) and phonoaudiology students (for cervical auscultation), who make such evaluations in their daily bedside clinical action.

In the analysis procedure the pulmonary and cervical auscultation comparison was made based on the data collected by the assistant researcher (evaluator 1) and from the students on the collection day (evaluator 2).

For comparison of the variables a general descriptive analysis was made.

In order to describe the sample profile according to the study's variables, categorical variables frequency tables (degree of dysphagia, cervical auscultation etc.) were prepared with absolute (n) and percentage (%) frequency values, as well as descriptive statistics of the ongoing variable (age), with average values, standard deviation, minimal, maximal and medial values and quartiles.

For comparison of the categorical variables between degrees of dysphagia we used the Chi-Square test, or, when applicable, the Fisher's exact test (in the cases of expected values lower than 5). To compare the numeric variable between the groups we used the Mann-Whitney test.

To analyze the concordance between the cervical and pulmonary auscultations by the 2 evaluators we used the concordance kappa coefficient (K), whose values above 0.75 indicated high concordance, while values between 0.40 and 0.75 indicated intermediate concordance, and values below 0.40 show a low concordance between the evaluators. In order to verify whether the evaluations were different between evaluators and analyze the relation between cervical and pulmonary auscultations we applied the McNemar test to the samples.

The level of significance adopted for the statistical tests was of 5%, that is, $p > 0.05$.

RESULTS

The descriptive analysis was set up by means of percentages of the variables (age, degree of dysphagia) of the patients evaluated and the cervical and pulmonary auscultation.

Through the general descriptive analysis and numeric variable, the sample is characterized by a mean age of 59.11 years and the standard deviation of 17.66 years.

The highest frequency of the population studied is between the age range of 60 to 79 years with light dysphagia in 66.67%, presence of dry clicks in 42.11% of the population (data that diverged between evaluators because the second evaluator found this noise altered in 78.95%), and pulmonary auscultation with a major frequency for the presence of normal vesicular murmur according to both evaluators.

For comparative analysis between degrees of dysphagia, we needed to group the data from cervical and pulmonary auscultation, and the following ones are from the cervical auscultation: dry clicks as normal and the other noises collected as altered; in the pulmonary auscultation: the vesicular murmur and the uniformly distributed vesicular murmur were considered to be normal and the other noises to be altered.

Tables 1 and 2 describe the main categorical and continual variables between the degrees of dysphagia (light vs. moderate or severe). Due to the reduced size of the sample, we needed to group the data between the patients younger than 60 years old who were found to have light dysphagia in 41.67% and the older than 60 years to have moderate to severe degree of dysphagia in 66.67%.

As for the cervical auscultation and the degree of dysphagia we found alteration in 83.33% of the patients with dysphagia of moderate and severe degrees.

When compared to dysphagia, the pulmonary auscultation had 100% of alteration in moderate and severe degrees.

Table 1. Comparison of categorical variables between degrees of dysphagia.

Age	Degrees of Dysphagia Frequency		
	Light	Mod/Sev	Total
Col Pct			
<60	5 (41,67%)	2 (33,33%)	7
>=60	7 (58,33%)	4 (66,67%)	11
Total	12 (100,00%)	6 (100,00%)	18

Fisher's exact test: P = 1.000

AUSCCERVI	Degrees of Dysphagia Frequency		
	Light	Mod/Sev	Total
Col Pct			
Normal	9 (75,00%)	1 (16,67%)	10
Altered	3 (25,00%)	5 (83,33%)	8
Total	12 (100,00%)	6 (100,00%)	18

Fisher's exact test: P = 0.043

AUSCCERV2	Degrees of Dysphagia Frequency		
	Light	Mod/Sev	Total
Col Pct			
Normal	12 (100,00%)	2 (33,33%)	14
Altered	0 (0,00%)	4 (66,67%)	4
Total	12 (100,00%)	6 (100,00%)	18

Fisher's exact test: P = 0.005

AUSCPULM1	Degrees of Dysphagia Frequency		
	LIGHT	MOD/SEV	Total
Col Pct			
Normal	9 (75,00%)	0 (0,00%)	9
Altered	3 (25,00%)	6 (100,00%)	9
Total	12 (100,00%)	6 (100,00%)	18

Fisher's exact test: P = 0.009

AUSCPULM2	Degrees of Dysphagia Frequency		
	Light	Mod/Sev	Total
Col Pct			
Normal	9 (75,00%)	0 (0,00%)	9
Altered	3 (25,00%)	6 (100,00%)	9
Total	12 (100,00%)	6 (100,00%)	18

Fisher's exact test: P = 0.009

Table 2. Comparison of ages between degrees of dysphagia.

DEGREE DYS	N	MEDIUM	D.P.	MIN	MEDIUM	MAX	VALUE-P*
LIGHT	12	59.33	10.81	43.00	60.00	78.00	P = 0.573
MOD/SEV	6	64.83	23.46	31.00	62.00	96.00	

* Value-P regarding the Mann-Whitney test for comparison of the variable between the degrees of dysphagia (light vs. moderate or severe).

From the results, we verify a significant difference between the moderate and/or severe degrees of dysphagia for the variables: cervical auscultation 1 ($p=0.043$) and 2 ($p=0.005$) and pulmonary auscultation 1 ($p=0.009$) and 2 ($p=0.009$).

With the descriptive and comparative analysis between cervical and pulmonary auscultations, the percentage of 47.37% was found as an alteration.

Table 3 presents the comparisons of the cervical and pulmonary auscultations for each evaluator. The results show there was no significant discordance between the cervical and pulmonary auscultations for evaluator 1 and there was significant discordance between the cervical and pulmonary auscultations for evaluator 2, which had a lower frequency in the cervical auscultations alterations and higher frequency in the pulmonary auscultation alterations.

In the descriptive and comparative analysis results between evaluators 1 and 2, McNemar test ($p=0.025$), we verified there was a significance discordance between the evaluators for the cervical auscultation (higher frequency of alterations for evaluator 1) and a perfect concordance

between the evaluators for the pulmonary auscultation ($IC=95\%$), because all the results were coincident. Table 4 provides a descriptive analysis and the concordance of the cervical and pulmonary auscultations between evaluators 1 and 2.

DISCUSSION

The clinical evaluation at bedside carried out by phonoaudiologists who operate in hospitals comprises a record analysis, deglutition dynamics, mental elaboration, orofacial structures mobility and vocal quality.

Our study used the AFDN protocol that meets the indications of the literature (3, 6, 9, 11), because it is used in the phonoaudiology service of the HPB, where the data collection was carried out.

When we set up the occurrence of dysphagia degree frequency of the patients with EVA, who compose our study, we find data of higher rate as for the presence of neurogenic oropharyngeal dysphagia of low degree (66.67%) and this data is according to that described in the literature (20).

Table 3. Comparison of the cervical and pulmonary auscultations, per evaluator.

Cervical and Pulmonary Auscultations						
Frequency	Evaluator 1			Evaluator 2		
	AUSCCERVI Normal	AUSCPULMI Altered	Total	AUSCCERV2 Normal	AUSCPULM2 Altered	Total
Normal	7 (36,84%)	3 (15,79%)	10 (52,63%)	10 (52,63%)	5 (26,32%)	15 (78,95%)
Altered	3 (15,79%)	6 (31,58%)	9 (47,37%)	0 (0,00%)	4 (21,05%)	4 (21,05%)
Total	10 (52,63%)	9 (47,37%)	19 (100,00%)	10 (52,63%)	9 (47,37%)	19 (100,00%)
	McNemar Test: S=0.0; GL=1; P=1.000 Kappa Coefficient: K=0.367; IC95%: (-0.052; 0.786)			McNemar Test: S=5.0; GL=1; P=0.025 Kappa Coefficient: K=0.457; IC95%: (0.114; 0.800)		

* Kappa concordance coefficient and interval of 95% of reliability (IC95%) P value regarding the McNemar test to analyze the difference of classification between the cervical and pulmonary auscultations (n = 19).

Table 4. Comparison of cervical and pulmonary auscultations between evaluators 1 and 2.

Frequency	Cervical Auscultations (Evaluator 1 vs. Evaluator 2)			Pulmonary Auscultations (Evaluator 1 vs. Evaluator 2)		
	AUSCCERVI Normal	AUSCCERV2 Altered	Total	AUSCPULMI Normal	AUSCPULM2 Altered	Total
Normal	10 (52,63%)	0 (0,00%)	10 (52,63%)	10 (52,63%)	0 (0,00%)	10 (52,63%)
Altered	5 (26,32%)	4 (21,05%)	9 (47,37%)	0 (0,00%)	9 (47,37%)	9 (47,37%)
Total	15 (78,95%)	4 (21,05%)	19 (100,00%)	10 (52,63%)	9 (47,37%)	19 (100,00%)
	McNemar Test: S=5.0; GL=1; P=0.025 Kappa Coefficient: K=0.457; IC95%: (0.114; 0.800)			McNemar Test: S=0.0; GL=1; P=1.000 Kappa Coefficient: K=1.000; IC95%: (1.000; 1.000)		

Kappa concordance coefficient and interval of 95% of reliability (IC95%). P value regarding the McNemar test to analyze the difference of classification between the 2 evaluators (n = 19).

Upon correlation of the data between the degree of dysphagia and the age of the sample's components, we find a higher frequency of light degree dysphagia in patients aged less than 60 years and of moderate to severe degree in patients aged 60 years or older, and there is no supportive reference in the literature, but we consider that in adults older than 60 years, we find dysphagia as a common problem, specially when associated to chronic health difficulties whose estimate is the occurrence above 80% (21).

The deglutition instrumental evaluation of the patient with dysphagia is aimed at observing how the deglutition is processed, with which level of effectiveness the bolus reaches the esophagus and mainly whether the deglutition function is safe. The instrumental resources that may be used during the clinical approach include the cervical auscultation and the wrist oxymetry.

The cervical auscultation is an additional instrumentation for detection of a clinical picture of dysphagia because the air passage and deglutition sounds are listened in the pharyngeal phase. In the wrist oxymetry, we measure the oxygen saturation in the functional hemoglobin and this may help the monitoring of the patients who desaturate oxygen as a consequence of the laryngotracheal aspiration (6-7).

In the literature we find the best region to carry out the cervical auscultation is the lateral part of the neck where the junction of the larynx, trachea and carotid artery occur (4, 6, 22) and this is the part used for data collection of this study.

Faced with disorder in deglutition, we may find an altered cervical auscultation that enables definition of its physiological characteristics (4, 6, 22).

We verified controversies in the literature as for the use of cervical auscultation because it does not allow a concordance between the scientific researchers as for the acoustic detection resource used, microphone or accelerometer, as mentioned in the study by REYNOLDS, VICE and GEWOLB (23), whether by the noises characterization (24) or this testing being used individually as an evaluative resource (25-26), or not containing specific data of physiological correspondence (26); but all agree we need further studies for its use.

Because this collection is subjective for the establishment of the presence or absence of the noise, as well as its characteristics, that is, in the quality to be set from the auditory-quantitative data, the researchers have been grouping the results into normal and/or altered, as in the study published by LESLIE et al (26). Our study followed this

practice and the results were grouped into normal and altered.

We found a percentage of 10.53% in absence of clicks, 5.26% in reduced clicks, 42.11% of dry clicks, 10.53% of dry clicks in the right side, 21.05% of rattling noises and 10.53% of tongue movement noises. From the grouping of such data, we obtained a percentage of 42.11% of normal noises and 67.99% of altered noises.

The comparison of the normal and altered noises between the cervical auscultation evaluators was considered to be significantly discordant, which confirmed the finding by LESLIE et al (26), which presents a poor concordance in the judgment between the evaluators and suggests cervical auscultation noise-related auditory characteristics.

The discordance found in our study allows us the hypothesis that the cervical auscultation depends upon a sensitive and of ongoing auditory training equipment.

The noises found in the cervical auscultation, in the literature, are characterized as follows: Stridor, rhonchi, distinct stridor, rattling, gurgling and bulla (2, 6, 10, 20). These are described in Graphic 1.

The pulmonary auscultation is a semiotic method to examine the thoracic region that helps the respiratory and cardiac evaluation and is made in comparative manner between the regions of each side of the lung. The stethoscope must be moved from a pulmonary segment, first in the right hemithorax and then in the left hemithorax.

The vesicular murmur (VM) is considered to be a normal noise of breathing, which is characterized from being heard during inspiration and in the beginning of expiration throughout the thorax and this term is mentioned as a tracheal sound (17).

Among the pulmonary noises, we found in the literature the following description: normal vesicular murmur, abolished vesicular murmur, reduced vesicular murmur, stridor, snore and sibilations (11, 20, 27-29). These are specified in Graphic 2.

In our study, we found 47.37% of vesicular murmur, 5.26% of abolished vesicular murmur, 10.53% of reduced vesicular murmur, 5.26% of strong vesicular murmur, 5.26% of uniformly distributed vesicular murmur and 10.53% of bilateral snores. These snores were grouped into normal 52.63% and altered in 47.37%.

When compared between both evaluators, the results of the pulmonary noises listened were the perfect concordance.

Graphic 1. Description of deglutition noises found in the cervical auscultation.

Types of Noises	Description	Evidence	Association/ Commitment
tracheal sound	tubular hearable sound in both phases of the respiratory cycle, but more intense in expiration	respiratory cycle	respiratory function
clicks, dry clicks, explosion pharynx builders	muscular contraction	passage of bolus	normal deglutition or burst
pharynx builders , wet and/or post-deglutition stridor	wet voice	presence of liquid, saliva, secretion of food in the vocal chords after deglutition.	Laryngeal penetration
rattling	high frequency noises that occurs between the clicks	datum not found in the literature	datum not found in the literature
bullas, bullous and/or bubbling	air bubbles	Subglottic air release during the passage of the bolus/or fine liquids	fine liquid aspiration
gurgling	noise of water going down from the sink	datum not found in the literature	fine liquid aspiration
stridor	described as a strong noise both during inspiration and expiration	adduction of the vocal chords	fine liquid aspiration

Graphic 2. Description of the pulmonary noises found in the pulmonary auscultation.

Types of Noises	Description	Evidence	Association/ Commitment
normal vesicular murmur	sounds produced in the large airways and diminished when they pass through distant structures of the lung. Noise difficult to be viewed and normally characterized for occurring upon Inspiration and expiration	respiratory cycle	normal breathing
abolished vesicular murmur	intercostal spaces retraction sample	absent or diminished noise	presence of liquid/or bronchial neoplasm
diminished vesicular murmur	diminished expansibility	diminishing of the respiratory noise	compensatory dilating emphysema
stridor	sound produced by obstruction from the larynx or the trachea	rude noise	provoked by diphtheria, acute laryngitis, carcinoma of larynx and stenosis of trachea
snore	Low sounds that appear with major prevalence in the expiration and in a short period of time	low sounds	wall vibrations bronchial and of contents gaseous
sibilations	originate from vibrations of bronchial walls and appear in expiration and inspiration	high frequency whistling	narrowing of the airways

Graphic 3. Correlation between the cervical and pulmonary noises.

Cervical Auscultation	Description	Pulmonary Auscultation	Description
tracheal sound	normal breathing sound that passes through the trachea	Vesicular murmur	respiratory cycle sound normal
transmission snore	noise produced with the oral cavity open	snore	low sound that originates from wall vibrations bronchial

In the comparison of the noises found in the cervical and pulmonary auscultations, departing from their physiologic description, we may deduce their hypothetic proximity, although it does not match the data by ANGELO and SANDOVAL (28) as for the Beau's breathing.

By correlating the auscultations, we may infer a similarity between the tracheal sound and the vesicular murmur and between the transmission snore and the snore. These are described in Graphic 3.

Taking into account the cervical auscultation and the auditory quality evaluation and comparing them to the pulmonary auscultation noises available at the 3M's website (30), we conclude that the rattling noises are similar, and described in the pulmonary auscultation exams, to the pulmonary auscultation snore and to the rattling noise from the cervical auscultation.

By analyzing the pulmonary auscultation variable and the degrees of dysphagia comparison, we find a frequency percentage of 100% as to the pulmonary auscultation alteration in the moderate and/or severe degrees of dysphagia.

These comparative data leads us to consider a certain relationship between dysphagia and the alterations found in the pulmonary auscultations, which suggests a possibility of occurrence of aspiration, and this is the group composed by adults older than 60 years.

We verify controversies in the literature regarding the use of cervical auscultation as an evaluation instrument, high level outcomes of sensitivity and specificity for clinical bedside evaluation for the deglutition disorders.

No studies were found relating the cervical and pulmonary auscultations, to which our study could be compared.

Our results show a strict relationship between the cervical and pulmonary auscultations, faced with the deglutition disorders. Such relationship must be better exploited because our sample presented a reduced size.

CONCLUSION

Our study establishes that, between the cervical and pulmonary auscultations, there is no relationship between the noises listened, even with the respiratory function as the basis and the evaluation region being close.

The results confirm the relationship between dysphagia and the pulmonary auscultation because our outcomes state the frequency of 100% of alteration in the pulmonary auscultation in the dysphagia pictures, at moderate to severe affection degrees, although we stand out that the group with such complication is composed by adults older than 60 years.

More studies must be availed concerning the use of such bedside evaluations of the cervical auscultation and comparisons between the noises listened.

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