

## Laryngotracheal Dyspnea, A New Classification.

Amourache Yacine<sup>1\*</sup>, M. Hachemi, N. Oukil, Y. Afri<sup>2</sup>,

<sup>1</sup>MD – PHD University Hospital Center Bab Eloued (Maillot) Algiers, ENT and cervico-facial surgery department University hospital center Bab Eloued Algiers, Faculty of medicine University of Algiers, ALGERIA.

<sup>2</sup>Mohamed Hachemi Lecturer University Hospital Center Bab Eloued (Maillot) Algiers, Yacine Afri Lecturer University Hospital Center Bab Eloued (Maillot) Algiers, Naila Oukil University hospital assistant professor of University Hospital Center Bab Eloued (Maillot) Algiers.

**\*Corresponding Author:** Amourache Yacine<sup>1\*</sup>, MD–PHD University Hospital Center Bab Eloued (Maillot) Algiers, ENT and cervico-facial surgery department University hospital center Bab Eloued Algiers, Faculty of medicine University of Algiers, ALGERIA.

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### Abstract:

#### Aim

Laryngeal and/or laryngotracheal dyspnea represents, especially by its severity, a real emergency that is sometimes life-threatening. The degree of severity of this dyspnea is of paramount importance. The classic classification stages dyspnea as mild, moderate or severe, some authors mainly consider the signs of severity of dyspnea. The aim of our work is to propose a clinical and decisional classification.

#### Patients and methods

This is a prospective study on patients with laryngeal or laryngotracheal dyspnea of any age, affecting both sexes. After a precise clinical evaluation of the dyspnea and the presence or absence of signs of severity or respiratory distress and depending on a possible etiological orientation, the dyspnea is staged and a therapeutic decision is made, according to the proposed classification (pre-established patient file).

#### Objective

The objective of this work is to improve the management of laryngotracheal dyspnea.

#### Results

According to the classification of laryngotracheal dyspnea proposed, there were 9 cases for STAGE I, 83 cases for STAGE II and 12 cases for STAGE III. For 9 cases (STAGE I), 6 emergency tracheotomies, 1 bilateral cordopexy and 2 unilateral cordopexy were performed. All other cases subsequently benefited from appropriate remote etiological treatment.

#### Discussion

Our results as well as our classification are discussed through a review of the international literature.

#### Conclusion

This new proposed classification of laryngotracheal dyspnea has improved our diagnostic strategy as well as our therapeutic decision, notably in relation to the time of intervention.

**Key Words:** laryngotracheal dyspnea, classification, management.

## Introduction:

Laryngeal and/or laryngotracheal dyspnea or so-called high breathing difficulty represents for any doctor and in particular emergency physicians, anesthesiologists-resuscitators and ENT specialists, especially by its severity, a real sometimes life-threatening emergency. This large and important symptom remains defiant and still causes serious deaths. It can be moderate or mild, but still worrying.

Determining the degree of severity of this dyspnea is of paramount importance in order to decide on an adequate and effective therapeutic attitude. Many authors who have published on laryngeal dyspnea, To appreciate the importance of dyspnea, consider above all the signs of severity of this dyspnea [1, 2, 3, 4, 5, 6], clinical pictures of dyspnea are evoked (severe, acute, subacute and chronic) [1] or clinical forms [4], but no classification has been reported.

The problem posed is that of establishing a classification that takes into account the definition, degree of severity and management of laryngotracheal dyspnea. Several search engines were searched, first Pub Med, with the keywords: laryngeal dyspnea-classification, laryngotracheal dyspnea-classification, the most relevant articles mainly report the classification of laryngotracheal stenosis. [7, 8, 9, 10, 11, 12].

The objective of our work is to establish a clinical and therapeutic classification in the context of a prospective study, with the aim of improving the management of laryngotracheal dyspnea with, in addition, an educational interest.

The management of these dyspnoea remains above all etiological [1, 2, 3, 4, 5, 6], with particular attention and specificity in children [5, 13, 14, 15, 16], because of the anatomical and pathological variations [5, 17, 18] but the opportune moment of intervention remains to be determined with sufficient precision, either in extreme urgency, or delayed [1, 2, 5, 6, 11, 12, 13, 19, 20].

Dyspnea may persist after treatment, but of lesser importance requiring reassessment and discussion on improving its management [21].

## Material And Method :

### Material

These are patients whose recruitment was carried out at the level of the ENT and cervico-facial surgery department of the CHU BEB EL OUED in the city of Algiers (Algeria) through the ENT consultation and the ENT emergency pavilion, presenting with laryngeal or laryngotracheal dyspnoea, of any age (adults and children), affecting both sexes, this is an unselected population. Excluded from the study were patients who presented with dyspnoea due to oropharyngeal and hypopharyngeal obstruction as well as dyspnoea affecting the lower respiratory tract (bronchopulmonary or of cardiac origin).

### Method

This is a prospective study, running from July 1, 2017 to December 31, 2019 (2.5 years) on patients with laryngeal or laryngotracheal dyspnea.

For this study, a classification (below) was developed, it includes 3 types or stages of dyspnea, (STAGE I, STAGE II, STAGE III) following a decreasing order of severity, and each stage is subdivided into 2 sub-stages (STAGE IA, STAGE IB – STAGE IIA, STAGE IIB – STAGE IIIA, STAGE IIIB).

### Classification Of Laryngotracheal Dyspnea

**STAGE I** Severe dyspnea with immediate or slightly delayed surgical indication (a few minutes to a few hours).

**STAGE IA** Dyspnea with signs of ARD, immediate indication for surgery: such as Heimlich maneuver, Intubation, Tracheostomy kit, Extreme emergency tracheostomy.

**STAGE IB** Dyspnoea without signs of ARD but with respiratory fatigue at rest, delayed indication for surgery (a few hours): such as: Tracheotomy, laser clearing (debulking), Cordopexy.

**STAGE II** Moderate dyspnea with indication for short-term surgery.

**STAGE IIA** Dyspnea present at rest tolerated but exacerbated with the slightest effort (dressing, washing, for the child: agitation, crying, effort when eating) fairly urgent indication for surgery (approximately one to 3 weeks), treatment of the cause.

**STAGE IIB** Dyspnoea absent at rest but appears with little effort (walking on the flat, household chores, for the child: agitation, crying) the indication for surgery fairly quickly (about 1 to 3 months), treatment of the cause.

**STAGE III** Dyspnea on exertion with indication for remote surgery.

**STAGE IIIA** Dyspnoea on exertion with respiratory fatigue on exertion (climbing stairs or slopes), indication for remote surgery (approximately 6 months), treatment of the cause.

**STAGE IIIB** Dyspnoea on exertion with respiratory fatigue on heavy exertion (light sporting activity), indication for surgery to be discussed depending on the cause and therapeutic limits.

This classification has been made available to ENT doctors (consultations and the ENT emergency department) in the form of a patient file including the number of the file, the date, the patient's surname, first name and age, as well as the cause of the dyspnoea, the treatment carried out and the time taken for treatment. For each patient, after a precise clinical evaluation of the dyspnea, according to its presence at rest with minimal or significant effort depending on the presence or absence of signs of severity or respiratory distress and depending on a possible etiological orientation, the dyspnea was staged and a treatment decision was made according to the proposed classification. The entry of the data notified on the patient file for each patient as well as the analysis of the results was carried out with the EXCEL software under Windows. The statistics are descriptive.

### Result :

Three types of essential results were noted, the first concerns the various dyspneic pathologies collected in number of cases (table 1).

Three types of essential results were noted, the first concerns the various dyspneic pathologies collected in number of cases (table 1).

**Table 1: Distribution of the number of cases according to pathology**

Pathology	Number of cases
Laryngeal diplegia	50
Laryngotracheal strictures	19
Laryngeal papillomatosis	14
Laryngeal malformations (Laryngomalacia Laryngeal palms)	10 (7 et 3)
Laryngeal cancers	10
Tracheal foreign body	1
Total	104

The second result concerns the number of cases and the type of pathologies found in adults and children (Table 2).

**Table 2: Distribution of cases by age (Adult / Child)**

Age	Number of cases	Pathology
Adult	73 cases	49 Laryngeal diplegia 10 tracheal stenosis 2 laryngeal strictures 10 laryngeal cancer
Child	31 cases	14 laryngeal papillomatosis 7 laryngomalacia 3 laryngeal webbing 5 tracheal stenosis 1 laryngeal diplegia et 1 tracheal foreign body
Total	104	

The third result concerns the distribution of cases (in type of treatment and the time to management based on the classification of pathologies and in number) according to the stage of dyspnoea, the of laryngotracheal dyspnoea (table 3).

**Table 3: Distribution of cases by stage of dyspnoea, treatment and time to management (according to the classification of laryngotracheal dyspnoea)**

DYSPNEA STAGE	Number of cases	Pathology	Therapeutic Decision Pick-up time
<b>STAGE I</b>	9 CASES		
<b>STAGE IA</b>	4	2 Laryngeal diplegia 1 laryngeal cancer 1 tracheal foreign body	immediate operative indication Tracheostomy (4)
<b>STAGE IB</b>	5	3 Laryngeal diplegia 2 laryngeal cancer	delayed surgical indication (a few hours) Cordopexy (3) Tracheotomy (2)
<b>STAGE II</b>	83 CASES		
<b>STAGE IIA</b>	37	21 Laryngeal diplegia 7 laryngeal cancer 5 laryngeal papillomatosis 2 laryngomalacia 2 laryngeal strictures	etiological treatment 1 to 3 weeks
<b>STAGE IIB</b>	46	17 Laryngeal diplegia 15 tracheal stenosis 9 laryngeal papillomatosis 5 laryngomalacia	etiological treatment 1 to 3 months

<b>STAGE III</b>	12 CASES		
<b>STAGE IIIA</b>	8	5 Laryngeal diplegia	adequate etiological treatment at a distance
		3 laryngeal webbing	
<b>STAGE IIIB</b>	4	2 Laryngeal diplegia	
		2 tracheal stenosis	

## Discussion

The term laryngotracheal dyspnea includes laryngeal and/or tracheal dyspnea forming part of so-called high dyspnea apart from obstructions of the oropharynx and hypopharynx. Knowing that laryngeal dyspnea is an inspiratory bradypnea and that tracheal dyspnea affects both breathing times [2]; this term was chosen because of mainly clinical criteria, because ultimately the stage of dyspnea is mainly linked to the severity criteria and the staging could be the same whether it is for laryngeal obstruction or tracheal obstruction or both at a time (same degrees of severity).

Regarding the classification of laryngeal or laryngotracheal dyspnea, when we were interested in this type of classification, we had to look for possible publications on this subject, so several search engines were questioned, first Pub Med, with the words keys: laryngeal dyspnea-classification, laryngotracheal dyspnea-classification, 53 results were found for the first and 18 results for the second; The most relevant articles mainly report the classification of laryngotracheal stenosis [7,8,9,10,11,12].

An extended search to MEDLINE (71 results) and google scholar (87 results), no article was retained, The classic classification stages dyspnea as mild, moderate or severe, a classification sometimes cited, is that of Chevalier Jackson and Pineau (Jackson and Pineau severity criteria divided into four stages).

Compared to dyspnea of cardio-pulmonary origin known as low and which are to be differentiated from high dyspnea, several classifications or evaluation scales have been established such as the classification of the NYHA (New York Heart Association) and the Sadoul scale.

Many authors who have published on laryngeal dyspnea, To appreciate the importance of dyspnea, consider above all the signs of severity of this dyspnea (duration of dyspnea greater than one hour, intensity of indrawing, superficial polypnea, signs of hypercapnia and hypoxia, hemodynamic and consciousness disorders) [1, 2, 3, 4, 5, 6 ], clinical pictures of dyspnea (severe, acute, subacute and chronic) are evoked [1, 3] or else clinical forms [4], but there has been no reported classification of dyspnea, nor in certain educational documents (courses and conferences at universities and colleges on high dyspnea).

For laryngotracheal stenosis, some authors report classifications linked to the site, Lano or McCaffrey classification [10] or to the importance (in percentage) of the stenosis, Myer-Cotton classification [10, 11, 12].

In this context, it seemed useful to establish and propose a classification which takes into account the definition, the degree of gravity and the management of this dyspnea, called clinical and therapeutic classification within the framework of a prospective study. , with the aim of improving the management of laryngotracheal dyspnea with, in addition, an educational interest.

Laryngeal dyspnea is a fairly frequent reason, whether in emergency or in ENT consultation [1, 5], it would be more frequent in adults than in children [2], on the other hand acute laryngeal dyspnea would be more frequent in children and chronic laryngeal dyspnea is more frequent in adults [3]. In our study, out of 104 cases, 73 cases in adults and 31 cases in children were counted for laryngeal or laryngotracheal dyspnea.

Namely that dyspneic inflammatory laryngeal pathology (acute laryngitis and laryngo-tracheitis) is almost completely taken care of at the level of the pediatric emergencies of our establishment.

For tracheobronchial foreign bodies, only one case of tracheal foreign body has been reported. Knowing that most tracheobronchial foreign bodies are directed and taken care of by a referral center, outside our establishment, in the capital of Algiers.

According to the etiological distribution, diplegia has been collected in adults, first, following laryngotracheal stenosis, then laryngeal cancers, while many authors [1, 2, 3, 4] report laryngeal cancer in first position.

In children, laryngeal papillomatosis is at the forefront, followed by laryngeal malformations (laryngomalacia and laryngeal webbing) then laryngotracheal stenosis.

For laryngeal malformations, laryngomalacia is reported as the first etiology [13,15]. Laryngeal papillomatosis is the most common benign tumor [1], tracheal or laryngotracheal stenosis is the most common cause of tracheal or laryngotracheal dyspnoea [7, 8, 9, 10, 11].

Regarding the results distributed according to the classification of laryngotracheal dyspnea, the latter allowed us to include the different cases of our series quite precisely at the level of the corresponding stages of dyspnea and with a management decision accordingly in relation to this stage of dyspnea.

We took into account the importance or degree of dyspnea as well as the therapeutic attitude, especially concerning the opportune moment to perform extreme emergency procedures or a fairly urgent, slightly delayed, or willingly remote intervention.

We staged this dyspnea in decreasing order of importance, stage I corresponds to so-called severe dyspnea involving the vital prognosis, we had 9 cases. For stage II corresponding to so-called moderate or average dyspnoea, which are the most frequent, we found 83 cases. For stage III corresponding to exertional dyspnea, 12 cases were recorded.

- Stage I is the most dreadful because it is the situation of extreme urgency, it is subdivided into stage IA and IB:

For stage IA, it is a dyspnea with signs of severity or acute respiratory distress for which the indication of surgery is immediate, we performed the tracheotomy for the 4 cases, i.e. two post-

thyroidectomy laryngeal diplegia operated in the visceral surgery department of our establishment, laryngeal cancer classified as T4 (TNM) with subglottic extension and a tracheal foreign body (Aboulker tube) in a child operated on for a laryngeal malformation, calibrated by this tube which migrated then to the trachea. For this stage, most authors insist on urgent management: Heimlich release maneuver, intubation, use of a tracheotomy or tracheotomy kit [1, 2, 3, 4, 5, 6, 13, 19].

For stage IB, dyspnea is present at rest with signs of fatigability and tendency to the installation of signs of gravity. For this stage, there is time for reflection, the indication for surgery can be postponed (a few hours) and we can allow ourselves to request an additional assessment quickly (such as imaging) for a precise diagnosis and management, adequate load, after discussion of the therapeutic indication. We listed 5 cases, three laryngeal diplegia for which cordopexy was performed, two unilateral and one bilateral and two laryngeal cancers each benefiting from a regulated tracheotomy after performing a CT scan within 6 to 12 hours.

For this stage IB, quite similar therapeutic attitudes are described in the literature such as cordopexy for laryngeal diplegia in closure [3], tracheostomy or laser tumor clearing for tumors (debulking) [1, 2].

- Stage II concerns so-called moderate or average dyspnoea, which are the most frequent (83 cases), also subdivided into 2 stages:

- For stage IIA, dyspnea is present at rest but appears at the slightest effort (dressing, washing), for the child (cries and crying or effort during feeding for the infant). For this stage, there is time for an additional assessment (imaging or other), but the indication for surgery must be fairly quick because there is a real handicap, a very poor quality of life and a risk of accentuation of dyspnea. The assessment must be as complete as possible, the diagnosis must be as precise and the treatment appropriate.

In the event of a lack of resources, the patient must be referred to fairly specialized structures (referral centres). We noted for this stage IIA 37 cases: 21 laryngeal diplegia, 7 laryngeal cancers, 5 laryngeal papillomatosis, 2 laryngomalacia and 2 laryngeal stenosis. The treatment was etiological within one to 3 weeks, it was carried out successively: posterior laser cordectomy including 5 cases with associated sub-arythenoidectomy for diplegia, 4 total laryngectomies and 3 organ preservation protocols (chemo -radiotherapy) for cancers of the larynx, laser peeling and spraying for laryngeal papillomatosis, laser section of the aryepiglottic folds for laryngomalacia and laser-associated microsurgery with placement of silastic for laryngeal stenosis.

For stage IIB, dyspnea absent at rest appears for a greater effort such as walking on the flat, for the child (cries and crying), we noted 46 cases: 17 laryngeal diplegia, 15 tracheal stenosis, 9 laryngeal papillomatosis and 5 laryngomalacia. For this stage, we were comfortable with the delay in treatment after diagnostic confirmation and appropriate therapeutic decision., the treatment was etiological within 1 to 3 months, it was carried out successively: a posterior cordectomy for diplegia, treatment by dilation and injection of corticosteroids locally for tracheal stenosis, of which 5 cases benefited from associated laser treatment (height of the stenosis equal to or less than 1cm), laser peeling and spraying for laryngeal papillomatosis and monitoring for laryngomalacia.

- Stage III corresponds to exertional dyspnea comprising 12 cases:

For stage IIIA, it is a question of an average effort (fast walking,

climbing stairs or slope), we noted for this stage 8 cases: 5 laryngeal diplegia having undergone a cordotomy in other structures, for which a posterior laser cordectomy was performed with sub-arythenoidectomy and 3 laryngeal (membranous) webs in children, they benefited from laryngeal microsurgery.

For stage IIIB, dyspnea is triggered by a fairly significant effort (such as light sporting activity), there were 4 cases: 2 laryngeal diplegia, 2 tracheal stenosis, whose diagnosis was known, these are patients already operated, for these cases the therapeutic indication was discussed with the patients according to the cause, the limits at the level of the means and the therapy. The 4 patients opted for monitoring and time for reflection.

The treatment concerning the different stages of dyspnea for stages II and III is consistent with the data in the literature where the treatment is mainly etiological for adults [1, 2, 3, 4, 7, 8, 9, 10, 11, 19] as well as in children [5, 12, 13, 14], for whom laryngotracheal stenoses remain marked by significant morbidity and mortality and whose surgical treatment can have a major impact on the development of laryngeal structures that can lead to the need for iterative gestures[12].

Certain pathologies can pass from one stage of significant dyspnea (stage I) to another in a decreasing order (stage II or stage III), after treatment, in particular for laryngeal papillomatosis, diplegia and laryngotracheal stenosis thus requiring a re- evaluation and further treatment [10, 21].

### Conclusion :

Our classification of laryngotracheal dyspnea allowed a differentiation into stages of degrees of severity as well as the evolutionary mode of dyspnea and to include different dyspneic pathologies at the level of the corresponding stages of laryngotracheal dyspnea, according to clinical and therapeutic criteria. It allowed on the one hand, to improve our diagnostic strategy as well as our therapeutic decision in relation to the time of intervention and the quality of the operative gesture and on the other hand, to know our limits in terms of expertise and means hence the interest of having a well-specialized team equipped with modern therapeutic means for convincing results both on the respiratory and phonatory levels.

This new classification could also have an interest in pedagogy and medical training and a practical utility in particular for ENT, emergency physicians and anesthesiologists-resuscitators.

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