

The Role of Awake Trans Nasal Esophagoscopy in Diagnosis of GERD in Infants with Laryngomalacia

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Abstract

Background: Laryngomalacia is the most common congenital anomaly causing stridor in infants.

Aim of Study: Was to evaluate Egyptian infants having laryngomalacia and presenting with feeding difficulties to assess the role of awake trans nasal esophagoscopy in diagnosis of GERD and compare the laryngoscopic and esophagoscopy findings in those with failure to thrive to those without failure to thrive to ascertain if severity of the symptoms in those infants influences the laryngeal picture and the esophageal function.

Patients and Methods: The study was conducted on 56 infants at the feeding and swallowing disorders clinic at the Phoniatic Unit, Cairo University Hospitals. They were selected from those who presented with inspiratory stridor and one or more symptoms of feeding difficulties. They were divided into Laryngomalacia cases with FTT and another group of laryngomalacia cases without FTT. History taking, laryngoscopic and awake trans-nasal esophagoscopy assessments were carried out for the two groups.

Results: Revealed that infants with FTT showed significant difference in some symptoms of feeding difficulties than those without FTT. There was non significant difference between the two groups regarding the laryngoscopic and the esophagoscopy findings.

Conclusion: Laryngoscopic findings don't change with the laryngomalacia severity. Laryngomalacia cases with feeding difficulties should be evaluated by both laryngoscopy and awake trans-nasal esophagoscopy.

Key Words: Laryngomalacia – Feeding difficulties – Failure to thrive – Laryngoscopic – Esophagoscopy assessment.

Introduction

LARYNGOMALACIA is the most common cause of stridor in infants and the most common congenital anomaly of the larynx [1,2]. It affects 50% to 75% of infants with stridor [2,3]. The stridor is

typically worse with agitation, crying, feeding, and supine positioning.

Patients with laryngomalacia can have feeding difficulty, failure to thrive, dysphagia, aspiration, apnea, cyanosis, reflux, obstructive sleep apnea, and pulmonary hypertension in severe cases [4,5].

The etiology of laryngomalacia is likely to be multifactorial. Anatomic, inflammatory, and neurologic factors are all contributing to the disease process [6,7]. Anatomic factors include abnormal prolapse of laryngeal tissue, associated with tissue redundancy causing supraglottic obstruction [8]. The cartilaginous theory suggests that immaturity of the laryngeal cartilage contributes to the obstruction [9]. Gastro esophageal reflux disease (GERD) is intimately associated with laryngomalacia and may play a role in the etiology of the disease [10,11]. The neurologic mechanism is best supported by the literature as the principal cause for laryngomalacia, including neuromuscular hypotonia and impaired neuromuscular control [12,13]. Thompson demonstrated that abnormal sensorimotor integrative function and laryngeal tone play an important role in the etiology of laryngomalacia [3].

The diagnosis of laryngomalacia is made with flexible fiberoptic laryngoscopy. Findings include collapse of the supraglottic structures during inspiration, leading to inspiratory stridor and airway obstruction, inspiratory prolapse of the arytenoid cartilages, redundant arytenoid mucosa, shortened aryepiglottic folds, and an “omega”-shaped or tubular epiglottis.

In infants with moderate-to-severe laryngomalacia, complementary gastrointestinal studies may be beneficial in prognosis and management. An esophagogram with small bowel follow-through

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is useful in evaluating reflux and aspiration along with ruling out containment gastrointestinal disorders such as pyloric stenosis. Aspiration during feedings can be evaluated by a videofluoroscopic swallow study or a functional endoscopic swallow study [4]. Twenty-four-hour pH studies and impedance studies may be useful in determining management strategies for the infant with severe reflux.

One of the alternatives for upper GI endoscopies is trans-nasal esophagoscopy. Although, it is an easy procedure to apply in the office, well tolerated and does not need sedation, it is not widely used by the phoniaticians in Egypt.

To our knowledge, there is no study investigated the role of trans nasal esophagoscopy as an easy tool administered in the office in evaluating the esophageal structure and function in cases of laryngomalacia manifesting with feeding difficulties. This raised the concern to evaluate its role in this common category of population.

The primary aim of this study was to evaluate Egyptian infants having laryngomalacia and presenting with feeding difficulties to assess the role of awake trans nasal esophagoscopy in diagnosis of GERD and compare the laryngeoscopic and esophageoscopic findings in those with failure to thrive to those without failure to thrive to ascertain if severity of the symptoms in those infants influences the laryngeal picture and the esophageal function.

We proposed the following hypothesis that infants with more severe symptoms of feeding difficulties presenting with failure to thrive will be more likely showing laryngeal and esophageal abnormalities.

Patients and Methods

The study was conducted on 56 infants seeking medical advice at the feeding and swallowing disorders clinic at the Phoniatic Unit, ENT Department, Cairo University Hospitals. They were selected from those who presented with inspiratory stridor and one or more symptoms of feeding difficulties. A careful interview and history taking were done for demographic data, age, sex, birth weight, current weight, natal and peri-natal history, and thorough analysis of the symptoms regarding onset, course, and duration, relieving and aggravating factors, any associated medical concerns or abnormalities of general status affecting weight gain and chest condition. The infants had no history of any accompanying neurological deficits, chro-

mosomal abnormalities or congenital heart disease. Clinical interview aimed at detecting the presence of symptoms of GERD such as dysphagia, poor suckling, vomiting and failure to thrive. According to the feeding difficulties, infants were grouped into infants with pre referral diagnosis of failure to thrive (24 infants) and those without pre referral diagnosis of failure to thrive (32 infants) in the pediatrics outpatient clinic.

Laryngoscopic examination was carried out using flexible nasolaryngoscopy. All the 56 infants received a diagnosis of laryngomalacia by two well trained phoniaticians based on the observed findings. Diagnosis depended on visualization of the larynx during respiration with video recording which was reviewed several times which allowed thorough recording of all the findings which supports diagnosis. Laryngoscopic findings that were present in all infants included:

- Anatomical changes in the larynx.
- Associated anomalies in the airway.
- Signs of gastro-esophageal reflux like posterior laryngeal and posterior pharyngeal wall congestion.
- Omega shaped epiglottis, short thickened aryepiglottic folds, redundant mucosal covering overlying arytenoids, edematous posterior glottis and airway narrowing on inspiration.

Infants were also assessed by the laryngoscopy for the presence of posterior glottis hyperemia, inter-arytenoids pachydermia, widening of post-cricoid area and regurge of secretions into hypopharyngeal inlet on straining.

Awake trans nasal esophagoscopy examination was done and the infants were assessed for signs of GERD in the form of presence of abnormality in the hypopharyngeal inlet, upper esophageal mucosal covering, lower esophageal mucosal findings, reflux of the gastric content at the lower esophageal sphincter and incompetent non reactive lower esophageal sphincter.

The infants were scored 1 for each symptom and for each finding in the laryngoscopic and esophagoscopy examination and scored 0 for absence of any symptom/laryngoscopic and esophagoscopy finding. After collecting the data, they were tabulated and statistically analyzed. The study was approved by the ethical committee of the department and was conducted in the period from January to June, 2018.

Results

The study was conducted on 56 infants seeking medical advice at the feeding and swallowing disorders clinic at the Phoniatic Unit, ENT Department, Cairo University Hospitals.

Statistical analysis was done using IBM® SPSS® Statistics version 22 (IBM® Corp., Armonk, NY, USA). Numerical data were expressed as mean and standard deviation or median and range as appropriate. Qualitative data were expressed as frequency and percentage. Chi-square test or Fisher's exact test was used to examine the relation between qualitative variables. All tests were two-tailed. A *p*-value <0.05 was considered significant.

In comparing the group with failure to thrive and those without failure to thrive regarding the presented feeding symptoms, infants with FTT showed significant dysphagia and more suckling symptoms than those without FTT.

In comparing the two groups regarding the laryngoscopic findings, no significant difference between the two groups was found

In comparing the two groups regarding the esophagosopic findings, it revealed no significant difference between the two groups.

Table (1): Comparison between the group with failure to thrive and those without failure to thrive regarding the presented feeding symptoms.

Esophagosopic findings	Laryngomalacia with FTT	Laryngomalacia without FTT	Sig.
Abnormal lower esophagus	15	21	0.809
Reflux of gastric content at the LES	15	21	0.809
Incompetent LES	9	13	0.813

LES: Lower esophageal sphincter. FTT: Failure to thrive

Table (2): Comparison between the group with failure to thrive and those without failure to thrive regarding the laryngoscopic findings.

Feeding symptoms	Laryngomalacia with FTT	Laryngomalacia without FTT	Sig.
Dysphagia	24	11	<0.001
Vomiting	19	20	0.179
Noisy breathing after feeds	22	23	0.065
Poor suckling	23	12	<0.001

FTT: Failure to thrive.

Table (3): Comparison between group with failure to thrive and those without failure to thrive regarding the esophagosopic findings.

Laryngoscopic findings	Laryngomalacia with FTT	Laryngomalacia without FTT	Sig.
Posterior glottis hyperemia	17	25	0.533
Interarytenoid packydermia	19	25	0.925
Widening of Post. cricoid	21	24	0.244
Regurge of secretions into hypopharyngeal inlet on straining	18	42	0.1

FTT: Failure to thrive.

Discussion

It was not until 1942 that the term 'laryngomalacia' was first used by Jackson and Jackson (Malaria is a Greek word that means morbid softening of part of an organ) [16] in describing the congenital laryngeal obstruction and the supraglottic collapse. Laryngomalacia has a disease spectrum that can be divided into mild, moderate, and severe categories [3].

These categories are not based on the quantity of stridor but rather by the associated feeding and obstructive symptoms. Those with mild disease usually have inconsequential inspiratory stridor. Those with moderate disease usually have stridor with feeding-related symptoms. The signs of severity include; poor weight gain (probably the most contributive element); dyspnea with permanent and severe intercostal or xyphoid retraction; episodes of respiratory distress; obstructive sleep apnea; and episodes of suffocation while feeding or feeding difficulties [9].

56 cases were examined in the current study and presented by airway symptoms and feeding difficulties secondary to laryngomalacia.

All the cases were presenting with feeding difficulties, given that swallowing interrupts breathing, infants with airway compromise or respiratory distress may not be able to safely coordinate sucking, swallowing, and breathing, leading to feeding difficulties such as dysphagia, and aspiration [17,18].

Among the cases in the current study, 24 infants (43%) had failure to thrive (severe cases) while 32 infants (57%) had feeding difficulties without failure to thrive (moderate cases). It is known that infants with moderate laryngomalacia present with

typical stridor and also, described by their caregivers as fussy and hard to feed. They have frequent feeding-associated symptoms of choking, regurgitation, and cyanosis during feeding. If not recognized and managed, feeding problems can lead to aspiration, weight loss, and laborious feedings.

This is in agreement with the facts that the increased metabolic demand of coordinating eating and breathing against the obstruction can be so severe that it results in weight loss and failure to thrive [19] and that the chronic airway obstruction induces an increase in the infant's energy expenditure, which, combined with feeding disorders, results in poor weight gain [9].

Comparison between the two groups of infants having laryngomalacia (Table 1) revealed that laryngomalacia cases with FTT have more significant dysphagia and poor suckling as symptoms of feeding difficulty while they showed noisy breathing after feeds and vomiting comparable to those laryngomalacia cases without FTT. Vomiting could be interpreted by the presence of GERD as will be discussed later in addition it can be interpreted by the assumption that aerophagia during feedings causes gastric distention leading to vagal reflexes followed by postprandial vomiting and regurgitation as explained by Hartl & Chadha [11].

Laryngomalacia has specific features of stridor. However, clinical diagnosis based on listening to the infant's breathing is not absolutely reliable [20] and must be confirmed by direct visualization of the larynx through flexible laryngoscopy. The positive diagnosis of laryngomalacia requires dynamic examination of the larynx in a conscious infant.

Visualization of more or less complete collapse of the supraglottis concomitant with stridor, during inspiration, which can obstruct visualization of the glottis with short aryepiglottic folds; anterior prolapse of the arytenoid cartilages and posterior prolapse of the epiglottis which can be curled up to form a tubular structure and described as omega shaped confirms the diagnosis of laryngomalacia as in agreement with other studies [21].

The two groups showed signs of GERD in the form of posterior glottis hyperemia, interarytenoid pachydermia, widening of post-cricoid and regurgitation of secretions into hypopharyngeal inlet on straining; with no significant difference. This goes with several authors who have reported that laryngomalacia is often associated with reflux [22,23,24] in the form of posterior laryngeal congestion and edema over the arytenoidal mucosa.

All the cases under study are having the same laryngoscopic findings; as mentioned above; although manifesting with two different grades of severity and that indicates that severity does not mainly depend on laryngoscopic finding.

The discrepancy showed between the severity of the symptoms and the appearance in laryngoscopy in the current study indicates the need to perform the investigations of GERD to the whole laryngomalacia cases or at least the categories of moderate and severe cases.

Screening of the esophagus in patients with GERD for associated disease has long been the standard of medical practice before the availability of transnasal esophagoscopy (TNE). Most physicians relied on barium esophagography to screen the esophagus for related disease because it was a relatively non-invasive method and sometimes relied on pH-esophageal manometry [25].

Transnasal esophagoscopy is a relatively new technology that has the additional advantages of allowing esophagoscopy to be performed in the office with the patient seated and not sedated.

All cases under study with and without FTT who underwent transnasal esophagoscopy have esophageal abnormality in the form of abnormal lower esophagus, reflux of gastric content at the LES and incompetent LES with no significant difference (Table 3).

The result in the current study did not go with our assumption that with increasing severity of the symptoms, the instrumental signs in both larynx and esophagus will increase as our results revealed the affection of esophagus to the same degree in both moderate and severe laryngomalacia cases. This confirms the need of proper GERD management to all cases of laryngomalacia with feeding difficulties not only for helping moderate cases not to progress into FTT but also because moderate cases have confirmed esophageal abnormality that needs management.

The current study shed light on the importance to use both laryngoscopy and transnasal esophagoscopy in examining the categories of moderate and severe laryngomalacia cases manifesting with feeding difficulties that will help confirming signs of GERD in those infants in the office and administer the proper therapeutic guidance.

Conflict of interest:

No conflict of interest was encountered in the current study.

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دور منظار المرئ الأنفى أثناء اليقظة فى تشخيص الارتجاع المعدى لدى رضع تلين الحنجرة

تلين الحنجرة من أشهر الحالات الخلقية المسببة لضيق التنفس لدى الأطفال وكان الهدف هو تقييم الرضع المصريين الذين يعانون من تلين الحنجرة والتعرض لصعوبات التغذية لقييم دور المنظار المريئ الأنفى فى تشخيص الارتجاع المعدى ومقارنة نتائج مناظير الحنجرة والمرئ عند هؤلاء الرضع الذين يعانون من فشل النمو والذين لا يعانون من فشل النمو للتأكد ما إذا كانت شدة الأعراض تؤثر على صورة الحنجرة ووظيفة المرئ.

وقد خضع ستة وخمسون رضيعاً فى وحدة اضطرابات التغذية والبلع بوحدة التخاطب فى مستشفيات جامعة القاهرة للدراسة. وقد تم اختيارهم ممن يعانون من صعوبة التنفس الشهيقى بالإضافة إلى عرض أو أكثر من أعراض صعوبات التغذية وتم تقسيم الحالات إلى مجموعتين. مجموعة تعاني من تلين الحنجرة وفشل النمو ومجموعة أخرى تعاني من تلين الحنجرة بدون فشل فى النمو وقد تم خضوعهم لجمع التاريخ المرضى ومناظير الحنجرة والمرئ الأنفى.

وقد أظهرت النتائج إختلافات ملحوظة فى رضع فشل النمو فى أعراض صعوبات التغذية عن نظائهم ممن لا يعانون من فشل النمو وأنه لا توجد إختلافات ملحوظة بين المجموعتين فى نتائج منظار الحنجرة والمرئ الأنفى.

الخلاصة أن نتائج المنظار الحنجري لا تتغير مع تغير شدة تلين الحنجرة وإنه من الضرورة أن يتم تقييم حالات تلين الحنجرة وصعوبات التغذية بمنظاري الحنجرة والمرئ الأنفى.