

# Otolaryngologic manifestation of gastroesophageal reflux in children

Ahmed Y. Al-Ammar, MD, FKSU.

## ABSTRACT

**Objective:** This study was performed to assess the role of gastroesophageal reflux (GER) in varieties of otolaryngologic dysfunction.

**Methods:** This study was carried out over a one year period, between January 1995 and January 1996, at Sainte-Justine Hospital, Montreal, Canada. Thirty-seven charts were examined for different variables including, symptoms, signs, dysfunction, investigations, treatment and outcome.

**Results:** In children with otolaryngologic manifestation of

GER, apnea and regurgitation were common presenting symptoms. Gastroesophageal reflux was also found to be more commonly associated with ear infection, adenoid hypertrophy, bronchial asthma and recurrent pneumonia.

**Conclusion:** Gastroesophageal reflux has complicated manifestations in otolaryngology that are difficult to prove. High index of suspicion is recommended in order to diagnose GER as a cause of some otolaryngologic dysfunction.

Saudi Med J 2003; Vol. 24 (1): 62-67

Gastroesophageal is one of the most frequent problems in pediatrics group. Its incidence is reported to range between 15-86% of children.<sup>1</sup> The male to female ratio is estimated to be 1.2:1.<sup>2</sup> The role of GER as a cause or a cofactor in many otolaryngologic disorders is still underestimated. One of the obstacles is to prove a cause and effect relationship between GER and these disorders. Gastroesophageal can be physiologic or pathologic.<sup>3</sup> This classification is based on whether the patient is symptomatic or not. Physiological regurgitation of gastric contents into the lower esophagus is normally found especially in postprandial periods. The pathological GER is usually more frequent, resulting in abnormal findings. Other way of defining physiological and pathological GER is based on the percentage of time at which esophageal pH is less than 4.<sup>3</sup> There is no general agreement regarding the percentage of time, however different studies have different criterias. More than 4% of the total pH monitoring time with pH of less than 4 can indicate

pathologic reflux.<sup>4,5</sup> It seems that most of GER occurs within 2 hours in the postprandial periods,<sup>6</sup> however, the pathological reflux is most pronounced in the asleep-fasted period.<sup>7</sup>

Euler-Byrne score of more than 50 is considered diagnostic of pathological reflux.<sup>8</sup> The score is calculated as  $x + 4y$ , where  $x$  equals the number of episodes in which the pH is less than 4, and  $y$  refers to the number of episodes that the pH is less than 4 for a duration of more than 5 minutes. On the other hand, silent GER, which is significant GER in absence of the classical gastroesophageal symptoms, should not be overlooked.<sup>3,9,11</sup> It has been hypothesized that it is the result of decreased or absence of acid sensitivity in the body of the esophagus.<sup>10</sup> The rate of silent GER with chronic respiratory manifestation is estimated to be between 17% and 60%.<sup>11</sup> Too many causes are known for GER that are based on alteration of antireflux barrier. These barriers include the lower esophageal sphincter, the intra-abdominal esophagus, gastric emptying, and the

From the Department of Otolaryngology, Faculty of Medicine, King Saud University, Riyadh, *Kingdom of Saudi Arabia*.

Received 28th May 2002. Accepted for publication in final form 10th October 2002.

Address correspondence and reprint request to: Dr. Ahmed Y. Al-Ammar, King Abdul-Aziz University Hospital, PO Box 61419, Riyadh 11565, *Kingdom of Saudi Arabia*. Tel. +966 (1) 4775735. Fax. +966 (1) 4775748. E-mail: ahmedalammar@hotmail.com

laryngeal competence. The reflux may occur as a result of increases intra-abdominal pressure or increase of negative intrathoracic pressure. Incompetence of lower esophageal sphincter can be caused by use of medication like, theophylline, beta agonists, and narcotics, also foods like, chocolate, fat, caffeine, alcohol, and nicotine.<sup>8,1</sup> Reflux may also occur as a result of anatomical abnormalities, like diaphragmatic hernia

The pathophysiology of GER in relation to the airways is not fully understood. It is thought that it affects the tissue by direct damage to its epithelial lining. However, it is not clear whether the damage is caused by the acid or the proteolytic enzymes that come with the reflux material.<sup>9</sup> The proenzyme (pepsingen) is converted to its active form (pepsin) at pH levels of less than 4, this is the reason to select pH of less than 4 as an indicator of GER episodes.<sup>9</sup> Studies of tracheal mucociliary flow in animal models demonstrated impairment of mucus transport capacity as consequence of GER.<sup>12</sup> Vagal reflex laryngobronchospasm originating from the lower esophagus is another mechanism that explains the airway symptoms.<sup>9,12-14</sup> Demonstration of acid reflux in the nasopharynx, may explain the rhinosinusitis and the otological problems that may be associated with it.<sup>9,14</sup> The otologic dysfunction is related to eustachian tube inflammation as a result of nasopharyngeal reflux, resulting in otitis media with effusion, that can change to bacterial acute otitis media (AOM).<sup>9</sup> Earache, on the other hand, could be the result of otitis media, or referred otalgia.<sup>5,9</sup>

The aim of this study is to highlight the manifestation of the GER in otolaryngology. And to construct a baseline of information regarding this problem, that can be utilized for better understanding of GER.

**Methods.** The files of 37 children, who underwent pH monitoring between January 1995 and January 1996, at Sainte-Justine Hospital, Montreal, Canada were reviewed. The Otolaryngologist requested pH monitoring for all of these children. The study evaluated signs, symptoms, and dysfunction that were associated with GER in children with otolaryngologic problems. All the patients were evaluated by pH monitoring for a period of 20-24 hours. Single-pH-probe was placed intraesophageal 4 cm above the lower esophageal sphincter. Confirmation of location was ascertain by chest radiograph. Probes were well tolerated and children were admitted to the hospital over night, and were allowed to feed based on their respective conditions. Spending more than 4% of that time with pH of less than 4, was considered to be diagnostic for pathologic reflux. The study group was divided into 2 subgroups: Group A; refers to children who were diagnosed to have pathologic reflux by pH monitoring regardless of other diagnostic tests being positive or negative (15 children). Group B; refers to children who were diagnosed to have pathological reflux by barium or fluoroscopy studies, but normal pH monitoring (7

children). Group C; refers to children who were excluded to have pathologic reflux by pH monitoring and barium or fluoroscopic studies (15 children).

**Results.** Two hundred and sixty-eight children underwent pH monitoring for variable indications. Pathological reflux was found in 101 patients, alkaline reflux accounted for 13 patients (13%) of the total refluxing patients. Thirty-seven (14%) children were sent for pH monitoring by an otolaryngologist to assess GER as a cause of their main problems. This was our study population. The male to female ratio was 1:1, and the age varied between a newborn and 18 years, with a mean age of 38 months. Pathologic reflux was very commonly associated with apnea and regurgitation (**Table 1**). Approximately 90% of the children, who presented with apnea associated with GER. Stridor was equally found in pathologic and non-pathologic reflux groups. Ear infection, adenoid hypertrophy, bronchial asthma, and recurrent pneumonia were commonly associated with pathologic reflux group compared to non-pathologic group. All the patients in the study group underwent pH monitoring. Fifteen patients (40%) manifested pathological reflux, only one patient had alkaline reflux (**Table 2**). Laryngo-tracheo-bronchoscopy was performed in 13 patients (35%) of the study group. Finding of erythema of arytenoids, interarytenoid region, posterior half of the vocal cords, as well as edema of the arytenoids may indicate presence of GER. Esophagoscopy was performed in 6 patients (16%) of the study group, all were normal except 2 patients in group B, one had esophagitis and the other had esophageal stenosis. Esophageal biopsy was carried out only for one patient in group C, the result was within normal. Polysomnogram was carried out in 8 patients (21%) of the study group. Two of them were carried out in conjunction with pH monitoring; there was no temporal relationship between occurrence of apnea and episodes of reflux. Barium study was carried out for 20 patients in the study group, 14 patient (70%) of them showed pathologic reflux. On the other hand barium fluoroscopy was carried out for 11 patients, 4 of them (36%) showed pathologic reflux. The treatment of the patients consisted of medical and surgical treatment (**Table 3**). Diet control and positioning of the patients were complimenting these 2 lines. The outcome of the treatment for group A and B is shown in (**Table 4**). The mean follow up period for the patients with pathological reflux was 19 months.

**Discussion.** Gastroesophageal reflux may be responsible for so many problems related to otolaryngology, with variable presentations. The symptoms that may be associated with it include; regurgitation that is reported to be present in 89% of children with GER.<sup>2</sup> Regurgitation was common finding in children with GER in this study. Dysphagia, burping, choking, failure to thrive, unusual posture and irritability

## Otolaryngologic manifestation of GER ... Al-Ammar

**Table 1** - Shows the number and percentage of patients with different clinical dysfunction in each group (N=37).

Dysfunction	Group A (15) n (%)	Group B (7) n (%)	Group A+B (22) n (%)	Group C (15) n (%)
Apnea	7 (46.6)	2 (28.5)	9 (40.9)	1 (6.6)
Stridor	6 (40)	4 (57.1)	10 (45.4)	8 (53.3)
Dysphonia	5 (33.3)	0	5 (22.7)	7 (46.6)
Cough	3 (20)	1 (14.3)	4 (18.2)	5 (33.3)
Regurgitation	4 (26.6)	4 (57.1)	8 (36.4)	4 (26.6)
Growth retardation	4 (26.6)	2 (28.5)	6 (27.3)	1 (6.6)
Ear infection	4 (26.6)	4 (57.1)	8 (36.4)	1 (6.6)
Adenoid hypertrophy	3 (20)	2 (28.5)	5 (22.7)	1 (6.6)
Tonsil hypertrophy\subglottic	2 (13.3)	1 (14.3)	3 (13.6)	0
Stenosis	3 (20)	1 (14.3)	4 (18.2)	0
Tracheomalacia	3 (20)	0	3 (13.6)	0
Laryngomalacia	1 (6.6)	3 (42.8)	4 (18.2)	1 (6.6)
Laryngitis	2 (13.3)	0	2 (9.1)	4 (26.6)
Sinusitis	1 (6.6)	1 (14.3)	2 (9.1)	0
Bronch. asthma	4 (26.6)	4 (57.1)	8 (36.4)	4 (26.6)
Pneumonia	2 (13.3)	4 (57.1)	6 (27.3)	1 (6.6)
Bronch. - bronchial				

**Table 2** - Shows the number and percentage of the patients in the study group who underwent different investigations.

Investigations	Group A (15) n (%)	Group B (7) n (%)	Group C (15) n (%)
pH, <4, for >4% of time	14 (93)	0	0
Alkaline pH of 7-8	1 (6.6)	0	0
Larungo-bronchoscopy	3 (20)	5 (71.4)	5 (33.3)
Esophagoscopy ± Bx	1 (7)	2 (28.6)	3 (20)
Polysomnogram	5 (33.3)	2 (28.6)	1 (6.6)
<b>Barium study</b>			
+ve for GER	8 (53.3)	6 (85.7)	0
-ve for GER	3 (20)	0	3 (20)
<b>Fluoroscopy study</b>			
+ve for GER	1 (6.6)	3 (42.83)	0
-ve for GER	3 (20)	0	4 (26.6)
GER - gastroesophageal reflux, Bx - biopsy, +ve - positive, -ve - negative			

**Table 3** - Shows the number and percentage of the patients in the study group according to the treatment modality.

Treatment modality	Group A (15) n (%)	Group B (7) n (%)	Group C (15) n (%)
Diet and positioning	15 (100)	7 (100)	0
Prokinetic agents	14 (93)	5 (71.4)	5 (33.3)
H <sub>2</sub> blockers	9 (60)	2 (28.6)	2 (15.4)
Antireflux surgery	4 (26.6)	3 (42.8)	0
Gastrostomy	1 (6.6)	2 (28.6)	0
H <sub>2</sub> - histamine blockers			

**Table 4** - Shows the outcome of treatment of pathologic reflux group (A+B).

Treatment	Diet, positioning and medical treatment n (%)	Antireflux surgery n (%)	Total n (%)
Improved	5 (23)	2 (9)	7 (32)
Partial improvement	4 (18)	4 (18)	8 (36)
No improvement	6 (27)	0	6 (27)
Lost to follow-up	3 (14)	1 (5)	4 (19)

are frequently encountered (**Table 1**). Heartburn, however, is not a common symptom in the pediatric population.<sup>3,9</sup> The rate of airway dysfunction that is associated with patients with GER is estimated to be around 30% of cases.<sup>8</sup> Hoarseness, globus sensation, repeated respiratory infection, coughing, snoring, central or obstructive apnea, disturbance of sleep, and halitosis are commonly found. Nielson et al<sup>4</sup> demonstrated an increase in the level of stridor 5-20 minutes after documenting the reflux by esophageal pH monitoring in 6 infants. They concluded that GER can cause continuous stridor that could be mixed with that caused by upper airway anomalies. Short episodes of inspiratory stridor could be the result of paradoxical vocal cord dysfunction caused by GER.<sup>15</sup> Fifty-five point five percent of the patients with stridor in our study group had pathological reflux. Walsh et al<sup>16</sup> studied the relationship of GER to obstructive and central apnea in 14 patients with pH monitoring and polysomnogram. They found no difference between the incidence of apnea at the time of GER episodes and the control episodes. There was no temporal relation in the majority of instances, between the occurrence of the apnea and GER episodes. Two of our patients were simultaneously studied by pH monitoring and polysomnogram, our results are in agreement with Walsh et al<sup>16</sup> regarding the lack of temporal relationship. However 90% of those who had apnea in our study group had pathological reflux. Gastroesophageal reflux may be implicated in cases of sudden infant death syndrome.<sup>14</sup>

Gastroesophageal reflux should be considered in otolaryngologic disorders that are reluctant to treatment, for example otitis media, rhinosinusitis, laryngotracheal, and lower respiratory disorders. Gastroesophageal reflux could be the underlying cause for any of these disorders, however this should not preclude search for common causes of these disorders as well as their treatment. High index of suspicion has to be practiced in order to diagnose GER as a possible cause for such problems (**Table 1**). Bronchoconstriction secondary to GER commonly occurs at night. Usually there is delay in esophageal clearance at that time.<sup>8,16</sup> Sixty-seven percent of the children, who had bronchial asthma, were found to have pathological reflux in our study. Laryngomalacia is suggested to have a strong correlation with laryngopharyngeal reflux, this is supported by the frequent pharyngeal reflux in these patients.<sup>13</sup> In our study 80% of the patients who were diagnosed to have laryngomalacia had pathologic reflux. Many of these children improve significantly as airway mucosal thickening resolves with pharmacotherapy for GER.<sup>17</sup> Neonatal esophageal perforation is reported to be associated with GER, however none of our patients had this complication.<sup>18</sup> There is no single diagnostic test for GER, however, a variety of tests are employed to assess its presence, severity, and whether it is responsible for the symptoms. The most frequent tests include esophageal pH monitoring, upper gastrointestinal series, nuclear scintiscan, esophagoscopy with or without

biopsy, bronchoscopy with or without aspiration for lipid-laden macrophages (LLMs), and modified Bernstein test.<sup>3</sup> The response of the symptoms to the treatment of GER may prove the cause-and-effect relationship.<sup>4</sup> **Table 2** shows the different tests employed to assess GER in our study. Combining pH monitoring with some of these previously mentioned tests was based on the main dysfunction the child presented with. Radiological tests include plain films and barium studies are mainly carried out to assess the reflux, as well to evaluate the anatomy and to exclude congenital anomalies, for example tracheo-esophageal communication, and hiatus hernia. Nuclear medicine scintiscans can detect delayed gastric emptying and gastric aspiration in tracheobronchial tree. However, it is of limited use in assessment of GER.<sup>11</sup> Normal esophageal mucosa can be seen in presence of significant GER.<sup>3,11</sup> However, esophagoscopy can demonstrate anatomical abnormalities beside esophagitis and esophageal erosion, this could be supplemented by esophageal biopsy. Meyers et al,<sup>2</sup> in their study evaluating the tests assessing GER, found that esophagoscopy is insensitive test. Forty-six percent of their patients with GER had normal esophagoscopy. They also found that esophageal biopsy has a high accuracy rate (95%) in predicting presence or absence of reflux. This is supported by Ferreira et al,<sup>19</sup> who suggested that esophagoscopy and biopsy should be the first procedure whenever there is a clinical findings of moderate to severe GER. Esophagoscopy was carried out for 6 patients in our study group, unfortunately only one of them had esophageal biopsy, which, was normal. Bronchoscopy is another direct diagnostic tool, where evidence of GER can be seen, and elimination of primary laryngotracheal physiological and anatomical abnormalities is carried out. Erythema of the arytenoids, interarytenoid region, posterior one half of the vocal folds, and trachea, or presence of interarytenoid mass are signs of GER. Thirteen patients in our study group underwent Bronchoscopy, that added to the accuracy of detecting laryngotracheal involvement. Tracheal aspiration of LLMs has gained popularity as a diagnostic tool of GER.<sup>3,9</sup> Its sensitivity in detecting GER is reported to be 85%.<sup>3</sup> Aspiration usually follows installation of 5 to 7 ml of saline into the subsegment bronchi. Then 100 macrophages are isolated after centrifugation and staining with oil red O to identify lipid. Lipid in the macrophages is graded from 0-4. Lipid score of more than 70 is an evidence of GER.<sup>8</sup> However GER is not the only condition responsible for the presence of LLMs, different irritative disorders can produce it.<sup>3</sup> No one in our study had this test carried out. The modified Bernstein test is a definitive proves of cause-and-effect relationship.<sup>3,8</sup> It depends on induction of airway symptoms such as bronchospasm or stridor by acidification of distal esophagus. Usually it is indicated if the standard diagnostic test fail to prove GER in presence of positive GER symptoms. No one in our study had this test. Prolonged esophageal pH monitoring

is the most practical and reliable test to diagnose GER with minimal side effects.<sup>3,9</sup> Normal gag reflex can occur with occasional vomiting during insertion of the probe, as well as the infrequent epistaxis and the potential risk of tracheal probe placement. Examination over a period of 24 hours is a good representative and comprehensive way for GER. However, there is controversy of standardization of the technique as well as the interpretation of the data.<sup>19</sup> The extraesophageal reflux may be underestimated by the esophageal probe alone. Pharyngeal pH monitoring has a high sensitivity in detecting reflux associated with laryngotracheal diseases, and when combined with esophageal pH monitoring, the specificity becomes higher.<sup>13,20</sup> Little et al<sup>13</sup> in their study of 222 children by double probe pH monitoring, found 76% of their study population had abnormal findings in either one or both of the pH probes. Forty-six of the children with abnormal test had pharyngeal reflux despite having normal result in esophageal probe. The normal pH values of the pharynx in children is unknown, this is due to ethical restriction prohibits access to healthy children. However, pharyngeal pH levels of less than 6 is postulated to be a potential irritant to the upper airway, and considered pathologic if the fraction of time spent is more than 1%.<sup>20</sup> Nasopharyngeal pH monitoring is also suggested to assess children with chronic rhinosinusitis and otitis media.<sup>14</sup> All of our patients underwent a single esophageal probe pH monitoring only.

Alkaline reflux can contribute for 12% of refluxing patients, 7% of the children in group A had alkaline reflux, however, it may not be detected by esophageal pH monitoring.<sup>3,19,21</sup> The incidence of esophagitis that is associated with alkaline reflux is almost the same as that caused by acid reflux, is reported to be around 73%.<sup>21</sup> It is caused by prolonged and repeated contact of the esophagus with bile acids and pancreatic enzymes. Other diagnostic tests may be helpful in detecting alkaline reflux. Simultaneous gastroesophageal pH monitoring is imperfect test, however, it is more reliable tool than the esophageal monitoring alone.<sup>21</sup> Evaluation by intraluminal impedance technique, that depends on measuring the change in electrical impedance in the lumen of the esophagus during the passage of a bolus, might improve the detection rate.<sup>6</sup>

It is recommended to exclude GER in some situation for example in preoperative assessment of cases with subglottic stenosis, and chronic sinusitis for functional endoscopic sinus surgery (FESS).<sup>3,11,12</sup> Also intubated patients in the ICU are more prone to have GER that predispose them to more severe laryngeal and tracheal complications observed after intubation.<sup>12</sup> The presence of GER in cases of post choanal atresia repair, is reported to be associated with repeated choanal granulation and stent occlusion.<sup>22</sup> The natural history of GER in pediatric population is benign, and is considered a self-limiting disorder. However its sequelae could be life threatening. Spontaneous remission usually occurs with maturation of the child, this is suggested to be as a

result of the child assuming an erect position.<sup>8,9</sup> It is reported that 60% of the patients with symptomatic GER improve at the age of 2 years, and 90% improve at the age of 4 years.<sup>18</sup> Different treatment modalities are used for GER that include positioning, dietary, medical, and surgical intervention. Positioning in prone-antitrendelenburg, alone is reported to be effective in 25% of infants.<sup>7</sup> Instructing the parents regarding the time of the last meal before the child goes to bed could be beneficial. Adding to them thickening of the milk for infants and elimination of caffeine for older children are usually the first line of treatment (**Table 3**). Prokinetic agents increase the rate of gastric emptying and the tone of the lower esophageal sphincter. Cisapride was the drug of choice prescribed for most of our patients. Cisapride, however, is associated with QTc prolongation, which resulted in its withdrawal from the market.<sup>23,24</sup> this resulted in an increase use of Metoclopramide.<sup>24</sup> Histamine blockers (H<sub>2</sub>) could be administered with prokinetic agents or alone. Cimetidine and ranitidine could reduce the parietal cell gastric acid secretion by 70%.<sup>8</sup> Usually they are reserved for persistent GER.<sup>3</sup>

Omeperazole is the most potent inhibitor of gastric acid secretion, can be used for a short time if prokinetic agent and H<sub>2</sub> blockers fail to control the reflux.<sup>8</sup> Forty-five percent improvement rate is reported for patients with upper airway manifestation of GER, that are treated medically, with one year follow-up.<sup>11</sup> **Table 4** shows the improvement rate for our patients with pathological reflux who were treated medically and or surgically. Surgery (Nissen fundoplication and gastropexy) can be indicated if the symptoms are intolerably severe or persistent despite compliance with medical treatment.<sup>11,25</sup> On the other hand surgery can be the first line of management in life threatening airway situation.<sup>3</sup> The mean follow-up period was 19 months for all the different treatment groups.

In conclusion GER has complex manifestations in otolaryngology that are difficult to prove. The clinician needs to have high index of suspicion regarding the possibility of GER being the underlying cause. In this paper, children were sent for assessment of GER for different otolaryngologic indications, our results and interpretations are limited to the manifestation of GER within children having otolaryngologic complaints. A prospective well-controlled study will be more beneficial to study the relationship of GER to otolaryngologic disorders.

## References

1. Bain WM, Harrington JW Thomas LE, Schaefer SD. Head and Neck manifestations of Gastroesophageal reflux. *Laryngoscope* 1983; 93: 175-179.
2. Meyers WF, Roberts CC, Johnson DG, Herbst JJ. Value of Tests for evaluation of Gastroesophageal reflux in Children. *J Pediatr Surg* 1985; 20: 515-520.
3. Burton DM, Pransky SM, Kearns DB, Katz RM, Seid AB. Pediatric airway manifestations of Gastroesophageal reflux. *Ann Otol Rhinol Laryngol* 1992; 101: 742-749.

4. Nielson DW, Heldt GP, Tooley WH. Stridor and Gastroesophageal reflux in infants. *Pediatrics* 1990; 85: 1034-1039.
5. Gibson WS, Cochran W. Otolgia in Infants and Children – a manifestation of Gastroesophageal reflux. *Int J Pediatr Otorhinolaryngol* 1994; 28: 213-218.
6. Skopnik H, Silny J, Hieber O, Schulz J, Rau G, Heimann G. Gastroesophageal reflux in Infants: Evaluation of a New Intraluminal Impedance Technique. *J Pediatr Gastroenterol Nutr* 1996; 23: 591-598.
7. Vandenplas Y, Deneyer M, Verlinden M, Aerts T, Sacre L. Gastroesophageal reflux incidence and Respiratory Dysfunction during sleep in Infants: Treatment with Cisapride. *J Pediatr Gastroenterol Nutr* 1989; 8: 31-36.
8. Bauman NM, Sandler AD, Smith RJH. Respiratory manifestations of Gastroesophageal reflux Disease in Pediatric patients. *Ann Otol Rhinol Laryngol* 1996; 105: 23-32.
9. Contencin P, Maurage C, Ployet M, Seid AB, Sinaasappel M. Symposium Gastroesophageal relax and ENT disorders in childhood. *Int J Pediatr Otorhinolaryngol* 1995; 32: 135-144.
10. Rival R, Wong R, Mendelsohn M, Rosgen S, Goldberg M, Freeman J. Role of Gastroesophageal reflux disease in Patients with Cervical Symptoms. *Otolaryngol Head Neck Surg* 1995; 113: 364-369.
11. Barbero GJ. Gastroesophageal reflux and upper airway disease. *Otolaryngol Clin North Am* 1996; 29: 27-39.
12. Gaynor EB. Gastroesophageal reflux as an etiologic factor in Laryngeal complications of Intubation. *Laryngoscope* 1988; 98: 972-979.
13. Little JP, Matthews BL, Reboussin DM, Glock MS, Loughlin CJ, Koufman JA. Extraesophageal Pediatric reflux: 24-Hours double-probe pH monitoring of 222 Children. *Ann Otol Rhinol Laryngol Suppl* 1997; 169: 1-16.
14. Contencin P, Narcy P. Nasopharyngeal pH monitoring in Infants and Children with chronic rhinopharyngitis. *Int J Pediatr Otorhinolaryngol* 1991; 22: 249-256.
15. Heatley DG, Swift E. Paradoxical vocal cord dysfunction in an infant with Stridor and Gastroesophageal reflux. *Int J Pediatr Otorhinolaryngol* 1996; 34: 149-151.
16. Walsh JK, Farrell MK, Keenan WJ, Lucas M, Kramer M. Gastroesophageal reflux in Infants: Relation to apnea. *J Pediatr* 1981; 99: 197-201.
17. Yellon RF. Update on the Effects of Gastroesophageal Reflux Disease on Otolaryngologic Disorders in Infants and Children. *Advances in Otolaryngology-Head and Neck Surgery* 2000; 14: 57-73.
18. Kimura K, Kubo M, Okasora T, Eto T, Tsugawa C, Matsumoto Y. Esophageal perforation in a Neonate associated with Gastroesophageal reflux. *J Pediatr Surg* 1984; 19: 191-193.
19. Ferreira C, Lohoues MJ, Bensoussan A, Yazbeck S, Brochu P, Roy CC. Prolonged pH monitoring is of limited usefulness for Gasroesophageal reflux. *AJDC* 1993; 147: 662-664.
20. Contencin P, Narcy P. Gastroesophageal reflux in Infants and Children A Pharyngeal pH monitoring study. *Arch Otolaryngol Head Neck Surg* 1992; 118: 1028-1030.
21. Tovar JA, Wang W, Eizaguirre I. Simultaneous Gastroesophageal pH monitoring and the diagnosis of alkaline reflux. *J Pediatr Surg* 1993; 28: 1386-1392.
22. Beste DJ, Conley SF, Brown CW. Gastroesophageal reflux complicating Choanal atresia repair. *Int J Pediatr Otorhinolaryngol* 1994; 29: 51-58.
23. Magill-Lewis J. KO'ing QT syndrome. *Drug Topics* 2001; 145: 53-58.
24. Glessner MR, Heller DA. Changes in related drug class utilization after market withdrawal of cisapride. *American Journal of Managed Care*
25. Koufman JA. The Otolaryngologic manifestations of Gastroesophageal reflux Disease: A clinical investigation of 225 Patients using Ambulatory 24-Hour pH monitoring and an experimental investigation of the role of Acid and Pepsin in the development of Laryngeal injury. *Laryngoscope* 1991; 101: 1-78.

### Related Abstract

#### Source: Saudi MedBase



Saudi MedBase CD-ROM contains all medical literature published in all medical journals in the Kingdom of Saudi Arabia. This is an electronic format with a massive database file containing useful medical facts that can be used for reference. Saudi Medbase is a prime selection of abstracts that are useful in clinical practice and in writing papers for publication.

#### Search Word: gastroesophageal reflux

- Authors:** K. A. Gawad, C. Bloechle, T. Strate, A. Bassas, A. Emmermann, C. Zornig  
**Institute:** University Hospital Eppendorf, Hamburg, Germany  
**Title:** Effective treatment of symptomatic gastroesophageal reflux disease by laparoscopic fundoplication  
**Source:** Saudi Med J 1999; Vol. 20 (9): 682-686

#### Abstract

**Objective:** To evaluate the outcome of our initial experience with laparoscopic fundoplication. **Methods:** Surgery was indicated if reflux disease was confirmed and more than 6 months of conservative treatment had failed. Nissen fundoplication was applied as the standard procedure, however, if motility disorders of the esophageal body were present partial Toupet fundoplication was performed. **Results:** Sixty-seven patients with a median age of 51 (27-78) years were treated with laparoscopic fundoplication. Patients reported typical complaints for 7 (0.5-50) years. Endoscopy revealed 58 patients with esophagitis. At manometry, the median resting pressure of the lower esophageal sphincter was 3 mm Hg (normal: 6-25 mm Hg). pH-monitoring confirmed significant reflux with a median preoperative DeMeester score of 53.9 (normal: < 14.7). Median operation time was 105 (50-230) minutes. Conversion was necessary in 2 (3%) patients. Postoperative hospital stay was 4 (2-20) days. Mortality was 0%. The first 34 patients were followed retrospectively, all others prospectively. At follow-up 14 (0.5-66) months 95% of patients were symptom free and satisfied with the procedure including 3 patients who were reoperated laparoscopically for recurrent disease. **Conclusion:** Laparoscopic fundoplication can effectively treat gastroesophageal reflux disease. It can be performed safely with minimum patient discomfort.