

Impact of laparoscopic anterior 270° fundoplication on the quality of life and symptoms profile of neurodevelopmentally delayed versus neurologically unimpaired children and their parents

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Abstract

Background This prospective study investigated the therapy-induced changes in the quality of life (QoL) experienced by neurologically healthy and neurodevelopmentally delayed children and their parents after laparoscopic anterior 270° fundoplication (LAF).

Methods In this study, 40 patients (21 impaired) with a mean age of 7.8 years underwent LAF for gastroesophageal reflux disease (GERD) and were evaluated before surgery and then 3 and 6 months afterward using the Gastrointestinal Quality-of-Life Index (GIQLI) supplemented by conventional symptom markers.

Results Growth, proton pump inhibitor use, and frequency of supraesophageal/respiratory symptoms improved significantly ($p < 0.001$) as did feeding parameters ($p < 0.05$). The global GIQLI score improved by $49 \pm 21\%$ ($p < 0.001$). The greatest improvement occurred in the symptoms domain ($p < 0.001$). However, positive alterations also were found in the dimensions of emotions (58%), social functions (37%) and physical functions (27%) ($p < 0.001$). Comparison of the overall benefit did not show any differences between the subgroups of neurologically fit and impaired children. However, for the child-centered symptoms domain, the benefit increased stepwise with the degree of impairment. This was counterbalanced by an inverse relationship for the parent-centered emotions domain ($p < 0.05$).

Conclusions Besides the known improvement in symptoms, LAF achieves a significant improvement in QoL for

children and their parents. There is no overall difference in the benefit experienced by neurologically impaired and healthy children.

Keywords Children · Laparoscopic fundoplication · Neurologically impaired · Parents · Quality of life

Fundoplication is one of the most common laparoscopic operations in pediatric surgical units [1]. However, ongoing discussion focuses on whether surgery is the optimal option for gastroesophageal reflux disease (GERD) in children [2]. Studies comparing the results between medical and surgical treatment of the condition are lacking.

Although GERD affects the quality of life (QoL) experienced by patients, studies on the outcome of antireflux procedures have focused mainly on physiologic parameters [3]. These studies have been supplemented by unstructured recordings of the symptoms [4] or unstructured estimations of QoL [5]. Using this approach, a poor correlation between symptoms and the results from “objective” investigations of patients with GERD has been reported [6–8]. Systematic, proper reviews of QoL both before and after fundoplication have been published for adults but are not available for children (Table 1).

In adults, GERD etiology is strongly linked to excess. Obesity, alcohol, and medications are among the major adult pathogenetic factors.

Conversely, in infants, spontaneous reflux due to anatomic variations and mental handicap are the two most important causes of GERD. It is thus obvious that the pediatric spectrum of GERD-associated symptoms and complaints differs both pre- and postoperatively from that for adults [2] and warrants a separate investigation. Moreover, refluxing children show a high prevalence of

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Table 1 Studies of pre- and postfundoplication quality of life (QoL) (2000–2009)

Author Type of study	Patients ^a Type of wrap Follow-up time	QoL-Instrument Data collection	Result/comment
Slim et al. [23] Prospective	50 adults Toupet, lap 1 year	GIQLI Telephone, mail	Heartburn and regurgitation improve towards the results of the healthy controls standard; dysphagia and gas bloat remain below healthy control
Kamolz et al. [29] Prospective	175 adults Toupet, Nissen, lap 3 years	GIQLI	Mean preoperative score of 90.4 normalized to >120 points and remained constant
Velanovich [24] Prospective	290 adults Nissen/Toupet, open + lap 29 months	GERD HRQ SF-36 Telephone	QoL instruments are predictive tools for outcome assessment
Dallemagne et al. [21] Retrospective	65 adults Nissen, Toupet lap 10 years	GIQLI Not quoted	Those who obtained good symptoms control at 5 years keep it at 10 years postoperatively
Woodcock et al. [8] Randomized Prospective	40 adults Nissen/Thal, lap 24 months	SF-36, IBQ Mail	Improvements occur early. Nissen vs. Thal: advantage in the Thal group (i.e., for physical and social functions), but this equals at 2 years postoperatively
Zeman & Tihanyi [22] Prospective	41 adults Nissen, Toupet, lap 3 years	QOLARS Interview, mail, telephone	Preoperative QoL scores may predict outcome
Balci & Turkcapar [17] Prospective	60 adults Nissen/mesh, lap 6 months	GERD HRQ SF 36 Personally	Improvement ($p < 0.001$) in all domains; the new onset symptoms—gas bloating and dysphagia—decrease with time
Srivastava et al. [25] Prospective	26 neurologically impaired children Nissen, open + lap 1 month	SF-36 Wee-FIM CHQ-PF 50 Mail	QoL of parents: no improvement QoL of patients: strong improvement

^a No. of patients with complete pre- to postoperative data sets

GERD gastroesophageal reflux disease, SF-36 Short-Form 36, IBQ illness behavior questionnaire, lap laparoscopically

neurodevelopmental delay. Because such delay itself also strongly influences the reflux pattern [9], it needs to be considered in the evaluation.

Gastroesophageal reflux disease in a child affects the QoL of the child's parents. The reaction of parents to their sick and perhaps neurologically impaired child involves feelings of anger, guilt, frustration, and self-blame [10]. These feelings together with practical and organizational issues merit consideration when the success of laparoscopic fundoplication in children is reviewed.

We hypothesized that laparoscopic anterior 270° fundoplication (LAF) improves QoL after a period of adaptation and that, as some authors [2] suggest, neurodevelopmentally delayed patients may benefit more from surgery than otherwise healthy patients. This study aimed to identify which specific QoL items and dimensions improve, remain constant, or deteriorate after surgery, and thus to determine

when fundoplication is indicated and when it is not. In addition, we aimed to determine the therapy-induced changes in the QoL of the caregivers. Because of a renewed trend toward medical therapy for the neurologically healthy children with GERD and because it has been stated that surgical therapy is mainly for the neurodevelopmentally delayed children [2], we analyzed the QoL outcome for these two groups separately.

Patients and methods

All pediatric patients with GERD who underwent LAF [11] from March 2001 to March 2006 at our institution were included in a prospective study investigating their symptomatic outcome and QOL. The Hannover Medical School (MHH) Ethical Committee approved the study. Evaluations

were performed before surgery, then 3 and 6 months afterward. The operations were performed by seven surgeons, each of whom had experience with more than 300 laparoscopic procedures.

Complete follow-up data sets could be obtained for 40 (53%) of 76 patients. Consequently, 36 patients were excluded from the study, including 3 patients who died of handicap-related causes (left heart hypotrophy, myelodysplasia, tracheal stenosis/cannula dislocation) 2 months postoperatively and 8 patients lost to follow-up evaluation.

All data collection was accomplished by personal interviews. No questionnaires were sent by mail. Patients with incomplete data sets (one or more missed evaluation visits) were strictly excluded ($n = 25$). The cohort characteristics of the included patients are summarized in Table 2. None of these characteristics differed significantly between the included and excluded patients.

The included patients were assigned to the following three groups according to their neurologic status [12]: otherwise healthy ($n = 19$), moderately impaired neurologically ($n = 8$), and severely impaired neurologically ($n = 13$). Of these 40 patients, nourishment was oral for 27 patients (66%), via a percutaneous gastrostomy (PEG) for 8 patients (21%), orally and via PEG for 2 patients (5%), and via a nasogastric tube (NGT) for 3 patients (8%).

Table 2 Patient characteristics ($n = 40$)

Description	Total (n)	Neurologically impaired (n)	Neurologically healthy (n)
Male/female	13/ 27	4/17	9/10
Age (years)			
<1	12	5	7
1–5	11	7	4
5–10	6	3	3
>10	11	6	5
Esophagitis ^a	17	6	11
Insufficiency of the cardia in gastrografin study (GS)	21	8	13
Gastric herniation in GS	16	3	13
Reflux in GS	37	16	21
Recurrent bronchitis ^b	23	15	8
Recurrent pneumonia ^c	17	13	4
Vomiting	36	19	17
Tetraparesis	11	11	–
Epilepsy	15	13	2
Postasphyxia/ postneurotrauma	13	9	4

^a Erosions in the distal esophagus

^b More than two recurrences of acute bronchitis, with fever and coughing requiring antibiotic treatment

^c Confirmed by chest X-ray

The preoperative workup for all the patients included patient history and examination, gastric emptying scintigraphy/ultrasonography, and upper gastrointestinal radiograph. Insufficiency of the cardia was defined as a significant amount of gastrografin in the lower third of the esophagus, gastrografin above the lower third of the esophagus, or both. The presence of GERD was confirmed by pH-metry according to standard protocols [13, 14]. Gastroscopy/bronchoscopy with biopsy and chest X-ray were optional.

Symptoms

Evaluation of the patient's symptoms was performed according to the eating habits criteria of DeMeester et al. [15]. Medications and related pathology, such as pneumonia (defined by positive chest X-ray results) and bronchitis (defined by upper airway infection requiring antibiotic treatment), were recorded.

Quality of life

All interviews were conducted in the presence of the patient and parents as well as two researchers not involved in clinical tasks. The parents answered the questions for their children younger than 8 years of age and those who were neurologically impaired. Older children accounted for themselves. The overall self-rating of the QoL for the parents and child was done by the parents on a 5-point visual analog scale.

For a more detailed evaluation, the Gastrointestinal Quality-of-Life Index (GIQLI) [16] was used. The authors modified the GIQLI slightly for pediatric use by replacing some patient-orientated items difficult to evaluate for children (i.e., inquiries about sexual life) or irrelevant (i.e., blood in the stool) with parent- and family-centered and GERD-specific items.

The GIQLI relies on 5-point discontinuous Likert scales. It explores 36 items redistributed to the following four main dimensions: symptoms and disease-specific items (pain, choking, salivation, vomiting, coughing, sweating, pallor, agitation and meal dependency of these), emotions and psychological items (pleasure with child, parental despair, frustration about child's situation, frustration about the parents' own situation), physical functions items (parent fatigue, parent stress coping capacity, child care), and social functions items (time for family activities, negative influence on family life, self-estimation of the parents' QoL, parents' estimation of the child's QoL).

Each of the questions was scored from 0 (deleterious state) to 4 (fully normal state): the higher the rating, the better the quality of life. The results were broken down into solitary domains or items, and summary data were normalized to the 5-point Likert scale for comparability.

Statistical methods

The Wilcoxon test was used for longitudinal intragroup evaluations of nonparametric GIQLI-data, whereas intergroup comparisons at 0, 3, and 6 months were ranked according to Mann–Whitney. The paired *t*-test was used for parametric symptoms data. Power analysis was performed with nQuery (<http://www.statsol.ie>).

Results

Nutrition and thrive parameters and general symptoms

All nasogastric feeding tubes had been replaced by PEGs. Otherwise, the nutrition pattern remained unchanged.

For all the children, the percentiles for weight rose from the average values of 4.2 ± 4.2 preoperatively to 4.9 ± 4.0 at 3 months and to 5.9 ± 4.2 at 6 months postoperatively ($p < 0.05$ vs. preoperative). The otherwise healthy children started preoperatively at higher weight percentiles than the children with severe neurologic impairment (6 ± 4 vs. 2.8 ± 3.4 ; $p < 0.05$ for the intergroup difference). At 6 months postoperatively, the neurologically healthy children had a moderate weight gain, whereas the weight gain for the children with severe neurologic impairment was relatively more pronounced (7.6 ± 4.2 vs. 4.7 ± 4.2). However, this intergroup difference was not significant ($p > 0.05$).

For height (all children), the respective percentiles were 4.4 ± 3.3 preoperatively, 4.5 ± 3.1 at 3 months, and 5.3 ± 3.4 at 6 months postoperatively ($p > 0.05$). There were no statistically significant intergroup differences (data not shown).

All the general symptoms presented in Table 3 showed significant improvement. Most parameters improved slightly more for the neurologically impaired children than for the neurologically healthy children, but this difference remained statistically insignificant.

With respect to the time course of the changes, it can be noted that no statistically significant evolution of the

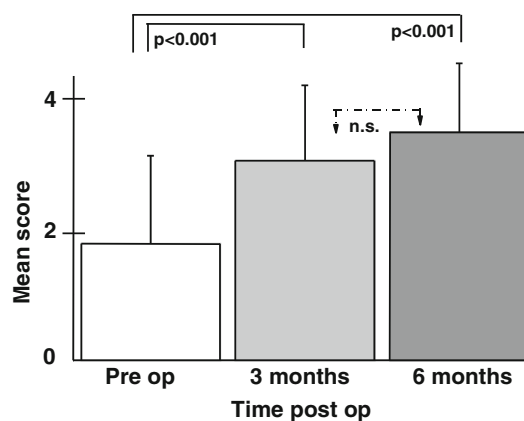


Fig. 1 Time-resolved evolution of a score for key items representative of different dimensions (salivation, vomiting, pain, parental frustration) for 40 patients preoperatively (white) and at 3 and 6 months postoperatively (grey/black). The horizontal arrows denote significance along the time axis. There was no significant evolution from 3 to 6 months postoperatively

general symptoms or QoL items occurred between 3 and 6 months postoperatively (Fig. 1). Therefore, except for the aforementioned thrive parameters, the 3-month postoperative data are not presented.

Quality of life

The QoL of the parents, self-rated on a visual analog scale, evolved from 1.8 ± 1.2 preoperatively to 3 ± 1.1 postoperatively ($p < 0.05$). The corresponding values for the children were 1.9 ± 0.8 and 3.2 ± 0.8 ($p < 0.01$). The global GIQLI score evolved from 72 ± 28.8 preoperatively to 120.6 ± 30.2 postoperatively ($p < 0.001$).

For easier understanding and comparability of the different dimensions and items (i.e., from pre- to postoperatively), the summarized results were divided by the number of items. Thus, all the following results are rated on the easy-to-understand 5-point Likert scale: the higher the rating the better the result.

Figure 2 displays the overall results, which show an 87% increase in the overall GIQLI score, accounted for mostly by symptoms and emotions. The most important

Table 3 Therapy-induced evolution of selected items (median and standard deviations)

Item	Global preoperatively	At 6 months postoperatively	<i>p</i> Value–longitudinal
Proton pump inhibitor (mg omeprazol/day)	18.4 ± 14	1.6 ± 4.8	<0.001
No. of bronchitis episodes ^a	1.6 ± 2.1	0.9 ± 1.6	<0.001
Pneumonias ^a	1 ± 1.7	0.4 ± 1.1	<0.001
Necessity of elevated posture	22/40	9/40	
Tolerated volume per serving orally (ml)	166 ± 54	239 ± 52	<0.001
Duration of meal orally (min)	30 ± 15	26 ± 16	<0.05
Tolerated volume per serving via PEG (ml)	99 ± 44	157 ± 61	<0.05

PEG percutaneous gastrostomy

^a During the previous 6 months

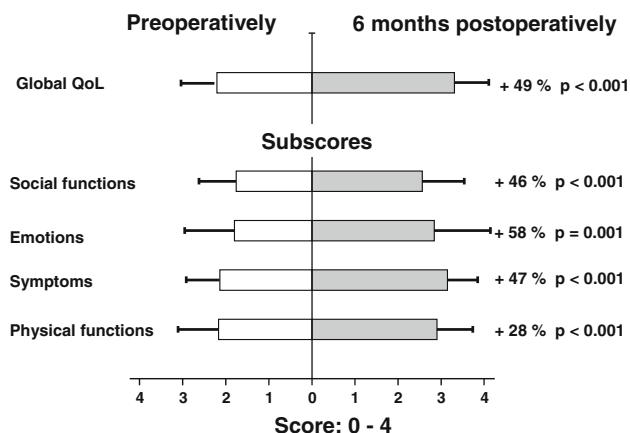


Fig. 2 Changes in the overall Gastrointestinal Quality-of-Life Index (GIQLI) score and its dimensions due to laparoscopic hemifundoplication for 40 patients. The preoperative GIQLI score and its four main dimensions are displayed to the left of the y-axis. A score of 4 represents the highest obtainable value on the discontinuous 5-point Likert scale. The percentage values indicate the improvement relative to the preoperative status

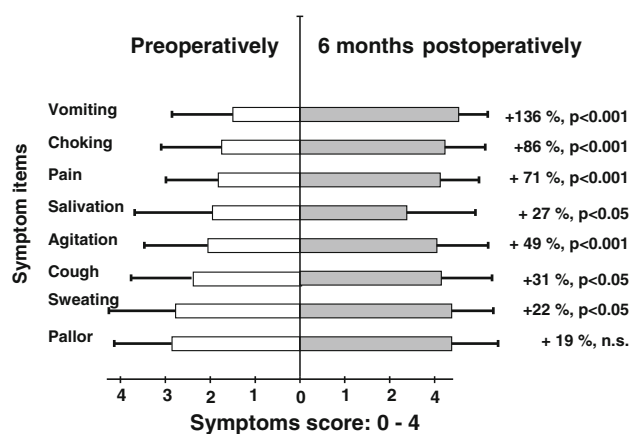


Fig. 3 Positive evolutions in the Gastrointestinal Quality-of-Life Index (GIQLI) dimension of symptoms for 40 patients

changes in the symptom items are broken down in Fig. 3. Vomiting, choking, agitation, and pain improved the most. The so-called “new-onset” symptoms [17] (dysphagia and bloating) did not increase significantly (2.2 ± 0.8 preoperatively to 2.0 ± 0.7 and 3.0 ± 1 to 2.9 ± 2 postoperatively). Figure 4 displays the parent-centered dimensions. There were significant positive alterations especially concerning the level of despair and frustration about the child’s illness and the parent’s own leisure time.

The analysis of the neurologically impaired and neurologically healthy children showed that both groups had an equal overall QoL benefit from the operation: 1.8 ± 0.9 (preoperatively) to 3.3 ± 0.8 (postoperatively) for the normal children versus 1.5 ± 0.8 to 3.1 ± 0.8 for the neurodevelopmentally delayed children ($p > 0.05$). However,

there were differences in the particular dimensions. For the child-centered symptoms dimension, the benefit was correlated with the degree of neurologic incapacitation. The absolute improvement throughout all the functional groups was constantly about 1 point on the Likert scale (± 0.6), but the preoperative score was lower for the neurologically incapacitated children than for the otherwise healthy children. Thus, the relative benefit increased proportionally to the degree of handicap ($p < 0.05$, Fig. 5A).

The resolution of this analysis can be enhanced further to the key items. For salivation, a relative benefit of 6% is shown for the neurologically healthy children (absolute score of 3.5 preoperatively to 3.67 ± 0.6 postoperatively; $p > 0.05$) versus 50% for the children with moderate neurologic impairment (1.0 to 1.5 ± 0.9 ; $p > 0.05$) and 202% for the children with severe neurologic impairment (0.38 to 1.15 ± 1.2 ; $p < 0.05$). The differences between the otherwise healthy children and the neurologically impaired children were highly significant ($p < 0.001$) with a test power of 99%.

For the two other key GERD end points, vomiting and choking, the absolute benefit was not a constant addition to a variable baseline value but increased evenly with increasing handicap (Fig. 5B). As a result, due to fundoplication, the neurologically normal and the neurologically impaired children obtained equal absolute scores. The slope value of the straight line laid over the pre- to postoperative increment bars may serve to characterize this relationship between increasing neurological incapacitation and increasing benefit (Fig. 5B).

Also, the item “coping with childcare” of the physical functions domain improved significantly more ($p < 0.05$) for the neurologically impaired patients ($49.8 \pm 34\%$) than for the moderately impaired patients ($19.3 \pm 40\%$) and the otherwise healthy patients ($7.7 \pm 23\%$).

The positive impact of fundoplication on emotions was correlated positively with the degree of neurologic fitness. This means that GERD children/parents without other diseases experienced a significantly higher benefit from the procedure than the neurodevelopmentally delayed children/parents. This applied to the relative (in % increment from the preoperative score) and absolute improvements (points on the Likert scale) as to the total score. Thus, the parents of the otherwise healthy children obtained better preoperative ratings and then experienced a significantly greater benefit than the parents of the impaired children. This finding is summarized in Fig. 6.

A closer look at two items from this dimension may illustrate the aforementioned finding. The item “parent’s frustration about own child’s illness” improved about 116.2% (to an absolute 3.6 ± 0.8 points on the Likert scale) in the neurologically normal group compared with only 62.4% (to an absolute of 2.8 ± 0.9) in the impaired

Fig. 4 Significant evolutions in the parent-centered domains of the Gastrointestinal Quality-of-Life Index (GIQLI) for 40 patients. The items “parental QoL/QoL child” represent self-ratings of the parents on a visual analog scale ranging from 0 to 4

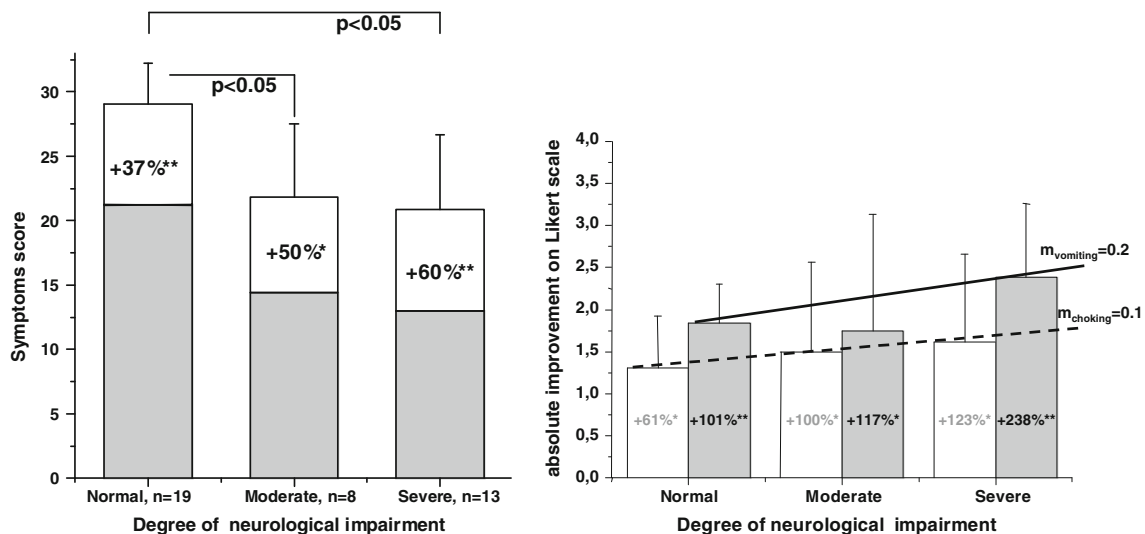
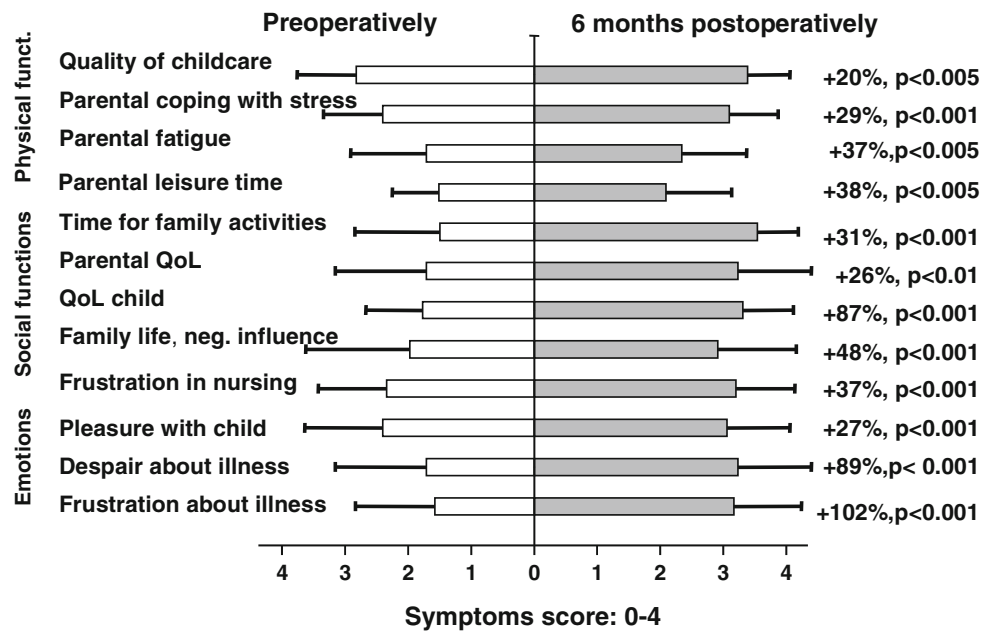


Fig. 5 **A** Symptoms score according to subgroups with different degrees of neurodevelopmental delay: preoperative symptoms (gray) and benefit (white). ** $p < 0.001$, * $p < 0.05$. The improvement for all the patients was $47 \pm 32.5\%$ ($p < 0.001$). The horizontal arrows indicate the intergroup differences for the relative benefit. **B**

group ($p < 0.05$ for the intergroup difference). For “despair,” these same figures were 94% (to 3.7 ± 0.7 for normal children) versus 73% (to 2.9 ± 0.9 for severely impaired children) ($p < 0.01$ for the intergroup difference).

In the QoL domains of physical functions and social functions ($p > 0.05$ for intergroup differences), an even benefit was shown statistically throughout the degrees of neurologic fitness. It may be interesting to note that for the item “child’s QoL, parent’s assessment” (from the social functions domain), the neurologically normal children showed significantly better absolute gains and absolute

Improvement of gastroesophageal reflux (GER)-specific symptoms and the degree of neurologic impairment. Bars: “choking” (white) and item “vomiting” (gray). ** $p < 0.001$, * $p < 0.05$. The slope (m) of a line plotted across the patients’ absolute improvements may quantify this relationship

postoperative scores than the children with severely delayed neurodevelopment (3.7 ± 0.5 vs. 2.9 ± 0.8 ; $p < 0.05$).

Discussion

Our data demonstrate that anterior fundoplication for children thoroughly improves general parameters such as the use of proton pump inhibitors, the handling of meals given both orally and via percutaneous feeding tubes, and the intensity and frequency of gastrointestinal and

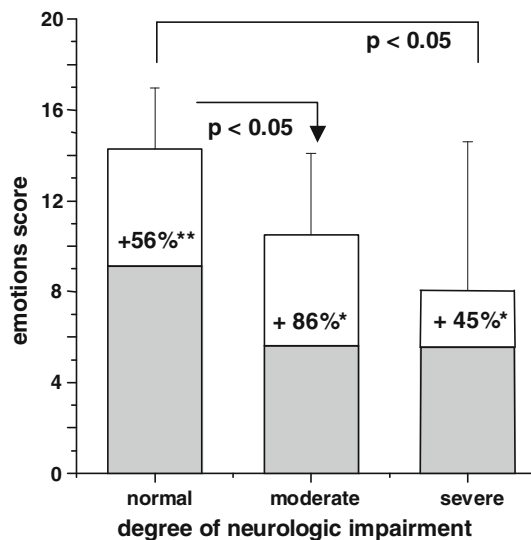


Fig. 6 Evolution of the summarized emotions score for the patients and parents by degree of neurologic impairment: preoperative emotions score (gray) and benefit (white). The horizontal arrows denote intergroup differences. ** $p < 0.001$, * $p < 0.05$

supraesophageal symptoms (Table 3). This is consistent with the literature for neurologically impaired and healthy pediatric GERD patients [5, 18, 19].

A considerable discrepancy may exist between the evolution of objective data and subjectively experienced well-being [6–8]. Therefore, QoL has been used as the major end point in the treatment of GERD in adults [20].

In our study, laparoscopic fundoplication improved the overall QoL of children and parents similarly to improvement of adult QoL [8]. More than half of the QoL items in the four dimensions improved significantly and this in both the child-centered “symptoms” domain and the parent-centered domains of social functions, emotions, and physical functions.

In children, especially when neurodevelopmentally delayed, any treatment extends to the parents. Our data show that laparoscopic fundoplication also lives up to the parents’ expectations and demands.

When analyzing the course of the symptoms by comparing the results at 3 and 6 months, we found that the patients who improved did so shortly after the operation. Furthermore, the patients who obtained symptom relief and good QoL values continued to do so. These kinetics are consistent with the literature on adult patients [8, 21, 22].

An inverse rather mechanical relationship of tightness and completeness of the fundoplication wrap (270° vs. 360°) to dysphagia has been suggested by some reports [8]. However, in our series of 270° anterior fundoplication, new-onset symptoms such as dysphagia and flatulence, which have been described for complete [17, 18] wraps, were negligible. There was only an insignificant increase in new symptoms by 3–8%, which did not change with time.

This is consistent with the results reported for the posterior 270° wrap [23].

It is suggested that a low preoperative QoL may predict a poor functional outcome [22, 24]. It is known that for dystrophic and neurologically impaired children and their parents, lower preoperative functional and QoL scores throughout all dimensions [25] may correspond with a poorer functional outcome [2, 4] and a higher recurrence rate [19] than for normal children [18]. On the other hand, it is suggested that otherwise healthy GERD patients benefit less from the operation and can therefore be managed medically [2].

We analyzed the QoL in the subgroups of otherwise healthy versus neurologically impaired children. The GIQLI is not designed to be a diagnostic tool [16], but it permits analysis of the relative benefit. For the disease and child-centered items of the symptoms dimension and for the parent-centered item “coping with childcare,” the relative and absolute benefits were linearly correlated to the degree of neurologic impairment. Patients with a higher grade of neurologic handicap benefited more, both relatively in relation to the preoperative value and absolutely.

Conversely, in the parent-centered emotions domain, the otherwise healthy cases showed a significantly higher benefit than the neurologic impairment cases. A possible explanation for this might be found in a statement made anecdotally by several parents of neurologically healthy infants. They stated that regurgitation and failure to thrive were experienced as the main drawbacks to complete satisfaction with their child’s well-being. Once these symptoms were treated successfully, their QoL score attained a near normal value. Finally, in the two dimensions of physical and social functions, the benefit was equally distributed throughout the groups.

In total, there was one dimension with a considerable preponderance of benefit for the neurodevelopmentally delayed children and one such dimension for the neurologically healthy children. The overall scores were not significantly different. We thus had to dismiss our hypothesis that neurologically impaired children generally have a superior benefit from surgery. Consequently, the majority of the parents/patients in our study stated they would again opt for surgery.

The GIQLI data obtained from normal adults may serve as an external reference. There is a considerable inhomogeneity in pediatric patient cohorts due to age differences, a wide range of other conditions, and history-taking from either patients or parents. Therefore, normal values have not been determined for children [26], and preoperative evaluations are mandatory for comparison. We therefore recorded pre- and postoperative QoL scores, then determined and interpreted the relative changes.

For the current study, the GIQLI was chosen for several reasons. The authors have gained experience with this instrument [27]. It has been used in other studies on outcome after pediatric surgical procedures [21], and it has been recommended by the European Association of Endoscopic Surgery for studies of fundoplication outcome [28]. Alternative pediatric QoL scores have not yet been used for the current purpose [26]. Because parental issues must be part of a comprehensive QoL study with children, we modified the GIQLI for parental aspects.

The evaluations were performed by researchers not involved in clinical work, and without exception were obtained by personal interview and not by mailed questionnaires. All patients included in the study had complete data sets such that the statistical statements were sound (power of the intergroup comparisons: 99%). However, the current study had some weaknesses. Modification of the GIQLI may have biased the results, and there was no control group with medical therapy alone, as reported in studies of adults [21]. For neurologically incapacitated children, this probably would not find ethical approval, but it would be desirable for neurologically unimpaired patients. However, the children who underwent surgery usually had not responded to previous conservative management.

In conclusion, this study demonstrated a significant positive impact of laparoscopic 270° anterior fundoplication on the symptomatic outcome and the QoL for children with GERD and their parents. This benefit manifested early postoperatively and then was sustained. There were no significant new-onset symptoms such as dysphagia, bloating, or flatulence. The analysis of neurologically fit and neurologically impaired children showed that the overall benefit in terms of QoL did not differ significantly between these subgroups. However, the neurologically impaired GERD patients benefited more in the child-centered domain of symptoms, whereas the neurologically healthy patients showed a higher benefit in the parent-centered domain of emotions.

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