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A Survey of IPEG-Middle East Chapter members to ascertain their perceptions of, and changes to, the Nissen's wrap design and the outcomes

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Abstract

Background: Nissen's description of fundoplication has proven seminal in our understanding of anti-GERD surgeries. This survey aimed to ascertain the perceptions of, and changes to, the Nissen's wrap design among the IPEG-ME surgeons and their outcomes.

Methods: During the months of February and March 2021, all IPEG-ME members were contacted via WhatsApp and asked to complete an anonymous online survey. Google Forms was used as the platform for the survey. Responses were collected over a four-week period.

Results: From a total of 99 IPEG-ME members, 51 practicing pediatric surgeons from eight countries reported seven separate conceptions for the original Nissen wrap design. With more surgeon years of experience, not hospital annual volume, the percentage of surgeons who choose to preserve the short gastric vessels at laparoscopic Nissen fundoplication increased from 10 to 25%. Moreover, transmigration and reoperation rates were cut in half, while dysphagia rates doubled as surgeon years of experience increased from under 10 to over 30.

Conclusion: Owing to haziness, specialized surgeons may have expressed non-identical thoughts of the original description of a commonly employed procedure. Wrap transmigration and reoperation rates were cut in half, while dysphagia rates doubled as surgeon years of experience increased from under 10 to over 30. It seems reasonable to standardize the wrap design based on the components' justifications rather than surgeons' preferences.

Keywords: Nissen fundoplication, Survey, Tension-free wrap, Surgeon years of experience, Case loads

Background

Even though much of his original contributions to the realm of thoracic surgery have been overlooked, his seminal input into the surgical management of gastroesophageal reflux disease (GERD) will long be remembered, as his name "Rudolph Nissen, 1896–1981" has got linked to the most widely anti-reflux surgery currently in use [1].

However, since its first description in 1956, the Nissen wrap has been subjected to a lot of technical modifications by him and his colleagues, as well as by others. Therefore, the term "Nissen fundoplication" might mean different steps to different surgeons [2–7].

As a result, evaluating the published Nissen fundoplication results is difficult. Not only because of the disparities in reporting methods and patient demographics, but also because of the dissimilarities in the surgical techniques used [8, 9].

The aim of this survey was to evaluate the perceptions of, and changes to, the Nissen's wrap among members of

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the International Pediatric Endo-surgery Group—Middle East Chapter (IPEG, ME), to draw attention to the discrepancies in views and their possible consequences for outcomes.

Materials and method

During the months of February and March 2021, all IPEG-ME members were contacted via WhatsApp® and asked to complete an anonymous online survey that included 10 single-choice items about Nissen's wrap fundoplication. Google® Forms (Google LLC, Mountain View, CA, USA) was used as the platform for the survey, and responses were collected over a four-week period.

The items on the questionnaire covered three elements: (1) participant characteristics, (2) Nissen wrap design, and (3) wrap outcomes. The ten survey questions are listed in "Supplementary Material 1".

For the current survey study, we identified three items in the wrap design: the fundus mobilization through division of the gastro-splenic ligament, the wrapped portion of the stomach, and the suturing orientation of the wrapped limbs.

We used three modules of 360˚ wrap to allow participants to easily pick their interpretation of the Nissen wrap and changes to it. In addition, we've added a new range of options to assist participants in precisely assembling their wraps when the modules don't meet their needs.

To place the hand on the areas of divergence and its justifications, the original papers by R Nissen as well as the early modifications implemented in the Nissen's clinic were revisited.

Data analysis

Data were retrieved, coded and entered using the statistical package for the Social Sciences (SPSS)® version 26 (IBM Corp., Armonk, NY, USA). Data was summarized using frequency (count) and relative frequency (percentage). For comparing categorical data, Chi square test was performed. Exact test was used instead when the expected frequency is less than 5 (Chan, 2003). *P*-values less than 0.05 were considered as statistically significant [10].

Results

From a total of 99 IPEG-ME members, 51 practicing pediatric surgeons from eight countries completed the survey. Most respondents (80.4%) did 360˚ fundoplication for more than 10 years with the following caseloads each year (annual volume): 1-5 cases (27.5%), 6-10 cases (37.3%), 11-15 cases (17.6%), and 16-20 cases (17.6%).

The 360˚ fundoplication wrap was the anti-GERD method currently in use by 38 respondents (74.5%), 270˚ wrap by 7 (13.7%), and 180˚ wrap by 3 respondents (5.9%). In addition, one surgeon recently switched to the Hill-Snow non-wrap method, while two others switched to the hybrid Nissen-Hill approach.

Two of the Nissen wrap concept responses were incomplete, so they were left out of the statistical analysis. The responses to this survey revealed seven different conceptions about the original Nissen wrap definition. The original Nissen's definition, according to 65% of respondents (n=32), was wrapping a fully mobilized gastric fundus and nearby greater curvature around the abdominal esophagus, with suture bites mounted at the mobilized fundus curve. Furthermore, 47% (n=23) of those polled believed Nissen's suturing of the completely wrapped fundus was in front of the lower esophagus, while 18% (n=9) felt it was skewed to the right to some extent.

In terms of the studied technical points, only one third of the participants (n=16) reported some differences between their conceptions of the original Nissen wrap design and the wrap design they adopt. Table (1) shows participant's conceptions of and changes to the Nissen wrap design.

Wrap migration and dysphagia attributed to a tight wrap were cited by 82.4% of respondents as the most common problems with their adopted Nissen wrap design (Fig. 1).

For 82.4% of the respondents, the average re-operation rate was less than 10%, and higher rates were recorded by the other respondents.

With more surgeon years of experience, the percentage of surgeons who choose to preserve the short gastric vessels at laparoscopic Nissen fundoplication increased from 10% to 25% (P value: 0.488). Moreover, transmigration and reoperation rates were cut in half, while dysphagia rates doubled as surgeon years of experience increased from under 10 to over 30 (P values: 0.694, 0.487 and 0.398, respectively).

Higher hospital annual volume, but not surgeon years of experience, is associated with increased reoperation rates (P value: 0.256). Hospital annual volume had no effect on surgeon preference for preserving the short gastric vessels when comparing the lowest and the highest volume groups.

Discussion

R. Nissen's description of fundoplication has proven seminal in our understanding of anti-GERD surgeries. But making some minor changes early could bring major alterations in the long term. So, we attempted to draw a more organized and revised image of the Nissen fundoplication, not without criticism, and with a better understanding of various aspects of anti-GERD coming into sharper focus in recent years.

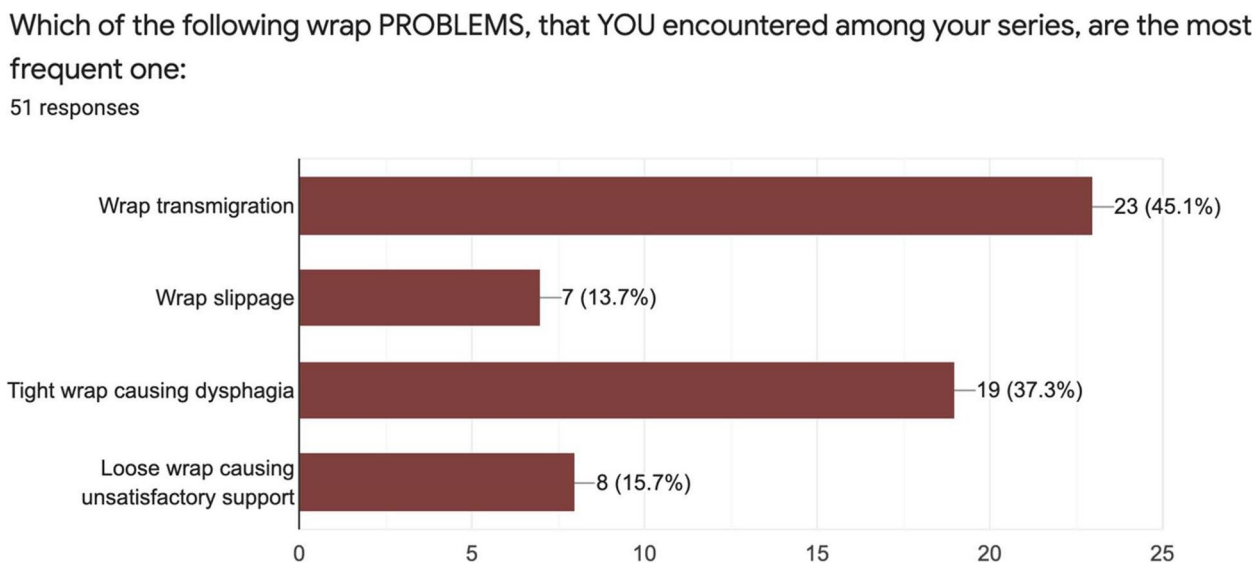

Fig. 1 Frequency of wrap-related troubles among the participants

According to his original description in 1956**, R. Nissen** opted to construct a Witzel tube from the gastric fundus around the abdominal esophagus, which he called a gastroplication. The phrenoesophageal ligament was divided and the esophagus was mobilized, meanwhile the short gastric vessels were always preserved. Through a window created in the gastrohepatic ligament, a fundoplication was created, which involved wrapping the stomach's posterior wall around the lower 6 cm of the esophagus and suturing it to the anterior wall. He used four or five interrupted silk sutures immediately in front of the lower esophagus, one or more of which incorporated part of the anterior wall of the esophagus. The diaphragmatic crura were untouched in his description [2, 11].

To mitigate related complications such as dysphagia, gas bloat, wrap slippage or dislocation, and paraesophageal hernia occurrence/recurrence, several improvements to the initial Nissen protocol have been suggested. Aside from the evolution of non-complete wraps, the key changes to Nissen fundoplication over time can be summarized as follows: use of the anterior aspect of the stomach for the wrap [7, 12], thorough dissection of the gastric fundus [13], fixation of the wrap to prevent dislocation, short floppy wrap [14–16], and cruroplasty [15–17].

According to the results of the conducted survey, most respondents thought the initial Nissen's wrap was wrapping a completely mobilized gastric fundus around the abdominal esophagus, with suture bites placed at the fundus's curve and suturing was either ventral to esophagus or tilted to the right to some degrees.

Meanwhile improvements made to the Nissen wrap in the literature and among respondents to this survey were aimed at creating a tension-free wrap to avoid the complications of dysphagia and wrap dislocation, both still present as the most common problems. This might indicate that the technique's alterations are primarily the consequence of a lack of sharp awareness of the original approach and are merely a matter of surgeon perceptions.

Hence, the words "Nissen fundoplication – Modified Nissen fundoplication" are nomenclatures that entitled variably inconsistent contents - to a large degree depending on surgeon preference –with nevertheless unpleasant consequences. It looked that each component's arguments needed to be re-evaluated in order to construct the most acceptable set. In this context, several studies contrasted Nissen operations with and without fundus mobilization [18, 19]. This maneuver does not minimize the likelihood of wrap disruption or the occurrence of postoperative dysphagia, according to the findings. Luostarinen et al., on the other hand, found an abnormally prolonged gastric transit time in patients undergoing fundus mobilization, indicating the possibility of partial stomach denervation during dissection [18]. Moreover, due to a slipping up of the wrap, the telescope phenomenon, fundus mobilization increased the recurrence rate of hiatal hernia [18, 19].

Further, we have recently argued that the antiperistaltic waves generated within the grinding pyloric antrum are absorbed by the dome-shaped gastric fundus, which works as a natural anti-reflux barrier in terms of fundus receptive relaxation as well as harboring a substantially compressible fundus air bubble. As a result, the

sided gastroesophageal junction is mostly immune to the splashes of antiperistaltic waves. When the gastrosplenic ligament is surgically divided to wrap a completely mobilized fundus around the abdominal esophagus, the antireflux mechanism is eventually sacrificed, rendering the new anatomical alignment exposed to stress with every antiperistaltic wave being propagated; this is motility generated dynamic tension (Fig. 2). Accordingly, we proposed that the gastric fundus should, preferably, not be mobilized when making a surgical wrap. Moreover, the natural inclination angle between the axis of the lower esophagus and the organoaxial "pyloro-dome" axis of the stomach should never be set to zero [20].

Cruroplasty is another contentious topic that puts component rationale versus surgeon choices. Since the crura's function as an antireflux mechanism has been sufficiently demonstrated [21, 22], surgeons frequently advocate for its closure [23]. It should be noted, however, that even in case of a normal hiatus, reflux can occur [24]. Furthermore, authors who did not perform any crural repair reported excellent results with no rise in the incidence of paraesophageal hernias [17, 25].

Other factors that may have influenced the outcome of laparoscopic fundoplication include the surgeon's number of years of experience as well as the annual volume per surgeon and per centre [26]. The fact that experienced practise improves outcomes emphasises that surgical training with intensive supervision ensures patient safety, whereas reducing supervision based on raising trainee autonomy may have unfavourable effects on surgical outcomes [26, 27].

Based on the facts presented, it seemed reasonable to re-define the tension free Nissen wrap in order to

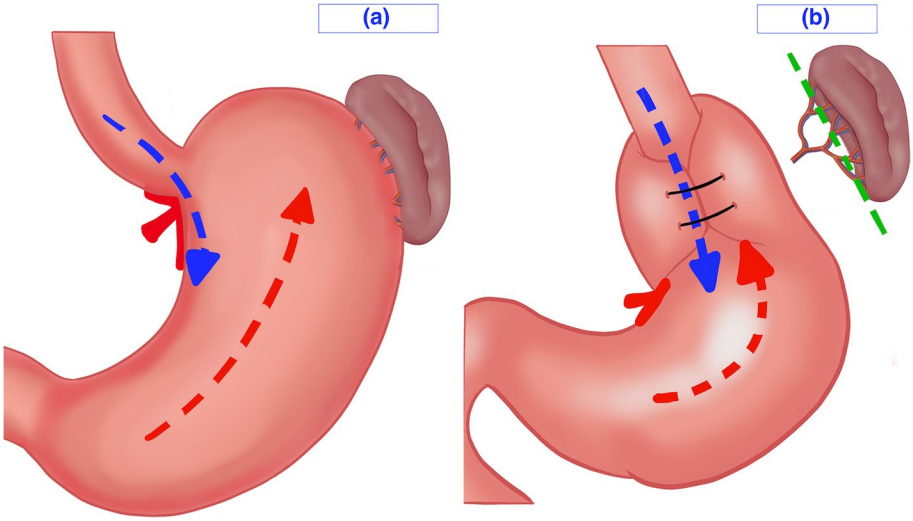

Fig. 2 **a** The physiological inclination angle between the esophagogastric axis (the blue dotted line), and the pyloro-dome axis for the antiperistaltic waves (the red dotted line). **b** A Floppy Nissen wrap created from a mobilized fundus; the designed wrap exposed to the expanding pressured waves generated within the grinding pyloric antrum

Table 1 Participant's conceptions of and changes to the Nissen wrap design

		Perception of Nissen		Adopted modification	
		Count	%	Count	%
Short gastric vessels	**Preserved**	14	28.6%	12	24.5%
	Divided	35	71.4%	37	75.5%
Wrapped zone	**Fundus**	36	70.6%	37	75.5%
	Anterior wall	5	9.8%	6	12.2%
	Anterior& posterior wall	10	19.6%	6	12.2%
Suturing orientation	**To the right**	15	29.4%	14	27.5%
	Tilted	12	23.5%	9	17.6%
	Infront	24	47.1%	28	54.9%

perhaps unify the technique based on components' justifications rather than surgeons' preferences.

Study limitations

The current study's main weaknesses appeared to be the relatively small number of respondents surveyed, as well as the lack of numerical values for the outcomes per respondent.

Conclusions

- Owing to haziness, specialized surgeons may have expressed non-identical thoughts about the original description of a commonly employed procedure. Moreover, their modified wrap designs may have failed to address its inherent drawbacks.
- Surgeons' preference for preserving the short gastric vessels during laparoscopic Nissen fundoplication climbed with increased surgeon years of experience, not hospital annual volume. Furthermore, transmigration and reoperation rates were cut in half, while dysphagia rates doubled as surgeon years of experience increased from under 10 to over 30.
- It seems reasonable to re-define the tension-free Nissen wrap and to standardize its design based on the components' justifications rather than surgeons' preferences.

Abbreviations

IPEG-ME: International Pediatric Endo-surgery Group—Middle East Chapter; GERD: Gastro-Esophageal Reflux Disease.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s43159-022-00229-5.

Additional file 1: Supplementary Material 1. An anonymous online survey that included 10 single-choice items about Nissen's wrap fundoplication.

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Authors' contribution

All authors of this report have substantial contributions to: Conception of the work, the acquisition, analysis, and interpretation of data for the work; AND Drafting the work or revising it critically for important intellectual content; AND Final approval of the version to be published.

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Availability of data and materials

All the datasets on which the conclusions of the manuscript are based are available as online supplementary materials upon request. The corresponding author hould be contacted if someone wants to request the data from this study.

Declarations

Ethical approval and consent to participate

This study conforms to the provisions of the Declaration of Helsinki in 1995 (as revised in Edinburgh 2000). All methods were carried out in accordance with relevant guidelines and regulations.
The study was approved by the Research Ethics Committee, Faculty of Medicine, Tanta University (FWA00022834 - IRP0010038 - Approval code:34502/2/21).
Consent to participate statement: the need for informed consent was waived by IRP0010038 as no patients participate in this study.

Consent for publication

Not applicable.

Competing interests

Drs. Seleim H, Magdy B, and Hashish A have no conflict of interest to disclose.

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