

Laparoscopic antireflux surgery for gastroesophageal reflux disease (GERD)

Results of a Consensus Development Conference

Held at the Fourth International Congress of the European Association for Endoscopic Surgery (E.A.E.S.), Trondheim, Norway, June 21–24, 1996

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Received: 29 November 1996/Accepted: 14 December 1996

Abstract

Background: Laparoscopic antireflux surgery is currently a growing field in endoscopic surgery. The purpose of the Consensus Development Conference was to summarize the state of the art of laparoscopic antireflux operations in June 1996.

Methods: Thirteen internationally known experts in gastroesophageal reflux disease were contacted by the conference organization team and asked to participate in a Consensus Development Conference. Selection of the experts was based on clinical expertise, academic activity, community influence, and geographical location. According to the criteria for technology assessment, the experts had to weigh the current evidence on the basis of published results in the literature. A preconsensus document was prepared and distributed by the conference organization team. During the E.A.E.S. conference, a consensus document was prepared in

three phases: closed discussion in the expert group, public discussion during the conference, and final closed discussion by the experts.

Results: Consensus statements were achieved on various aspects of gastroesophageal reflux disease and current laparoscopic treatment with respect to indication for operation, technical details of laparoscopic procedures, failure of operative treatment, and complete postoperative follow-up evaluation. The strength of evidence in favor of laparoscopic antireflux procedures was based mainly on type II studies. A majority of the experts (6/10) concluded in an overall assessment that laparoscopic antireflux procedures were better than open procedures.

Conclusions: Further detailed studies in the future with careful outcome assessment are necessary to underline the consensus that laparoscopic antireflux operations can be recommended.

In the last 2 years, growing experience and enormous technical developments have made it possible for almost any abdominal operation to be performed via endoscopic surgery. Laparoscopic cholecystectomy, appendectomy, and hernia repair have been going through the characteristic life cycle of technological innovations, and cholecystectomy, at least, seems to have proven a definitive success. To evaluate this life cycle, consensus conferences on these topics have been organized and performed by the E.A.E.S. [76b].

Currently, the interest of endoscopic abdominal surgery is focusing on antireflux operation. This is documented by an increasing number of operations and publications in the literature. The international societies such as the European Association for Endoscopic Surgery (E.A.E.S.) have the responsibility to provide a forum for discussion of new developments and to provide guidelines on best practice based on the current state of knowledge. Therefore, a consensus development conference on laparoscopic antireflux surgery for gastroesophageal reflux disease (GERD) was held, which included discussion of some pathophysiological aspects of the disease. Based on the experience of previous consensus conferences (Madrid 1994), the process of the consensus development conference was slightly modified. The development process was concentrated on one subject—reflux disease—and during the 4th International Meeting of the E.A.E.S., a long public discussion, including all aspects of the consensus document, was incorporated into the process.

The methods and the results of this consensus conference are presented in this comprehensive article.

Methods

At the Annual Meeting in Luxemburg in 1995, the joint session of the Scientific and Educational Committee of the E.A.E.S. decided to hold a Consensus Development Conference (CDC) on laparoscopic antireflux surgery for gastroesophageal reflux disease. The 4th International Congress of the E.A.E.S. in June 1996 in Trondheim should be the forum for the public discussion and finalization of the Consensus Development Conference.

The Cologne group (E. Neugebauer, E. Eypasch, F. Fischer, H. Troidl) was authorized to organize the CDC according to general guidelines. The procedure chosen was the following: A small group of 13 internationally known experts was nominated by the Scientific Committee of the E.A.E.S. The criteria for selection were

1. Clinical expertise in the field of endoscopic surgery
2. Academic activity
3. Community influence
4. Geographical location

Internationally well-known gastroenterologists were asked to participate in the conference in the interest of a balanced discussion between internists and surgeons.

Prior to the conference, each panelist received a document containing guidelines on how to estimate the strength of evidence in the literature for specific endoscopical procedures and a document containing descriptions of the levels of technology assessment (TA) according to Mosteller

and Troidl [190a]. Each panelist was asked to indicate what level of development, in his opinion, laparoscopic antireflux surgery has attained generally, and he was given a form containing specific TA parameters relevant to the endoscopic procedure under assessment. In this form, the panelist was asked to indicate the status of the endoscopic procedure in comparison with conventional open procedures and also to make a comparison between surgical and medical treatment of gastroesophageal reflux disease. The panelist's view must have been supported by evidence in the literature, and a reference list was mandatory for each item. Each panelist was given a list of relevant specific questions pertaining to each procedure (indication, technical aspects, training, postoperative evaluation, etc.). The panelists were asked to provide brief answers with references. Guidelines for response were given and the panelists were asked to send their initial evaluation back to the conference organizers 3 months prior to the conference.

In Cologne, the congress organization team analyzed the individual answers and compiled a preconsensus provisional document.

In particular, the input and comments of gastroenterologists were incorporated to modify the preconsensus document.

The preconsensus documents were posted to each panelist prior to the Trondheim meeting. During the Trondheim conference, in a 3-h session, the preconsensus document was scrutinized word by word and a version to be presented in the public session was prepared. The following day, a 2-h public session took place, during which the text and the tables of the consensus document were read and discussed in great detail. A further 2-h postconference session of the panelists incorporated all suggestions made during the public session. The final postconsensus document was mailed to all expert participants, checked for mistakes and necessary corrections and finalized in September 1996. The full text of the statements is given below.

Consensus Statements on Gastroesophageal Reflux Disease (GERD)

1. What are the epidemiologic facts in GERD?

In western countries, gastroesophageal reflux has a high prevalence. In the United States and Europe, up to 44% of the adult population describe symptoms characteristic of GERD [124, 127, 242]. Troublesome symptoms characteristic of GERD occur in 10–15% with equal frequency in men and women. Men, however, seem to develop reflux esophagitis and complications of esophagitis more frequently than women [23].

Data from the literature indicate that 10–50% of these subjects will need long-term treatment of some kind for their symptoms and/or esophagitis [34, 195, 225, 242].

The panelists agreed that the natural history of the disease varies widely from very benign and harmless reflux to a disabling stage of the disease with severe symptoms and morphological alterations. There are no good long-term data indicating how the natural history of the disease changes

from one stage to the other and when and how complications (esophagitis, stricture, etc.) develop.

Topics which were the subject of considerable debate but which could not be resolved during this conference are listed here [8, 11, 23, 28, 68]:

- The cause of the increasing prevalence of esophagitis
- The cause of the increasing prevalence of Barrett's esophagus and adenocarcinoma
- The discrepancy between clinically and anatomically determined prevalence of Barrett's esophagus
- The problem of ultrashort Barrett's esophagus and its meaning
- The relationship between *Helicobacter pylori* infection and reflux esophagitis
- Gastroesophageal reflux without esophagitis and abnormal sensitivity of the esophagus to acid
- The role of so-called alkaline reflux, which is currently difficult to measure objectively

2. What is the current pathophysiological concept of GERD?

GERD is a multifactorial process in which esophageal and gastric changes are involved [27, 65, 98, 251, 283].

Major causes involved in the pathophysiology are incompetence of the lower esophageal sphincter expressed as low sphincter length and pressure, frequent transient lower esophageal sphincter relaxations, insufficient esophageal peristalsis, altered esophageal mucosal resistance, delayed gastric emptying, and antroduodenal motility disorders with pathologic duodenogastroesophageal reflux [27, 65, 92, 95, 134, 251, 283].

Several factors can play an aggravating role: stress, posture, obesity, pregnancy, dietary factors (e.g., fat, chocolate, caffeine, fruit juice, peppermint, alcohol, spicy food), and drugs (e.g., calcium antagonists, anticholinergics, theophylline, β -blockers, dihydropyridine). All these factors might influence the pressure gradient from the abdomen to the chest either by decreasing the lower esophageal sphincter or by increasing abdominal pressure.

Other parts of the physiological mosaic that might contribute to gastroesophageal reflux include the circadian rhythm of sphincter pressure, gastric and salivary secretion, esophageal clearance mechanisms, as well as hiatal hernia and *Helicobacter pylori* infection.

3. What is a useful definition of the disease?

A universally agreed upon scientific classification of GERD is not yet available. The current model of gastroesophageal reflux disease sees it as an excessive exposure of the mucosa to gastric contents (amount and composition) causing symptoms accompanied and/or caused by different pathophysiological phenomena (sphincter pressure, peristalsis) leading to morphological changes (esophagitis, cell infiltration) [65, 98].

This implies an abnormal exposure to acid and/or other gastric contents like bile and duodenal and pancreatic juice in cases of a combined duodenogastroesophageal reflux.

GERD is frequently classified as a synonym for esophagitis, even though there is considerable evidence that only 60% of patients with reflux disease sustain damage of their mucosa [8, 91, 150, 200, 231, 243]. The MUSE and Savary esophagitis classifications are currently used to stage damage, but they are poor for staging the disease [8].

The modified AFP Score (Anatomy-Function-Pathology) is an attempt to incorporate the presence of hiatus hernia, reflux, and macroscopic and morphologic damage into a classification [83]. However, this classification lacks symptomatology and should be linked to a scoring system for symptoms or quality of life; both scoring systems are extremely important for staging of the disease and for the indication for treatment [195a,b].

4. What establishes the diagnosis of the disease?

A large variety of different symptoms are described in the context of gastroesophageal reflux disease, such as dysphagia, pharyngeal pain, hoarseness, nausea, belching, epigastric pain, retrosternal pain, acid and food regurgitation, retrosternal burning, heartburn, retrosternal pressure, and coughing. The characteristic symptoms are heartburn (retrosternal burning), regurgitation, pain, and respiratory symptoms [150, 204]. Symptoms are usually related to posture and eating habits.

In addition, typical reflux patients may have symptoms which are not located in the region of the esophagus. Patients with heartburn may or may not have pathological reflux. They may have reflux-type "nonulcer dyspepsia" or other functional disorders.

The diagnostic tests that are needed must follow a certain algorithm. After the history and physical examination of the patients, an upper gastrointestinal endoscopy is performed. A biopsy is taken if any abnormalities (stenosis, strictures, Barrett's, etc.) are found [8].

If no morphologic evidence can be detected, only functional studies, e.g., measuring the acid exposure in the esophageal lumen by 24-h esophageal pH monitoring, are helpful and indicated to detect excessive reflux [65]. It is of vital importance that the pH electrode be accurately positioned in relation to the lower esophageal sphincter (LES). Manometry is the only objective way to assess the location of the LES.

Ordinary esophageal radiologic studies (barium swallow) are considered another mandatory basic imaging study [105a].

At the next level of investigation there are a number of tests that look for the cause of pathologic reflux using esophageal manometry as a basic investigative tool for this purpose to assess lower esophageal sphincter and esophageal body function [27, 65, 91, 134, 283]. Video esophagography or esophageal emptying scintigraphy may also be helpful.

Optional gastric function studies are 24-h gastric pH monitoring, photo-optic bilirubin assessment to assess duodenogastroesophageal reflux, gastric emptying scintigraphy, and antroduodenal manometry [81, 93, 95, 118, 146, 234].

Currently these gastric function studies are of scientific

Table 1. Diagnostic test ranking order for GERD

Basic diagnostic tests	Physiologic/pathologic criteria	References
Endoscopy + histology	Savary-Miller classification I, II, III, IV, V MUSE classification (M) metaplasia (U) ulcer (S) stricture (E) erosions	Savary [231] Armstrong [8]
Radiology	Barium swallow	Gelfand [105a]
24-h esophageal pH monitoring	Percentage time below pH 4 DeMeester score	DeMeester [65]
Stationary esophageal manometry ^a	LES: Overall length Intraabdominal length Pressure (Transient LES relaxations) esophageal body disorders weak peristalsis	DeMeester [65] Dent [69a] Eypasch [78]
Optional tests		
24-h gastric pH monitoring	Persistent gastric acidity Excessive duodenogastric reflux	Barlow [14b] Fuchs [93, 95] Schwizer [234]
Gastric emptying scintigraphy	Delayed gastric emptying	Clark [40]
Photo-optic bilirubin assessment	Esophageal bile exposure Gastric bile exposure	Kauer [146] Fein [81]

^a The concise numerical values for sphincter length, pressure, and relaxation depend on the respective manometric recording system used in the esophageal-function lab

interest but they do not yet play a role in overall clinical patient management, apart from selected patients. The diagnostic test ranking order is displayed in Table 1.

5. What is the indication for treatment?

Pivotal criteria for the indication to medical treatment in gastroesophageal reflux disease are the patient's symptoms, reduced quality of life, and the general condition of the patient. When symptoms persist or recur after medication, endoscopy is strongly indicated.

Mucosal damage (esophagitis) indicates a strong need for medical treatment. If the symptoms persist, partially persist, or recur after stopping medication, there is a good indication for doing functional studies. Gastrointestinal endoscopy, already mentioned as the basic imaging examination in GERD, should be performed in context with the functional studies.

Indication for surgery is again centrally based on the patient's symptoms, the duration of the symptoms, and the damage that is present.

Even after successful medical acid suppression the patient can have persistent or recurrent symptoms of epigastric pain and retrosternal pressure as well as food regurgitation due to the incompetent cardia, insufficient peristalsis, and/or a large hiatal hernia.

With respect to indication, one important factor in the patient's general condition is age. On the one hand, age plays a role in the risks stratification when the individual risk of an operation is estimated together with the comorbidity of the patient. On the other hand, age is an economic factor with respect to the break-even point between medical and surgical treatment [21b].

Concerning the indication for surgery, a differentiation in the symptoms between heartburn and regurgitation is considered important. (Medical treatment appears to be more effective for heartburn than for regurgitation.)

Therefore the indication for surgery is based on the following facts:

- Noncompliance of the patient with ongoing effective medical treatment. Reasons for noncompliance are preference, refusal, reduced quality of life, or drug dependency and drug side effects.
- Persistent or recurrent esophagitis in spite of currently optimal medical treatment and in association with symptoms.
- Complications of the disease (stenoses, ulcers, and Barrett's esophagus [11, 68]) have a minor influence on the indication. Neither medical nor surgical treatment has been shown to alter the extent of Barrett's epithelium. Therefore mainly symptoms and their relation to ongoing medical treatment play the major role in the indication for surgery. However, antireflux surgery may reduce the need for subsequent endoscopic dilatations [21a]. The participants pointed out that patients with symptoms completely resistant to antisecretory treatment with H₂-blockers or proton-pump inhibitors are bad candidates for surgery. In these individuals other diseases have to be investigated carefully. On the contrary, good candidates for surgery should have a good response to antisecretory drugs. Thus, compliance and preference determine which treatment is chosen (conservative or operative).

6. What are the essentials of laparoscopic surgical treatment?

The goal of surgical treatment for GERD is to relieve the symptoms and prevent progression and complications of the disease creating a new anatomical high-pressure zone. This must be achieved without dysphagia, which can occur when the outflow resistance of the reconstructed GE junction exceeds the peristaltic power of the body of the esophagus. Achievement of this goal requires an understanding of the

natural history of GERD, the status of the patient's esophageal function, and a selection of the appropriate antireflux procedure.

Since the newly created structure is only a substitute for the lower esophageal sphincter, it is a matter of discussion to what extent it can show physiological reactions (normal resting pressure, reaction to pharmacological stimuli, appropriate relaxations during deglutition, etc.). There is no agreement on how surgical procedures work and restore the gastroesophageal reflux barrier.

With respect to the details of the laparoscopic surgical procedures, the following degree of consensus was attained by the panel (11 present participants) (yes/no):

1. Is there a need for mobilization of the gastric fundus by dividing the short gastric vessels? (7/4)
2. Is there a need for dissection of the crura? (11/0)
3. Is there a need for identification of the vagal trunks? (7/4)
4. Is there a need for removal of the esophageal fat pad? (2/9)
5. Is there a need for closure of the crura posteriorly? (11/0)
6. Should nonabsorbable sutures be used (crura, wrap)? (11/0)
7. Should a large bougie (40–60 French) be used for calibration? (5/6)
8. Should objective assessment be performed (e.g., calibration by a bougie, others) for
 - Tightness of the hiatus? (9/0)
 - Tightness of the wrap? (9/2)
9. If there is normal peristalsis should one
 - Routinely use a 360° short floppy fundoplication wrap? (8)
 - Routinely use a partial fundoplication wrap? (2)
 - Use a short wrap equal to or shorter than 2.5 cm? (1)
10. In cases of weak peristalsis, should there be a "tailored approach" (total or partial wrap)? (5/6)¹

7. Which are the important endpoints of treatment whether medical or surgical?

The important endpoints for the success of conservative/medical as well as surgical therapy must be a mosaic of different criteria, since neither clinical symptoms, functional criteria, nor the daily activity and quality-of-life assessment can be used *solely* to assess the therapeutic result in this multifactorial disease process.

Patients show great variety in demonstrating and expressing the severity of clinical symptoms and, therefore, they alone are not a reliable guide. Functional criteria can be assessed objectively, but may not be used in the decision-making process without looking at the stage of mucosal damage or morphological abnormalities (hiatus hernia, slipped wrap; AFP Score).

Complete evaluation includes assessment of symptoms, daily activity, and quality of life—ideally, in every single patient.

Instruments: The examples of instruments are listed in references 80a, 195a, and 195b.

The earliest point at which one ought to collect functional data after the operation is 6 months. The reasonable time of assessment in the postsurgical follow-up phase is probably 1 year followed by 2-year intervals.

Economic assessment is considered to be a significant endpoint and is dealt with in a later section.

There is no evidence that laparoscopic surgery should be any better than conventional surgery. If laparoscopic surgery is correctly performed, apart from the problems of abdominal wall complications like hernia, infection, and wound rupture, there should be no difference in outcome as compared to the standard obtained in open surgery.

Laparoscopic surgery, however, has the potential to reduce postoperative pain and limitations of daily activity.

8. What is failure of treatment?

In gastroesophageal reflux disease, lifelong medication is needed in many patients, because the disease persists but the acid reduction can take away the symptoms during the time the medication is taken. The disease is treated by reducing the acid and not by treating or correcting the causes of the disease. This latter argument can be used by surgeons, since they mechanically restore the sphincter area and, therefore, correct the most frequent defect associated with the disease.

In surgery, failure of a treatment is defined as the persistence or recurrence of symptoms and/or objective pathologic findings once the treatment phase is finished. In GERD, a definite failure is present when symptoms which are severe enough to require at least intermittent therapy (heartburn, regurgitation) recur after treatment or when other serious problems ("slipped Nissen," severe gas bloat syndrome, dumping syndrome, etc.) arise and when functional studies document that symptoms are due to this problem. Recurrence can occur with or without esophageal damage (esophagitis). Professor Blum (Lausanne) suggested that further long-term outcome studies of medical and surgical treatment are needed.

Quality-of-life measurements are able to differentiate whether and to what extent recurrent symptoms are really impairing the patient's quality of life.

It was agreed upon that a distinction is necessary between the two types of failures of the operation: "the unhappy 5–10%" (i.e. slipped Nissen, etc.) and the 10–40% of individuals who only become aware of their dyspeptic symptoms postoperatively while the reflux-related symptoms are treated. Dyspeptic symptoms occur in the normal population in 20–40% [174b].

Some of the "postfundoplication symptoms" are present already before the operation and are due to the dyspeptic symptomatology associated with GERD.

Patients with failures should be worked up with the available diagnostic tests to detect the underlying cause of the failure. If there is mild recurrent reflux, it usually can be treated by medication as long as the patient is satisfied with this solution and his/her quality of life is good. In the case of severe symptomatic recurrent reflux or other complications, and if endoscopy shows visible esophagitis, the indication for refundoplication after a thorough diagnostic workup must be established. Surgeons very experienced in pathophysiology, diagnosis, and the surgical technique of

¹During the public discussion, Professor Montori (Rome) mentioned the Angelchick prosthesis as a rare alternative—however, this was not discussed in the consensus group.

Table 2a. Ratings of published literature on antireflux operations and medical treatment: strength of evidence in the literature-antireflux operations

Study type	Strength of evidence	References
Clinical randomized controlled studies with power and relevant clinical endpoints	III	202, 203, 246, 274
Cohort studies with controls <ul style="list-style-type: none"> ● prospective, parallel controls ● prospective, historical controls 	II	32, 37, 49, 80, 87, 110, 130, 147, 163, 188, 217, 221, 272, 274, 281
Case-control studies		
Cohort studies with literature controls	I	3, 4, 12, 19, 22, 36, 44, 47, 49, 55, 60, 61, 63, 72, 73, 95, 89, 107, 113, 126, 132, 159, 162, 163, 177, 184, 187, 190, 192, 208, 212, 213, 216, 219, 237, 255, 267
Analysis of databases		
Reports of expert committees		
Case series without controls	0	Numerous
Anecdotal reports		
Belief		

Table 2b. Ratings of published literature on antireflux operations and medical treatment: strength of evidence in the literature-medical treatment

Study type	Strength of evidence	References
Clinical randomized controlled studies with power and relevant clinical endpoints	III	10, 17, 24, 26, 39, 56, 70, 112, 115, 116, 120, 121, 139, 151, 161, 168, 171, 180, 189, 202, 223, 224, 227, 228, 240, 244, 246, 263, 265, 268, 270, 274, 282, 284
Cohort studies with controls <ul style="list-style-type: none"> ● prospective, parallel controls ● prospective, historical controls 	II	3, 6, 23, 29, 38, 85, 101, 130, 135, 139
Case-control studies		
Cohort studies with literature controls	I	16, 23, 50, 72, 117, 123, 135, 152, 157, 172, 174, 200, 229, 241, 260, 264
Analysis of databases		
Reports of expert committees		
Case series without controls	0	Numerous
Anecdotal reports		
Belief		

the disease should perform these redo operations. Expert management of patients undergoing redo surgery for a benign condition is of extreme importance.

9. What are the issues in an economic evaluation?

With respect to a complete economic evaluation the panelists refer to the available literature [14a, 76a].

Cost, cost minimization, and cost-effectiveness analyses of gastroesophageal reflux disease must take into account the following issues (list incomplete):

1. Costs of medications
2. Costs of office visits
3. Costs of routine endoscopies
4. Frequency of sick leaves at work
5. Frequency of restricted family or hobby activity at home
6. Assessment of job performance and restrictions due to the disease
7. Costs of diagnostic workup including functional studies and specialized investigations
8. Costs of surgical intervention
9. Costs for treatment of surgical complications
10. Costs of treatment of complications of maintenance medical therapy, such as emergency hospital admissions, e.g., swallowing discomfort, bolus entrapment in peptic stenoses

11. Perspective of the analysis (patient, hospital, society)
12. Health care system (socialized, private)

A special issue is the so-called break-even point between medical and surgical treatment (duration and cost of medical treatment vs laparoscopic antireflux treatment) [21b].

Ultimately, the results of medical or surgical treatment, especially with respect to age of the patient, should be translated into quality-adjusted life-years (QALYs) to differentiate which treatment is better for what age, comorbidity, and stage of disease.

Literature list with ratings of references

All literature submitted by the panelists as supportive evidence for their evaluation was compiled and rated. The ratings of the references are based on the panelists' evaluation. The number of references is incomplete for the case series without controls and anecdotal reports. The result of the panelists' evaluation is given in Table 2a for the endoscopic antireflux operations and in Table 2b for medical treatments (all options). The consensus statements are based on these published results. A complete list of all references mentioned in Table 2a and 2b is included.

Question 1. What stage of technological development are endoscopic antireflux operations at (in June 1996)?

The definitions for the stages in technological development follow the recommendations of the Committee for Evaluat-

Table 3. Evaluation of the status of endoscopic antireflux surgery 1996: level attained and strength of evidence

Stages in technology assessment ^a	Level attained/ strength of evidence ^b	Consensus in % ^c
1. Feasibility Technical performance, applicability, safety, complications, morbidity, mortality	II	64 (7/11)
2. Efficacy ● Benefit for the <u>patient</u> demonstrated in centers of excellence	II	64 (7/11)
● Benefit for the <u>surgeon</u> (shorter operating time, easier technique)	0–I	67 (6/9)
3. Effectiveness Benefit for the patient under normal clinical conditions, i.e., good results reproducible with widespread application	II	60 (6/10)
4. Costs Benefit in terms of cost-effectiveness	I–II	70 (7/10)
5. Ethics Issues of concern may be: long operation times, frequency of thrombo-embolization, incidence of reoperations, altered indication for surgery, etc. ^c	0	57 (4/7)
6. Recommendation	Yes	100 (11/11)

^a Mosteller F (1985) *Assessing Medical Technologies*, National Academy Press, Washington, DC [190a]; and Troidl H (1995) *Endoscopic Surgery—A Fascinating Idea Requires Responsibility in Evaluation and Handling*. Minimal Access Surgery, Surgical Technology International III (1995) pp 111–117 [265a].

^b Level attained to the definitions of the different grades.

^c Percentage of consensus was calculated by dividing the number of panelists who voted 0, I, II or III by total number of panelists who submitted their evaluation forms.

Table 4a. Antireflux surgery vs open conventional procedures: evaluation of feasibility parameters by all panelists at CDC in Trondheim*

Stages of technology assessment	Assessment based on evidence in the literature					Consensus ^b	Strength of evidence ^c 0–III
	Definitely better ^a	Probably better	Similar	Probably worse	Definitely worse		
Feasibility							
Safety/intraop. adverse events							
—Gastric or esophageal leaks/ perforations	1		6	4		55% (6/11) similar	I–II
—Hiatal entrapments of gastric warp with necrosis	1		9	1		82% (9/11) similar	I–II
—Vascular injury, bleeding, splenic injury	2	4	5			55% (6/11) better	I–II
—Emphysema	1		3	4	2	60% (6/10) worse	II
Operation time			3	5	1	67% (6/9) worse	II
Postoperative adverse events							
—Bleeding	1	2	8			73% (8/11) similar	I–II
—Wound infection	3	6	2			82% (9/11) better	I–II
—Reoperation		2	6	3		55% (6/11) similar	I–II
—Warp disorders		1	8	2		73% (8/11) similar	I–II
—Hernias of abdominal wall	3	6	2			82% (9/11) better	I–II
—Thrombosis/pulmonary embolism	1	3	6	1		55% (6/11) similar	I
Mortality		3	7			70% (7/10) similar	I–II

* Footnotes explained in Table 4b.

Table 4b. Antireflux surgery vs open conventional procedures: evaluation of efficacy parameters by all panelists prior to CDC in Trondheim

Stages of technology assessment	Assessment based on evidence in the literature						Strength of evidence ^c I–III
	Definitely better ^a	Probably better	Similar	Probably worse	Definitely worse	Consensus ^b	
Efficacy							
Postoperative pain	6	4				100% (10/10) better	I–II
Postoperative disorders							
—Bloating			9	1		90% (9/10) similar	I–II
—Flatulence			10	1		91% (10/11) similar	I–II
—Dysphagia			9	2		82% (9/11) similar	I–II
—Recurrent reflux			10			100% (10/10) similar	I–II
Hospital stay	4	7				100% (10/10) better	I–II
Return to normal activities and work	7	3	1			91% (10/11) better	I–II
Cosmesis	7	2	2			82% (9/11) better	I–II
Effectiveness (overall assessment)	1	5	4			60% (6/10) better	I–II

^a Comparison: laparoscopic fundoplication techniques vs open conventional procedure.

^b Percentage of consensus was calculated by dividing the number of panelists who voted better (probably and definitely), similar, or worse (probably and definitely) by the total number of panelists who submitted their evaluation forms.

^c Refer to Table 1.

ing Medical Technologies in Clinical Use (190a) (Mosteller F., 1985) extended by criteria introduced by Troidl (1995). The panel's evaluation as to the attainment of each technological stage by endoscopic antireflux surgery, together with the strength of evidence in the literature, is presented in Table 3.

Technical performance and applicability were demonstrated by several authors as early as 1992/1993. The results on safety, complications, morbidity, and mortality data depend on the learning phase (>50 cases) of the operations. The complication, reoperation, and conversion rates are higher in the first 20 cases of an individual surgeon. It is strongly advocated that experienced supervision be sought by surgeons beginning laparoscopic fundoplication during their first 20 procedures [278,a,b]. Data on *efficacy* (benefit for the patient) demonstrated in centers of excellence were based on type II studies. The benefit for the surgeon in terms of elegance, ease, and speed of the procedure is not yet clear cut. The operation time is the same or longer, and the technique is harder initially—however, the view of the operating field is better. The effectiveness data are still insufficient, long-term results are missing, and the results reported come mainly from interested centers and multicenter studies. It is important to audit continually the results of antireflux operations, especially because different techniques are used. The economic evaluation of laparoscopic antireflux surgery is still premature (few data from small studies only). Future studies are recommended in different health care systems, assessing the relative economic advantages of laparoscopic antireflux surgery in comparison to the available and paid medical treatment.

A major issue of ethical concern is the altered indication for surgery. A change of indication might produce more cost and harm in inappropriately selected patients. Laparoscopic

antireflux surgery should be recommended in centers with-sufficient experience and an adequate number of individuals with the disease. Randomized controlled studies are recommended to compare medical vs laparoscopic surgical treatment and partial vs total fundoplication wraps.

Question 2. What is the current status of laparoscopic antireflux surgery vs open conventional procedures in terms of feasibility and efficacy parameters?

A table with specific parameters relevant to open and laparoscopic antireflux procedures summarizes the current status (Table 4). The evaluation is mainly based on type I and type II studies (see list of references).

The results show that safety is comparable and rather favorable compared to the open technique. The incidence for complications, morbidity, and mortality is similar to the open technique once the learning phase has been surpassed. For specific intraoperative and postoperative adverse events see Table 4.

In terms of *efficacy*, significant advantages of the endoscopic antireflux operations are: less postoperative pain, shorter hospital stay, and earlier return to normal activities and work.

In general, laparoscopic antireflux surgery has advantages over open conventional procedures if performed by trained surgeons.

Laparoscopic antireflux surgery has the potential to improve reflux treatment provided that appropriate diagnostic facilities for functional esophageal studies and adequately trained and dedicated surgeons are available.

Acknowledgments. The organizers would like to thank the panelists of the

conference for their tremendous work and input in reaching these consensus statements. We appreciate very much the time and energy spent to make the conference possible.

The organization of the conference was only possible with the generous support of Professor Myrvold (Trondheim), the excellent assistance of Mrs Karin Nasskau (Cologne) and Dr. Rolf Lefering (Cologne) who strongly supported the conference evaluations.

Thanks also to the E.A.E.S. for their financial support and to Professor Myrvold, the President of the 4th International Conference of the E.A.E.S. for enabling and supporting the conference.

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