Laparoscopic antireflux surgery for gastroesophageal reflux disease (GERD): results of a consensus development conference

Eypasch, E.; Neugebauer, E.; Fischer, F.; Troidl, H.; Study group members AMC, .; van Lanschot, J.J.B.

DOI

[10.1007/s004649900382](https://doi.org/10.1007/s004649900382)

Publication date

1997

Published in

Surgical Endoscopy and other interventional Techniques

[Link to publication](#)

Citation for published version (APA):

Eypasch, E., Neugebauer, E., Fischer, F., Troidl, H., Study group members AMC, ., & van Lanschot, J. J. B. (1997). Laparoscopic antireflux surgery for gastroesophageal reflux disease (GERD): results of a consensus development conference. *Surgical Endoscopy and other interventional Techniques*, 11, 413-426. <https://doi.org/10.1007/s004649900382>

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

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

Conference Organizers: E. Eypasch,¹ E. Neugebauer² with the support of F. Fischer¹ and H. Troidl¹ for the Scientific and Educational Committee of the European Association for Endoscopic Surgery (E.A.E.S.)

Expert Panel: A. L. Blum, Division de Gastro-Entérologie, Centre Hospitalier, Universitaire Vaudois (CHUV) Lausanne (Switzerland); D. Collet, Department of Surgery, University of Bordeaux, (France); A. Cuschieri, Department of Surgery, Ninewells Hospital and Medical School, University of Dundee, Dundee, Scotland (U.K.); B. Dallemagne, Department of Surgery, Saint Joseph Hospital, Liège (Belgium); H. Feussner, Chirurgische Klinik u. Poliklinik rechts der Isar, Universität München, München (Germany); K.-H. Fuchs, Chirurgische Universitätsklinik und Poliklinik Würzburg, Universität Würzburg, Würzburg (Germany); H. Glise, Department of Surgery, Norra Älvsborgs Länssjukhus, Trollhättan (Sweden); C. K. Kum, Department of Surgery, National University Hospital, Singapore; T. Lerut, Department of Thoracic Surgery, University Hospital Leuven, Leuven (Belgium); L. Lundell, Department of Surgery, Sahlgren's Hospital, University of Göteborg, Göteborg (Sweden); H. E. Myrvold, Department of Surgery, Regionsykehuset, University of Trondheim, Trondheim (Norway); A. Peracchia, Department of Surgery, University of Milan, School of Medicine, Milan (Italy); H. Petersen, Department of Medicine, Regionsykehuset, University of Trondheim, Trondheim (Norway); J. J. B. van Lanschot, Academisch Ziekenhuis, Department of Surgery, University of Amsterdam, Amsterdam (Netherlands) Representative of Prof. Dr. Tytgat (Netherlands)

¹ Surgical Clinic Merheim, II Department of Surgery, University of Cologne, Ostermerheimer Str. 200, 51109 Cologne, Germany

² Biochemical and Experimental Division, II Department of Surgery, University of Cologne, Ostermerheimer Str. 200, 51109 Cologne, Germany

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.

Key words: Consensus development conferences — Laparoscopic antireflux operations — Outcome assessment

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 Barium swallow	Savary [231] Armstrong [8]
Radiology 24-h esophageal pH monitoring Stationary esophageal manometry ^a	Percentage time below pH 4 DeMeester score LES: Overall length Intraabdominal length Pressure (Transient LES relaxations) esophageal body disorders weak peristalsis	Gelfand [105a] DeMeester [65] 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 Photo-optic bilirubin assessment	Delayed gastric emptying Esophageal bile exposure Gastric bile exposure	Clark [40] 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	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
Cohort studies with literature controls		
Analysis of databases		
Reports of expert committees	0	Numerous
Case series without controls		
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	I	16, 23, 50, 72, 117, 123, 135, 152, 157, 172, 174, 200, 229, 241, 260, 264
Cohort studies with literature controls		
Analysis of databases		
Reports of expert committees	0	Numerous
Case series without controls		
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.

References

Literature not mentioned in the statements but discussed during the conference is also cited in this list of references.

- Ackermann C, Margreth L, Müller C, Harder F (1988) Das Langzeitresultat nach Funduplicatio. *Schweiz Med Wochenschr* 118: 774
- Allison PR (1951) Reflux oesophagitis, sliding hernia and the anatomy of repair. *Surg Gynecol Obstet* 92: 419–431
- Anvari N, Allen C (1996) Incidence of dysphagia following laparoscopic Nissen fundoplication without division of short gastrics. *Surg Endosc* 10: 199
- Anvari M, Allen C, Born A (1995) Laparoscopic Nissen fundoplication is a satisfactory alternative to long-term omeprazole therapy. *Br J Surg* 82: 938–942
- Apelgren K (1996) Hospital charges for Nissen fundoplication and other laparoscopic procedures. *Surg Endosc* 10: 359–360
- Armstrong D, Blum AL (1989) Full-dose H₂-receptor antagonist prophylaxis does not prevent relapse of reflux oesophagitis. *Gut* 30: A1494
- Armstrong D, Monnier P, Nicolet M, Blum AC, Savary M (1991) Endoscopic assessment of esophagitis. *Gullet* 1: 63–67
- Armstrong D, Blum AL, Savary M (1992) Reflux disease and Barrett's esophagus. *Endoscopy* 24: 9–17
- Armstrong D, Nicolet M, Monnier P, Chapuis G, Savary M, Blum AL (1992) Maintenance therapy: is there still a place for antireflux surgery? [Review]. *World J Surg* 16: 300–307
- Arvanitakis C, Nikopoulos A, Theoharidis A (1993) Cisapride and ranitidine in the treatment of gastro-oesophageal reflux disease—a comparative randomized double-blind trial. *Aliment Pharmacol Ther* 7: 635–641
- Attwood SEA, Barlow AP, Norris TL, Watson A (1992) Barrett's oesophagus: effect of antireflux surgery on symptom control and development of complications. *Br J Surg* 79: 1060–1063
- Aye RW, Hill LD, Kraemer SJ, Snopkowski P (1994) Early results with the laparoscopic Hill repair. *Am J Surg* 167: 542–546
- Bagnato VJ (1992) Laparoscopic Nissen fundoplication. *Surg Laparosc Endosc* 2: 188–190
- Ball CS, Norris T, Watson A (1988) Acid sensitivity in reflux oesophagitis with and without complications. *Gut* 29: 799
- a. Barnes BA (1982) Cost benefit and cost effectiveness analysis in surgery. *Surg Clin North Am* 62: 737–748
- b. Barlow AP, DeMeester TR, Boll CS, Eypasch EP (1989) The significance of gastric hypersecretion in gastroesophageal reflux disease. *Arch Surg* 124: 937–940
- Bechi P, Pucciani F, Baldini F (1993) Long-term ambulatory entero-gastric reflux monitoring. Validation of a new fiber optic technique. *Dig Dis Sci* 38: 1297–1306
- Beck IT, Cannon J, Lemire S, Thomson ABR (1992) Canadian consensus conference on the treatment of gastroesophageal reflux disease. *Can J Gastroenterol* 6: 277–289
- Behar J, Sheahan DG, Biancani B, Spiro HM, Storer EH (1975) Medical and surgical management of reflux esophagitis: a 38-month report on a prospective clinical trial. *N Engl J Med* 293: 263–268
- Bell NJV, Burget B, Howden CW (1992) Appropriate acid suppression for the management of gastro-oesophageal reflux disease. *Digestion* 51: 59–67
- Bell RCW, Hanna P, Treibling A (1996) Experience with 1,202 laparoscopic Toupet funduplications. *Surg Endosc* 10: 198
- Belsey R (1977) Mark IV repair of hiatal hernia by the transthoracic approach. *World J Surg* 1: 475–483
- Berguer R, Stiegmann GV, Yamamoto M, Kim J, Mansour A, Denton J, Norton LW, Angelchik JP (1991) Minimal access surgery for gastroesophageal reflux: laparoscopic placement of the Angelchik prosthesis in pigs. *Surg Endosc* 5: 123–126
- a. Bonavina L, Bardini R, Baessato M, Peracchia A (1993) Surgical treatment of reflux stricture of the esophagus. *Br J Surg* 80: 317
- b. Boom VDG, Go PMMYH, Hameeteman W, Dallemagne B (1996) Costeffectiveness of medical versus surgical treatment in patients with severe or refractory gastroesophageal reflux in the Netherlands. *Scand J Gastroenterol* 31: 1–9
- Bittner HB, Meyers WC, Brazer SR, Pappas TN (1944) Laparoscopic Nissen fundoplication: operative results and short-term follow-up. *Am J Surg* 167: 193–200
- Blum AL (1990) Treatment of acid-related disorders with gastric acid inhibitors: the state of the art. *Digestion* 47: 3–10
- Blum AL (1990) Cisapride prevents the relapse of reflux esophagitis. *Gastroenterology* 98: A22
- Blum AL, The EUROCIS-trialists (1990) Cisapride reduces the relapse rate on reflux esophagitis. *World Congress of Gastroenterology*, Sydney, Australia
- Blum AL, Adami B, Bouzo MH (1991) Effect of cisapride on relapse of esophagitis. A multinational placebo-controlled trial in patients healed with an antisecretory drug. *Dig Dis Sci* 38: 551–560
- Bonavina L, Evander A, DeMeester TR, Walther B, Cheng SC, Palazzo L, Concannon JL (1986) Length of the distal esophageal sphincter and competency of the cardia. *Am J Surg* 151: 25–34
- Brossard E, Monnier PH, Olhoy JB (1991) Serious complications—stenosis, ulcer and Barrett's epithelium—develop in 21.6% of adults with erosive reflux esophagitis. *Gastroenterology* 100: A36
- Brunner K, Creutzfeldt W (1989) Omeprazole in the long-term management of patients with acid-related diseases resistant to ranitidine. *Scand J Gastroenterol* 24: 101–105
- Cadiere GB, Houben JJ, Bruyns J, Himpens J, Panzer JM, Gelin M (1994) Laparoscopic Nissen fundoplication: technique and preliminary results. *Br J Surg* 81: 400–403
- Cadiere GB, Himpens J, Bruyns J (1995) How to avoid esophageal perforation while performing laparoscopic dissection of the hiatus. *Surg Endosc* 9: 450–452
- Cadiere GB, Bruyns J, Himpens J, Vertuyen M (1996) Intrathoracic migration of the wrap after laparoscopic Nissen fundoplication. *Surg Endosc* 10: 187
- Castell DO (1985) Introduction to pathophysiology of gastroesophageal reflux. In: Castell DO, Wu WC, Ott DJ (eds) *Gastro-oesophageal reflux disease: pathogenesis, diagnosis, therapy*. Future, New York, pp 3–9
- Castell DO (1994) Management of gastro-esophageal reflux disease 1995. Maintenance medical therapy of gastro-esophageal reflux—which drugs and how long? *Dis Esophagus* 7: 230–233
- Cederberg C, Andersson T, Skanberg I (1989) Omeprazole: pharmacokinetics and metabolism in man. *Scand J Gastroenterol* 24: 33–40
- Champault G (1994) Gastroesophageal reflux. Treatment by laparoscopy. 940 cases—French experience. *Ann Chir* 48: 159–164
- Champion JK, Mc Kernan JB (1995) Technical aspects for laparoscopic Nissen fundoplication. *Surg Technol Int* IV: 103–106
- Chiban N, Wilkinson J, Hurst RH (1943) Symptom relief in erosive GERD, a meta-analysis. *Am J Gastroenterol* 88: 9
- Chopra BK, Kazal HL, Mittal PK, Sibia SS (1992) A comparison of the clinical efficacy of ranitidine and sucralfate in reflux oesophagitis. *J Assoc Physicians India* 40: 162–163
- Clark GWB, Jamieson JR, Hinder RA, Polishuk PV, DeMeester TR, Gupta N, Cheng SC (1993) The relationship of gastric pH and the emptying of solid, semisolid and liquid meals. *J Gastrointest Mot* 5: 273–279
- Cloud ML, Offen WW, Robinson M (1994) Nizatidine versus placebo in gastro-oesophageal reflux disease: a 12-week, multicentre, randomised, double-blind study. *Br J Clin Pract* 76: 3–10
- Cloyd DW (1994) Laparoscopic repair of incarcerated paraesophageal hernias. *Surg Endosc* 8: 893–897
- Coley CR, Bang MJ, Specbler SJ, Williford WO, Mulley AG (1993) Initial medical vs surgical therapy for complicated or chronic gastroesophageal reflux disease. A cost effectiveness analysis. *Gastroenterology* 104: A5
- Collard JM, de Gheldere CA, De Kock M, Otte JB, Kestens PJ (1994) Laparoscopic antireflux surgery. What is real progress? *Ann Surg* 220: 146–154
- Collard JM, Romagnoli R, Kestens PJ (1996) Reoperation for unsat-

- isfactory outcome after laparoscopic antireflux surgery. *Dis Esophagus* 9: 56–62
46. Collen MJ, Strong RM (1992) Comparison of omeprazole and ranitidine in treatment of refractory gastroesophageal reflux disease in patients with gastric acid hypersecretion. *Dig Dis Sci* 37: 897–903
 47. Collet D, Cadiere GB, the Formation for the Development of Laparoscopic Surgery for Gastroesophageal Reflux Disease Group (1995) Conversions and complications of laparoscopic treatment of gastroesophageal reflux disease. *Am J Surg* 169: 622–626
 48. Congrave DP (1992) Brief clinical report. Laparoscopic paraesophageal hernia repair. *J Laparoendosc Surg* 2: 45–48
 49. Coster DD, Bower WH, Wilson VT, Butler DA, Locker SC, Brebrick RT (1995) Laparoscopic Nissen fundoplication: a curative, safe, and cost-effective procedure for complicated gastroesophageal reflux disease. *Surg Laparosc Endosc* 5: 111–117
 50. Creutzfeldt W (1994) Risk-benefit assessment of omeprazole in the treatment of gastrointestinal disorders. *Drug Saf* 10: 66–82
 51. Crist DW, Gradaez TR (1993) Complications of laparoscopic surgery. *Surg Clin North Am* 73: 265–289
 52. Csendes A, Braghetto I, Korn O, Cortes C (1989) Late subjective and objective evaluations of antireflux surgery in patients with reflux esophagitis: analysis of 215 patients. *Surgery* 105: 374–82
 53. Cuschieri A (1993) Laparoscopic antireflux surgery and repair of hiatal hernia. *World J Surg* 17: 40–45
 54. Cuschieri A, Shimi S, Nathansson LK (1992) Laparoscopic reduction—crural repair and fundoplication of large hiatal hernia. *Am J Surg* 163: 425–430
 55. Cuschieri A, Hunter J, Wolfe B, Swanson LL, Hutson W (1993) Multicenter prospective evaluation of laparoscopic antireflux surgery. Preliminary report. *Surg Endosc* 7: 505–510
 56. Dahhach M, Scott GB (1994) Comparing the efficacy of cisapride and ranitidine in esophagitis: a double-blind, parallel group study in general practice. *Br J Clin Pract* 48: 10–14
 57. Dallemagne B, Weerts JM, Jehaes C, Markiewicz S, Lombard R (1991) Laparoscopic Nissen fundoplication: preliminary report. *Surg Laparosc Endosc* 1: 138–143
 58. Dallemagne B, Weerts JM, Jehaes C, Markiewicz S, Lombard R (1992) Laparoscopic Nissen fundoplication: preliminary report. *Surg Laparosc Endosc* 2: 188–190
 59. Dallemagne B, Weerts JM, Jehaes C, Markiewicz S, Lombard R (1993) Techniques and results of endoscopic fundoplication. *Endosc Surg Allied Technol* 1: 72–75
 60. Dallemagne B, Taziaux P, Weerts J, Jehaes C, Markiewicz S (1995) Laparoscopic surgery of gastroesophageal reflux. *Ann Chir* 49: 30–36
 61. Dallemagne B, Weerts JM, Jehaes C, Markiewicz S (1996) Causes of failures of laparoscopic antireflux operations. *Surg Endosc* 10: 305–310
 62. DeMeester TR (1989) Prolonged esophageal pH monitoring? In: Read NW (ed) *Gastrointestinal motility: which tests?* Wrightson Biomedical, Petersfield, England, pp 41–51
 63. DeMeester TR (1994) Antireflux surgery. *J Am Coll Surg* 179: 385–393
 64. DeMeester TR, Johnson LF, Kent AH (1974) Evaluations of current operations for the prevention of gastroesophageal reflux. *Ann Surg* 180: 511–523
 65. DeMeester TR, Johnson LS, Joseph GJ, Toscano MS, Hall AW, Skinner DB (1976) Patterns of gastroesophageal reflux in health and disease. *Ann Surg* 184: 459–470
 66. DeMeester TR, Bonavina L, Albertucci N (1986) Nissen fundoplication for gastroesophageal disease: evaluation of primary repair in 100 consecutive patients. *Ann Surg* 204: 9–20
 67. DeMeester TR, Fuchs KK, Ball CS (1987) Experimental and clinical results with proximal end-to-end duodenojejunostomy for pathologic duodenogastric reflux. *Ann Surg* 206: 414–426
 68. DeMeester TR, Attwood SEA, Smyrk TC, Therkildsen DH, Hinder RA (1990) Surgical therapy in Barrett's esophagus. *Ann Surg* 212: 528–542
 69. Demmy TL, Caron NR, Curtis JJ (1994) Severe dysphagia from an Angelchik prosthesis: futility of routine esophageal testing. *Ann Thorac Surg* 57: 1660–1661
 - 69a. Dent JA, Dodds WJ, Friedman RH, Sekeguchi P, Hogen WJ, Arndorfer EC, Petrie DJ (1980) Mechanisms of gastroesophageal reflux in recumbent human subjects. *J Clin Invest* 65: 256–267
 70. Dent J, Yeomans ND, Mackinnon M, Reed W, Narielvala FM, Hetzel DJ, Solcia E, Shearman DJC (1994) Omeprazole v ranitidine for prevention of relapse in reflux oesophagitis. A controlled double blind trial of their efficacy and safety. *Gut* 35: 590–598
 71. DePaula AL, Hashiba K, Bafutto M, Machado CA (1995) Laparoscopic reoperations after failed and complicated antireflux operations. *Surg Endosc* 9: 681–686
 72. DeVault KR (1994) Current diagnosis and treatment of gastroesophageal reflux disease. *Mayo Clin Proc* 69: 867–876
 73. Deveney K, Swanson L, Shepard B, Deneney C (1996) A statewide registry for outcome of open and laparoscopic anti-reflux procedures. *Surg Endosc* 10: 197
 74. Dimenäs E (1993) Methodological aspect of evaluation of quality of life in upper gastrointestinal diseases. *Scand J Gastroenterol* 28: 18–21
 75. Donahue PE, Samelson S, Nyhus LM, Bombeck T (1985) The floppy Nissen fundoplication. Effective long-term control of pathological reflux. *Arch Surg* 120: 663–668
 76. Dor J, Humbert P, Dor V (1962) L'interet de la technique de Nissen modifiée dans la prevention du reflux apres cardiomyotomie extramucuse de Heller. *Mem Acad Chir Paris* 27: 877
 - 76a. Drummond MF, Stoddart GL, Torrance GW (1987) Methods for the economic evaluation of health care programmes. Oxford University Press, Oxford
 - 76b. Educational Committee of the European Association for Endoscopic Surgery and other interventional techniques (E.A.E.S.). Conference Organizers: Neugebauer E., Troidl H., Kum C.K., Eypasch E., Miserez M., Paul A. (1995) The E.A.E.S. Consensus Development Conferences on Laparoscopic Cholecystectomy, Appendectomy, and Hernia Repair. Consensus Statements. *Surg Endosc* 9: 550–563
 77. Eller R, Olsen D, Sharp K, Richards W (1996) Is division of the short gastric vessels necessary? *Surg Endosc* 10: 199
 78. Eypasch EP, Stein H, DeMeester TR, Johansson K-E, Barlow AP, Schneider GT (1990) A new technique to define and clarify esophageal motor disorders. *Am J Surg* 159: 144
 79. Eypasch E, Spangenberg W, Neugebauer E, Troidl H (1992) Frühe postoperative Verbesserung der Lebensqualität nach laparoskopischer Cholezystektomie. In: Häring R (ed) *Diagnostik und Therapie des Gallensteinleidens*. Blackwell, Berlin
 80. Eypasch R, Holthausen U, Wellens E, Troidl H (1994) Laparoscopic Nissen fundoplication: potential benefits and burdens. Update in gastric surgery. In: Röher HD (ed) *Grenzland Symposium, Düsseldorf*. Thieme, Stuttgart
 - 80a. Eypasch E, Williams JI, Wood-Dauphinée S, Ure BM, Schmülling C, Neugebauer E, Troidl H (1995) The Gastrointestinal Quality of Life Index (GQLI): development and validation of a new instrument. *Br J Surg* 82: 216–222
 81. Fein M, Fuchs K-H, Bohrer T, Freys S, Thiede A (1996) Fiberoptic technique for 24 hour bile reflux monitoring—standards and normal values for gastric monitoring. *Dig Dis Sci* 41: 216–225
 82. Feussner H, Stein HJ (1994) Minimally invasive esophageal surgery. Laparoscopic antireflux surgery and cardiomyotomy. *Dis Esophagus* 7: 17–23
 83. Feussner H, Petri A, Walker S, Bollschweiler E, Siewert JR (1991) The modified AFP score: an attempt to make the results of anti-reflux surgery comparable. *Br J Surg* 78: 942–946
 84. Filipi CJ, Hinder RA, DePaula AL, Hunter JG, Swanson LL, Stalter KD (1996) Mechanisms and avoidance of esophageal perforation by bougie and nasogastric intubation. *Surg Endosc* 10: 198
 85. Fiorucci ST, Santucci L, Morelli A (1990) Effects of omeprazole and high doses of ranitidine on gastric acidity and GOR in patients with moderate-severe oesophagitis. *Am J Gastroenterol* 85: 1485–1462
 86. Fontauard E, Espalieu P, Boulez J (1995) Laparoscopic Nissen-Rosetti fundoplication. *Surg Endosc* 9: 869–873
 87. Frantzides CT, Carlson MA (1992) Laparoscopic versus conventional fundoplication. *J Laparoendosc Surg* 5: 137–143
 88. Freston JW, Malagelada JR, Petersen H, McClay RF (1995) Critical issues in the management of gastroesophageal reflux disease. *Eur J Gastroenterol Hepatol* 7: 577–586
 89. Fuchs KH (1993) Operative procedures in antireflux surgery. *Endosc Laparosc Surg* 1: 65–71
 90. Fuchs KH, DeMeester TR (1987) Cost benefit aspects in the management of gastroesophageal reflux disease. In: Siewert JR, Hoelscher AH (eds) *Diseases of the esophagus*. Springer, Heidelberg: pp 857–861

91. Fuchs KH, DeMeester TR, Albertucci M (1987) Specificity and sensitivity of objective diagnosis of gastroesophageal reflux disease. *Surgery* 102: 575–580
92. Fuchs KH, DeMeester TR, Albertucci M, Schwizer W (1987) Quantification of the duodenogastric reflux in gastroesophageal reflux disease. In: Siewerter JR (ed) *Diseases of the esophagus*. Springer, Heidelberg: pp 831–835
93. Fuchs KH, DeMeester TR, Hinder RA, Stein HJ, Barlow AP, Gupta NC (1991) Computerized identification of pathological duodenogastric reflux using 24-hour gastric pH monitoring. *Ann Surg* 213: 13–20
94. Fuchs KH, Freys SM, Heimbucher J (1992) Indications and technique of laparoscopic antireflux operations. In: Nabeya K, Hanaoka T, Nogami H (eds) *Recent advances in diseases of the esophagus*. Springer, Heidelberg: pp 43–50
95. Fuchs KH, Selch A, Freys SM, DeMeester TR (1992) Gastric acid secretion and gastric pH measurement in peptic ulcer disease. *Prob Gen Surg* 9: 138–151
96. Fuchs KH, Freys SM, Heimbucher J (1993) Erfahrungen mit der laparoskopischen Technik in der Antirefluxchirurgie. *Chirurg* 64: 317–323
97. Fuchs KH, Heimbucher J, Freys SM, Thiede A (1994) Management of gastro-esophageal reflux disease 1995. Tailored concept of antireflux operations. *Dis Esophagus* 7: 250–254
98. Fuchs KH, Freys SM, Heimbucher J, Fein M, Thiede A (1995) Pathophysiologic spectrum in patients with gastroesophageal reflux disease in a surgical GI function laboratory. *Dis Esophagus* 8: 211–217
99. Funch-Jens P (1995) Is this a reflux patient or is it a patient with functional dyspepsia with additional reflux symptoms? *Scand J Gastroenterol* 30: 29–31
100. Gallup Ltd. (1989) Gallup poll—UK attitudes to heartburn and reflux. Gallup Ltd., New Maldeu
101. Galmiche JP, Brandstötter G, Evreux M (1988) Combined therapy with cisapride and metoprolol in treatment of reflux esophagitis. *Dig Dis Sci* 35: 675–681
102. Galmiche JP, Bruley des Varannes S (1994) Symptoms and disease severity in gastroesophageal reflux disease. *Scand J Gastroenterol* 29: 62–68
103. Garnett WR (1993) Efficacy, safety, and cost issues in managing patients with gastroesophageal reflux disease. *Am J Hosp Pharm* 50: 11–18
104. Geagea T (1991) Laparoscopic Nissen's fundoplication: preliminary report on ten cases. *Surg Endosc* 5: 170–173
105. Geagea T (1994) Laparoscopic Nissen-Rossetti fundoplication. *Surg Endosc* 8: 1080–1084
- 105a. Gelfand DW (1988) Radiologic evaluation of the pharynx and esophagus. In: Gelfand DW, Richter JE (eds) *Dysphagia—diagnosis and treatment*. Ikagu-Shoin, New York, pp 45–83
106. Glise H (1989) Healing relapse rate and prophylaxis of reflux esophagitis. *Scand J Gastroenterol* 24: 57–64
107. Glise H, Hallerbäck B (1996) Principles of operative treatment for GR and critical review of results of such operations. SAGES postgraduate course: problem solving in endoscopic surgery, SAGES, Santa Monica, CA, USA
108. Glise H, Hallerbäck B, Johansson B (1995) Quality of life assessments in evaluation of laparoscopic Rossetti fundoplication. *Surg Endosc* 9: 183–189
109. Glise H, Johansson B, Rosseland AR, Hallerbäck B, Hultén S, Carling L, Knapstad LJ Gastroesophageal reflux symptoms—clinical findings and effect of ranitidine treatment. (submitted)
110. Gooszen HG, Weidema WF, Ringers J, Horbach JM, Maschee AA, Lamers CB (1993) Initial experience with laparoscopic fundoplication in The Netherlands and comparison with an established technique (Belsey Mark IV). *Scand J Gastroenterol* 200: 24–27
111. Grande L, Toledo-Pimentel V, Manterola C, Lacima G, Ros E, Garcia-Valdecasas JC, Fuster J, Visa J, Pera C (1994) Value of Nissen fundoplication in patients with gastro-oesophageal reflux judged by long-term symptom control. *Br J Surg* 81: 548–550
112. Hallerbäck B, Unge P, Carling L, Edwin B, Glise H, Havu N, Lyrenäs E, Lundberg K (1994) Omeprazole or ranitidine in long term treatment of reflux oesophagitis. *Gastroenterology* 107: 1305–1311
113. Hallerbäck B, Glise H, Johansson B, Rödmark T. (1994) Laparoscopic Rossetti fundoplication. *Surg Endosc* 8: 1417–1422
114. Hamelin B, Arnould B, Barbier JP (1994) Cost-effectiveness comparison between omeprazole and ranitidine for treatment of reflux. *Gastroenterology* 106: 88
115. Hatlebakk JG, Berstad A, Carling L, Svedberg LE, Unge P, Ekstrom P, Halvorsen L, Stallemo A, Hovdenak N, Trondstad R (1993) Lansoprazole versus omeprazole in short-term treatment of reflux oesophagitis. Results of a Scandinavian multicentre trial. *Scand J Gastroenterol* 28: 224–228
116. Havelund T, Laurensen LS, Skoubo-Kristensen R (1988) Omeprazole and ranitidine in the treatment of reflux esophagitis: double blind comparative trial. *Br Med J* 296: 89–92
117. Heading RC (1995) Long-term management of gastroesophageal reflux disease. *Scand J Gastroenterol* 30: 25–30
118. Heimbucher J, Kauer WKH, Peters JH (1994) Physiologic basis of peptic ulcer therapy. In: Peter JH, DeMeester TR (eds) *Minimally invasive surgery of the foregut*. Quality Medical, St Louis, pp 199–214
119. Hendel L, Hage E, Hendel J, Stentoft P (1992) Omeprazole in the long-term treatment of severe gastro-oesophageal reflux disease in patients with systemic sclerosis. *Aliment Pharmacol Ther* 6: 565–577
120. Hetzel DJ (1992) Controlled clinical trials of omeprazole in the long-term management of reflux disease. *Digestion* 51: 35–42
121. Hetzel DJ, Dent J, Reed W (1988) Healing and relapse of severe peptic esophagitis after treatment with Omeprazole. *Gastroenterology* 95: 903–912
122. Hill AD, Walsh TN, Bolger CM, Byrne PJ, Hennessy TP (1994) Randomized controlled trial comparing Nissen fundoplication and the Angelchik prosthesis. *Br J Surg* 81: 72–74
123. Hillman AL (1994) Economic analysis of alternative treatments for persistent gastroesophageal reflux disease. *Scand J Gastroenterol* 29: 98–102
124. Hillman AL, Bloom BS, Fendrick AM, Schwartz JS (1992) Cost and quality effects of alternative treatments for persistent gastroesophageal reflux disease. *Arch Int Med* 152: 1467–1472
125. Hinder RA, Filipi CJ (1992) The technique of laparoscopic Nissen fundoplication (Review). *Surgical Laparosc Endosc* 2: 265–272
126. Hinder RA, Filipi CJ, Weltscher G, Neary P, DeMeester TR, Perdakis G (1994) Laparoscopic Nissen fundoplication is an effective treatment of gastroesophageal reflux disease. *Ann Surg* 220: 481–483
127. Howard J, Heading RC (1992) Epidemiology of gastro-esophageal reflux disease. *World J Surg* 16: 288–293
128. Howden DW, Castell DO, Cohen S, Freston IW, Orlando RC, Robinson M (1995) The rationale for continuous maintenance treatment of reflux esophagitis. *Arch Int Med* 155: 1465–1471
129. Hunt RH (1995) The relationship between the control of pH and healing and symptom relief in gastro-oesophageal reflux disease. *Aliment Pharmacol Ther* 9: 3–7
130. Incabone R, Peters JH, Heimbucher J, Dvorak D, DeMeester CG, Bremner TR (1995) A contemporaneous comparison of hospital charges for laparoscopic and open Nissen fundoplication. *Surg Endosc* 9: 151–154
131. Isal JB, Zeitun B, Barbier B (1990) Comparison of two dosage regimens of omeprazole—10 mg once daily and 20 mg week-ends—as prophylaxis against recurrence of reflux esophagitis. *Gastroenterology* 98: A63
132. Jamieson GG, Watson DI, Britten-Jones R, Mitchell PC, Anvari M (1992) Laparoscopic Nissen fundoplication on esophageal motor function. *Arch Surg* 127: 788–791
133. Jamieson CG, Watson DI, Britten-Jones R, Mitchell PC, Anvari M (1994) Laparoscopic Nissen fundoplication. *Ann Surg* 220: 137–145
134. Joelsson BE, DeMeester TR, Skinner DB (1982) The role of the esophageal body in the antireflux mechanism. *Surgery* 92: 417–424
135. Joelsson S, Joelsson IB, Lundberg PP, Wolan A, Wallander MA (1992) Safety experience from long-term treatment with omeprazole. *Digestion* 51:93–101
136. Jönsson B, Stålhammar NO (1993) The cost-effectiveness of omeprazole and ranitidine in intermittent and maintenance treatment of reflux esophagitis—ten cases of Sweden. *Br J Med Econ* 6: 111–126
137. Johansson B, Glise H, Hallerbäck B (1995) Thoracic herniation and intrathoracic gastric perforation after laparoscopic fundoplication. *Surg Endosc* 9: 917–918
138. Johansson J, Johansson F, Joelsson B, Floren CH, Walther B (1993) Outcome 5 years after 360 degree fundoplication for gastro-oesophageal reflux disease. *Br J Surg* 80: 46–49
139. Johansson KE, Tibbling L (1986) Maintenance treatment with Ran-

- itidine compared with fundoplication in gastro-oesophageal reflux disease. *Scand J Gastroenterol* 21: 779–788
140. Johnsen R, Bernersen B, Straume B, Forde OH, Bostad L, Burhol PG (1991) Prevalences of endoscopic and histological findings in subjects with and without dyspepsia. *Br Med J* 302: 749–752
141. Johnsson F, Joelsson B, Gudmundson K, Greif L (1987) Symptoms and endoscopic findings in diagnosis of gastro-oesophageal reflux disease. *Scand J Gastroenterol* 22: 714–718
142. Jones R (1995) Gastro-oesophageal reflux disease in general practice. *Scand J Gastroenterol* 30: 35–38
143. Jones R, Lydeard S (1989) Prevalence of dyspepsia in the community. *Br Med J* 298: 30–32
144. Jones RH, Lydeard SE, Hobbs FRD (1990) Dyspepsia in England and Scotland. *Gut* 31: 401–405
145. Katada N, Hinder RA, Raiser F, McBride P, Filipi CJ (1995) Laparoscopic Nissen fundoplication. *Gastroenterologist* 3: 95–104
146. Kauer W, Peters JH, DeMeester TR, Ireland AP, Bremner CG, Hagen JA (1995) Mixed reflux of gastric and duodenal juices is more harmful to the esophagus than gastric juice alone. *Ann Surg* 222: 525–533
147. Kauer WK, Peters JH, DeMeester TR, Heimbucher J, Ireland AP, Bremner CG (1995) A tailored approach to antireflux surgery. *J Thorac Cardiovasc Surg* 110: 141–146
148. Kimmig JM (1995) Treatment and prevention of relapse of mild oesophagitis with omeprazole and cisapride: comparison of two strategies. *Aliment Pharmacol Ther* 9: 281–286
149. Kiviluto T, Luukkonen P, Salo J (1994) Laparoscopic gastro-oesophageal antireflux surgery. *Ann Chir Gynaecol* 83: 101–106
150. Klausner AG, Schindlbeck NE, Müller-Lissner SA (1990) Symptoms in gastro-oesophageal reflux disease. *Lancet* 335: 205–208
151. Klinkenberg-Knol EC (1992) The role of omeprazole in healing and prevention of reflux disease. *Hepatogastroenterology* 39: 27–30
152. Klinkenberg-Knol EC, Meuwissen SGM (1992) Medical therapy of patients with reflux oesophagitis poorly responsive to H₂-receptor antagonist therapy. *Digestion* 51: 44–48
153. Klinkenberg-Knol EC, Jansen JMBJ, Festen HPM, Meuwissen SGM, Lamers CBHW (1987) Double-blind multicentre comparison of omeprazole and ranitidine in the treatment of reflux oesophagitis. *Lancet* 1: 349–351
154. Klinkenberg-Knol EC, Jansen JBM, Lamers CBHW (1989) Use of omeprazole in the management of reflux oesophagitis resistant to H₂-receptor antagonists. *Scand J Gastroenterol* 24: 88–93
155. Klinkenberg-Knol EC, Festen HPM, Janesen JBM (1994) Long-term treatment with omeprazole for refractory esophagitis: efficacy and safety. *Ann Intern Med* 121: 161–167
156. Klinkenberg-Knol EC, Festen HP, Meuwissen SG (1995) Pharmacological management of gastro-oesophageal reflux disease. *Drugs* 49: 695–710
157. Koelz HR (1989) Treatment of reflux esophagitis with H₂-blockers, antacids and prokinetic drugs: an analysis of randomized clinical trials. *Scand J Gastroenterol* 24: 25–36
158. Koop H, Arnold R (1991) Long-term maintenance treatment of reflux esophagitis with omeprazole. Prospective study with H₂-blocker-resistant esophagitis. *Dig Dis Sci* 36: 552
159. Kraemer SJ, Aye R, Kozarek RA, Hill LD (1994) Laparoscopic Hill repair. *Gastrointest Endosc* 40: 155–159
160. Kuster SGR, Gilroy S (1993) Laparoscopic repair of paraesophageal hiatal hernia. *Surg Endosc* 7: 362–363
161. Laursen LS, Bondesen S, Hansen J (1992) Omeprazole 10 mg or 20 mg daily for the prevention of relapse in gastroesophageal reflux disease? A double-blind comparative study. *Gastroenterology* 102: A109
162. Laycock WS, Mauren S, Waring JP, Trus T, Branum G, Hunter JG (1995) Improvement in quality of life measures following laparoscopic antireflux surgery. *Gastroenterology* 108: A1128
163. Laycock WS, Oddsdottir M, Franco A, Mansour K, Hunter JG (1995) Laparoscopic Nissen fundoplication is less expensive than open Belsey Mark IV. *Surg Endosc* 9: 426–429
164. Laycock WS, Trus TL, Hunter GE (1996) New technology for the division of short gastric vessels during laparoscopic Nissen fundoplication. *Surg Endosc* 10: 71–73
165. Lerut T, Coosemans W, Christiaens R, Gruwez JA (1990) The Belsey Mark IV antireflux, procedure: indications and long-term results. In: Little AG, Ferguson MK, Skinner DP (eds) *Diseases of the esophagus* vol. II: Benign diseases. Futura, Mount Kisco: pp 181–188
166. Liebermann DA (1987) Medical therapy for chronic reflux esophagitis: long-term follow-up. *Arch Intern Med* 147: 1717–1720
167. Low DG, Hill LD (1989) Fifteen to 20-year results following the Hill antireflux operation. *Thorac Cardiovasc Surg* 98: 444–450
168. Lundell L, Backman L, Ekström P (1990) Omeprazole or high-dose ranitidine in the treatment of patients with reflux esophagitis not responding to standard doses of H₂-receptor antagonists. *Aliment Pharmacol Ther* 4: 145–155
169. Lundell L, Backman L, Ekström P (1990) Prevention of relapse of esophagitis after endoscopic healing: the efficacy of omeprazole compared with ranitidine. *Gastroenterology* 98: A82
170. Lundell L (1992) Acid suppression in the long-term treatment of peptic stricture and Barrett's oesophagus. *Digestion* 51: 49–58
171. Lundell L (1994) The knife or the pill in the long-term treatment of gastroesophageal reflux disease? *Yale J Biol Med* 67: 233–246
172. Lundell L (1994) Long-term treatment of gastro-oesophageal reflux disease with omeprazole. *Scand J Gastroenterol* 29: 74–78
173. Lundell L, Abrahamsson H, Ruth N, Sandberg N, Olbe LC (1991) Lower esophageal sphincter characteristics and esophageal acid exposure following partial 360° fundoplication: results of a prospective randomized clinical study. *World J Surg* 15: 115–121
174. Lundell L, Backman L, Enström D (1991) Prevention of relapse of reflux esophagitis after endoscopic healing. The efficacy and safety of omeprazole compared with ranitidine. *Scand J Gastroenterol* 26: 248–256
- 174a. Lundell L, Abrahamson H, Ruth M, Rydberg C, et al. (1996) Long-term results of a prospective randomized comparison of total fundic wrap (Nissen-Rossetti) vs. semifundoplication (Toupet) for gastroesophageal reflux. *Br J Surg* 83: 830–835
- 174b. Jones RH, Lydeard SE, Hobbs FDR, Kenkre JE, Williams EI, Jones SJ, Repper JA, Caldwell JL, Dunwoodie WMB, Bottomley JM (1990) Dyspepsia in England and Scotland. *Gut* 31: 402–405
175. Luostarinen R (1993) Nissen fundoplication for reflux esophagitis. Long-term clinical and endoscopic results in 109 of 127 consecutive patients. *Ann Surg* 217: 329–337
176. Luostarinen M (1995) Nissen fundoplication for gastro-oesophageal reflux disease: long-term results. *Ann Chir Gynaecol* 84: 115–120
177. Luostarinen M, Isolauri J, Laitinen J (1993) Fate of Nissen fundoplication after 20 years: a clinical, endoscopic and functional analysis. *Gut* 34: 1015–1020
178. Luostarinen M, Koskinen M, Reinikainen P, Karvonen J, Isolauri J (1995) Two antireflux operations: floppy versus standard Nissen fundoplication. *Ann Med* 27: 199–205
179. Mangar D, Kirchhoff GT, Leal JJ, Laborde R, Fu E (1994) Pneumothorax during laparoscopic Nissen fundoplication. *Can J Anaesth* 41: 854–856
180. Marks R, Richter J, Rizzo J (1994) Omeprazole vs H₂-receptor antagonists in treating patients with peptic stricture and esophagitis. *Gastroenterology* 106: 907–915
181. Marrero JM, de Caestecker JS, Maxwell JD (1994) Effect of famotidine on oesophageal sensitivity in gastro-oesophageal reflux disease. *Gut* 35: 447–450
182. Matthews HR (1996) A proposed classification for hiatal hernia and gastroesophageal reflux. *Dis Esophagus* 9: 1–3
183. McAnena OJ, Willson PD, Evans DF, Kadirkamanathan SS, Mannur KR, Wingle DL (1995) Physiological and symptomatic outcome after laparoscopic fundoplication. *Br J Surg* 82: 795–797
184. McKernan JB (1994) Laparoscopic antireflux surgery. *Int Surg* 79: 342–345
185. McKernan JB (1994) Laparoscopic repair of gastroesophageal reflux disease. Toupet partial fundoplication versus Nissen fundoplication. *Surg Endosc* 8: 851–856
186. McKernan JB, Laws HL (1994) Laparoscopic Nissen fundoplication for the treatment of gastroesophageal reflux disease. *Am Surg* 60: 87–93
187. McKernan JB, Champion JK (1995) Laparoscopic antireflux surgery. *Am Surg* 61: 530–536
188. Meyer C, de Manzini N, Rohr S, Thiry CL, Perraud V (1995–95) Laparoscopic treatment of gastroesophageal reflux. Cardiopexia with the round ligament versus Nissen's type fundoplication. *Chirurgie* 120: 107–112
189. Mössner J, Hölscher AH, Herz R, Schneider A (1995) A double-blind study of pantoprazole and omeprazole in the treatment of reflux oesophagitis: a multicenter trial. *Aliment Pharmacol Ther* 9: 321–326
190. Mosnier H, Lepout J, Aubert A, Kianmanesh R, Sbai Idrissi MS,

- Guivarch M (1995) A 270 degree laparoscopic posterior fundoplasty in the treatment of gastroesophageal reflux. *J Am Coll Surg* 181: 220–224
- 190a. Mosteller F (1985) *Assessing Medical Technologies*. National Academic Press, Washington, DC.
191. Mouiel J, Katkhouda N (1995) Laparoscopic Rossetti fundoplication. *Surg Technol Int* III: 207–213
192. Mouiel J, Katkhouda N, Jugehheim J (1993) Reflux gastro-oesophagie: experience laparoscopique. In: Mouiel J (ed) *Actualite digestives medico-chirurgicales*. 14e serie. Masson, Paris, pp 26–33
193. Myrvold HE (1995) Laparoscopic reflux surgery; the merits and the problems. *Ann Med* 27: 29–33
194. Nathanson LK, Shimi S, Cushieri A (1991) Laparoscopic ligamentum teres (round ligament) cardiopexy. *Br J Surg* 78: 947–951
195. Nebel OT, Fornes MF, Castsell DO (1976) Symptomatic gastroesophageal reflux incidence and precipitating factors. *Am J Dig Dis* 21: 953–956
- 195a. Neugebauer E, Troidl H, Wood-Dauphinée S, Bullinger M, Eypasch E (1991) Meran Consensus Conference Quality-of-Life-Assessment in Surgery, 3–8 October 1990. Part I and Part II. *Theor Surg* 6: 121–165, 195–220
- 195b. Neugebauer E, Troidl H, Wood-Dauphinée S, Bullinger M, Eypasch E (1992) Meran Consensus Conference Quality-of-Life-Assessment in Surgery, 3–8 October 1990. Part III. *Theor Surg* 7: 14–38
196. Neunheim KS, Baue AE (1994) Paraesophageal hiatal hernia. In: Shield TW (ed) *General thoracic surgery*. Williams & Wilkins, Philadelphia, pp 644–651
197. Nissen R (1956) Ein einfache operation sur beeinflussing der reflux esophagitis. *Schw Med Wochenschr* 86: 590–592
198. Nowzaradan Y, Barnes P (1993) Laparoscopic Nissen fundoplication. *J Laparoendosc Surg* 3: 429–438
199. Oddsdotti M, Franco AL, Laycock WS, Warring JP, Hunter JE (1995) Laparoscopic repair of paraesophageal hernia. New access, old technique. *Surg Endosc* 9: 164–168
200. Ollyo JB, Monnier P, Fontalliet C (1993) The natural history and incidence of reflux esophagitis. *Gullet* 3: 3–10
201. O'Reilly MJ, Mullins SG (1993) Laparoscopic Nissen fundoplication: report of first 15 cases. *J Laparoendosc Surg* 3: 317–324
202. Ortiz A, Martinez de Haro LF, Parilla P, Morales G, Molina J, Bermejo J, Liron R, Aguilar J (1996) Conservative treatment versus antireflux surgery in Barrett's oesophagus: long-term results of a prospective study. *Br J Surg* 83: 274–278
203. Ovaska J, Rantala A, Laine S, Gullichsen R (1996) Laparoscopic vs conventional Nissen fundoplication: a prospective randomized study. *Surg Endosc* 10: 178
204. Palmer ED (1958) Hiatus hernia in the adult: clinical manifestations. *Am J Dig Dis* 3: 45–58
205. Paluch TA (1996) Ambulatory laparoscopic Nissen fundoplication: a preliminary report. *Surg Endosc* 10: 198
206. Paluch TA, Hilford MA, Feitelbert SP (1996) Laparoscopic fundoplication and managed care: cost effective in the treatment of gastroesophageal reflux. *Surg Endosc* 10: 187
207. Paritek D, Tam PKH (1991) Results of fundoplication in a UK Paediatric centre. *Br J Surg* 78: 346–348
208. Patti MG, Arcerito M, Pellegrini CA, Mulvihill SJ, Tong J, Way LW (1995) Minimally invasive surgery for gastroesophageal reflux disease. *Am J Surg* 170: 614–618
209. Peillon C, Manouvrier JL, Labreche J, Kaeffer N, Denis P, Testart J (1994) Should the vagus nerves be isolated from the fundoplication wrap? A prospective study. *Arch Surg* 129: 814–818
210. Pellegrini CA (1994) The role of minimal-access surgery in esophageal disease. *Curr Opin Gen Surg* 117–119
211. Pellegrini CA (1995) Therapy for gastroesophageal reflux disease: the new kid on the block. Editorial. *J Am Coll Surg* 180: 485–487
212. Peracchia A, Bancewicz J, Bonavina L (1995) Fundoplication is an effective treatment for gastroesophageal reflux disease. *Gastroenterol Intern* 8: 1–7
213. Perissat J, Collet D (1995) Laparoscopic treatment of gastroesophageal reflux disease. *Surg Technol Int* III: 201–205
214. Perissat J, Collet D, Edye M (1992) Therapeutic laparoscopy. *Endoscopy* 24: 138–143
215. Peters JH, DeMeester TR (1995) Indications, principles of procedure selection and technique of laparoscopic Nissen fundoplication. *Semin Laparosc Surg* 2: 27–44
216. Peters JK, DeMeester TR (1995) Early experience with laparoscopic Nissen fundoplication. *Surg Technol Int* IV: 109–113
217. Peters JH, Heimbucher J, Kauer WKH, Incarboni R, Bremner CG, DeMeester TR (1995) Clinical and physiologic comparison of laparoscopic and open Nissen fundoplication. *J Am Coll Surg* 180: 385–393
218. Peterson H (1995) The prevalence of gastro-esophageal reflux disease. *Scand J Gastroenterol* 30: 5–6
219. Pitcher DE, Curet MJ, Martin DT (1994) Successful management of severe gastroesophageal reflux disease with laparoscopic Nissen fundoplication. *Am J Surg* 168: 547–554
220. Raiser F, Hinder RA, McBride PJ, Katada N, Filipi CJ (1995) The technique of laparoscopic Nissen fundoplication. *Chest Surg Clin North Am* 5: 437–448
221. Rattner DW, Brooks DC (1995) Patient satisfaction following laparoscopic and open antireflux surgery. *Arch Surg* 130: 289–294
222. Richter JE, Long JF (1995) Cisapride for gastroesophageal reflux disease: a placebo-controlled, double-blind study. *Am J Gastroenterol* 90: 423–430
223. Robertson CS, Evans DF, Ledingham SJ, Atkinson M (1993) Cisapride in the treatment of gastro-oesophageal reflux disease. *Aliment Pharmacol Ther* 7: 181–190
224. Robinson M, Decktor DL, Maton PN, Sabesin S, Roufail W, Kogut D, Roberts W, McCullough A, Pardoll P, Saco L (1993) Omeprazole is superior to ranitidine plus metoclopramide in the short-term treatment of erosive oesophagitis. *Aliment Pharmacol Ther* 7: 67–73
225. Rösch W (1987) Erosion of the upper gastrointestinal tract. *Clin Gastroenterol* 7: 623
226. Rosetti N, Hell K (1977) Fundoplication for treatment of gastroesophageal reflux in hiatal hernia. *World J Surg* 1: 439–444
227. Rush DR, Stelmach WJ, Young TL, Kirchdoerfer LJ, Scott-Lennox J, Holverson HE, Sabesin SM, Nicholas TA (1995) Clinical effectiveness and quality of life with ranitidine vs placebo in gastroesophageal reflux disease patients: a clinical experience network (CEN) study. *J Fam Pract* 41: 126–136
228. Sandmark S, Carlson R, Fauser O, Lundell L (1988) Omeprazole or ranitidine in the treatment of reflux esophagitis. Results of a double-blind randomized Scandinavian multi-center study. *Scand J Gastroenterol* 23: 625–632
229. Santag SJ (1990) The medical management of reflux oesophagitis. *Gastroenterol Clin North Am* 19: 683–709
230. Sato TL, Wu WC, Castell DO (1992) Randomized, double-blind, placebo-controlled crossover trial of pirenzepine in patients with gastroesophageal reflux. *Dig Dis Sci* 37: 297–302
231. Savary N, Miller G (1978) The esophagus: handbook and atlas of endoscopy. In: Fassman AG (ed) *Solothern, Switzerland*, pp 135
232. Schauer PR, Meyers WC, Eubanks S (1996) Mechanism of gastric and esophageal perforations during laparoscopic Nissen fundoplication. *Ann Surg* 223: 43–52
233. Schindbeck NE, Klausner AG, Berghammer G, Londong W, Muller-Lissner SAL (1992) Three year follow up of patients with gastroesophageal reflux disease. *Gut* 33: 1016–1019
234. Schwizer W, Hinder RA, DeMeester TR (1989) Does delayed gastric emptying contribute to gastroesophageal reflux disease? *Am J Surg* 157: 74–81
235. Siewert JR, Feussner H (1987) Early and long-term results of antireflux surgery. A critical look. *Bailliere clinical gastroenterology* Saunders, Oxford, pp 821–842
236. Siewert JR, Isolaure J, Feussner H (1989) Reoperation following failed fundoplication. *World J Surg* 13: 791
237. Siewert JR, Stein HJ, Feussner H (1995) Reoperations after failed antireflux procedures. *Ann Chir Gynaecol* 84: 122–128
238. Sito E, Thor PJ, Maczka M, Lorens K, Konturek SJ, Maj A (1993) Double-blind crossover study of ranitidine and ebrotidine in gastroesophageal reflux disease. *J Physiol Pharmacol* 44: 259–272
239. Skinner DB, Belsey R (1967) Surgical management of esophageal reflux and hiatus hernia: long-term results with 1030 patients. *J Thorac Cardiovasc Surg* 53: 33–54
240. Smith PM, Kerr GD, Cockel R, Ross BA, Bate CM, Brown P, Dronfield MW, Green JRB, Hislop WS, Theodossi A, McFarland RJ, Watts DA, Taylor MD, Richardson PDI, The Restore Investigator Group (1994) A comparison of omeprazole and ranitidine in the prevention or recurrence of benign esophageal stricture. *Gastroenterology* 107: 1312–1318

241. Sölvell L (1989) The clinical safety of omeprazole. *Scand J Gastroenterol* 24: 106–110
242. Sonntag SJ (1993) Rolling review: gastroesophageal reflux disease. *Aliment Pharmacol Ther* 7: 293–312
243. Sonntag SJ, Schnell TG, Miller TQ (1991) The importance of hiatal hernia in reflux esophagitis compared with lower esophageal sphincter pressure or smoking. *J Clin Gastroenterol* 13: 628–643
244. Sontag S, Robinson M, Roufail W (1992) Daily dose of omeprazole (OME) is needed to maintain healing an erosive esophagitis (EE). *Am J Gastroenterol* 87: 1258
245. Soper NJ, Brunt LM, Kerbl K (1994) Laparoscopic general surgery. *N Engl J Med* 330: 409–419
246. Specbler SJP, Veterans Affairs Gastroesophageal Reflux Disease Study Group (1992) Comparison of medical and surgical therapy for complicated gastroesophageal reflux disease. *N Engl J Med* 326: 786–792
247. Specbler SJ, Gordon DW, Cohen J, Williford WO, Krol W (1995) The effects of antireflux therapy on pulmonary function in patients with severe gastroesophageal reflux disease. *Am J Gastroenterol* 90: 915–918
248. Staerk-Laursen L, Havelund T, Bondsens S (1995) Omeprazole in the long-term treatment of gastroesophageal reflux disease. *Scand J Gastroenterol* 30: 839–846
249. Stein HJ, DeMeester TR (1992) Who benefits from antireflux study? *World J Surg* 16: 312
250. Stein HJ, Feussner H, Siewert JR (1992) Minimally invasive antireflux procedures. *World J Surg* 16: 347–348
251. Stein HJ, Barlow AP, DeMeester TR, Hinder RA (1992) Complications of gastroesophageal reflux disease: role of the lower esophageal sphincter, esophageal acid/alkaline exposure, and duodenogastric reflux. *Ann Surg* 216: 35–43
252. Stein HJ, Feussner H, Siewert JR (1996) Failure of antireflux surgery: causes and management strategies. *Am J Surg* 171: 36–40
253. Stewart KC, Urschel JD, Hallgren RA (1994) Reoperation for complications of the Angelchik antireflux prosthesis (see comments). *Source Thorac Surg* 57: 1557–1558
254. Stipa S, Fegiz G, Iacone C, Paolini A, Moraldi A, De Marchi C, Chicco PA (1989) Belsey and Nissen operations for gastroesophageal reflux. *Ann Surg* 210: 583–589
255. Swanström L, Wayne R (1994) Spectrum of gastrointestinal symptoms after laparoscopic fundoplication. *Am J Surg* 167: 538–541
256. Swanstrom L, Pennings J (1995) Safe laparoscopic dissection of the gastroesophageal junction. *Am J Surg* 169: 507–511
257. Tack J, Coremans G, Janssens J (1995) A risk-benefit assessment of Cisapride in the treatment of gastro-intestinal disorders. *Drug Safe* 12: 384–392
258. Than KBA, Silaner T (1989) A long term randomized prospective trial of the Nissen procedure versus a modified Toupet technique. *Ann Surg* 210: 719–724
259. Thibault C, Marceau P, Biron S, Borque RA, Beland L, Potvin M (1994) The Angelchik antireflux prosthesis: long-term clinical end technical follow-up. *Can J Surg* 37: 12–17
260. Thomson ABR (1992) Medical treatment of gastro-esophageal reflux disease: options and priorities. *Hepetogastroenterology* 39: 14–23
261. Timmer R, Breumelhof R, Nadorp JHSM, Smout AJPM (1993) Recent advances in the pathophysiology of gastroesophageal reflux disease. *Eur J Gastroenterol Hepatol* 5: 485–491
262. Toupet A (1963) Technique d'oesophago-gastroplastie avec phrenogastropexie appliqué dans la cure radicale des hernies hiatales et comme complètement de l'opération d'Heller dans les cardiospasmes. *Mem Acad Chir* 89: 384
263. Toussaint J, Gussuin A, Deruuttre M (1991) Healing and prevention of a relapse esophagitis by cisapride. *Gut* 32: 1280–1285
264. Tytgat NJ, Nuo CY, Schotborgh RY (1990) Reflux esophagitis. *Scand J Gastroenterol* 25: 1–12
265. Tytgat GNJ, Anker-Hansen OJ, Carling L (1992) Effect of cisapride on relapse of reflux esophagitis, healed with an antiseecretory drug. *Scand J Gastroenterol* 27: 175–183
- 265a. Troidl H (1995) *Endoscopic Surgery—a Fascinating Idea Requires Responsibility in Evaluation and Handling*. Minimal Access Surgery, *Surg Tech Int* III: 111–117
266. Urschel JD (1993) Complications of antireflux surgery. *Am J Surg* 166: 68–70
267. Van den Boom G, Go PMM, Hamelteman W, Dallemagne B, Ament AJHA (1996) Cost effectiveness of medical versus surgical treatment in patients with severe or refractory gastroesophageal reflux disease in The Netherlands. *Scand J Gastroenterol* 31: 1–9
268. Van Trappen G, Rutgeer TSL, Schurmans P, Coenegrachts JL (1988) Omeprazole (40 mg) is superior to ranitidine in the short-term treatment of ulcerative reflux esophagitis. *Dig Dis Sci* 33: 523
269. Verlinden M (1990) Healing and prevention of relapse of reflux oesophagitis by cisapride. *Gastroenterol* 98: A144
270. Vignier S, Termini R, Leandro G (1995) A comparison of five maintenance therapies for reflux esophagitis. *N Engl J Med* 333: 1106–1110
271. Waterfall WE, Craven MA, Allen CJ (1986) Gastroesophageal reflux: clinical presentations, diagnosis and management. *Can Med Assoc J* 135: 1101–1109
272. Watson A, Spychal RT, Brown MG, Peck N, Callander N (1995) Laparoscopic physiological antireflux procedure: preliminary results of a prospective symptomatic and objective study. *Br J Surg* 82: 651–656
273. Watson DI, Reed MWR, Johnson AG (1994) Laparoscopic fundoplication for gastroesophageal reflux. *Ann R Coll Surg Engl* 76: 264–268
274. Watson DI, Gourlay R, Globe J, Reed MWR, Johnson AG, Stoddart CJ (1994) Prospective randomized trial of laparoscopic (LNF) versus open (ONF) Nissen fundoplication. *Gut* 35: S15
275. Watson DI, Jamieson GG, Devitt PG, Matthew G, Britten-Jones RE, Game PA, Williams RS (1995) Changing strategies in the performance of laparoscopic Nissen fundoplication as a result of experience with 230 operations. *Surg Endosc* 9: 961–966
276. Watson DI, Jamieson GG, Mitchell PC, Devitt PG, Britten-Jones R (1995) Stenosis of the esophageal hiatus following laparoscopic fundoplication. *Arch Surg* 130: 1014–1016
277. Watson DI, Jamieson GG, Devitt OG, Mitchell PC, Game PA (1995) Paraesophageal hiatus hernia: an important complication of laparoscopic Nissen fundoplication. *Br J Surg* 82: 521–523
278. Watson DI, Jamieson GG, Nyers JC, Tews JP (1996) The effect of 12 weeks Cisapride on esophageal and gastric function in patients with gastroesophageal reflux disease. *Dis Esophagus* 9: 48–52
- 278a. Watson DI, Baigrie RJ, Jamieson GG (1996) A learning curve for laparoscopic fundoplication, definable, avoidable, or a waste of time? *Ann Surg* 224: 198–203
- 278b. Watson DI, Jamieson GG, Baigrie RJ, Mathew G, Devitt PG, Game PA, Britten-Jones R (1996) Laparoscopic surgery for gastroesophageal reflux: beyond the learning curve. *Br J Surg* 83: 1284–1287
279. Weerts JM, Dallemagne B, Hamoir E, Demarche M, Markiewicz S, Jehaes C, Lombard R, Demoulin JC, Etienne M, Ferron PE (1993) Laparoscopic Nissen fundoplication: detailed analysis of 132 patients. *Surg Laparosc Endosc* 3: 359–364
280. Weerts JM, Dallemagne B, Jehaes C, Markiewicz S (1996) Laparoscopic management after failed reflux operations. *Surg Endosc* 10: 198
281. Wu JS, Dunnegan DL, Luttman DR, Soper NJ (1996) The influence of surgical technique on early clinical outcome of laparoscopic Nissen Fundoplication. *Surg Endosc* 10: 187
282. Zaitown P, Rampol P, Barbier P (1989) Omeprazole (20 mg om) versus ranitidine (150 mg diad) in reflux esophagitis. Results of a double-blind randomized trial. *Gastroenterol Clin Biol* 13: 457–462
283. Zaninotto G, DeMeester TR, Schwites W (1988) The lower esophageal sphincter in health and disease. *Am J Surg* 155: 104–111
284. Zeitoun P (1989) Comparison of omeprazole with ranitidine in the treatment of reflux oesophagitis. *Scand J Gastroenterol* 24: 83–87