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The Impact of Reflux Esophagitis, Gastroesophageal Reflux Disease, and Barrett's Esophagus After Five Years of Sleeve Gastrectomy

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Abstract Over the past two decades, there has been a surge in the number of bariatric surgeries due to the increasing obesity epidemic. Currently, sleeve gastrectomy is the most commonly performed bariatric surgery. One of the complications is reflux esophagitis. The prevalence of gastroesophageal reflux disease (GERD) has increased over the last few decades, and it is now the most common chronic disease. GERD is defined by recurring and troublesome heartburn and regurgitation, as well as specific complications. It affects approximately 20% of the adult population in high-income countries. If the diagnosis is unclear, then endoscopy, esophageal manometry, and esophageal pH monitoring are recommended. Lifestyle changes, medications, and surgery are the main treatments for GERD. As a result, GERD can be categorized into three groups of patients: non-erosive reflux disease, erosive esophagitis, and Barrett's esophagus. By dividing GERD into these three unique groups of patients, we can focus on the different mechanisms that lead to the development of each of these GERD-related disorders. This will help us concentrate on the specific therapeutic modalities that will benefit each group of patients. The objective of this review to determine the impact of reflux esophagitis and GERD after sleeve gastrectomy. The conclusions drawn from this review are: (1) the pathophysiology of GERD is multifactorial; (2) surgical therapy for GERD is the most appropriate treatment; and (3) the genesis of esophageal adenocarcinoma is associated with GERD.

Key Words Barrett esophagus, gastroesophageal reflux disease, heartburn, obesity, sleeve gastrectomy, bariatric surgery, proton pump inhibitors

1. Introduction

Gastroesophageal reflux disease (GERD) is a gastrointestinal motility that results from the reflux of stomach contents in the esophagus or oral cavity, which causes symptoms or complications. The common signs observed in most individuals with GERD entail heartburn and backup of stomach acid in the area of throat. The ordinary understanding of the term heartburn is the burning or otherwise uncomfortable feeling that one gets in the behind of the sternum. Regurgitation on the other hand is the passage or flow of the content of the stomach into the mouth or hypopharynx. Epigastric pain as such is another symptom typical for GERD. On the other hand, some of the manifestations of the extraesophageal reflux include dental erosions, laryngitis, cough, and asthma [1]. GERD is a common digestive disorder that affects millions of people in the world with the approximate prevalence of 18%. 1–27. 8%. Near to half of the adults said that they are suffering from some kind of reflux. On the same note, GERD is usually diagnosed by the symptoms and their complications of the disease. It is recommended that quality of life, decrease in physical pain, increase in vitality, physical and chemical function, as well as the emotional state define successful treatment of GERD [2]. According to the survey done, Sleeve gastrectomy (SG) is the most frequent bariatric surgery all over the world in the present generation. It is related to de novo GERD, esophagitis and some extent of BE and prognosis of BE in some may worsen. In the planned follow-up of the study, the clinical and endoscopic progression of GERD, esophititis and BE is set to be made after 3 to 4 years from SG [3]. Esophagitis persists as a continuing and relapsing condition with the use of long-term anti-secretory management. Its principal complication is adenocarcinoma, a cancer that originates out of Barrett metaplasia, a type of precancerous change. Otolaryngological manifestations for the most part is managed by anti-secretory agents and reflux-induced asthma is convincingly responsive to anti-reflux surgery only [4].

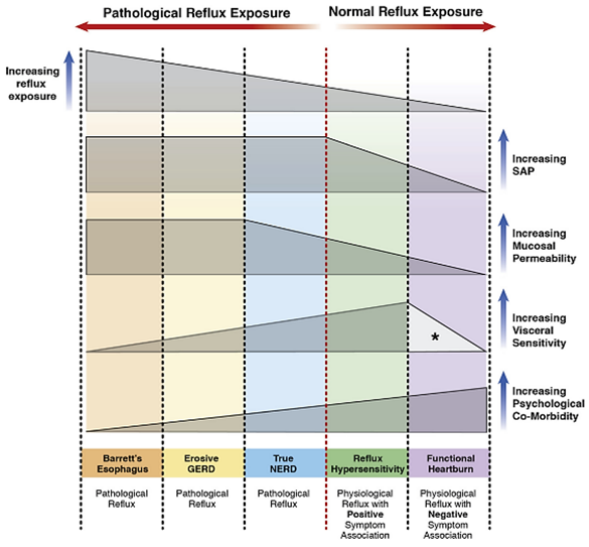

Figure 1: The gastroesophageal junction

Current epidemiological data on GERD are estimated mainly from the two cardinal symptoms, heartburn and regurgitation [5]. An anti-reflux barrier in the oesophagus involves of lower oesophagal sphincter, extracural diaphragm and other parts of the support system of the gastro-oesophageal valve. Reflux disease showing the multiple-aggressive and defensive factors that largely contribute to the development of the disease (Figure 1) [6]. Regurgitation has poorer and more scattered clinical trials and epidemiologic studies on GERD. Many patients are linked with gastroparesis and these symptoms raise a lot of complexity in finding medical solution for the classic heartburn [7].

In the United States, 44% of the adults noted that they had endured heartburn once a month, while 14% had it weekly and 7% had it daily. The prime effect of GERD is related mostly to symptoms (burning of the chest and/or stomach discomfort, commonly referred to as heartburn, and sour or bitter fluid regurgitation) that intrude on patients' lives. Hos Figure 2, se det utmärkt att patienter med GERD uppnår lägre resultat i algoritm för bedömning av livskvalitet än patenter med sjuka hjärtan eller kärcher. In fact, GERD patient's population that reports symptoms to physician at community-based practices are shown to exhibit a negative endoscopy in approximately 70%. It is possible that a large number of patients with NERD or endoscopy-negative reflux disease do not attend the physician and make GERD diagnosis. This fact may be explained by the fact of such components of the gastroesophageal reflux disease esophagitis as the measurable excess of the acid exposure in the distal esophagus in 75-90 % of the cases. In persons with erosive esophagitis, one can not speak about the prediction of these symptoms with or without the mucosal lesion of the esophagus. Even with esophagitis, sensation is reduced to less than 5 % of reflux events. It is adequately understood that Barrett's esophagus has the highest esophageal acid exposure in contrast to NERD or erosive esophagitis [8]. According to Montreal Consensus, GERD was described as "condition which develops when reflux of gastric content causes troublesome symptoms or complications." Brazilian Consensus conference described GERD as "a chronic disorder related to retrograde flow of gastro-duodenal content into the oesophagus or adjacent organs which may give a range of symptoms with/without mucosal damage."

The occurrence of GERD complications grows nowadays and tendencies of the growing number of GERD symptoms were observed – from 12% up to 17%. The prevalence of GERD diagnosis rose between the period 1970 and 1996. In two more community hospitals the prevalence of the new esophageal strictures increased during the 1986–1993 and, on the contrary, decreased during 1994–2001, which was paralleled by the rising prescriptions for PPIs. The first outcome depicts a significant shift in the trends of new esophageal stricture formation in regard to the Upper endoscopies that were performed between the years 1998 and 2003 reducing by 12% We also have depicted a reduction of the incidence rate of recurrent esophageal strictures within the first year by 36%. There has been a significant reduction in the overall number of upper endoscopies with stricture from 1992-2000 with a reduction of the proportion of patients' diagnosed with stricture by 11% and the incidence of recurrent strictures has reduced by 30% following introduction of PPI [9].

Several factors modulate the sensation of GERD symptoms including; the pH of the refluxate, D-GER, LMC and central sensitization. The GERD symptoms expressed are apparent in a vast array of patients [10]. GERD is a long-lasting, and recurrent acid-peptic disease that presents with the same reflux symptoms like esophageal complication, reflux esophagitis and extra-esophageal manifestation. GERD has been previously viewed as a newly developing digestive peril [11]. Thus, GERD is the most prevalent gastrointestinal diagnosis identified in outpatient clinic visits. In regard to prevalence, a study of the occurrence of any mental disorder in the United States shows that 14 to 20% of adults are affected. In 2004, the reported incidence of about 8000 esophageal adenocarcinoma incidental cases which is found burden of the disease has increased 2 to 6 over past one or two decades [12].

The use of reflux monitoring helps in coming up with the contact time with the esophageal acid, the number of reflux events, and the connection between Gastroesophageal Reflux Diseases. It may be also carried out with a wireless telemetry capsule or trans-nasal catheter (Table 1) [13]. Esophageal acid clearance time gives the time the esophagus takes to clear an acidic reflux content with a pH of <4.The exposure of the esophagus to refluxate increases the incidence of GERD induced esophageal complaints which are in the form of heartburn, reflux and esophageal chest pain as well as complications such as reflux esophagitis, stricture formation and Barret's esophagus. The GERD patient population has three unique groups of patients: Creators of NERD, erosive oesophagitis, and Barrett's oesophagus. The subject of

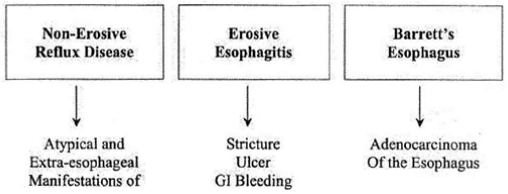

Figure 2: A proposed conceptual model that abandons the "GERD spectrum"

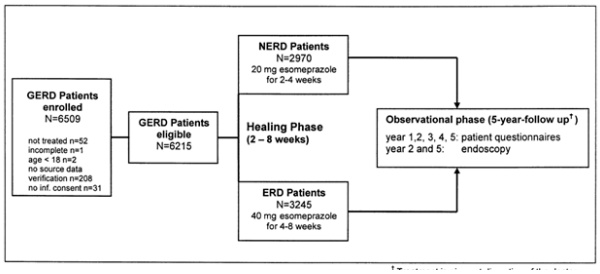

Figure 3: Study flow chart

treatment will be changed to symptomatology instead of esophageal mucosal damage. Based on the methods used, patients with erosive esophagitis that do not present with Barret's esophagus underlying the inflamed mucosa are virtually free or at negligible risk of developing adenocarcinoma of the esophagus (Figure 2) [8].

GERD symptoms are common in general; the prevalence of heartburn occurring at least once a month ranges from 21% to 44%. Chest pain, dysphagia, asthma, chronic bronchitis, hoarseness, Globus sensation, dyspepsia, and Barrett's esophagus (a premalignant condition) have been reported to be associated with GERD [14].

In the last decades, GERD has been a common disease becomes an acquaintance to human beings. The proportion of the population increased to 27% it is estimated. North America has the smallest percentage of Cyber risks, which is 8%, while Europe and Asia/Rest of the world have 25% each. Only 9% in Europe after 1995 has been the impact. The diarrhea is related to numerous symptoms, that are divided into primary and secondary gastroesophageal reflux symptoms. He heartburns and expels acid back into his throat and mouth are common symptoms while symptoms such as chest pain that is not of cardiac origin, cough, hoarseness, sensation of having a lump in the throat, and throat irritation are considered atypical. So, GERD patients involve acid reflux. Thus, the study revealed that 31% of GERD patients had a form of dysfunction in the movement of their food pipes. However, even though hypoperistalsis or 31% occurs in GERD patient, it is yet scientifically ambiguous whether motility disorders could act as the cause of affiliation rather than the referral [10] (Figure 3). There have been enhancements in identifying and treating of the primary disorders in North America nonetheless reflux rates are rising [15].

Thus, the primary outcome is the differentiation of endoscopic and symptomatic progression of GERD. The secondary objective is to assess other patient-related risk factors concerning reflux as well as reflux-specific quality of life.

2. Materials and Methods

The progression study of GERD is a prospective, multicenter, and open cohort study. The patients with GERD symptoms were followed up for five years after they healed on esomeprazole treatment.

The type of patients that were included in the study comprised of either male or female who were 18 years and above with a GERD diagnosis based on heart burn. In May 2000 to February 2001 we recruited 5952 patients of a total 1185 centres from Germany, 136 patients of a total 33 centres from Austria, and 127 patients of a total 35 centres from Switzerland, using the hospital (endoscopic centres or specialized endoscopic units).

There are four types of medications, which are used for the management of GERD these are; proton pump inhibitors, H2-receptor antagonists, prokinetics and antacids. At the onset of the healing phase of the study, the only study medications were claimed to be acid suppressing agents to be taken. Other poison may also be given. After drugs prescribed to the patients suffering from GERD include proton pump inhibitors, H2 receptor antagonists, prokinetics, sucralfate and antacids. New patients will require treatment evaluation for the first week and then healing phase for up to eight weeks after which they will need to follow up for five years. Minimally, the epidemiologic follow-up phase entitles patients to reception of necessary medical care and physicians independently treat GERD. Annual standardized patient questionnaires will be added to the assessment methodology which will go together with endoscopic and histologic examinations at two and five years.

The past medical exposures of GERD patients comprise of GERD medication and other surgical procedures related to GERD and other critical diseases include cardiovascular, pulmonary, renal, or gastrointestinal diseases. Patients complete the "Reflux Disease Diagnostic Questionnaire" which documents information about GERD before endoscopic assessments are performed; a "GERD score" including items concerning heartburn and regurgitation is summed up. The psychometric evidence of this patient self-reporting questionnaire was in the same range as that of a GERD questionnaire completed by the health administrators.

Strictures, Barrett's esophagus and ulcers were assessed using endoscopy and graded according to the LA classification. Histologic biopsies were also performed from the antrum, corpus and distal oesophagus for H. pylori and histologic gastritis staging [11].

The clinical decision support tools help in the diagnosis of GERD and encourage the handling of such patients. Hence, the therapeutic protocol is useful to minimize systems and enhance patients' well-being [13].

Preoperatively, endoscopy was conducted in about fifty-

Diagnostic Test	Indication	Highest Level of Evidence	Recommendation
Proton Pump Inhibitor (PPI) Trial	Typical symptoms without warning signs	Meta-analysis	A negative trial does not exclude GERD
Barium Swallow	Not for diagnosing GERD; use for assessing dysphagia	Case-control study	Avoid use unless evaluating for complications (e.g., stricture, ring)
Endoscopy	Alarm symptoms, screening for high-risk patients, chest pain	Randomized controlled trial	Consider early in elderly, those at risk for Barrett's esophagus, non-cardiac chest pain, or patients unresponsive to PPI
Esophageal Biopsy	Exclude non-GERD causes of symptoms	Case-control study	Not recommended for diagnosing GERD
Esophageal Manometry	Preoperative assessment for surgery	Observational study	Not recommended for diagnosing GERD; use to rule out achalasia or scleroderma-like esophagus before surgery
Ambulatory Reflux Monitoring	Preoperatively for non-erosive disease, refractory GERD symptoms, or when GERD diagnosis is unclear	Observational study	Correlate symptoms with reflux, document abnormal acid exposure, or reflux frequency

Table 1: Diagnostic testing for gerd and utility of tests

eight patients, while at around 3-4 years of SG, the figure reduced to nearly 44. 9% of patients followed. It is important though to note that endoscopy is arranged for all subjects in SG irrespective of any symptoms. The measures of effectiveness are the percent weight loss (%TWL), application of PPL, progression of esophagitis, development of de novo reflux, and BE formation [3].

Behavioral changes are considered the main pillars of GERD management or treatment. Lifestyle changes especially counseling should highlight the necessity of weight loss as a critical factor in the prevention of GERD where obesity counts as a risk. Research indicated increase in the consistency of patients' GERD signs and pH tracking when the head end of the bed was raised [16].

3. Results

At post-op follow-up, the %TWL was 23%. The average BMI decreased from 49. 07 to 37. 5. New onset reflux was identified in thirteen Patients (30. 9%). Out of 16 Patients with GERD pre-operation, 37. Five percent said it was faster, 25 percent reported being sick at times and 37 percent said they had a disease. 5% had worsening symptoms. For the esophagus rate, it has recently almost reached a two fold increase from 37. 9% pre-op to 70. 6% post-op. The majority of post-op Patients' condition was found to have mild, moderate or severe esophagitis, respectively (Table 1) Majority of them were with mild esophagitis 87. 1% having LA classes C and D The percentage of readers having LA classes A and B is nearly 46. Among the Patients who were out-patients after surgery the prevalence of Asymptomatic esophagitis was 2 percent. Employing ERF data, the overall chance of BE was determined as 12. Thirty-seven percent of patients had BE extension at 7% post-op, with de novo BE developing in 4 patients, constituting 7%. 2% [3].

According to this, heartburn is moderately sensitive for GERD diagnosis, given that it indicates esophagitis. Esophageal manometry has very little role in antireflux surgery other than to assist in proper positioning of an electrode to measure pH. pH assessment is moderately sensitive and specific for GERD. Upper endoscopy GERD sensitivity is lower than that of pH tests [11]. Table 2.

It is hereby assumed that GERD complications are tantamount to the density of patients with erosive esophagitis and those with Barrett's esophagus spared by NERD. To know about GERD complications, there is needed its usual conception based on inflammation of the esophagus. Firstly, the quality of life of the NERD patients is severely affected much like the erosive esophagitis patients (2, 35, 36). Second, most patients with atypical and extraesophageal GERD signs and symptoms are asymptomatic with regards to traditional endoscopically proven esophagitis ranging from 70% to 90%. Consequently, NERD patients may evolve to have erosive esophagitis, some complications of GERD, stricture or Barrett's esophagus and ultimately adenocarcinoma of the esophagus [8].

In the largest natural core studies where the researchers have evaluated the patients with NERD no complications related to GERD have been reported. Sociodemographic characteristics and risk factors of the 6,215 patients are presented at the baseline. Current BE was identified in the patients in 11% regarding to the NERD and ERD patients, and significantly more commonly in men than in women, 13% vs 8%; we hereby report these BE separate [11] Table 3.

The mean duration of GERD was estimated to be 2.6 years, however, the range covered 1 month and approximately 7 years. The main correlates of the frequency of GERD in patients with more than five years of disease history were age and BMI. The same factors were noted to be related to more than 1 year duration in GERD patients [11].

Adult patients who do not respond to medical treatment, do not adhere to medical therapy regimens, or complain of side effects from chronic GERD medication, presence of large hiatal hernia, or patients' desire to avoid long term medications are candidates for surgery. Two meta-analyses of medical therapy compared to surgical treatment from large patients described the effectiveness of GERD. RYGB is less effective of all the bariatric surgeries in the reduction of GERD symptoms. This is suggested as an operative bariatric procedure if GERD is apparent before the primary surgery [16].

4. Discussion

Previous reports have revealed a clear difference in NERD, ERD, and BE risk factors. Thus, the frequency or severity of the symptom was different associations with three GERD subgroups or other characteristic disease factors including extraesophageal disorders and H. pylori infection. Hence, the studies pointed to the relevant factors on groups of GERD, which include age, BMI and long-standing reflux disease. To understand other factors is also useful for optimizing the patient care for distinguishing patients with a higher likelihood of the development of the complications with GERD [11].

No.	Author	Year	No. of Questions	Sensitivity	Specificity
1	Greatorex and Thorpe	1983	6	NR	NR
2	Locke et al	1994	80	NR	NR
3	Carlsson et al	1998	7	92%	19%
4	Shaw et al	2001	22	NR	NR
5	Elola-Olasu et al	2002	80	NR	NR
6	Numans and de Wit	2003	7	48%-73%	50%-73%
7	Wong et al	2003	20	82%	84%
8	Wang et al	2004	3	79%-96%	35%-69%

Table 2: Questionnaires used to diagnose gastroesophageal reflux disease

No.		Total cohort (n=6215)	NERD (n=2853)	ERD (n= 2660)	Barrett (n= 702)	P - Value
1	Symptoms of GERD during the last week					
	Regurgitation of gastric contents	80	80	79	79	n.s.
	Acid taste	80	80	79	79	n.s.
2	GERD total score	16.5	16.3	16.7	16.6	n.s.
3	Positive GERD family history	26	26	26	28	n.s.
4	Duration of GERD					
	<1year	32	36	30	19	
	$\geq$ 1- 5 years	39	38	39	42	
	$\geq$ 5 years	29	26	31	39	
5	Previous GERD medications	71	68	71	82	<0.01
	Extraesophageal disorders	37	35	39	40	0.07
GERD= Gastroesophageal reflux Disease , NERD= Nonerosive Reflux Disease, ERD= Erosive Reflux Disease						

Table 3: Medical history of GERD patients at baseline

Two recent works also pointed for the association between the H. pylori infection and a lower frequency of GERD. Self-rated health status was also poorer in the sample than in two random samples of GERD subjects; the average disease duration was shorter. Reflux symptoms in the patients' population were as follows: 42% had suffered from reflux for over five years in Croner's survey while 60% had done so in Locke's survey, this compares to 29% in the present study. Other aspects that have been observed as relevant related to adenocarcinoma of the esophagus include the length of time patients experience GERD, the frequency of its symptoms, and if they have Barrett's epithelium.

In the present research work, 66 percent of the respondents expressed that they observed that they had detailed communications with the treating physician about the factors influencing GERD. On the same note, 85% of the patients who are taking PPIs already engage in an elaborative dialogue and already know when to consume the medicine. Out of the participants who did not have a deep discussion alone 18 % answered correctly to questions, which is as lucky as tossing a coin (20%), and None of these patients seems to have pen picture knowledge about when to take medication. Patient is more knowledgeable about when to do anti-reflux medication with their attending physician and that, GERD symptoms can be reduced through lifestyle adjustments, and GERD has symptoms like a chronic cough, hoarse voice or sore throat (respectively 85 % & 53%,18% & 22%, 79% & 36%; P<0. 001) [15].

Of all respondents, 367 (55%, 95% CI:51%-58%) of them reported that they ever had a feeling of heartburn, which is characteristic of GERD. A total of 78 of these people (12%, 95% CI: (9% to 14%) are identified as having GERD since they give an affirmative response to questions about the occurrence of GERD at least once a week [17].

Therefore, the three psychological conditions that were measured; depression, anxiety and neurosis were not correlated with GERD. However, as per the previous researches, research has only addressed the relationship of GERD and psychological disorders and emotional disorders [17].

Clinical GERD concerns many people and determine their lives' quality; moreover, it affects the great amount of health care and societal expenditure. These include changing one's behaviour and taking PPIs, but the most prescribed is laparoscopic fundoplication. PPI use prevails as the prevalent treatment but long-term consequences entail recheck and follow-up for any side effects.

5. Conclusion

SG is associated with asymptomatic esophagitis increased rates along with 3 to 4 years post-op de novo reflux. Although, as it was noted earlier, GERD as a spectrum disease, the provided data of the authors is not enough to support this concept. It has largely targeted esophageal mucosa damage or is much less focused on it, and therapeutic trials carried out in GERD indicated healing and improvement of symptoms in patients with erosive esophagitis.

This paper demonstrates that GERD is a spectrum and presents a conceptual model of that. First, what this finding seems to suggest is that perhaps different GERD patients do not have the same pathophysiologic processes. Second, GERD patients are not homogeneous; they have different treatment, and even such diagnostic measures as pH testing are effective in varying degrees and have different uses in different cases. Patients in different groups, according to the

literature study, have minimal probability of transferring to other groups. This new view of GERD will focus on the symptoms and let us turn our attention toward aspects responsible for emergence of each of the GERD-related disorders. Also, it makes it possible to concentrate on specific therapeutic methods that are of importance to specific categories of patients.

GERD is not a disease but a syndrome, the development of which is determined by multiple factors, the primary of which are the anatomical and functional abnormalities of the gastroesophageal junction together with the action of refluxed gastric contents. Medical therapy is only able to influence secretion of gastric acid. The outcome of this study is in tandem with previous works that established that GERD is a prevalent health condition. The separate variables that placed the patient at risk to experience GERD included smoking and high cholesterol level.

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Conflict of interest

Author declares no conflict of interests. Author read and approved final version of the paper.

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