Introduction

Gastroesophageal reflux disease is one of the most common diseases in western societies. The prevalence is estimated to be around 10% in those populations, if the presence of the disease is based on weekly or daily reflux symptoms [1–3]. The disease has been diagnosed more often due to increased and improved diagnostic activities, but there is also a true increase in incidence of the problem. Since it is related to western lifestyle, eating habits and environmental factors are discussed. In addition in recent years, detection of extraesophageal problems, especially respiratory symptoms and problems, is increasing, often related to reflux [4, 5]. A special interest in this disorder has emerged in the past 15 years since studies have shown the possible connection between reflux, the development of intestinal metaplasia in the esophagus, and the increase in the incidence of adenocarcinoma in Barrett’s esophagus [6–10].

The pathophysiologic background of the disease is multifactorial, as has been shown in recent years [11, 16]. The main reason for pathologic reflux is a malfunction of the antireflux barrier at the level of the gastroesophageal junction. This antireflux barrier consists of the high pressure zone of the lower esophageal sphincter as well as the hiatus or the phrenico-esophageal ligament, also causing a pinching effect at the level of the lower esophageal sphincter [13, 14]. The lower esophageal sphincter has been assessed quantitatively by mechanical parameters such as the lower esophageal sphincter pressure, the overall length, and the intraabdominal length. On the other hand, a functional description of transient lower esophageal sphincter relaxations described by many gastroenterologists brings up more dynamic facts on the antireflux barrier [13, 16].

Definition

An important issue when discussing pathophysiology is the appropriate definition of the disease. Several definitions have been discussed in the past decades. Currently, the definition of the GENVAL-consensus conference is being widely used [1]. Based on the latter, gastroesophageal reflux disease is present when the person/patient has a risk of complications due to excessive reflux and/or a significant reduction of her/his quality of life and well-being. Of course, the definition of gastroesophageal reflux disease can be discussed controversially since there is no diagnostic test that proves the presence of this disease in all cases and is able to exclude the disease at the same time [11, 12]. Endoscopy has a high specificity and can show the presence of esophagitis. However, its sensitivity is not sufficient since only about 60% of patients with gastroesophageal reflux disease have developed an endoscopically-visible esophagitis at the time of the initial investigation. Similar circumstances can be discussed for 24-hour-esophageal pH monitoring, which is often called the gold standard in the objective assessment of gastroesophageal reflux disease [13]. It quantitatively measures gastroesophageal acid exposure in the esophageal lumen. Negative results may be caused by technical failures, a “good day” in borderline reflux cases, the combination of mixed reflux with high proportion of duodenal juice, or a non-acidic stomach under PPI therapy. More-
over, typical symptoms such as heartburn and regurgitation are of course present in many but not in all reflux patients. As a consequence, symptoms cannot be a reliable guide for a definitive diagnosis. Therefore the detection of the disease must be based on a spectrum of diagnostic investigations in order to prove its presence [14].

The most accurate definition for the disease is a pathophysiologic explanation: The disease is present when pathologic exposure of the esophageal lumen to gastric juice occurs, and this can be a pathologic amount of acid and/or a pathologic amount of duodenal components such as bile [12]. The most frequent condition in gastroesophageal reflux disease is pathologic acid exposure, and therefore this is often used synonymously. Nevertheless, the role of duodenogastroesophageal reflux has been investigated recently, and its importance in complications of the disease such as Barrett’s esophagus has been shown [15].

In order to obtain more information about the definition of gastroesophageal reflux disease used in clinical practice, the definitions of the disease used in randomized trials for antireflux therapy can be reviewed. It is surprising what a variety of definitions have been used for the disease by several authors performing randomized trials in the past decades. In 25 randomized trials focusing on surgical therapy of the disease, the definition used by the majority of the studies was the presence of symptoms and esophagitis [17–40]. Only in about one-third of the studies was positive pH-monitoring as a more specific tool to verify pathologic esophageal acid exposure used as the definition. Only a few studies relied on symptoms only, since symptoms can be an unreliable guide for the presence of gastroesophageal reflux disease.

It must be emphasized that the presence of typical symptoms such as heartburn and acid or fluid regurgitation have been shown to be very specific symptoms with a positive predictive value for therapeutic success [41]. The authors of this study have shown that a good result of laparoscopic antireflux surgery is more probable in patients with preoperative presence of typical symptoms of reflux such as heartburn and regurgitation, a preoperative positive test in 24-hour-esophageal pH monitoring showing a pathological acid exposure in the esophagus, and a positive response to proton-pump inhibitors, indicating that medical acid reduction will also reduce at least some of the heartburn of the patient.

Regarding the diagnostic requirements, pH monitoring and endoscopy are necessary for the objective documentation of the disease [11–13]. With manometry other esophageal functional disorders can be excluded, which potentially cause a postoperative failure, especially spastic disorders [11]. Since a weak lower esophageal sphincter has been shown to be a poor prognostic sign regarding the future prognosis of GERD, one could use this criterion for the indication [42]. In addition, selection of patients with preoperative normal lower esophageal sphincter parameters can be indicative for worse postoperative results [43]. However, several studies have shown that its predictive value for the postoperative results remains controversial and is therefore not recommended by gastroenterologists [44, 45].

Currently gastroesophageal reflux disease has been redefined in three subgroups [1]. These subgroups are nonerosive reflux disease, erosive reflux disease, and Barrett’s esophagus. This is a reasonable division. However, it must be kept in mind that there is some overlapping especially between patients with Barrett’s esophagus and erosive gastroesophageal reflux disease, since it has been shown that this overlapping is present in at least 30% of the Barrett’s patients in several series [11, 12, 15, 46, 47].

### The antireflux barrier

The lower esophageal sphincter has been assessed quantitatively by mechanical parameters such as the lower esophageal sphincter pressure, the overall length, and the intraabdominal length [11, 13]. Since reflux can be caused by different factors such as elevation of intragastric pressure, elevation of intraabdominal pressure and loss of gravity when persons lay down. In persons in a supine position, the sphincter system must prevent reflux in several ways. The intraabdominal portion of the lower esophageal sphincter is involved in preventing