English summary

The increasing incidence of morbid obesity is a world-wide problem, rising to endemic proportions. The treatment of (morbid) obesity is challenging and especially conservative treatment options often fail. The only long term effective treatment so far is bariatric surgery; however, it is an invasive treatment with significant complication rates. Furthermore, the success of bariatric surgery in terms of weight loss and resolution of comorbidities is highly depended on patient’s adjustment to required lifestyle modifications. Nowadays the laparoscopic Roux-en-Y gastric bypass (LRYGB) and the laparoscopic sleeve gastrectomy (LSG) are the most frequently performed procedures.

This dissertation aimed to provide knowledge concerning some of these complications, to identify necessary perioperative actions for decreasing the incidence of these complications and to elucidate risk factors associated with perioperative complications.

Part I: Pre-and postoperative assessment:

An important long-term complication after LRYGB surgery is a marginal ulcer (MU).

In chapter 2, all published literature concerning MU was collected and analysed. The study showed a wide range in the incidence of MU, between 0.5 and 25%. Risk factors seemed to be location and size of the pouch, the usage of non-steroidal anti-inflammatory drugs (NSAIDS) and smoking. In the majority of cases, treatment with a proton pump inhibitor (PPI) was sufficient, however, around 23% of the patients with MU needed surgical intervention. The patients who needed this surgical intervention were mostly the patients with a perforation due to ulcer disease, a dilated pouch or fistulae.

Chapter 3 describes a retrospective analysis of a consecutive group of patients who developed MU after RYGB surgery. The incidence of MU was 6.6% and 1.1% of the patients presented with a gastric perforation due to MU. Risk factors were the usage of corticosteroids and NSAIDS and smoking. Five (22%) out of the 23 patients needed surgical treatment, all other patients were successfully treated conservatively.

Complementary to the first two chapters is chapter 4. An alteration in the postoperative protocol enabled the analysis of two patient cohorts, one without postoperative PPI pro-
phylaxis and one with PPI prophylaxis during six months. It turned out that in the patient group who received prophylactic PPI’s, the incidence of MU was 1.2% compared to 7.3% in the patients without prophylaxis.

The necessity of screening all patients prior to surgery with an esophagogastroduodenoscopy (EGD) was assessed in chapter 5. All patients who were scheduled for bariatric surgery, LRYGB or LSG, underwent an EGD prior to the procedure. All outcomes were analysed and divided into groups ranging from no abnormalities to an abnormality that altered the operative procedure. In half of the patients no abnormality was found, while in seven (1.3%) of the 523 patients, the scheduled bariatric procedure was altered or cancelled. Six patients required another EGD after treatment with PPI’s. In those patients the operation was postponed. In one patient the operation was cancelled due to an oesophageal carcinoma found at the EGD. As this number of patients who benefited from preoperative EGD was very small, screening in every patient was deemed unnecessary.

The letter to the editor in chapter 6 further elaborated the need of preoperative screening by EGD by comparing the preoperative findings with the postoperative outcome. None of the findings at EGD predisposed to postoperative complications.

In chapter 7 one of the most common obesity associated diseases, obstructive sleep apnoea (OSA) is addressed. As OSA predisposes to desaturations (low level of oxygen), its severity depends on the apnoea hypopnea index (AHI). Whether bariatric patients with severe OSA are in need of standard postoperative monitoring is much debated. As in some clinics patients with a high AHI are routinely admitted at the ICU for postoperative monitoring the literature was searched for evidence. In the systematic review presented in chapter 7, 13 articles were analysed, no clear associated between OSA and postoperative ICU admissions, cardiopulmonary complications and mortality was found. However, the available evidence was very limited and future studies are necessary.

Chapter 8 contains a retrospective review of a consecutive patient group who underwent bariatric surgery. All were screened by poly(somno)graphy for the presence of OSA. Severe OSA (AHI >30) was present in 151 of the 794 patients and all 151 patients were postoperatively admitted to the ICU as part of the centres standard postoperative protocol. In all 151 patients, no deaths, re-intubations or cardiopulmonary complications occurred. However, phylaxis and one with PPI prophylaxis during six months. It turned out that in the patient group who received prophylactic PPI’s, the incidence of MU was 1.2% compared to 7.3% in the patients without prophylaxis.

The necessity of screening all patients prior to surgery with an esophagogastroduodenoscopy (EGD) was assessed in chapter 5. All patients who were scheduled for bariatric surgery, LRYGB or LSG, underwent an EGD prior to the procedure. All outcomes were analysed and divided into groups ranging from no abnormalities to an abnormality that altered the operative procedure. In half of the patients no abnormality was found, while in seven (1.3%) of the 523 patients, the scheduled bariatric procedure was altered or cancelled. Six patients required another EGD after treatment with PPI’s. In those patients the operation was postponed. In one patient the operation was cancelled due to an oesophageal carcinoma found at the EGD. As this number of patients who benefited from preoperative EGD was very small, screening in every patient was deemed unnecessary.

The letter to the editor in chapter 6 further elaborated the need of preoperative screening by EGD by comparing the preoperative findings with the postoperative outcome. None of the findings at EGD predisposed to postoperative complications.

In chapter 7 one of the most common obesity associated diseases, obstructive sleep apnoea (OSA) is addressed. As OSA predisposes to desaturations (low level of oxygen), its severity depends on the apnoea hypopnea index (AHI). Whether bariatric patients with severe OSA are in need of standard postoperative monitoring is much debated. As in some clinics patients with a high AHI are routinely admitted at the ICU for postoperative monitoring the literature was searched for evidence. In the systematic review presented in chapter 7, 13 articles were analysed, no clear associated between OSA and postoperative ICU admissions, cardiopulmonary complications and mortality was found. However, the available evidence was very limited and future studies are necessary.

Chapter 8 contains a retrospective review of a consecutive patient group who underwent bariatric surgery. All were screened by poly(somno)graphy for the presence of OSA. Severe OSA (AHI >30) was present in 151 of the 794 patients and all 151 patients were postoperatively admitted to the ICU as part of the centres standard postoperative protocol. In all 151 patients, no deaths, re-intubations or cardiopulmonary complications occurred. However,
almost one fifth of the patients experienced desaturations of which six patients had an episode of very severe desaturations. Although routinely post-operative admission at an ICU is not indicated, continuously monitoring of patients by means of digital oximetry remains essential.

To enhance the success of bariatric surgery and the demanded postoperative lifestyle changes preoperative information transfer is of utmost importance. Therefore, chapter 9 focuses on the preoperative information transfer that patients require prior to surgery. What are patients’ preferences in information transfer and is it possible to identify sub groups which require a different information transfer? It shows that patients satisfactory information supply is based on three pillars: to verify patients’ understanding of the provided information during the consult, to discuss the influence of surgery into daily life with patients and to approach them as individuals. Furthermore, the baseline variables were inventoried and no subgroup could be distinguished who would benefit of a different information transfer approach compared to their fellow patients.

PART II: complications in bariatric surgery
In this part, complications of bariatric surgery and its risk factors are further analysed. Chapter 10 starts with a systematic review on revisional bariatric surgery. In the early 1990-2000 many patients with morbid obesity undergone laparoscopic adjustable gastric band (LAGB) surgery. However, the long-term results were disappointing and many patients needed another operation for postoperative complications or failed weight-loss. In most cases revision from LAGB into LRYGB or LGS is performed. Even though this revisional procedure has been done on a large scale and results seemed promising, a systematic analysis of the risks and complications did not exist. The systematic review addressed in this chapter showed that although the complication rate is higher compared to primary surgery, revisional surgery from LAGB into LRYGB or LGS is safe and feasible. Short term complications occurred in 8.5 and 15.7%, long term complications in 8.9 and 2.5% respectively.

Chapter 11 focuses on trocar port herniations, a specific, more long-term complication. Due to their morbid obesity, closing the fascia after laparoscopy is difficult and is often not performed in bariatric surgery patients. It is thought that due to the higher abdominal pressure in morbidly obese patients, their risk on trocar port herniations is increased compared to non-obese patients who undergo laparoscopic surgery. Therefore, all patients who

almost one fifth of the patients experienced desaturations of which six patients had an episode of very severe desaturations. Although routinely post-operative admission at an ICU is not indicated, continuously monitoring of patients by means of digital oximetry remains essential.

To enhance the success of bariatric surgery and the demanded postoperative lifestyle changes preoperative information transfer is of utmost importance. Therefore, chapter 9 focuses on the preoperative information transfer that patients require prior to surgery. What are patients’ preferences in information transfer and is it possible to identify sub groups which require a different information transfer? It shows that patients satisfactory information supply is based on three pillars: to verify patients’ understanding of the provided information during the consult, to discuss the influence of surgery into daily life with patients and to approach them as individuals. Furthermore, the baseline variables were inventoried and no subgroup could be distinguished who would benefit of a different information transfer approach compared to their fellow patients.

PART II: complications in bariatric surgery
In this part, complications of bariatric surgery and its risk factors are further analysed. Chapter 10 starts with a systematic review on revisional bariatric surgery. In the early 1990-2000 many patients with morbid obesity undergone laparoscopic adjustable gastric band (LAGB) surgery. However, the long-term results were disappointing and many patients needed another operation for postoperative complications or failed weight-loss. In most cases revision from LAGB into LRYGB or LGS is performed. Even though this revisional procedure has been done on a large scale and results seemed promising, a systematic analysis of the risks and complications did not exist. The systematic review addressed in this chapter showed that although the complication rate is higher compared to primary surgery, revisional surgery from LAGB into LRYGB or LGS is safe and feasible. Short term complications occurred in 8.5 and 15.7%, long term complications in 8.9 and 2.5% respectively.

Chapter 11 focuses on trocar port herniations, a specific, more long-term complication. Due to their morbid obesity, closing the fascia after laparoscopy is difficult and is often not performed in bariatric surgery patients. It is thought that due to the higher abdominal pressure in morbidly obese patients, their risk on trocar port herniations is increased compared to non-obese patients who undergo laparoscopic surgery. Therefore, all patients who
were operated between 2006 and 2013 were analysed. All patients with a symptomatic abdominal wall herniation were included. Fourteen of the 1524 patients had developed a symptomatic abdominal wall herniation of which eight (0.5%) had a trocar port hernia. It can be concluded that a symptomatic trocar port herniation seldom occurs after bariatric laparoscopic surgery and routinely closure of the fascia of trocar ports equal or smaller than 12 mm is therefore not advised.

After bariatric surgery, some patients present themselves at the emergency department or outpatient clinical with severe abdominal pain. Although many patients suffer from marginal ulcer, internal herniations, gall bladder stones or other somatic diseases, in a part of the patients, no diagnosis can be found. To increase the awareness concerning unexplained abdominal pain after bariatric surgery among clinicians and patients, chapter 12 focusses on the incidence and risk factors. In 1788 patients, 133 (7.4%) suffered from unexplained abdominal pain, revisional surgery was a significant predictor. Unexplained abdominal pain causes significant morbidity and should be part of the preoperative informed consent.

Several risk prediction models have been developed in the last decades. The obesity surgery mortality risk score (OS-MRS) is frequently used to predict the risk on mortality after bariatric surgery. Although validated for mortality, the score is often used to predict postoperative complications despite the lack of evidence for this purpose. Therefore, the aim of the study in chapter 13 was to evaluate the OS-MRS for its value in predicting postoperative complications after LRYGB. In both primary and revisional LRYGB, no association between the OS-MRS classification and complications was found. As in other studies, revisional surgery was an independent risk factor for the development of postoperative complications. The OS-MRS can therefore not be used in the risk stratification for postoperative complications in bariatric patients.

Additional to chapter 12, in chapter 14 an attempt was made to create a risk model for the development of complications after LRYGB or LSG. The Bariatric Surgery Index of Complications (BASIC) is based on preoperative patient characteristics to predict postoperative complications. The BASIC identified the following six preoperative variables: the usage of anticoagulants, the presence of chronic obstructive pulmonary disease, dyslipidaemia, male gender, suffering of a psychiatric history and revisional surgery. These six variables enable...
the classification of patients in a low (0-1 risk factor), intermediate (2 risk factors) or high-risk group (3 or more risk factors) for the development of postoperative complications.

Bariatric surgery is increasingly being performed with early recovery protocols, limiting the admission time after LRYGB or LSG till 20-30 hours. Therefore, identifying clinical parameters that can predict the risk on anastomotic leakage at an early stage are important. Chapter 15 makes in attempt in identifying these parameters and finds that heart rate and diastolic blood pressure are significantly altered compared to the measurements preoperatively in patients with anastomotic leakage.

Chapter 16 investigates whether patients who suffered a complication after bariatric surgery have an impaired weight loss compared to patients without postoperative complications. As weight loss is one of the primary end points of bariatric surgery, it is important in patient education to know whether a postoperative complication compromises this important end point. All patients operated from November 2007 onwards were included. Primary and revisional bariatric surgery was separately analysed. In both groups, postoperative weight loss was not negatively influenced by complications.

Part III: discussion:
Chapter 17 elaborates the relationship between obesity, food intake and production and environmental issues starting with the calculation of the reduction in CO₂ emission rate if all patients with morbid obesity undergo bariatric surgery. This is further extrapolated to the decrease in emission if less food is produced and if the food industry adjusts their products and takes responsibility combined with obesity prevention programs funded by the government to increase individual, global and environmental health.