



**Karolinska  
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**Övre gastrointestinal forskning  
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## Effects of bariatric surgery

**AKADEMISK AVHANDLING**  
som för avläggande av medicine doktorsexamen vid Karolinska  
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av

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# ABSTRACT

Globally, 500 million people are obese (body mass index [BMI]  $\geq 30$ ). In Sweden, 14% of the population is obese. Obesity is associated with an increased risk of mortality, cancer and several co morbidities. Bariatric surgery is the only treatment with documented long-term benefits, i.e. decreased mortality and co morbidities and sustainable weight loss.

The aim of the thesis was to clarify effects of clinically relevant aspects of bariatric surgery and make comparisons with the general population of corresponding age, sex and calendar period. The included studies are nationwide Swedish population based retrospective cohort studies, comparing defined outcomes before and after bariatric surgery.

Study I tested the hypothesis that the risk of obesity-related cancer decreases with increasing time after bariatric surgery. It included 13,123 patients who had undergone bariatric surgery in 1980-2006 in Sweden. Standardised incidence ratios (SIR) were calculated to assess risk. There was no overall decreased risk of cancer with increasing time after bariatric surgery ( $p$  for trend 0.4). Rather, the risk of colorectal cancer was increased with time after bariatric surgery ( $p=0.01$ ).

In study II, the risk of in-hospital care for obesity related diseases before and after bariatric surgery in 13,273 patients during 1980-2006 was compared to a matched random sample of 132,730 individuals from the general population. Preoperative incidence rate ratios (IRR) and postoperative hazard ratios (HR) were calculated. The postoperative risk of diabetes, myocardial infarction, hypertension, stroke and angina remained increased compared to the general population. The risk estimates for diabetes (HR 1.2, 95% CI 0.9-1.7) and myocardial infarction (HR 0.8, 0.4-1.5) were lower after gastric bypass than after restrictive bariatric procedures (HR 2.8, 96% CI 2.5-3.1 and HR 1.6, 95% CI 1.4-1.9, respectively).

Study III assessed whether cholecystectomy is indicated as part of the bariatric surgery due to the known increased preoperative risk of gallstone formation. The need for cholecystectomy in a bariatric surgery cohort ( $n=13,443$ ) during 1987-2008 was compared to the general population, and to two cohorts of patients who had undergone antireflux surgery ( $n=16,176$ ) or appendectomy ( $n=154,751$ ). An increased need for cholecystectomy after bariatric surgery was confirmed (SIR 5.5, 95% CI 5.1-5.8), but the absolute rate of cholecystectomy was low (8.5%) and the increased SIR after antireflux surgery (SIR 2.4, 95% CI 2.2-2.6) and appendectomy (SIR 1.7, 95% CI 1.6-1.7) indicated detection bias.

Study IV addressed the risk of hospital admission for psychiatric disorders, including substance- and alcohol abuse before (IRR) and after (HR) bariatric surgery was compared to such admissions of the general population. The bariatric surgery cohort ( $n=12,277$ ) during 1980-2006 was compared to a matched sample from the general population ( $n=122,770$ ). Patients undergoing bariatric surgery were more likely to be hospitalised for all studied diagnoses prior to surgery compared to the general population, e.g. IRR of depression was 2.8 (95% CI 2.5-3.0). After gastric bypass, there was an increased risk of inpatient care for alcohol abuse compared to those undergoing a restrictive surgical procedure (HR 2.3, 95% CI 1.7-3.2).

To conclude, bariatric surgery might not entail any reduced risk of obesity-related cancer with increasing time after surgery. The need for cholecystectomy following bariatric surgery was increased, but prophylactic cholecystectomy might not be generally recommended. Gastric bypass surgery seems to reduce the risk of inpatient care for diabetes and myocardial infarction, but increase the risk of inpatient care for alcohol abuse as compared to restrictive bariatric procedures.