

Original article

## Gastric sleeve resection as day-case surgery: what affects the discharge time?

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### Abstract

**Background:** Sleeve gastrectomy, with its short operating time, is possible to perform as same-day surgery, with the most common reason for requiring overnight hospital stay being postoperative nausea and vomiting.

**Objective:** To demonstrate the feasibility and safety of sleeve gastrectomy as same-day surgery with regard to complication rate. Additionally, the study aimed to evaluate factors determining the duration of hospital stay, such as type of anesthesia, time of procedure, degree of postoperative nausea and pain, American Society of Anesthesiologists score, or previous abdominal surgery.

**Setting:** Nonacademic primary referral center.

**Methods:** A substudy of a single-center, double-blind, randomized controlled trial. Patients included in this study underwent sleeve gastrectomy and were randomized into 1 of the following 2 types of anesthesia: total intravenous anesthesia with propofol or desflurane. Primary endpoint was the number of patients discharged the same day as surgery. Secondary endpoints were unplanned telephone calls, readmission rate, and complication rate. Time of procedure was registered by the staff at the operation theatre. Visual analog scales score estimating patients' intensity of pain and nausea were completed at the postoperative unit, surgical ward, and 24 to 48 hours postoperatively.

**Results:** Ninety-three patients were included in the study. Fifty-nine (63%) were discharged the same day as surgery (32 desflurane and 27 total intravenous anesthesia), 30 patients (32%) were discharged 1 day after surgery, and 4 patients (4%) were discharged after >2 days (15 desflurane and 19 total intravenous anesthesia). The most common reasons for prolonged stay were pain, nausea, and fatigue. Statistical analyses showed no association between day of discharge and the type of anesthesia, time of the procedure, degree of postoperative nausea and vomiting, pain intensity, American Society of Anesthesiologists score, or previous abdominal surgery.

**Conclusion:** Same-day surgery is feasible and safe in terms of low complication rate. The type of anesthesia, time of procedure, degree of postoperative nausea and vomiting and pain, American Society of Anesthesiologists score and previous abdominal surgery does not appear to

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**Key words:** SG; Obesity; VAS; Anesthesia; Desflurane; Total intravenous anesthesia; Bariatric surgery; Outpatient surgery; Ambulatory surgery

Surgical procedures that allow the patient to return home within 12 hours postsurgery may be described as “same-day,” “outpatient,” or “ambulatory” surgery.

Same-day discharge reduces the risk of hospital acquired infections, is cost-effective, and improves accessibility to bariatric surgery [1]. Moreover, there is a large body of evidence indicating high satisfaction rates among patients who are discharged the same day as gastric banding (76%) [2], laparoscopic Roux-en-Y gastric bypass (84%) [3], and sleeve gastrectomy (SG) (92%–98%) [4–8].

Laparoscopic Roux-en-Y gastric bypass is the most widely applied type of bariatric surgery in Norway; however, SG has shown increased popularity over the last years [9]. The SG procedure is reported to be a relatively fast procedure with 100 minutes as mean operative time [10]. At our department, the mean operative time is 35 minutes.

As the number of procedures increases, many health centers are currently performing bariatric surgery as a same-day surgery.

Most of the evidence available on SG as same-day surgery is based on retrospective reviews [11–13]. The aim of our study was to demonstrate the feasibility of SG as a same-day surgery and to determine factors influencing the duration of hospital stay, such as type of anesthesia, time of procedure, degree of postoperative nausea and vomiting and pain, American Society of Anesthesiologists (ASA) score, or previous abdominal surgery affects the hospital stay.

## Methods

### Study design

This study is a subanalysis of a single-center, double-blind, randomized controlled trial (RCT) that included all patients undergoing bariatric surgery at the Østfold hospital, in the period 2016 to 2017 [14]. Patients included in the RCT underwent either laparoscopic Roux-en-Y gastric bypass or SG and were randomized to receive intravenous anesthesia (TIVA) with propofol or desflurane. This subanalysis includes only the subgroup of patients who underwent SG. A study flow chart is outlined in Fig. 1.

The study was approved by the Regional Ethics Committee, and a written informed consent was acquired from all patients.

### Preoperative assessment

All patients received preoperative consultations with a nurse, physician, dietician, and the surgeon. During the

consultations, a complete medical history was obtained, and a physical examination was performed. Patients were requested to have a preoperative low-calorie diet of 1000 kcal/d for 3 weeks before the surgery as a low-caloric diet before surgery reduces the liver volume and increases accessibility to the upper abdominal compartment during surgery [15,16]. During the preoperative consultation, patients were informed about the study and that they would be encouraged to be discharged the same day as surgery. All patients were required to have a support person available during the first night after surgery.

The treatment of obesity follows national guidelines in Norway. The patient must be motivated and able to comply with a long-term treatment course.

### Inclusion criteria

Indication for surgery are as follows: (1) body mass index (BMI) 35 to 40 kg/m<sup>2</sup> with obesity-related diseases, which can be significantly improved or cured with weight reduction; (2) BMI  $\geq$ 40 kg/m<sup>2</sup>; or (3) when conservative treatment efficacy is not achieved despite multidisciplinary treatment, including consultations with physician, psychologist, nutritionist, and physiotherapist.

### Exclusion criteria

Contraindications to surgery include serious medical conditions that increase the risk of surgery, such as end-stage lung disease, severe heart failure, unstable coronary artery disease, active cancer diagnosis/treatment, cirrhosis with portal hypertension, uncontrolled drug or alcohol addiction, and severely impaired intellectual capacity. In addition, serious mental health problems were considered a contraindication to bariatric surgery. All patients undergoing bariatric surgery were over the age of 18-years old.

A description of the randomization process is explained in detail in a previous publication [14].

Preoperatively, patients were administered a standard regimen of antibiotics and thrombosis prophylaxis with low-molecular weight heparin. All patients were premedicated with glycopyrron (an anticholinergic agent; .2 mg) intravenous (IV), metoclopramide (20 mg) IV, sodium citrate (30 mL) IV, and dexamethasone (16 mg) IV. Fentanyl was given to all patients as an induction. In patients randomized to TIVA, propofol and remifentanyl were administered throughout the surgery. In patients randomized to gas anesthesia, propofol and remifentanyl were administered for

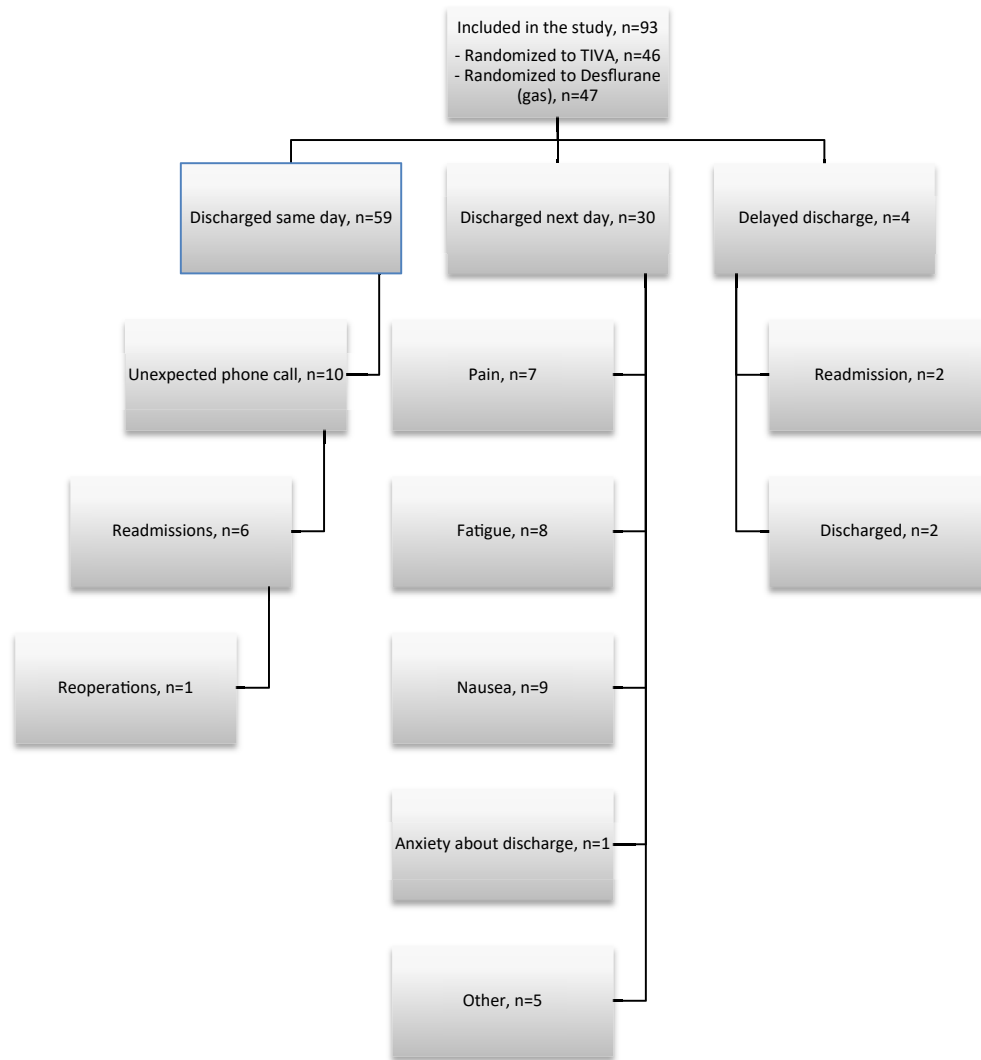


Fig. 1. Study synopsis.

induction, and remifentanyl/desflurane was used for continuation. Muscle relaxant was used routinely during surgery. Tracheal intubation was facilitated using lidocaine spray in the trachea preintubation.

### Surgical technique

All patients were operated on with the SG technique. It was performed laparoscopically by experienced bariatric surgeons. Our patients are operated on with standard technique by using 5 trocars, 2 5 mm in diameter, 2 × 12 mm, and 1 15 mm. Calibration of the stomach is applied with a 32-Fr bougie. Resection of the stomach started 4 cm from the pylorus with 2 × 45-mm Endo GIA Tri-Staple Technology (Medtronic stapling, Medtronic Norway), purple magazine. It then continued with 60-mm beige magazines, reaching the His angle. Some metal clips were used to stop minor bleedings along the resected curvature.

The specimen is removed through the 15-mm trocar opening. Local anesthesia is used in the skin lesions, and the lesions are closed with metal clips.

### Postoperative follow-up

After surgery, the patients were transported to the postoperative unit for observation of vital signs and for treatment of nausea and/or pain. Nausea was treated with ondansetron 4-mg IV or metoclopramide 20-mg IV. For pain, IV ketobemidone was provided.

Patients were also given 3- to 5-L oxygen via nasal cannula expect from those who were prescribed continuous positive airway pressure preoperatively.

As soon as the patient was stable, he or she was encouraged to take water orally, and 1 hour later the patient was required to use a positive expiratory pressure device for 3 × 10 repetitions in a sitting position. After 1 hour, they

received thromboprophylaxis with low-molecular weight heparin (2 hr postoperatively). After this, as the patients were transferred to the surgical ward, the personnel at the postoperative unit measured their intensity of pain and nausea using visual analog scales (VAS) scales. At the surgical ward they were encouraged to undertake as much physical activity as possible by taking small walks. If the patient was not able to perform any physical activity, they were encouraged to use the positive expiratory pressure device (3 × 10 times) regularly to prevent respiratory complications.

#### Discharge criteria postsurgery

The following factors were evaluated before the patient could be discharged: (1) the patient's mental state with regards to the remaining effects of anesthetic and pain medications, such as headache, dizziness, and faintness; (2) normal mobility without the use of a walking aid; (3) degree of pain <5 on the VAS; (4) oral intake of water; (5) degree of nausea and vomiting not >3 on the nausea VAS; and (6) elimination of urine and gas before discharge.

All patients were informed about medication use, such as low-molecular weight heparin, antiemetics, analgesics, and proton pump inhibitors before discharge. The most essential information was the 24-hour service number at the hospital, which the patient could call in case of increasing pain, nausea, fatigue, malaise, or with any other questions for the surgeon.

The patients were always contacted by the nurse postoperative day one (POD1) before 12 PM. In case of readmission, the Classification of Surgical Complications, Clavien-Dindo, was used [17].

#### Study outcomes

The primary endpoint for the study was the proportion of patients discharged the same day as surgery. Secondary outcomes were unplanned telephone calls, readmission rate, and complication rate. We studied the association between patient- and operation-related factors and duration of postoperative stay. Patient-related factors included BMI, weight, type of anesthesia, ASA score, previous abdominal surgery, obesity-related co-morbidities, such as sleep apnea, hypothyroidism, diabetes type 2, psychiatric disorders, and fibromyalgia (see Table 1). Operation-related factors included type of anesthesia, time of procedure, duration of anesthesia, and degree of postoperative nausea and vomiting and pain (see Table 2). Time of procedure was registered by the staff at the operation theatre, VAS score estimating patients' intensity of pain and nausea were completed at the postoperative unit, recovery room (surgical ward), and 24 to 48 hours postoperatively. ASA score was evaluated by the anesthesiologist at the hospital.

#### Statistics

This study includes a subgroup of patient operated with SG that were included in the previously reported RCT [14]. Continuous data were expressed by mean and standard deviation (SD) and compared using student's *t* test and categorical data were expressed by number and proportion and compared using  $\chi^2$  test or Fisher mid *-P* test (due to small proportions). *P* values < .05 were considered statistically significant. To determine factors influencing the duration of hospital stay a multivariable analysis was performed

Table 1  
Patient characteristics

	Same-day discharge	Delayed discharge	All patients	<i>P</i> value
Number of patients, (%)	59 (63)	34 (37)	93 (100)	-
TIVA, n (%)	27 (59)	19 (41)	46 (49)	.347
Desflurane, n (%)	32 (68)	15 (32)	47 (51)	
Age, yr*	40 ± 11	45 ± 13	42 ± 12	.048
Weight, kg*	124 ± 24	121 ± 24	123 ± 24	.532
BMI kg/m <sup>2</sup> *	43 ± 7	42 ± 7	42 ± 7	.804
Waist, cm*	124 ± 12	122 ± 17	123 ± 14	.547
Female, n (%)	46 (64)	26 (36)	72 (77)	.868
Male, n (%)	13 (62)	8 (38)	21 (23)	
ASA				
1, n (%)	5 (56)	4 (44)	9 (10)	.868
2, n (%)	50 (64)	28 (36)	78 (84)	
3, n (%)	4 (67)	2 (33)	6 (7)	
Previous abdominal surgery, n (%)	18 (64)	10 (36)	28 (30)	.912
Hypertension, n (%)	19 (59)	13 (41)	28 (30)	.555
T2D, n (%)	7 (54)	6 (46)	13 (14)	.439
Hypothyroidism, n (%)	8 (47)	9 (53)	17 (18)	.121
Sleep apnea, n (%)	10 (50)	10 (50)	20 (22)	.136
Psychiatric disorder, n (%)	15 (60)	10 (40)	25 (27)	.613
Fibromyalgia, n (%)	9 (56)	7 (44)	16 (17)	.512

TIVA = total intravenous anesthesia; BMI = body mass index; ASA class = American Society of Anesthesiologists classification; T2D = type 2 diabetes.

\* Values expressed as mean ± standard deviation.

Table 2  
Intra- and postoperative data

	Same-day discharge	Delayed discharge	All patients	<i>P</i> value
Number of patients (%)	59 (63)	34 (37)	93 (100)	-
Duration of surgery, hr:min*	32 ± 10	36 ± 15	33 ± 12	.132
Duration of anesthesia, min*	48 ± 9	54 ± 17	50 ± 12	.057
Time of awakening, min*	7 ± 5	8 ± 6	8 ± 5	.471
VAS score:				
Pain leaving recovery room*	2 ± 2	2 ± 2	2 ± 2	.524
Nausea leaving recovery room*	1 ± 2	2 ± 3	2 ± 2	.243

VAS = visual analog scale.

\* Values expressed as mean ± standard deviation.

including variable with *P* value < 0.2 in the univariate analysis. Statistical analyses were performed with IBM SPSS, version 22 (IBM Corp, Armonk, NY, USA).

## Results

Patient characteristics are shown in Table 1. In total, 93 patients were included in the study. Fifty-nine patients (63%) were discharged the same day as surgery, 31 patients (33%) stayed until POD1, while 4 patients (4%) stayed in hospital for ≥2 days. Mean age (SD) was 40 ± 11 years for those discharged same day, and 45 ± 13 years for the delayed discharge group (Table 2). Female:male ratio was 3:1. Mean BMI (SD) was 43 ± 7 kg/m<sup>2</sup> for the patients discharged the same day as surgery and 42 ± 7 kg/m<sup>2</sup> for the delayed discharge group. The differences between the groups are listed in Table 1.

Forty-seven patients (51%) received TIVA and 46 patients (49%) received desflurane (gas) anesthesia, see study flow chart Fig. 1. Eighteen of 47 patients (38%) were discharged POD1 in TIVA versus 13 of 46 patients (28%) in desflurane group (*P* = .280).

In the univariate analyses performed, younger age was found to be associated with same-day discharge. A trend toward an association between the duration of anesthesia and length of stay was found (*P* = .057).

The mean operating time for the group of patients who were discharged the same day as surgery was 32 ± 10 and 36 ± 15 minutes for the group with delayed discharge. Mean anesthesia time was 48 ± 9 and 54 ± 17 minutes, respectively. Mean time of awakening was 7 ± 5 and 8 ± 6 minutes. There was no significant difference in the groups of discharge and ASA score (*P* = .868) or previous abdominal surgery (*P* = .912).

However, the multivariate analysis performed showed no association between any of the studied factors and duration of hospital stay. Further factors are listed in Tables 1 and 2.

The most common reasons for prolonged hospital stay were pain (n = 10), nausea (n = 9), and fatigue (n = 8). All reasons are listed in Fig. 1. No significant difference was found in the time variables. Mean (SD) VAS score for pain leaving the recovery room was 2 ± 2 for both groups (the same-day discharge group and delayed discharge group). Mean (SD) VAS score for nausea leaving the

recovery room was 1 ± 2 and 2 ± 3, respectively, with no significant difference found.

## Postdischarge contacts and readmissions

Ten patients contacted the surgeon on-call after discharge due to pain (n = 5), dysphagia (n = 1), obstipation (n = 2), and general questions regarding food and drink (n = 2). Of these consultations, 6 (6.5%) were referred to the emergency department at the hospital for further examination. Three patients were sent home same day after examination at the emergency department and 3 patients were admitted to hospital. Two of 3 patients admitted were from the same-day discharge group. One was diagnosed with gastric leak, the second had dysphagia, and the third was admitted due to obstipation was discharged at POD1. In addition to the mentioned complications, 2 of 4 patients with delayed discharge after surgery were admitted to hospital for further follow-up due to abdominal pain and clinical shock-like condition, with no cause found on computed tomography of the abdomen for the first patient and stabilization and observation for the second patient. The patient diagnosed with gastric leak was admitted to hospital 4 days after discharge.

Postoperative complications (within 30 d postoperatively), were classified by Clavien-Dindo. Four patients were classified as score I, 1 of which had dysphagia, 2 had obstipation, and 1 had a clinical shock like condition, which was stabilized with fluids and observation. One patient had a score of IIIa, in need of computed tomography of abdomen due to abdominal pain with no findings. One patient had a score of IIII and had gastric leak. There were no postoperative deaths. There was no significant difference in complication rate in patients being discharge the day of surgery (n = 2) and prolonged discharge (n = 4; *P* = .113). There was no significant difference in complication rate in the TIVA (n = 4)/desflurane (n = 2) groups.

## Discussion

Our study is a prospective study, which investigated patients operated for SG in a primary referral center, including those discharged the same day as surgery and

those admitted to hospital after the operation. This allowed us to investigate the feasibility and safety of SG as same-day surgery in terms of complication rate. We have also explored patient- and operation-related factors that could have affected the length of hospital stay in relation to SG as same-day surgery. Same-day surgery in the gastrointestinal field has been applied for years [18]. Cholecystectomy, inguinal hernia repair, and fundoplication surgery are some of the surgeries that are done as same-day surgery with good results, both worldwide and at our department [19,20]. Bariatric surgery has also been performed in same-day settings, but with careful patient selection, accepting only patients with minimal surgical risk [6,7,11,13]. In this study, we found that the most common reasons of prolonged stay were pain ( $n = 10$ ), nausea ( $n = 9$ ), and fatigue ( $n = 8$ ). However, we found no association between type of anesthesia, vomiting, pain, and day of discharge. All factors in the univariate analysis with  $P$  values  $< .2$  were adjusted for in the multivariable model, to tease out the relative impact of factors as age, hypothyroidism, sleep apnea, duration of surgery, and duration of anesthesia. No significant relationship between the factors mentioned above and same-day discharge were found.

The readmission rates after SG being performed as same-day surgery are found to be between .6% and 8.5%, and the reoperation rates are .6% to 3% [4,6–8,11–13]. In the present study, the readmission rate was 6.5% and the 1 reoperation was due to gastric leak. Although most of the studies mentioned above concluded that it is safe to discharge the same day after SG surgery, 1 study reported the opposite. Inaba et al. [12] compared patients discharged the same day after SG with patients discharged at POD1 and found higher overall morbidity, readmission rate, and reoperation rate for patients discharged the day of surgery. In a study of unanticipated admission to hospital after same-day surgery, one reason was predicted to be postoperative vomiting and type of anesthesia used [21]. Several studies have been conducted to compare different anesthetic approaches in obese patients undergoing bariatric surgery; however, there is no clear consensus as to which approach should be recommended for this group of patients. Juvin et al. [22] showed faster postoperative recovery after desflurane compared with propofol and Isoflurane, but only 36 patients were included in the study. Another small study ( $n = 40$  patients), which randomized patients to TIVA or gas anesthesia showed no significant difference in postoperative recovery [23]. No such association was found in our main RCT [14].

## Conclusions

In conclusion, same-day surgery appears to be feasible and safe in terms of low complication rate. We failed to identify any factor whether patient- or operation-related that had influence on the duration of hospital stay.

## Disclosures

*The authors have no commercial associations that might be a conflict of interest in relation to this article.*

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