Tidsskriftet Tidsskrift for Den norske legeforening

Robot-assisted oesophageal and gastric resection at Oslo University Hospital

SHORT REPORT

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Background and aim

The use of robot-assisted surgery in Norway has increased over the past decade. We report selected quality indicators for robot-assisted oesophageal and gastric resection for cancer or premalignant lesions.

Material and method

A retrospective review of selected quality indicators following oesophageal and gastric resection for cancer or premalignant lesions at Oslo University Hospital between 2018 and 2024. We recorded the proportion of patients with anastomotic leakage and 90-day mortality, and assessed whether these rates were within the target levels defined by the Norwegian Registry for Gastrointestinal Surgery (NORGAST). For gastric resections, the 30-day reoperation rate was also recorded.

Results

A total of 104 patients with oesophageal cancer and 96 patients with gastric cancer or premalignant lesions were included in the study. Anastomotic leakage following surgery for oesophageal and gastric cancer occurred in 17 % and 5 % of cases, respectively. Corresponding 90-day mortality rates were 3 % and 2 %. The reoperation rate after gastric resection was 11 %. All values were within the national target levels set by NORGAST.

Interpretation

Target levels for the selected quality indicators were met following the introduction of robot-assisted oesophageal and gastric resection. Use of this technique appears to be safe at our centre, which has prior experience with minimally invasive surgery for oesophageal and gastric cancer.

Main findings

Since the introduction of robot-assisted oesophageal and gastric resection for cancer at Oslo University Hospital, the incidence of anastomotic leakage, mortality rates and reoperation rates have been within national recommendations.

The method appears to be safe when performed at a centre with prior experience in minimally invasive surgery for oesophageal or gastric cancer.

In Norway, 673 new cases of oesophageal or gastric cancer were recorded in 2024 (1). Curative treatment involves perioperative chemo(radio)therapy combined with oesophageal or gastric resection (2). Both procedures are technically challenging, with morbidity rates of up to 60 % (3).

Over the past decade, there has been a marked increase in robot-assisted surgery in Norway and globally. Robot-assisted oesophageal resection has become a standard treatment at many centres internationally, and in 2024,

68 % of all oesophageal resections in Norway were performed wholly or partly using robot-assisted techniques (4, 5). During surgery for oesophageal or gastric cancer, lymph node dissection is routinely performed. Studies indicate that robot-assisted surgery is particularly effective for lymph node dissection compared with conventional minimally invasive surgery (6, 7).

The Norwegian Registry for Gastrointestinal Surgery (NORGAST) is a national quality register for surgical procedures involving organs of the digestive system. Individual hospitals report their own results to the registry. This allows each hospital to monitor its own outcomes with aggregated national data as a reference. Perioperative quality indicators are defined for the procedures included in the register, such as the incidence of anastomotic leakage, together with corresponding target levels and acceptable complication rates, which are determined by an expert advisory group (5). Despite the increasing use of robot-assisted surgery in Norway, few centres have reported their outcomes following the introduction of robot-assisted techniques. We therefore aim to present our experience with robot-assisted oesophageal and gastric resection, focusing on established quality indicators from NORGAST.

Material and method

We conducted a retrospective quality assurance study using prospectively registered data from patients undergoing robot-assisted oesophageal or gastric resection at Oslo University Hospital, Ullevål for oesophageal cancer and gastric cancer or precancerous lesions. Data were collected from three local prospective patient registers. Standard oncological treatment consisted of perioperative chemotherapy or neoadjuvant chemoradiotherapy followed by surgery.

All procedures were performed using the Da Vinci Xi surgical robot (Intuitive Surgical) by a team of four senior consultants, with at least two present for each operation. Robot-assisted gastric resection was introduced at Oslo University Hospital in November 2018, and robot-assisted oesophageal resection in November 2022.

We included patients in the study who underwent robot-assisted oesophageal resection for cancer between November 2022 and December 2024, or robot-assisted subtotal or total gastric resection for cancer or precancerous lesions between November 2018 and December 2024. Patients who were inoperable, who underwent alternative resections, or who were operated on using other surgical approaches were excluded.

We identified the proportion of patients with anastomotic leakage, 90-day mortality and reoperation, and examined the extent to which these rates fell within NORGAST's target levels (5). Reoperation is not included in NORGAST's quality indicators for patients undergoing oesophageal resection. Ninety-day mortality captures deaths that occur in the later postoperative period, for example following a prolonged stay in intensive care.

Surgical approach

Oesophagus. Surgery for oesophageal cancer requires access to both the thorax and the abdomen. All patients underwent oesophageal resection, lymph node dissection in the thorax and abdomen, and oesophagogastric anastomosis (Ivor Lewis oesophagectomy) (Figure 1). The robot was used in both the abdomen and thorax (2). The gastric conduit was anastomosed end-to-side, typically at or just above the carina using a circular stapler.

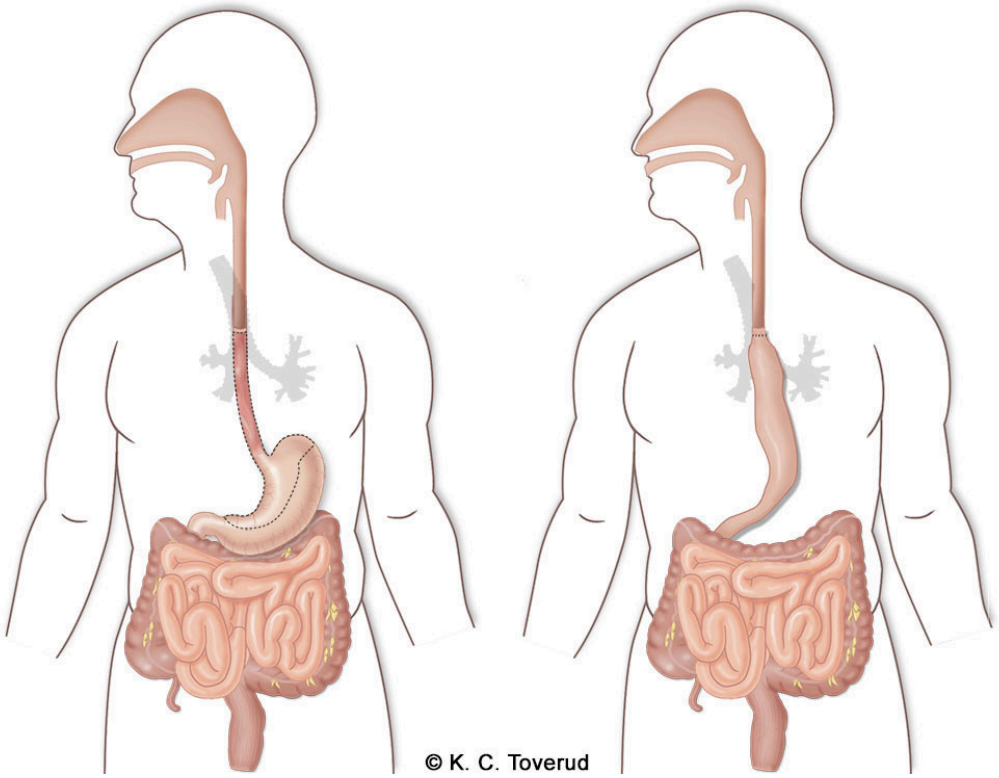

Figure 1 Schematic representation of an Ivor Lewis oesophagectomy

Abdomen. Patients underwent Roux-en-Y reconstruction with subtotal or total gastrectomy (Figure 2). In 91 patients, lymph node dissection was performed as recommended in the national gastric cancer guidelines (D2 dissection) (2). A linear stapler was used for the gastroenterostomy, and a circular or linear stapler for the oesophagojejunostomy (8).

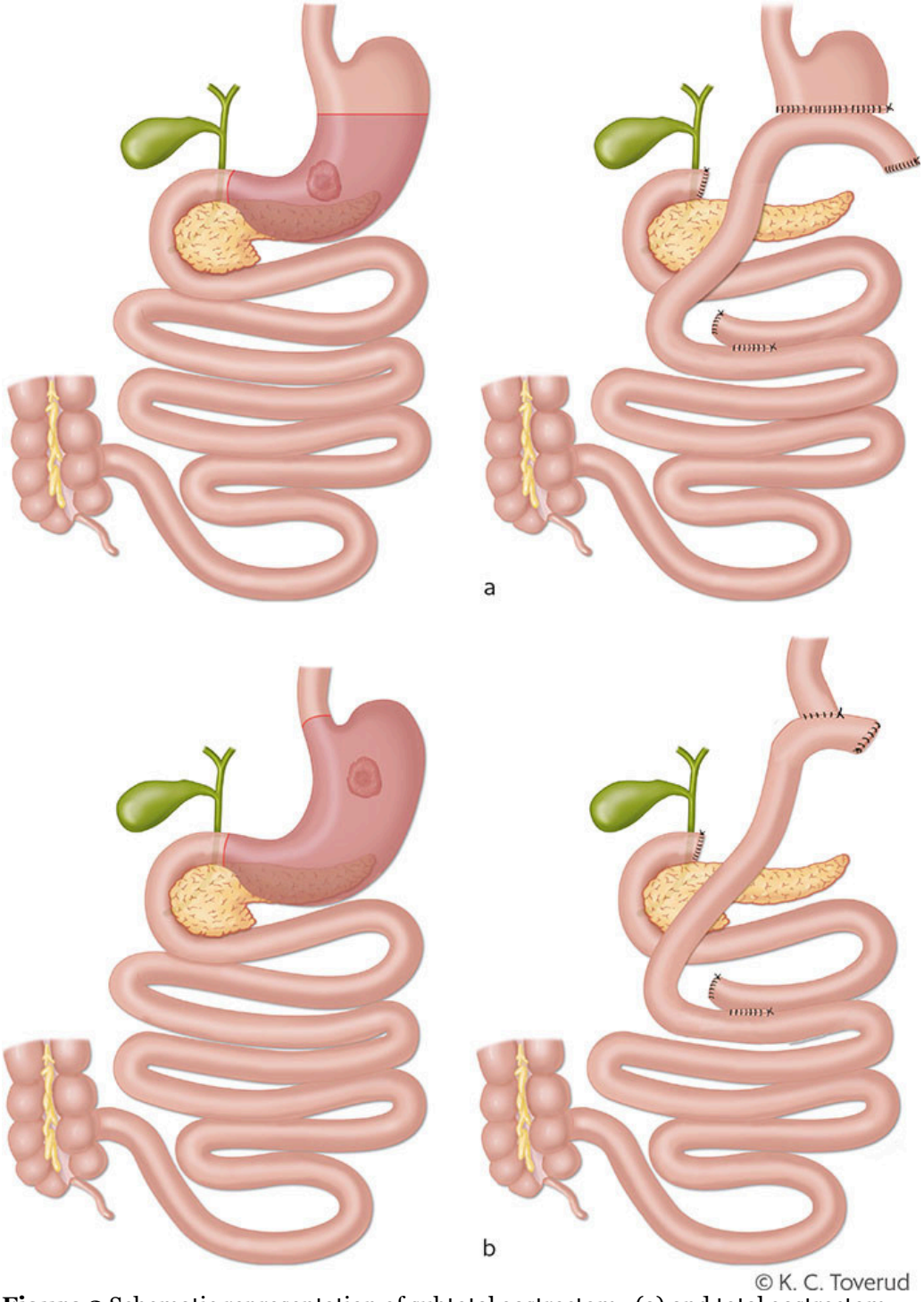

Figure 2 Schematic representation of subtotal gastrectomy (a) and total gastrectomy (b), before and after surgery

Ethics

Patient data were recorded in a quality register approved by the data protection officer for the use of personal data for publication, as well as in consent-based quality and research registers.

Results

A total of 116 patients underwent oesophageal resection, 12 of whom were excluded due to gastrectomy with distal oesophageal resection (n = 2) or non-robot-assisted technique (n = 10). The remaining 104 patients were included. The median age was 65 years (range 30–82 years), 78 were men and 80 had received neoadjuvant oncological treatment. Histology included adenocarcinoma in 91 patients, squamous cell carcinoma in 11 and adenosquamous carcinoma in 2. Four procedures were converted to open surgery.

A total of 192 patients underwent surgery for gastric cancer or precancerous gastric lesions. Ninety-six patients were operated on laparoscopically. The remaining 96 patients were included in the study. The median age was 69 years (range 18–89 years), 54 were men and 48 had received neoadjuvant chemotherapy. Histology included adenocarcinoma in 84 patients and precancerous gastric lesions in 12. Two procedures were converted to open surgery.

Table 1 shows the quality indicators after robot-assisted oesophageal and gastric resection at Oslo University Hospital, compared with the national target levels specified in NORGAST. All quality indicators were within the target levels set by NORGAST.

Discussion

In this study of patients undergoing robot-assisted oesophageal and gastric resection at Oslo University Hospital, the incidence of anastomotic leakage, 90-day mortality and reoperation was within the national standards defined by the target levels set by NORGAST. Unlike the NORGAST annual report, this study presents exclusively the outcomes of patients operated on using a robot-assisted technique and represents the total institutional experience since robot-assisted procedures were established in 2018 (5). NORGAST's annual reports show that the proportion of robot-assisted procedures nationally for the oesophagus and abdomen, for both benign and malignant diseases, was 38.1 % and 17.4 % in 2022, and 67.7 % and 34.2 % in 2024, respectively (5, 9). Large-scale international multicentre studies report anastomotic leakage in approximately 20 % of robot-assisted oesophageal resections and 5 % of robot-assisted gastric resections (4, 10). The reoperation rate after gastric resection is reported to be around 7 % (10). Reported 90-day mortality is approximately 4 % for robot-assisted oesophageal resection and 5 % for robot-assisted gastric resection (11, 12). Our observations, which encompass the introduction of robot-assisted surgery, are therefore consistent with the outcomes reported by leading international centres.

Oslo University Hospital is one of four centres performing surgery for oesophageal or gastric cancer in Norway. During the study period, we performed approximately 60 oesophageal resections and 30 gastric resections annually. Prior to the introduction of robot-assisted surgery, operations were performed using minimally invasive techniques, specifically thoracolaparoscopic oesophageal resection from 2013 and laparoscopic gastric resection from 2015.

In April 2025, the Decision Forum (a governmental body responsible for approving new diagnostic and treatment methods in Norway) concluded that the evidence base for the use of robot-assisted surgery was limited. It was recommended that the acquisition of new surgical robots outside university hospitals be restricted to hospitals with sufficient volumes in rectal, prostate and uterine cancer surgery (13). We therefore believe it is particularly important to document outcomes using the technique, with special emphasis on validated quality indicators. We have previously published more detailed articles on the introduction of robot-assisted oesophageal and gastric resection at our department in international peer-reviewed journals (8, 14).

Throughout the study period, the department enlisted a large number of patients in a randomised trial (Kinetic) comparing the use of a nasogastric tube (standard treatment) with no tube (experimental treatment) after oesophageal resection (15). This was the only systematic change in postoperative patient management during the period and may have contributed to a higher incidence of anastomotic leakage than previously, as nasogastric tubes appear to protect against leakage, and there was an increased focus on leakage diagnostics during the study period (14).

The study suggests that robot-assisted oesophageal and gastric resection has been introduced safely at our institution, which has prior experience with minimally invasive surgery for oesophageal and gastric cancer.

The article has been peer-reviewed.

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Publisert: 24 March 2026. Tidsskr Nor Legeforen. DOI: 10.4045/tidsskr.25.0681
Received 5.11.2025, first revision submitted 20.12.2025, accepted 20.2.2026.