Robotic Surgery may offer solutions for higher risk in revision MBS

Anthony Clough, Eastern Health, Melbourne Australia

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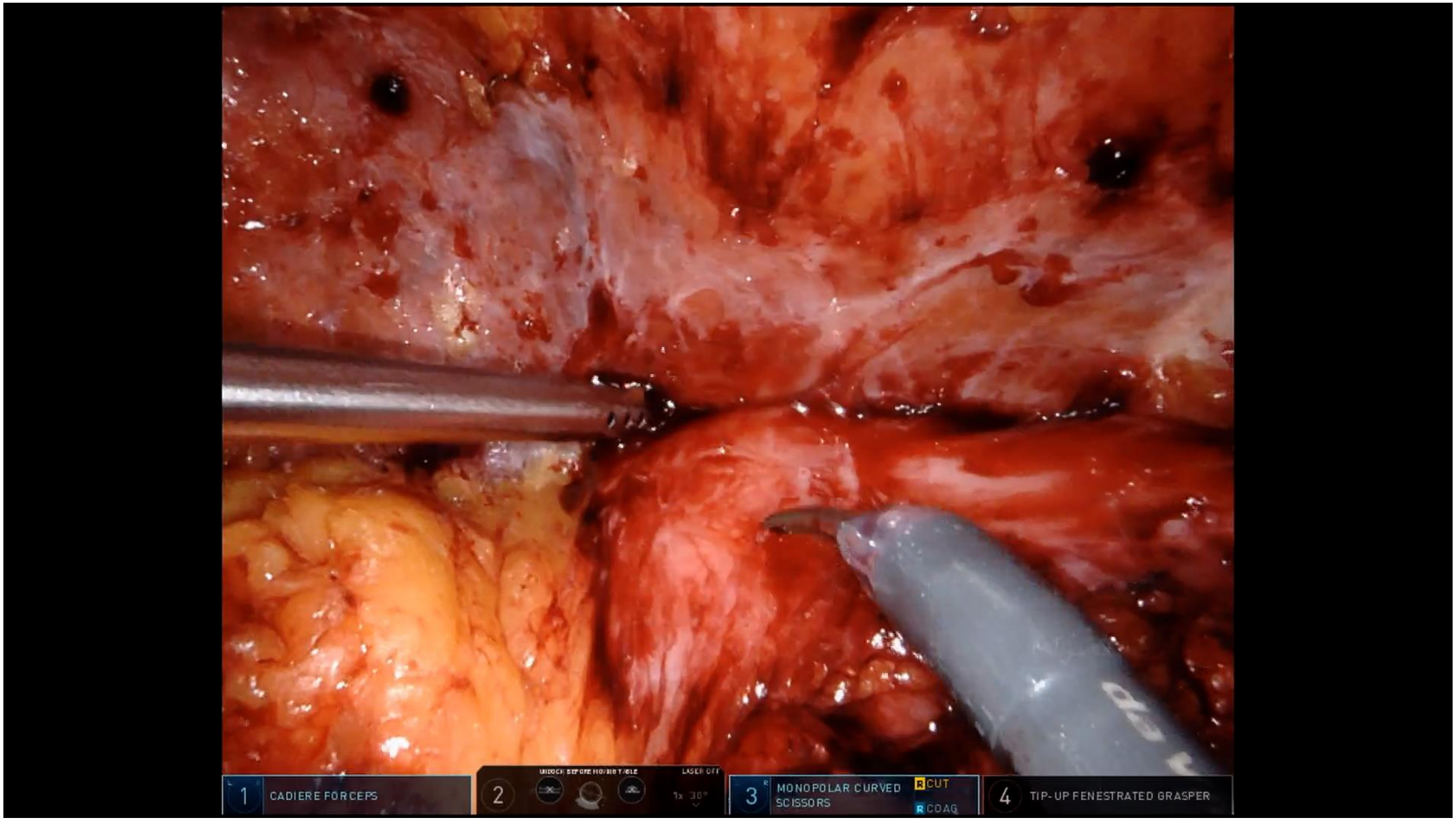
Caseload Breakdown

Anthony Clough

- Sleeve: 44% (4% revisional)
- Bypass: 37% (44% revisional)
- SADI-S: 16% (64% revisional)
- Band/Orbera/Overstitch: 3%

- *Disclosures/Conflicts*
- *Paid proctor for Da Vinci robotic cases*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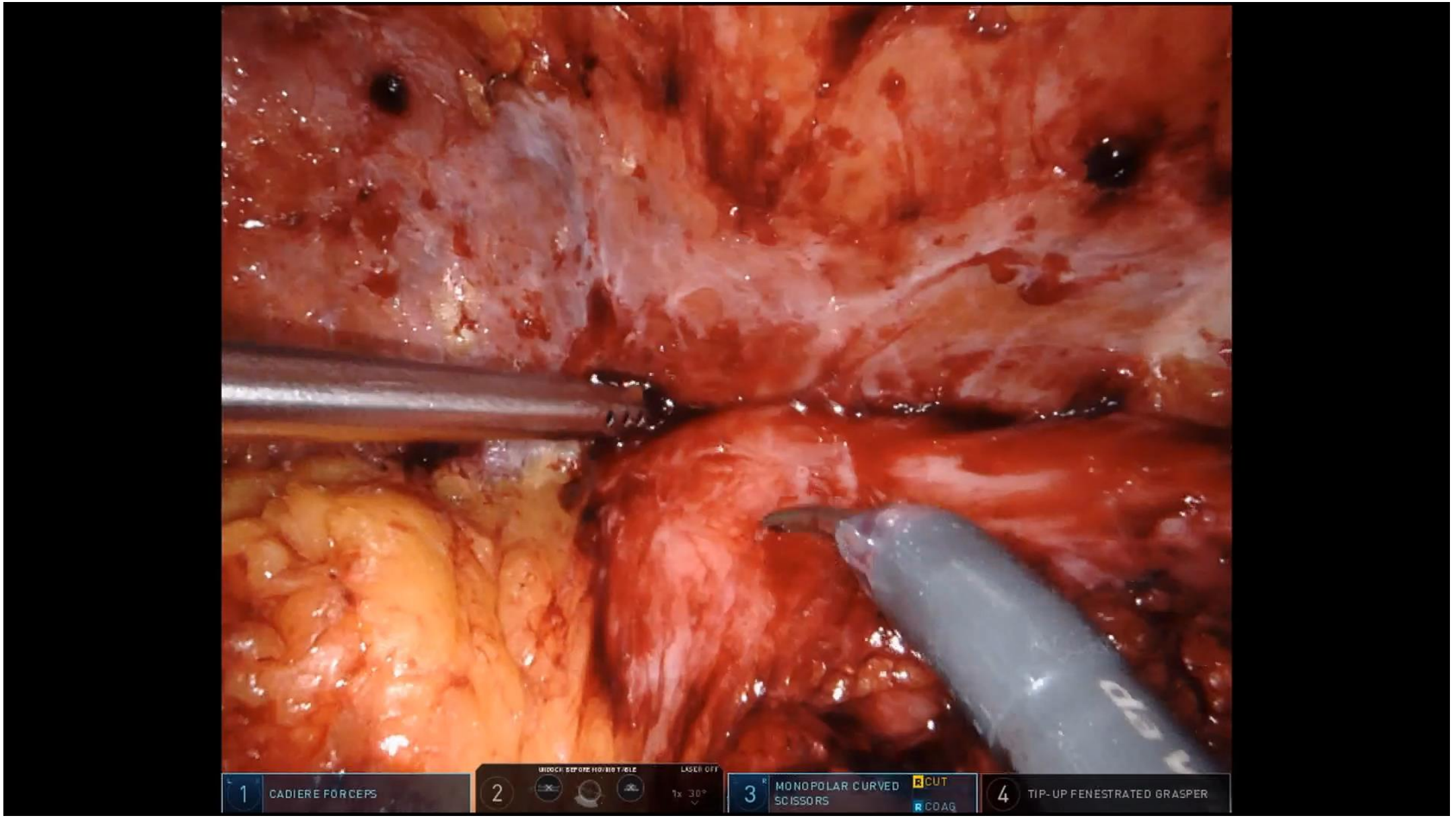
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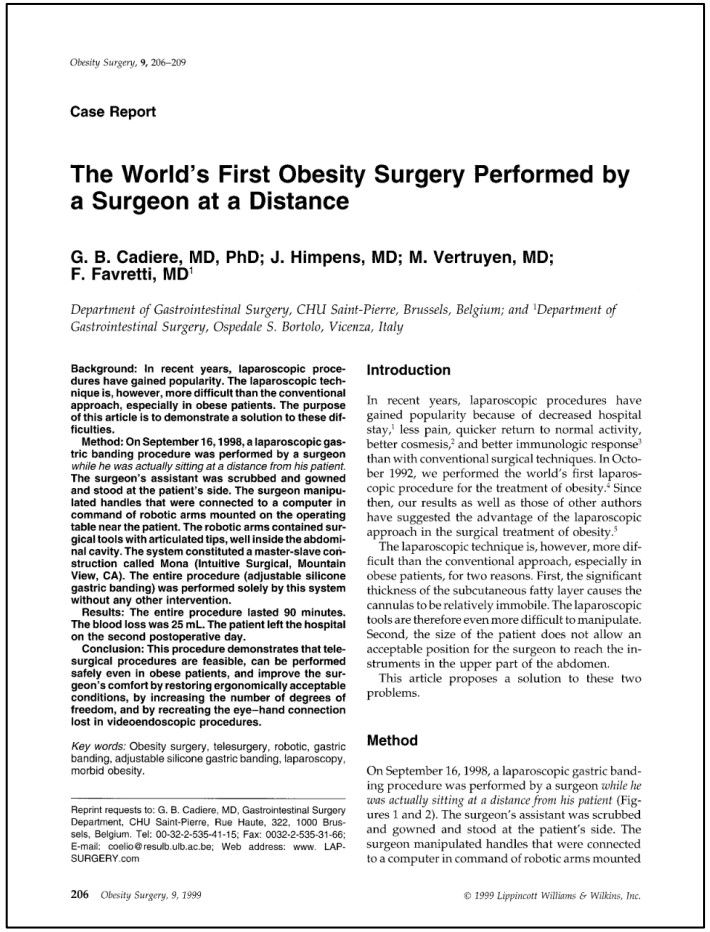
Robotic Bariatrics

1. *First published case*(Cadiere, Himpens et al. 1999)
2. Now in 2020 approx. **1/5.5** cases done robotically(Bauerle, Mody et al. 2023)
3. Australia first cases 2014



Obesity Surgery, **9**, 206–209

Case Report

The World's First Obesity Surgery Performed by a Surgeon at a Distance

G. B. Cadiere, MD, PhD; J. Himpens, MD; M. Vertruyen, MD; F. Favretti, MD[1]

Department of Gastrointestinal Surgery, CHU Saint-Pierre, Brussels, Belgium; and [1]*Department of Gastrointestinal Surgery, Ospedale S. Bortolo, Vicenza, Italy*

Background: In recent years, laparoscopic procedures have gained popularity. The laparoscopic technique is, however, more difficult than the conventional approach, especially in obese patients. The purpose of this article is to demonstrate a solution to these difficulties.

Method: On September 16, 1998, a laparoscopic gastric banding procedure was performed by a surgeon *while he was actually sitting at a distance from his patient.* **The surgeon's assistant was scrubbed and gowned and stood at the patient's side. The surgeon manipulated handles that were connected to a computer in command of robotic arms mounted on the operating table near the patient. The robotic arms contained surgical tools with articulated tips, well inside the abdominal cavity. The system constituted a master-slave construction called Mona (Intuitive Surgical, Mountain View, CA). The entire procedure (adjustable silicone gastric banding) was performed solely by this system without any other intervention.**

Results: The entire procedure lasted 90 minutes. The blood loss was 25 mL. The patient left the hospital on the second postoperative day.

Conclusion: This procedure demonstrates that telesurgical procedures are feasible, can be performed safely even in obese patients, and improve the surgeon's comfort by restoring ergonomically acceptable conditions, by increasing the number of degrees of freedom, and by recreating the eye–hand connection lost in videoendoscopic procedures.

Key words: Obesity surgery, telesurgery, robotic, gastric banding, adjustable silicone gastric banding, laparoscopy, morbid obesity.

Reprint requests to: G. B. Cadiere, MD, Gastrointestinal Surgery Department, CHU Saint-Pierre, Rue Haute, 322, 1000 Brussels, Belgium. Tel: 00-32-2-535-41-15; Fax: 0032-2-535-31-66; E-mail: coelio@resulb.ulb.ac.be; Web address: www. LAPSURGERY.com

Introduction

In recent years, laparoscopic procedures have gained popularity because of decreased hospital stay,[1] less pain, quicker return to normal activity, better cosmesis,[2] and better immunologic response[3] than with conventional surgical techniques. In October 1992, we performed the world's first laparoscopic procedure for the treatment of obesity.[4] Since then, our results as well as those of other authors have suggested the advantage of the laparoscopic approach in the surgical treatment of obesity.[5]

The laparoscopic technique is, however, more difficult than the conventional approach, especially in obese patients, for two reasons. First, the significant thickness of the subcutaneous fatty layer causes the cannulas to be relatively immobile. The laparoscopic tools are therefore even more difficult to manipulate. Second, the size of the patient does not allow an acceptable position for the surgeon to reach the instruments in the upper part of the abdomen.

This article proposes a solution to these two problems.

Method

On September 16, 1998, a laparoscopic gastric banding procedure was performed by a surgeon *while he was actually sitting at a distance from his patient* (Figures 1 and 2). The surgeon's assistant was scrubbed and gowned and stood at the patient's side. The surgeon manipulated handles that were connected to a computer in command of robotic arms mounted

USA "Nationwide Readmissions Database"

(NRD). Years 2010 - 2019(Klock, Bremer et al. 2023)

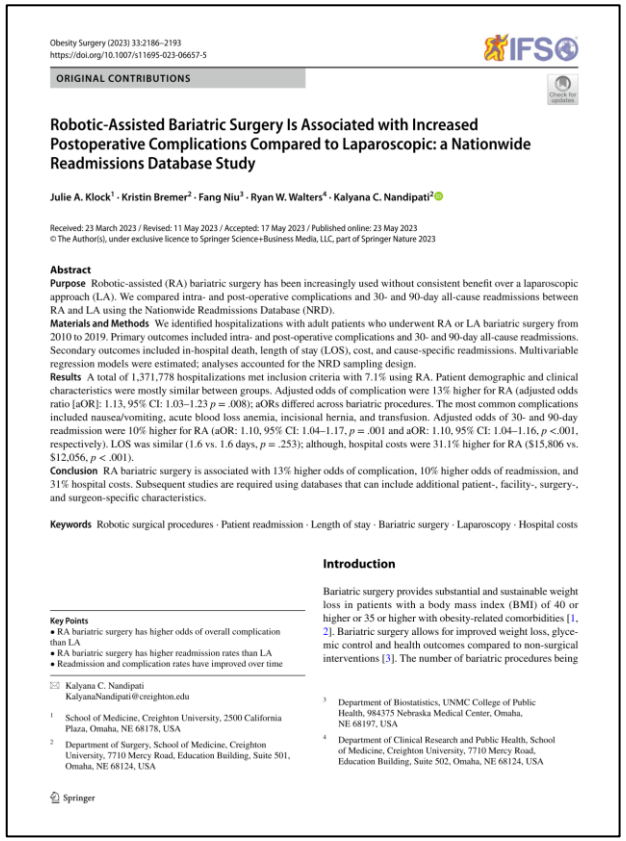
Lap Cases Identified: 1,274,147

Robot Cases Identified: 97,631

Overall composite complication rates

8.1% LAP vs 9.1% ROBOT **(p = 0.008)**

- ***Difference reduced over time…***
- ***Multiple issues with group differences, facility differences etc. etc.***



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ORIGINAL CONTRIBUTIONS

Robotic-Assisted Bariatric Surgery Is Associated with Increased Postoperative Complications Compared to Laparoscopic: a Nationwide Readmissions Database Study

Julie A. Klock[1] · Kristin Bremer[2] · Fang Niu[3] · Ryan W. Walters[4] · Kalyana C. Nandipati[2]

Received: 23 March 2023 / Revised: 11 May 2023 / Accepted: 17 May 2023 / Published online: 23 May 2023

Abstract

Purpose Robotic-assisted (RA) bariatric surgery has been increasingly used without consistent benefit over a laparoscopic approach (LA). We compared intra- and post-operative complications and 30- and 90-day all-cause readmissions between RA and LA using the Nationwide Readmissions Database (NRD).

Materials and Methods We identified hospitalizations with adult patients who underwent RA or LA bariatric surgery from 2010 to 2019. Primary outcomes included intra- and post-operative complications and 30- and 90-day all-cause readmissions. Secondary outcomes included in-hospital death, length of stay (LOS), cost, and cause-specific readmissions. Multivariable regression models were estimated; analyses accounted for the NRD sampling design.

Results A total of 1,371,778 hospitalizations met inclusion criteria with 7.1% using RA. Patient demographic and clinical characteristics were mostly similar between groups. Adjusted odds of complication were 13% higher for RA (adjusted odds ratio [aOR]: 1.13, 95% CI: 1.03–1.23 $p = .008$); aORs differed across bariatric procedures. The most common complications included nausea/vomiting, acute blood loss anemia, incisional hernia, and transfusion. Adjusted odds of 30- and 90-day readmission were 10% higher for RA (aOR: 1.10, 95% CI: 1.04–1.17, $p = .001$ and aOR: 1.10, 95% CI: 1.04–1.16, $p < .001$, respectively). LOS was similar (1.6 vs. 1.6 days, $p = .253$); although, hospital costs were 31.1% higher for RA ($15,806 vs. $12,056, $p < .001$).

Conclusion RA bariatric surgery is associated with 13% higher odds of complication, 10% higher odds of readmission, and 31% hospital costs. Subsequent studies are required using databases that can include additional patient-, facility-, surgery-, and surgeon-specific characteristics.

Keywords Robotic surgical procedures · Patient readmission · Length of stay · Bariatric surgery · Laparoscopy · Hospital costs

Introduction

Bariatric surgery provides substantial and sustainable weight loss in patients with a body mass index (BMI) of 40 or higher or 35 or higher with obesity-related comorbidities [1, 2]. Bariatric surgery allows for improved weight loss, glycemic control and health outcomes compared to non-surgical interventions [3]. The number of bariatric procedures being

Key Points
- RA bariatric surgery has higher odds of overall complication than LA
- RA bariatric surgery has higher readmission rates than LA
- Readmission and complication rates have improved over time

✉ Kalyana C. Nandipati
KalyanaNandipati@creighton.edu

[1] School of Medicine, Creighton University, 2500 California Plaza, Omaha, NE 68178, USA

[2] Department of Surgery, School of Medicine, Creighton University, 7710 Mercy Road, Education Building, Suite 501, Omaha, NE 68124, USA

[3] Department of Biostatistics, UNMC College of Public Health, 984375 Nebraska Medical Center, Omaha, NE 68197, USA

[4] Department of Clinical Research and Public Health, School of Medicine, Creighton University, 7710 Mercy Road, Education Building, Suite 502, Omaha, NE 68124, USA

US registry MBSAQIP data – data from year 2020(El Chaar, Petrick et al. 2023)

BYPASS (Lap vs Robot)

- **N = 13,132 (propensity matched)**

- Op time: 110 vs 144 mins
- Hospital LOS: 0.91 vs 0.90 (p = 0.39)
- 30d Readmit: 4.33% vs 5.65% (p< 0.001)
- SEOs: 4.60% vs 4.23% – RR 0.92 (p=0.305)

Multivariable model with a host of common risk factors controlled for confirms same

Obesity Surgery (2023) 33:2025–2039
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ORIGINAL CONTRIBUTIONS

Outcomes of Robotic-Assisted Bariatric Surgery Compared to Standard Laparoscopic Approach Using a Standardized Definition: First Look at the 2020 Metabolic and Bariatric Surgery Accreditation Quality Improvement Project (MBSAQIP) Data

Maher El Chaar[1] · Anthony Petrick[2] · Benjamin Clapp[3] · Jill Stoltzfus[4] · Luis A. Alvarado[5]

Received: 24 January 2023 / Revised: 4 April 2023 / Accepted: 5 April 2023 / Published online: 15 May 2023

Abstract

Purpose The primary objective of this study is to evaluate the outcomes of robotic-assisted (RA-) approach compared to the standard laparoscopic (L-) approach using the 2020 Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) registry Public Use File (PUF). Our secondary objective is to establish standards for the reporting of outcomes using PUF.

Materials and Methods Using the PUF database ($n = 168{,}568$), patients were divided into sleeve gastrectomy (SG), Roux-en-Y gastric bypass (RYGB), revisions, and conversions and then analyzed separately. We created balanced covariate through propensity score matching and inverse probability treatment weighting (IPTW). We also conducted multivariable relative risk regression to confirm our results.

Results For RYGB, the incidence of "transfusion" was significantly lower in the RA-RYGB compared to the L-RYGB. There was no significant difference in the rate of Serious Event Occurrences (SEOs) or rate of intervention at 30 days. For SG, there was a higher rate of "transfusion" in the RA group. Incidence of SEOs was also significantly higher in the RA-group. There was no significant difference in SEOs for conversions; however, revisions had a trend toward a lower rate of SEOs favoring the robotic approach. Operative times were significantly higher for all RA-groups.

Conclusion RA- approach in metabolic and bariatric surgery (MBS) remains controversial because of differences in outcomes. The use of SEOs as reported by MBSAQIP in its semi-annual report can be used as a composite score to assess outcomes while using PUF. Further studies are needed to compare RA- to L- MBS.

Keywords Robotic-assisted (RA-) · Laparoscopic (L-) · Roux-en-Y gastric bypass (RYGB) · Sleeve gastrectomy (SG) · Revision · Conversion

Key points
1. Data comparing the outcomes of robotic-assisted (RA-) and laparoscopic (L-) metabolic and bariatric surgery (MBS) based on MBSAQIP PUF is inconsistent because of lack of standardized outcome reporting measures.
2. The purpose of the manuscript was to compare the outcomes of RA- to L- MBS using a standardized definition as defined by the MBSAQIP risk-adjusted semi-annual reports.
3. For RYGB, there was no difference in the rate of serious event occurrences (SEOs) for RA- and L- groups despite a lower "transfusion rate" in the RA-group. For SG, there was a higher rate of SEOs in the RA-group because of higher "transfusion" rate.
4. Revisions had a trend toward a lower rate of SEOs favoring the robotic approach.

✉ Maher El Chaar
Maher.elchaar@uhn.org
Extended author information available on the last page of the article

Introduction

Obesity is a major health issue in the USA and other countries as well. Obesity-associated health conditions can negatively affect patient quality of life, longevity and result in major morbidities and increased health-care costs [1]. Metabolic and bariatric surgery (MBS) is the most effective long-term treatment for patients suffering from morbid obesity. MBS has also a well-established safety track record. The safety of MBS is largely due to the adoption of advanced laparoscopic (L-) techniques and the establishment of accredited centers in addition to fellowship training [2, 3]. The two most common MBS procedures performed in the

USA Registry Study(Seton, Mahan et al. 2022)

Sleeve to Bypass conversions only

Propensity matched

- Lap cases 2274
- Robot cases 1137

No differences in complications or length of stay

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ORIGINAL CONTRIBUTIONS

Is Robotic Revisional Bariatric Surgery Justified? An MBSAQIP Analysis

Tristan Seton[1] · Mark Mahan[2] · James Dove[2] · Hugo Villanueva[2] · Vladan Obradovic[2] · Alexandra Falvo[1] · Ryan Horsley[1] · Anthony Petrick[2] · David M. Parker[2]

Received: 16 August 2022 / Revised: 23 September 2022 / Accepted: 28 September 2022 / Published online: 20 October 2022

Abstract

Background The laparoscopic approach is utilized in greater than 90% of bariatric surgeries. With the growing prevalence of robotic-assisted surgery in bariatrics, there has been limited consensus on the superiority of either laparoscopic or robotic approaches, especially in revisional procedures (conversion from sleeve gastrectomy (SG) to Roux-en-Y gastric bypass (RYGB)).

Methods A retrospective analysis was performed of the MBSAQIP PUF database of patients who underwent conversion from SG to RYGB procedures in either laparoscopic or robotic-assisted approaches. The groups underwent 2:1 propensity matching and primary outcomes included post-conversion days until discharge (POD), conversion operation length, total and major morbidity, 30-day readmission, 30-day reoperation, 30-day reintervention, and 30-day mortality after conversion.

Results After 2:1 propensity score matching, 3411 patients (2274 laparoscopic vs 1137 robotic) were included in the study. Intraoperatively, no significant difference was found in total morbidity (6.5% lap vs 5.9% robotic) or major morbidity (1.9% lap vs 1.7% robotic); however, the operative times were significantly longer robotically (126 min vs 164 min). Postoperatively, no significant differences were found in discharge day (1.8 lap vs 1.8 robotic), 30-day readmission (7.6% lap vs 8.6% robotic), reoperation rate (2.9% lap vs 3.7% robotic), additional intervention rate (2.5% lap vs 3.3% robotic), or 30-day mortality (0.1% vs 0.1%).

Conclusion There is no significant difference in perioperative or intraoperative outcomes between laparoscopic and robotic-assisted SG to RYGB conversion procedures other than a longer operative time in the robotic approach, suggesting increased efficiency with the laparoscopic approach.

Keywords Bariatric revisions · Laparoscopic · Robotic · Roux-en-y gastric bypass · Sleeve gastrectomy · MBSAQIP

Key Points
- There is no significant difference in intraoperative and 30-day post-operative outcomes in bariatric revisional procedures when comparing laparoscopic and robotic approaches.
- Revisions with the robotic approach took significantly longer intraoperatively than with the laparoscopic approach.
- The results of this analysis suggest that laparoscopy is a more efficient method than the robotic approach.

David M. Parker
dparker@geisinger.edu

[1] Geisinger Community Medical Center, 1800 Mulberry St, Scranton, PA 18510, USA

[2] Geisinger Medical Center, 100 North Academy Ave, Danville, PA 17821, USA

Introduction

Bariatric surgery remains the most effective treatment for obesity and obesity-related disease. Bariatric surgery has thus been gradually increasing in utilization for the past decade, with recent data from ASMBS showing an estimated 256,000 patients in the USA who underwent bariatric surgical procedures in 2019. Of that population, nearly 43,000 procedures were revisional, making it the third most common bariatric procedure performed during this period. Sleeve gastrectomy is the most common bariatric surgery in the USA comprising nearly 152,000 of these cases annually [1]. Some patients that undergo laparoscopic sleeve gastrectomy (L-SG) has significant reflux symptoms postoperatively or other modifiable conditions requiring a revisional procedure to convert to a Roux-en-Y gastric bypass (RYGB) [2].

Systemic Review & Meta-Analysis(Bertoni, Marengo et al. 2021)

- 6 studies included:
- Lap Revisions – 27,431, Robot Revisions – 2459
- OVERALL no significant differences across all cases, however:

REVISION <u>BYPASS</u> CASES ONLY SUBGROUP

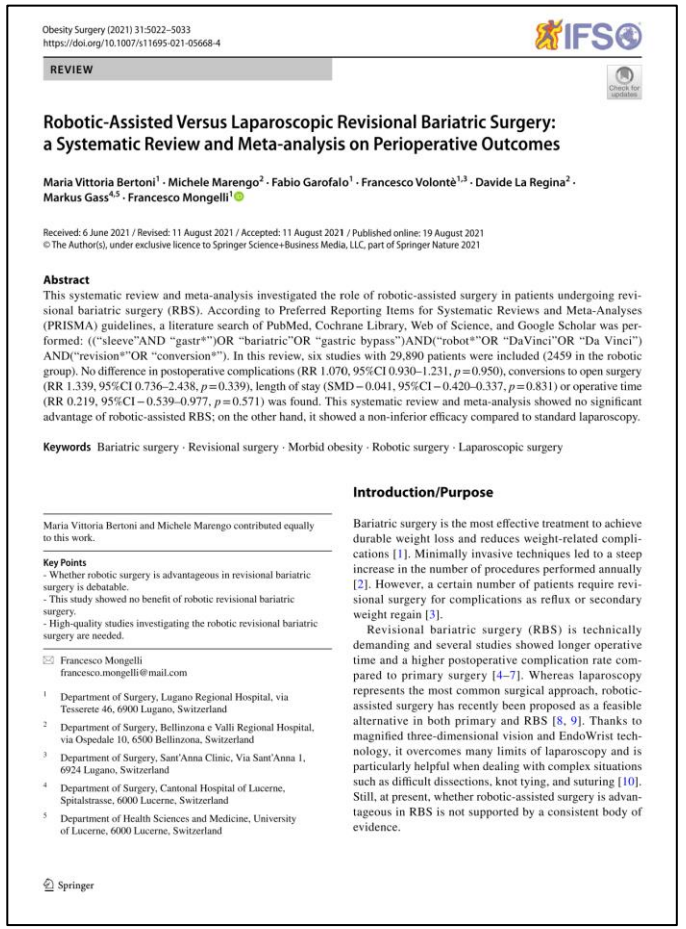
Early postop Complications

- **Lap 11.6% vs Robot 9.2% p = 0.123**

Mean length of stay (days)

- **Lap 2.5 vs Robot 2.4 p = 0.171**

Overall study quality – "poor"



Obesity Surgery (2021) 31:5022–5033
https://doi.org/10.1007/s11695-021-05668-4

IFSO

REVIEW

Robotic-Assisted Versus Laparoscopic Revisional Bariatric Surgery: a Systematic Review and Meta-analysis on Perioperative Outcomes

Maria Vittoria Bertoni[1] · Michele Marengo[2] · Fabio Garofalo[1] · Francesco Volonté[1,3] · Davide La Regina[2] · Markus Gass[4,5] · Francesco Mongelli[1]

Received: 6 June 2021 / Revised: 11 August 2021 / Accepted: 11 August 2021 / Published online: 19 August 2021

Abstract
This systematic review and meta-analysis investigated the role of robotic-assisted surgery in patients undergoing revisional bariatric surgery (RBS). According to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a literature search of PubMed, Cochrane Library, Web of Science, and Google Scholar was performed: ((“sleeve”AND “gastr*”)OR “bariatric”OR “gastric bypass”)AND(“robot*”OR “DaVinci”OR “Da Vinci”) AND(“revision*”OR “conversion*”). In this review, six studies with 29,890 patients were included (2459 in the robotic group). No difference in postoperative complications (RR 1.070, 95%CI 0.930–1.231, $p = 0.950$), conversions to open surgery (RR 1.339, 95%CI 0.736–2.438, $p = 0.339$), length of stay (SMD − 0.041, 95%CI − 0.420–0.337, $p = 0.831$) or operative time (RR 0.219, 95%CI − 0.539–0.977, $p = 0.571$) was found. This systematic review and meta-analysis showed no significant advantage of robotic-assisted RBS; on the other hand, it showed a non-inferior efficacy compared to standard laparoscopy.

Keywords Bariatric surgery · Revisional surgery · Morbid obesity · Robotic surgery · Laparoscopic surgery

Maria Vittoria Bertoni and Michele Marengo contributed equally to this work.

Key Points
- Whether robotic surgery is advantageous in revisional bariatric surgery is debatable.
- This study showed no benefit of robotic revisional bariatric surgery.
- High-quality studies investigating the robotic revisional bariatric surgery are needed.

Francesco Mongelli
francesco.mongelli@mail.com

[1] Department of Surgery, Lugano Regional Hospital, via Tesserete 46, 6900 Lugano, Switzerland
[2] Department of Surgery, Bellinzona e Valli Regional Hospital, via Ospedale 10, 6500 Bellinzona, Switzerland
[3] Department of Surgery, Sant'Anna Clinic, Via Sant'Anna 1, 6924 Lugano, Switzerland
[4] Department of Surgery, Cantonal Hospital of Lucerne, Spitalstrasse, 6000 Lucerne, Switzerland
[5] Department of Health Sciences and Medicine, University of Lucerne, 6000 Lucerne, Switzerland

Introduction/Purpose

Bariatric surgery is the most effective treatment to achieve durable weight loss and reduces weight-related complications [1]. Minimally invasive techniques led to a steep increase in the number of procedures performed annually [2]. However, a certain number of patients require revisional surgery for complications as reflux or secondary weight regain [3].

Revisional bariatric surgery (RBS) is technically demanding and several studies showed longer operative time and a higher postoperative complication rate compared to primary surgery [4–7]. Whereas laparoscopy represents the most common surgical approach, robotic-assisted surgery has recently been proposed as a feasible alternative in both primary and RBS [8, 9]. Thanks to magnified three-dimensional vision and EndoWrist technology, it overcomes many limits of laparoscopy and is particularly helpful when dealing with complex situations such as difficult dissections, knot tying, and suturing [10]. Still, at present, whether robotic-assisted surgery is advantageous in RBS is not supported by a consistent body of evidence.

Springer

Small single centre study(King, Galvez et al. 2021)

- Assorted revisional cases
- Lap 115, Robot 52 cases

Major complications

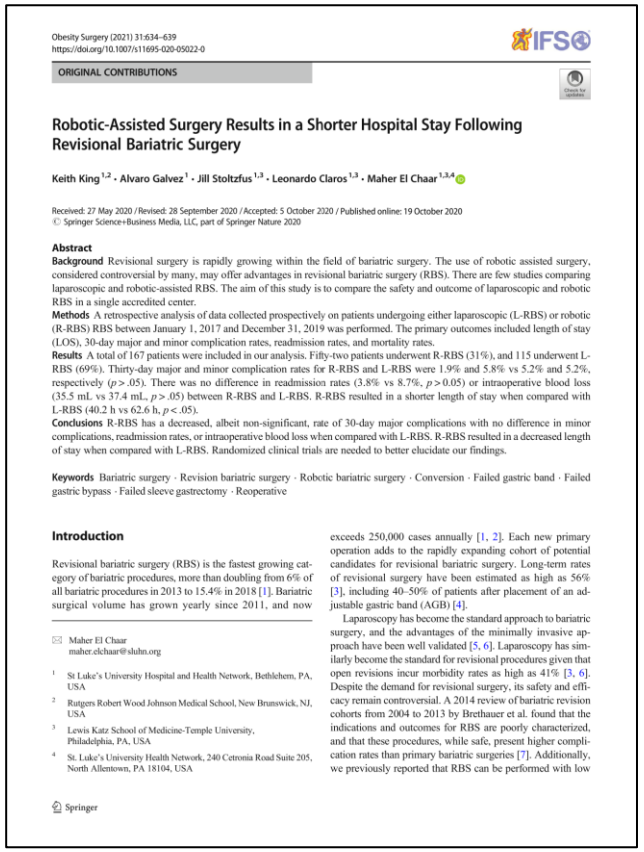
- Lap 5.2% vs robot 1.9% NS

Minor complications

- Lap 5.2% vs Robot 5.8% NS

Length of Stay (total hours)

- Lap = 62.6 vs Robot 40.2 p < 0.05



Obesity Surgery (2021) 31:634–639
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ORIGINAL CONTRIBUTIONS

Robotic-Assisted Surgery Results in a Shorter Hospital Stay Following Revisional Bariatric Surgery

Keith King [1,2] · Alvaro Galvez [1] · Jill Stoltzfus [1,3] · Leonardo Claros [1,3] · Maher El Chaar [1,3,4]

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Abstract

Background Revisional surgery is rapidly growing within the field of bariatric surgery. The use of robotic assisted surgery, considered controversial by many, may offer advantages in revisional bariatric surgery (RBS). There are few studies comparing laparoscopic and robotic-assisted RBS. The aim of this study is to compare the safety and outcome of laparoscopic and robotic RBS in a single accredited center.

Methods A retrospective analysis of data collected prospectively on patients undergoing either laparoscopic (L-RBS) or robotic (R-RBS) RBS between January 1, 2017 and December 31, 2019 was performed. The primary outcomes included length of stay (LOS), 30-day major and minor complication rates, readmission rates, and mortality rates.

Results A total of 167 patients were included in our analysis. Fifty-two patients underwent R-RBS (31%), and 115 underwent L-RBS (69%). Thirty-day major and minor complication rates for R-RBS and L-RBS were 1.9% and 5.8% vs 5.2% and 5.2%, respectively ($p > .05$). There was no difference in readmission rates (3.8% vs 8.7%, $p > 0.05$) or intraoperative blood loss (35.5 mL vs 37.4 mL, $p > .05$) between R-RBS and L-RBS. R-RBS resulted in a shorter length of stay when compared with L-RBS (40.2 h vs 62.6 h, $p < .05$).

Conclusions R-RBS has a decreased, albeit non-significant, rate of 30-day major complications with no difference in minor complications, readmission rates, or intraoperative blood loss when compared with L-RBS. R-RBS resulted in a decreased length of stay when compared with L-RBS. Randomized clinical trials are needed to better elucidate our findings.

Keywords Bariatric surgery · Revision bariatric surgery · Robotic bariatric surgery · Conversion · Failed gastric band · Failed gastric bypass · Failed sleeve gastrectomy · Reoperative

Introduction

Revisional bariatric surgery (RBS) is the fastest growing category of bariatric procedures, more than doubling from 6% of all bariatric procedures in 2013 to 15.4% in 2018 [1]. Bariatric surgical volume has grown yearly since 2011, and now exceeds 250,000 cases annually [1, 2]. Each new primary operation adds to the rapidly expanding cohort of potential candidates for revisional bariatric surgery. Long-term rates of revisional surgery have been estimated as high as 56% [3], including 40–50% of patients after placement of an adjustable gastric band (AGB) [4].

Laparoscopy has become the standard approach to bariatric surgery, and the advantages of the minimally invasive approach have been well validated [5, 6]. Laparoscopy has similarly become the standard for revisional procedures given that open revisions incur morbidity rates as high as 41% [3, 6]. Despite the demand for revisional surgery, its safety and efficacy remain controversial. A 2014 review of bariatric revision cohorts from 2004 to 2013 by Brethauer et al. found that the indications and outcomes for RBS are poorly characterized, and that these procedures, while safe, present higher complication rates than primary bariatric surgeries [7]. Additionally, we previously reported that RBS can be performed with low

✉ Maher El Chaar
maher.elchaar@sluhn.org

[1] St Luke's University Hospital and Health Network, Bethlehem, PA, USA
[2] Rutgers Robert Wood Johnson Medical School, New Brunswick, NJ, USA
[3] Lewis Katz School of Medicine-Temple University, Philadelphia, PA, USA
[4] St. Luke's University Health Network, 240 Cetronia Road Suite 205, North Allentown, PA 18104, USA

Our Epworth Study (Soon et al. 2022)

First 100 robotic bypasses vs 100 sequential laparoscopic bypasses. Matched by revisional status, 1/3 revisional.

30d major complications

- Lap 11 vs robot 2 p = 0.018

30d minor complications

- Lap 20 vs Robot 6 p = 0.005

Median Length of Stay (days)

- Lap = 5 vs Robot = 4

Surgical Endoscopy
https://doi.org/10.1007/s00464-021-08723-4

Australian experience with robot-assisted Roux-en-Y gastric bypass with comparison to a conventional laparoscopic series

David Sien Chin Soon[1,2] · Xavier Moar[1,3] · Dewei Jordan Lee[1,2] · Patrick Moore[1] · Anthony Clough[1]

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Abstract

Background Robotic surgery is a novel approach to abdominal surgery. In Australia, the uptake of robotic assistance for bariatric surgery has been relatively slow compared to many other countries. The aim of this study is to report the first high volume experience of robotic-assisted Roux-en-Y gastric bypass surgery in Australia (RRYGB) and compare outcomes with a similar laparoscopic group (LRYGB).

Methods Retrospective analysis of 100 RRYGB versus 100 LRYGB was carried out over a period of seven years performed by two surgeons. These groups were matched by revisional status. Outcomes recorded included operative times, conversion rate, hospital stay, short-term (30 days) complication rates, and long-term complication rates. Baseline comorbidities of patients were also recorded.

Results Baseline characteristics of the two groups were similar except for comorbidity rates (higher in LRYGB group). The mean age was 43 (RRYGB) and 44(LRYGB) years, respectively. The mean pre-op BMI was 44.3 in the RRYGB group and 44.7 in the LRYGB group. Mean operating time in the RRYGB group was 208 min compared to 175 min in the LRYGB group. The number of patients with major complications was 1 in the robotic group versus 5 in the laparoscopic group (*P*: 0.2166). Minor complications were higher in the robotic group (17 vs. 5, *P*: 0.0054). Median length of stay of patients with RRYGB was 4 days compared to 5 days for the LRYGB group.

Conclusion RRYGB has been successfully implemented in Australia with low complication rates compared to conventional laparoscopic RYGB. Operating times are longer compared to LRYGB which is consistent with most published literature. To justify increased costs generally associated with robotic surgery, better quality studies are needed to accurately assess potential cost savings with length of stay and safety benefits to patients and institutions.

Keywords Bariatric surgery · Obese · Robotic Roux-en-Y gastric bypass · Laparoscopic Roux-en-Y gastric bypass

Laparoscopic Roux-en-Y gastric bypass (LRYGB) is a technically demanding procedure, first performed by Wittgrove in 1994 [1]. Advances in technology, however, may improve our ability to perform complex surgery safely and effectively. The da Vinci robot has been utilized in Roux-en-Y gastric bypass (RYGB) cases for over 15 years now and several large series have since been published with generally equivocal results when compared to LRYGB [2–5]. This platform offers wristed instruments, true three-dimensional view with surgeon control of the camera, surgeon control of assisting instruments and ergonomic benefits. On the other hand, disadvantages include lack of haptic feedback and reliance on assistants for functions, such as suction, and insertion and removal of components such as sutures and gauzes.

Robotic-assisted Roux-en-Y gastric bypass (RRYGB) cases are more costly [6] unless other factors can mitigate this such as reduced length of stay (LOS) or intensive care (ICU) utilization. Studies have been conflicted regarding these issues so far. Across the board, increased operating time is found in robotic series.

✉ David Sien Chin Soon
davidsoon1991@gmail.com

[1] Department of General Surgery, Epworth Richmond, 89 Bridge Road, Richmond, VA 3121, USA

[2] Department of General Surgical Specialties, Royal Melbourne Hospital, 300 Grattan St, Parkville, VIC 3050, Australia

[3] Department of General Surgery, St Vincent's Private Hospital, 22-36 Scott St, Toowomba, QLD 4350, Australia

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Should I use it?

QUESTIONS

- Does your practice involve more complex surgery/revisional surgery?
- Do you really need to do handsewn anastomoses and are unwilling/unable to learn laparoscopically?
- Do you have availability of good help/proctoring to navigate the learning curve?

- Do you have time and energy in your career to embark on a several years' learning curve for new technology?
- Extending your career??
- Ergonomically better??
- Patients want it??

Enjoy Melbourne!!