

Original Research Article

A comparative study between robotic sleeve gastrectomy and robotic mini gastric bypass: which one is better?

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ABSTRACT

Background: Bariatric surgery now days is a commonly done procedure for morbid obese or super obese patients. With the development of less invasive procedures like laparoscopy & robotic surgery, the use of bariatric surgery is becoming more common. The present study was conducted with an idea to compare the post operative outcomes in 2 groups (robotic sleeve gastrectomy & robotic mini gastric bypass) in terms of various parameters such as operative time, post-op. pain, length of hospital stay.

Methods: Present study has been conducted on 35 patients, divided into two groups, based on two commonly performed procedures, Group one-21 patients (Robotic one anastomosis gastric bypass/Mini gastric bypass) and group two-14 patients (Robotic Sleeve Gastrectomy). All the cases in both groups were selected according to the patient's BMI, associated symptoms and patient's own preference for the procedure; both groups were followed for a period of 6 months.

Results: On analysis, group 2 patients had a shorter operating time ($p < 0.01$) and shorter hospital stay ($P \text{ value} < 0.05$) with almost similar results in term of weight loss after 6 months. Only one patient in group 1 had significant post operative complication in term of pulmonary embolism that was successfully managed conservatively

Conclusions: Group 2 had a significantly shorter operating time & shorter hospital stay, with almost similar weight reduction after 6 months period of follow up and had no post operative complication, group 1 had one post operatively complications in term of pulmonary embolism which was managed by conservative means.

Keywords: Robotic one anastomosis gastric bypass, Robotic sleeve gastrectomy, Bariatric surgery

INTRODUCTION

Obesity is the second leading cause of preventable deaths in US and it is second to Smoking on the list of preventable factors responsible for increased health care Costs. Morbid obesity is defined as being 100 lb above ideal weight, twice ideal body weight or a body mass index (which is weight in kg/height in m²) of 40 kg/m². BMI is calculated by following method; BMI=Weight in

kg/height in meters.¹ Overweight and obesity are the fifth leading risk for global deaths. Increasing evidence suggests that traditional nonsurgical weight loss methods are ineffective and that bariatric surgery is the most sustainable and effective treatment for weight loss in the morbidly obese, no medical therapy (e.g., sibutramine, or listat) has shown significant weight reduction effect in a morbid obese patient.² Surgical options are now a days getting popular day by day. Surgical treatment of morbid

obesity is termed as Bariatric Surgery. Bariatric surgical procedures are based on mainly two mechanisms of actions; Restrictive procedures: This decreases food intake and promote on early feeling of satiety after meals. This includes-Vertical Band Gastroplasty, Longitudinal Adjustable Gastric Banding, Laparoscopic or Robotic Sleeve Gastrectomy (RYGB-Largely restrictive, mildly absorptive). Malabsorptive Procedures: This decreases the absorption of food intake & reduces calories, protein & other nutrients. This includes Bilio-Pancreatic division, & duodenal switch. Both restrictive and malabsorptive: Roux-en-Y Gastric Bypass, one anastomosis gastric bypass popularly known as mini gastric bypass. With the advent of laparoscopy in 1980s & robotics (da Vinci) in 1990s Bariatric Surgery began to perform with minimally invasive technique. Main advantage of Minimal invasive surgery (both Robotics & laparoscopic) compared to traditional Open surgery are less trauma & adhesions, reduced post operative pain, infections & Incidence of incisional hernia, reduced hospital stay, reduced convalescence & finally better outcome. In this study we took two procedures sleeve gastrectomy and One anastomosis gastric bypass (mini gastric bypass) commonly performed now a days in India, so we divided the whole sample into two group, group one ROAGB (robotic one anastomosis gastric bypass), and group second RSG, those patients who were having high BMI more then 45, associated GERD symptoms and severe co morbid conditions were preferred for ROAGB, while rest of the patients were offered both of the options ROAGB, & RSG (robotic sleeve gastrectomy).

Aim and objectives

The aim of our study was to assess the intraoperative and postoperative parameters such as blood loss, operative time, post op. hospital stay, morbidity and weight loss at 1 week, 1 month, 3 month and after 6 month in patients who were going to be operated by robotic da Vinci system either robotic sleeve gastrectomy or robotic one anastomosis gastric bypass in morbidly obese patients, and provide data as ROAGB group & RSG group.

METHODS

Study design, location and duration

Current study is a Prospective, Observational, Comparative Study conducted at Department of Minimal Invasive & Robotic surgery, Indraprastha Apollo Hospitals, New Delhi. Study duration was From November 2021 to January 2023.

Selection criteria

Patients admitted in Indraprastha Apollo Hospital, New Delhi for bariatric surgery who fulfilled the following criteria: All patients of body mass index of >37.5 kg/m² regardless of the presence of co morbidities. Those

patients with body mass index of 32.5 to 37.5 kg/m² candidates with obesity related co morbidities. Those patients who were properly advised counseled for bariatric surgery particularly robotic bariatric surgery. Patients who had a history of failed non-surgical therapy atleast tried for 6 months now motivated ready for bariatric surgery. Age group for this study was 18 to 65 years irrespective of sex.

Procedure

Robotic Sleeve Gastrectomy Restrictive procedure: This decreases food intake and promote on early feeling of satiety after meals. Robotic one anastomosis gastric bypass popularly known as Mini gastric bypass; both restrictive (this decreases food intake and promote on early feeling of satiety after meals) and malabsorptive (this decreases the absorption of food intake & reduces calories, protein & other nutrients).

Statistical analysis

Data was tabulated in MS Office Excel worksheet. Descriptive statistics was computed for all the numerical data. Frequency tables was constructed for categorical data. Chi square test was used to test for association between the categorical data. Wilcoxon Sign Test was used to test effect of robotic bariatric surgery on patient's weight reduction thus on BMI. For all the statistical analysis a $p \leq 0.05$ was considered to indicate as significant difference at 5% level of significance. All statistical analyses were performed by using software SPSS version 16.0 Data was collected as per study Performa, & post operative pain was assessed by visual analogue pain score. All patients were operated by a single surgical team, with da Vinci robotic Si surgical system (Intuitive Surgical, Inc., Sunnyvale, CA, USA) only, A written and informed consent was taken from the patient and their first degree relative those who were included in this study. All information were carried out either telephonically or by sending an email.

RESULTS

In this study we took two commonly performed procedures now a days in India sleeve gastrectomy and one anastomosis gastric bypass, so we divided the whole sample (35 patients) into two group, group one ROAGB, and group two RSG, in group one 21 patients and in group two 14 patients out of 35 patients. Procedure selection was; patient with BMI higher than 45 and with GERD symptoms & severe co morbid conditions were preferred for ROAGB and in rest of the patients both options were offered. The aim of our study was to assess the intra operative and post operative parameters such as blood loss, operative time, post op. hospital stay, morbidity, any peri-operative, early or late post-operative complications and weight loss at 1 week, 1 month, 3 month and after 6 month in patients who were operated by robotic da Vinci system either robotic sleeve

gastrectomy or robotic one anastomosis gastric bypass in morbidly obese patients, and provide data as ROAGB group & RSG group. Our observations of the outcomes are as follows: Age and sex distribution: The age of the patients who underwent surgical intervention in this study was in the range of 20 to 62 years with a mean of 41.25 years with SD 12 (Table 1); male to female ratio was 14:21 (Table 2). The (Figure 1) shows initial BMI according to both procedures.

Table 1: Age distribution.

Age group (years)	Female	Male	Grand total
>50	6	4	10
20-30	5	3	8
31-40	6	2	8
41-50	4	5	9
Grand total	21	14	35

Table 2: Gender distribution.

Geder	N
Male	14
Female	21

Duration of surgery

Mean duration of surgery for robotic one anastomosis gastric bypass was 115 minutes (range 70-170 minutes), while mean duration of surgery for robotic sleeve gastrectomy was 84 minutes (range 45-150 minutes) (Figure 2). Mean operative time for last five cases in our study, ROAGB group was 74 minutes, while in RSG group was 51 minutes, much shorter operating time in comparison to mean operative time in both groups, showing better results after gaining learning curve (Figure 3). All the patients were followed up at 1 week, 4 week, 3 month and 6 month period for evaluation of excess weight loss, and for any late complications, any nutritional deficiency.

Intra-operative complications and conversion to open surgery

Robotic one anastomosis gastric bypass and Robotic Sleeve Gastrectomy: There was 0% conversion to open surgery in our study. There was no case of pneumothorax subcutaneous emphysema, injury to short gastric vessels, injury to diaphragm, injury to stomach, and injury to spleen. Average blood loss with patients undergoing ROAGB was 23.3 ml and with RSG was 17.9 ml ($p=0.078$) (Figure 4).

Immediate post operative complication

No immediate post-operative complication was seen in both groups. There was no staple line leak, no patient had intra-abdominal bleed and none had any other complication like DVT or pulmonary complications.

Great care was taken in all patients to ensure no staple line bleed is present and leave a dry field in all cases.

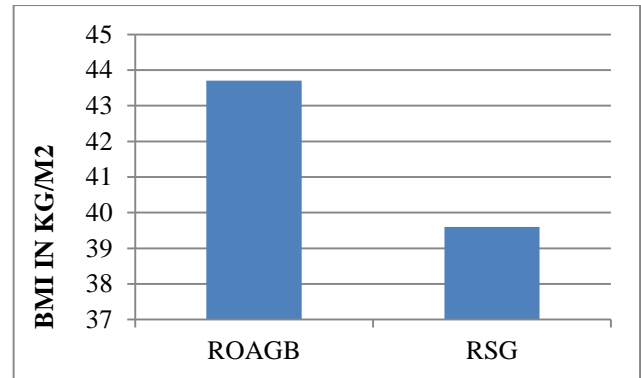


Figure 1: Initial BMI.

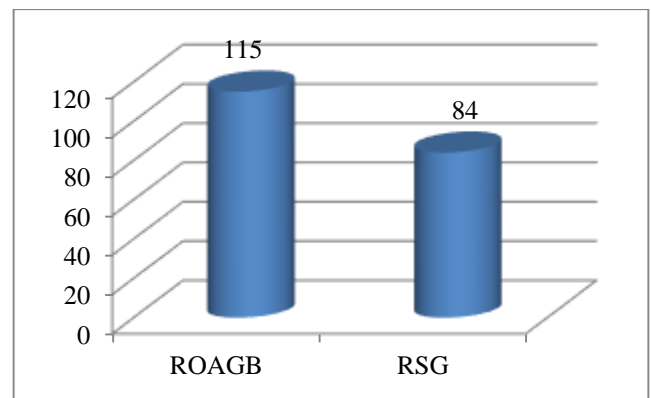


Figure 2: Average time of operation.

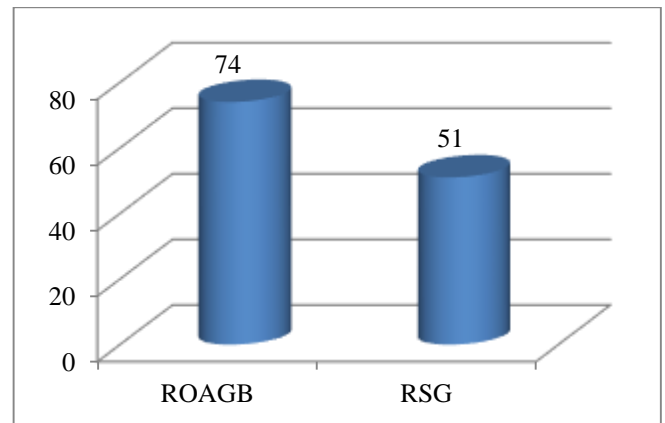


Figure 3: Average time of operation in last 5 cases.

Duration of hospital stay

The mean duration of hospital stay for all the patients undergoing ROAGB was 3.2 days, because one patient had a postoperative complication (PTE) stayed for 12 days. The mean duration of hospital stay of patients undergoing RSG was 2.4 days (Figure 5). Pain score by using visual analogue pain score was 2 at 6 hrs, 1 at 24 hrs and 0 at 72 hrs in both the groups.

Early post operative complications

No post operative leak was found in any of the group, one patient of ROAGB, developed breathlessness, fever and sudden fall in SpO₂ on pod3, patient was diagnosed with Pulmonary Embolism, managed conservatively, and discharged on pod12. 2 (9.5%) patients out of 21 ROAGB suffered from nausea, while 5 (37.5%) patients of RSG group suffered with nausea. 1 (4.7%) patient in ROAGB group and 1 (7%) patient in RSG group complained of vomiting. 6 (28%) patients in ROAGB group and 2 (14%) patients in RSG group complained of Dumping syndrome, while 3 (14%) patients in ROAGB complained of post operative hypoglycemia, 0% in RSG group (Figure 6).

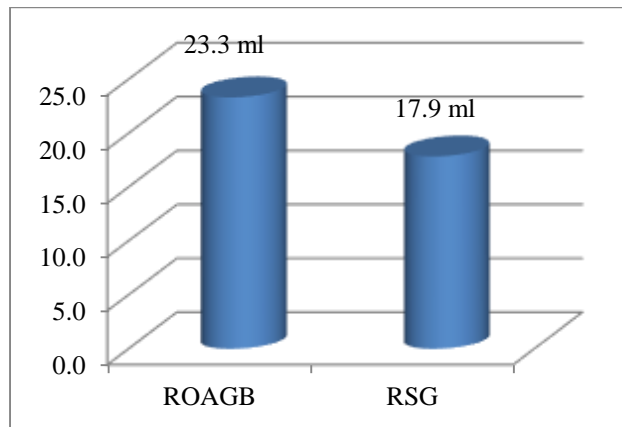


Figure 4: Average blood loss.

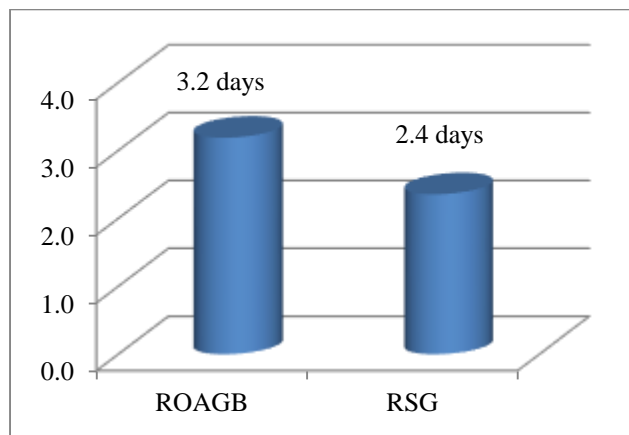


Figure 5: Average length of hospital stay.

Late postoperative complications

Total 2 (9%) patients in ROAGB group complained of bile reflux, none of the patients in both group complained of stomal ulcer, intestinal obstruction, esophagitis or any symptoms pertaining to Carcinoma stomach or esophagus. 3 (14%) patients in ROAGB group and 1 (7%) patient in RSG group complained of anemia and iron deficiency, Vit. D deficiency in 1 (4.7%) patient in ROAGB group, none in RSG, Vit. B₁₂ def. in 3 (14%)

patients in ROAGB none in RSG, while 3 (14%) patients in ROAGB and 1 (7%) patient in RSG group found to have protein deficiency (Figure 7).

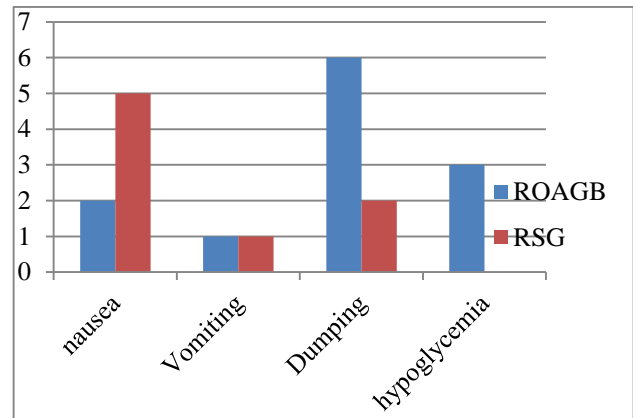


Figure 6: Early post operative complications.

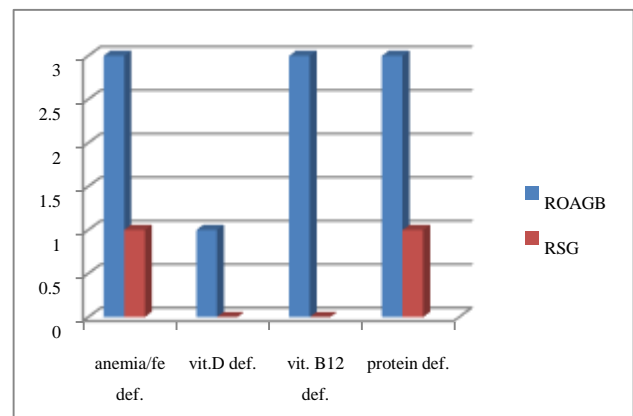


Figure 7: Nutritional deficiency.

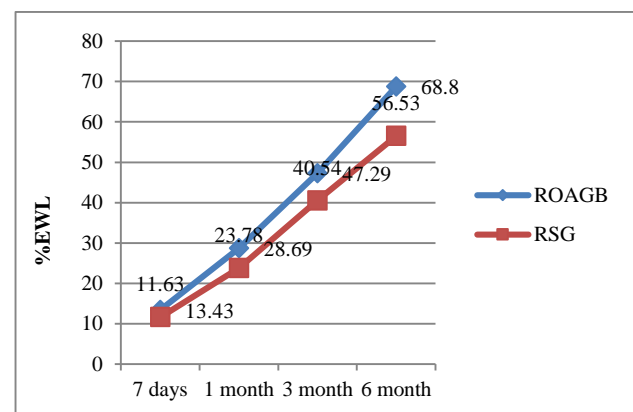


Figure 8: Estimated body weight loss percentage.

Comparison between ROAGB & RSG

In our study if we compare between ROAGB & RSG, ROAGB had a longer surgical time, $p < 0.01$, (< 0.05) & longer hospital stay, $p = 0.033$, (< 0.05), but similar intraoperative blood loss, $p = 0.078$, (> 0.05) similar rate of perioperative complications and EWL% at 6 months of

follow up was almost similar if ROAGB compared to RSG, $p=0.380$, (>0.05) (Figure 8). If we compare data in term of late or delayed complications in both groups, ROAGB had a slightly higher number of nutritional deficiencies because of its malabsorptive function or might be because patient didn't follow dietary advices.

DISCUSSION

As such no study is available in literature till today which provide an comparative data between ROAGB & RSG, so most probably this is the first study which is providing an comparative data between ROAGB & RSG. Study conducted by Arun Prasad also considered the same parameters like intra & post operative complications, morbidity, weight loss.^{3,4} Lee et al in his 10-year study taken around 1657 patients for comparison between LRYGB & laparoscopic mini gastric bypass (LMGB) (LOAGB) in term of operative time, estimated blood loss, length of hospital stay and operative complications were assessed. Late complications, changes in body weight, BMI were assessed. Mean duration of surgery for Robotic one anastomosis gastric bypass was 115 minutes (range 70-170 minutes). Operative time in study Prasad was 85+-35, which is closer to our study.³ Tien et al in his 8 year study on 1100 robotic assisted gastric bypass patients mean operative time was 155 minutes, while Amjad et al showed operating time of 227 minutes in his study on 87 patients who underwent RRYGB, which is much higher than our study.^{5,6} Domene et al conducted a study on 100 morbid obese patients who underwent RGB between 2013 & 2014, operating time was 105 minutes (40-185 minutes).⁷ Mean duration of surgery for Robotic Sleeve Gastrectomy was 84 minutes (range 45-150 minutes). Ayloo et al in his study patient undergoing robotic sleeve gastrectomy, mean operative time was 135 minutes, similar study by Diamantis et al done on 19 patients with an operating time of 95.5 minutes in patient undergoing for robotic sleeve gastrectomy.^{8,9} A study conducted by Bhatia et al showed mean operating time for RSG IS 116 ± 24.7 minutes in a comparative study of morbid obese and super obese patients.¹⁰ Operative time for RSG in our study is much shorter than the operative time taken as per literature available. There was 0% conversion to open surgery in our study. Arun Prasad³ also showed 0% conversion in his study on 50 patients. Tien et al also showed zero percent conversion rates in his study Domene et al showed no intraoperative complications or no mortality.^{5,7} Study conducted by Bhatia et al also showed no complication, no conversion to open or no perioperative deaths almost similar to our study results.¹⁰

Average blood loss with patients undergoing ROAGB was 23.3 ml and with RSG was 17.9 ml ($p=0.078$), Mean blood loss was 19.36 ± 4.62 ml in a study conducted by Bhatia et al, while study by Prasad showed blood loss of 70 ± 40 in his 50 patients study undergoing ROAGB.^{3,10} Romero et al done his study on 134 cases underwent RSG which showed 0% leak, and 0% mortality, while study

conducted by Diamantis et al reported complication rate 0%.^{9,11} So, our study correlates with the literature & data available in term of intraoperative complications, conversion rates & perioperative mortality. No immediate post-operative complication was seen in both groups. Ayloo et al showed 0% complication rates while studying on morbid obese patients who underwent RSG while Tien et al in his study showed complication two pulmonary embolism (0.19%), three Deep Vein Thrombosis (0.27%), 1 leak at gastrojejunal anastomosis (0.09%), 19 internal hernia (1.7%), 9 staple line bleed (0.82%) and 4 anastomosis stricture (0.38%) in 1100 patients who underwent RRYGB.^{5,6} Arun reported 0% complication rates in his study.³ Amjad et al in his study on 87 patients showed leaks in 2 patients (2.2%), while no leak or other complications were found intraoperatively or in early post operative period of our study.⁶ The mean duration of hospital stay for all the patients undergoing ROAGB was 3.2 days, the mean duration of hospital stay of patients undergoing RSG was 2.4 days. Praveen Bhatia et al¹⁰ in his study showed mean length of hospital stay was 3.4 ± 0.8 days which is higher than our RSG group and almost similar to our ROAGB group. No post operative leak was found in any of the group while Kenneth Tien et al⁵ reported one leak at Gastrojejunal anastomosis site (0.09%), While Ali et al reported leaks in 2 patients (2.2%), showing better results in our study in term of leak.⁶

In our study one patient of ROAGB, developed Pulmonary Embolism, Kenneth et al reported 2 patients who experienced pulmonary embolism at a rate of 0.19% while Domene et al reported 2 lower limb deep vein thrombosis after RSG at a rate of 2%.^{5,7} 2 (9.5%) patients out of 21 ROAGB suffered from nausea, while 5 (37.5%) patients of RSG group suffered with nausea. 1 (4.7%) patients in ROAGB group and 1 (7%) patients in RSG group complained of vomiting. 6 (28%) patients in ROAGB group and 2 (14%) patients in RSG group complained of Dumping syndrome, while 3 (14%) patients in ROAGB complained of post operative hypoglycemia, 0% in RSG group (Table 9, Figure 6). Study done by Prasad showed nausea in 8 patients (24%), Dumping in 15 patients (45%), hypoglycemia in 4 patients (12%), and 13 patients complained of diarrhea (39%) in ROAGB patients.¹²

Comparison between ROAGB & RSG

Similar study was done by Kosanovic et al in 2014 by comparing RSG vs. RGB, RGB has a longer surgical time ($p<0.001$) & high incidence of long-term complications ($p=0.005$) but similar length of hospital stay ($p=0.093$), rate of perioperative complications ($p=0.487$) and EWL% at 1 year of follow up compared to RSG, which is showing almost similar result to our study.¹³ Our results of mean weight loss and percentage of excess weight loss are comparable and better than the described weight loss in many other studies available in literature on RSG and on Robotic Gastric Bypass. This is

possibly due to exactness of surgical procedure, meticulous counseling in the pre-operative period and diligent follow up in the post-operative period.

Limitations

Limitations were Observation period is very small (6months), longer time observation is needed. Sample size is not so big, larger sample size & longer duration observation is required to conclude anything. Pre existing co-morbid conditions and effect of surgery onto them should also be included.

CONCLUSION

With our experience, we are of the opinion that Robotic Bariatric surgery either ROAGB or RSG seems to be the safe and effective procedure for obesity surgery with very minimal blood loss, minimal or no postoperative pain, minimal hospital stay, with very minimal or no post operative complications and early return to activity and with good amount of excess body weight loss. While if we compare two commonly performed procedures, ROAGB had a longer surgical time & longer hospital stay, but similar intraoperative blood loss, similar rate of perioperative complications, and EWL% at 6 months of follow up was almost similar if ROAGB compared to RSG. ROAGB group was having slightly higher rate of late post-operative complications, but still long term data are needed to comment which procedure is actually better.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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