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REVIEW

Bariatric surgery in elderly patients: a systematic review

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Abstract: Controversy exists regarding the effectiveness and safety of bariatric/metabolic surgery in elderly patients. We performed a systematic review on this issue in patients aged 60 years or older. MEDLINE, Cochrane Library, Embase, Scopus, and Google Scholar were searched until August 2015 for studies on outcomes of bariatric surgery in elderly patients. The results were expressed as pooled proportions (%) with 95% confidence intervals. Heterogeneity across the studies was evaluated by the I^2 test, and a random-effects model was used. Twenty-six articles encompassing 8,149 patients were pertinent with this issue and included data on bariatric surgery outcomes in elderly population. Fourteen patients died during the 30-day postoperative period, with a pooled mortality of 0.01%. Pooled overall complication rate was 14.7%. At 1-year follow-up, pooled mean excess weight loss was 53.77%, pooled diabetes resolution was 54.5%, and pooled hypertension resolution was 42.5%, while pooled lipid disorder resolution was 41.2%. Outcomes and complication rates of bariatric surgery in patients older than 60 years are comparable to those in a younger population, independent of the type of procedure performed. Patients should not be denied bariatric surgery because of their age alone.

Keywords: morbid obesity, bariatric surgery, elderly, gastric bypass, weight loss, laparoscopy

Introduction

Life expectancy has been steadily increasing regardless of sex and ethnic background in the USA.[1] In Finland, life expectancy of a 60-year-old woman in 2008 was 24.3 years, whereas for a man of the same age, it was 22.8 years.[2]

Obesity is known to decrease the quality of life as well as life expectancy,[3] and bariatric/metabolic surgery is the most effective treatment for morbid obesity.[4] The efficacy of bariatric procedures in the induction and maintenance of weight loss is largely superior to that obtainable by current medical therapies.[4] Surgery results in greater weight loss and improvement in weight-associated comorbidities compared with nonsurgical interventions, regardless of the type of procedure used.[4]

Several studies have compared weight loss outcomes between different types of bariatric surgeries,[5] or different techniques of the same procedure,[6] whereas others have analyzed different preoperative predictors, with controversial results.[7–11] Only few studies have aimed at analyzing the effects of age on weight loss in a sufficiently large cohort of patients undergoing the same bariatric operation, and long-term follow-up data are often lacking.

There is some evidence that elderly patients lose less weight and benefit less from bariatric surgery than younger patients.[12,13] However, controversy exists regarding the indications and outcomes of bariatric/metabolic surgery in elderly patients. In some studies, younger bariatric patients have better comorbidity,

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mortality, and weight loss outcomes[12,13] compared to older patients. Surgical indications for elderly patients should be carefully considered,[12] although weight loss and reduction in comorbidities and mortality of patients older than 55 years might be comparable to the general bariatric surgery population.[14–16]

We performed a systematic review on this issue to summarize the current evidence in patients 60 years or older who have so far been considered high-risk patients.

Methods

A literature search was performed through MEDLINE, Cochrane Library, Embase, Scopus, and Google Scholar for any study written in English on bariatric and metabolic surgery in elderly patients. We applied Boolean searches to above-mentioned databases using the following search terms: morbid obesity, bariatric surgery, metabolic surgery, gastric bypass, sleeve gastrectomy, adjustable gastric banding, biliopancreatic diversion, duodenal switch, elderly, over 55/60 years, advanced age, and old.

The search was performed in August 2015, aiming at those studies showing outcomes of bariatric/metabolic surgery in patients aged 60 years or older. In addition, the reference lists of all relevant articles were searched. Only full-length articles written in English were considered for this systematic review.

A cutoff at 60 years of age was chosen, although the age of 55 has been commonly used to define older age in the bariatric literature.[14–16] It was considered an appropriate cutoff for the purposes of this study, as the age of 55 is low in the non-bariatric surgery literature. Data were retrieved only from the articles, and no attempt was made to get missing data from the authors. We retrieved data on study size, type of intervention, excess weight loss (EWL) percentage, outcomes at 1-year follow-up, 30-day mortality, and diabetes, hypertension, and lipid disease resolution percentages at the minimum of 1-year follow-up.

Statistical analysis was performed using the freely downloadable software Open Meta-Analyst.[17] The results were expressed as pooled proportions (%) with 95% confidence intervals (CIs). Heterogeneity across the studies was evaluated using the I^2 test. Because heterogeneity was anticipated among the observational studies, the evaluation was made a priori by using a random-effects model (DerSimonian–Laird).

We followed the Preferred Reporting Items for Systematic and Meta-analysis statement for reporting this systematic review,[18] and the language of the articles was defined as reported in MEDLINE.

Results

The literature search yielded 7,625 articles, 26 of which[16,19–43] were pertinent to our study, and sources of reported outcomes of bariatric surgery in patients 60 years or older (Table 1). The literature search flowchart is shown in Figure 1. Different types of bariatric surgery procedures were involved. The analysis encompassed a total of 8,149 patients. Fourteen patients died during the 30-day postoperative period, with an untransformed proportion of 0.01% (95% CI 0.01–0.02; Figure 2). Pooled overall complication rate was 14.7% (95% CI 11.0–18.3; Figure 3), ranging from 1.33%[39] to 47%.[33]

Pooled mean EWL% was 53.77% (95% CI 48.42–59.13; Figure 4), including 15 studies.

Seventeen studies showed results on diabetes resolution, ranging from 33%[42] to 83%,[33,40] with a pooled mean of 54.5% (95% CI 39.1–69.1; Figure 5).

Similarly, 14 studies reported data on hypertension resolution, ranging from 14%[43] to 88%,[28] with a pooled mean of 42.5% (95% CI 25.1–60.0; Figure 6), while ten studies reported results on lipid disease resolution, ranging from 2.8%[33] to 83%,[28] with a pooled mean of 41.2% (95% CI 19.4–63.1; Figure 7).

Discussion

This systematic review involving 8,149 patients provides a compelling insight into the value of bariatric surgery in patients 60 years or older. Our pooled analysis showed an overall low mortality and an acceptable complication rate (0.01% and 14.7%, respectively), while pooled EWL% was successful (53.77%; Figure 4) at 1-year follow-up in this population that has been considered high risk.

The prevalence of obesity among populations 60 years or older is likely to increase as the baby boomer generation continues to age. Thus, the number of elderly patients undergoing bariatric surgery is increasing.

Recent large studies have showed that body mass index and age are strong risk predictors for 30-day mortality in Laparoscopic Roux-en-Y Gastric Bypass (LRYGB) patients,[44–46] demonstrating even a linear relationship between increasing body mass index and increasing age with mortality risk.[45] However, the number of bariatric surgery procedures performed in elderly patients has been growing significantly during the past decade,[39] with >10% of patients older than 60 years in the USA. Indeed, this patient volume increase has coincided with a reduction in mortality and perioperative morbidity.[39]

A large multicenter study demonstrated that older age predicts prolonged length of hospital stay but not major events following bariatric surgery, although a statistically

Table 1 Characteristics of the included studies

Studies	Number of patients	Mean age (years)	Age range (years)	Preoperative BMI	Female (%)	Intervention	Weight loss 1 year (EWL%)	Diabetes cured (%)	Hypertension cured (%)	Lipid disease cured (%)	30-day mortality (n)	Overall complications (%)
Abu-Abeid et al[19]	18	63.6	60–71	44.4	73	LAGB	nr	71	33	nr	0	22.2
Sosa et al[20]	23	64.4	60–75	48.5	nr	LRYGB	65	75	nr	60	1	4.3
Quebbemann et al[21]	27	68	65–74	47	63	Combined	51	66	45	nr	0	11.1
St Peter et al[22]	20	65.2	60–73	46.4	nr	LRYGB	nr	nr	nr	nr	0	10
Hazzan et al[23]	55	61.5	60–70	46.2	65	Combined	nr	nr	nr	nr	0	7.3
Taylor and Layani[24]	40	65.8	60–72	42.2	80	LAGB	nr	37	14	13	0	7.5
Trieu et al[25]	92	62.2	60–74	48.4	63	LRYGB	nr	nr	nr	nr	0	21.7
Busetto et al[26]	216	64.1	60–83	44.2	85	LAGB	nr	nr	nr	nr	1	7.9
Mittermair et al[27]	27	nr	60–69	44.3	nr	LAGB	32	nr	nr	nr	0	37
Wittgrove and Martinez[28]	120	62	60–74	45.2	62	LRYGB	nr	75	88	83	0	21.7
Wool et al[29]	13	63	60–66	47.5	nr	Combined	61	66	nr	nr	0	38.5
O'Keefe et al[30]	197	67.3	65–78	48.1	72	Combined	55	nr	nr	nr	0	7.6
Willkomm et al[31]	100	68	65–77	45	nr	LRYGB	75	63	23	nr	0	8
Clough et al[32]	113	63.6	60–73	42.4	67	LAGB	nr	nr	nr	nr	0	30
Leivonen et al[33]	17	>59	nr	46.4		SG	45.6	83	58	0	0	47
Ramirez et al[34]	42	73.5	71–80	44	nr	Combined	47.7	53	56	54	0	31.8
Soto et al[35]	35	66.3	60–79	46.3	68.6	SG	47.4	53	73	40	0	8.4
Loy et al[36]	55	72.4	70–82	45	60	LAGB	37	35	27	28	0	9
Giordano and Victorzon[16]	59	62.6	60–70	45.4	56.3	LRYGB	59.4	36.3	33.9	nr	0	23.5
Robert et al[37]	24	61.7	nr	41.3	67	LRYGB	73.7	37	45	25	1	13
Thereaux et al[38]	48	62.6	nr	45.6	81	LRYGB	63.0	53.3	18.8	42.9	1	nr
Gebhart et al[39]	6,105	>60	nr	nr	nr	Combined	nr	nr	nr	nr	7	1.33
Burchett et al[40]	17	≥62	nr	45	nr	SG	44	83	69	67	0	12
Qin et al[41]	303	67.5	nr	44.7	67.3	SG	nr	nr	nr	nr	2	7.30
Daigle et al[42]	30	67.1	nr	55.9	80	Combined	45.1	33	nr	nr	0	16.7
Moon et al[43]	353	63.1	60–72	43.97	nr	Combined	50.8	10.2	14	nr	1	5.13

Abbreviations: BMI, body mass index; EWL, excess weight loss; LAGB, Laparoscopic adjustable gastric banding; LRYGB, Laparoscopic Roux-en-Y Gastric Bypass; nr, not reported; SG, sleeve gastrectomy.

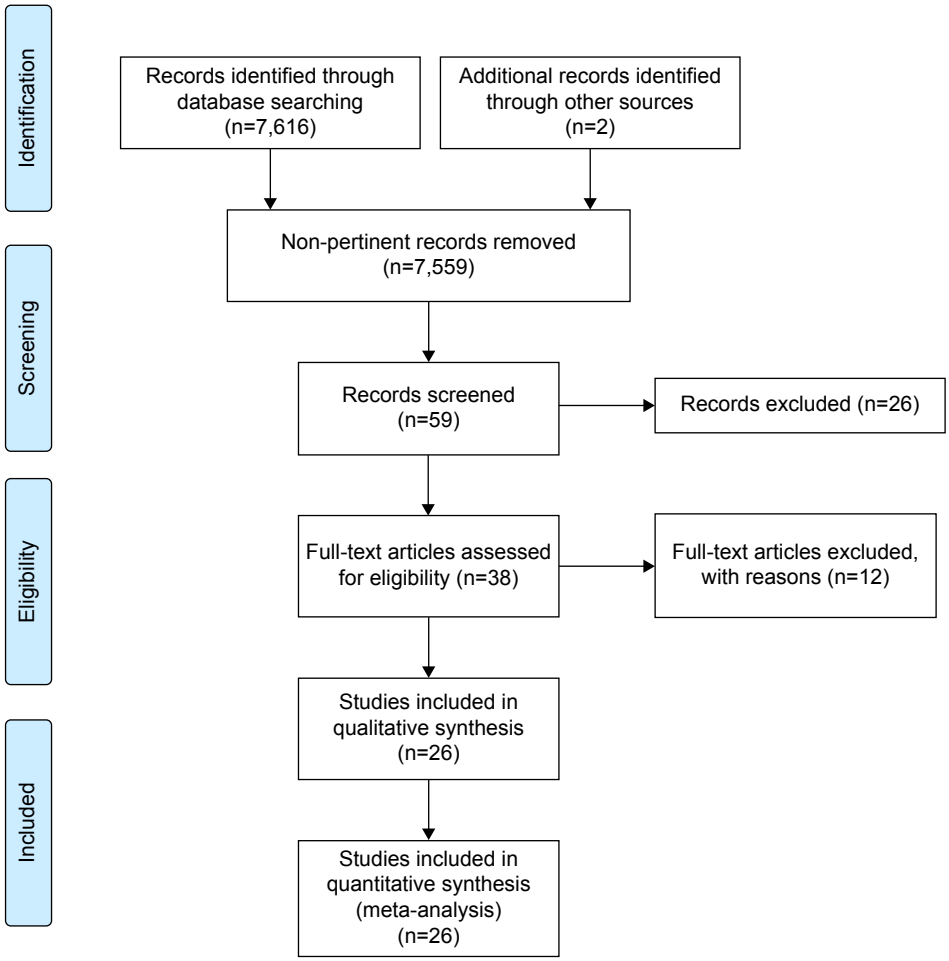

Figure 1 Flowchart summarizing literature search results.

nonsignificant trend toward predicting mortality was detected.[46] More recently, Spaniolas et al[47] demonstrated that in elderly population, sleeve gastrectomy is not associated with significantly different 30-day outcomes compared to LRYGB, and both procedures showed acceptably low morbidity and mortality rates.

Older patients might lose less weight because of impaired metabolic capacity and greater presence of sarcopenia compared to younger patients. They have suffered from associated comorbidities longer, which might have an influence in their baseline physical condition.[13]

Energy requirements normally decrease with age[48] with a lower lipolytic capacity,[49] especially after sympathetic stimulation.[50] This might explain the increased adipose tissue deposition in older subjects. Reduced lipolytic activity has been described in obese, postmenopausal women subjected to a hypocaloric diet.[51] These findings suggest that older obese women have a decreased capacity to use energy through the mobilization of lipids from fat stores, and this could also induce a larger caloric intake after surgery. This fact has recently been demonstrated measuring the short-term weight loss in women 20–45 years versus 55–65 years of age following bariatric surgery. The weight loss was significantly higher in younger women but not in men, indicating a role played by estrogens.[52] On the other hand, a greater reduction in energy intake after LRYGB has been detected in younger patients.[53]

Total body energy expenditure begins to decline from the age of 40 years,[54] and this age-dependent decrease is apparently due to a reduction in physical activity.[55] The more sedentary lifestyle seems to be one reason for lower weight loss in patients older than 55 years.[56] Younger patients may have more active lifestyles with better exercise tolerance, and it is well known that successful long-term weight maintenance is associated with a physically active lifestyle.[57]

As mentioned, the age of candidates for surgery is increasing.[58] There is a detrimental impact of age on wound healing in all tissues. Aging intrinsically and extrinsically

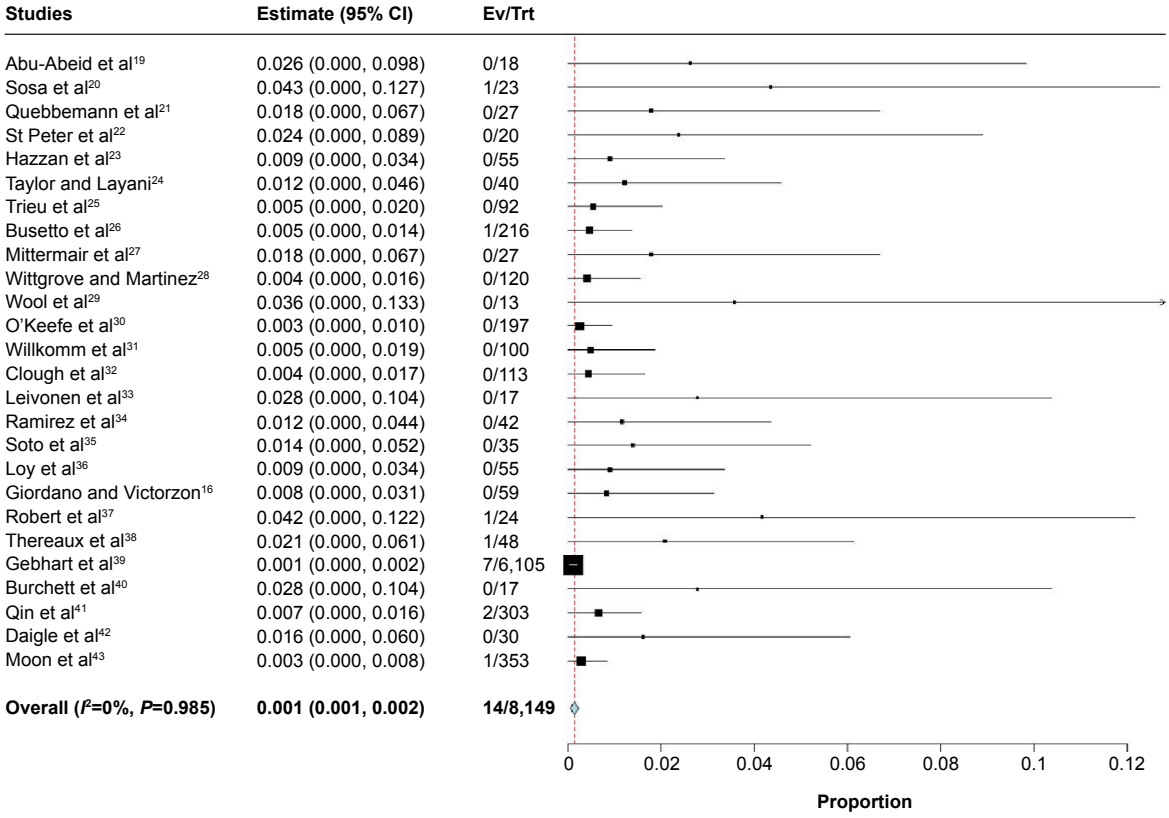

Figure 2 Forest plot summarizing the 30-day mortality.
Abbreviations: CI, confidence interval; Ev/Trt, event/treated.

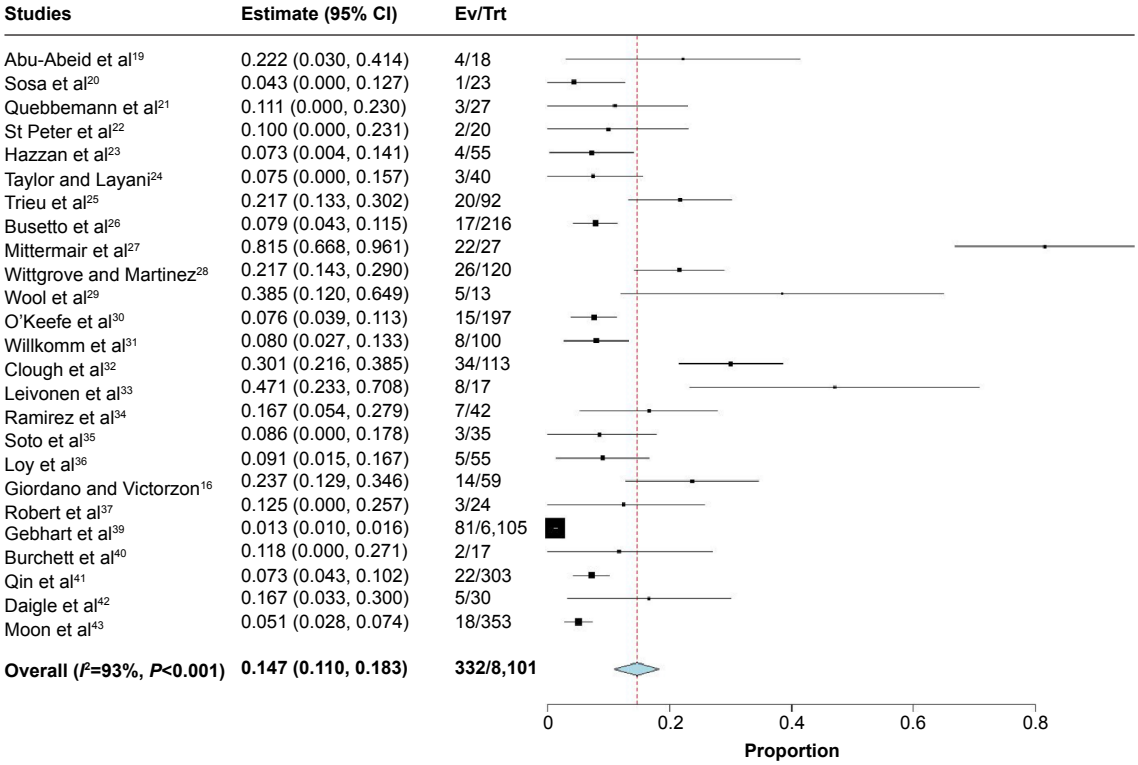

Figure 3 Forest plot summarizing the overall complications occurred.
Abbreviations: CI, confidence interval; Ev/Trt, event/treated.

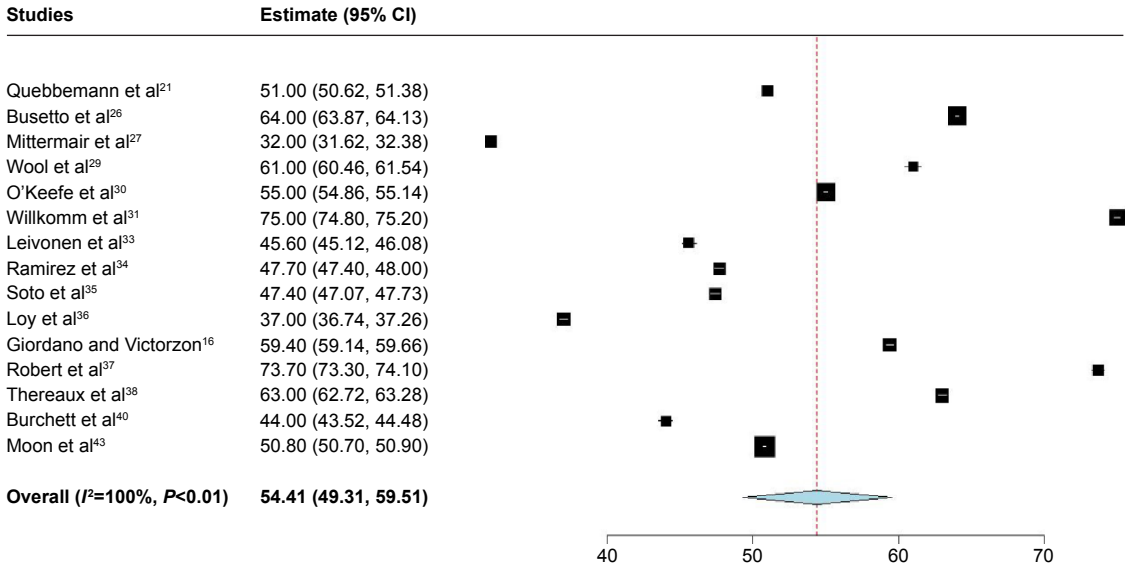

Figure 4 Forest plot summarizing the EWL% at 1-year follow-up or later.
Abbreviations: EWL, excess weight loss; CI, confidence interval.

impacts the skin, leading to atrophy, progressive loss of function, increased vulnerability to the environment, and decreased homeostatic capability.[59] At the microscopic level, there are decreased levels of growth factors, and diminished cell proliferation and migration. Diminished extracellular matrix slows wound healing.[59] These factors together with higher comorbidity prevalence in elderly patients may explain the higher complication rates.

However, three recent reviews on this topic show a good weight loss efficacy in elderly with acceptable risks.[14,60,61] We performed a pooled analysis in order to quantify those risks and show the achieved results.

Although outcomes might be worse than in younger patients,[12,13] our pooled analysis demonstrated a significant EWL, and an overall improvement in the most common obesity-related comorbidities in patients ≥60 years (Figures 4–7). We concluded that elderly patients do benefit from bariatric surgery with acceptable rates of morbidity and mortality, which might justify taking a higher perioperative risk. In a recent statement, the Italian Society for Bariatric

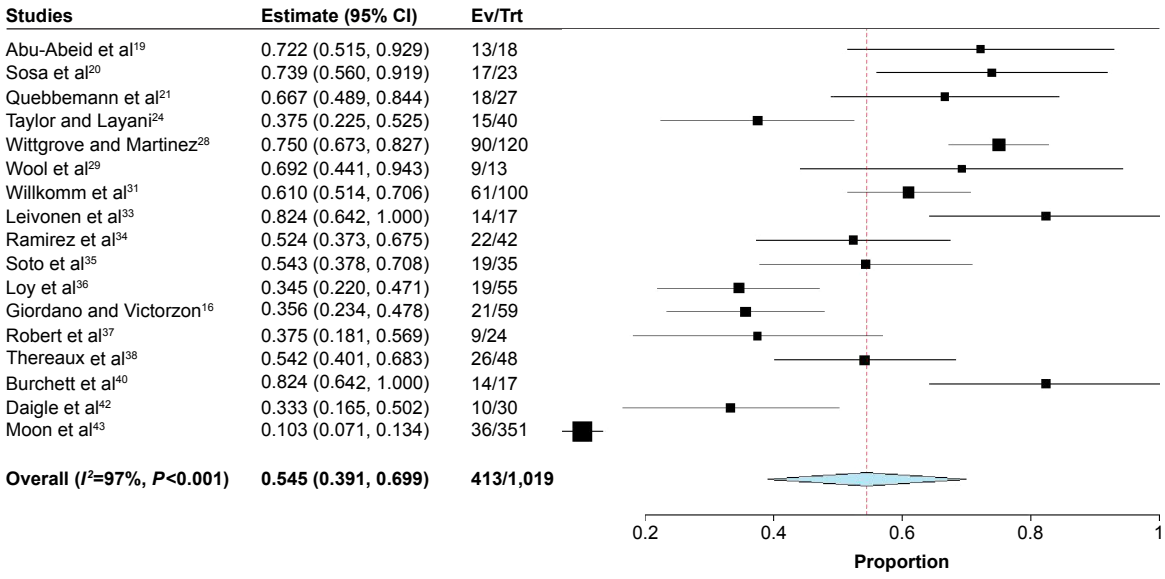

Figure 5 Forest plot summarizing the diabetes resolution at 1-year follow-up or later.
Abbreviations: CI, confidence interval; Ev/Trt, event/treated.

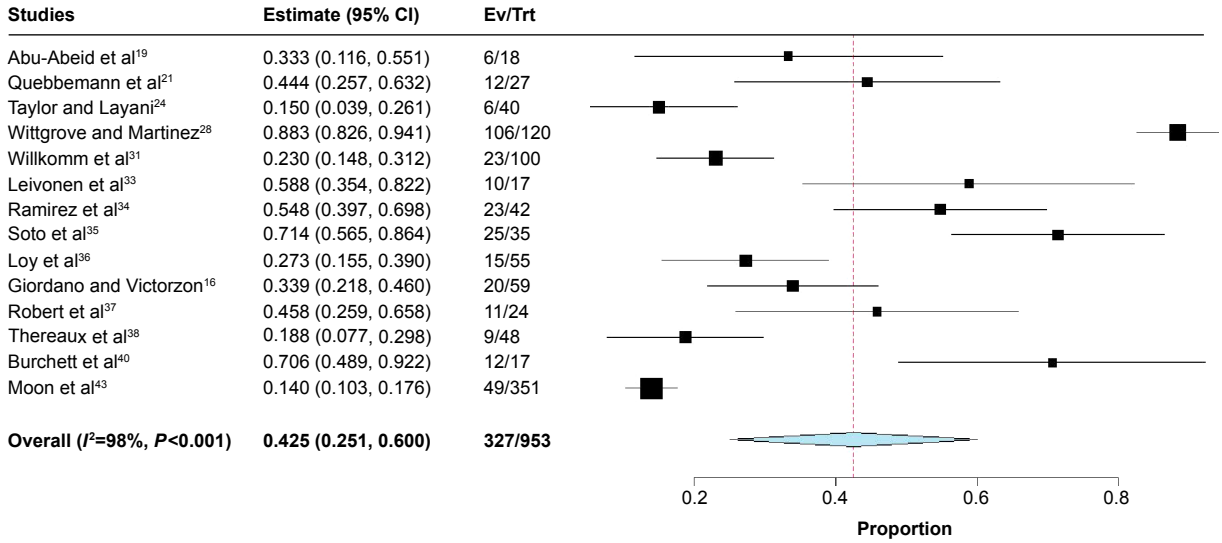

Figure 6 Forest plot summarizing the hypertension resolution at 1-year follow-up or later.
Abbreviations: CI, confidence interval; Ev/Trt, event/treated.

and Metabolic Surgery has extended the indications for bariatric surgery for morbidly obese patients up to 70 years of age.[62]

Age alone should not be an absolute contraindication for bariatric surgery. Indications should be carefully evaluated in the light of routine preoperative tests and discussed with the patients knowing that there are some risks, and that the results might not be as good as they might expect.

The current study has several limitations and potential bias influencing these findings.

There was a paucity of well-reported studies, and there were differences in what was considered elderly population, with discrepancies in lower age limit varying from 50 to 70 years. Most of the studies contained <100 patients. Furthermore, the reporting of confidence measures was poor, introducing further inaccuracy in our calculations. We did not attempt to show pooled results from different bariatric procedures as data were mostly unavailable, and the main aim of this review was to give a compelling picture of bariatric surgery in a population of 60 years or older.

The types of complications were mostly not classified. Only one study adopted the Clavien–Dindo Classification.[16] Thus, we pooled together all major and minor complications in order to show the overall complication rate (Figure 3). Follow-up time and adherence were different among the studies, and the comorbidity resolution rates were measured at the last follow-up control. We did not attempt to analyze other conditions such as obstructive sleep apnea, joint disease, gastroesophageal reflux, depression, and asthma because of the paucity of reported data.

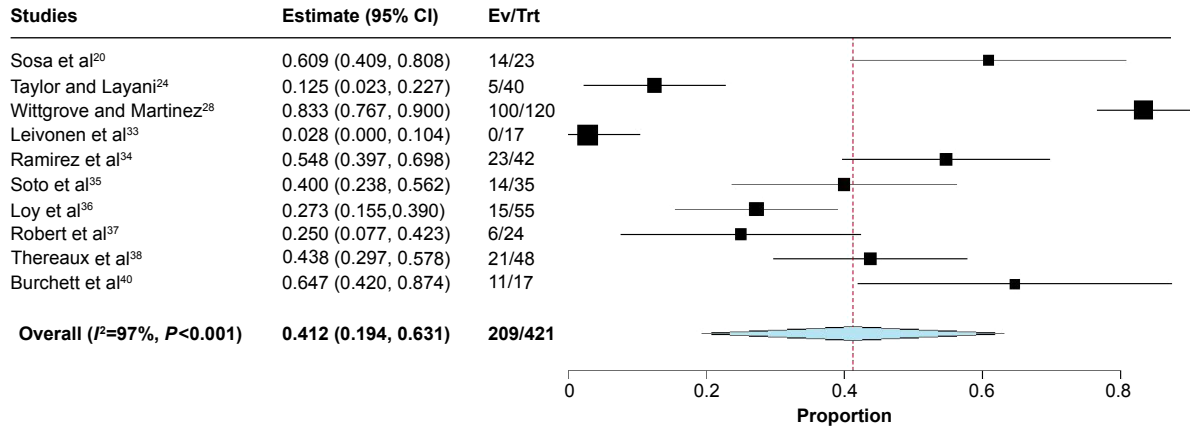

Figure 7 Forest plot summarizing the lipid disease resolution at 1-year follow-up or later.
Abbreviations: CI, confidence interval; Ev/Trt, event/treated.

Conclusion

This systematic review supports the use of bariatric surgery in elderly patients. Older patients should not be denied an operation only because of their age. However, elderly patients should be carefully counseled about the slightly increased risks and the possibility of less satisfactory outcomes.

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Disclosure

The authors have no conflicts of interests to declare.

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