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Carolina Rodrigues Oliveira

Efficiency and safety of Single Anastomosis Sleeve Ileal (SASI) bypass in the treatment of obesity and associated comorbidities: A systematic review and meta-analysis

MARÇO, 2023

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Efficiency and safety of Single Anastomosis Sleeve Ileal (SASI) bypass in the treatment of obesity and associated comorbidities: A systematic review and meta-analysis

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UC Dissertação/Projeto (6º Ano) - DECLARAÇÃO DE INTEGRIDADE

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TÍTULO DISSERTAÇÃO/~~MONOGRAFIA~~ (riscar o que não interessa)

Efficiency and safety of Single Anastomosis Sleeve Ileal (SASI) bypass in the treatment of obesity and associated comorbidities: A systematic review and meta-analysis

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“There's a fine line between wrong and visionary. Unfortunately, you have to be a visionary to see it.”

- Sheldon Cooper

Esta tese trouxe muitas novidades para a minha vida, incluindo alguns cabelos brancos. Foi o produto de muitas horas passadas ao computador na tentativa de desenvolver capacidades e absorver o máximo de conhecimentos sobre uma técnica cirúrgica que me era desconhecida.

Neste sentido queria destacar o Doutor Hugo Santos Sousa e o Professor Doutor Bernardo Sousa Pinto pela orientação neste projeto. Agradeço ao meu colega Filipe Amorim Cruz pela paciência e dedicação nos momentos de maior desespero.

De salientar o papel da minha co-autora Maria Costa, que embarcou neste desafio comigo e que foi uma constante neste caminho que parecia interminável. Por fim, gostava de destacar a importância da minha família, sem ela nada disto seria possível.

Efficiency and safety of Single Anastomosis Sleeve Ileal (SASI) bypass in the treatment of obesity and associated comorbidities: A systematic review and meta-analysis

Shortened title: Efficiency and safety of the SASI bypass

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Conflict of Interest: The authors declare that they have no conflict of interest

Abstract

Background: The Single Anastomosis Sleeve Ileal (SASI) bypass is a new bariatric surgery corresponding to an adaptation of the Santoro approach, consisting of a sleeve gastrectomy (SG) followed by loop gastroileostomy. Therefore, we aimed to systematically assess all the current literature on SASI bypass in terms of safety, weight loss, improvement in associated comorbidities, and complications.

Methods: Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations, we conducted a systematic review and meta-analysis by searching three databases (PubMed, Scopus, and Web of Science). We performed a meta-analysis of risk ratios and mean differences to compare SASI bypass with SG and One-Anastomosis Gastric Bypass (OAGB) for percentage excessive weight loss, improvement/remission in type 2 diabetes mellitus (T2DM), hypertension (HT), dyslipidemia (DL), obstructive sleep apnea (OSA), and complications. Heterogeneity was assessed using the I^2 statistic.

Results: Eighteen studies were included in the qualitative analysis and four in the quantitative analysis. Compared to SG, the SASI bypass was associated with improved weight loss (MD=11.32; 95% confidence interval (95%CI) [7.89;14.76]; p< 0.0001), and improvement or remission in T2DM (RR=1.35; 95%CI [1.07;1.69]; p=0.011), DL (RR=1.41; 95%CI [1.00;1.99]; p=0.048) and OSA (RR=1.50; 95%CI [1.01;2.22]; p=0.042). No statistically significant differences in any of the assessed outcomes was observed when compared with OAGB.

Conclusion: Although studies with longer follow-up periods are needed, this systematic review and meta-analysis showed that SASI bypass has a significant effect on weight loss and metabolic variables. Variations in outcomes between studies reinforce the need for standardisation.

Key Points:

- SASI bypass is a new technique that has a significant effect on weight loss and remarkable metabolic results.
- The complication rate was comparable with other bariatric surgeries, we can consider this a safe procedure.
- There was a wide variation in outcomes, reinforcing the importance of standardisation.

Keywords: Obesity; Bariatric Surgery; SASI bypass; Single Anastomosis Sleeve Ileal Bypass; Sleeve gastrectomy; One-Anastomosis Gastric Bypass; Systematic review; Meta-analysis

Introduction

With the growing prevalence of obesity and its comorbidities, obesity has become a major public health concern [1]. Conservative treatment typically fails to provide satisfactory results for most patients. On the other hand, bariatric surgery has proven to be the most effective treatment [2].

Bariatric surgery can be classified as restrictive, malabsorptive, or a combination according to the weight loss mechanisms. The most common surgical bariatric procedure is the Sleeve Gastrectomy (SG) followed by Roux-en-Y Gastric Bypass (RYGB) [3].

To create a new technique that takes a physiological and evolutionary approach, Santoro *et al.* designed a method that consisted of performing sleeve gastrectomy with Transit Bipartition, amplifying the nutritive stimulation of the distal gut, and simultaneously decreasing it in the proximal bowel without exclusion of the duodenum to minimize nutritional complications [4].

In 2014, Mui *et al.* described a new technique that was adapted from the Santoro approach, which consisted of sleeve gastrectomy followed by loop gastroileostomy 250 cm from the ileocecal valve [5]. In 2016, Mahdy *et al.* presented the first case series of 50 patients with 1-year follow-up and named it the Single Anastomosis Sleeve Ileal (SASI) bypass [6]. By changing the Roux-en-Y anastomosis of Santoro to a simple loop, the SASI bypass appears to be a simpler and safer technique without losing benefits in the treatment of obesity and its comorbidities.

Several studies evaluated the efficacy and safety of this technique. The common limb length varied between 200 and 350 cm, considering that it has not yet been standardised. Due to this variation in SASI bypass, some authors referred to this technique as “Laparoscopic sleeve gastrectomy with loop bipartition” [7, 8], “Laparoscopic sleeve gastrectomy with loop

gastroileal bypass" [9] and "Laparoscopic sleeve gastrectomy with transit loop bipartition" [10].

Therefore, in this systematic review and meta-analysis, we aimed to systematically assess the current literature on SASI bypass in terms of safety, weight loss, improvement in associated comorbidities, and complications. Additionally, we aimed to establish a comparison with other bariatric surgeries. To the best of our knowledge, this is the first meta-analysis comparing this technique with other bariatric procedures. This study will contribute to a better understanding of this technique and will allow standardisation for improved outcomes in the future.

Methods

This systematic review and meta-analysis was conducted by the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement guidelines [11].

Eligibility of Primary Studies

In this systematic review, we included all studies assessing adult patients with obesity who underwent SASI bypass. We included both single-arm studies and experimental or observational studies comparing SASI bypass with other bariatric surgeries.

The following outcomes were considered: weight loss and change in body mass index (BMI), improvement in comorbidities such as type 2 diabetes mellitus (T2DM), hypertension (HT), dyslipidemia (DL), gastroesophageal reflux disease (GERD), obstructive sleep apnea (OSA), and complications during or after surgery.

We excluded animal studies, unrelated articles, editorials, correspondence, video reports, reviews, and meta-analyses. In addition, we excluded studies assessing less than 10 participants.

Search Strategy

In October 2022, a systematic review of the available literature was conducted using three search databases - PubMed, Scopus, and Web of Science. The search queries are listed in Supplementary Table 1. In addition, reference lists of the primary articles were hand-searched.

We considered only studies published after 2013, as this technique was first described in 2014 by Mui *et al.* [5].

Study selection

After removing the duplicates, study selection was conducted independently by two authors (C.O. and M.O.) in two separate phases. Firstly, the articles were searched by title and abstract. Subsequently, articles not excluded in the first phase were selected based on their full-text reading. Any disagreements were discussed between the reviewers and a third author (H.S.S.).

Data collection process

Data were independently extracted by two authors (C.O. and M.O.) into a predesigned data extraction form that was developed according to the Cochrane Handbook [12] to extract relevant information such as author name, publication year, country and journal of the publication, study design, duration of follow-up, sample size, PICO, patient inclusion and exclusion criteria, participants characteristics (mean age, percentage of each gender, mean BMI, number of patients with T2DM, HT, DL, GERD and OSA), interventions, specifics measures of the SASI bypass, outcomes measures (weight loss and improvement in comorbidities), and complications after surgery.

Quality Assessment

The quality of the studies was independently assessed by two reviewers (M.C. and C.O.) using the National Institutes of Health quality assessment criteria for Observational studies [13], and the Cochrane Collaboration Risk of Bias Tool for randomized control trials (RCT) [14].

The first tool is a series of 14 questions to answer yes or no, resulting in a final rating (Good, Fair, or Poor). Because exposure is a surgical procedure that can't be quantified or measured more than once, questions assessing these parameters were considered not applicable in every study.

The second tool classifies each study as having a high, low, or unclear risk bias, based on selection, performance, detection, elimination, reporting, and other bias factors.

Quantitative Synthesis of Results

We performed a random-effects meta-analysis (using the restricted maximum likelihood approach) of mean differences (MD) for the continuous outcome (percentage of excess weight loss, %EWL) and relative risks (RR) for dichotomous variables (improvement or remission of T2DM, HT, DL, OSA, and complications).

Heterogeneity was evaluated using Cochran's Q statistic p-value and the I^2 statistic. Heterogeneity was considered high if I^2>50% or Cochran's Q test p-value <0.10. Sources of heterogeneity were studied using leave-one-out sensitivity analysis.

A p-value lower than 0.05 was considered statistically significant. The meta package of software R was used to analyse the data for the meta-analysis.

%EWL is a measured that is calculated as [(preoperative weight–weight on follow-up)/ (preoperative weight - ideal weight)] x 100, with an ideal weight corresponding to an BMI of 25 kg/m^2.

Results

Study selection

After the search in the three databases referred to previously, a total of 840 studies were found, of which 409 were duplicates. After the screening phase, 15 articles were fully read, and all were included. Hand searching resulted in 3 additional articles. A total of 18 articles were included in the qualitative synthesis and 4 in the quantitative synthesis (meta-analysis). The study selection process is summarized in Figure 1 [11].

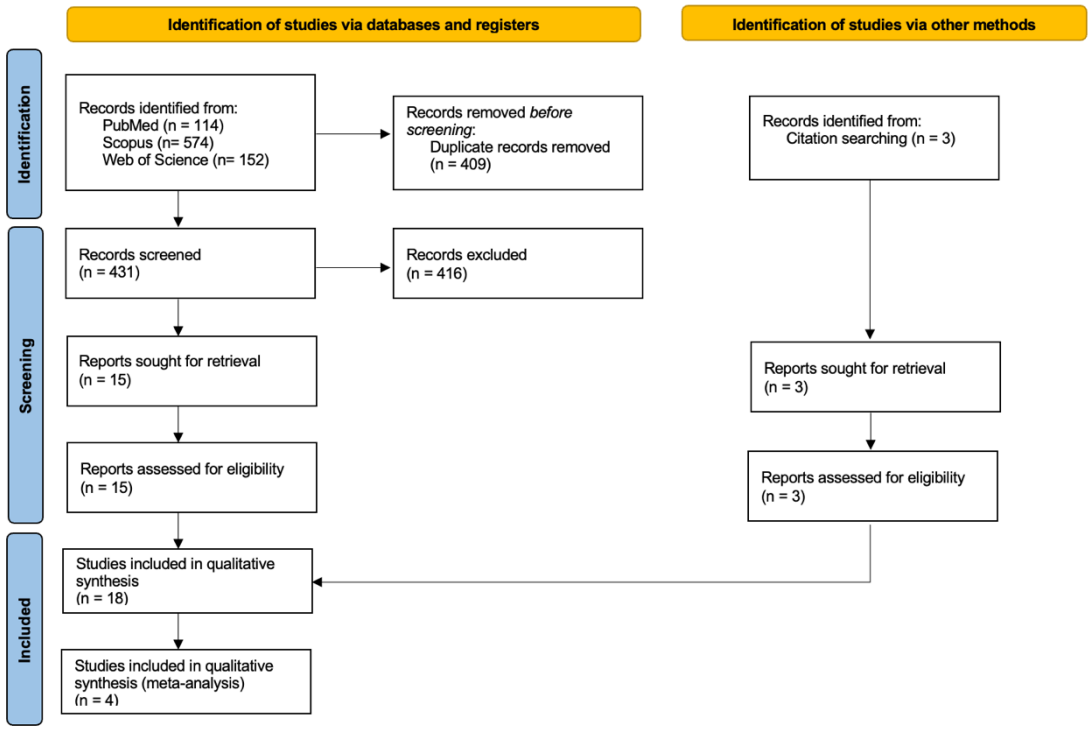

Figure 1 - Flow diagram of study selection.

Study characteristics

Table 1 shows the characteristics of all studies included in the systematic review. Of the 18 articles included 13 were retrospective observational studies [6, 8, 10, 15-24], 4 were prospective observational studies [9, 25-27], and 1 was an RCT [7].

These studies were published between 2016 and 2022 and were conducted in Iran [15, 16, 23], United Arab Emirates (UAE) [18, 20], Egypt [6, 7, 21, 25-27], Poland [22], Mexico[24], India [9], Bahrain [10], and Turkey [8]. Two of the studies were multicentric, one was conducted in 7 countries (UAE, Kuwait, Egypt, Germany, Norway, Portugal, and Turkey) [19], and the other was in 2 countries (Egypt and UAE) [17].

A total of 1714 patients were studied, with sample sizes ranging from 19 to 551. The shortest follow-up time was 3 months and the longest was 36 months.

Table 1 presents the characteristics of the SASI bypass in each study, particularly preoperative BMI, follow-up time, and common limb length.

Risk of Bias of Individual Studies

The risk of bias in the observational studies is demonstrated in the Supplementary Table 2. Most studies failed to justify the sample size, and none ensured that the assessors were blinded to the exposure status. Only two studies had a loss of follow-up after baseline higher than 20%. For the other criteria, most studies showed a low risk of bias. Therefore, all studies were considered good or fair.

The results of the quality assessment of RCT are shown in Supplementary Table 3 [28]. Overall, this study was considered to have a low risk of bias since only two parameters were considered unclear.

Comparison between SASI bypass and SG

Percentage of excess weight loss

A total of 329 patients were analysed in three studies on %EWL after 12 months (Figure 2). SASI was found to be significantly better than SG in the meta-analytical %EWD MD (MD=11.32; 95%C [7.89;14.76]; p< 0.0001), with a moderate heterogeneity (I^2=11%; p=0.33). Heterogeneity ceased to be observed after removing the study by Madyan *et al*. (Supplementary Table 4).

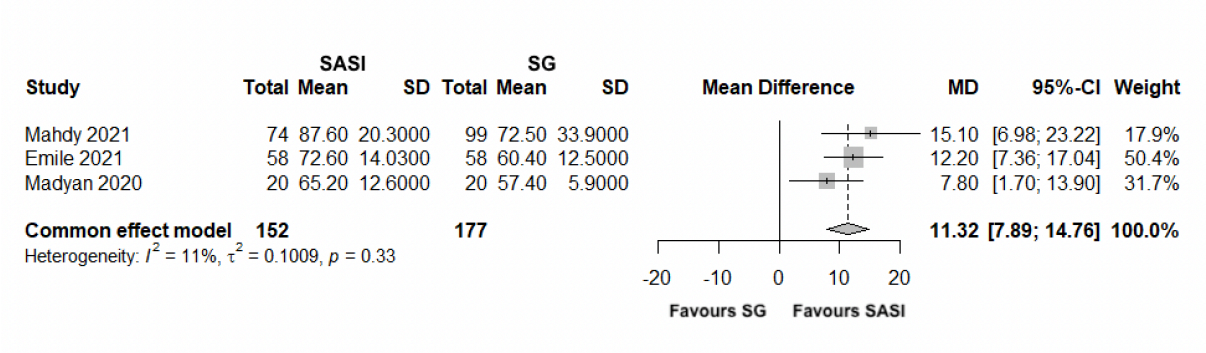

Figure 2 - Forest plots of the comparation between SASI and SG regarding %EWL.

Type 2 Diabetes Mellitus

A total of 124 patients were analysed in four studies that compared SASI versus SG on the partial or complete remission of T2DM after 12 months.

Compared with SG, SASI bypass was associated with 1.35 times more probability of improvement or resolution of T2DM, and this difference was significant (RR=1.35; 95%CI [1.07; 1.69]; p=0.011). No heterogeneity was detected (I^2=0%; p=0.96) (Figure 3).

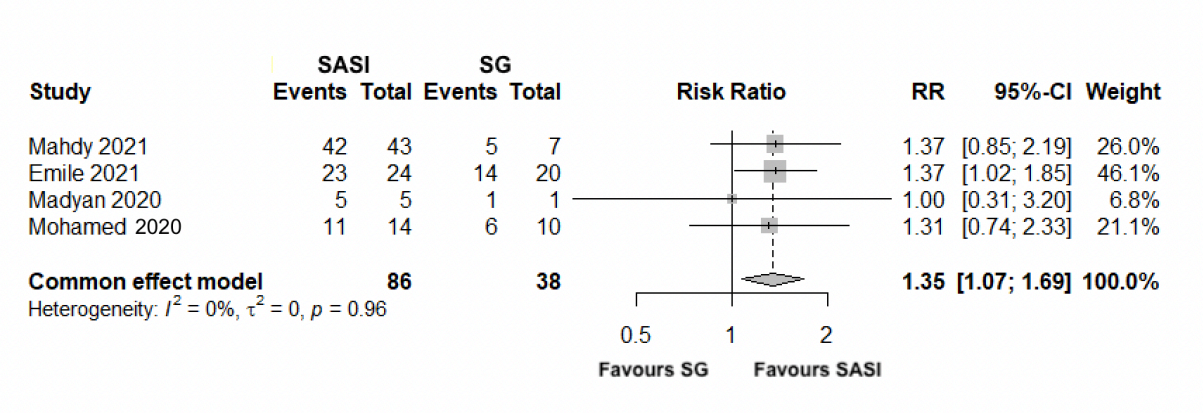

Figure 3 - Forest plots of the comparation between SASI and SG regarding T2DM.

Hypertension

Four studies compared SASI and SG on the improvement or resolution of HT in these two techniques (101 patients) after 12 months. The results presented in Figure 4 show no significant difference (RR=1.10; 95%CI [0.82;1.46]; p=0.532) between the two approaches, and no heterogeneity was detected (I^2=0%; p=0.95).

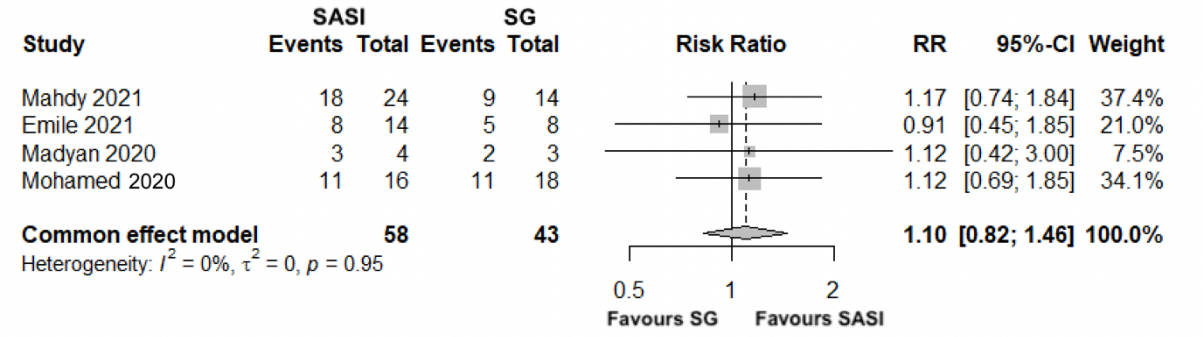

Figure 4 - Forest plots of the comparation between SASI and SG regarding HT.

Dyslipidemia

A total of 68 patients were analysed in two studies that compared partial or complete remission of DL after 12 months.

Compared to SG, a patient who underwent SASI bypass was associated with 1.41 times more probability of improvement or resolution of DL (RR=1.41; 95%CI [1.00;1.99]; p=0.048). No heterogeneity was detected (I^2=0%; p=0.91) (Figure 5).

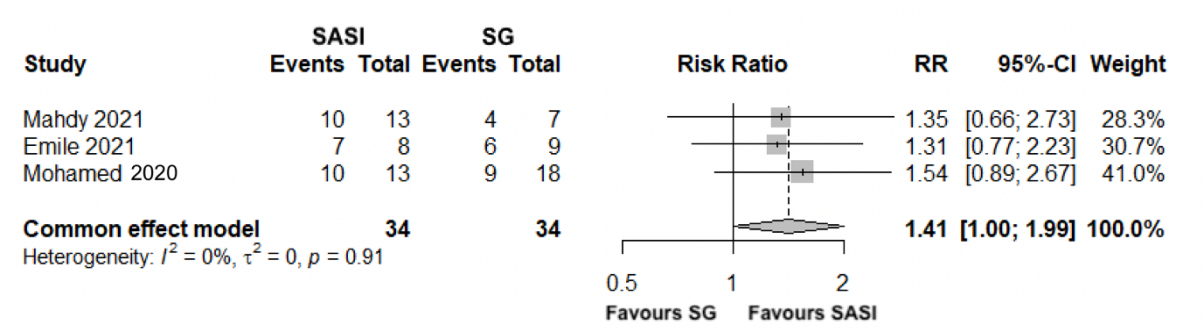

Figure 5 - Forest plots of the comparation between SASI and SG regarding DL.

Obstructive sleep apnea

A total of 34 patients were analysed in two studies that compared partial or complete remission of OSA after 12 months.

Compared to SG, a patient who underwent SASI bypass was associated with 1.5 times greater chance of improvement or resolution of OSA (RR=1.50; 95%CI [1.01; 2.22]; p=0.042). No heterogeneity was detected (I^2=0%; p=0.32) (Figure 6).

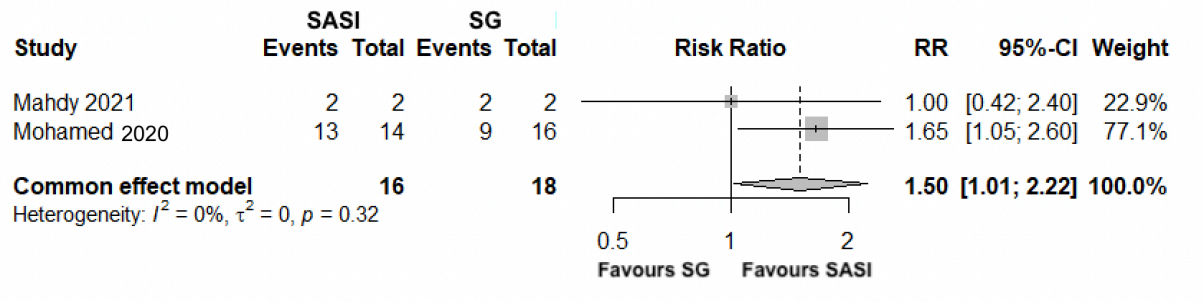

Figure 6 - Forest plots of the comparation between SASI and SG regarding OSA.

Complications

A total of 467 patients were analysed in four studies after 12 months (Figure 7). No significant differences between techniques (RR=2.81; 95%Cl [0.3;20.61]; p=0.310) were observed, and severe heterogeneity was detected (I^2=86%; p<0.01). Heterogeneity decreased (albeit remaining severe – 67.1%) with the exclusion of the Emile *et al.* study (Supplementary Table 5).

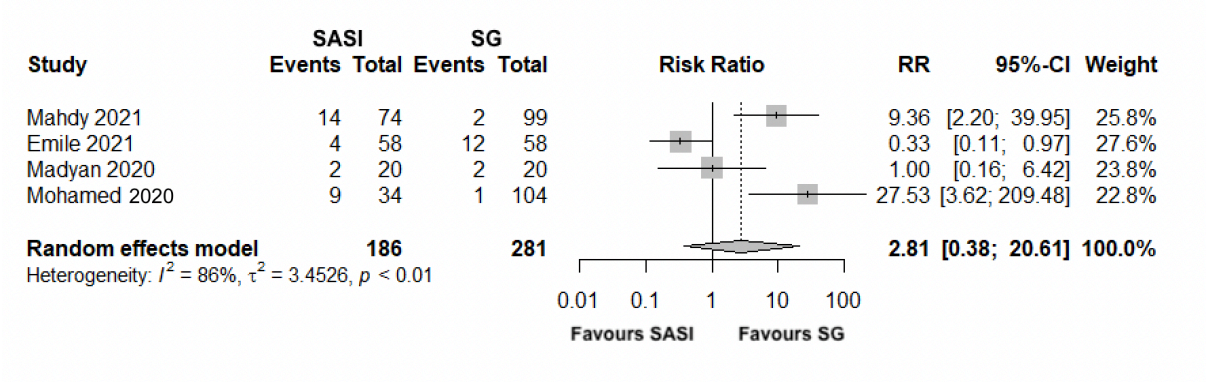

Figure 7 - Forest plots of the comparation between SASI and SG regarding complications.

Comparison between SASI bypass and OAGB

Comorbidities

Two studies evaluated the improvement or remission of T2DM (110 patients), HT (81 patients), DL (50 patients), and OSA (33 patients) after 12 months. No significant differences between techniques were observed in T2DM (RR=1.08; 95%CI [0.94; 1.24]; p=0.257), HT (RR=0.87; 95%CI [0.69; 1.11]; p=0.266), DL (RR=1.03; 95%CI [0.75; 1.41]; p=0.854), and OSA (RR=1.14; 95%CI [0.85; 1.52]; p=0.3789). No heterogeneity was detected in any of these outcomes (Figure 8a, b, c, d).

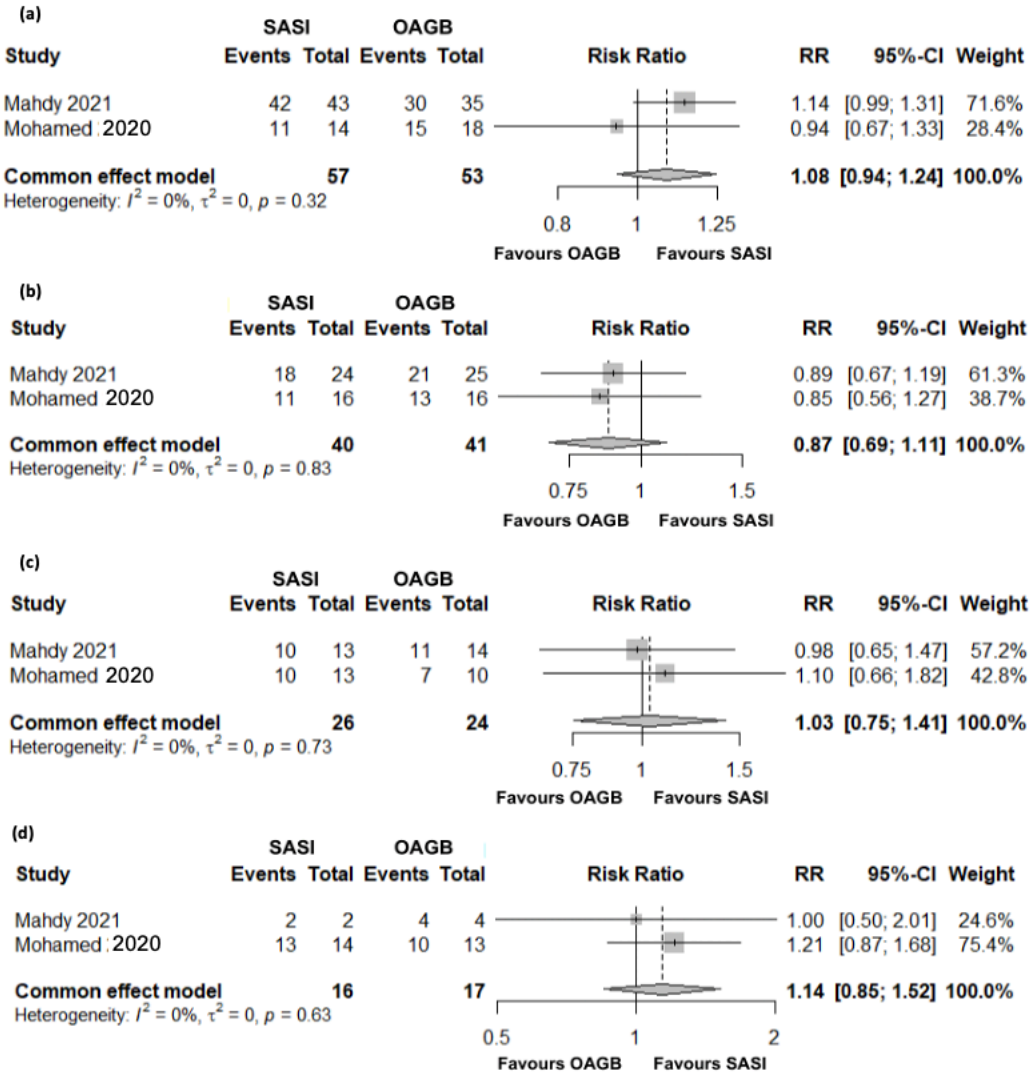

Figure 8 - Forest plots of the comparation between SASI and OAGB; (a) T2DM, (b) HT, (c) DL, and (d) OSA.

Complications

Four studies evaluated the complications in 283 patients after 12 months (Figure 9). No significant differences were observed between techniques (RR=2.47; 95%CI [0.3;20.61]; p=0.31), although moderated heterogeneity was observed (I^2=42%; p=0.19).

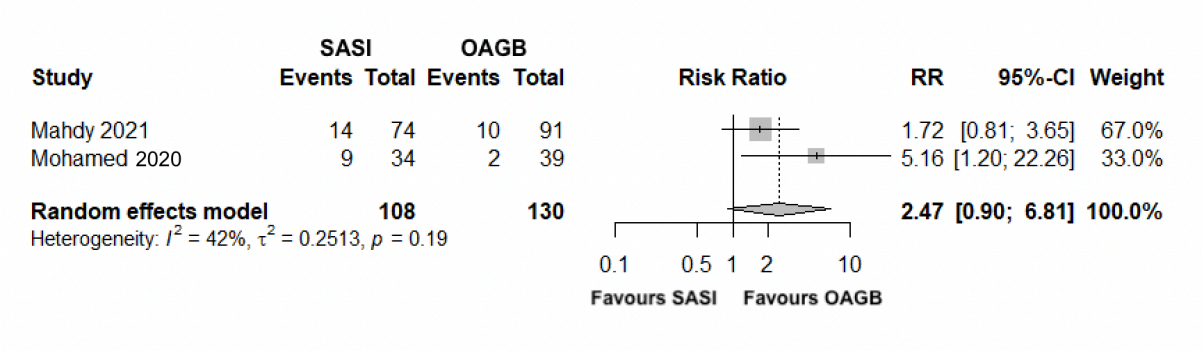

Figure 9 - Forest plots of the comparation between SASI and OAGB regarding complications.

Discussion

Summary of evidence

The ideal bariatric surgery should be safe, technically simple, and successful in reducing weight and treating comorbidities [29]. The Santoro technique [4] was the foundation for SASI bypass, which was developed with the goals of facilitating the procedure and lowering the risk of complications, by reducing the number of anastomoses [6].

Patients who undergo SASI bypass tend to eat less because they have earlier satiety due to a hypothalamic-generated satiety sensation, which is caused by the perception of nutrients in the distal bowel [30]. The distal gut hormones, such as glucagon-like peptide-1 (GLP-1), have central satiety effects and reduce gastric emptying [19].

Most studies (14) used the percentage of excess weight loss (%EWL) to evaluate the impact of SASI bypass on the weight of participants [6, 7, 9, 15-24, 27]. The median %EWL at 12 months was 87.14%, which was nearly the same as in the initial report by Mahdy *et al.* (90%) [6].

A wide variation in the values was registered within the studies, varying between 63.9% and 94.33%. This deviation may be attributed to distinct patients' characteristics, variations in surgeons' experience, or a lack of technical standardisation.

Studies with a lower %EWL had a higher preoperative BMI. This is consistent with previous studies that showed that patients with a higher BMI had a lower percentage of excess weight loss after bariatric surgery. [31]. Additionally, two [17, 19] of the studies with low %EWL were multicentred, which can be associated with variation in surgeons' experience.

Comparing these results with a systematic review by Emile *et al.,* which showed that SG had a %EWL of 67.3% after 12 months [32], we can verify that SASI bypass has a better

%EWL (87.14%), demonstrating a greater efficiency in weight loss. These results are concordant with those in the comparison of SASI bypass with SG, indicating a clear superiority of SASI bypass. Due to a lack of data, we were unable to compare SASI bypass and OAGB in the meta-analysis.

Two studies reported results after two years of follow-up, showing even better results (90.7% [16] and 96.7% [21]). Additionally, one study [16] had a three-year follow-up that showed a mean %EWL of 80.6%.

A systemic review by Colquitt *et al*. demonstrated that surgery, regardless of the type of procedure, will have a better improvement in comorbidities than non-operative interventions [33].

SASI bypass is thought to improve T2DM through several mechanisms. A pronounced reduction in caloric intake and a bipartition mechanism allows rapid entrance of undigested food to increase nutritive stimulation of the distal gut. Secondly, the passage of a smaller part of the meal through the duodenum reduces nutritive overstimulation of the proximal gut. [34, 35].

In total, 713 patients were studied for the improvement or remission of T2DM after 12 months in 16 studies. The results ranged between 78.6% and 100%, with a median of 96.35% [6, 7, 9, 10, 15-24, 26, 27], which is higher than the results reported in previous studies for SG, RYGB, and OAGB [32, 36]. Although there was a wide range of results, only four studies verified a partial or total remission rate lower than 90%.

These results are concordant with those of our meta-analysis, which demonstrated that patients who underwent SASI bypass had better chances of improvement or resolution than those who underwent SG. Additionally, when compared with the OAGB, the SASI bypass had similar results.

Regarding HT, 15 studies evaluated the rate of complete remission and improvement, in 514 patients after 12 months [6, 9, 10, 15-24, 26, 27]. With a median of 75.8%, the findings were between 36.1% and 100%, with only five studies reporting an outcome under 75%. The lowest results were obtained by Madhy *et al*. (36.1 %), this diverged from others, which can be attributed to the fact that this research was multinational, the surgeons' levels of expertise varied, and the study had the highest number of HT patients (238) [19].

In our analysis, we determined that the SASI bypass had similar results compared to SG and OAGB.

In 11 studies, 340 patients with DL were evaluated after one year to calculate the proportion of full remission and improvement [6, 10, 15-20, 23, 24, 26]. The findings ranged from 65% to 100%, with a median of 87.5%, and only one study had a median of under 75%.

According to our analysis, SASI bypass had higher chances of DL improvement or resolution than SG but had similar results compared to OAGB.

OSA was evaluated in eight studies that showed an improvement or remission between 20% and 100%, with a median of 89.3% [15, 16, 18-21, 23]. Although the range of values was considerable, only three studies had a rate lower than 75%, and this difference could result from the distinct features between patients. The study that reported a value of 20% had a sample size of five patients with OSA, which can also explain the low results. According to our meta-analysis, SASI bypass had better results than SG and similar results to OAGB.

Six studies evaluated GERD and reported a median improvement or remission rate of 84.1%, ranging from 75% to 100% [17, 19-21, 24, 27].

Improvement in GERD symptoms after SASI bypass can be explained by the addition of the anastomosis, which will reduce intragastric pressure and help drain gastric acidity, thus contributing to the improvement of symptoms. [17, 19].

Owing to the limited sample size and lack of research, we were unable to establish a comparison for the meta-analysis of this outcome.

Two studies reported results regarding complete remission of non-alcoholic fatty liver disease (NAFLD) after 12 months. Kermansanavi *et al.* reported a rate of approximately 73% [23], and Hosseini *et al.* reported a rate of 90% [15]. Although these results are promising, further studies are needed to evaluate the efficiency of SASI bypass in NAFLD remission.

The effectiveness of SASI bypass, in terms of weight reduction and improvement in comorbidities, was also associated with a favourable safety profile. In this review, complications were observed in 11.7% of patients, which is comparable to the complication rate reported in previous studies for SG [32]. Concerns regarding the need for reversal surgery were mainly due to excessive weight loss or hypoalbuminemia. However, in this review, the rates of excessive weight loss and hypoalbuminemia were 1.03% and 1.5%, respectively.

This review verified that technical variations in SASI bypass could induce different rates of weight loss, improvement in comorbidities and complications.

These variations included the length of the common limb, which varied between 200 and 350 cm; the size of the gastro-ileal anastomosis, which was 3 or 4 cm; and the gastro-ileal anastomosis distant to the pylorus, which ranged between 3 and 6 cm.

Hosseini *et al.* demonstrated that a longer biliopancreatic limb was associated with greater improvement in hypertension, the cause of which is not clear. It may be related to alterations in the levels of ghrelin and GLP-1 hormones with respect to the length of the common limb, but further research is needed to better understand this mechanism [15].

On the other hand, a larger anastomosis size was associated with higher weight loss and a decrease in hypertension due to food diversion from the gastric pouch to the ileum, leading to an increasement in the malabsorptive effect [15].

Recently, a world consensus meeting was held in India, resulting in a statement suggesting standardisation of numerous bariatric surgeries, including SASI bypass. Recommendations to standardise the SASI bypass method included a width of the residual sleeve of 3 cm, a size of the gastric pouch between 150 and 250 cc, separating the gastroileal anastomosis from the pylorus by 2–6 cm, an anastomosis size of 3 cm, and a common limb length of 300 cm [37].

Throughout the studies, there were many advantages of the SASI bypass. One anastomosis is a simplification without the need for division of the duodenum, which makes mastering this procedure much faster and significantly decreases the risk of serious complications compared with more complex techniques [22]. Another advantage of this procedure is that it allows endoscopic inspection of the duodenum and biliary tract due to the preservation of natural endoscopic access.

SASI bypass can be considered a technique between SG and SADI-S. Removing the anastomosis converts the SASI bypass to SG, and sectioning the duodenum converts the SASI bypass into a modified SADI-S. Therefore, it can be easily converted to SG in cases of malnutrition or excessive weight loss, or modified to SADI-S if the bariatric and metabolic outcomes are considered unsatisfactory [38].

Additionally, the anti-incretin theory proposes that nutrient passage in the bowel can cause negative feedback to balance the effects of incretins (enhanced insulin secretion, insulin action, and β-cell function and growth). Surgeries that resect parts of the foregut or exclude segments of the small bowel from nutrient transit (i.e. RYGB), there are changes in the anti-incretin/incretin balance that may explain the improvement or remission of T2DM, however, reducing anti-incretin signals below the necessary thresholds to control incretin-driven responses might result in postprandial hyperinsulinemic hypoglycemia [39]. SASI bypass does not exclude or bypass segments of the small bowel, it only deviates a portion of the nutrients from the anti-incretin production part of the bowel, allowing maintenance of the anti-incretin/incretin balance. Although it may not be as effective in the improvement or remission of T2DM, through this mechanism, postprandial hyperinsulinemic hypoglycemia can be avoided.

The main findings of our study were the following: (1) The SASI bypass had significantly superior results regarding weight loss and improvement in comorbidities, compared to SG; (2) SASI bypass had a complication rate comparable to other bariatric surgeries, and it can be improved with standardisation; (3) and studies with longer follow-ups to demonstrate and verify the long-term safety and efficiency of SASI are needed.

Limitations

According to Mahawar *et al.*, the evaluation of a new bariatric procedure requires a minimum of 5 clinical trials with at least 5 years of follow-up and a minimum of 500 patients for this new bariatric procedure to be considered as an option in clinical practice [40]. Therefore, one of the main limitations of this review was the fact that only two studies [16, 21] had more than 12 months of follow-up, and despite the timeframe being sufficient to observe

an association between exposure and outcome, there is a need for more studies with a longer follow-up period to evaluate mid-term and long-term outcomes. Additionally, a longer follow-up period is needed to guarantee that long-term complications such as malnutrition, hypoalbuminemia, and excessive weight loss will not develop.

Secondly, given that this technique is relatively recent, most studies had a limited number of participants. Therefore, most of the existing studies consist of small or medium-sized cohorts.

Owing to the small number of studies included in the SASI and OAGB meta-analyses, there are insufficient data to establish a significant comparison between these techniques.

The high statistical heterogeneity obtained in some of the analyses, can be potentially explained by distinctive patient features, variation in surgeons' experience in this technique, or lack of technical standardisation.

Lastly, observational studies, which are more susceptible to bias and confounding variables, constituted nearly all the included studies. Consequently, determining a more effective technique can be more challenging. Therefore, more RCT are required.

Conclusions

Although there is a need for mid to long-term studies, this review showed that SASI bypass has a significant effect on weight loss, and remarkable metabolic control. Additionally, this new technique has been proven to be a safe bariatric surgical procedure. The variations in outcomes reinforce the need for standardisation to achieve better results.

Supplementary Information

Supplementary Data is available in the following pages.

Statements

Conflict of Interest: The authors declare that they have no conflict of interest.

Ethics Approval: This article does not contain any studies with human participants or animals performed by any of the authors

Informed Consent: For this type of study, formal consent is not required

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Table 1 – Studies included in the systematic review and characteristics of patients who underwent SASI bypass.

Author, year	Country	Study Design	Sample size, nº	Female (%)	Preoperative BMI (kg/m^2), mean ± SD	Follow-up (months)	Common limb, cm	Compares with (nº)
Mahdy *et al.*, 2016 [6]	Egypt	Retrospective cohort	50	66	48.7 ± 7.6	12	250	-
Salama *et al.*, 2017 [25]	Egypt	Prospective cohort	45	75.5	43.2	12	300	-
Vennapusa *et al.*, 2017 [9]	India	Prospective cohort	113	41.6	43.48±7.57	12	250, 300 or 350*	-
Arslan *et al.*, 2018 [8]	Turkey	Retrospective cohort	15	46.7	35.05 ± 4.15	3	300	-
Abouzeid *et al.*, 2019 [26]	Egypt	Prospective cohort	20	80	45.80 ± 7.60	12	250	-
Khalil *et al.*, 2019 [7]	Egypt	Randomized control trial	26	73.1	45.5±7.1	12	250	SG (25)
Mahdy *et al.*, 2020 [19]	Multicenter	Retrospective cohort	551	70.8	43.2 ± 12.5	12	250	-
Mohamed *et al.*, 2020 [10]	Bahrain	Retrospective cohort	34	-	58.3	12	250	SG (104) and OAGB (39)
Kermansaravi *et al.*, 2020 [23]	Iran	Retrospective cohort	24	79.2	44.2 ± 4.3	12	250	-
Madyan *et al.*, 2020 [27]	Egypt	Prospective cohort	20	85	53.7 ± 5.9	12	300	SG
Khalaf *et al.*, 2021 [21]	Egypt	Retrospective cohort	322	61.5	50.1 ± 7.7	24	250 or 300 **	-
Romero *et al.*, 2021 [24]	Mexico	Retrospective cohort	83	63.8	40.9 ± 7.1	12	300	-
Mahdy *et al.*, 2021 [18]	UAE	Retrospective cohort	46	50	44.4± 9.8	12	300	RYGB (46)
Mahdy *et al.*, 2021 [20]	UAE	Retrospective cohort	74	70.3	42.1±14.5	12	300	SG (99) and OAGB (91)
Emile *et al.*, 2021 [17]	Multicenter	Retrospective cohort	58	77.6	48.9 ± 16.9	12	250	SG (58)

Tarnowski *et al.*, 2022 [22]	Poland	Retrospective cohort	19	94.7	40.3 ±3.74	12	300	-
Hosseini *et al.*, 2022 [16]	Iran	Retrospective cohort	116	84.5	43.54 ± 3.88	36	300	-
Hosseini *et al.*, 2022 [15]	Iran	Retrospective cohort	138	84.8	45.35± 4.61	12	≥ 200	SASJ (24)

a - NIH (National Institutes of Health) quality assessment criteria for observational studies: it is based on a quality rating of G (good), F (fair), and P (poor), and 14 questions that can be answered with yes/no/not applicable/not reported/cannot determine. Y/N is the ratio of questions with positive answers (Y-yes) and negative answers (N–no).

* Common channel length was 250 cm in 18 patients, 300 cm in 88 patients, and 350 cm in 7 patients.

** The length of the CL was determined according to the total bowel length (TBL). If the TBL was ≤ 6 m, the CL length was 250 cm. The CL length was 300 cm if the TBL was more than 6 m. 250 cm was performed 36% (116) of the time and 300 cm 64% of the time (206).

SD – Standard deviation; SASJ – Single anastomosis sleeve jejunal bypass.

Supplementary Material

Supplementary Table 1 – Search terms and queries.

MEDLINE/PubMed	("obesity"[MeSH Terms] AND "bariatric surgery"[MeSH Terms] AND ("bipartite"[All Fields] OR "bipartition"[All Fields] OR "bipartitions"[All Fields] OR (("single person"[MeSH Terms] OR ("single"[All Fields] AND "person"[All Fields]) OR "single person"[All Fields] OR "single"[All Fields] OR "singles"[All Fields]) AND ("anastomosis, surgical"[MeSH Terms] OR ("anastomosis"[All Fields] AND "surgical"[All Fields]) OR "surgical anastomosis"[All Fields] OR "anastomosis"[All Fields]) AND ("sleeve"[All Fields] OR "sleeved"[All Fields] OR "sleeves"[All Fields] OR "sleeving"[All Fields]) AND ("ileum"[MeSH Terms] OR "ileum"[All Fields] OR "ileal"[All Fields]) AND ("bypass"[All Fields] OR "bypassed"[All Fields] OR "bypasses"[All Fields] OR "bypassing"[All Fields]))))
Web of Science	TS=((obesity) AND (bariatric surgery) AND ((Bipartition) OR (SASI) OR (Single anastomosis sleeve ileal bypass)))
Scopus	ALL((obesity) AND (bariatric surgery) AND ((Bipartition) OR (SASI) OR (Single anastomosis sleeve ileal bypass)))

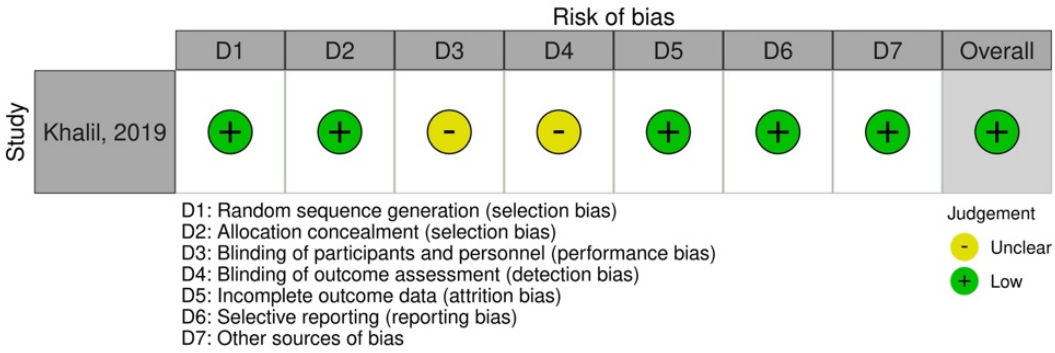
Supplementary Table 2 – Description of the answers in the NIH (National Institutes of Health) quality assessment criteria for observational studies.

Author, year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Y/N	G/F/P
Mahdy et al, 2016	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	10/2	G
Salama et al, 2017	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	10/2	G
Vennapusa et al, 2017	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	No	NA	Yes	No	No	Yes	8/4	F
Arslan et al, 2018	No	Yes	Yes	Yes	No	Yes	No	NA	Yes	NA	Yes	No	Yes	Yes	8/4	F
Abouzeid et al, 2019	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	10/2	G
Mahdy et al, 2019	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	10/2	G
Khalaf et al, 2020	Yes	No	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	9/3	F
Mohamed et al, 2020	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	10/2	G
Kermansaravi et al, 2020	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	10/2	G
Madyan et al, 2020	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	10/2	G
Romero et al, 2021	Yes	No	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	9/3	F
Mahdy et al, 2021	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	11/1	G
Mahdy et al, 2021	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	11/1	G
Emile et al, 2021	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	11/1	G
Tarnowski et al, 2022	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	Yes	NA	No	No	Yes	Yes	9/3	F
Hosseini et al, 2022	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	Yes	Yes	10/2	G
Hosseini et al, 2022	Yes	Yes	Yes	Yes	No	Yes	Yes	NA	Yes	NA	Yes	No	No	Yes	9/3	F

1 - Was the research question or objective in this paper clearly stated?
2 - Was the study population clearly specified and defined?
3 - Was the participation rate of eligible persons at least 50%?
4 - Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?
5 - Was a sample size justification, power description, or variance and effect estimates provided?
6 - For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?

7 - Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?
8 - For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as a continuous variable)?
9 - Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
10 - Was the exposure(s) assessed more than once over time?
11 - Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
12 - Were the outcome assessors blinded to the exposure status of participants?
13 - Was loss to follow-up after baseline 20% or less?
14 - Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?
NA - not applicable; G - good; F - fair; P - poor; Y - yes; N – no

Supplementary Table 3 - Risk of bias summary of the RCT included.



Supplementary Table 4 – Leave-one-out sensitivity analysis for comparation between SASI and SG regarding %EWL.

Omitted study	MD; 95% CI; p-value	I^2
Mahdy 2021	10.41; [6.18; 14.64]; < 0.0001	18.6%
Emile 2021	10.94; [3.85; 18.02]; 0.0025	49.6%
Madyan 2020	12.96; [8.80; 17.11]; < 0.0001	0.0%

Supplementary Table 5 – Leave-one-out sensitivity analysis for comparation between SASI and SG regarding complications

Omitted study	MD; 95% CI; p-value	I^2
Mahdy 2021	1.89; [0.14; 24.72]; 0.6270	85.9%
Emile 2021	6.30; [1.01; 39.20]; 0.0483	67.1%
Madyan 2020	4.00; [0.28; 56.28]; 0.3036	90.7%
Mohamed 2020	1.42; [0.19; 10.43]; 0.731	84.8%

Section/topic	#	Checklist item	Reported on page and paragraph/ table #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Page 1, 2 & 6 "Efficiency and safety of Single Anastomosis Sleeve Ileal (SASI) bypass in the treatment of obesity and associated comorbidities: A systematic review and meta-analysis"
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Page 7
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known	Page 9 & 10 (Paragraph 4, 5) "(…) simpler and safer technique without losing benefits in the treatment of obesity and its comorbidities. Several studies have evaluated the efficacy and safety of this technique, but do to the fact that the technique hasn't yet standardised, the common limb length varied between 250-300 cm."
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS)	Page 10 (Paragraph 2) "Therefore, in this systematic review and meta-analysis, we aimed to systematically assess all the current literature on SASI bypass in terms of safety, weight loss, improvement in associated comorbidities, and complications. Additionally, we aimed to establish a comparation with other bariatric surgeries."
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	Not registered
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	Page 11 (Paragraph 2-4) "(…) we included all studies assessing adult patients with obesity who underwent SASI bypass. We included both single-arm studies and experimental or observational studies comparing SASI bypass with other bariatric surgeries. The following outcomes were considered: weight loss and change in BMI, improvement in comorbidities such as type 2 diabetes Mellitus (T2DM), hypertension (HT), dyslipidemia (DL), gastroesophageal reflux disease (GERD), obstructive sleep apnea (OSA), and complications during or after surgery. We excluded animal studies, unrelated articles, editorials, correspondence, video reports, reviews, and meta-analyses. In addition, we

			excluded studies assessing less than 10 participants."
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	Page 11 (Paragraph 5) "In October 2022, a systematic review of available literature was conducted using three search databases - PubMed, Scopus, and Web of Science. (…) In addition, the reference lists of primary articles were hand-searched."
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Page 11 (Paragraph 5; Supplementary Table 1) "Search queries are detailed in Supplementary Table 1."
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	Page 12 (Paragraph 1) "After the removal of duplicates, study selection was conducted by two authors independently (C.O. and M.O.) in two separate phases. Firstly, the articles were searched by title and abstract. Subsequently, the articles not excluded in the first phase were selected based on their full-text reading. Any disagreements were discussed between the reviewers and a third author (H.S.S.)."
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	Page 12 (Paragraph 2) "Data were extracted by two independent authors (C.O. and M.O.) into a predesigned data extraction (…)"
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	Page 12 (Paragraph 2) "extract relevant information such as author name, publication year, country and journal of the publication, study design, duration of the follow-up, sample size, PICO, patient inclusion and exclusion criteria, participants characteristics (mean age, percentage of each gender, mean body mass index (BMI), number of patients with T2DM, HT, DL, GERD and OSA), interventions, specifics measures of the SASI bypass, outcomes measures (weight loss and improvement in comorbidities) and complications after surgery."
Risk of bias in individual studies / Risk of bias across studies	12/ 15	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	Page 12 (Paragraph 3,4;), 13 (Paragraph 1) "The quality of the studies was independently assessed by two reviewers (M.C. and C.O.) using the National Institutes of Health quality assessment criteria for Observational studies, and the Cochrane Collaboration Risk of Bias Tool for Randomized control trials (RCT). The first tool is a series of 14 questions to answer yes or no, resulting in a final rating (Good, Fair, or Poor). (…)" The second tool classifies each study as having a high, low, or unclear risk bias, based on selection, performance, detection, elimination, reporting, and other bias factors.
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	Page 13 (Paragraph 3) "We performed random-effects meta-analysis (using the restricted maximum likelihood approach) of mean differences (MD) for the continuous outcome (%EWL), and relative risks (RR) for dichotomous variables (…)"
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each	Page 13 (Paragraph 4, 5) "Heterogeneity was evaluated using the Cochran's Q statistic p-value, and the I2 statistic. (…) A p-value lower than 0.05 was considered

		meta-analysis.	statistically significant. (…)"
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	Page 13 (Paragraph 4) "Heterogeneity sources were studied using the leave-one-out sensitivity analysis."
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	Page 14 (Paragraph 1) (Figure 1) "After the search in the three databases referred to previously, a total of 840 studies were found, of which 409 were duplicates. After the screening phase, 15 articles were fully read, and all were included. Hand searching resulted in 3 additional articles. A total of 18 articles were included in the qualitative synthesis and 4 in the quantitative synthesis (meta-analysis). The study selection process is summarized in Figure 1"
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Page 15 (Paragraph 1-4) (Table 1) "Table 1 shows the characteristics of all studies included in the systematic review. (…)"
Risk of bias within and across studies	19/ 22	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Page 15 (Paragraph 5-6) (Supplementary Table 2, and Table 3) "The risk of bias in the observational studies is demonstrated in the Supplementary Table 2. (…) Therefore, all the studies were considered good or fair. The results of the quality assessment of the RCT are displayed in Supplementary Table 3. Overall, this study was considered to have a low risk of bias since only two parameters were considered unclear."
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Point a) Page 16 (Paragraph 1,2) "A total of 329 patients were analysed in three studies (…) A total of 124 patients were analysed in four studies that compared the partial or complete remission of T2DM after surgery Page 17 (Paragraph 1, 2) "Four studies compared SASI and SG on the improvement or resolution of HT in these two techniques (101 patients). A total of 68 patients were analysed in two studies that compared the partial or complete remission of DL" Page 18 (Paragraph 2) "A total of 34 patients were analysed in two studies that compared the partial or complete remission of OSA" Page 19 (Paragraph 1) "A total of 467 patients were analysed in four studies"; Page 19 (Paragraph 2) "Two studies evaluated the improvement or remission in T2DM (110 patients), HT (81 patients), DL (50 patients), and OSA (33 patients)." Page 20 (Paragraph 1) "Four studies evaluated the complications in 283 patients after 12 months" Point b) Page 16-20 (Figure 2-9)
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Page 16 (Paragraph 1, 3) "SASI was found to be significantly better than SG in the meta-analytical %EWD MD (MD=11.32; 95%C [7.89;14.76]; p< 0.0001), with a moderate heterogeneity (I2=11%; p=0.33)." "Compared with SG, SASI bypass was associated with 1.35 times more probability of

			improvement or resolution of T2DM, and this difference was significant (RR=1.35; 95%CI [1.07; 1.69]; p=0.011). No heterogeneity was detected (I2=0%; p=0.96).” Page 17 (Paragraph 1) “The results presented in Figure 4 show no significant difference (RR=1.10; 95%CI [0.82;1.46]; p=0.532) between the two approaches, and no heterogeneity was detected (I2=0%; p=0.95).” Page 18 (Paragraph 1,3) “Compared to SG, a patient who underwent SASI bypass was associated with 1.41 times more probability of improvement or resolution of DL (RR=1.41; 95%CI [1.00;1.99]; p=0.048). No heterogeneity was detected (I2=0%; p=0.91)” “Compared to SG, a patient who underwent SASI bypass was associated with 1.5 times greater chance of improvement or resolution of OSA (RR=1.50; 95%CI [1.01; 2.22]; p=0.042). No heterogeneity was detected (I2=0%; p=0.32)” Page 19 (Paragraph 1, 2) “No significant differences between techniques (RR=2.81; 95%Cl [0.3;20.61]; p=0.310) were observed, and severe heterogeneity was detected (I2=86%; p<0.01).” “No significant differences between techniques were observed in T2DM (RR=1.08; 95%CI [0.94; 1.24]; p=0.257), HT (RR=0.87; 95%CI [0.69; 1.11]; p=0.266), DL (RR=1.03; 95%CI [0.75; 1.41]; p=0.854), and OSA (RR=1.14; 95%CI [0.85; 1.52]; p=0.3789). No heterogeneity was detected in any of these outcomes.” Page 20 (Paragraph 1) “No significant differences were observed between techniques (RR=2.47; 95%CI [0.3;20.61]; p=0.31), although moderated heterogeneity was observed (I2=42%; p=0.19).”
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	Page 16 (Paragraph 1) “Heterogeneity ceased to be observed after removal of the Madyan et al. study (Supplementary Table 4).” Page 19 (Paragraph 1) “Heterogeneity decreased (albeit remaining severe – 67.1%) with the exclusion of the Emile et al. study (Supplementary Table 5).”
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	Page 27 (Paragraph 2) “The main findings of our study were the following: (1) The SASI bypass had significant results regarding weight loss and improvement in comorbidities, with it being remarkably superior to SG in terms of weight loss and improvement of T2DM; (2) SASI bypass had a complication rate comparable to other surgeries, and it can be improved with standardisation; (3) there is a need for studies with longer follow-ups to demonstrate and verify the long-term safety and efficiency of SASI.”
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	Page 27 (Paragraph 3), Page 28 (Paragraph 1-5) “Therefore, one of the main limitations of this review was (…). Additionally, the longer follow-up is needed (..). In addition, most studies had a small number of participants (...). Owing to the small number of studies included in the SASI and OAGB meta-analyses (…). Lastly, the high

			statistical heterogeneity (…).”
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	Page 28 (Paragraph 6) “Although there is a need for mid to long-term studies, this review showed that SASI bypass had a significant effect on weight loss, and a remarkable metabolic effect. Additionally, it has been shown that this new technique is a safe bariatric surgical procedure. The variations in the outcomes reinforce the need for standardisation to achieve better results.”
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Page 29 (Paragraph 2) “The authors declare that they have no conflict of interest.”

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: **www.prisma-statement.org**.

OBESITY SURGERY - INSTRUCTIONS FOR AUTHORS

Contents

1. ABOUT OBSU 1
2. FILE SUBMISSION CHECKLIST 2
3. IMPORTANT SUBMISSION INFORMATION 3
   - 3a. SYSTEM REQUIREMENTS 3
   - 3b. YOUR AUTHOR ACCOUNT 3
   - 3c. ONLINE SUBMISSION 3
   - 3d. SUPPORT AND ASSISTANCE 3
4. MANUSCRIPT PREPARATION 4
   - 4a. MANUSCRIPT TYPES AND FORMAT 4
   - 4b. TERMINOLOGY 7
   - 4c. MANUSCRIPT SECTIONS AND FILE ITEM TYPES 7
   - 4d. ADDITIONAL SUBMISSION DETAILS 11
   - 4e. JOINT STATEMENT BY THE SURGERY JOURNAL EDITORS GROUP 2018 12
5. ETHICAL RESPONSIBILITIES OF AUTHORS 12
   - 5a. AUTHORSHIP CRITERIA
   - 5b. DISCLOSURE OF POTENTIAL CONFLICT OF INTEREST 12
   - 5c. STATEMENT OF HUMAN AND ANIMAL RIGHTS 15
6. RESEARCH DATA POLICY 16
7. AFTER ACCEPTANCE 17
   - 7a. COPYRIGHT TRANSFER STATEMENT 17
   - 7b. AUTHOR PROOFS 17
   - 7c. OPEN CHOICE 17
   - 7d. PUBLICATION OF COLOR FIGURES 18
   - 7e. OFFPRINTS/ REPRINTS 18
8. TRANSFER DESK OPTION 18

1. ABOUT OBSU

Obesity Surgery is published by Springer Nature and is the official journal of the International Federation for the Surgery of Obesity and metabolic disorders (IFSO). Requirements are in accordance with the "Uniform Requirements for Manuscripts submitted to Biomedical Journals," www.icmje.org .

All manuscripts submitted to OBSU are blind-reviewed and decisioned through Editorial Manager (EM) http://www.editorialmanager.com/obsu . Letters to the Editor and Invited Letter Replies do not need to be blinded. Articles accepted for publication are done so with the understanding that they or their substantive contents have not been and will not be submitted to any other publication.

Obesity Surgery is a specialty journal, and the readership is well versed in the world statistics about the prevalence of obesity and metabolic/bariatric surgery, as well as other broad interdisciplinary topics. The Editorial Board, therefore, asks that submissions for publication adhere to what is new to be told. Focus the introduction and discussion of an article on the specific knowledge gap. Aim current studies toward sharpening reader attention to any new information provided. Brevity will also favor acceptance of a submission.

2. FILE SUBMISSION CHECKLIST

Before you begin your submission, make sure to have ready for upload all the file items described in the submission checklist below. Please use American English spelling. If any of the required file items listed below are missing, not correctly blinded, or otherwise incorrect, and/or if the English grammar is insufficient, your manuscript will be returned to you for correction.

For File Item descriptions, see section 4c., MANUSCRIPT SECTIONS AND FILE ITEM TYPES.

☑ **Title Page** (Word, RTF, TXT) **–** The complete title page is separate from the rest of the manuscript text. Any Keywords and non-blinded details should be placed in the Title Page.

If you are submitting a…

☑ **Text-based Manuscript** (Word, RTF, TXT), **include, as applicable:**

- □ Textual Abstract and 3 to 4 Key Points (different from Keywords, in bullet-point format)
- □ The complete manuscript text (must be blinded for review purposes – no author/affiliation details)
- □ Blinded statements for Conflict of Interest, Ethical/Board approval, and Informed Consent (as applicable)
- □ References in PubMed® style
- □ Optional: Embedded tables, schemes, figures, and captions
- □ Dynamic (supplementary) Video, if present, is not to exceed three (3) minutes in length; must be blinded and clearly narrated in English
- □ If present, video must be in either .MP4 or .MOV format.

If you are submitting a…

☑ **Video-based Manuscript** (Multimedia Article in MP4 or MOV)**, include:**

- □ Blinded Video Abstract and Key Points, as well as Ethical, COI, and Human/Animal Rights statements, and references
- □ Video not to exceed ten (10) minutes in length (blinded for review purposes)
- □ Narrated in English
- □ Video HD-ready in either .MP4 or .MOV file format, not to exceed 500 MB (website limit).

☑ **Figures/Images/Media** (JPG, EPS, TIFF)

- □ No identifying information about patients or logos unless permission specifically provided.
- □ Patient and/or publisher permissions (e.g., for images or logos, etc.), as applicable.

FOR REVISIONS ONLY:

☑ Revised/blinded text, tables, figures

- □ One clean copy (Word, RTF, TXT)
- □ One annotated copy

☑ A blinded, Point-by-Point Reply to Reviewer Comments (Word, RTF, TXT)

☑ Only required for Original Contributions and New Concepts: A blinded Graphical Abstract (Word, PPT, JPG, EPS, TIFF). This should be primarily graphic and consist of icons (not just text). You may use the Graphical Abstract template provided here and see example here. *(Note re: terminology - "Graphical Abstract" = "Visual Abstract")*

3. IMPORTANT SUBMISSION INFORMATION

3a. SYSTEM REQUIREMENTS

Authors will need the following items to use EM:

- Internet access
- A current Adobe Acrobat browser plug-in
- Electronic files of all required documents listed in the File Submission Checklist

3b. YOUR AUTHOR ACCOUNT

If you have previously accessed the system at http://www.edmgr.com/obsu/ *always use your existing account* for ALL subsequent submissions. If you have forgotten your Username or Password, use the "Send Login Details" link at the Login Page. Authors entering the journal's EM site for the first time can create a new account by clicking "Register Now."

3c. ONLINE SUBMISSION

After you log into your account and enter your Author Center, EM will lead you through a step-by-step submission process. Note: Always keep original copies of your manuscript files. The system will not allow you to complete your submission if any required submission fields are incomplete. If you cannot finish your submission in one visit, you may save a draft and later re-enter the process at the same step by clicking on the "Incomplete Submissions" link in your Author Main Menu.

We recommend that you have all items listed in the File Submission Checklist complete and ready for upload before starting your online submission. After uploading the files, the system will convert the files to PDF. Thoroughly review the PDF of your submission before confirming your submission. Note: documents that are not viewable to reviewers (cover letter, title page, etc.) may not appear in your PDF proof; simply make sure that they have been successfully uploaded in your list of uploaded files. After confirming that your submission is complete, click "Submit." All contributing authors will receive an emailed confirmation. If the submission is not complete, inaccurate, or not fully blinded when the editorial office receives it, it will be returned to your Author Center, with an e-mail notifying you of what needs to be corrected.

Once your manuscript is correctly submitted, it will be assigned to an editor, and the review process will begin.

3d. SUPPORT AND ASSISTANCE

If you have questions or need assistance at any point during the submission and review process, contact our OBSU Managing Editor:
Attn: Deana Rodriguez, Managing Editor, OBSU Editorial Office Phone: +001 (562) 961-9928 E-mail: obsu.rodriguez@gmail.com

4. MANUSCRIPT PREPARATION

- Authors must use person-first language: e.g., "patients with obesity" rather than "obese patients."
- Double-space the text and set page borders at one inch.
- Number all pages.
- Use a normal, plain font (e.g., 12-point Times Roman) for text.
- Express all scientific units in SI units.
- Abbreviations may be used but must be spelled out the first time the term is mentioned.

4a. MANUSCRIPT TYPES AND FORMAT

The manuscript types that Obesity Surgery accepts include Original Contribution, New Concept, Review Article, Brief Communication, Letter to the Editor, and Multimedia Article. You may submit your manuscript following the format requirements detailed in the MANUSCRIPT FORMATS table below.

Each manuscript type requires specific submission format and file types. When required by the nature of the report, manuscripts that do not follow these formats may be considered. Please note that the page, word, and figure limits in the table below are a guideline rather than a rule; the editors and reviewers make the final evaluations. Please remain succinct in your wording.

MANUSCRIPT FORMATS

The double-spaced page and word counts below are a guideline rather than a rule. Title Page, references, figures, legends, and tables are not considered in the page/word counts below. See section 4c below, ***MANUSCRIPT SECTIONS AND FILE ITEM TYPES***, for descriptions of each file item.

MANUSCRIPT	Description	Pp/Words	Blinded Manuscript Text Contents	Figures
Original Contribution	Paper involves clinical or basic science research	8pp/2400 words	•Title •Structured textual Abstract, includes subheadings (250 words) • 3 to 4 one-line, bulleted Key Points (different from Keywords) •Graphical Abstract (required upon revision) •Introduction/Purpose •Materials/ Methods/ Results/ Conclusion •Blinded COI/Ethics/ Consent Statements required •References •Figure Legends (if any) •Tables (if any) •Supplementary video (if any)	Up to 6
New Concept	Innovative technologies, devices, procedures, or treatment protocols; should include a detailed description of the procedure and the results.			
Review Article	A scholarly literature review of a current topic. May be solicited or unsolicited.	10pp/ 3000 words	• Title • One-Paragraph textual Abstract (125 words) • 3 to 4 one-line Key Points • Graphical Abstract (optional, upon revision) • Format may vary based on topic • Blinded COI/Ethics/ Consent Statements required • References • Figure Legends (if any)	Up to 6
Brief Communication	A short report that presents research, an innovated concept, or a procedure.	3pp / 800 words	• Title • No Textual Abstract, but • Yes 3 to 4 one-line Key Points at beginning of text • Graphical Abstract (optional, upon revision) • Methods /Results/ Conclusion • Blinded COI/Ethics/ Consent Statements required • Limit references to eight (8) • Figure Legends (if any)	Up to 2
Letter to the Editor	A short report, case series, or opinion, or an unstructured comment on a published paper. The editors reserve the right to accept, reject or excerpt letters without changing the views expressed by the author(s).	4pp/ 1200 words	• Title page and main text do not need to be blinded. • No Textual Abstract, No Graphical Abstract • Unstructured • COI/Ethics/ Consent Statements required • Limited number of references	Up to 3

MANUSCRIPT	Description	Pp/Words	Blinded Manuscript Content	Figures
Multimedia Article	Manuscripts submitted as dedicated Multimedia Articles must be accompanied by a text Abstract that briefly describes the video.	2pp / 500 words	• Title • No Graphical Abstract • Blinded Text Abstract including Title, Key Points, Introduction, Materials/ Methods/ Results/ Conclusion/ Blinded Statements required, References (if any) • Blinded video(s) in .mp4 or .mov format only; not to exceed 10 minutes/500 MB, with narration required, in English.	N/A

4b. TERMINOLOGY

Please follow the mandatory manuscript terminology standards**.**

- Weight loss must be expressed as change in BMI or %total weight loss (%TWL)
- The term for the operative procedure that was previously labeled “Mini Gastric Bypass (MGB)” should no longer be used. Instead, use the accepted term “One Anastomosis Gastric Bypass (OAGB)”.
- Authors must use person-first language: e.g., "patients with obesity" or “patients with a BMI over 50 kg/m^2" rather than "obese patients.”
- We support uniform, defined reporting of the sex used for human, animal, tissue, and cell research in ALL manuscripts published in our journals. If only one sex is reported, authors must include a justification statement as to why only a single-sex study was conducted.
- Patient data extending beyond 30 days must include **“**lost to follow-up” information in the Abstract and Results section, including all tables and figures, with the denominator provided as to how many patients were available at **each time point** and the number of patients actually seen.
- Avoid using stigmatizing language (e.g., use the term "extreme" or "clinically severe" rather than “morbid”).

4c. MANUSCRIPT SECTIONS AND FILE ITEM TYPES

When you upload your manuscript documents to EM, the system will ask you to indicate each manuscript “File Item.” Your manuscript will be submitted in various parts. Your blinded “Manuscript” will be uploaded separately from the “Title Page.” Images may be submitted separately, as should any electronic supplementary material and videos (either as supplementary dynamic videos or a dedicated Multimedia Article file).

I. **File Item: Title Page (*required*; must include all author information)**
   In the "File Upload" step, submit your Title Page separately from the blinded text of the manuscript under the category, "Title Page." *Do not upload your Title Page as a PDF file.*
   This page will not be seen by reviewers and should include the following:
   a. Complete title of the article and a shortened title (max 30 characters, including spaces).
   b. Complete names, titles, departments, and institutional addresses of each contributing author (See ICMJE Guidelines for co-author qualifications), with an asterisk indicating the corresponding author.
   c. "Correspondence to" followed by name and contact information for corresponding author. Only one author may be indicated as the corresponding author.
   d. Equal Contribution: If any authors have contributed equally, you may include the following statement: “Authors (name) and (name) have contributed equally to this work.”
   e. The main text Word Count (does not include references, figures/captions, or tables).
   f. Any grant information and acknowledgment of grant support.
   g. Acknowledgments*: Should only be included on this separate Title Page. List individuals other than authors who directly participated in the work. *Acknowledgment(s) require written permission from the person(s) being acknowledged. Any dedications should also be included here.
   h. At least 3 Keywords.

Collaborator Groups: ***If your manuscript is authored by a large collaborator group, please follow these instructions to ensure proper indexing of all author names:***

a. Include a note on the Title Page stating that the collaborators for the ''XYZ Group" are listed in the Acknowledgements.
b. Place your Acknowledgments paragraph, containing all author names, at the bottom of the Title Page.
c. Affiliations are not mandatory for all collaborators, but affiliations are preferred. If they are included, city/state/nation is required.
d. The Collaborator group must gather all author names & affiliations [if any].
e. Please double check all information to ensure names are correctly spelled.

II. **File Item: Graphical Abstract (blinded, *required* at revision for Original Contributions and New Concepts; *optional* for Reviews and Brief Communications)**

NOTE: The "Graphical Abstract" file will only be required if we request a revision of your manuscript. It should be a selection of high-quality images or icons - a visual summary of the information provided in your textual Abstract. The use of color is encouraged. You may use the Graphical Abstract template provided here and view a completed example here. It must be submitted in Word, PPT, JPG, TIFF, or EPS format. *Do not upload your Graphical Abstract as a PDF file.* This Graphical Abstract may be used via IFSO/Obesity Surgery's social media to provide more visibility to your study, if it is accepted.

As an author submitting to the journal, you may ***elect*** to make use of services provided at Springer Nature for high quality, professionally created visual abstracts for a fee. Click here to find out more about the service, and a 20% discount will be automatically applied when using this link. Note that using this service does not in any way impact likelihood of manuscript acceptance.

III. **File Item: Blinded Manuscript – Main Text (*required*; blinded for review)**

The "Blinded Manuscript" file should include the Main Text, References, and Figure Legends (if any). Tables may also be included in this text document or submitted separately. *Do not upload your manuscript documents as PDF files.*

This "Blinded Manuscript" text document should be double-spaced and include the following manuscript headings.

- **Abstract* and Key Points****
  a. *For Original Contributions and New Concepts:* Abstract must be structured in four paragraphs (Introduction/Methods/Results/Conclusion) and limited to 250 words. Three to four bulleted, one-sentence Key Points should be included at the end of the Abstract text.
  b. *For Reviews*: Abstract must be one paragraph of up to 125 words and include 3 to 4 bulleted, one-sentence Key Points at the end of the Abstract text.
  c. *For Brief Communications:* Abstract is not required; Include Key Points at the beginning of main text.

d. *For Letters*: Abstract and Key Points not required.

**For Multimedia Articles*: No separate Abstract is needed. You will instead submit a Blinded Video Abstract that includes all other headings listed in this section 4b. III. and include Key Points at the beginning of the text.

** Key Points are different from Keywords. Key Points are bullet points that convey the core findings of the article. Each bullet point should not exceed 85 characters (including spaces) for potential social media use. The Key Points are not included in the word count for the Abstract but are a part of the general text word count.

- **Introduction/Purpose; Materials and Methods; Results; Conclusion.**
- Blinded Conflict of Interest Disclosure Statement (see Section 5a. for details)
- Statements regarding ethics and consent. (see Section 5b. for details)
- **References**
  a. Use Medline®/Pubmed® Style. Visit the following website for sample references: http://www.nlm.nih.gov/bsd/uniform_requirements.html
  b. Type references double-spaced; list them in consecutive, numerical order as they appear in the text.
  c. Identify reference citations in the text by numbers in square brackets (e.g., [1]). Once a reference is cited, all subsequent citations should be to the original number.
  d. Cite all references in consecutive, numeric order, within the text and tables.
  e. Papers that have been accepted for publication or are in press may be listed in the References, however OBSU does not reference unpublished data or personal communications.

  Note: The knowledge base in bariatric surgery is ever evolving and it is important to frame manuscripts by the most current information. Make sure to undertake a contemporary review of the supporting literature in the focused area of the study.

- **Tables**
  a. Use the table function (not spreadsheets) to make tables.
  b. Number all tables using Arabic numerals.
  c. Always cite tables in the text in consecutive, numerical order. All tables must be cited.
  d. For each table, supply a title and brief description above it; it should explain clearly and concisely the components of the table.
  e. Footnotes to tables should be indicated by superscript lower-case letters (or asterisks for significance values and other statistical data) and included beneath the table body.

IV. File Item: Cover Letter (*optional*; may include identifying information)

You may submit your non-blinded Cover Letter under this File Item, as well as any other non- blinded documents, such as Permissions, Language Editing certificates, or other official documents that may identify authors/affiliations.

V. File Item: Figure / Image (*optional*; must be blinded for review)

Figures may be inserted in the manuscript text, nearest to where each is first cited, or submitted as separate graphics files. Common graphics files such as GIF, JPEG, EPS, TIFF and many others are supported. *Do not upload figures as PDF files.*

All figures must be numbered using Arabic numerals. Figure parts should be denoted by lowercase letters. Figures should always be cited in text in consecutive numerical order. For each figure, include the figure legends at the end of the manuscript text. Name your figure files with "Fig" and the figure number, e.g., Fig1.eps.

- **Image Format**
  a. Acceptable image file types: JPG, DOV, PDF, TIFF, PPT, PNG, or EPS.
  b. Specification for pixel dimensions: 8 bit, 300/600/1200 dpi.
  c. Image files should be provided in RGB.

- **Image Dimensions**
  a. Sub Column: 3.9cm
  b. 1 Column: 6.5cm/8.35cm
  c. 1.5 Column: 11cm/12.9cm
  d. 2 Column: 15cm/17.37cm
  e. Max Height: 23.4cm

  Photographs of patients in which the subject is identifiable must either have the face masked out or be accompanied by written permission from the individual in the photograph for publication.

If you include figures/images that have already been published elsewhere, or any logos, you must obtain and provide permission from the copyright owner(s) for both the print and online format. Such permissions documents should be submitted under the “Cover Letter” file type.

VI. File Item: Multimedia Article (blinded for review)

A Multimedia Article submission is a dedicated video of no more than 10 minutes/500 MB in duration/size. Keep the video length / size as precise as possible, as some reviewers may experience problems when uploading, downloading, or viewing larger files, depending on server speed and other external factors.

- ***Requirements for Multimedia Articles***
  a. Multimedia Articles must be accompanied by a “Blinded Video Abstract” which includes 3-4 Key Points at the beginning of the text.
  b. Video must be submitted in either .mp4 or .mov file format.
  c. Video files must not exceed ten (10) minutes in length.
  d. Video files must not exceed 500 MB
  e. Narration is *required* and must be in English, with correct grammar. Background music is not allowed.
  f. Include at least 2-3 slides at the beginning of the video describing:
     - Why your video is important to the readership of Obesity Surgery [1 slide].
     - The patient’s history and exam as applicable [1 slide] and any pertinent images or endoscopic findings [1-2 slides].
  g. Make sure to highlight important portions of the video using appropriate tools, including still images.
  h. Use normal speed for the majority of the video.

i. Include a slide at the end of the video with summary/conclusion/take-home messages.
j. Video quality must be sufficient to allow for *streaming* if published (e.g., HD ready, 720p, with a video bitrate of 5.000 to 8.000 Kbit/s and an audio bitrate of 320 Kbit/s; a resolution of at last 480p; and a video codec of H.264 and “High” or at least “Extended” profile).

VII. **File Item: Blinded Dynamic Article Video (Supplementary Video) – optional file; blinded**

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3. Mansukhani NA, Yoon DY, Teter KA, Stubbs VC, Helenowski IB, Woodruff TK, Kibbe MR. Determining If Sex Bias Exists in Human Surgical Clinical Research. JAMA Surg. 2016 Nov 1;151(11):1022-1030.
4. National Institutes of Health Office of Extramural Research. Consideration of Sex as a Biological Variable in NIH-funded Research.

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