# «Gastric bypass» or «sleeve gastrectomy» for morbid obesity : a systematic review

## "Gastric bypass" ou "sleeve gastrectomy" pour l'obésité morbide : revue systématique

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**RÉSUMÉ**

**Prérequis :** La chirurgie bariatrique constitue un traitement efficace de l'obésité morbide permettant non seulement la perte de poids mais aussi le contrôle des comorbidités liées à l'obésité. Bien que la 'Sleeve gastrectomy' et le 'gastric bypass' constituent actuellement les deux interventions les plus pratiquées, la supériorité de l'une d'entre elles et les indications restent imprécises.

**But:** Le but de ce travail est de répondre de façon factuelle aux questions suivantes relatives aux deux procédures bariatriques : 1/ Quelle procédure est plus efficace sur la perte de poids? 2/Laquelle est pourvoyeuse de moins de morbidité ? 3/ Laquelle entraine le plus de rémission des comorbidités ?

**Méthodes:** Une recherche bibliographique sur Pubmed, Cochrane Library et Scopus a été conduite sur la période allant de Janvier 2008 à Mars 2015, en prenant comme mots clés "Gastric Bypass" et "Sleeve Gatrectomy"».

**Résultats:** Les résultats de la 'Sleeve Gastrectomy' et du 'Gastric Bypass' sont comparables en termes de perte de poids et de contrôle des comorbidités à court et à moyen terme. Le 'gastric bypass' est associé à une durée opératoire plus longue, à une morbidité postopératoire légèrement plus élevée et à des déficits vitaminiques plus fréquents mais il permet un meilleur contrôle d'un reflux gastro-œsophagien préopératoire.

**Conclusion:** La 'sleeve gastrectomy' et le 'gastric bypass' sont équivalents en termes de perte de poids et de contrôle des comorbidités mais des études à plus longs termes sont nécessaires pour affiner les indications en fonction des caractéristiques du patient.

**Mots-clés**

Gastric bypass - sleeve gastrectomy - obésité

**SUMMARY**

**Background:** Introduction: Bariatric surgery represents an efficient treatment of morbid obesity allowing not only weight loss but also the control of comorbidities related to obesity. Although the sleeve gastrectomy and gastric bypass are currently the two most common procedures, the superiority of one over another and the indications remain imprecise.

**Aim:** The aim of this work was to provide an evidence based answer to the following questions: What is the most efficient surgical procedure: gastric bypass or sleeve gastrectomy regarding weight loss, postoperative morbidity and remission of comorbidities related to obesity?

**Methods:** A literature search has been conducted in the data bases of Pubmed, Cochrane Library and Scopus during the period between January 2008 to March 2015, with the keywords "Gastric Bypass" and "Sleeve Gastrectomy".

**Results:** the results of sleeve gastrectomy and gastric bypass regarding weight loss and remission of comorbidities are comparable in the short and medium terms. Gastric Bypass is associated with a longer duration of surgery, a slightly higher early morbidity and more frequent deficiencies in vitamins D and B12 but it allows a better control of a pre-operative gastroesophageal reflux disease.

**Conclusion:** Sleeve gastrectomy and gastric bypass are equivalent in terms of loss of weight and control of comorbidities but longer term studies are needed to refine the indications depending on the characteristics of the patient.

**Key-words**

Gastric bypass - sleeve gastrectomy - obesity

Bariatric surgery represents an efficient treatment of morbid obesity allowing not only weight loss but also the control of comorbidities related to obesity [1]. The « gastric bypass » (GBP) is the operation most carried out in the world in view of its significant and stable results at both levels of weight loss and reduction of comorbidities [2]. The « sleeve gastrectomy » (SG) is a more recent surgical procedure which represented at the beginning the first phase of biliopancreatic diversion with duodenal switch required in extremely obese patients with high surgical risk [3]. The favourable results of SG have made this restrictive procedure a definitive surgical treatment of morbid obesity [4]. Its achievement, considered as less traumatic and easier than GBP accounts, in part, for the clear rise of SG prevalence from 0 to 37 % between 2003 and 2013 compared with the whole bariatric surgery [5]. However, the superiority of one of the two procedures has not been proved.

The aim of this work was to provide an evidence based answer to the following questions: What is the most efficient surgical procedure: GBP or SG regarding weight loss, postoperative morbidity and remission of comorbidities related to obesity?

## METHOD

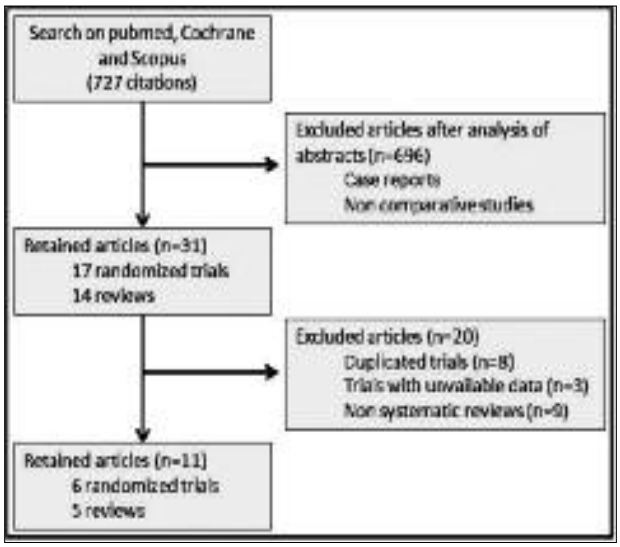
A literature search has been conducted in the data bases of Pubmed, Cochrane Library and Scopus during the period between January 2008 to March 2015, with the keywords "Gastric Bypass" and "Sleeve Gastrectomy". The research was limited to randomized controlled trials for patients with preoperative Body Mass index (BMI) > 35 Kg/m² and operated on by laparoscopic approach. The literature reviews were retained only if they were relevant according to the aim of this study. The editorials, the not factual developments, the clinical cases and abstracts were excluded. All retained articles have been analyzed qualitatively and the conclusions have been classified according to the levels of evidence and recommendations according to the classification of ANAES [6].

## RESULTS

**• Retrieved articles**

According to inclusion and exclusion criteria, 31 articles in which the results of SG and GBP have been compared in patients with a BMI > 35kg/m² were retained (Fig. 1). They were 17 randomized trials and 14 literature reviews. Among the randomized trials, we have excluded eight references that corresponded to duplications of a same trial and three trials that did not include data relating to weight loss and post-operative complications. As regards reviews, two meta-analyses and three systematic reviews have met our selection criteria.

**Figure 1 :** Flowchart of articles selection




**• Weight loss (Table 1)**

In five randomized trials, the results of weight loss have been compared after SG and GBP [7-11]. In two trials [7,8], the numbers

**Table 1 :** Results of randomized trials comparing sleeve gastrectomy and gastric bypass in terms of weight loss.

| Trials | | No. of patients | BMI (m/kg²) at 1 year | p | %EWL at 1 year | p | %EBMIL at 1 year | p | %EWL at 3 years | p | %EBMIL at 3 years | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Keidar [7] | | | | | | | | | | | | |
| | SG | 18 | 30,4 | ns | - | | - | | - | | - | |
| | GBP | 19 | 31,4 | | - | | - | | - | | - | |
| Ramon [8] | | | | | | | | | | | | |
| | SG | 8 | - | ns | - | | - | ns | - | | - | |
| | GBP | 7 | - | | - | | - | | - | | - | |
| Vix [9] | | | | | | | | | | | | |
| | SG | 55 | - | | 82.98 | ns | 70.62 | ns | - | | - | |
| | GBP | 45 | - | | 80.38 | | 71.79 | | - | | - | |
| Kehagias [10] | | | | | | | | | | | | |
| | SG | 30 | - | | 72,9 | 0,05 | - | | 68,5 | 0,74 | 68,2 | 0,12 |
| | GBP | 30 | - | | 65,6 | | - | | 62,1 | | 61,4 | |
| Peterli [11] | | | | | | | | | | | | |
| | SG | 107 | 30,1 | 0,25 | - | | 72 | | - | | 63,3 | ns |
| | GBP | 110 | 29,9 | | - | | 86 | | - | | 72,8 | |

SG=sleeve gastrectomy, GBP= gastric bypass, BMI=body mass index, %EWL=excess weight loss percentage, %EBMIL=percentage of excess BMI loss, ns=non significant

included in each group were reduced ranging from 8 to 19 cases. The results of the two procedures were evaluated only on the comparison of the post-operative BMI after a one-year-follow-up. In these two studies, there was no difference between the two procedures. In the french trial [9] which included 55 SG and 45 GBP, there was no difference between the two groups in terms of excess weight loss percentage (%EWL) one year later (82,98 and 80.38 % after SG and GBP respectively ). The same is true for the percentage of excess BMI loss (% EBMIL) which was not significant between the two groups (70,62 vs. 71,79%). In the greek trial of Kehagias[10] including 30 cases in each group, the %EWL after one year was higher after SG (72,9 vs 65,6%) with a significant difference (p=0,05). After three years of follow-up, the difference between the two procedures, assessed in 95% of patients proved non-significant both in terms of %EWL (68,5 vs 62,1% p=0,74) and %EBMIL (68,2 vs. 61,4% p=0,12). Finally, the swiss trial [11] included 107 SG and 110 GBP. The %EBMIL after one year stood at 72% after SG and 86% after GBP but the difference was not significant. The results were similar after three years but assessed in only 32% of patients.

In a recent meta-analysis [12], the authors have compared the loss of weight and /or of BMI after SG and GBP from seven randomized trials. This meta-analysis did not reveal significant difference in the short term between the two procedures.

The results on a longer term have been studied in a systematic review [13] which included only the series with a minimum two-year-follow-up and a rate of lost-to-follow-up patients lower than 20%. Thus, 3544 GBP have been compared with 115 SG. The average of %EWL weighted by the size of the sample between two and three years, stood at 64,5% after SG and 65,7% after GBP.

These results are consistent with the conclusions of a second systematic review [14] which supports a comparable weight loss between the two procedures even after three years of follow-up.

To sum up, the results of SG and GBP regarding weight loss are comparable in the short and medium terms for patients with a BMI > 35kg/m² (evidence level 1). On the other hand, the data are insufficient to compare the two procedures on a longer term. Obesity being a chronic disease evolving in the long term, no recommendation can be made.

**• Duration of surgery, early and late complications , mortality** (Table 2)

Duration of surgery, rate of conversion, morbidity and mortality after SG and GBP have been the subject of three randomized trials. In the Greek trial of Kehagias [10], the duration of surgery was significantly shorter during SG (126 vs. 186 min p<0,01). The rate of conversion was not mentioned in the two groups. One single patient has been readmitted after SG while three patients have been readmitted after GBP (fistula and anastomotic stenosis, bridle obstruction). Two patients presented after SG with anastomotic dehiscence managed by a conservative treatment. The death rate was nil in the two groups. On the longer term, GBP was the cause of a greater deficiency in vitamin B12 than after SG. In the Swiss trial [11], the duration of surgery was also significantly shorter during SG. A conversion has been noted in each group and readmissions have been more frequent after GBP without reaching level of significance (five vs. one re-intervention p=0,21). One death was recorded in the BPG group. As regards distant results, a gastro-œsophageal reflux disease (GERD) has developed more frequently after SG (12,5% vs. 4% p=0,12). Besides, in patients with pre-operative GERD, the improvement in their symptoms has been more often noted after GBP (p=0,008). As regards vitamin deficiency, deficiency of vitamin D was the most frequent one without difference between the two groups whereas vitamin B12 deficiency was more frequent after GBP but without significant difference. However, the study of Vix [9] has shown a vitamin D deficiency significantly higher after GBP. As to the preliminary results of a Turkish trial [15], which included 121 SG and 119 GBP, the duration of surgery was significantly shorter after SG. Overall morbidity was higher after GBP (17,1 vs. 7,4% p=0,023) but the rate of major complications (anastomotic fistula, bleeding and obstruction) was comparable between the two groups as well as the rate of re-intervention (p=0,719).

A systematic review of early complications including 10906 GBP vs. 4816 SG [16] has shown that anastomotic fistulae were more frequent after SG with a difference at the limit of significance (p=0,07). However, the bleeding complications and the anastomotic stenosis were more frequent after GBP (p=0,001 in both cases). Revisions were also more frequent after GBP (p=0,184) as well as mortality (p=0,110).

Finally, the conclusions of the Cochr ane meta-analysis [12] do not show any differences between the two procedures in terms of morbidity except for the improvement in GERD symptoms which is more frequently recorded after GBP.

To sum up, the two procedures are associated with a low mortality rate.

**Table 2 :** Results of randomized trials comparing sleeve gastrectomy and gastric bypass in terms of operating time, early complications and mortality

| Trials | No. of patients | Operating time (min) | p | Early complications | p | Mortality | p |
|---|---|---|---|---|---|---|---|
| Kehagias [10] | | | | | | | |
| SG | 30 | 126 | <0,01 | 7% | ns | 0 | ns |
| GBP | 30 | 186 | | 7% | | 0 | |
| Peterli [11] | | | | | | | |
| SG | 107 | 87 | 0,003 | 8,4% | 0,067 | 0 | ns |
| GBP | 110 | 108 | | 17,2% | | 1 | |
| Helmiö [15] | | | | | | | |
| SG | 121 | 66 | <0,001 | 13,2 | 0,01 | 0 | ns |
| GBP | 119 | 94 | | 26,5 | | 0 | |

SG=sleeve gastrectomy, GBP= gastric bypass, ns=non significant

GBP is associated with a longer duration of surgery (evidence level 1) and a slightly higher early morbidity (evidence level 1). On the longer term, GBP is responsible for more frequent deficiencies in vitamins D and B12 (evidence level 1) but it allows a better control of a pre-operative GERD (evidence level 1). Therefore, in the presence of GERD, the key intervention consists in GBP (Grade A of recommendation).

**• Control of comorbidities:**

In the Swiss randomized trial [11], more than 50% of diabetic patients did no longer take any antidiabetic treatment one year after SG or GBP. The difference between the two procedures was not significant with a rate of diabetes cure of 57,7% after SG and 67,9% after GBP. High blood pressure, dyslipidemia and sleep apnea syndrome stabilized in a similar way after the two procedures. The same results were found by Keidar as regards diabetes [7]. On the other hand, in the study of Kehagias [10], GBP has allowed a better control of dyslipidemia after three years of follow-up whereas SG allowed a better control of high blood pressure.

The results of a meta-analysis that included randomized trials comparing the two techniques in patients whose BMI is > 25 kg/m², showed a significant benefit of GBP in the control of diabetes and dyslipidemias [17].

Lastly, the Cochrane meta-analysis [12] did not show differences between the two techniques in the control of comorbidities: diabetes, high blood pressure, dyslipidemias and sleep apnea syndrome.

To sum up, SG and GBP provide an effective and similar control of comorbidities on the short and medium terms (evidence level 1).

## DISCUSSION

This systematic review concluded that SG and GBP were similar in terms of weight loss and remissions of comorbid conditions but at the cost of a longer surgical procedure and a tendency for more post-operative complications after GBP. However, all these conclusions have been based on data that did not exceed three years of follow-up. Actually, if the efficiency of GBP on weight loss has been documented after a follow-up that reached 20 years [18], the same cannot be confirmed for SG [13] where long-term data (more than 5 years) are few in number. In 2014, a literature review [19] included nine series reporting a follow-up of more than five years after SG, has assessed weight loss only in 258 patients. The %EWL at 5 years ranged between 49,5 and 86%. This large diversity in long-term results of SG, probably due to the lack of standardization of the technique, adds up to the rarity of data, making it difficult to conclude about the efficiency of SG over the long term. The best results on the long term, as regards weight loss, were observed when the gastric tube was narrow as it was reported in the series of Rawlins[20] in which SG has been performed by starting gastric section 3 cm from the pylorus and using a 26,4 F calibration tube, thus leading to a narrow gastric tube. However, in 2013 a published review [21] including 5000 SG showed that the use of a calibration tube < 40 F increased the risk of anastomotic fistulae. These fistulae happen more often at the level of the proximal part of the staple line [22] and would be caused by a tension of sutures at that level ahead of a stenosis or a partial obstruction of the gastric tube. This mechanism, associated with a long staple line , make the rate of anastomotic fistulae following SG, which is about 2,4%, slightly higher than following GBP , in contrast with anastomotic stenosis and post-operative bleeding [16].

Another controversial issue is that of the impact of SG on GERD. The last consensus conference dating back to 2012 [23] has retained as absolute contraindication to SG the presence of Barett's esophagus and not GERD. However, some studies showed that SG involved not only a reduction in the pressure of the lower esophageal sphincter probably through a modification of the anatomy of gastroesophageal junction [24] but also a rise in the intragastric pressure [25], two mechanisms that favour the appearance of GERD [26]. These data have been confirmed by Cochrane [12] meta-analysis which has shown a greater improvement in the GERD symptoms after GBP, which makes this procedure a prime indication in obese patients with GERD.

## CONCLUSION

SG and GBP represent two effective options for the treatment of morbid obesity allowing weight loss and remission of comorbid conditions with a nearly nil mortality rate and a poor morbidity. Compared with GBP, SG provides the benefit of an easier and shorter procedure, and lower post-operative morbidity apart from the worsening of a pre-existing GERD which must represent a contraindication to this technique. SG might be an interesting option in extremely obese patients at high anesthetic risk, allowing weight loss first and likely to be secondarily associated with digestive bypass in case of insufficient weight loss. However, since the distant results of SG are not numerous, studies comparing the two techniques on the long-term are required to improve indications according to the patient's characteristics.

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