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A Review of the Long-Term Outcomes of Sleeve Gastrectomy by Laparoscopic Method as a Way to Control Obesity

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Abstract: Sleeve Gastrectomy (SG) is very famous for being used in treating obese individuals. The present study was carried out in order to examine the long-term weight-losing outcomes after Laparoscopic Sleeve Gastrectomy (LSG) reported in other studies that had carried out appropriate follow-ups after the surgery. Keywords like sleeve gastrectomy, obesity and long-term outcomes were used to search PubMed database which led to finding 16 appropriate studies. Over 5 and more years 492 patients had been followed up after laparoscopic sleeve gastrectomy who were included in the present study. Among them, 71% were female and their mean age was 45.2 year. The results of the present study indicated that BMI before the surgery among the patients of 16 studies was 49.2. The mean weight reduction was 62, 54, 43 and 55% of their overweight respectively in 5, 6 and 7 year after LSG. It seems that in LSG 5 and even more years after it, the rate of weight reduction becomes stable and it can be used as an appropriate method to reduce weight among the obese individuals.

Key words: Sleeve gastrectomy, obesity, digestive system, manipulation, method

INTRODUCTION

It is proved that surgery through manipulating the digestive system is the only stable long-term intervention. After several years, Laparoscopic Sleeve Gastrectomy (LSG) has become a reliable method to treat obesity because it leads to favorable outcomes in terms of postsurgical complications and weight loss (Brethauer *et al*., 2009). Sleeve Gastrectomy (SG) was first introduced by Marko to reduce weight as a component of biliopancreatic diversion (Marceau *et al*., 1991). LSG as a part of biliopancreatic diversion with duodenal switching was carried out by Ren *et al*. (2000) and was finally used as the initial approach in the two-stage method for obese patients. With passage of time, LSG became popular and at present in three international conferences it is known as the best method due to its reliability and efficiency (Deitel *et al*., 2008; Gagner *et al*., 2009; Deitel *et al*., 2011). In a meta-analysis covering 36 studies including 2,570 patients, it was concluded that LSG is an appropriate method to decrease weight without causing any complications (Brethauer *et al*., 2009). While the obtained data indicated significant results for short and mid-term outcomes, there are few studies proving the long-term outcomes of LSG.

MATERIALS AND METHODS

Details of search in PubMed database using the keyword of sleeve gastrectomy in long-term led to finding >150 studies out of which only 16 are presented in the following Table 1.

Among these 16 studies, 8 were carried out in Europe, 6 in the US, 1 in Asia and 1 in Latin America. All of the studies except one (Catheline *et al*., 2013) were only from one institute. Four studies stated that SG is a suitable therapeutic method for individuals at risk. Only 4 studies pointed out that the patients lost 60 and over 60% of their Overweight. The follow-up period after LSG was determined to be 5 or more years in 13 studies. A total number of 492 patients participated in those studies; 71% were female with a mean age of 45.2 years and BMI of 49.3. In the study carried out by Eid *et al*. (2012) , a weight loss of 43% of overweight over 84 months after the surgery was reported. Rawlins *et al*. (2013) reported a weight loss of 86% of overweight 60 months after the surgery. In other 9 studies, follow-up duration was 60 month. The average weight loss was reported to be 63% of overweight in those 9 studies. In three studies, the patients were continuously followed up for 72 month and a weight loss of 54% of overweight was observed. Only in one study, the patients were followed up for 84

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Table 1: Long-term outcomes of LSG to treat obesity

Researchers	No. of patients	Average BMI before surgery (kg m^{-2})	No. of follow-up months	Average weight loss percentage of overweight
Weiner *et al.* (2007)	8	61.6	60	40
Bohdjalian *et al.* (2010)	21	48.2	60	55
Himpens *et al.* (2010)	30	39.0	72	53
D'Hondt *et al.* (2011)	27	39.0	60	71
Sarela *et al.* (2012)	13	45.9	96	69
Strain *et al.* (2011)	23	56.1	60	48
Eid *et al.* (2012)	19	66.0	72	52
Rawlins *et al.* (2013)	49	65.0	60	86
Lim *et al.* (2014)	14	40.2	60	57
Abbatini *et al.* (2013)	13	52.0	60	56
Saif *et al.* (2012)	30	52.0	60	48
Braghetto *et al.* (2012)	60	38.0	60	57
Zachariah *et al.* (2013)	6	37.4	60	63
Catheline *et al.* (2013)	45	49.0	60	50
Brethauer *et al.* (2013)	23	50.0	60	49
Sieber *et al.* (2014)	54	43.0	60	57

continuous months and a weight loss of 43% of overweight was observed. In 2 studies, the follow-up lasted for >96 months and a weight loss of 55% of overweight was seen.

RESULTS AND DISCUSSION

Durable weight loss is one of the advantages of manipulation and surgery of the digestive system. The main principle in this surgery is success or failure in weight loss. One of the most important features of LSG surgery is the durability of weight loss in over 5 years after the surgery. Most studies believe that weight may return after the surgery (Weiner *et al*., 2007; Langer *et al*., 2006). In the past, this issue was also reported about limiting, blocking, and wrapping the digestive system (Dixon *et al*., 2009; Cohen *et al*., 2005). In their review of short and long-term outcomes of LSG, Brethauer *et al.* (2013) considered this method as an initial and essential method. In a study carried out in 2009, all patients who had undergone LSG were followed up. That study included 24 studies including 1,750 patients whose mean BMI was 47 before the study ranging from 37-55. Continuous follow-up was conducted from 3-36 month after the surgery. The average weight loss was from 36-85% of overweight. In the review study carried out by Rawlins *et al.* (2013), it is reported that follow-up for over 5 year indicated that weight loss after the surgery was more than those reported in the studies carried out by Bohdjalian *et al.* (2010), D'Hondt *et al.* (2011), Lim *et al.* (2014), Abbatini *et al.* (2013), Braghetto *et al.* (2012), Zachariah *et al.* (2013), Catheline *et al.* (2013) and Brethauer *et al.* (2009) who estimated weight loss 57% of overweight. The studies carried out by Braghetto *et al.* (2012) and Zachariah (2013) are remarkable because although BMI in those studies was respectively 33 and 32, the permission of surgery and manipulation of the digestive system was issues, which is debatable. The study conducted by Sieber *et al.* (2014) included two groups of patients who had undergone LSG as the certain cure. The difference between the two groups was that group 1 had never undergone the manipulation of the digestive system while group 2 had undergone unsuccessful laparoscopic gastric banding (16 patients, 59%) lack of appropriate weigh loss (11 patients, 40% weight loss), banding (10 patients, 37%). In comparing the two groups of the patients, this is remarkable that the patients of both group did not lose a remarkable amount of weight and there was no significant difference between them.

Now a days, LSG is used as a certain treatment for obesity more than before. Therefore, the long-term outcomes of this method on weight loss should be evaluated and compared with other methods. Twelve studies out of 16 reported weight reduction after LSG as the certain treatment. In those studies, average pre-surgical BMI was 44 and the average weight loss during 5 years after the surgery was 57% of overweight which is indicated in Table 1. Taking into consideration these results, it is reasonable that average pre-surgical BMI is lower in groups undergoing certain surgery because patients of other groups had higher BMI and underwent LSG in order to reduce their weight before the second stage of the surgery. The percentage of weight loss in 5 years after the surgery in the certain surgery group was lower than that of the other group though. Sleeve size in this group of patients was smaller than those undergone LSG as a part of treatment method.

A possible explanation for this issue is that patients who had undergone LSG as a stage method lost a major part of their weight due to having high BMI before surgery, therefore, they experienced a higher percentage of weight loss after the surgery. One of the issues that plays an important role in losing weight after SG may be

the changes in the levels of plasma ghrelin which is the only environmental hormone known in absorbing nutrients and increasing appetite.

In sleeve gastrectomy, gastric fundus as the most important region of producing ghrelin cells is completely removed. Therefore, it is expected that les hunger occurs. Among the literature, only 3 studies focused on levels of plasma ghrelin before and after surgery during continuous follow-ups (Bohdjalian *et al*., 2010; Karamanakos *et al*., 2008; Cohen *et al*., 2005). All of these studies confirmed this hypothesis that SG leads to a reduction in the level of plasma ghrelin after surgery.

It is obvious that LSG leads to weight decrease which remains stable during the first 5 years after the surgery and during this time there is a high tendency to lose weight. Over 6 and more years, the percentage of weight decrease is <5 year; however, 50% of them have stable weight. Except for the study carried out by Eid *et al*. (2012) in which this issue is not true during 7 year after the surgery and this rate was 43%. This decrease in weight over 6 year and after it cannot be attributed to weight regain.

It can be stated that LSG can be an acceptable method and solution as an initial method of manipulating the digestive system and as a stage method for patients with high risk among other methods. Since only a small number of patients about 500 patients, were continuously followed up, it cannot be stated that weight decrease percentage over the following years is due to inefficiency of this method but other factors can affect this issue, because weight stays more stable over these 5 year and even more.

CONCLUSION

LSG may be used as a stage method in patients with high risk or as an initial method to change and manipulate the digestive system. The results of the present review indicated that weigh decrease percentage occurs over 5 years or even a little more after the surgery and this weight decrease stays stable therefore, it can be used as a method to treat obese individuals at risk.

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