Metabolic effects of combined sleeve gastrectomy, omentectomy and liposuction: Chance outcome or sound logic?

Krishnan Swaminathan, Arumugasamy SureshKumar, Anandharajan SathishLal

Citation: Swaminathan K, SureshKumar A, SathishLal A (2014) Metabolic effects of combined sleeve gastrectomy, omentectomy and liposuction: Chance outcome or sound logic? *Diabesity in Practice* **3**: 18–22

Article points

1. The performance of bariatric surgery has increased to help address the worldwide problem of obesity and type 2 diabetes.
2. There is evidence that sleeve gastrectomy, omentectomy liposuction each provide some metabolic benefits against a background of diabetes, although the evidence varies between the procedures.
3. It is unclear whether the weight-lowering and metabolic effects seen in this case study were due to the combined effects of the three procedures.

Key words

- Gastric bypass
- Liposuction
- Sleeve gastrectomy

Authors

Professor Krishnan Swaminathan is Consultant Endocrinologist, Arumugasamy SureshKumar is Surgical Gastroenterologist and Anandharajan SathishLal is Consultant Plastic Surgeon, all at the Apollo Specialty Hospital, Madurai, India.

Obesity is a major public health problem worldwide, and increasingly so among people with type 2 diabetes. The performance of bariatric surgery has risen to help manage this problem. Laparoscopic standard Roux-en-Y gastric bypass and laparoscopic sleeve gastrectomy are two of the main surgical procedures most often used to promote weight loss. In this article, the authors describe the case of a man with a 4-year history of poorly controlled diabetes who was successfully managed by combined sleeve gastrectomy, omentectomy and liposuction. Possible molecular explanations for the observed reversal of type 2 diabetes are discussed alongside prevailing literature on the topic.

A 46-year-old South Indian male with a body mass index of 36 kg/m^2 presented to us with a 4-year duration of poorly controlled type 2 diabetes, hypertension and microalbuminuria. His medication list included 140 units/day of insulin, 100 mg/day of vildagliptin (a dipeptidyl peptidase-4 inhibitor), 1 g/day of metformin, 10 mg/day of enalapril (for the treatment of hypertension) and 20 mg/day of atorvastatin (a blood cholesterol-lowering agent). Blood investigations revealed a fasting glucose of 180 mg/dL, glycosylated haemoglobin (HbA_{1c}) of 97 mmol/mol (11%), low-density lipoprotein of 210 mg/dL (5.4 mmol/L), high-density lipoprotein of 23 mg/dL (0.5 mmol/L) and fasting triglycerides of 300 mg/dL (3.3 mmol/L). Blood pressure was recorded at 150/90 mmHg. Insulin injection sites and techniques were satisfactory. Various treatment options were discussed, including further lifestyle changes, glucagon-like peptide-1 (GLP-1) receptor agonists and metabolic surgery.

The patient decided to elect for sleeve gastrectomy with omentectomy but, in addition, wanted to explore the option of liposuction to contour his abdominal flanks. Detailed counselling was given about the lack of evidence with combined sleeve gastrectomy and liposuction, but the patient was still keen for a combined procedure, fully understanding the positive and negative implications.

Power-assisted liposuction was performed with 1800 mL of lipoaspirate (*Figure 1*) from the lower abdominal wall and flanks. This was followed by a laparoscopic sleeve gastrectomy (*Figure 2*) and omentectomy. Post-operative recovery was uneventful. Insulin requirements reduced to 20 units/day within 2 weeks of surgery.

Figure 1. Lipoaspirate from the abdominal flanks.

By the end of 3 months, a 15 kg weight loss (50% of excess body weight) was documented. The man needed no insulin, and glycaemic control was maintained on 1 g metformin/day. Antihypertensive medication was withdrawn under close supervision. Five months after the operation, his glycaemic control had improved to an HbA_{1c} level of 53 mmol/mol (7%), blood pressure was 130/80 mmHg without antihypertensive medication, and microalbuminuria had completely reversed. The man is now managed under close long-term supervision.

Discussion

We here report impressive metabolic effects in a South Indian male 5 months after a combined sleeve gastrectomy, omentectomy and liposuction against a background of poorly controlled diabetes, large doses of insulin, hypertension and body image issues. Whether the success of this combination procedure is wishful experimenting or the result of sound logic remains to be seen.

Laparoscopic sleeve gastrectomy

Bariatric surgery is one of the fastest growing procedures worldwide, with an absolute growth rate in Asia of 449% over a 5-year period (Lomanto et al, 2012). Laparoscopic sleeve gastrectomy (LSG) has also gained popularity in Asia, showing a relative increase of 24.8 at the expense of laparoscopic adjustable gastric banding. Sleeve gastrectomy is technically easier to perform than Roux-en-Y gastric bypass surgery, as it does not require multiple anastomoses, and is considered to be less drastic by patients. It is thought to be safer in the intermediate term, with less risk of protein and mineral malabsorption (Moon Han et al, 2005; Felberbauer et al, 2008).

Mounting evidence suggests that the mechanisms of weight loss and the metabolic effects after sleeve gastrectomy may not be only related to gastric restriction, but also to neurohormonal changes. Studies have shown markedly reduced levels of ghrelin (a hunger-stimulation peptide), leptin (an adipokine that plays a key role in regulating energy intake and expenditure) and amylin (a peptide hormone that slows gastric emptying and promotes satiety), along with increased levels of GLP-1 in people who have undergone sleeve gastrectomy (Dimitriadis et al, 2013). However, a recent meta-analysis of five worldwide randomised controlled trials demonstrated that laparoscopic Roux-en-Y gastric bypass (LRYGB) is more effective than LSG for weight loss, and is associated with greater reductions in insulin resistance and remission of type 2 diabetes (Chouillard et al, (2011). In a systematic review of fifteen randomised controlled trials of durations ranging from 6 months to 3 years, the remission rate for type 2 diabetes with LSG ranged from 26.5–75%, showing that the role of LSG in the treatment of type 2 diabetes requires further investigation (Trastulli et al, 2013).

It is, therefore, reasonable to consider novel procedures that can have an additive effect on metabolic parameters without causing additional comorbidities.

Omentectomy

There are theoretical advantages to performing omentectomy in combination with other procedures to maximise weight loss and improve insulin sensitivity. Increased visceral fat promotes low-grade inflammation and contributes to the risk of metabolic syndrome. The current evidence for omentectomy, however, is ambiguous as it is limited by the small number of individuals and mixture of subjects with and without diabetes included in the study groups. In a recently published randomised

Figure 2. A laparoscopic sleeve gastrectomy specimen.

Page points

1. Sleeve gastrectomy is technically easier to perform than Roux-en-Y gastric bypass surgery and is thought to be safer.
2. Increasing evidence suggests that the mechanisms of weight loss and the metabolic effects after sleeve gastrectomy may not be only related to gastric restriction, but also to neurohormonal changes.
3. There are theoretical advantages to performing omentectomy to maximise weight loss and improve insulin sensitivity, but the practical evidence is limited and ambiguous.

Page points

1. There is very limited evidence on the beneficial effect of liposuction on insulin resistance and vascular inflammation.
2. It is not certain whether or not the impressive weight-lowering and metabolic effects observed in this case study 5 months post-operatively were due to the combination of procedures.
3. Long-term follow-up of this individual is needed to ascertain whether the metabolic improvement will be transient or permanent.

prospective study comparing the outcomes of patients with morbid obesity submitted to undergo sleeve gastrectomy with or without omentectomy, body mass index and levels of insulin, interleukin-6 (IL-6) and high-sensitivity C-reactive protein (hs-CRP) each decreased significantly in both groups compared to baseline (Sdralis, 2013). However, addition of omentectomy to LRYGB and laparoscopic adjustable gastric bypass has shown favourable effects on glucose homeostasis, lipid levels and adipokine profiles in at least some select studies (Thörne et al, 2002; Dillard, 2013). Whether there could be differential effects on glucose homeostasis depending on the type of bariatric surgery performed with omentectomy remains to be seen.

Liposuction

Liposuction has been proposed as a potential treatment for the metabolic complications of obesity (*Figure 1*). There is very limited evidence on the beneficial effect of liposuction on insulin resistance and vascular inflammatory parameters. In a small study of 14 women who underwent large volume liposuction, reductions in body weight, fat mass, systolic blood pressure and fasting insulin levels were observed over a 4-month period (Giese, 2001). In another study of premenopausal obese women undergoing single, large-volume liposuction, subjects were found 6 months after the operation to be less insulin resistant with improved lipid profiles and inflammatory markers (Giugliano, 2004). However, such results need to be tempered with both short- and long-term follow-up studies that show no benefit in metabolic factors with large-volume liposuction (Klein, 2004; Mohammed, 2008).

Conclusion

Our subject had significant insulin resistance based on his phenotype and insulin requirements. We felt that omentectomy could contribute to additional metabolic benefits in this clinical scenario. However, the omentum has other functions and currently, though no major complications have been reported, we do not have data on long-term outcomes in large groups of patients post-omentectomy. Therefore, our patient was counselled in detail prior to getting informed consent. The decision to undergo liposuction was made by the patient for cosmetic reasons, though he understood that there is no long-term evidence of associated long-term metabolic benefit. Whether the impressive weight-lowering and metabolic effects in our subject 5 months post-operatively were due to combined effects of all the procedures together is uncertain, but definitely gives food for thought. Long-term follow-up of our patient is mandatory to ascertain whether the metabolic effects will be transient or permanent. ■

Funding

This research received no funding grants.

Acknowledgements

Dr Bala Reddy and Dr Jayaprakash at the Apollo Specialty Hospital, Madurai are acknowledged for their support in producing this article.

Chouillard EK, Karaa A, Elkhoury M et al (2011) Laparoscopic Roux-en-Y gastric bypass versus laparoscopic sleeve gastrectomy for morbid obesity: case-control study. *Surg Obes Relat Dis* **7**: 500–5

Dillard TH, Purnell JQ, Smith MD et al (2013) Omentectomy added to Roux-en-Y gastric bypass surgery: a randomized, controlled trial. *Surg Obes Relat Dis* **9**: 269–75

Dimitriadis E, Daskalakis M, Kampa M et al (2013) Alterations in gut hormones after laparoscopic sleeve gastrectomy: a prospective clinical and laboratory investigational study. *Ann Surg* **257**: 647–54

Felberbauer FX, Langer F, Shakeri-Manesch S et al (2008) Laparoscopic sleeve gastrectomy as an isolated bariatric procedure: intermediate-term results from a large series in three Austrian centers. *Obes Surg* **18**: 814–8

Giese SY, Bulan EJ, Commons GW et al (2001) Improvements in cardiovascular risk profile with large-volume liposuction: a pilot study. *Plast Reconstr Surg* **108**: 510–9

Giugliano G, Nicoletti G, Grella E et al (2004) Effect of liposuction on insulin resistance and vascular inflammatory markers in obese women. *Br J Plast Surg* **57**: 190–4

Klein S, Fontana L, Young VL et al (2004) Absence of an effect of liposuction on insulin action and risk factors for coronary heart disease. *N Engl J Med* **350**: 2549–57

Lomanto D, Lee WJ, Goel R et al (2012) Bariatric surgery in Asia in the last 5 years (2005–2009). *Obes Surg* **22**: 502–6

Mohammed BS, Cohen S, Reeds D et al (2008) Long-term effects of large-volume liposuction on metabolic risk factors for coronary heart disease. *Obesity (Silver Spring)* **16**: 2648–51

Moon Han S, Kim WW, Oh JH (2005) Results of laparoscopic sleeve gastrectomy (LSG) at 1 year in morbidly obese Korean patients. *Obes Surg* **15**: 1469–75

Sdralis E, Argentou M, Mead N et al (2013) A prospective randomized study comparing patients with morbid obesity submitted to sleeve gastrectomy with or without omentectomy. *Obes Surg* **23**: 965–71

Thörne A, Lönnqvist F, Apelman J et al (2002) A pilot study of long-term effects of a novel obesity treatment: omentectomy in connection with adjustable gastric banding. *Int J Obes Relat Metab Disord* **26**: 193–9

Trastulli S, Desiderio J, Guarino S et al (2013) Laparoscopic sleeve gastrectomy compared with other bariatric surgical procedures: a systematic review of randomized trials. *Surg Obes Relat Dis* **9**: 816–29