

## Use of Liraglutide in a Tertiary Bariatric Clinic: A Case Series

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### Abstract

Liraglutide is a glucagon-like peptide-1 analogue approved for obesity management. In controlled clinical trials, high dose liraglutide (3.0 mg) has previously demonstrated efficacy and safety as a pharmacological option for weight loss in patients with obesity. The study objective was to describe various clinical scenarios where high dose liraglutide was used and led to positive outcomes in a tertiary bariatric clinic. Data was retrospectively collected from a review of patient charts. Unique cases of liraglutide use in both short- and long-term scenarios were reported. Short-term usage is observed in patients using liraglutide for weight loss prior to bariatric surgery or other medical treatments. Long-term liraglutide is used as an alternative to bariatric surgery or to treat weight recidivism in post-bariatric surgical patients. The experience in bariatric clinics has proved liraglutide is a useful adjunct to multidisciplinary diet and exercise interventions.

### Keywords

Bariatric surgery, Tertiary clinic, Liraglutide, Saxenda, Obesity, Weight loss

### Abbreviations

BMI: Body Mass Index; IVF: *In-Vitro* Fertilization; PCOS: Polycystic Ovarian Syndrome; RYGB: Roux-en-Y Gastric Bypass; SG: Sleeve Gastrectomy

### Introduction

Obesity is an increasingly worsening epidemic, affecting a large proportion of the global population. Worldwide, it has been reported that at least 30% of men and 35% of women are classified as obese. Furthermore, individuals with obesity have an increased likelihood to develop cardiovascular diseases [1].

Strategies to prevent obesity include, but are not limited to tobacco cessation, prudent dietary patterns, dietary quality, community prevention, and reducing sedentary behaviours [2]. However, for the purpose of weight loss, exercise training through physical activity has shown to be not effective in promoting clinically significant weight loss [3]. Surgical interventions, such as Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy (SG), are highly effective for the treatment of severe obesity [4]. However, these are generally reserved for patients with severe obesity who have failed with other weight loss strategies. Weight recidivism following bariatric surgery also remains an issue [5]. Thus, there is a

need for adjuncts or alternatives to bariatric surgery that can promote weight loss or maintain weight loss after bariatric surgery.

Liraglutide is a glucagon-like peptide-1 receptor agonist and was initially approved for the management of type 2 diabetes at a lower dose (1.8 mg; trade name -*Victoza*<sup>®</sup>). In 2015, high-dose liraglutide (3.0 mg; trade name -*Saxenda*<sup>®</sup>) was approved for chronic weight management in adults with obesity. As a result of its incretin effect, liraglutide stimulates insulin release from pancreatic beta cells in a glucose-dependent manner. Simultaneously, it also inhibits glucagon secretion, improving glucose homeostasis. Furthermore, liraglutide has been shown to slow gastric emptying via autonomic inhibition of vagal activity and reduces hunger and increases satiety [6] by way of signalling the hypothalamus (the hunger and satiety center).

Liraglutide can be utilized in various patient scenarios as a primary treatment for weight loss. It can also be used as a bridge to bariatric surgery or other medical procedures, and for postoperative weight recidivism. In this series, six cases of liraglutide use at a tertiary bariatric clinic are presented.

## Material and Methods

A retrospective review of patients from the University of Alberta Adult Bariatric Specialty Clinic was performed. All cases were chosen based on liraglutide treatment for weight management in association with the bariatric clinic. Consent was received from all participants to publish details of their respective cases, and the study was approved by the University of Alberta Health Research Ethics Committee. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Table 1 summarizes the patient characteristics and therapeutic outcomes of the patients included in the study.

**Table 1:** Summary of patient characteristics and outcomes after liraglutide treatment.

Characteristic	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Gender, male/female	female	female	male	female	female	female
Age, years	26	39	31	29	51	39
Dosage of liraglutide, mg	3.0	3.0	3.0	1.8	3.8	3.0
BMI, kg/m <sup>2</sup>						
Pre-treatment	45.0	83.0	39.4	65.7	35.0	52.7
Post-treatment	31.0	57.4	28.2	54.6	27.4	34.0

## Case Reports

### Case 1: Significant weight loss on liraglutide prior to bariatric surgery

A 26-year old female had an initial body mass index

(BMI) of 45 kg/m<sup>2</sup>. The patient conveyed interest in losing weight while awaiting bariatric surgery and was prescribed liraglutide to augment her weight loss efforts. The patient had a significant decline in hunger, reduced her snacking, slowed her pace of eating, and had better control of eating behaviours (noting higher impulse control). The patient had mild transitory side effects such as dyspepsia, decreased bowel routine, and mild dysgeusia. She lost a significant amount of weight and had a preoperative BMI of 31 kg/m<sup>2</sup>. Despite this remarkable weight loss, the patient still wished to pursue bariatric surgery as she did not want to remain on lifelong medication. She successfully underwent SG and reached a postoperative stable BMI of 25.3 kg/m<sup>2</sup>.

### Case 2: Liraglutide as a bridge to bariatric surgery for extreme obesity

A 39-year old female was assessed for extreme obesity with an initial BMI of 83 kg/m<sup>2</sup>. It was recommended that the patient lose a significant amount of weight preoperatively to enable bariatric surgery. The patient was prescribed liraglutide while decreasing caloric intake with partial meal replacements. Eight months following, the patient's BMI was 73 kg/m<sup>2</sup> and she began complete meal replacement to promote further weight loss. Subsequently, her weight decreased to a BMI of 57.4 kg/m<sup>2</sup>. The patient successfully underwent RYGB without complication.

### Case 3: Long-term liraglutide for weight loss

A 31-year old male started liraglutide treatment at a BMI of 39.4 kg/m<sup>2</sup>. The patient noted manageable side effects such as nausea, mild heartburn, headaches, and constipation. Three months later, the patient's BMI decreased to 33.6 kg/m<sup>2</sup>, and he initially conveyed a preference for bariatric surgery rather than long-term liraglutide therapy. However, the patient ultimately cancelled plans for bariatric surgery as a result of concerns over postoperative dietary restrictions. He opted to remain on liraglutide therapy due to its greater flexibility in lifestyle and behaviour. Nine months after beginning liraglutide, the patient's BMI was further reduced to 28.2 kg/m<sup>2</sup>. He was subsequently discharged from the clinic and continues long-term liraglutide therapy.

### Case 4: Weight recidivism due to poor access to liraglutide

A 29-year old female was assessed in clinic with an initial BMI of 65.7 kg/m<sup>2</sup>. The patient was started on liraglutide as an adjunct to lifestyle modifications, which resulted in a significant reduction in hunger, decreased food-seeking behaviours, and reduced caloric intake. On liraglutide, the patient's weight decreased to a BMI of 57.2 kg/m<sup>2</sup>. However, the patient was paying out-of-pocket for liraglutide and was struggling with the associated financial burden. As a result, the patient discontinued liraglutide and her BMI increased to 63.5 kg/m<sup>2</sup>. She consulted with her bariatric physician and indicated that she remained surgically focused. She elected to go back on liraglutide but was advised to use a lower dose of 1.8 mg subcutaneously daily to reduce costs, while using partial meal replacement. With this option, she again reduced her BMI to 54.6 kg/m<sup>2</sup>. The patient then successfully underwent RYGB.

### Case 5: Weight recidivism after bariatric surgery treated with liraglutide

A 51-year old female had a preoperative BMI of 44 kg/m<sup>2</sup> prior to RYGB. Postoperatively, the patient successfully reduced her BMI to 23 kg/m<sup>2</sup>. Over time, she experienced weight recidivism and her BMI increased to 35 kg/m<sup>2</sup>. Initially, after RYGB, the patient was compliant with dietary restrictions to promote weight loss; however, the year prior to her re-engaging with the bariatric clinic, she began excessively grazing, regularly consuming liquid calories, and increasing her intake of calorie-dense foods. Following this, she began a dietary plan and liraglutide therapy that led to reduced daily caloric intake, less liquid calories, and decreased grazing behaviours. She achieved a stable BMI of 27.4 kg/m<sup>2</sup>.

### Case 6: Liraglutide for weight loss to qualify for *in-vitro* fertilization

A 39-year old female was assessed for severe obesity, with an initial BMI of 52.7 kg/m<sup>2</sup> and ongoing fertility issues due to polycystic ovarian syndrome (PCOS). She wished to pursue *in vitro* fertilization (IVF); however, she was advised from a fertility clinic that her BMI had to be below 35 kg/m<sup>2</sup> due to poor ovarian response with severe obesity. The patient wanted to start fertility treatment as soon as possible due to her advancing age. While bariatric surgery was discussed, the long wait times discouraged her from seeking it. She would also be required to wait 18 months postoperatively before attempting conception. Thus, the patient elected for liraglutide therapy. The patient did well, noting minimal side effects. At 10 months, with her BMI decreased to 37 kg/m<sup>2</sup>, the patient began complete meal replacement to facilitate further weight reduction. She was able to reduce her BMI to 34 kg/m<sup>2</sup> and successfully underwent IVF.

## Discussion

In all these cases, significant weight loss was achieved in patients treated with liraglutide. Short-term use was effective for weight loss in patients with severe obesity, allowing these patients to have bariatric surgery that may otherwise have proved difficult. Similarly, liraglutide was effective at reducing weight substantially enough to enable patients to receive fertility treatment. In some cases, long-term liraglutide treatment was found to be an effective alternative to bariatric surgery for weight loss and/or to manage weight recidivism post-operatively.

There are multiple studies both short - [7] and long-term [8] that have demonstrated the efficacy of liraglutide for chronic weight management. There is also evidence that liraglutide augments further weight loss after initial weight loss strategies have been implemented [9]. Similarly, a retrospective study has shown that patients with prior bariatric surgery benefited from high dose liraglutide for the management of postoperative recidivism and weight plateau [10].

Another potential use of liraglutide is for weight loss prior to specific medical or surgical treatment. Case 6 demonstrates successful weight loss to allow for IVF treatment. High BMI

has also been associated with negative patient outcomes after certain medical interventions. For example, one study demonstrated poorer outcomes for ventral hernia repair in patients with high BMI [11]. Thus, liraglutide use may prove useful in improving the outcomes of many clinical interventions.

While this case series provides scenarios where liraglutide may potentially be a useful pharmacological adjunct in bariatric clinics, there are some caveats. Side effects such as gastrointestinal distress, nausea and vomiting have been linked to liraglutide use. While these adverse effects are mild and transient, they may still lead to intolerability and withdrawal from treatment in some [12]. Liraglutide may also be associated with gastroparesis and esophageal dysmotility which can affect upper gastrointestinal investigations [13]. Another barrier to liraglutide use, especially long-term, is accessibility due to cost. The average cost of liraglutide 3.0 in Canada is approximately \$400.00 CAD per month. In our cases, one patient experienced weight recidivism due to poor access.

There are limitations to these case series. The data were collected retrospectively, and only specific cases deemed of didactic interest were selected. However, this case series is not meant to be a comprehensive analysis on the outcomes of liraglutide, which have been studied in multiple randomized controlled trials. The outcomes of this study provide insight on unique patient scenarios in a bariatric clinic where liraglutide has proven to be useful for weight management.

## Authors Contribution

R.M performed the chart reviews. D.T and J.D were the major contributors in writing the manuscript. All authors read and approved the final manuscript.

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## Conflict of Interests

A.S has received speaker and consulting honorarium from Novo Nordisk and Valeant. R.M has received speaker and consulting honorarium from Novo Nordisk. Authors D.T, J.D, and S.K have no conflict of interest to disclose.

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