Gastric Botulinum Toxin-A Application for Weight Loss Therapy

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ABSTRACT

Background/Aims: *The aim of this study is to share the results of gastric botulinum toxin (BTX) application in individuals who are overweight or type 1 obese without comorbidity.*

Materials and Methods: *In this study, 13 patients were included who were enrolled for gastric BTX application for the first time. A total of 300 U of BTX-A (Allergan Botox®1 vial 100 U) was diluted with 8 mL of 0.9% NaCl saline, and antrum (100 U to 8 spots), corpus (100 U to 8 spots), and fundus (100 U to 8 spots) regions were injected intramuscularly. Patients were given a 1200-calorie low-carb diet and this was followed for 6 months.*

Results: *Gastric BTX application was applied to 13 patients with a mean age of 40.9 ± 5.2 (85% female), a mean body mass index (BMI) of 28.41 ± 1.4 kg/m² (26-31.6) and a mean excess weight of 10.1 ± 3.6 kg. As a result of the 6-month follow-up, only four patients (30.8%) were able to lose more than 50% of their excess weight (6-15 kg). Six patients (46.2%) could not lose any weight. There was an average decrease of 3.3 kg in the weight of patients before and after BTX application (P = .03). A mean decrease of BMI was detected, 1.17 kg/m² (P = .032).*

Conclusion: *It was concluded that the application of gastric BTX for weight loss does not provide effective results.*

Keywords: *Endoscopy, botulinum toxin A, weight loss*

INTRODUCTION

Obesity is a serious public health problem that is rapidly increasing in the world and in our country. According to the latest data of the Ministry of Health, more than 30% of the adult population in our country is obese.[1] The first approach in the treatment of obesity is diet and exercise. For people who fail to lose weight by diet and exercise, the most effective method is bariatric surgery.[2] Bariatric surgery criteria were established by the National Institute of Health (NIH) in 1991. According to the NIH, if an individual who cannot achieve success with methods such as diet and exercise and has a body mass index (BMI) above 40 kg/m² or if their BMI is in the range of 35-40 kg/m² and has two accompanying obesity-related diseases, that individual is a candidate eligible for bariatric surgery.[3] There are many individuals in the community who do not meet the criteria for surgical treatment, but are overweight in the range of BMI 25-30 kg/m², or type 1 obese in the range of BMI 30-35 kg/m². For these individuals who cannot succeed with diet and exercise, the search for an effective non-surgical method continues. Endoscopic applications specially are a continuous research subject. Possible risks of surgical methods and problems such as nutritional deficiency in the long term highly attract the interest of patients and practitioners to endoscopic methods.[4]

One of the endoscopic applications that has been widely used in our country recently is gastric botilinum toxin (BTX). BTX is a neurotoxin produced by the species of *Clostridium botulinum* bacteria.[5] This toxin has eight isotypes such as a, b, c1, c2, d, e, f and g. Type a, b, and c toxins are toxins associated with botulism in humans.[5] BTX-A isotype has been used in clinical practice for many years for the treatment of certain diseases.[6] These diseases range from dystonia to nystagmus and tremors and neuropathic pain.[6] In addition, BTX-A is used for the treatment of achalasia, a motility disorder of the gastrointestinal system. BTX-A inhibits the contraction of smooth and skeletal muscles by inhibiting the release of acetylcholine in the neuromuscular junction.[5] By inhibiting gastric motility with BTX-A injection into the stomach, gastric emptying is delayed. In this way, people are expected to lose weight by eating less by providing satiety for a longer period.[7] According to the limited number of studies in the literature, the question of whether gastric BTX application is effective on weight

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loss is controversial. In this study, our aim is to share the results of gastric BTX application in individuals who do not meet the criteria of bariatric surgery (overweight or type 1 obese without comorbidity).

MATERIALS AND METHODS

Ethics committee approval was received for this study (ATADEK 2019-20/5). Informed consent was obtained from all individuals. In 2019, 13 patients who underwent gastric BTX application for the first time and completed at least 6 months of follow-up care were included in the study. None of the patients had obesity-related comorbidity. Patients comprised individuals who tried diet and exercise programs but could not achieve effective weight loss. The procedure was applied to all patients using the same technique. In the endoscopy unit, under the guidance of an anesthesiologist, under sedation anesthesia (0.05 mg/kg midazolam, 1-2 mg/kg propofol), patients first underwent endoscopy (Olympus GIF-H180J). Patients were checked for any pathology in the stomach and duodenum. No unexpected pathology was detected in any patient. Subsequently, a total of 300 U of BTX-A (Allergan Botox ®1 vial 100 U) was diluted with 8 mL of 0.9% NaCl saline, and antrum (100 U to 8 spots), corpus (100 U to 8 spots), and fundus (100 U to 8 spots) regions were injected intramuscularly with 1 mL at each spot using a sclerotherapy needle (Boston Scientific 23-G 4 mm). Starting from the pre-pyloric region, patients were injected at 16 regions in the entire stomach. Patients were monitored for 1-2 hours after the procedure and were then discharged. No complications were detected in any of the patients. By providing a 1200-calorie low-carb diet and active life support, patients were provided follow-ups for 6 months. In the 3rd month, patients were also evaluated in terms of appetite and feelings of satiety after meals. Patient data that were recorded prospectively were analyzed retrospectively.

Statistical Analyses

Statistical analyses were done using SPSS (version 21, SPSS, Inc., Chicago, IL, USA). For the variables with normal distribution, mean with the standard deviation was used and for the variables without normal distribution, the median was used. For continuous variables, dependent sample T test or Wilcoxon test was used. *P* value <.05 was considered statistically significant.

RESULTS

Gastric BTX-A was applied to 13 patients with a mean age of 40.9 ± 5.2 (85% female), a mean BMI of 28.41 ± 1.4 kg/m^2 (26-31.6) and a mean excess weight of 10.1 ± 3.6 kg.

As a result of the 6-month follow-up, only four patients (30.8%) were able to lose more than 50% of their excess weight (6-15 kg). Three patients lost 25% of their excess

Table 1. Results on Weight and BMI with Gastric Botulinum Toxin Injection

Patients	Sex	Age	Weight (kg)	BMI	1 Month	3 Months	6 Months	Weight*	BMI*
1	F	43	81	28.4	79	75	75	−6	−2.1
2	M	43	82	28.5	82	83	82	0	0
3	F	34	97	30	96	97	97	0	0
4	F	43	83	28.1	79	75	75	−8	−2.7
5	F	29	76	26	76	77	76	0	0
6	F	48	83	29.4	75	72	68	−15	−5.3
7	F	37	71.6	27.4	65	62	64	−7	−3
8	F	41	74.8	27.2	75	75	74	0.8	−0.3
9	F	47	73	28.2	69	69	71	−2	−0.8
10	F	41	85	31.6	82	79	80	−5	−2.1
11	F	45	80	28	77	80	80	0	0
12	F	40	77	29	77	77	80	+3	+1.2
13	M	41	80	27.7	76	74	79	−1	−0.4

*Weight and BMI: difference before and 6 months after endoscopic injection.
BMI, body mass ındex (kg/m^2); F, female; M, male; weight (kg), weight before and monthly after the endoscopic injection.

weight during this period. Six patients (46.2%) could not lose any weight (Table 1).

At the end of the 6-month follow-up, there was a mean decrease of 3.3 kg in the weight of patients before and after BTX application ($P = .03$). When this comparison was made in terms of BMI, a mean decrease of 1.17 kg/m^2 was detected in patients after 6 months ($P = .032$).

In the evaluation made 3 months after BTX application, five patients (n =13.39%) stated that their appetite decreased, that they felt satiety for a longer period, and that this situation lasted for 1-1.5 months. Three of the five patients were in the group that lost more than 50% of their excess weight after 6 months of follow-up. The remaining eight patients stated that there was no change in their appetite and duration of satiety.

DISCUSSION

In the literature, there are three experimental studies that investigated the effect of BTX application in the stomach on weight loss and stomach functions. The first one is the study by Gui et al. where they compared the injection of BTX and saline into the gastric antrum in mice. After 10 weeks of follow-up, they detected more weight loss and less food consumption in the BTX group.[8] In a similar study conducted in our country, it was found that weight loss was observed for a temporary period and gastric emptying was accelerated in the scintigraphic study.[9] A similar study from Korea has recently been published, and a 6-week follow-up revealed significant weight loss in mice treated with BTX compared to the saline group.

BTX application to stomach in an obese patient was performed for the first time by Rolnikk et al. and it was published as a case study. In this study, 100 U BTX was applied to the pre-pyloric antral wall in a patient with a BMI of 31.4 kg/m^2 and a decrease of 8.9% was observed in the total BMI.[10] Later, the first clinical study was done by Garcia-Compean et al. In their study, Garcia-Compean et al. applied 100 U BTX to 8 spots in the antrum in 12 obese individuals, and they did not detect any significant difference in terms of weight loss after 8 weeks of follow-up.[11] Foschi et al. administered saline to one group of patients and to another group 200 U of BTX was applied to the antrum, and both groups were supported with a 1200-calorie diet. During the follow-up, the BTX group lost an average of 11.2 kg and the saline group lost 5.7 kg.[12] of excess weight. In a study by Liu et al., 300 and 100 U BTX were compared and it was detected that 300 U provided more weight loss.[13] In another study by Topazian et al. including 60 patients, patients were divided into four groups and saline, 100, 300 and 500 U BTX injections were as administered using guided ultrasound. After 16 weeks of follow-up, there was no difference in weight loss in the groups.[14]

Two meta-analyses have been published on gastric BTX application. The first of these is the study published by Bang et al. in 2015. In this meta-analysis, seven studies were evaluated and BTX application was found to be more effective than placebo.[15] The second meta-analysis was published in 2017 and it was concluded that the application of BTX to stomach has no effect on weight loss.[16]

In our study, at the end of the 6-month follow-up after 300 U of BTX application, when the patients were compared according to their weight status, there was an average decrease of 3.3 kg ($P = .03$). Six patients could not lose any weight. However, four patients were able to lose more than 50% of their excess weight (6-15 kg). The remaining three patients were able to lose 25% of their excess weight. When this comparison was made in terms of BMI, after 6 months, a decrease of 1.17 kg/m^2 was detected in patients ($P = .032$).

Gastric BTX application has recently become one of the frequently used weight loss methods in our country. The reason might be that it is non-invasive and perceived as a completely risk-free weight-loss therapy. In our study, no complications developed in the patients administered BTX. In fact, there were no serious side effects reported in clinical studies either. Only in one case report, total gastric necrosis after BTX application was reported which necessitated total gastrectomy.[17] In the report published in 2008 due to various indications for BTX application, the American Food and Drug Administration (FDA) reported 16 deaths due to respiratory arrest aspiration pneumonia.[17,18] From this perspective, gastric BTX should not be seen as a completely risk-free application.

In our study, only overweight and type 1 obese individuals without comorbidity were included. Morbidly obese individuals were not included. Participants received a single session of BTX application. With repeated BTX applications, no result has been obtained as to whether a more effective weight loss can be achieved in this study.

Our study was carried out in a small group of patients. In our study, a low-calorie diet was also given to patients after BTX application. When evaluated from this perspective,

it was concluded that the application of gastric BTX as a weight loss therapy does not provide effective results. Our study was small in size, so more research is needed to confirm the results in larger groups.

Ethics Committee Approval: This study was approved by the Ethics Committee of the Acıbadem University (ATADEK-2019/20).

Informed Consent: Written informed consent was obtained from the patients who participated in this study.

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