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ORIGINAL CONTRIBUTIONS

Good Clinical Practices on Argon Plasma Coagulation Treatment for Weight Regain Associated with Dilated Gastrojejunostomy Following Roux-en-Y Gastric Bypass: a Brazilian-Modified Delphi Consensus

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Abstract

Introduction Argon plasma coagulation (APC) alone is effective and safe at treating weight regain following Roux-en-Y gastric bypass (RYGB). However, technical details of the treatment vary widely among studies. Therefore, we aimed to create good clinical practice guidelines through a modified Delphi consensus, including experts from the collaborative Bariatric Endoscopy Brazilian group.

Methods Forty-one locally renowned experts were invited to the consensus by email. Experiences of > 150 APC-treated cases or authorship of relevant articles were the eligibility criteria. An initial questionnaire with short-answer questions was distributed to the experts. The organizing committee converted the responses into statements for an online 2-day voting webinar. Consensus was defined as more than 67% of positive answers. Three consecutive voting rounds were planned with discussion and statement refinements between rounds.

Results Thirty-seven experts fulfilled eligibility criteria and attended the live webinar voting. The total number of patients treated by the panel was 12,349. By the third round, all 79 statements reached consensus. The recommendations include the definition of dilated gastrojejunal anastomosis as ≥ 15 mm, minimum regain of 20% of the lost weight to indicate the APC therapy, 6 to 8 weeks as the ideal interval between ablation sessions, and stopping treatment when the stoma reaches < 12 mm of breadth.

Conclusions This consensus provides several recommendations based on a highly experienced panel of endoscopists. Although it covers most aspects of the treatment, the level of evidence is low for the majority of the statements. Therefore, bariatric endoscopists should be constantly attentive to new evidence on APC treatment.

Keywords Argon plasma coagulation · Obesity · Bariatric · Weight regain · Roux-en-Y gastric bypass

Key Points •The argon plasma coagulation is widely available and has recently been employed to reduce stoma size in patient with post-RYGB weight regain.

•Definitions, indications, contraindications, patient preparation, procedural techniques, and follow-up strategies lack standardization.

•This consensus provides several recommendations on the APC treatment based on a highly experienced panel of endoscopists.

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Introduction

As obesity rates escalate worldwide, the number of bariatric procedures also rises exponentially [1]. As of 2016, the estimated number of procedures performed reached 685,000, accounting for an 18% increase compared to the 2014 estimation [2]. Roux-en-Y gastric bypass (RYGB) is the second most commonly performed procedure worldwide but still the most common in Latin America [3]. It is a safe and effective procedure, but most patients recover part of the lost weight after reaching the nadir [4]. Among those, up to a

third regain a significant amount of weight, worsening quality of life, increasing health-related expenditure, and leading to the recidivism of related comorbid conditions [5–7].

Data show that such a condition is multifactorial as psychological, endocrine, social, and anatomical factors coexist. Nonetheless, reliable studies support the gastrojejunal anastomosis (GJA) dilation as one of the contributing anatomical factors [8, 9]. In this sense, level 1A evidence indicates that reducing the anastomosis size leads to enhanced weight loss [10]. However, most articles describe the use of endoscopic suturing devices, which are expensive, not widely available, and require general anesthesia and specific training with a longer learning curve.

In 2009, Ahmed Aly described the alternative use of argon plasma coagulation (APC) to address the stoma dilation [11]. Based on the observation from APC treatment for Barrett's esophagus—in which some patients developed fibrotic strictures—Aly demonstrated that the circumferential ablation of the gastric side of the GJA was capable of reducing the stoma size.

Since then, several studies, including multicenter series, randomized trials, and systematic reviews, have consistently shown that APC is effective and safe for this purpose [12–15]. However, technical details of the treatment vary widely among studies. Definitions, indications, contraindications, patient preparation, procedural techniques, and follow-up strategies lack standardization. Therefore, we aimed to create good clinical practice guidelines through a modified Delphi consensus, including experts from the collaborative Brazilian Bariatric Endoscopy (BEB) group.

Methods

The Delphi Process

The RAND Corporation developed the Delphi method in the 1950s for the United States Air Force as a straightforward decision-making tool [16]. Initially, it was meant to improve forecasting based on expert opinions. More recently, it has also been employed in medical literature as an objective method to collect and summarize group opinions [17–19]. There are four basic principles of the Delphi method: anonymity, iteration, controlled feedback, and statistical group response [20]. Firstly, a questionnaire is provided to the enrolled respondents. The answers are then summarized and anonymously redistributed to a discussion in the next round. That is an iterative process with usually three rounds.

The Modified Delphi Method

The original Delphi process was based on an in-person meeting. Due to the COVID-19 pandemic and the current regulatory social distancing guidelines, we modified the method to a webinar-based process. The study coordinators (MGN, LGQ, LB, ACF, JHF, VOB, AA, JCM, EG, HP, AT, TFS, MF) developed a survey with short-answer questions based on clinical experience and the available literature. This survey was distributed to Brazilian experts by email.

The responses supported the creation of multiple-choice questions, which composed the first questionnaire (first round). In a 2-day webinar-based meeting, the coordinators provided questionnaires to the participants for an online real-time voting. During this first round, the most relevant supporting literature was presented for voters, which was later used to provide the related grade of recommendation. For the subsequent rounds (second and third), questions were converted to statements based on the responses of the first voting. For each statement, the experts were asked to show their level of agreement using a 5-point Likert scale (1 = completely disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = completely agree). The anonymous responses to each statement were immediately provided to the respondents. Anonymity was ensured by configuring the online platform to provide deidentified answers. At the end of each round, the experts were free to discuss and to suggest refinements to the statements. After discussion, the study coordinators restructured the next round of voting statements seeking a greater level of agreement among the participants, using the same 5-point Likert scale. A total of three rounds were planned.

Consensus was defined as at least 67% of positive answers (either agree or completely agree). For a negative consensus (disagree or completely disagree), the statement was converted to denial in the subsequent round to seek a positive answer. That aimed at augmenting straightforwardness in the voting process. Figure 1 summarizes the proposal for this modified Delphi process. After reaching consensus, the coordinators assessed the grades of recommendation of the statements according to the Oxford Centre for Evidence-Based Medicine [21], as follows: grade A originated from consistent level 1 studies; grade B from level 2 or 3 studies, or extrapolation from level 1 studies; grade C from level 4 studies or extrapolation from level 2 or 3 ones; grade D originates from level 5 evidence or troublingly inconsistent or inconclusive studies of any level.

Expert Panel Selection

In Brazil, APC has been widely used over the last decade to address weight regain following RYGB. Therefore, Brazilian experts built up extensive experience in this field. The identification of Experts was primarily based on local recognition of a broad clinical experience. Primarily, study coordinators screened the collaborative Brazilian Bariatric Endoscopy network for eligible participants. This network

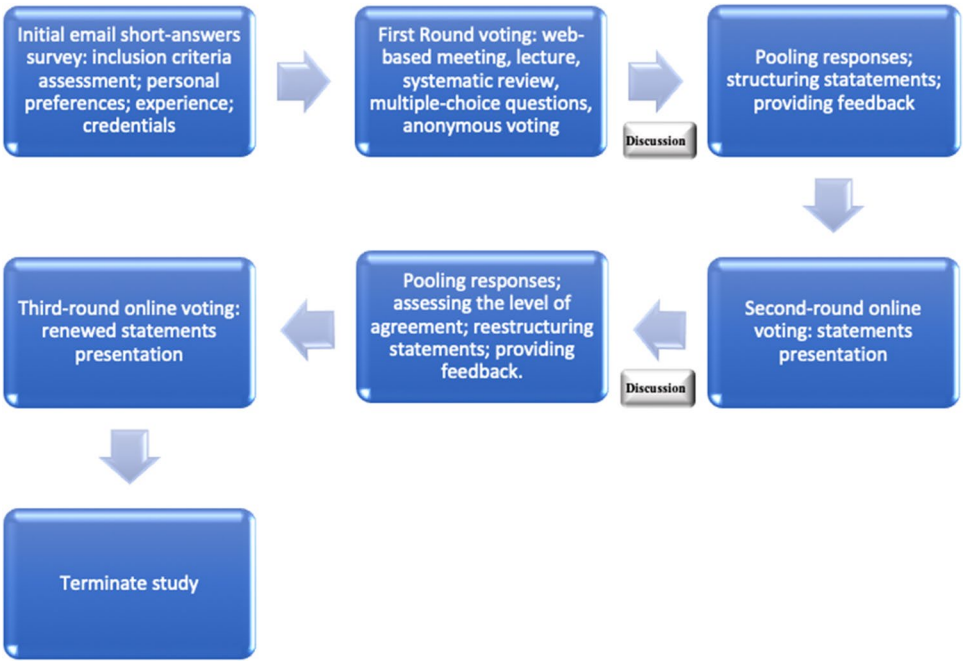

Fig. 1 The proposed methodology for the modified Delphi consensus

comprises more than 250 endoscopists actively working in the bariatric endoscopy field and have gathered before for similar purposes [22, 23]. The inclusion criterion for this study was a clinical experience comprising more than 150 APC patients. After inclusion, the experts were asked to name other potentially eligible professionals that were then screened for eligibility through the same email invitation process. Authorship of relevant studies was also considered for eligibility. Therefore, selected endoscopists were invited due to their significant contribution in the field despite the number of treated patients.

Conduct of the Survey

The initial survey included 58 short-answer questions covering seven aspects of the APC treatment: expert demographics; patient demographics; multidisciplinary team; preprocedural evaluation; equipment and settings; technique; and postprocedural care (Supplementary Material 1). The study coordinators sent the questionnaire by email to 41 Brazilian endoscopists actively working with bariatric endoscopy. The responses were due in 15 days. Answering this initial survey was considered a prerequisite for inclusion in the subsequent online voting rounds. The webinar-based meeting took place on April 20 and 21, 2021.

Supporting Systematic Literature Search

A systematic review of the available evidence was conducted by two independent researchers (VOB and LGQ). Literature was screened from inception to March 2021. The retrieved results were confronted to achieve a more sensitive strategy. A study coordinator reviewed the whole process (MGN). The search strategy is available as Supplementary Material 2. The systematic review results were distributed to all included experts via email before the first online voting to homogenize knowledge. The systematic review followed guidelines from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA statement) [24].

Results

Systematic Review

The search strategy retrieved 97 records from PubMed/MEDLINE, Embase, Central Cochrane, and gray literature. After duplicate removal, 91 were screened through title and abstract evaluation, among which 67 articles were excluded as they did not report APC treatment for post-RYGB weight regain. From the remaining 24 studies selected for full-text appraisal, eleven articles were excluded. Finally, 13 were included in the descriptive analysis (available in Supplementary Material 3). Figure 2 shows the enrollment flowchart and reasons for exclusion after full-text evaluation.

Initial Survey Responses

The study coordinators submitted the initial survey to forty-one experts by email. All of them answered before the due date. Among the 41 experts, two did not meet inclusion criteria, and two others missed the first online

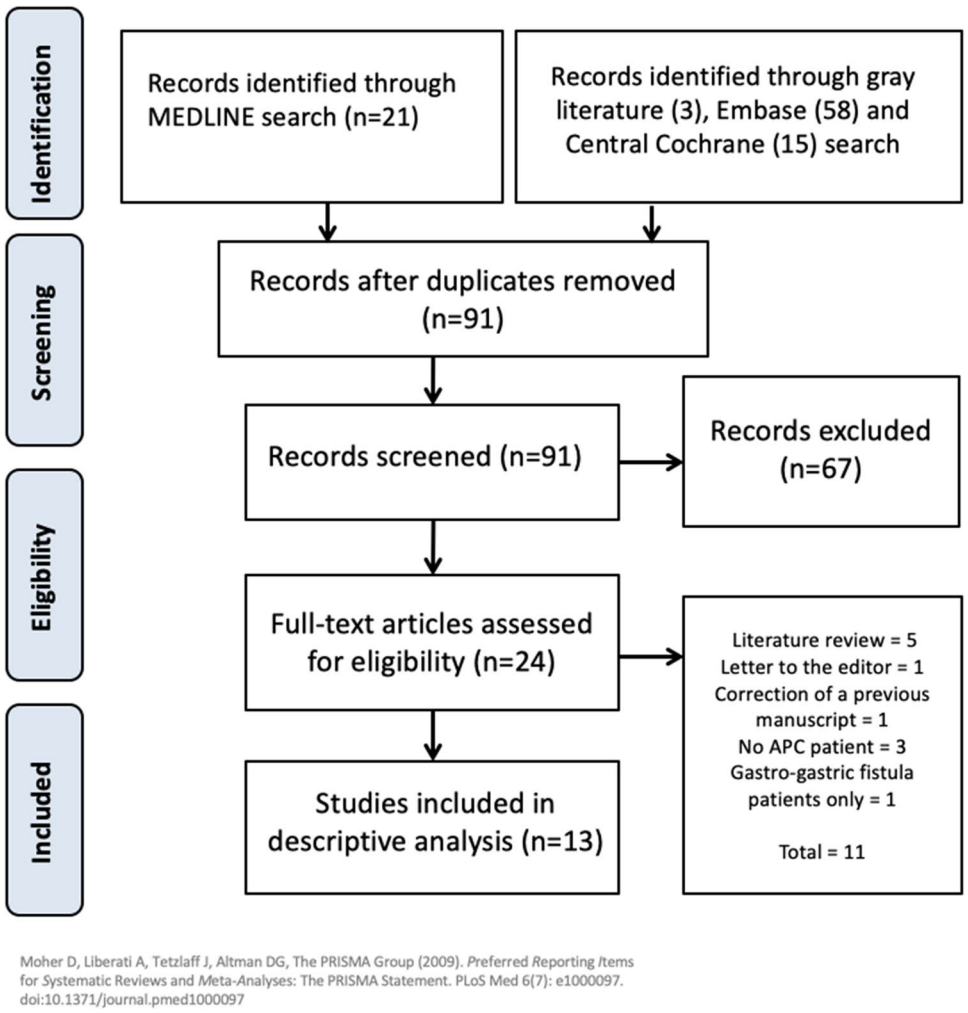

Fig. 2 The systematic review flowchart from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA statement) [24]

voting. Therefore, our consensus ultimately included 37 experts (27 with experience ≥ 150 cases), who participated in all voting rounds. Among the 58 short-answer questions, 15 concerned experts' and patients' demographics and patient outcomes. Therefore, those questions were not suitable for conversion into statements for the subsequent rounds.

Most experts were men (34 M / 3F), and the mean age was 45.1 ± 6.6 years old. Their average experience in the endoscopy field was 15.5 ± 7.3 years, and all were board-certified specialists. Ten experts practiced in academic centers while the remainder only in private settings. The total number of patients treated was 12,349. The mean number of sessions was 2.25/patient with a mean duration of 14.2 ± 6.5 min/session. The self-reported mean absolute weight loss (AWL) was 11.8 ± 3.6 kg, corresponding to 11.8 ± 3.8% total weight loss (%TWL).

As to adverse events (AEs), there were 173 cases (1.4%). Stricture was the most common one with 122 reports (0.98%), followed by bleeding (38 cases; 0.3%), perforation (11 cases; 0.08%), and persistent ulcer (2 cases; 0.016%). There was a single death after the APC treatment (0.00008%).

Online Voting

The remaining 43 short-answer questions were converted into 83 multiple-choice questions for the first online voting. The responses were summarized into 79 statements, composing the second questionnaire. In this second online voting, 72 statements reached consensus, and seven did not. The ones not reaching consensus are presented in Supplementary Material 4. Consensual assertions were kept in the last questionnaire to assess stability, while the remainder were modified based on the intervening discussion. Finally, all statements in the third questionnaire reached a consensus.

Table 1 outlines the consensual statements, while Fig. 3 summarizes the most relevant recommendations.

Table 1 Summary of all consensual statements for the APC treatment of post-RYGB weight regain associated with dilated gastrojejunostomy

Statements	Level of agreement	Grade of recommendation[21]
Required qualification		
Local regulatory certification for performing endoscopy is required	100%	D
Theoretical and practical hands-on courses is the minimum training required	100%	D
Multidisciplinary team		
A dietitian is required in the multidisciplinary team	97%	A
A bariatric endoscopist is required for evaluation and follow-up	100%	A (extreme plausibility)
A psychologist is recommended in the multidisciplinary team	97%	C
The endocrinologist is not required in the multidisciplinary team	91%	D
A physician nutrition specialist is not required in the multidisciplinary team	100%	D
A psychiatrist is not required in the multidisciplinary team	98%	D
A bariatric surgeon is not required in the multidisciplinary team	77%	D
A physical educator is not required in the multidisciplinary team	100%	D
Preprocedural workup		
An upper diagnostic endoscopy is required before APC treatment, but it may be performed as a same-session procedure	100%	B
For patients with weight regain undergoing an upper diagnostic endoscopy, the report should provide the measures of pouch and stoma but not suggest APC treatment	97%	D
An upper GI series is not necessary	100%	D
Abdominal ultrasound or abdominal computed tomography is not necessary	97%	D
A coagulation profile is required to perform APC treatment	83%	D
General lab tests (full blood count, electrolytes, renal panel) are required before APC treatment	85%	D
Gastric scintigraphy is not necessary	100%	D
Indications and contraindications		
Standard indications and definitions		
There is no minimum age for indication	83%	D
There is no maximum age for indication	94%	D
Dilated GJA is defined as diameter $\geq$ 15 mm	89%	B
The assessment of the anastomotic diameter requires the employment of an objective parameter (endoscopic ruler or foreign body forceps)	94%	B
A dilated stoma is a criterion for indication	97%	A
Weight regain $\geq$ 20% of the lost weight is a criterion for indication	98%	B
Time from surgery $\geq$ 18 months a criterion for indication	77%	C
Successfully attending the multidisciplinary visits is a criterion for indication	89%	D
Clinical complaints of delayed satiation or short-term satiety are criteria for indication	89%	D
The presence of co-morbid conditions (hypertension or diabetes) is not a necessary criterion for indication	94%	D
Absolute contraindications		
GJA diameter < 10 mm is an absolute contraindication	100%	A
GJA diameter < 12 mm is an absolute contraindication	92%	D
Current use of anticoagulation drugs not amenable to withholding is an absolute contraindication	86%	D
Severe erosive esophagitis (Los Angeles grades C and D) is an absolute contraindication	73%	D
Active anastomotic and marginal ulcers are absolute contraindications	100%	D
Uncontrolled psychiatric disorders are absolute contraindications	86%	D
The presence of a gastro-gastric fistula is an absolute contraindication for anastomotic APC ablation	80%	D
Severe anemia (Hb < 8 g/dL) is an absolute contraindication	88%	D
Dysplastic Barrett's esophagus is an absolute contraindication	82%	D

Table 1 (continued)

Statements	Level of agreement	Grade of recommendation[21]
Untreated AIDS is an absolute contraindication	97%	D
Pregnancy is an absolute contraindication	100%	D
Relative contraindications		
Gastric pouch < 2 cm is a relative contraindication	95%	D
Coagulopathy is a relative contraindication	98%	D
Migrated silastic ring is a relative contraindication	86%	D
Intact normal silastic ring (diameter < 15 mm) is a relative contraindication	78%	C
Chronic use of non-steroidal anti-inflammatory drugs is a relative contraindication	91%	D
Not contraindications		
Dilated silastic ring (diameter ≥ 15 mm) is not a contraindication	95%	D
Gastritis is not a contraindication	97%	D
Mild erosive esophagitis (Los Angeles grades A and B) is not a contraindication	97%	D
Long gastric pouch (> 7 cm) is not a contraindication	97%	C
Wide gastric pouch (> 5 cm) is not a contraindication	92%	C
Non-dysplastic Barrett's esophagus is not a contraindication	92%	D
Positive serology for HIV is not a contraindication	100%	D
Treated AIDS is not a contraindication	94%	D
Off-label indications		
Insufficient weight loss associated with a dilated stoma is an off-label indication	94%	D
APC treatment for optimization of weight loss before completing 18 postoperative months is an off-label indication	88%	D
Struggle to maintain weight or progressive weight regain associated with a dilated stoma is an off-label indication	97%	D
Dumping syndrome is an off-label indication	94%	C
Equipment and settings		
The minimum required setting is an endoscopy clinic with advanced life support equipment and a well-established referral protocol	94%	D
Any kind of gastroscope is suitable for APC treatment	95%	D
Routine CO_2 insufflation is recommended	80%	D
For Covidien (WEM, Covidien, Medtronic, Ribeirão Preto, Brazil) electrosurgical units, the suggested setting is power = 70–80 watts and flow = 2 L	100%	D
For ERBE (Erbe Elektromedizin GmbH, Tuebingen, Germany) electrosurgical units, the suggested setting is power = 45–60 watts and flow = 1–2 L	88%	D
Patient preparation		
Eight hours fasting is recommended before the APC ablation	91%	A
Routine preprocedural PPI is not recommended	85%	D
Technique		
The procedure may be performed under monitored anesthetic care	100%	B
An accompanying anesthesiologist is recommended	86%	D
Circumferential ablation is the standard approach	100%	A
Intraprocedural gas exchange is recommended	98%	D
Cessation of ablations is recommended when stoma size < 12 mm (Fig. 4)	94%	C
The proximal extension of the ablation is 1–2 cm	100%	B
Antispasmodic drugs are recommended if peristalsis creates technical difficulties	100%	D
Cardinal preprocedural marking is not routinely recommended	86%	D
Postprocedural care		
Liquid diet is recommended for at least two weeks	88%	D
Sucralfate and full-dose PPIs are routinely recommended	83%	D
Painkillers and antispasmodic drugs are only recommended if pain or cramps	100%	D
The recommended interval between ablation sessions is 6–8 weeks	100%	B

Table 1 (continued)

Statements	Level of agreement	Grade of recommendation[21]
Management of adverse events		
Endoscopic dilation is indicated only if consistent clinical presentation (refractory nausea and vomiting) AND stoma size < 10 mm	97%	D
Balloon dilation to 10–12 mm is the primary therapeutic approach to post-APC strictures	97%	D
Refractory stricture is defined as symptoms and stricture persistence after 3 balloon dilation sessions (from 10–15 mm)	100%	D
The primary approach to refractory strictures is endoscopic stricturotomy	92%	D

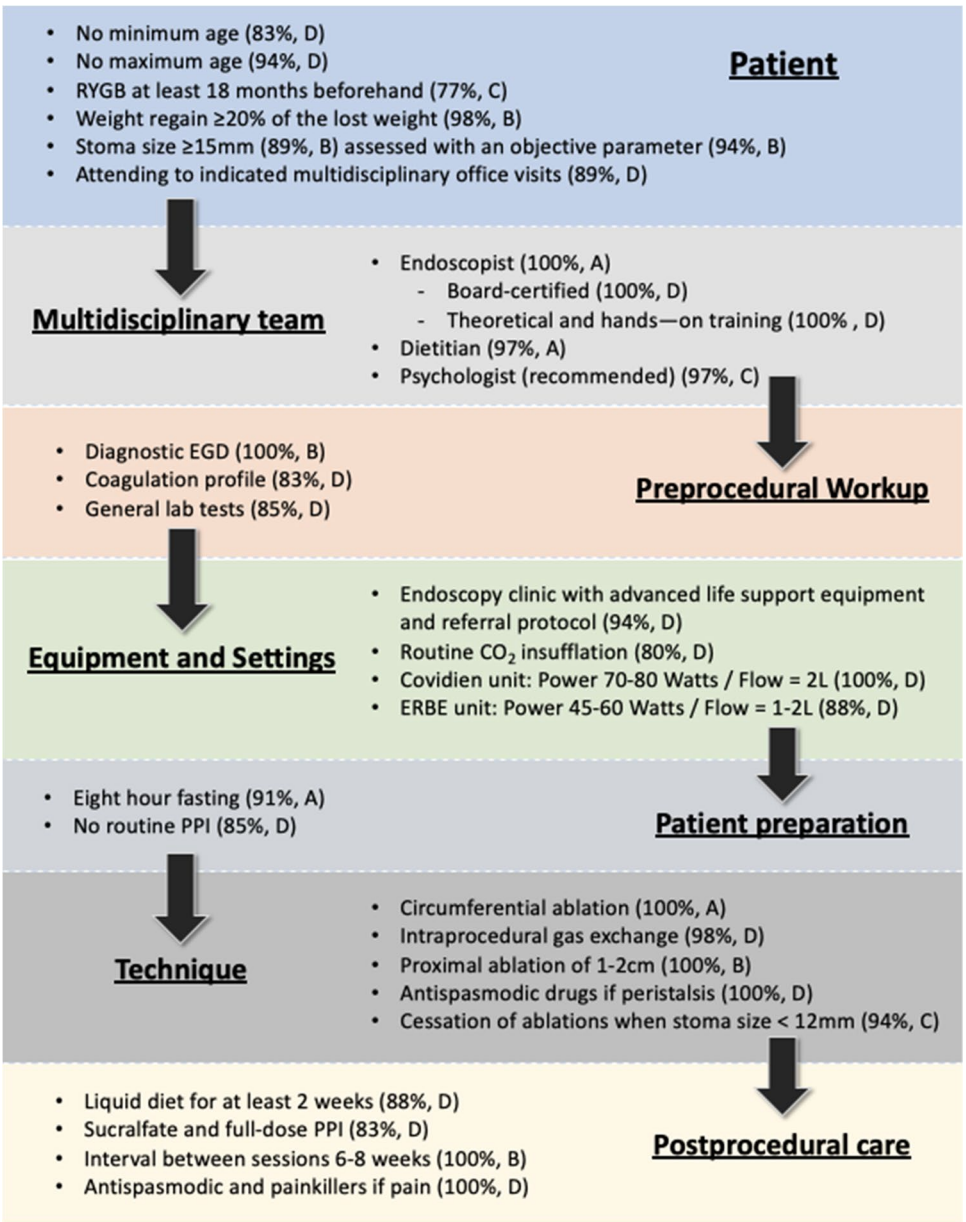

Fig. 3 The summary of recommendations from the Brazilian Consensus for APC treatment of post-RYGB weight regain

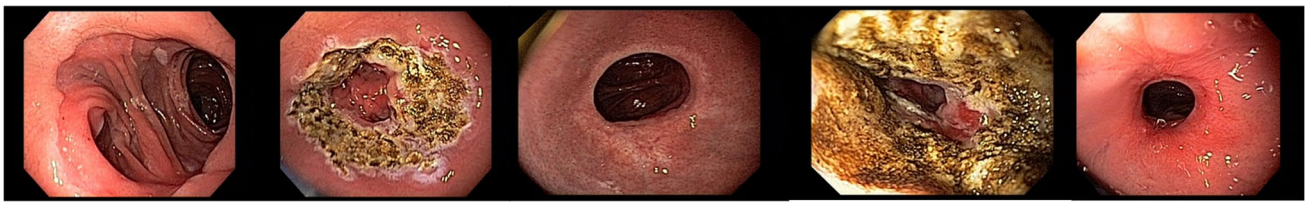

Fig. 4 A sequence of APC sessions showing the progressive reduction of the stoma size

Discussion

In the context of an increasing number of bariatric procedures and the natural course of body weight after nadir, physicians are currently facing a growing problem: the escalation of patients suffering from post-bariatric significant weight regain [5, 25]. Identifying pathologic weight trends towards regain is central to mitigate its negative impact as it worsens quality of life, leads to the recidivism of overweight-related comorbidities, and increases health-related expenditure [5–7]. In this sense, a broadly available, reproducible, cost-effective, and safe alternative to the knowingly morbid surgical revision is of paramount importance.

The APC method has been extensively reported in the literature for this purpose over the last decade. To date, large series, randomized trials, and meta-analyses support its efficacy and safety at treating post-RYGB weight regain [12, 14, 15]. However, there are several non-standardized technical issues and definitions, which hamper adequate spread of the therapy. Our initiative addresses those gaps by creating practical recommendations based on a highly experienced panel's opinion while nurturing a potent platform for hypothesis generation for future studies.

Concerning our methods, we opted for a qualified majority (2/3) instead of a simple majority to define consensus aiming at a stricter threshold. This methodology is supported by current literature, and as it demands a greater level of agreement, it also enhances the strength of consensual statements [26]. The current COVID-19 pandemic triggered the modifications to the Delphi methodology. However, we found this webinar-based configuration to be expeditious and well-received by the expert panel. That translated into a higher adherence rate than other Delphi studies [19], ultimately strengthening the consensual assertions. Hence, further studies could replicate this methodology, even after the pandemic is controlled.

As to the results of the APC consensus, several points are amenable to discussion. First, considering that obesity and weight regain are multifactorial conditions, most centers employ a multidisciplinary approach [27]. However, most guidelines and groups fail to describe which professionals should integrate the team. Current APC studies vary widely in this matter: Baretta et al. and Fayad et al. did not mention a multidisciplinary team [28, 29]. Moon et al. mention a team but do not detail the composing professionals [12]. Jirapinyo et al. describe a psychologist and dietitian, and Brunaldi et al. added a bariatric surgeon to the group [14, 30]. Finally, de Quadros et al. reported the most comprehensive team, including the formerly appointed specialists and a physical educator [13]. The current consensus defined endoscopist and dietitian as essential members and a psychologist as a non-essential but recommended one. Of note, including other specialties might incur enhanced outcomes, but their absence should not hinder the therapy.

Most available studies were conducted in academic hospitals rather than endoscopy clinics. That seems reasonable as the majority of the current medical evidence is university-centered. However, real-world practice frequently differs from the literature. In this sense, our expert panel has vast experience in performing APC in endoscopy clinics. Advanced life support equipment and a hospital referral protocol are mandatory to guarantee the adequate management of potential clinical or surgical adverse events that may arise from any medical intervention. That explains why the panel considered such a setting—and not a hospital—as the minimum required to perform the APC treatment.

Although available studies report the age range for the included population, few determine age limits for eligibility. Our expert panel deliberated there is no minimum age for APC treatment considering that, to undergo APC, the patient must have attained the minimum age for bariatric surgery. Moreover, this individual must have reached weight nadir and presented significant weight regain to fulfill eligibility criteria. Of note, a further consensual statement recommended the APC to be performed at least 18 months after surgery.

As to preoperative tests, the present consensus created specific recommendations for the APC treatment: general lab tests (full blood count, electrolytes, renal panel) and coagulation profile are mandatory. However, that does not exempt other preprocedural tests that might be indicated due to different baseline comorbid conditions.

One of the most critical topics regards the definition of a dilated stoma. Most APC articles included patients with anastomotic diameters $\geq$ 15 mm [12–14, 28]. Fayad et al. treated patients with stoma sizes $\geq$ 20 mm, while Jirapinyo

et al. defined 10 mm as the threshold for inclusion [29, 30]. In fact, Abu Dayehh et al. demonstrated earlier that larger stoma sizes correlate with progressively increasing weight regain starting from a 10-mm width [8]. However, considering that most surgeons calibrate the GJA using a 36Fr (12 mm) Faucher, it would be senseless to define stoma sizes ≤ 12 mm as dilated. Finally, APC-specific studies demonstrated that reaching 10–12-mm breadth carried the best risk–benefit ratio for the APC therapy [28]. That could not be possible if patients with baseline stoma sizes between 10 and 12 were considered eligible. Therefore, our expert panel deliberated that 15 mm is the preferred threshold for eligibility.

The assessment of the anastomotic diameter is also challenging since the gold standard method—the endoscopic ruler—is not commercially available anymore. Interestingly, de Quadros et al. validated an alternative technique using a guidewire marked each 5 mm [31]. That is a cost-effective and straightforward method that may be routinely employed since guidewires are broadly available and all endoscopists are familiar with them. Nonetheless, relevant studies and several experts use large foreign body forceps to assess the stoma size [15, 28]. Therefore, our panelists deliberated that both objective methods of assessment are adequate.

Virtually all bariatric patients regain a part of their lost weight after reaching the nadir [4]. However, the definitions of expected weight gain and significant weight regain remain controversial. Whereas some studies demonstrate that regaining 15% of the lost weight can negatively affect health and quality of life [6], others consider 20% the threshold for normality [5, 32]. In 2015, Berti et al. published a communication letter on behalf of the Brazilian Society for Bariatric and Metabolic Surgery (SBCBM) with clear definitions for weight regain. This society defines ≤ 20% as expected weight gain, 20–50% as controlled recidivism of obesity, and > 50% or > 20% associated with relapse of overweight-related comorbidity as recidivism of obesity [32]. Such a definition probably explains why most Brazilian experts employ 20% as the threshold for indicating the APC treatment, and ultimately, why this threshold reached consensus among our panelists.

As to the off-label indications, the most commonly reported in the literature is the treatment of Dumping syndrome. Although there is no study on APC alone for such a purpose, several articles demonstrate the effectiveness of APC plus endoscopic suturing [33, 34]. Since reliable data supports the similarity between APC alone and endoscopic suturing to reduce the stoma size [14, 15], indicating APC on a routine basis for Dumping syndrome seems plausible. However, the other off-label conditions for APC treatment are far less common. Though insufficient weight loss, desire to optimize weight loss or even progressive weight gain were considered amenable to APC treatment, one should opt for the APC on a case-by-case basis. A thorough discussion with both patient and multidisciplinary team on the risk–benefit of APC is mandatory considering that, despite this consensus, no relevant data shows the effectiveness of the stoma size reduction in those situations.

Concerning the APC dose, the expert panel deliberated in favor of lower doses rather than higher doses. In a retrospective cohort study, Jirapinyo et al. reported greater weight loss in the high dose group (forced; power 70–80 W; flow = 0.8 L/min) than the low dose one (pulsed; effect 2; power 45–55 W; flow = 0.8 L/min). However, the incidence of strictures was also significantly higher after high-dose procedures [30, 35]. That setup concerns the ERBE equipment, which is a potent electrosurgical unit. Other units may demand higher doses to achieve the same tissue effect, explaining the different settings suggested for the Covidien electrosurgical unit.

The definition of technical success or when stop performing APC sessions is also controversial in the available literature. In the first published case series, Baretta et al. performed three sessions despite the stoma size. However, a post hoc analysis revealed that diameters between 10 and 12 mm carried the best risk–benefit ratio. Those between 8 and 10 mm were also related to good weight loss, but the patients frequently suffered from obstructive symptoms [28]. Consequently, later studies employed diameter limits aligned with the number of sessions. Fayad et al. and Brunaldi et al. established a 12-mm threshold, while de Quadros et al. determined a range from 10 to 14 mm [13, 14, 29]. Jirapinyo et al. routinely aimed at 10 mm. Still, their article describes the highest rate of post-APC strictures in the literature (7.6% in the high-dose cohort), corroborating the previous findings of Baretta et al. [28, 30]. Therefore, our expert panel recommended 12 mm as the ideal diameter for terminating the treatment.

This consensus is not exempt from limitations. The first and foremost regards the low level of evidence of most assertions. On the one hand, it weakens the strength of our recommendations, but on the other one, it also highlights the importance of creating such a consensus. In a context of insufficient literature, expert opinion plays a central role in determining good clinical practices. The second limitation regards our inclusion criteria. Only experienced Brazilian endoscopists were included. On one side, an international consensus could provide more generalizable recommendations, but on the other side, logistics and costs would also escalate, eventually precluding the conduction of the study. Nonetheless, APC treatment is a common procedure in Brazil since 2010. Consequently, Brazilian endoscopists are probably the most experienced ones in the world, corroborated by the huge number of pooled APC-treated patients.

Conclusion

The APC treatment for weight regain following RYGB is an effective and reproducible method to reduce the stoma size. This consensus provides several recommendations based on a highly experienced panel of endoscopists. Although it covers most aspects of the treatment, the level of evidence is low for the majority of the statements. Therefore, bariatric endoscopists should be constantly attentive to new evidence on APC treatment.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11695-021-05795-y.

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Declarations

Ethics Approval 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.

Conflict of Interest Relevant to this article, Manoel Galvao Neto and Vitor Ottoboni Brunaldi report receiving personal fees for lectures from Erbe Elektromedizin GmbH. Other potential conflicts of interest: Manoel Galvao Neto is consultant for GI Dynamics, Apollo EndoSurgery, USGI, Colubris Mx, Scitech, and MITech, outside the submitted work; is Scientific Advisor for Apollo EndoSurgery and Keyron; and is speaker for Olympus LA, Erbe, and Meditronics LA, outside the submitted work. Eduardo Grecco is consultant for Scitech and speaker for Apsen and Allurion. Luiz Gustavo Quadros is consultant for Apollo Endosurgery, outside the submitted work. Andre Teixeira is proctor for Intuitive and Ethicon and consultant for Boehringer labs, outside the submitted work. Newton Teixeira is speaker for Novonordisk and ProSurgery, outside the submitted work. João Caetano Marchesini is consultant for Medtronic and Abbott and speaker for MSD and Novonordisk, outside the submitted work. The other authors declare no competing interests.

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