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Type 2 diabetes mellitus remission 10 years after metabolic and bariatric surgery: a multicenter retrospective study in Poland (BARI-10-POL)

Paweł Jaworski[1], Natalia Dowgiałło-Gornowicz[2], Michał Orłowski[3], Paula Franczak[3], Izabela Karpińska[4], Piotr Major[4], Wiesław Tarnowski[1]

1 Department of General, Oncological, and Bariatric Surgery, Centre of Postgraduate Medical Education, Orłowski Hospital, Warszawa, Poland
2 Department of General, Minimally Invasive, and Elderly Surgery, Collegium Medicum, University of Warmia and Mazury, Olsztyn, Poland
3 Department of General and Oncological Surgery, Ceynowa Hospital, Wejherowo, Poland
4 Second Department of General Surgery, Jagiellonian University Medical College, Kraków, Poland

KEY WORDS

metabolic and bariatric surgery, one anastomosis gastric bypass, sleeve gastrectomy, type 2 diabetes mellitus

ABSTRACT

INTRODUCTION Type 2 diabetes mellitus (T2DM), a chronic metabolic disease, affects millions of people worldwide, causes numerous complications, (eg, cardiovascular disease, kidney damage, neuropathy), and is strongly associated with obesity, a primary risk factor for its development and progression. In this paper, we presented 10-year outcomes of patients with T2DM who underwent metabolic and bariatric surgery (MBS), focusing on factors contributing to T2DM remission.

AIM This 10-year study evaluated MBS efficacy, focusing on T2DM remission predictors and complications.

MATERIALS AND METHODS We analyzed data of 113 patients with T2DM who underwent primary MBS between 2008 and 2014. Individuals with missing/inconsistent data or follow-up shorter than10 years were excluded. Information on surgery and treatment outcomes (described via standardized reporting) was analyzed.

RESULTS The most frequently performed surgery was sleeve gastrectomy (57.5%). Among the analyzed cohort, 10 years postsurgery, 80 patients (70.8%) experienced T2DM remission, 19 (16.8%) T2DM improvement, and 14 (12.4%) had no T2DM-related changes. Median (interquartile range) follow-up was 10.9 (10.4–11.7) years. Multivariable logistic regression showed that T2DM duration of over 10 years was associated with lower likelihood of T2DM remission, whereas the type of surgery was not a significant factor influencing it. However, undergoing one anastomosis gastric bypass (OAGB) tended to increase the probability of T2DM remission.

CONCLUSIONS Although T2DM duration remains a significant predictor of remission, the study suggests a potential trend toward higher remission rates after OAGB, which requires confirmation in larger studies.

Correspondence to:
Paweł Jaworski, MD, PhD, Department of General, Oncological, and Bariatric Surgery, Centre of Postgraduate Medical Education, Orłowski Hospital, ul. Czerniakowska 231, 00-418 Warszawa, Poland, phone: +48 22 584 11 30, email: pawel.jaworski@cmkp.edu.pl
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INTRODUCTION Type 2 diabetes mellitus (T2DM) affects millions of people globally. It is a chronic metabolic disorder characterized by various complications, including neuropathy, renal damage, and cardiovascular disease.[1,2] There is a robust correlation between T2DM and obesity, the latter being a major driver of the disease onset and advancement.[3] While conventional management has prioritized pharmacological interventions—such as insulin and oral agents—alongside dietary and exercise-based lifestyle changes, these standard approaches often fail to provide sustained glycemic control or effectively mitigate complication risks in populations with obesity. In response to these challenges, metabolic and bariatric surgery (MBS) is being considered as a potential solution for patients with severe obesity and concomitant T2DM.[4]

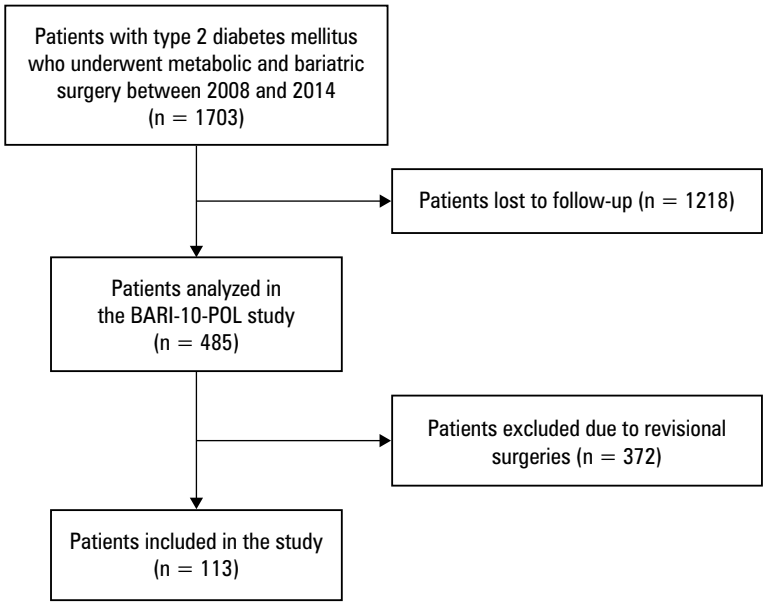

FIGURE 1 Flowchart of the study

TABLE 1 Characteristics of the study patients and procedures (n = 113)

Variable		Value
Age, y		51 (42–62)
Sex	Men	69 (61)
	Women	44 (39)
Preoperative BMI, kg/m^2		41.5 (37.3–46.3)
Follow-up, y		10.9 (10.4–11.7)
Length of hospital stay, d		4 (3–6)
Operative time, min		100 (70–140)
Type of surgery	SG	65 (57.5)
	RYGB	21 (18.6)
	OAGB	27 (23.9)

Data are presented as median (interquartile range) or number (percentage).

Abbreviations: BMI, body mass index; OAGB, one anastomosis gastric bypass; RYGB, Roux-en-Y gastric bypass; SG, sleeve gastrectomy

Numerous studies have shown that MBS not only leads to significant weight loss but also improves metabolic parameters, including glycemic control.[5-7] There is considerable evidence indicating that, in patients with T2DM, MBS can improve insulin sensitivity, reduce the need for diabetes medications, and, in many cases, even contribute to lasting remission of the disease.[8]

AIM The aim of this study was to report 10-year outcomes of the patients with T2DM who underwent MBS, with a focus on factors contributing to T2DM remission and postoperative complications, to assess the sustainability of surgical treatment effects and their potential role in managing T2DM.

MATERIALS AND METHODS **Patients** This was a multicenter, retrospective analysis of individuals with T2DM who underwent MBS between 2008 and 2014 in Poland. The study, which was carried out under the auspices of the Metabolic and Bariatric Surgery Chapter of the Association of Polish Surgeons, included patients from 5 high-volume Polish bariatric centers. The inclusion criteria were eligibility for MBS and a history of T2DM. Individuals who underwent a revisional bariatric procedure, had missing or inconsistent data, and those with follow-up shorter than 10 years were excluded from the study.

Data collection The database included demographic characteristics of the patients (sex, age, maximum weight, preoperative body weight, and body mass index [BMI]), information on obesity-related diseases, such as T2DM, hypertension, obstructive sleep apnea, and gastroesophageal reflux disease, and data on a history of laparoscopic MBS procedures. Information on surgery (type of surgery, operative time, length of hospital stay, complications) and treatment outcomes (current body weight and BMI, remission of obesity-related diseases) was analyzed on the basis of standardized reporting.[9] T2DM remission was defined as having normal glucose metabolism (ie, glycated hemoglobin [HbA_{1c}] <6.5% or fasting blood glucose <125 mg/dl) in the absence of antidiabetic medications. %TWL was calculated as (initial weight – current weight) / initial weight × 100, while %EWL was calculated as (initial weight – current weight) / (initial weight – ideal weight) × 100. The patients were divided into 2 groups: the responders (R group), comprising patients with T2DM remission, and the non-responders (NR group), encompassing patients without T2DM remission. All results corresponded to the follow-up duration.

Surgical techniques and preoperative care All bariatric procedures were performed laparoscopically. From the database of operations, only primary surgeries were analyzed: sleeve gastrectomy (SG), Roux-en-Y gastric bypass (RYGB), and one anastomosis gastric bypass (OAGB). The surgical procedures were performed in accordance with the guidelines.[10] SG was performed with a 36F bougie, starting 4–6 cm from the pylorus. For RYGB, the biliopancreatic limb length was approximately 100 cm, and alimentary limb length was approximately 150 cm. In OAGB, the length of the biliopancreatic limb was approximately 200 cm from the ligament of Treitz. Pre-, peri-, and postoperative protocols were standardized in each participating center.

Statistical analysis A descriptive statistical analysis was conducted. All data were analyzed using Statistica software, version 13 PL (TIBCO Software Inc., Palo Alto, California, United States). The normality of the data was checked using the Shapiro–Wilk test. Continuous values were presented as medians with interquartile ranges (IQRs). The Mann–Whitney test was used for continuous variables. Qualitative variables were compared using the Pearson χ^2 test. Significant

TABLE 2 Characteristics and outcomes of the study patients

Variable		Responders (n = 80)	Nonresponders (n = 33)	*P* value
Sex	Men	36 (45)	10 (31)	0.16
	Women	44 (55)	23 (69)	
Age, y		50.5 (44–62)	50.1 (36–63)	0.8
BMI, kg/m^2	Preoperative BMI	28.7 (25.5–31.2)	29.7 (27.7–34.7)	0.03
	Lowest BMI	28.7 (25.5–31.2)	(27.7–34.7)	0.04
	Current BMI	31.6 (27.2–34.1)	32.9 (28.7–39)	0.09
Time to lowest BMI, y		2 (1–5.5)	2 (1–2)	0.27
%TWL		23.1 (16.7–30.3)	23.1 (14.4–32.5)	0.9
%EWL		61.6 (43.8–86.1)	62.7 (35.8–75.1)	0.4
Time to T2DM remission, mo		1 (1–12)[a]	n/a	n/a

Data are presented as median (interquartile range) or number (percentage).

a Data available for 43 patients

Abbreviations: %EWL, percentage of excess weight loss; n/a, not applicable; T2DM, type 2 diabetes mellitus; %TWL, percentage of total weight loss; others, see **TABLE 1**

variables in univariable logistic regression models (P <0.1) were then adjusted in a multivariable analysis to obtain significant, independent risk factors, and to calculate the odds ratio (OR) with 95% CI. P values below 0.05 were considered significant.

Ethics The data were completely anonymized. The study was conducted in accordance with the ethical standards of the 1964 Declaration of Helsinki and its subsequent amendments, and approved by the Bioethics Committee of the University of Warmia and Mazury in Olsztyn (10/2024).

RESULTS The total study population consisted of 1703 patients. Individuals lost to follow-up were excluded from the analysis (**FIGURE 1**). Ultimately, the BARI-10-POL (Bariatric Ten Years Outcomes in Poland) database[11] included 485 patients, with a follow-up rate of 28.5%. For this analysis, we included individuals with T2DM and excluded those with missing data or subjected to revisional surgery. The final cohort comprised 113 patients. The participants were divided into 2 groups: the R group and the NR group. Median (IQR) age was 51 (42–62) years, and median (IQR) preoperative BMI was 41.5 (37.3–46.3) kg/m^2 (**TABLE 1**).

The most frequently performed surgery was SG (57.5%; **TABLE 2**). As many as 80 patients (70.8%) experienced T2DM remission, 19 (16.8%) had improvements in T2DM control, and 14 (12.4%) experienced no changes related to T2DM. Median (IQR) follow-up time was 10.9 (10.4–11.7) years.

The patients in the R and NR groups did not differ significantly in terms of sex, age, current BMI or time to achieve it, %TWL, or %EWL (**TABLE 2**). Differences were observed in the preoperative BMI and the lowest achieved BMI (P = 0.03 and P = 0.045, respectively). Median (IQR) time to T2DM remission was 1 (1–12) months.

All available factors contributing to T2DM remission were analyzed via univariable logistic regression models. Preoperative BMI, type of surgery, operative time, and minimal achieved BMI were significantly associated with the likelihood of T2DM remission (**TABLE 3**). All significant factors in the univariable logistic regression were adjusted for in the multivariable analysis. According to the multivariable logistic regression analysis, T2DM duration of more than 10 years was found to decrease the likelihood of T2DM remission (OR, 0.043; P = 0.001), whereas the type of surgery was not significantly associated with it. However, undergoing OAGB tended to increase the probability of T2DM remission (OR, 6.424; P = 0.06).

Eleven complications (9.7%) occurred among the study group. There were 4 Clavien–Dindo grade III complications (3.5%) within 30 days postoperatively: 1 intraperitoneal bleeding (0.9%) and 3 cases (2.7%) of leakage. There were 3 intraoperative iatrogenic injuries to the intestine (2.7%), which were treated during the primary procedure. There were 4 cases (3.5%) of rhabdomyolysis. No postoperative deaths occurred.

DISCUSSION Our study is a retrospective analysis of 113 patients with T2DM who underwent MBS at least 10 years ago. To our knowledge, this is one of the few studies assessing factors associated with T2DM remission in a long-term (≥10 y) follow-up. The analysis is based on the data from a Polish project called BARI-10-POL.[11] In our study, the remission rate of T2DM was 70.8%. In the published research, it is highly variable, ranging from 26% in the SLEEVEPASS study[12] to the values achieved in our analysis and in a study by Shahmiri et al.[13] As reported previously, this rate depends on many factors, most importantly are patient age and disease duration.[14-16]

TABLE 3 Univariable and multivariable logistic regression analyses factors predicting type 2 diabetes mellitus remission

Parameter		Univariable analysis			Multivariable analysis		
		OR	95% CI	*P* value	OR	95% CI	*P* value
Female sex		1.404	0.6–3.29	0.43	–	–	–
Age		1.007	0.98–1.04	0.65	–	–	–
Preoperative BMI		0.941	0.89–1	0.048	1.008	0.91–1.11	0.88
Type of surgery	RYGB	0.375	0.14–1.03	0.06	0.473	0.1–2.17	0.34
	OAGB	3.304	0.89–12.3	0.08	6.424	0.93–44.21	0.06
Complications		0.906	0.23–2.89	0.74	–	–	–
T2DM duration (reference <5 y)	5–10 y	0.331	0.08–1.48	0.15	0.201	0.04–1.05	0.06
	>10 y	0.059	0.01–0.29	0.001	0.043	0.01–0.26	0.001
Medications	Oral drugs	0.261	0.03–2.23	0.22	–	–	–
	Insulin	0.231	0.03–2.02	0.19	–	–	–
Comorbidities	Hypertension	0.475	0.15–1.53	0.21	–	–	–
	GERD	0.788	0.29–2.17	0.65	–	–	–
	OSA	0.811	0.19–3.46	0.78	–	–	–
Current BMI		0.952	0.9–1.01	0.12	–	–	–
%EWL		1.006	1–1.02	0.31	–	–	–
%TWL		1.001	0.98–1.03	0.94	–	–	–
Lowest BMI		0.928	0.86–1	0.06	0.932	0.08–1.09	0.37

Abbreviations: OR, odds ratio; GERD, gastroesophageal reflux disease; OSA, obstructive sleep apnea; others, see **TABLES 1** and **2**

The participants in our study were relatively young (median [IQR] age, 51 [42–62] y), and almost half of them underwent malabsorptive MBS, which also favors TD2M remission.[17] Our work assessed the remission of T2DM following various types of bariatric procedures, and analyzed factors contributing to its occurrence using univariable and multivariable logistic regression models. Specifically, preoperative BMI, type of surgery, operative time, and the lowest postoperative BMI achieved significantly influenced the odds of T2DM remission.

As compared with recent findings, Moradi et al[18] reported that MBS substantially improved long-term T2DM remission, with RYGB resulting in the highest remission rates after 1 year. However, after 3 years, the effectiveness of OAGB in the treatment of T2DM increased. We obtained similar results. Although the type of surgery was not a significant factor in our study, OAGB tended to increase the likelihood of T2DM remission (OR, 6.424; $P = 0.06$).

Studies by Jans et al[15] and Gavira et al[19] emphasized that the duration of T2DM remains a critical determinant for T2DM remission. This finding is in line with our observations, which demonstrated that T2DM duration of over 10 years notably decreased the likelihood of T2D remission (OR, 0.043; $P = 0.001$). Liagre et al[20] specifically emphasized the effectiveness of OAGB, reinforcing our findings that this procedure may yield superior metabolic outcomes. Similarly, Lafarge et al[21] investigated the relationship between preoperative BMI and remission in patients with T2DM, reporting that a higher BMI was associated with a decreased likelihood of remission, which aligns with our results.

Moradi et al[18] and Dicker et al[22] examined various bariatric procedures and reported that, while all types significantly contribute to T2DM remission, individual patient factors—such as BMI and disease duration—play crucial roles in predicting outcomes. This comprehensive review of literature further supports our emphasis on patient selection and preoperative assessment.

We observed no significant association between %TWL or %EWL and T2DM remission. Although weight loss is traditionally considered an important determinant of metabolic improvement, several studies suggest that metabolic effects of bariatric surgery may occur partially independently of weight reduction, and may be related to hormonal and incretin-mediated mechanisms.[23,24] Therefore, factors, such as pancreatic β-cell function and T2DM duration, may play a more important role in long-term remission. However, the relatively small sample size of our study may have also limited the possibility of detecting subtle associations between weight loss parameters and T2DM remission.

There is a growing consensus about a new paradigm for managing T2DM, one that emphasizes the development of individualized treatment strategies to improve patient outcomes. This viewpoint supports our call for expanded research with larger patient cohorts and extended follow-ups, aimed at refining surgical approaches to achieve optimal metabolic outcomes.[25] The results of such long-term observations have clinical implications not only for selecting the most suitable, patient-tailored procedures, but also for

estimating potential outcomes, which may indirectly improve patient compliance.

Although we did not assess patient quality of life using validated questionnaires, it can be assumed that medication discontinuation or improved glycemic control may have increased it. During follow-up visits in hospital clinics, the patients often emphasized considerable improvements in quality of life after MBS, which has also been highlighted in many studies published thus far.[26]

A decade of post-MBS follow-up is very long. During this period, very effective drugs have been introduced for the treatment of T2DM and obesity, and many new bariatric procedures have emerged. Those that are very promising in terms of both weight loss and T2DM remission are single-anastomosis duodenoileal bypass with SG (SADI-S) and single-anastomosis sleeve ileal (SASI) bypass.[27,28] Future studies should validate these findings and explore the mechanistic pathways through which both "old" operations (eg, OAGB, RYGB) and new techniques (eg, SADI-S, SASI) may enhance T2DM remission, contributing to the evolving landscape of MBS.

Limitations The study has several limitations. The major limitation is the relatively low follow-up rate (28.5%), which results from the long observation period and the multicenter design of the study. The follow-up rate ranged from 15% to 67% between the participating centers. However, in the initial analyses, median outcomes did not differ significantly between the centers, which may partially minimize the potential impact of follow-up bias. The other limitations of the study were its retrospective nature and the fact that it was performed at different centers, which resulted in different patient management protocols. We are aware of certain incompleteness of the data. There is a lack of detailed metabolic predictors, such as preoperative HbA_{1c}, C-peptide levels, and detailed pharmacological treatment data. These parameters are known predictors of diabetes remission and their absence limits the robustness of the predictive model. Another limitation is the relatively small number of patients undergoing OAGB. Therefore, the observed trend toward higher remission rates after OAGB should be interpreted with caution and requires confirmation in larger cohorts. This study was also affected by the lack of longitudinal laboratory data, including HbA_{1c}, during follow-up. Consequently, remission was assessed based on the last available follow-up visit at least 10 years after surgery, which does not allow for evaluation of remission durability or relapse rates. Despite these limitations, our findings may be useful for predicting TD2M remission in a group of patients with obesity.

CONCLUSIONS After a 10-year follow-up, 70.8% of the patients achieved T2DM remission, while 16.8% experienced improvement. Factors significantly influencing T2DM remission included a lower preoperative BMI and the lowest achieved BMI. Additionally, T2DM duration of over 10 years significantly reduced the likelihood of remission. Our study suggests a potential trend toward higher remission rates after OAGB, which requires confirmation in larger studies.

ARTICLE INFORMATION

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CONTRIBUTION STATEMENT PJ and ND-G created the concept of the study. PJ, ND-G, MO PF, and IK collected the data. PJ, ND-G, MO, PF, and IK wrote the main manuscript. ND-G prepared the figures and tables. All authors read and approved the final version of the manuscript.

CONFLICT OF INTEREST None declared.

AI STATEMENT Artificial intelligence was not used in the preparation of this manuscript.

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REFERENCES

1 Khan MAB, Hashim MJ, King JK, et al. Epidemiology of type 2 diabetes – global burden of disease and forecasted trends. J Epidemiol Glob Health. 2020; 10: 107-111.

2 Crawford AL, Laiteerapong N. Type 2 diabetes. Ann Intern Med. 2024; 177: ITC81-ITC96.

3 Ruze R, Liu T, Zou X, et al. Obesity and type 2 diabetes mellitus: connections in epidemiology, pathogenesis, and treatments. Front Endocrinol (Lausanne). 2023; 14: 1161521.

4 Affinati AH, Esfandiari NH, Oral EA, et al. Bariatric surgery in the treatment of type 2 diabetes. Curr Diab Rep. 2019; 19: 156.

5 Bhandari V, Kosta S, Bhandari M, et al. Bariatric metabolic surgery: an effective treatment of type 2 diabetes. J Minim Access Surg. 2022; 18: 396-400.

6 Canakis A, Wall-Wieler E, Liu Y, et al. Type 2 diabetes remission after bariatric surgery and its impact on healthcare costs. Obes Surg. 2023; 33: 3806-3813.

7 Mingrone G, Panunzi S, De Gaetano A, et al. Metabolic surgery versus conventional medical therapy in patients with type 2 diabetes: 10-year follow-up of an open-label, single-centre, randomized controlled trial. Lancet. 2021; 397: 293-304.

8 Mingrone G, Cummings DE. Changes of insulin sensitivity and secretion after bariatric/metabolic surgery. Surg Obes Relat Dis. 2016; 12: 1199-1205.

9 Bhandari M, Fobi MAL, Buchwald JN; Bariatric Metabolic Surgery Standardization (BMSS) Working Group. Standardization of bariatric metabolic procedures: world consensus meeting statement. Obes Surg. 2019; 29: 309-345.

10 Janik MR, Stanowski E, Paśnik K. Present status of bariatric surgery in Poland. Wideochir Inne Tech Maloinwazyjne. 2016; 11: 22-25.

11 Dowgiałło-Gornowicz N, Jaworski P, Orłowski M, et al. Long-term outcomes of metabolic bariatric surgery: a 10-Year multicenter retrospective study in Poland (BARI-10-POL). Langenbecks Arch Surg. 2025; 410: 142.

12 Salminen P, Grönroos S, Helmiö M, et al. Effect of laparoscopic sleeve gastrectomy vs Roux-en-Y gastric bypass on weight loss, comorbidities, and reflux at 10 years in adult patients with obesity: the SLEEVEPASS randomized clinical trial. JAMA Surg. 2022; 157: 656-666.

13 Shahmiri SS, Pazouki A, Jazi AHD, et al. Long-term weight loss outcomes of one anastomosis gastric bypass: assessment of 1971 patients with 5–9-year follow-up. Obes Surg. 2025; 35: 102-111.

14 Dowgiałło-Gornowicz N, Jaworski P, Walędziak M, et al. Predictors of complete remission of hypertension in patients over 65 years of age after

bariatric surgery – a multicenter study. Wideochir Inne Tech Maloinwazyjne. 2024; 19: 76-82.

15 Dowgiałło-Gornowicz N, Jaworski P, Walędziak M, et al. Predictors of complete remission of type 2 diabetes in patients over 65 years of age – a multicenter study. Obes Surg. 2023; 33: 2269-2275.

16 Jans A, Näslund I, Ottosson E, et al. Duration of type 2 diabetes and remission rates after bariatric surgery in Sweden 2007–2015: a registry-based cohort study. PLoS Med. 2019; 16: e1002985.

17 Kamvissi V, Salerno A, Bornstein SR, et al. Incretins or anti-incretins? A new model for the "entero-pancreatic axis." Horm Metab Res. 2015; 47: 84-87.

18 Moradi M, Kabir A, Khalili D, et al. Type 2 diabetes remission after Roux-en-Y gastric bypass (RYGB), sleeve gastrectomy (SG), and one anastomosis gastric bypass (OAGB): results of the longitudinal assessment of bariatric surgery study. BMC Endocr Disord. 2022; 22: 260.

19 Mateo-Gavira I, Sánchez-Toscano E, Mayo-Ossorio MÁ, et al. Evaluation of clinical factors predictive of diabetes remission following bariatric surgery. J Clin Med. 2021; 10: 1945.

20 Liagre A, Benois M, Queralto M, et al. Ten-year outcome of one--anastomosis gastric bypass with a biliopancreatic limb of 150 cm versus Roux-en-Y gastric bypass: a single-institution series of 940 patients. Surg Obes Relat Dis. 2022; 18: 1228-1238.

21 Lafarge JC, Aron-Wisnewsky J, Pattou F, et al. ARMMS-T2D Consortium; Le Guludec D, David DJ, Carbonneil C. French National Authority for Health assessment of metabolic surgery for type 2 diabetes remission – a meta-analysis in patients with class I to III obesity. Diabetes Metab. 2024; 50: 101495.

22 Dicker D, Yahalom R, Comaneshter DS, et al. Long-term outcomes of three types of bariatric surgery on obesity and type 2 diabetes control and remission. Obes Surg. 2016; 26: 1814-1820.

23 Pérez-Pevida B, Escalada J, Miras AD, et al. Mechanisms underlying type 2 diabetes remission after metabolic surgery. Front Endocrinol (Lausanne). 2019; 10: 641.

24 Meira I, Menino J, Ferreira P, et al. Diabetes remission after bariatric surgery: a 10-year follow-up study. Obes Surg. 2025; 35: 161-169.

25 Capoccia D, Leonetti F, Natali A, et al; Italian Society of Diabetes (SID). Remission of type 2 diabetes: position statement of the Italian society of diabetes (SID). Acta Diabetol. 2024; 61: 1309-1326.

26 Wysocki M, Mizera M, Karpińska I, et al. Analysis of quality of life in patients with clinically severe obesity and type 2 diabetes mellitus after laparoscopic sleeve gastrectomy – a 12-month prospective observational study. Pol Przegl Chir. 2024; 96: 20-30.

27 Jaworski P, Dowgiałło-Gornowicz N, Parkitna J, et al. Efficacy of single anastomosis sleeve-ileal bypass in weight control and resolution of type 2 diabetes mellitus – a retrospective cohort study. Sci Rep. 2024; 14: 26360.

28 Wityk M, Bobowicz M, Pryt M, et al. Early results of laparoscopic single-anastomosis duodeno-ileal bypass with sleeve gastrectomy: case series from a single Polish bariatric center. Wideochir Inne Tech Maloinwazyjne. 2024; 19: 460-464.