An evaluation of the knowledge of the surgical treatment of obesity among surgeons

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Abstract

Introduction: *Surgical treatment of obesity is currently the only effective treatment option for patients with excess body weight, especially morbid obesity and diseases caused by it. There are no studies evaluating the knowledge of surgeons in the field of bariatric surgery.*
Aim: *To assess the knowledge of surgeons regarding bariatric surgery.*
Material and methods: *An anonymous questionnaire was conducted among 143 surgeons in 2010–2011 during local educational conferences. The survey consisted of 10 questions dedicated to the fundamental problems of the surgical treatment of obesity.*
Results: *Theoretical and practical knowledge connected to the so-called "epidemiological awareness" in the surgical treatment of obesity was possessed by 25% of the respondents. Knowledge of surgical techniques is known to most surgeons. Reducing the "oncological risk" after bariatric surgery is known to only 27% of surgeons. Almost 80% of surgeons indicated a necessity of their further education regarding the surgical treatment of obesity.*
Conclusions: *Knowledge of Polish general surgeons in the surgical treatment of obesity is not high, with a high number of surgeons who possess knowledge of the operating technique, whereas only a quarter have a basic knowledge of the indication for surgical treatment. Most surgeons who participated in our study are awaiting educational programmes focused on this issue.*

Key words: *bariatric surgery, knowledge, surgeons.*

Introduction

In recent years, the incidence of obesity has been increasing rapidly. In Europe, this concerns 10% to 25% of men and 10% to 30% of women [1]. In the 2012 report concerning the member countries of the European Union (EU) [2], it was reported that 52% of the adult population are overweight, of which 17% are obese. At the country level, in 18 of the 27 EU member countries, the problem of excess weight and obesity affects over 50% of the residents. In Poland, over a 10-year period (NATPOL 2002 and NATPOL 2011 studies) an increasing tendency in the number of people who are overweight was also observed [3], mainly among young men (18–34 years old) – 36.1% (an increase of 6.2% in comparison with the observation in 2002). The percentage of obese young people has also increased, mainly women – 7.4% in 2011, as compared to 4.4% nine years earlier. The definition and classification of obesity is based on the body mass index (BMI), which is the body mass measured in kilograms divided by the square of the height measured in metres. The following divisions of obesity have been adopted depending on the value

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of the BMI index: class I obesity – 30–35 kg/m^2, class II obesity – 35–40 kg/m^2, class III obesity – above 40 kg/m^2. Morbid obesity, which is an indication for surgical treatment, is considered to be the state when (1) the BMI on its own exceeds 40 kg/m^2 or (2) the BMI is over 35 kg/m^2 and is accompanied by comorbidities. Among them most often observed are: type 2 diabetes, hypertension, dyslipidaemia, osteoarthritis, sleep apnoea and others. Obesity plays a key role in the pathophysiology of many metabolic diseases and increases the risk of cardiovascular disease [4]. The close relationship between obesity and diabetes is confirmed by the fact that among people with type 2 diabetes, as many as 90% are people with excess body mass [5]. In the Framingham study, it was shown that the development of hypertension is directly connected with obesity, where each increase in body mass of 5 kg is associated with an increase of systolic pressure of 4.5 mm Hg [6]. Excess weight is also a risk factor of certain cancers (colon and prostate cancer in men, and breast, uterine and ovarian cancer in women). Obesity and the above-mentioned comorbidities also have enormous economic consequences, which in these days of global crisis cannot be ignored. The estimated costs connected with the treatment of patients with excess body mass is 10% higher than in the case of those with the correct body mass, whereas the costs are 36% higher for persons suffering from obesity [7]. Over the last few decades, the development of bariatric surgery has been observed, which represents currently the only permanent and comprehensive method for the treatment of obese patients. The type of treatments and the indications for their application in particular patients are not the topic of this study. Laparoscopic techniques increase safety and reduce perioperative trauma, enabling a faster return to physical and social activity [8–10]. The benefits of surgical treatment are not limited to the reduction of body mass. The results of numerous studies have indicated the reduction of mortality risk in long-term follow-up in the group of patients treated surgically when compared with patients treated conservatively [11–15]. The constant increase in the number of publications concerning the treatment of type 2 diabetes connected with obesity proves the effectiveness of this method of therapy [16] and its superiority over current conservative therapy [17–21]. This has been recognised by the International Diabetes Federation, which brings together organisations from 160 countries in the world, including the Polish Diabetes Association and the Polish Associations of Diabetics. In 2011, they published recommendations concerning the principles of treating type 2 diabetes taking into account the role of bariatric surgery [22], in accordance with which bariatric surgery should be given priority in the treatment of patients with type 2 diabetes and BMI over 40 kg/m^2. Patients with BMI over 35 kg/m^2 are also eligible for this type of treatment and are prioritised when conservative treatment is not able to reduce the level of glycated haemoglobin to below 7.5%. After bariatric treatment, we observe a reduction of hypertension and the normalisation of lipid disorders, which are, together with diabetes, criteria for the diagnosis of metabolic syndrome. This results in a reduction of the risk of cardiovascular disease [23–28], which gives the bariatric surgeon a leading role in the treatment of morbidly obese patients. It has also been shown that there are beneficial influences of bariatric surgery on the occurrence of certain types of cancers [29–31]. This pleiotropic influence of bariatric surgery causes a reduction in the costs of the health service by reducing the costs of treating comorbidities, whose conservative treatment absorbs medical resources over the long term and is often ineffective [32–34]. The previous study of the authors demonstrated insufficient knowledge among general practitioners (GPs) of surgical treatment of obesity [35], where only one tenth of primary care doctors possess basic knowledge of the indications for bariatric surgery.

Aim

In this study, the goal is to evaluate the knowledge of surgeons in this area.

Material and methods

The study was undertaken during 2010–2011. The research tool was a questionnaire, which the authors developed on the basis of the results of the research presented in the introduction. This questionnaire was given to doctors taking part in local education conferences (before the start of the conferences) and on a website dedicated to the study. Information about the survey was sent to National Chief Consultants and Presidents of Medical Associations. In total, 778 questionnaires were returned including 143 questionnaires completed by surgeons who made up the group being studied. The question-

1. What are the indications for surgery of obesity?
A. the incidence of obesity-related diseases with the weight of twice the normal;
B. the incidence of obesity-related diseases with a body mass index above 35;
C. the incidence of obesity-related diseases with the body weight of 40 kg more than normal;
D. none of the above.

2. In which patient should surgery be considered as a treatment option: a man: height 200 cm, weight 141 kg with type 2 diabetes mellitus; a woman: height 150 cm, weight 80 kg with hypertension?
A. the man;
B. the woman;
C. both;
D. none of the above patients.

3. How many patients should be referred by a General Practitioner for weight loss surgery assuming that 2,500 patients are under his/her care (choose the most likely answer with results of epidemiological studies in our country)
A. 1 patient;
B. 10 patients;
C. 100 patients;
D. 1000 patients;

4. What does it really mean "surgical treatment of obesity":?
A. reduction of the intake of food or its digestion and absorption through operations on the stomach and intestines;
B. excision of excess intra abdominal fat, especially greater omentum;
C. excision of excess subcutaneous fat within the abdomen and lower extremities;
D. introduction of a balloon into the stomach, which is filled with methylene blue solution or air, which restricts food intake.

5. Which of the techniques, in accordance with scientific evidence, is the safest way to perform weight loss surgery?
A. laparotomy - a wide opening of the abdominal cavity to allow precise insight into it;
B. laparoscopic: miniinvasive technique, also known as " keyhole Surgery ";
C. endoscopic: allowing access to the abdominal cavity through natural orifices such as mouth, anus, vagina;
D. none of the above.

6. Accordingly to results published in recent years, surgical treatment of obesity in comparison to its conservative treatment leads to:
A. shortening life expectancy;
B. extending life expectancy;
C. extending life expectancy, with reduced quality of life;
D. shortening life expectancy, with an increase in quality of life.

7. Surgical treatment of obesity leads to:
A. increasing the risk of cancer;
B. decreasing the risk of cancer;
C. does not affect the risk of cancer;
D. the impact on the cancer risk has been established, but so far there is insufficient scientific evidence to conclude if surgical treatment of obesity leads to decreasing or increasing of it.

8. Medical discipline concerned with the treatment of obesity is:
A. balneology
B. lipology
C. orology
D. bariatrics

9. Surgical treatment of obesity leads to:
A. an increase in health-care costs for patients suffering from obesity;
B. a reduction in health-care costs for patients suffering from obesity;
C. does not affect the health-care costs for patients suffering from obesity;
D. above issue has not yet been explicitly investigated.

10. How do you assess your knowledge about the surgical treatment of obesity?
A. completely satisfactory;
B. insufficient, but I study it by myself;
C. inadequate, I am interested in participating in courses and workshops dedicated to this topic;
D. minor, but I do not need it in my practice..

Figure 1. Questionnaire

naire was anonymous, and consisted of 10 questions concerning basic issues from the area of the surgical treatment of obesity (Figure 1).

The first three questions of the questionnaire were designed to evaluate knowledge of the indication for surgical treatment, where Question 1 checked the theoretical knowledge, Question 2 checked the ability to use this knowledge in practice, whereas Question 3 evaluated the "epidemiological awareness" of the doctor of the population of Polish patients. Ques-

Table I. Responses to individual questions. The result which is the correct answer is underlined (for questions 1–9)

N = 143	Answer A (*n*/%)	Answer B (*n*/%)	Answer C (*n*/%)	Answer D (*n*/%)
Question 1	9 persons/6.3%	110 persons/77%	8 persons/5.6%	16 persons/11.1%
Question 2	17 persons/11.9%	25 persons/17.5%	76 persons/53.1%	25 persons/17.5%
Question 3	12 persons/8.4%	72 persons/50.3%	58 persons/40.6%	1 person/0.7%
Question 4	130 persons/90.9%	0 persons/0%	0 persons/0%	13 persons/9.1%
Question 5	2 persons/1.4%	132 persons/92.3%	4 persons/2.8%	5 persons/3.5%
Question 6	1 person/0.7%	120 persons/83.9%	12 persons/8.4%	10 persons/7%
Question 7	4 persons/2.8%	39 persons/27.3%	53 persons/37.1%	47 persons/32.8%
Question 8	1 person/0.7%	2 persons/1.4%	0 persons/0%	140 persons/97.9%
Question 9	2 persons/1.4%	132 persons/92.3%	0 persons/0%	9 persons/6.3%
Question 10	17 persons/11.9%	31 persons/21.7%	84 persons/58.7%	11 persons/7.7%

tions 4 and 5 evaluated knowledge of the types of treatment and the application of surgical techniques. Questions 6, 7 and 9 referred to the obtained results of the treatment and their influence on the costs of healthcare for this group of patients. Question 8 was designed to evaluate the knowledge of the term "bariatric surgery". Question 10 concerned the evaluation of the interest to acquire more knowledge in this area.

Results

The results obtained are presented in Table I. The study shows that the majority of surgeons (77%) possess theoretical knowledge on the subject of the indications for the surgical treatment of obesity. As indicated by Question 2, more than half (53.1%) are able to use this knowledge in practice. However, the so-called "epidemiological awareness" of the threat of the occurrence of this disease in the population was possessed by 40.6% of those who completed the questionnaire. A report listing the correct answers to the first three questions made it possible to identify the group of surgeons who possess both theoretical and practical knowledge as well as the so-called "epidemiological awareness", which is a condition for making correct therapeutic decisions. This group represented together 25% of the total number of surgeons questioned (Figure 2).

Correct knowledge concerning the surgical methods applied in the treatment of obesity was possessed by more than 90% of those questioned. To Question 5, concerning the techniques of performing operations, the correct answer was also given by more than 90% of the surgeons. Altogether 120 doctors (83.9%) gave answers that were in accordance with published scientific results concerning the benefits of bariatric treatment. For question 7, only 27% of the respondents demonstrated appropriate knowl-

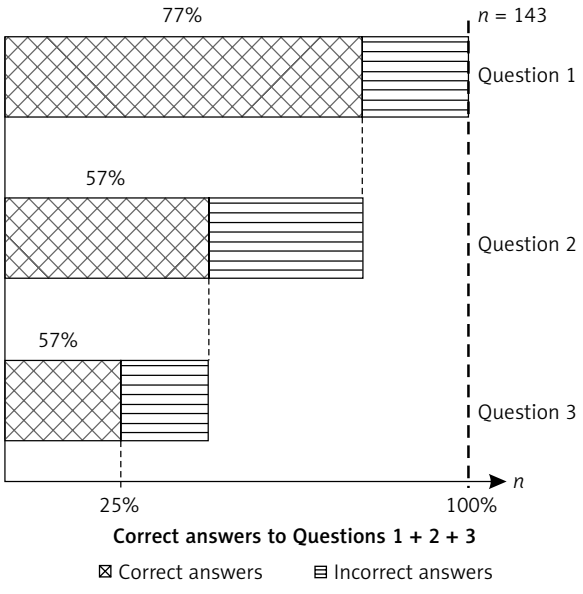

Figure 2. Summary of correct answers given by surgeons to questions assessing their theoretical knowledge (Question 1), practical knowledge (Question 2) and "epidemiological consciousness" (Question 3) considering indications for bariatric surgery

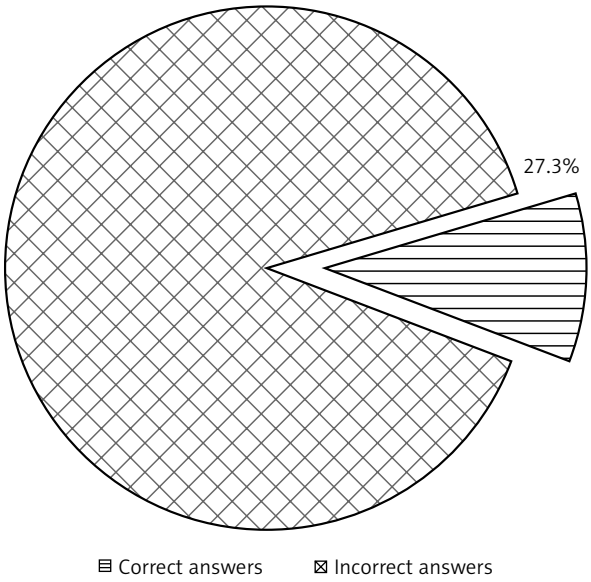

Figure 3. Assessment of the knowledge of surgeons regarding the impact of bariatric surgery on the incidence of malignant tumours (Question 7)

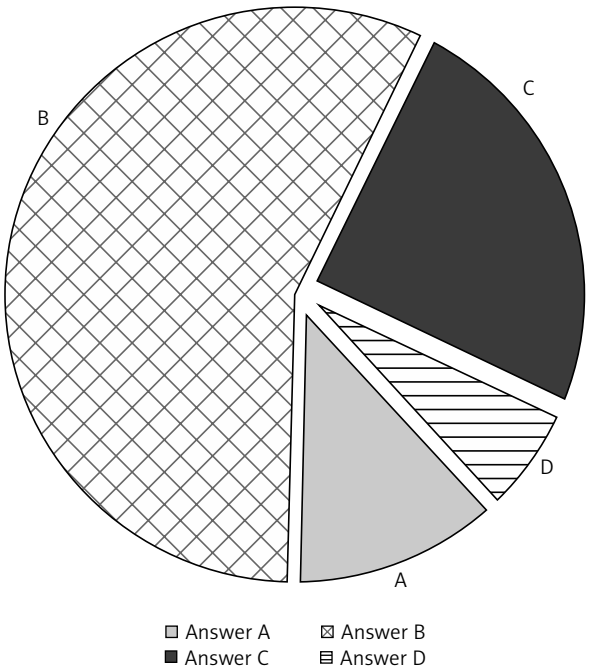

Figure 4. Self-assessment considering surgical treatment of obesity (Question 10)

edge concerning the beneficial influence of bariatric surgery on the frequency of the occurrence of cancer in patients suffering from obesity (Figure 3).

Almost everybody knew that bariatric surgery is a discipline concerned with the treatment of obesity. The knowledge that the surgical treatment of obesity reduces healthcare costs was possessed by 132 doctors (92.3%). In spite of such good results, almost 80% of the surgeons recognise that they would benefit from further education in the field of surgical treatment of obesity (Figure 4).

Discussion

Conservative treatment of morbid obesity (including here miracle diets, physical activity and psychological support) has been shown to be ineffective in long-term follow-up. The knowledge of general practitioners in Poland is insufficient to identify patients who should be sent for bariatric surgery. Consequently, many patients are still dying due to morbid obesity and its complications without proper treatment. To conclude, the healthcare for this disease in Poland should be evaluated and organised in accordance with evidence-based medicine. Only a few years ago, the surgeon was regarded as a doctor being at the end of the diagnostic-treatment path of obesity. Surgeons were responsible mainly for the treatment of its complications such as diabetic foot, nephropathy, atherosclerosis, etc. Bariatric surgery, which nowadays is recognised as metabolic surgery, can offer patients preventative surgery that can not only reduce excess body weight but can also lead to the resolution of diabetes, hypertension, dyslipidaemia, etc [36–38]. As evaluated in our study, the knowledge of bariatric surgery among surgeons in our country is high. In spite of the fact that the study group is relatively small, which could be considered to be a research limitation, this is still the first such study in our country that gives us a general overview of the quality of knowledge in this field. We would also like to underline that, to the best of our knowledge, no such study has been reported from another country. The theoretical knowledge for qualification for bariatric surgery is possessed by more than 3/4 of those questioned, which in connection with the practical knowledge and the awareness of the "epidemiological" aspects demonstrated the excellent preparation of 25% of the questioned surgeons. For the sake of comparison, similar knowledge in this area is possessed by three times fewer general practitioners (8.1%). Knowledge concerning the principles of surgical treatment (more than 90% correct answers) is

a result of the ongoing education of surgeons, which to a large extent was made easier thanks to a series of articles appearing in different journals, and developed under the patronage of the Chapter of Metabolic and Bariatric Surgery of the Association of Polish Surgeons, and dedicated to particular issues from the area of bariatric and metabolic surgery. Also, the increasing number of conferences which make it possible to meet pioneers and leaders of bariatric surgery in Poland and in the world to exchange experience and to attend training in leading centres increases not only knowledge but also the safety of the procedures performed. The choice of laparoscopy as a method of treatment is currently the intuitive choice of surgeons resulting from the enormous and constantly increasing experience in the field of abdominal surgery and other surgical fields (gallbladder surgery, anti-reflux surgery, colorectal surgery, adrenalectomy, nephrectomy and others). The advantages of a better view in the surgical operating field and the constant improvements in surgical techniques result in the reduction of intra- and post-operative complications [39]. The relatively low level of knowledge observed concerning the influence of bariatric surgery on the reduction of cancer risk can be explained by the fact that surgeons perform oncological procedures on a routine basis. The reduction of the risk of cancer observed among patients who underwent bariatric surgery is considered by the surgeon as an additional beneficial effect and another argument in negotiations with patients and other doctors, mainly GPs. This fact does not change the reality observed in our country where as a result of the low quality of primary preventative care, the lack of systematic activities to improve the awareness of society and the medical environment itself, the number of oncological patients and the advancement of cancer in the population forces surgeons to constantly improve their skills in this field. In spite of the excellent knowledge of bariatric surgery, it is satisfying that the majority of those questioned (about 80%) declare an interest to increase their qualifications, either in the form of self-education (about 22%) or in the form of courses and conferences (about 59%). This demonstrates the enormous interest in the subject and confirms that current thinking believes that metabolic surgery will become a dominant branch of medicine in the future. Proof of a systematic approach to the problem is the introduction of the issues of bariatric surgery (at the moment as a pilot programme) to the training programme of medical students during their surgical studies at the Jagiellonian University in Krakow.

Conclusions

The undertaken study demonstrates that the knowledge of Polish surgeons in the area of the surgical treatment of obesity is uneven. It was found in this study that the level of knowledge of surgeons on the subject of bariatric surgery represents a basis for further development in this area in our country in accordance with epidemiological requirements. The majority of surgeons are still interested in increasing their knowledge in this area.

References

1. James WP. The epidemiology of obesity: the size of the problem. J Intern Med 2008; 263: 336-52.
2. http://ec.europa.eu/health/reports/european/health_glance_2012_en.htm.
3. http://www.forumfarmaceutyczne.pl/index.php/aktualnoci/39-news/317-diagnoza-stanu-zdrowia-polakow-wedug-nat-pol-2011.
4. Bergman RN, Kim SP, Hsu IR, et al. Abdominal obesity: role in the pathophysiology of metabolic disease and cardiovascular risk. Am J Med 2007; 120 (2 Suppl. 1): 3-8.
5. Van Itallie TB. Health implications of overweight and obesity in the United States. Ann Intern Med 1985; 103: 983-8.
6. Kannel WB, Garrison RJ, Dannenberg AL. Secular blood pressure trends in normotensive persons: the Framingham Study. Am Heart J 1993; 125: 1154-8.
7. Thompson D, Brown JB, Nichols GA, et al. Body mass index and future healthcare costs: a retrospective cohort study. Obes Res 2001; 9: 210-8.
8. Parikh MS, Shen R, Weiner M, et al. Laparoscopic bariatric surgery in super-obese patients (BMI>50) is safe and effective: a review of 332 patients. Obes Surg 2005; 15: 858-63.
9. Banka G, Woodard G, Hernandez-Boussard T, et al. Laparoscopic vs. open gastric bypass surgery: differences in patient demographics, safety, and outcomes. Arch Surg 2012; 147: 550-6.
10. Reoch J, Mottillo S, Shimony A, et al. Safety of laparoscopic vs open bariatric surgery: a systematic review and meta-analysis. Arch Surg 2011; 146: 1314-22.
11. Christou NV, Sampalis JS, Liberman M, et al. Surgery decreases long-term mortality, morbidity, and health care use in morbidly obese patients. Ann Surg 2004; 240: 416-23.
12. Adams TD, Gress RE, Smith SC, et al. Long-term mortality after gastric bypass surgery. N Engl J Med 2007; 357: 753-61.
13. Adams TD, Pendleton RC, Strong MB, et al. Health outcomes of gastric bypass patients compared to nonsurgical, nonintervened severely obese. Obesity 2010; 18: 121-30.
14. Wittgrove AC, Clark GW. Laparoscopic gastric bypass, Roux-en-Y- 500 patients: technique and results, with 3-60 month follow-up. Obes Surg 2000; 10: 233-9.

15. Paluszkiewicz R, Kalinowski P, Wróblewski T, et al. Prospective randomized clinical trial of laparoscopic sleeve gastrectomy versus open Roux-en-Y gastric bypass for the management of patients with morbid obesity. Videosurgery Miniinv 2012; 7: 225-32.
16. Sjöström L, Lindroos AK, Peltonen M, et al. Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. N Engl J Med 2004; 351: 2683-93.
17. Schauer PR, Kashyap SR, Wolski K, et al. Bariatric surgery versus intensive medical therapy in obese patients with diabetes. N Engl J Med 2012; 366: 1567-76.
18. Mingrone G, Panunzi S, De Gaetano A, et al. Bariatric surgery versus conventional medical therapy for type 2 diabetes. N Engl J Med 2012; 366: 1577-85.
19. Reis CE, Alvarez-Leite JI, Bressan J, et al. Role of bariatric-metabolic surgery in the treatment of obese type 2 diabetes with body mass index <35 kg/m^2: a literature review. Diabetes Technol Ther 2012; 14: 365-72.
20. Iaconelli A, Panunzi S, De Gaetano A, et al. Effects of bilio-pancreatic diversion on diabetic complications: a 10-year follow-up. Diabetes Care 2011; 34: 561-7.
21. Hady Razak Hady, Dadan J, Gołaszewski P, et al. Impact of laparoscopic sleeve gastrectomy on body mass index, ghrelin, insulin and lipid levels in 100 obese patients. Videosurgery Miniinv 2012; 7: 251-9.
22. Dixon JB, Zimmet P, Alberti KG, et al. Bariatric surgery: an IDF statement for obese Type 2 diabetes. Diabet Med 2011; 28: 628-42.
23. Hallersund P, Sjoestroem L, Olbers T, et al. Gastric bypass surgery is followed by lowered blood pressure and increased diuresis – long term results from the Swedish obese subjects (SOS) Study. PLoS One 2012; 7: e49696.
24. Nordstrand N, Hertel JK, Hofsø D, et al. A controlled clinical trial of the effect of gastric bypass surgery and intensive lifestyle intervention on nocturnal hypertension and the circadian blood pressure rhythm in patients with morbid obesity. Surgery 2012; 151: 674-80.
25. Sjöström L, Peltonen M, Jacobson P, et al. Bariatric surgery and long-term cardiovascular events. JAMA 2012; 307: 56-65.
26. Shayani V, Voellinger D, Liu C, et al. Safety and efficacy of the LAP-BAND AP® adjustable gastric band in the treatment of obesity: results at 2 years. Postgrad Med 2012; 124: 181-8.
27. Kwiatkowski A, Paśnik K, Stanowski E, et al. Regression of metabolic syndrome depending on type of bariatric surgery. Videosurgery Miniinv 2009; 42: 53-8.
28. Bužga M, Holéczy P, Švagera Z, et al. Effects of sleeve gastrectomy on parameters of lipid and glucose metabolism in obese women – 6 months after operation. Videosurgery Miniinv 2013; 8: 22-8.
29. Adams TD, Stroup AM, Gress RE, et al. Cancer incidence and mortality after gastric bypass surgery. Obesity 2009; 17: 796-802.
30. Adams TD, Hunt SC. Cancer and obesity: effect of bariatric surgery. World J Surg 2009; 33: 2028-33.
31. Sjöström L, Gummesson A, Sjöström CD, et al. Effects of bariatric surgery on cancer incidence in obese patients in Sweden (Swedish Obese Subjects Study): a prospective, controlled intervention trial. Lancet Oncol 2009; 10: 653-62.
32. Agren G, Narbro K, Näslund I, et al. Long-term effects of weight loss on pharmaceutical costs in obese subjects. A report from the SOS intervention study. Int J Obes Relat Metab Disord 2002; 26: 184-92.
33. Narbro K, Agren G, Jonsson E, et al. Pharmaceutical costs in obese individuals: comparison with a randomly selected population sample and long-term changes after conventional and surgical treatment: the SOS intervention study. Arch Intern Med 2002; 162: 2061-9.
34. Neovius M, Narbro K, Keating C, et al. Health care use during 20 years following bariatric surgery. JAMA 2012; 308: 1132-41.
35. Giaro M, Wyleżoł M, Truszczyński O, et al. Assessment of the knowledge of GPS considering the surgical treatment of obesity. Pol Przegl Chir 2012; 84: 383-9.
36. Dadan J, Iwacewicz P, Hady Razak Hady. Quality of life evaluation after selected bariatric procedures using the Bariatric Analysis and Reporting Outcome System. Videosurgery Miniinv 2010; 5: 93-9.
37. Visockiene Z, Brimas G, Abaliksta T, et al. Metabolic changes one year after laparoscopic adjustable gastric banding operation in morbidly obese subject. Videosurgery Miniinv 2013; 8: 13-21.
38. Proczko M, Kaska Ł, Kobiela J, et al. Roux-en-Y gastric bypass in dialysed morbidly obese patients as a preparation for a kidney transplantation: case series. Videosurgery Miniinv 2013; 8: 174-7.
39. Puzziferri N, Austrheim-Smith IT, Wolfe BM, et al. Three-year follow-up of a prospective randomized trial comparing laparoscopic versus open gastric bypass. Ann Surg 2006; 243: 181-8.

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