

Multidisciplinary treatment of a patient with type 2 diabetes and morbid obesity, or perhaps already a surgical diabetology

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Abstract

Relationships between abdominal obesity and glucose tolerance disorders have been well documented. There are also many reports concerning body weight gain during insulin therapy. On the other hand, there are reports pertaining to the effectiveness of surgical treatment of obesity and related type 2 diabetes. The case is presented of a 39-year-old woman with morbid obesity (maximum weight – 141 kg, BMI – 48.8 kg/m²), who reported to the outpatient department for metabolic diseases in December 2009. The patient had suffered from diabetes for 8 years and was treated with insulin – a dose of 114 IU from the day of the first visit. The patient received education concerning the modification of lifestyle, diet and insulin therapy. A balanced diet of 1,200 kcal daily was recommended. The daily insulin dose was reduced to 56 units. The patient was considered as a potential candidate for bariatric surgery. During the preparation for this procedure she was hospitalized in the Diabetology Ward, where the doses of insulin were further reduced and then discontinued. In March 2010, gastric sleeve resection was performed. Within 18 months, the patient's body weight was reduced by 66 kg and normalization of glycaemia was obtained, despite the total discontinuation of anti-diabetic drugs. In addition, the remission of psoriatic changes was observed.

Conclusions: In patients with type 2 diabetes and severe obesity, in whom a satisfactory metabolic control cannot be achieved with standard hypoglycaemic therapy, further intensification of insulin treatment does not have to be the method of choice, although it may lead to the normalization of glycaemia. In some patients there is the possibility of total remission of glucose intolerance due to bariatric surgery, irrespective of the previous method of treatment.

Key words

obesity, type 2 diabetes, insulin therapy, bariatric surgery

CASE REPORT

A patient aged 39 with obesity since adolescence (maximum body weight – 141 kg, BMI – 48.8 kg/m²) was admitted to the Outpatient Department for Metabolic Diseases in December 2009 (body weight – 139 kg).

The medical history obtained from the patient showed that body weight increase had occurred after pregnancies and discontinuation of smoking, and had continued throughout the last 10 years. The patient had attempted to lose weight many times, using different methods, including laxatives, slimming pills (sibutramine) and metformin.

The patient had conceived 5 times (2 miscarriages, 3 deliveries by cesarean section, birth weight of the babies < 4,000 g). In the case of full-term pregnancies, each time gestational diabetes was diagnosed. In the last pregnancy in 2001, she received insulin treatment for this reason. After delivery, high glycaemic levels persisted, thus, type 2 diabetes was diagnosed, and insulin treatment continued. The patient reported that during this therapy the doses of insulin were

systematically increased, and that she gained weight. At the time of the first visit to the Outpatient Department of Metabolic Diseases, she was treated with short-acting human insulin 26 IU, three times a day before main meals, and 36 IU of isophane insulin before sleep. She did not report hypoglycaemia, and the majority of glucose levels registered in the self-management diary indicated normoglycaemia.

Apart from obesity and diabetes, the patient also suffered from psoriasis, and twice she had undergone erysipelas of the right lower leg. In 1978, she had an appendectomy performed, and in 1993 a cholecystectomy. She works as a nurse, and in the past had smoked small amounts of cigarettes and negated alcohol consumption.

The review taken at the Outpatient Department for Metabolic Diseases indicated that until then the patient did not take much care of own health, and focused instead on her ill children (one with severe mental retardation, one with bronchial asthma). She committed many dietary mistakes. The patient reported that she was very mobile at home and at work, and practices various sports.

The patient received complete education, particularly concerning the modification of life style, and principles of health-promoting nutrition, self-management and insulin therapy. A balanced diet was recommended – 1,200 kcal daily. The daily insulin dose was immediately reduced to

56 units (63% of the initial dose), and intensive glycaemia monitoring was recommended.

Considering body weight, the existing concomitant disorder (diabetes) and failure of previous attempts to lose weight, the patient was qualified for the programme of intensive body weight loss, and as a potential candidate for bariatric surgery. During the preparation for the surgical procedure the patient was hospitalized in the Diabetology Ward at the Institute of Rural Health, from 14-18 December 2009. She received dietary education once again. Metformin was introduced into the treatment, and further reduction of insulin doses applied, followed by its total discontinuation after the determination of serum C peptide concentration, thus confirming secretory possibilities with relation to endogenous insulin.

In March 2010, the patient had gastric sleeve resection performed at the Clinic of General and Gastrointestinal Surgery and Gastrointestinal Oncology in Lublin. After the surgery, the patient continued to remain under the common diabetic-bariatric care, applied the recommended diet, and continued the physical exercises ordered. On 18 April 2011, with the patient's body weight of 77 kg, in the above-mentioned Hospital abdominal hernia plasty was performed with resection of the abdominal skin flap. Both surgical procedures were completed without complications. Due to very good cooperation with the patient and a considerable reduction in body weight, it was decided that after a year of further therapy the process of treatment could be terminated, and the anti-diabetic medications discontinued.

During the period 13-14 June 2011, the patient was hospitalized for control purposes in the Diabetology Ward at the Institute of Rural Health. Within 18 months she had reduced her body weight by 66 kg, and normalization of glucose obtained (OGTT 75 g: glucose 0' – 78.3 mg/dl, glucose 120' – 82 mg/dl). In addition, a remission of psoriatic changes was observed, and the USG of the abdominal cavity showed regression of the fatty liver. Table 1 presents the compilation of selected biochemical and clinical parameters during both hospitalization periods in the Diabetology Ward.

DISCUSSION

The etiology of body weight gain in patients with type 2 diabetes is multifactorial – from self-perpetuating mechanism (increased body weight – reduction in physical activity – decreased utilization of energy – increase in body weight) via complicated mechanisms associated with anabolic effect of endogenous insulin, incretin hormones, or exogenous insulin applied.

Other mechanisms of body weight gain are, among others, insulin therapy itself [1, 2, 3, 4, 5], fear of hypoglycaemia resulting in an increased food intake, or reduction in physical activity for protective purposes, intensification of depression in the course of a chronic disease and negative behaviours during its course [6], continuation of negative behaviours learned in childhood, and finally, the mechanism of social exclusion characteristic of both obesity and depression. It may seem that new generations of antidepressant drugs should effectively cope with the disease; unfortunately, in literature, an increase in body weight has been reported in patients with diabetes and treated for depression due to the sole mechanism of action of these medications [6].

Table 1. Comparison of selected characteristics of the patient obtained in December 2009 (at onset of treatment) and June 2011 (after bariatric surgery)

Characteristics	December 2009	June 2011
body weight (kg)	138.8	73
BMI (kg/m ²)	48.1	24.7
waist circumference (cm)	145	92
hip circumference (cm)	130	99
WHR	1.11	0.93
mean blood pressure (mmHg)	119/65	122/66
HbA1c (%)	6.53	4.94
C peptide fasting (ng/ml)	2.25	1.53
C peptide after food intake (ng/ml)	4.5	3.17
total cholesterol (mg/dl)	174	181
HDL cholesterol (mg/dl)	27	53.4
LDL cholesterol (mg/dl)	123	108.2
triglycerides (mg/dl)	114	97
creatinine (mg/dl)	0.8	0.5
uric acid (mg/dl)	5.3	4.0
TSH (μIU/ml)	1.76	1.75

Considering pathogenesis, the treatment of type 2 diabetes should start from the modification of life style: adequate diet and increase in physical activity. Such actions may entirely prevent the development of diabetes, and are indispensable for the reduction in body weight [7]. They are also necessary in combination with pharmacotherapy of the existing diabetes. Unfortunately, patient education with respect to health promoting life style requires an engagement from the medical staff and devoting a considerable amount of time, and is often ineffective because of the old habits of patients.

Obesity is an independent risk factor of cardiovascular diseases, the prevention of which is among the primary goals of diabetes treatment. However, many drugs used in the treatment of diabetes are conducive to further body weight gain. This concerns primarily sulphonylurea derivatives and insulin. An increase in body weight during treatment with these drugs was observed, among others, in the UKPDS study [8]. Thiazolidinediones, used to improve insulin sensitivity, may cause oedema, and therefore also weight gain. Metformin, at present considered the oral antidiabetic drug of the first choice in patients with type 2 diabetes, is neutral with regard to body weight [9]. New antidiabetic drugs – glucagon-like peptide 1 (GLP-1) receptor agonists, favour the reduction of body weight, while dipeptidyl peptidase – 4 antagonists do not exert any significant effect on weight [10].

Until recently, a normal or close to normal level of HbA1c and absence of late complications has been considered as a success in the treatment of type 2 diabetes, whereas body weight loss by 5-10% of the initial weight – as a metabolically effective reduction in body weight. This solved the problem of hyperglycaemia; however, it did not solve the problem of treatment of obesity and side-effects related to the sole treatment of diabetes. The possibility of diabetologists and bariatric surgeons jointly being in charge of a patient may result in the creation of new criteria for therapeutic success, i.e. complete patient recovery from both diabetes and obesity, before the development of complications of these diseases.



Figure 1. The patient at the beginning of treatment (2009)



Figure 2. The patient after treatment (June 2011)



An improvement in insulin sensitivity as early as during the first week after surgery and an increase in insulin production result in an improvement of metabolic control of diabetes, and even its quick remission in patients who have undergone bariatric surgery, irrespective of body weight loss. The first mechanism remains unexplained. Nevertheless, apart from body weight loss, it is considered that the other mechanism is related to the increased production of GLP1 after food intake [11].

This year, the important results of the Swedish Obese Subjects Study were presented where two groups of patients were compared, who were analogous with regard to age, gender, and BMI: those who received bariatric surgery (implanting a gastric band around the upper part of the stomach, vertical gastroplasty, or gastric bypass), and conservative treatment. After a 14-year period of observation, no significant change in body weight were noted in the group of patients who received conservative treatment, whereas in the group of patients who had undergone bariatric surgery, body weight reduction ranged from 18% – 23%, according to the method. Moreover, during the period of study, the number of deaths due to cardiovascular causes among patients who had undergone bariatric surgery was lower by 53%. The number of myocardial infarctions, both fatal and non-fatal, was reduced by 33% (a decrease of 29%), as well as number of strokes (decrease of 34%). It is noteworthy that relatively greater benefits from the surgical intervention were observed in patients with higher insulinemia, and not higher BMI. This may be of great importance while qualifying patients for bariatric surgery procedures [12].

At earlier stages of the Swedish Obese Subjects Study it was confirmed that in patients who received invasive treatment, the remission of respiratory disorders in sleep, dyspnea, chest pain, hypertension, lipid disorders and diabetes was more frequent, and cancer incidence lower. In this group, a decrease in mood disorders related to obesity was also observed, including remission in depressive disorders. Patients who had undergone bariatric surgery more often discontinued smoking and increased their physical activity [13, 14, 15].

In the recommendations by the International Diabetologic Federation of 2011, an opinion may be found that bariatric surgery is an efficient, safe, and cost-effective method of improving glycemic control in very obese patients with type 2 diabetes, and should be recommended to patients with type 2 diabetes and BMI of $\geq 35 \text{ kg/m}^2$, after previous qualification by a multidisciplinary team of specialists, proper education and preparation, according to standardized surgical procedures [16].

In the case of the above-described patient, a number of mistakes were committed at the beginning of the treatment. The patient was not sufficiently motivated to change her life style, she did not receive proper education, which frequently happens with the present pace of work in medicine. Despite the lack of indications, insulin therapy was continued after pregnancy. Moreover, the doses of insulin were systematically increased, reaching a very high daily dose. Fortunately, the patient reported in time to the Outpatient Department for Metabolic Diseases where the previous mistakes were corrected. The referral of the patient for bariatric surgery

allowed full therapeutic success in the form of remission of diabetes and normalization of body weight.

CONCLUSIONS

In patients with type 2 diabetes and morbid obesity, in whom satisfactory metabolic control of diabetes cannot be achieved with the use of oral medications, insulin therapy does not have to be the method of choice, despite the fact that its use would lead to the normalization of glycaemia. In some of these patients it is possible to obtain full remission of glucose intolerance by using bariatric surgery, irrespective of the previous method of treatment, even in the case of application of high doses of insulin.

Caution should be observed while initiating therapy with medications which favour body weight gain, such as sulphonylurea derivatives and insulin, and increasing their doses in patients with type 2 diabetes and obesity, and if their application is necessary, body weight should be strictly controlled during the treatment.

In the case of patients with type 2 diabetes with concomitant morbid obesity, it is necessary to re-define therapeutic success from the words: 'normoglycaemia without complication' to 'complete remission of the disease without the necessity for pharmacotherapy'.

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