

Case Report

Type 2 diabetes in young adults, can we do more for them? – case presentation

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Abstract

Type 2 diabetes mellitus (T2DM), once considered a disease of old age, now occurs not uncommonly in children and young adults. Youth-onset type 2 diabetes is on the rise, and trends in childhood obesity only partially explain the recent appearance of a condition that was previously confined to adults. The difficulty in T2DM in young adults highlights the critical need to promote healthy lifestyle to prevent or postpone the development of T2DM in those at risk. For individuals with early onset T2DM, glycemic control must be carefully monitored and treated. We reported here a case that provides a successful management and treatment of the use of metformin, liraglutide, and most important lifestyle modifications to reduce body weight in young obese patient with poorly controlled and new diagnosed T2DM.

Keywords: lifestyle, liraglutide, obesity, Type 2 diabetes, young adults.

Introduction

We are all very well acquainted with the enormous and increasing impact of diabetes mellitus on individuals and society worldwide. The obesity pandemic has spared no age group, including young children. Type 2 diabetes mellitus (T2DM), once considered a disease of old age, sadly now occurs not uncommonly in children and young adults [1]. Youth-onset T2DM is on the rise, and trends in childhood obesity only partially explain the recent appearance of a condition that was previously confined to adults [2, 3].

The mechanism of T2DM onset in youth:

1. Development of T2DM in youth is influenced by biological and environmental variables, e.g., genetic risk, epigenetics, diet, physical

activity, sex hormone production, and insulin resistance during puberty.

2. Some risk factors differentiate effects according to sex and stage of life, e.g insulin resistance is higher in females from childhood to mid-puberty, whilst it is greater in males during late puberty and adulthood [4, 5].

The largest clinical trial, Treatment Options for T2DM in Adolescents and YOUTH (TODAY study), has shown that oral agent monotherapy does not maintain durable glycemic control in approximately 50% of patients with adolescent-onset T2DM and a hemoglobin A1c (HbA1c) >6.3% in females and 5.6% in males following initial metformin monotherapy predicts glycemic deterioration [6]. Thus, it is important to optimize treatment using a combination



of pharmacological and non-pharmacologic interventions [7], with close monitoring and follow-up [8, 9]. Ideally, the care of an adolescent with T2DM should be managed by a multidisciplinary team, including an endocrinologist, nurse educator, dietitian, mental health professional, and sometimes an exercise physiologist [10, 11, 12].

The following case presentation provides a successful management and treatment of the use of metformin, liraglutide, and most important the lifestyle modifications which help to reduce body weight in young obese patients with poorly controlled and newly diagnosed T2DM.

Case Presentation

A 19-year-old obese male presented to the department of Endocrinology, 8th September City General Hospital, Skopje, for the first time with complaints of high glycaemia (30 mmol/l), feeling very thirsty, often urinating and blurry vision for one month. He was diagnosed as type 1 diabetes mellitus (T1DM) 2–3 days ago in a local poly clinic and insulin therapy in four doses (basal bolus therapy) was prescribed without any improvement. He had a family history of diabetes, high blood pressure and dyslipidemia. He is a nonsmoker with no children and works in private firm.

Investigations

Initial investigations showed extremely elevated HgA1c 110.3 mmol/mol (12.2%), high glycaemia (30 mmol/l), glycosuria, elevated cholesterol (7.0 mmol/l), and triglyceride (2.8 mmol/l). His renal and liver functional tests were within normal limits. The tests for thyroid functional were also normal. Because of his weight, additional tests were made T1DM was ruled out by negative anti-islet antibody test results. He was 170 centimeter tall, 107 kg weight and his body mass index (BMI) was 37.0. Echotomography showed steatotic liver, echocardiography, and ophthalmic tests were normal.

Treatment

Based on clinical and biochemical tests, the patient was diagnosed with T2DM and rehydration with fluids and fast acting insulin in small doses was given until we achieved the desire glycemia. Because the patient was overweight and his biggest concern was his weight, he also had insulin resistance and many other additional factors, the medical team decided to start the treatment with metformin (1000 mg couple of days and after 2000 mg per day) and liraglutide with gradual titration of the dose (was started at 0.6 mg daily subcutaneously for one week and then increased to 1.2 mg daily) with additional lifestyle modifications (balancing food and physical activity). The goal of this combination was to improve glycemic control and encourage weight loss (table 1). The patient felt good, without any side effects from the therapy. As soon as we achieved glycemia at referent values his lipids status was normalized. He was discharged from our department in good condition, without any symptoms and with liraglutide 1.2 mg per day and Tbl Metformin a 2000 mg per day.

At the follow-up visit one month later, the patient denied any side effects or adverse reactions from the therapy with liraglutide and metformin and was pleased that he had lost 4 kg. He had greatly improved HgA1c 64.4 mmol/mol (8.0%) and fasting glycaemia 4.64 mmol/l. He also reported checking his blood glucose often and having glycemia in referent values.

Three months later his HgA1c was improved to 37.1 mmol/mol (5.5%), fasting glycaemia 4.78 mmol/l and additional liver and kidney tests were normal. He admitted having some episodes of hypoglycemia (glycemia 3.7–4.0 mmol/l) but he said they were asymptomatic and did not require medical attention. He had lost additional 12kg and his BMI now was 31.5. He said he had more energy and felt better every day. He continued with the therapy, balancing food intake and physical activity.

At follow-up 3–4 months later, his average glucose readings were between 3.0–4.8 mmol/l. While taking liraglutide, combined with balance food and physical activity he had lost additional 12 kg and his BMI has decreased to 27.3. His HgA1c

was 34.8 mmol/l (5%) and the other functional tests were in referent values. But he admitted having more frequent episodes of hypoglycemia, particularly after physical activity, but they did not require medical attention because after consuming carbohydrates he felt better. Because of this information we advised the patient to stop taking liraglutide and to continue only with metformin 2000 mg daily, balance food and physical activity.

At the next follow-up 5–6 months later, his average glucose reading was 5.0 mmol/l, his HgA1c was 37.3 mmol/l (5.5%), and he had lost additional 5 kg. His BMI now was 25.6 and he hadn't experienced hypoglycemic episodes for the past 5–6 months. We continued with this treatment and neither any adverse event or elevated glycemia and HgA1c had occurred thereafter.

Discussion

Metformin monotherapy provided durable glycemic control in only one part of patients, indicating that this disease can be more aggressive and rapidly progressive when onset is early in life. It is therefore important to carefully and frequently monitor these patients and intensify therapy, according to their parameters. Individualizing treatment regimens should be given consideration [7]. GLP-1 has been reported to have several functions as follows: stimulating

insulin secretion, inhibiting glucagon secretion, promoting glucose production and glucose uptake in the liver, increasing glucose uptake and glycogen production in skeletal muscle, decreasing food intake for the central nerve, delay of gastric emptying, and so on [13, 14].

In our case report, we observed that the prevalence of T2DM and metabolic syndrome in the young patient was in correlation with a family history of diabetes. Moreover, young adults with a currently normal glucose tolerance, but with family history of diabetes, have higher FPG and triglyceride levels, which indicates a future risk of progression to T2DM and metabolic disorders [15]. The risk of T2DM and metabolic syndrome is greater among young adults with a family history of diabetes [3], so that's why screening and lifestyle interventions are needed [16]. In this case presentation, we showed the efficacy of liraglutide, its influence on changes in quality of life (QOL) [12], and the correlation between changes in HbA1c and body weight [9]. Liraglutide therapy decreased HbA1c level and body weight, and improved patient QOL as evidenced [17]. As expected, we observed a significant improvement in clinical parameters, reduction in weight, BMI, and HbA1c at 12 weeks after liraglutide initiation [18].

One of the elements of diabetes treatment is normalization of glucose levels, which protects the patient from the consequences of chronic hyperglycemia [19]. Change in lifestyle habits remains an important component

Table1: Patient's diabetes medication changes over time.

Reference date	Medical change	HgA1c (%) at time of change	Weight loss
Date liraglutide was added	Liraglutide 1.2 mg + metformin 2000 mg daily	12.2%	107 kg
1 month after starting liraglutide	Liraglutide 1.2 mg + metformin 2000 mg daily	8.0%	103 kg
3 months after starting liraglutide	Liraglutide 1.2 mg + metformin 2000 mg daily	5.5%	91 kg
7–8 months after starting liraglutide	Liraglutide 1.2 mg + metformin 2000 mg daily	5%	79 kg
5–6 months after stop taking liraglutide	Metformin 2000 mg daily	5.5%	74 kg
1 years after stop taking liraglutide	Metformin 2000 mg daily	5.3%	75 kg

in the management of young people with T2DM [20, 11]. Several diabetes prevention trials in adults demonstrate that lifestyle intervention, consisting of increased physical activity and dietary modification with lower caloric intake and weight loss, reduces the rate of progression to T2DM in people with impaired glucose tolerance [21, 22]. However, based on observations in adults, the current recommendation in the management of adolescents with T2DM includes both dietary and exercise modification [1, 10].

Conclusion

The case presented here summarized the benefit of initial treatment for young people with T2DM, the combination of GLP-1 receptor agonist, metformin, and most important the lifestyle changes. The potential benefits of adding GLP-1 receptor agonist to the therapy to metformin include weight loss, improved glycemic control, and enhanced safety in getting the desired results [7]. GLP-1 receptor agonists are especially promising and should be tested in this population without delay [14]. The potential disadvantages are gastrointestinal side effects and the risk of hypoglycemia if the doses of concurrent hypoglycemic medication are not titrated, especially if the weight loss is more than expected [13, 23]. The goals of managing a young patient with T2DM include the following: 1. to achieve and maintain near normal glycemic control, 2. to improve insulin sensitivity and secretion, which results in improved glycemic control [4], 3. to identify and treat, if necessary, comorbidities such as hypertension, dyslipidemia, and nonalcoholic fatty liver disease and 4. to prevent the vascular complication of T2DM [20]. Weight reduction improves glycemic control and is a crucial component of successful management of T2DM in young people [3]. Lifestyle modifications to reduce body weight should be initiated in all patients with this disorder, because weight loss reduces insulin resistance and improves insulin secretion [10, 22].

For initial treatment of the young with T2DM, we recommend both pharmacologic and nonpharmacologic therapy

(lifestyle modification) for all patients. Laboratory measurement of glycaemia, HgA1c, should be routinely monitored, and medication type and dose adjusted as needed [11]. Ongoing therapeutic choices are dependent upon the response of patients to the initial therapy. Screening and treatment for diabetes-related comorbidities and complications (hypertension, dyslipidemia, non-alcoholic fatty liver disease, macro and micro-vascular disease) is essential in preventing early morbidity and mortality, and should be performed once a year [21, 18].

In conclusion, liraglutide is an effective treatment option for obese T2DM patients [17], and it helps in reducing body weight and improving glycemic control without deteriorating QOL [9, 24, 12]. The difficulty in treating T2DM in youth highlights the critical need to promote healthy lifestyle to prevent or postpone the development of T2DM in those at risk [1]. For individuals with early onset T2DM, glycemic control must be carefully monitored and treated. Young adults with diabetes risk factors, such as a family history of diabetes, should be considered for screening of diabetes and metabolic disorders [2, 15].

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Conflict of Interest

The authors declare no conflict of interest.

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