

## Brittle Diabetes Needs Patient Centered Treatment and Lifestyle Modification in the Rural

### Brittle Diyabet Kırsalda Hasta Odaklı Tedaviye ve Yaşam Biçimi Değişikliklerine Gereksinim Duyar

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#### ABSTRACT

The 'brittle' type 1 diabetes mellitus is characterized by severely fluctuating blood glucose levels, recurrent and long hospital admissions, and disruption of quality of life. When the case is brittle, it is more difficult to manage diabetes mellitus in the rural Turkey than in urban areas. We present a case of 33-year-old male patient with brittle type 1 diabetes mellitus for over 15 years. His life was a vicious cycle of episodes of hyper and hypoglycemia needing hospitalization approximately every 5 or 6 months for the regulation of his blood glucose levels. A family physician attributed the problem to stressful life circumstances. The patient has been divorced for many years, lost contact with his children and had difficulties in managing his life alone. A family physician counseled him using non-pharmacologic approaches. She arranged diet based on the patient's eating patterns, preferences, and metabolic goals. Macronutrient proportions were individualized. He learned carbohydrate counting and administered insulin for each meal based on the carbohydrate content. He quitted smoking. His socialization developed through psychiatric interventions. Despite lacking regular exercise, lifestyle modification helped the patient achieve more stable plasma glucose levels, avoid being 'brittle' and improve his quality of life in this rural context.

**Keywords:** Brittle diabetes, lifestyle, rural

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#### ÖZET

"Brittle" Tip 1 Diyabet, kan şekeri düzeylerinde ciddi dalgalanmalarla, yineleyen ve uzun hastane yatışlarıyla tedavi görmeyi gerektiren ve yaşam kalitesinin bozulmasıyla karakterizedir. Olgu "Brittle" olduğunda, Türkiye'nin kırsal kesimlerinde diyabeti yönetmek kentsel alanlara göre daha zordur. Bu yazıda 15 yılı aşkın süredir Brittle tip 1 diabetes mellitus tanısı olan 33 yaşında bir erkek hasta sunulmaktadır. Hastamızın yaşamı, kan şekeri düzeylerinin düzenlenmesi için yaklaşık her 5 ya da 6 ayda bir hastaneye kaldırılmasını gerektiren hiper ve hipoglisemi ataklarından oluşan bir kısır döngüydü. Aile hekimi uzmanı, sorunun sorunun stresli yaşam koşullarından da kaynaklandığını düşündü. Hasta uzun yıllar önce boşanmış, çocuklarıyla ilişkisini kaybetmiş ve hayatını tek başına yönetmekte güçlük çekiyordu. Aile hekimi uzmanı, farmakolojik olmayan yaklaşımlar da kullanarak danışmanlık yaptı. Diyeti hastanın yeme alışkanlıklarına, tercihlerine ve metabolik hedeflerine göre düzenledi. Makro besin oranları bireyselleştirildi. Karbonhidrat sayımını öğrenmesi ve karbonhidrat içeriğine göre her öğün insülin uygulaması sağlandı. Sigarayı bıraktı. Sosyalleşmesi psikiyatrik müdahalelerle gelişti. Düzenli egzersiz yapmamasına rağmen, yaşam biçimi değişikliği, hastanın daha stabil plazma glikoz seviyelerine ulaşmasına, "kırılganlıktan" kaçınmasına ve kırsal ortamda yaşam kalitesini iyileştirmesine yardımcı oldu.

**Anahtar Sözcükler:** Brittle Diyabet, Yaşam Tarzı, Kırsal

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**INTRODUCTION**

Diabetes mellitus (DM) is a growing problem in rural areas worldwide. The term "brittle" diabetes defines the unstable insulin-dependent diabetes mellitus (IDDM) with frequent rises and falls of blood sugar (1-4). These fluctuations can be life-threatening and cause unnecessary complications. Treatment is difficult and recurrent and long hospital admissions are among its characteristics, which in the long run, disrupts the lives of the patient and family members (1-7). It is easier to manage patients, even in rural areas, if they are compatible with their doctors in modification of their lifestyle (8) and optimising the insulin therapy (3,4), and if the doctors are compatible with their patients in managing their stress (1,3,4). Treatment must deal with the effects of psychosocial problems on brittleness, a major cause of impairment of the quality of life in these patients (1,3,4,6,7,9).

The case is a man with 15 years of insulin-dependent diabetes mellitus (IDDM), with 'brittle' behavior, and five years of high blood pressure. Over years of monitoring, he has had recurrent attacks of hypo-and-hyperglycemia and has refused to use insulin at times. Two years ago, his family physician, in addition to analogue insulin treatment, brought a strict modification to his lifestyle, which resulted in the diabetes changing from 'brittle' to 'stable'. This showed the importance of lifestyle modification coping with prolonged brittleness of diabetes.

**CASE REPORT**

A 33-year-old male patient from the South West of Turkey was first diagnosed with IDDM when he was 18-years-old. His life was disrupted by episodes of hyper-but mostly hypoglycemic attacks, requiring hospitalization every 5 or 6 months for the regulation of his blood glucose levels. At every admission, the insulin dose was readjusted, and he was provided with recommendations of diet prior to discharge. Due to his job as a cook, the patient found it difficult to comply with diets. A family physician attributed the 'brittle' characteristic of his diabetes to the stressful life circumstances. The patient had divorced long before and had lost contact with his children. He had difficulty managing his life alone. He had a history of high blood pressure since he was 28, a family history of type II diabetes mellitus in both parents and three aunts. His father died of heart failure in his early 40s. He smoked 20 cigarettes a day for 18 years but did not consume alcohol.

Two years ago, the local family physician gave him non-pharmacological counseling for the fluctuations of his plasma glucose levels. Physical examination revealed he weighed 70 kg, was 172 cm tall with a body mass index of 23.7 kg/m<sup>2</sup>. The physician arranged a diet of six small-volume meals per day (three main and three snacks) based on the patient eating patterns, preferences, and metabolic goals with individualized macronutrient proportions. He received an optimal diet of 25 kcal/kg of his ideal body weight (1800 calorie); 60% carbohydrates, 15 - 20% protein, and 20-25% fat (10). Consistent with the recommendations to increase dietary fiber intake by 3.0 g/1,000 kcal of total energy per day (8), his diet was high in fiber, vegetables and low-fat dairy products, but low in saturated fats. The amount of dietary fiber consisted of either 6-7 g of oatmeal or bran, or 50 to 100 g of nuts, or one serving of beans or broad beans, as recommended (8). The patient was given a translated and simplified version of the Carb Counting and Meal Planning brochure (11) involving a sample meal plan of 1800 calories daily. The patient eventually learned carbohydrate counting and started to administer analogue insulin based on the carbohydrate count for each meal. Daily insulin regimen included 'basal:bolus' application. He was persuaded to quit smoking. However, the main concern remained the depressive mood of the patient. He claimed to have no time to engage in physical exercise and made no effort. Nonetheless, lifestyle modification helped him in achieving more stable plasma glucose levels, which resulted in sustained stability, and an end to being 'brittle'. The patient, a cook, spent much of the day on his feet. He complained of pain in his right lower limb and in 22.05.2017, a colored-doppler ultrasound of the right lower extremity was performed. The ultrasound showed no atherosclerotic lesions in the arteries, no thrombosis or insufficiency in the veins.

The patient was able to manage the changes in his behaviour only for eight months, before reverting to his former lifestyle. In 2018, he presented with a complaint of pigmentation and swelling on the extensor side of the right lower extremity, and severe pain on the plantar side of his right foot, a typical diabetic foot lesion. He complained of difficulty in working on his feet. He was anxious and depressed.

At admission blood pressure was 150/90 mmHg, laboratory results revealed the white blood cell count: 13.5 K/μL, glucose: 347 mg/dl, HbA1c: 14.7 % (4.6-6.5), CRP (turbidimetric): 19.6 mg/dL (0-6), urea: 56 mg/dL (10-50), creatinine: 1.7 mg/dL (0.6-1.2), albumin: 1.9 g/dL (3.2-4.8), vitamin D: 3 ng/mL (4.92-47.9), vitamin B12: 121.3 pmol/L (197-771), TSH: 1.03 uIU/mL (0.35-5.5), Free T4: 1.06 ng/dL (0.89-1.76). Urine analysis revealed (+3) proteinuria without ketonuria. He was hospitalized. Insulin Aspart 10-10-10 IU at meal times and insulin Glargine 10 IU at night was administered. Each dose of insulin was only 2 units higher than his previous doses. His diet was rearranged. Enalapril 10 mg once daily was replaced with Lercanidipine- Enalapril 20 mg once daily, but all these precautions failed to regulate his blood pressure and blood sugars. Orthopedics consultation showed Wagner stage 1 ulcer<sup>12</sup> on the plantar side of his right foot. Pressure relief on the ulcer was recommended. He was treated with third-generation cephalosporin, Ceftriaxone 1gr 2x1 iv, and foot dressing twice a day with Rifampicin 125mg amp and Ethylene glycol Monophenyl Ether + Triticum Vulgare. The follow-up blood sugars were between 65 and 87 mg/dl, and he was vulnerable to hypoglycemia. Blood pressure was under control after Carvedilol 6.25 mg 1x1 po was administered to his previous antihypertensive drugs and insulin therapy was changed to insulin Lispro 6-6-6 IU and insulin Detemir 12 IU. Treatment with antibiotics continued for 14 days. Control laboratory results on 16 February 2018 revealed: blood glucose: 103 mg/dl, CRP (turbidimetric): 8.8 mg/dl, Urea: 62 mg/dl, creatinine: 1.9 mg/dl, potassium: 3 mmol/L (3.5-5.5), albumin: 1.7 g/dL (3.2-4.8), globulin: 2 g/dl (2.5-3.4). CBC was unremarkable except for Hb: 11.5 g/dl. Urinalysis showed (+1) proteinuria. Ketone bodies, bacteria and nitrite were negative. Citalopram 10 mg po was administered for the recurring depression. Liver functions remained normal and the drug dose was adjusted to 20 mg po daily. The patient was presented to a tertiary hospital for renal doppler ultrasonography for proteinuria and for colored-doppler ultrasound of his lower limb. In the follow-up of the patient, he underwent renal replacement therapy of 4 hours hemodialysis with bicarbonate 3 times in a week.

**DISCUSSION**

Among the specific etiologies causing brittle diabetes, the most common one was defined to be psychological (1,13). Among other causes are delayed gastric emptying from autonomic neuropathy, defects of counter-regulatory hormones, defective insulin absorption or increased insulin degradation, and certain drugs like alcohol and antipsychotics<sup>4</sup>. Only half of these patients with any of these specific etiologies could be treated previously (13). Today, management of 'brittle' diabetes with intensive insulin treatment (14,15) and changing behavior based on lifestyle recommendations is one treatment option to achieve blood glucose targets, and reduce or prevent the risk of diabetic complications<sup>8</sup>. Another option is education and close communication between physicians and patients (14). However, in spite of all measures of close supervision and intensive insulin treatment, there may be still difficulty in the control of patients with brittle diabetes (1,15), as in the case of our patient. In this context, in most cases, an approach based on different disciplines and strategies is recommended to help patients in achieving the targets (15). In the present case, one of the feasible changes was directed at the eating pattern, which included three main meals with three snacks between to avoid fluctuations in plasma glucose levels. The daily carbohydrate and energy intake were adjusted according to the body weight and amount of physical activity. Meals were rich in vegetables and vegetable fibers with less fats from animal sources, as recommended (16). A combination of medical and psychological care for behavior and lifestyle change could be very helpful for people with DM because these factors are believed to interact and overlap (17). Group care was found valuable for patients with diabetes in issues such as how to eat and exercise, in how to manage stress and life issues, such as problems with children and parents, marital problems, sexual problems, and work problems, because such an approach gave patients time for discussion (17). Depression was an ongoing state in our patient. We preferred Citalopram, a selective serotonin reuptake inhibitor (SSRI). The SSRIs have proved to have effective antidepressant potentials and possess a favorable pharmacological profile (18).

To conclude, high blood glucose levels were prevalent in the majority of patients with type 1 diabetes, as well as negative mood states, including anger and sadness<sup>18</sup>. We must be aware that the treatment of brittle diabetes is likely to be prolonged, and that the cooperation among the diabetologist, psychotherapist, the patient and the family is necessary for a successful outcome (6).

**CONCLUSION**

Non-pharmacologic approaches, i.e. management of diet and psychosocial factors, proved to be efficient in controlling the 'brittle' diabetes in a 33-year-old man after 15 years of insulin treatment. Instability in blood sugar levels can have a number of underlying causes, many of which are treatable. The treatment includes diabetes education, intensive insulin therapy with frequent or continuous glucose monitoring, and constant interaction between patient and the clinician. Psychotherapy is advised in selected patients, as in this case.

**Conflict of interest**

No conflict of interest was declared by the authors.

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**REFERENCES**

- 1- Gill GV. The spectrum of brittle diabetes. *J R Soc Med* 1992; 85:259-261.
- 2- Benbow SJ, Walsh A, Gill GV. Brittle diabetes in the elderly. *J R Soc Med* 2001; 94:578-580.
- 3- Gill GV, S. Walford S, Alberti KGMM. Brittle diabetes - present concepts. *Diabetologia* 1985; 28:579-589.
- 4- Vantyghe MC, Press M. Management strategies for brittle diabetes. *Ann Endocrinol* 2006; 67(4):287-296.
- 5- Cartwright A, Wallymahmed M, Macfarlane IA, Wallymahmed A, Williams G, Gill GV. The outcome of brittle type 1 diabetes—A 20 year study. *Q J Med* 2011; 104:575–579.
- 6- Pelizza L, Pupo S. Brittle diabetes: Psychopathology and personality. *Journal of Diabetes and Its Complications* 2016; 30:1544–1547.
- 7- Tattersall R, Gregory R, Selby C, Kerr D, Heller S. Course of brittle diabetes: 12 year follow up. *BMJ* 1991; 302:1240–1243.
- 8- Feldman AL, Long GH, Johansson I, Weinehall L, Fhärm E, Wennberg P, et al. Change in lifestyle behaviors and diabetes risk: evidence from a population-based cohort study with 10 year follow-up. *International Journal of Behavioral Nutrition and Physical Activity* 2017; 14:39.
- 9- Tattersall R B. Brittle Diabetes Revisited: the Third Arnold Bloom Memorial Lecture. *DIABETIC MEDICINE*, 1997; 14:99–110.
- 10- Akasaka T, Sueta D, Tabata N, Takashio S, Yamamoto E, Izumiya Y, et al. Effects of the mean amplitude of glycemic excursions and vascular endothelial dysfunction on cardiovascular events in nondiabetic patients with coronary artery disease. *J Am Heart Assoc* 2017; 6: e004841.
- 11- Cornerstones4Care® Novo Nordisk. Carb counting and meal planning. American Diabetes Association educational material including the Standards of Medical Care in Diabetes. New Jersey: Novo Nordisk A/S., 2015; 17-62.
- 12- Oyibo SO, Jude EB, Tarawneh I, Nguyen HC, Harkless LB, Boulton AJM. A Comparison of Two Diabetic Foot Ulcer Classification Systems. The Wagner and the University of Texas wound classification systems. *Diabetes Care* 2001; 24:84–88.
- 13- Schade DS, Burge MR. Brittle diabetes: etiology and treatment. *Adv Endocrinol Metab* 1995; 6:289-319.
- 14- Bertuzzi F, Verzaro R, Provenzano V, Ricordi C. Brittle type 1 diabetes mellitus. *Curr Med Chem* 2007; 14(16):1739-1744.
- 15- Voulgari C, Pagoni S, Paximadas S, Vinik AI. "Brittleness" in diabetes: easier spoken than broken. *Diabetes Technol Ther* 2012; 14(9):835-848.
- 16- Czakó L, Hegyi P, Rakonczay Z Jr, Wittmann T, Otsuki M. Interactions between the endocrine and exocrine pancreas and their clinical relevance. *Pancreatol* 2009; 9:351– 359.
- 17- Mehl-Madrone L. Comparisons of Health Education, Group Medical Care, and Collaborative Health Care for Controlling Diabetes. *The Permanente Journal* 2010; 14(2):4-10.
- 18- Lustman PJ, Clouse RE. Depression in diabetic patients. The relationship between mood and glycemic control. *Journal of Diabetes and Its Complications* 2005; 19:113– 122.