

CASE SERIES

Improved Clinical Outcomes of Patients With Type 2 Diabetes Mellitus Utilizing Integrative Medicine: A Case Report

改善患者的临床转归2型糖尿病患者利用中西医结合治疗：病例报告

La mejora de los resultados clínicos de los pacientes con diabetes mellitus tipo 2. La utilización de Medicina Integrativa: Reporte de un caso

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ABSTRACT

This case report demonstrates a successful approach to managing patients with type 2 diabetes mellitus (DM2). Botanical herbs (including *Gymnema sylvestre*) and nutrients (including alpha lipoic acid and chromium) were used alongside metformin to help improve insulin sensitization; however, the greatest emphasis of treatment for this patient centered on a low-carbohydrate, whole-foods diet and regular exercise that shifted the focus to the patient's role in controlling their disease. Research on DM2 often focuses on improving drug efficacy while diet and lifestyle are generally overlooked as both a preventive and curative tool. During the 7 months of treatment, the patient's hemoglobin A1c and fasting glucose significantly decreased to within normal ranges and both cholesterol and liver enzyme markers normalized. A significant body of evidence already exists advocating for disease management using various diets, including Mediterranean, low-carb, and low-fat vegan diets; however, no clear dietary standards have been established. This study supports the use of naturopathic medicine as well as dietary and lifestyle changes to develop the most efficacious approach for the treatment of DM2.

摘要

这份病例报告证明了对 2 型糖尿病 (DM2) 患者的成功管理办法。草药 (包括匙羹藤) 和营养素 (包括硫辛酸和铬) 与二甲双胍一起用于帮助改善胰岛素的敏化作用。但此患者的治疗主要着重于低碳水化合物、天然健康饮食以及定期运动, 因此患者的角色主要变成了控制疾病。2 型糖尿病的研究通常主要在于提高药物效用, 而饮食和生活方式通常被忽略, 只将其作为一种预防和治疗工具。在治疗的 7 个月内, 患者的血红蛋白 A1c 和空腹血糖均大大降低至正常范围以内, 而且血脂和肝酶标记均正常。大量证据已经存在, 倡议疾病管理可使用不同的饮食, 包括地中海式、低碳水化合物和低脂的素食饮食。但还未建立清晰的饮食标准。此研究支持使用自然疗法药物以及饮食和生活方式的改变, 以制定对 2 型糖尿病最有效的治疗方法。

SINOPSIS

Este informe de un caso muestra un enfoque satisfactorio para el control de pacientes con diabetes mellitus de tipo 2 (DM2). Se utilizaron hierbas (incluida la *Gymnema sylvestre*) y nutrientes (incluido el ácido alfa-lipoico y el cromo) junto con metformina para ayudar a mejorar la sensibilización

a la insulina; sin embargo, el mayor énfasis del tratamiento para este paciente se centró en una dieta con alimentos no procesados y baja en carbohidratos y ejercicio regular, lo que desplazó el foco hacia el papel del paciente en el control de su enfermedad. La investigación sobre la DM2 se centra a menudo en mejorar la eficacia de los fármacos, mientras que se soslaya el papel del estilo de vida y de la dieta como herramientas preventivas y curativas. Durante los siete meses de tratamiento, la hemoglobina A1c y la glucosa en ayunas del paciente se redujeron significativamente hasta los niveles normales y tanto el colesterol como los marcadores enzimáticos hepáticos se normalizaron. Ya existen numerosas evidencias significativas que abogan por el control de la enfermedad usando diferentes dietas, entre las que se incluyen la dieta mediterránea, la dieta baja en carbohidratos y la dieta vegana baja en grasas; sin embargo, no se han establecido patrones dietéticos claros. Este estudio respalda el uso de la naturopatía, así como los cambios en la dieta y el estilo de vida, para desarrollar el enfoque más eficaz posible para el tratamiento de la DM2.

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Key Words

Type 2 diabetes mellitus, low-carbohydrate diet, glucose tolerance, *Gymnema sylvestre*, chromium, naturopathic medicine, motivational interviewing

Disclosures

The authors completed the ICMJE Form for Disclosure of Potential Conflicts of Interest and had no conflicts to disclose.

INTRODUCTION

Diabetes mellitus type 2 (DM2) is a disease often related to poor lifestyle choices resulting in hyperglycemia; it affects nearly 10% of the entire US population, including more than 25% of seniors.¹ Conventional medicine views DM2 as a chronic, irreversible disease and focuses on disease management

utilizing insulin-sensitizing agents, such as biguanides, and oral hypoglycemic agents, such as sulfonylureas. Naturopathic approaches for DM2 focus on disease management utilizing motivational interviewing to empower patients to make dietary and lifestyle changes, while employing both conventional and natural agents, such as chromium and *Gymnema sylvestre*, for

their insulin sensitizing-effect.^{2,3} Although both conventional and naturopathic physicians often recommend dietary and lifestyle modification in the treatment of DM2, there is a stark difference in the amount of time spent consulting with the patient on the dietary recommendations and the frequency of follow-up visits that allows for more compliance via patient support, empowerment, and education with naturopathic physicians.^{4,5} Previous studies have shown that lifestyle modification is superior to metformin at restoring normoglycemia in patients who were at high risk for diabetes.⁶ The following case reflects these findings and demonstrates the need for focusing treatment and prevention of diabetes on lifestyle modification while utilizing both natural and conventional treatments to improve clinical outcomes.

PRESENTING CONCERNS

A 56-year-old Caucasian male presented with a diagnoses of hypertension, hyperlipidemia, and fatty liver disease. He had a 10-year history of elevated liver enzymes. His 30-year history of hypertension was linked to anxiety, and he was currently employed in a high-stress job. Past medical interventions included carvedilol (6.25 mg) and lisinopril/hydrochlorothiazide (20/12.5 mg), both of which he voluntarily stopped using approximately 6 months before starting naturopathic treatment. Blood pressure at time of intake was 173/96 mm Hg. Prior to seeking naturopathic treatment, the patient had been told by conventional doctors to decrease alcohol consumption and to improve diet and exercise, but he was unable to make these lifestyle changes.

INTERVENTION

Pharmacological, preventive, and lifestyle interventions were utilized as treatments. Metformin and DB-7 nutritional supplement (Figure 1) were both used to manage DM2 by improving insulin sensitization. To attempt reversal of DM2, weight loss via diet and liver and gallbladder cleansing via cholagogue herbs were recommended, along with exercise. In addition, motivational interviewing was used to empower the patient to move away from a standard American diet high in processed foods, alcohol, and sugar, to a whole-foods, high-vegetable diet with a maximum of 20 g per day net grain carbohydrates, which was crucial for proper glucose control.⁷ Each visit with the naturopathic physician typically lasted approximately 1 hour. At the initial visit, the physician spent 20 minutes explaining the diet and provided a handout with the complete guidelines, resources, and recipe information. At each follow-up visit, a period of 10 minutes was spent discussing diet, exercise practices, and goals. The physician had the patient complete a 7-day diet diary and glucograph upon initiating the diet; the patient measured his blood glucose level on waking, 1.5 hours after each meal, and before bed. This intervention was designed to help the patient understand the effects of various foods on his

DB-7: 2 Capsules:

- *Gymnema sylvestre* (supplying 25% gymnemic acids), 750 mg
- Vitamin C (ascorbic acid), 250 mg
- Alanine, 250 mg
- Glutamine, 100 mg
- Zinc (L-monomethionine), 30 mg
- Chromium (chromium polynicotinate), 200 µg
- Vanadium (vanadyl sulfate), 1.5 mg

Opti Lipotropic: 4 Capsules:

- Vitamin B₆, 30 mg
- Magnesium, 75 mg
- Choline, 225 mg
- Inositol, 600 mg
- L-methionine, 900 mg
- Dandelion root, 300 mg
- Celandine (*Cynara*) leaf, 150 mg
- Beet leaf, 150 mg
- Oregon grape root, 300 mg
- Milk thistle (*Silybum*) seed, 120 mg

Figure 1 Ingredient lists of DB-7 and Opti Lipotropic nutritional supplements used in treatment.

blood sugar and allowed for personal accountability to occur. In addition to dietary recommendations, the patient was encouraged to increase exercise to 20 to 30 minutes per day. Supplementation included DB-7 nutritional supplement (Rx Vitamins Inc, Elmsford, New York; 1 capsule 3 times daily with meals), Opti Lipotropic herbal supplement (Eclectic Institute, Sandy, Oregon; 2 capsules twice daily), alpha lipoic acid (300 mg/d), Lypo-spheric Vitamin C: (LivOn Labs, Henderson, Nevada; 1000 mg twice daily), and Rauwolfia tincture (10 drops 2-3 times/d) (See Figure 1 for ingredient lists). Pharmaceutical intervention included metformin (500 mg twice daily).

OUTCOMES

Laboratory testing was done at the onset of treatment and following 3 months, 7 months, and 10 months of treatment. Figures 2A and 2B demonstrate the levels of DM2 markers of fasting glucose and glycated hemoglobin (HbA_{1c}), respectively. After 7 months of treatment, the patient's fasting glucose went from 168 mg/dL to 97 mg/dL and HbA_{1c} went from 7.7% to 5.0%. At the 7-month mark, the patient no longer met diagnostic criteria for DM2, so both the DB-7 and metformin were discontinued while the patient continued the diet and lifestyle recommendations. As shown in Figure 2B, after 3 months without taking both DB-7 and metformin, the patient's HbA_{1c} remained within the normal range and slightly improved from 5.0% to 4.7%. Figure 3 illustrates the improvement of the patient's elevated liver function. Alanine aminotransferase (ALT) decreased from 138 IU/L to 41 IU/L, and aspartate aminotransferase (AST) decreased from 83 IU/L to 32 IU/L, both within the normal range. Figure 4 demonstrates the improve-

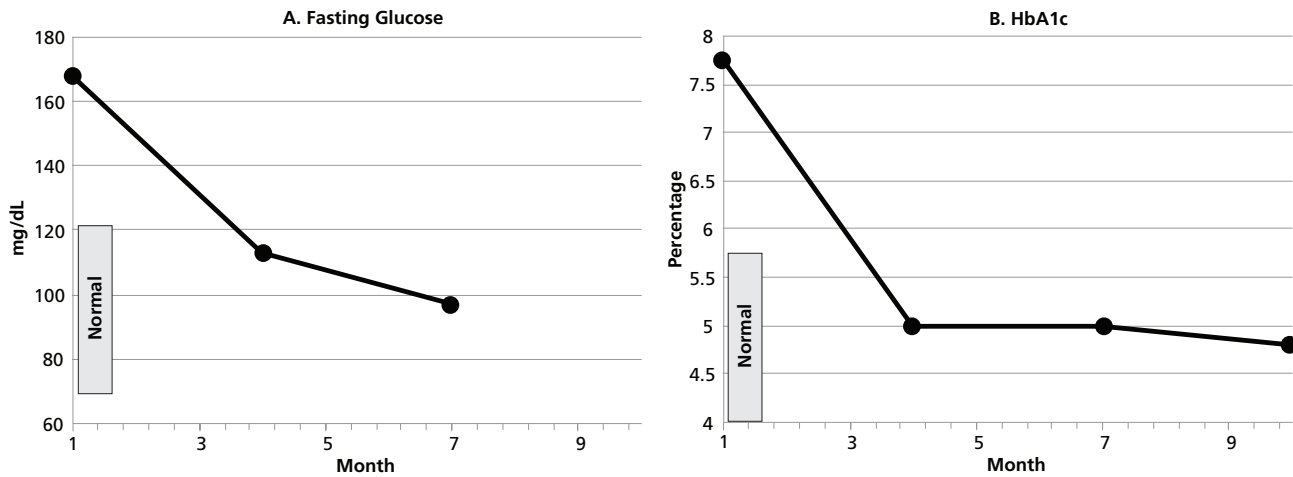


Figure 2 Fasting glucose and hemoglobin A1c (HbA1c) results over the treatment period. Figure 2A illustrates the patient’s fasting glucose levels (mg/dL) over a 7-month period. The normal range of fasting glucose is indicated. Figure 2B illustrates the patient’s HbA1c levels (percentage) over a 10-month period. The normal range of HbA1c is indicated.

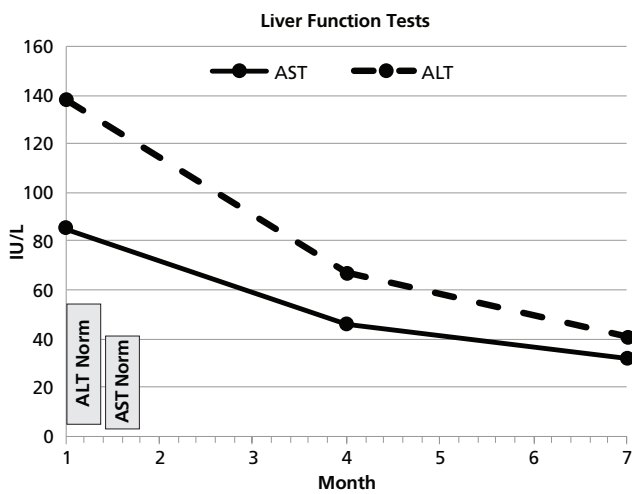


Figure 3 Liver function results over the treatment period. This figure illustrates the patient’s alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels (IU/L) over a 7-month period. The normal range of ALT and AST is indicated. The patient had a 10-year history of fatty liver disease with elevated liver enzymes previous to starting treatment.

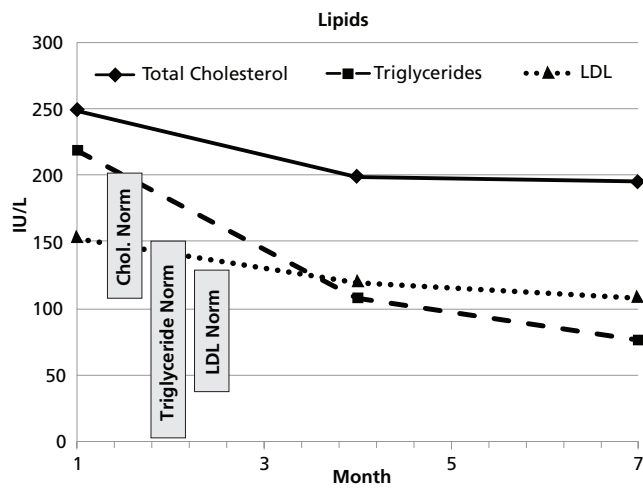


Figure 4 Lipid levels over the treatment period. This figure illustrates the patient’s total cholesterol, triglycerides, and low-density lipoprotein (LDL) levels (IU/L) over a 7-month period. The normal range of total cholesterol, triglycerides, and LDL is indicated.

ment of his fasting lipid profile during the first 7 months of treatment. The total cholesterol decreased from 249 mg/dL to 196 mg/dL; triglycerides decreased from 219 mg/dL to 76 mg/dL; and low-density lipoprotein (LDL) decreased from 153 mg/dL to 104 mg/dL. The most significant improvement in his lipids was demonstrated by the dramatic decrease in triglycerides, which was likely directly related to his changes in dietary carbohydrate intake. Figure 5 shows a timeline illustrating the treatment alongside the laboratory results during the 10 months of treatment.

DISCUSSION

This case documents the results of an integrative approach to the treatment of DM2 using a short-term course of herbal and nutritional supplementation and metformin in conjunction with a long-term implemen-

tation of a low-carbohydrate diet and regular exercise. The patient was able to reverse the diagnosis of DM2 during treatment as his biological markers fell well within the normal range for the last 3 months of treatment. When approaching a patient with DM2, naturopathic physicians typically focus on treating the whole person through diet, exercise, and insulin-sensitizing and antioxidant supplementation. Dietary changes are often difficult for the patient to implement, so the physician practiced “*docere*” or “to teach,” 1 of the 6 main philosophies of naturopathic doctors, by taking the necessary time to educate and motivate the patient toward proper dietary practices. The amount of time the naturopathic physician spent with the patient was approximately 60 minutes per visit, which is up to 5 times longer than conventional doctors.⁸ By employing motivational interviewing strategies, the naturopathic physician was able to inspire the patient to

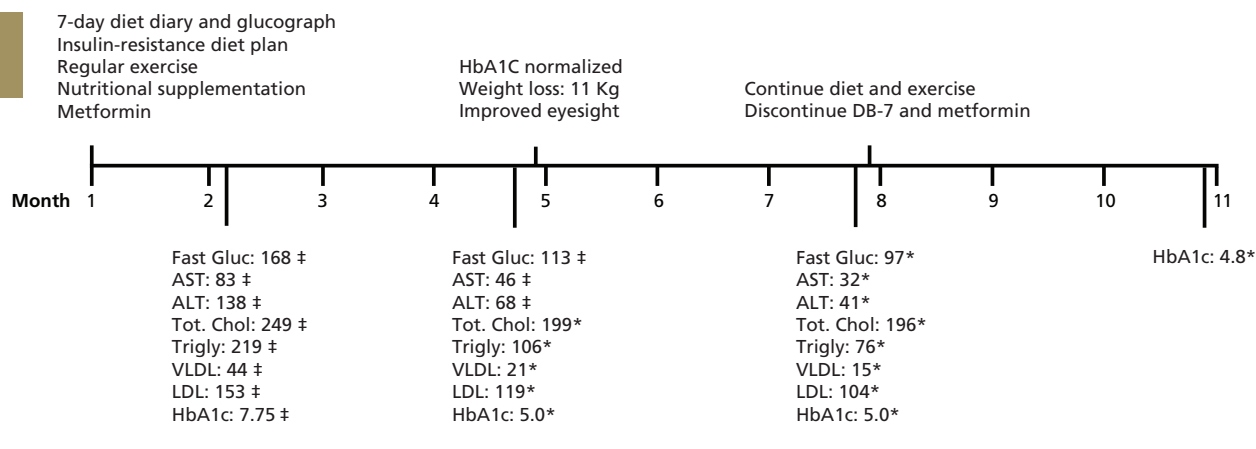


Figure 5 Timeline of treatment recommendations, clinical findings, and lab results over the 10-month treatment period. Lab values followed by ‡ indicate values that meet diagnostic criteria for DM2 (fasting glucose and HbA1c), hyperlipidemia (Tot. Chol., Trigly., LDL, VLDL), and fatty liver disease (ALT and AST). Lab values followed by * indicate values that are within the normal reference range.

Abbreviations: ALT, alanine aminotransferase; AST, aspartate aminotransferase; fast gluc, fasting glucose; HbA1c, hemoglobin A1C; tot. chol, total cholesterol; LDL, low-density lipoprotein; trigly, triglycerides; VLDL, very low-density lipoprotein.

become an active participant in his health improvement. Through the interview process, the physician and patient were able to explore the patient's motivations for drinking, which revolved around a difficulty with dealing with work-related stress. The physician was able to discuss the risks vs benefits with the patient of continued drinking vs stopping in terms of his diabetes but also with regard to his previously diagnosed fatty liver disease. One of the central themes of motivational interviewing is that if patients make the case for positive life change, they are more likely to follow through, and this was apparently the case here. Patient empowerment and self-responsibility must be further studied, as they may be the most important aspects of successfully reversing chronic disease.^{9,10}

The alpha lipoic acid and lipospheric vitamin C may have contributed to insulin sensitization, which along with exercise and low-carbohydrate foods helped facilitate the patient's weight loss.¹¹ These substances are also antiinflammatory, which is paramount in effectively treating diabetes since systemic inflammation is a major contributor to excess weight gain and leads to micro- and macrovascular complications.^{12,13} For this patient, utilizing frequent follow-up and laboratory testing helped support the lifestyle changes needed to improve his DM2. The improvements in liver function tests were most likely due to consuming less alcohol and may have been supported by the low-carbohydrate, whole-foods diet and the Opti Lipotropic and vitamin C supplements. Proper liver functioning is key to proper glucose control via glycogen storage, gluconeogenesis, and glycogenolysis. By addressing liver function through diet and lifestyle changes, supported by dietary supplementation, the physician helped prime the patient's body to regain control of glucose management.

This case study focused on a low-carbohydrate, whole-foods diet to improve DM2, which is supported by previous research.^{14,15} In comparison, various diets for treating DM2 including the Mediterranean^{16,17} and

low-fat vegan diets^{18,19} have also been shown to have efficacy. Previous research has shown that reversal of DM2 is possible with dietary modifications, although 1 study used a 600 kcal/day diet, which would be very difficult for most patients to follow.²⁰ We believe this case report documents that less intensive dietary changes can be recommended to patients with good clinical results as long as adequate follow-up and accountability are established and maintained throughout treatment. The significance of lifestyle modifications including diet and exercise is well documented by Figure 2 and Figure 5, which show that the patient's HbA1c continued to improve after pharmaceutical and nutritional supplementation were discontinued. This has enormous consequences for health economics, preventive health strategy, and health policy. In conclusion, we believe that conventional practice management guidelines for DM2 should be adjusted to shift the emphasis of treatment from medication to lifestyle modifications via motivational interviewing and patient education.

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