

THE REMISSION OF TYPE 2 DIABETES MELLITUS WITH SOLELY LIFESTYLE MODIFICATION

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ABSTRACT

Once a person is diagnosed to have type 2 diabetes mellitus (T2DM), NICE guidelines recommends them to be started on oral hypoglycaemics along with lifestyle modification to control blood sugar levels. A 65-year-old man with T2DM however is not willing to take medication to lower his blood sugar levels and instead decided to commence intense physical exercise and calorie-intake restriction. This patient started off with HbA1c levels of 110mmol/mol and average fasting blood glucose of 14mmol/L. In a couple of months, he managed to lose 15kg of weight and his capillary blood sugar levels dropped to normal levels. Since he now has good glycaemic control, he is deemed to have achieved remission and is discharged from diabetes clinic follow-up.

This case illustrates the potential of T2DM patients achieving remission with just lifestyle modification alone. Although NICE guidelines advise to add medication into the treatment of T2DM, this method could be an alternative treatment strategy to encourage and empower patients who are uninterested in oral tablets or insulin to optimise their blood sugar levels.

Keywords: Type 2 diabetes mellitus, lifestyle modification, low carbohydrate diet, remission, without medication, smoking, weight loss

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a global epidemic affecting people of different walks of life. In the UK, it is estimated that there are 4.5 million people living with T2DM which represents approximately 6% of the population (Diabetes UK, 2016). It is thought that obesity and a high sugar diet are some of the many risk factors for T2DM. For optimal glycaemic control, National Institute of clinical excellence (NICE) guidelines advise oral glucose-lowering therapies and/or insulin in addition to lifestyle modifications for T2DM patients. Here, we would be discussing a case of a T2DM patient with poor glycaemic control who successfully entered remission with only lifestyle modifications.

CASE

A 65- year-old gentleman, who was known to have T2DM was referred to the diabetes clinic by his General Practitioner who was concerned that his HbA1c had risen to 110mmol/mol. He was diagnosed 5 years ago and had stable HbA1c readings. He, who was previously on diet control alone, was now advised to be started on oral hypoglycaemics for better control of his blood sugar levels.

His past medical history includes COPD (on inhalers) and he was an ex-smoker. During this episode, he complained of the osmotic symptoms of diabetes such as polyuria, polydipsia and polyphagia.

Instead of taking his metformin, he opted for the lifestyle modification method such as weight loss exercises and low-calorie-diet. Subsequently, the patient was successful in losing 15kg over the following couple of months and his fasting blood glucose readings improved from an initial average level of about 14mmol/L to about 6mmol/L. His previous BMI was 32 and had then dropped to 26.

After managing to lose weight in a rapid fashion, he settled for a healthy diet instead of a low-calorie diet and his weight risen a little bit more especially over the Christmas period. However, his fasting blood

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glucose readings after that remained between 4.5mmol/L to 6.4mmol/L suggesting good glycaemic control.

Reflecting back, he reported stopping smoking and gaining one to two stones in weight in a period of approximately 4 years and this could have been a trigger for him developing diabetes.

During the last diabetic clinic, he was deemed in remission as his HbA1c dropped drastically to 38mmol/mol. On examination, there was no acromegalic or Cushingoid features and no proximal muscle weakness. There was no resting tremor or sweaty palms. His home blood sugar readings were all within target range. As for his weight, it had rose slightly to 78.5kg from 75kg and was asymptomatic.

Finally, he was discharged from the diabetic clinic with yearly monitoring of his HbA1c to ensure that he does not develop diabetes in the future.

DISCUSSION

Today, there are over 340 million people globally living with T2DM and up to half of them are unaware of their condition. (Members *et al.*, 2013) T2DM is also associated with a high risk of developing cardiovascular disease which is the major cause of death in these patients. (Morrish, Wang, Stevens, Fuller, & Keen, 2001)

NICE guidelines recommend that patients who are formally diagnosed with T2DM are to be treated with lifestyle modifications and an oral hypoglycaemic as first-line to reduce these risks (NICE, 2019). However, could it be possible for a diabetic patient to control using just lifestyle measure?

Lifestyle modifications as advised by NICE comprises of diet, exercise and cessation of smoking and recreational substances.

According to NICE guidelines, a healthy balanced diet consists of plenty of fibre, low-glycaemic-index sources of carbohydrates, low-fat dairy products, oily fish and foods with low saturated and trans fatty acids (NICE, 2019). By having diets with low-glycaemic index, the insulin requirement in T2DM patients are reduced as there is lesser serum glucose to be metabolised, thus reducing the demand of insulin (Brand-Miller, Hayne, Petocz, & Colagiuri, 2003). A meta-analysis discovered that studies with patients committing to a low glycaemic-index-diet for more than 8 weeks duration displayed the maximal improvement in HbA1c (Brand-Miller *et al.*, 2003). In addition, short-term effects such as reduced serum glucose can be seen as soon as within 24 hours (Boden *et al.*, 2005). At the same time, diet control would reduce weight which is one of the risk factors of T2DM (Westman *et al.*, 2008).

Exercise is defined as 150 minutes of moderate physical activity or 75 minutes of vigorous physical activity over a week period and this should be spread out over a period of 2 days or more (NICE, 2019). According to a research done by Krotkiewski *et al.* (1985), it was stated that glucose tolerance in T2DM patients improved with physical exercise. By performing intense physical activity, cholinergic and beta-adrenergic nervous system (Krotkiewski *et al.*, 1980) was shown to have increased sensitivity, leading to more insulin production especially immediately after exercising. In a study of rats, physical exercise increase glucose uptake in other tissues such as liver and muscles rather than adipose tissues. This is beneficial especially to obese T2DM patients as glucose would be distributed to other destinations rather than solely in the adipose tissues (Vinten & Galbo, 1983).

One of the many exercise techniques that are proven to be effective is the circuit weight training (CWT). CWT is an example of a resistance training program which incorporates moderate weight loads and frequent repetitions interspersed with short rest periods (Dunstan *et al.*, 1998). It is also an aerobic exercise that involves upper and lower body muscle groups that could achieve greater amount of muscle mass than other common exercises. A study showed that T2DM patients after CWT generally showed improved insulin response to oral glucose tolerance test and displayed lower self-monitored capillary glucose levels (Dunstan *et al.*, 1998).

NICE guidelines recommend cessation and abstinence of smoking. It was elucidated that smoking contributes to poor blood glucose control as it increases insulin resistance. Smokers have a significantly

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increased homeostatic model assessment insulin resistance index (HOMA-IR) an hour after smoking (Chang, 2012). Homeostatic model assessment (HOMA) is a method for assessing β -cell function and insulin resistance (IR) from basal (fasting) glucose and insulin or C-peptide concentrations (Wallace, Levy, & Matthews, 2004). A study showed that insulin-mediated glucose disposal was markedly reduced in smokers with T2DM compared to their non-smoking counterparts by interfering with early insulin action on glucose such as signal transduction, glucose transport and glucose phosphorylation leading to an impairment of both oxidative and non-oxidative glucose use. Nonetheless, chronic smoking could potentially have negative effects on insulin sensitivity in smokers with or without T2DM (Targher *et al.*, 1997).

CONCLUSION

Although antidiabetic medications are no doubt effective in controlling T2DM, this case report has highlighted that significant lifestyle modification can indeed contribute to optimising glycaemic control and potentially cure T2DM. However, it is also important that there is no long term follow up for this patient therefore, it is difficult to say if a patient can remain in remission long term. There is also a need to recognise that a high level of motivation and commitment is required to sustain this lifestyle change for the long run.

Key Points

1. It is possible for T2DM patients to achieve remission with rigorous lifestyle modification such controlled carbohydrate intake, regular effective exercises and smoking cessation.
2. T2DM patients need to be motivated and committed to sustain this lifestyle long-term.

REFERENCES

- Boden G, Sargrad K, Homko C, Mozzoli M & Stein TP (2005).** Effect of a Low-Carbohydrate Diet on Appetite, Blood Glucose Levels, and Insulin Resistance in Obese Patients with Type 2 Diabetes. *Annals of Internal Medicine*, **142**(6), 403–411. <https://doi.org/10.7326/0003-4819-142-6-200503150-00006>
- Brand-Miller J, Hayne S, Petocz P, & Colagiuri S (2003).** Low-Glycemic Index Diets in the Management of Diabetes. *Diabetes Care*, **26**(8), 2261 LP – 2267. <https://doi.org/10.2337/diacare.26.8.2261>
- Chang SA (2012).** Smoking and Type 2 Diabetes Mellitus. *Diabetes Metab J*, **36**(6), 399–403. Retrieved from <http://synapse.koreamed.org/DOIx.php?id=10.4093%2Fdmj.2012.36.6.399>
- Diabetes UK. (2016).** Diabetes Facts and Stats. Retrieved August 10, 2019, from Diabetes UK website: https://diabetes-resources-production.s3-eu-west-1.amazonaws.com/diabetes-storage/migration/pdf/DiabetesUK_Facts_Stats_Oct16.pdf
- Dunstan DW, Puddey IB, Beilin LJ, Burke V, Morton AR & Stanton KG (1998).** Effects of a short-term circuit weight training program on glycaemic control in NIDDM. *Diabetes Research and Clinical Practice*, **40**(1), 53–61. [https://doi.org/https://doi.org/10.1016/S0168-8227\(98\)00027-8](https://doi.org/https://doi.org/10.1016/S0168-8227(98)00027-8)
- Krotkiewski M, Lönnroth P, Mandroukas K, Wroblewski Z, Rebuffé-Scrive M, Holm G, Björntorp P (1985).** The effects of physical training on insulin secretion and effectiveness and on glucose metabolism in obesity and Type 2 (non-insulin-dependent) diabetes mellitus. *Diabetologia*, **28**(12), 881–890. <https://doi.org/10.1007/BF00703130>
- Krotkiewski M, Sjöström L & Björntorp P (1980).** Physical training in hyperplastic obesity. V. Effects of atropine on plasma insulin. *International Journal of Obesity*, **4**(1), 49–56. Retrieved from <http://europepmc.org/abstract/MED/6993387>
- Members AF, Rydén L, Grant PJ, Anker SD, Berne C, Cosentino F, ... Xuereb RG (2013).** ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD: The Task Force on diabetes, pre-diabetes, and cardiovascular diseases of the European Society of Cardiology (ESC) and developed in collaboratio. *European Heart Journal*, **34**(39), 3035–3087.

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<https://doi.org/10.1093/eurheartj/eh108>

Morrish NJ, Wang SL, Stevens LK, Fuller JH, & Keen H (2001). Mortality and causes of death in the WHO Multinational Study of Vascular Disease in Diabetes. *Diabetologia*, **44 Suppl 2**, S14-21.

NICE. (2019). Diabetes - Type 2 Scenario: Management - adults. Retrieved July 20, 2019, from (NICE), National Institute for Health Care Excellence website: <https://cks.nice.org.uk/diabetes-type-2#!scenario>

Targher G, Alberiche M, Zenere MB, Bonadonna RC, Muggeo M, & Bonora E (1997). Cigarette Smoking and Insulin Resistance in Patients with Noninsulin-Dependent Diabetes Mellitus1. *The Journal of Clinical Endocrinology & Metabolism*, **82**(11), 3619–3624. <https://doi.org/10.1210/jcem.82.11.4351>

Vinten J & Galbo H (1983). Effect of physical training on transport and metabolism of glucose in adipocytes. *American Journal of Physiology-Endocrinology and Metabolism*, **244**(2), E129–E134. <https://doi.org/10.1152/ajpendo.1983.244.2.E129>

Wallace TM, Levy JC, & Matthews DR (2004). Use and Abuse of HOMA Modeling. *Diabetes Care*, **27**(6), 1487 LP – 1495. <https://doi.org/10.2337/diacare.27.6.1487>

Westman EC, Yancy WS, Mavropoulos JC, Marquart M & McDuffie JR (2008). The effect of a low-carbohydrate, ketogenic diet versus a low-glycemic index diet on glycemic control in type 2 diabetes mellitus. *Nutrition & Metabolism*, **5**(1), 36. <https://doi.org/10.1186/1743-7075-5-36>.