# Type II Diabetes and Keto Diet in Family Medicine Clinic: A Case Report

Dr. Dante Paredes, Dr. Karos Torres, Joshua Moton, OMSIV TCOM

Medical City Fort Worth

## Background

- The concept of a ketogenic diet was first developed by Dr. Russel Wilder in 1921 for refractory seizure management in pediatric patients. The idea was to mimic fasting by reducing carbohydrate intake enough that the brain would run on fat, i.e. on ketones. Ketogenic diets originally consisted of 4:1 ratio of fat to carbohydrates and protein or a goal of less than 50 g/day of carbohydrates. There is also a minimal limitation of protein involved to about 1g/lb of body weight as protein breakdown can be used for access to glucose as well (3). Normally fat is not restricted in this type of diet. Once both glucose intake and glycogen storage are both depleted, energy used by the body is converted to use of ketones. Ketones are produced in the setting of low access to glucose and result in the requirement of lipolysis and further breakdown of lipids into ketone bodies within the liver (2). The absorption of fats from the diet also contribute to energy usage through ketone production.
- Upon the initiation of the ketogenic diet, initial cholesterol labs show significant increase. In the setting of cardiovascular disease, this would theoretically increase the risk in patients, especially those who have already had a cardiovascular event. However, the initial increase may be secondary to movement of cholesterol from fat cells and overall weight loss that will stabilize over time (5). Multiple studies show improvement in lipid profiles over a period of time. Concern for worsening of LDL particles post cardiovascular event is reasonable but with overwhelming evidence of improvement in lipid profiles long term, with shared decision making, the diet was initiated with this patient.
- The ketogenic diet is an inherently anti-inflammatory diet. As we know, initial damage through endothelial dysfunction affected by such things as smoking, hyperglycemia, infection, aging among many others, results in LDL particles to enter the endothelial lining and form plaques. In theory, initiating such an anti-inflammatory diet could improve plaque formation as damage from inflammation secondary to glucose levels is reduced(4,6).
- Here we discuss a case report of a patient who attempted a Mediterranean diet and still had a myocardial infarction despite his best efforts. His lipid panel had worsened and he requested to be placed on a ketogenic diet as he had been successful in the past. Here we present his improvement in lipid profile and overall metabolic health.

## Objective

To show an example of how the ketogenic diet is an effective lifestyle change that improves metabolic and cardiovascular health

## Methods

Observation of 40 year old male patient with recent MI in 2022 with initiation of lifestyle modifications through the ketogenic diet along with intermittent fasting.

Regular one-to-two-week follow-up appointments with both his primary care physician (PCP) and a pharmacist

Blood sugars were monitored using a FreeStyle Libre 2 continuous glucose monitor (CGM).

Measurements included
- time in range percentage (120-180)
- time below range percentage (>100)
- time very below range percentage (>70)

- Cautious 20% reduction of insulin based on his starting doses at each follow-up appointment, provided that the patient was tolerating the treatment well without significant adverse events
- 16:8 fasting
- Restricted to consuming 1600-1800 calories a day
- Carbohydrate intake limited to 50-80g per day
- At least 100g of protein daily
- Fat intake as desired for satiety

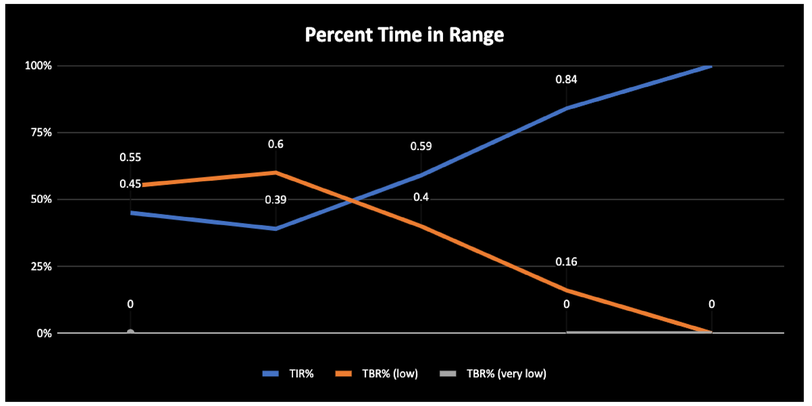
## Results

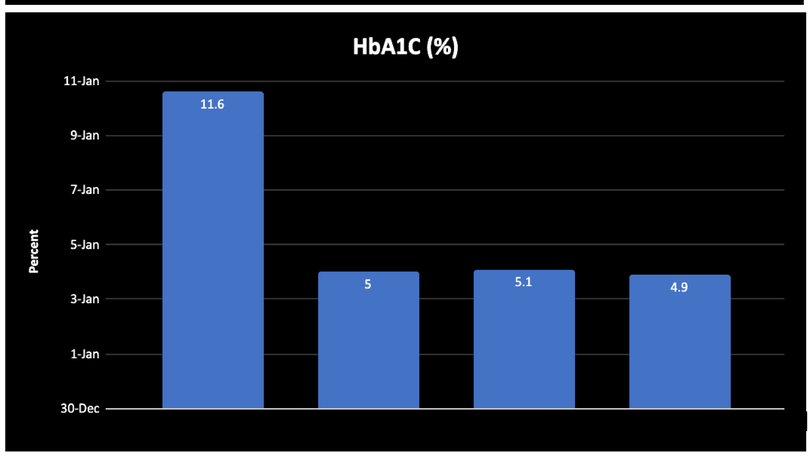
**HgA1c**

| | A1c |
|---|---|
| Visit 1 | 11.6 |
| Visit 2 | 5 |
| Visit 3 | 5.1 |
| Visit 4 | 4.9 |

**CGM Readings**

| | Visit 1 | Visit 2 | Visit 3 | Visit 4 | Visit 5 |
|---|---|---|---|---|---|
| TIR% (w/i | 49 | 39 | 59 | 84 | 100 |
| TBR% (low) | 55 | 60 | 40 | 16 | 0 |
| TBR% (very low) | 0 | 1 | 1 | 0 | 0 |




## Discussion

- Insulin therapy is known to increase cardiovascular risks amongst patients with T2DM.
- This treatment approach has been shown to predispose patients to atherosclerosis, hypertension, dyslipidemia, and at times heart failure.
- Furthermore, insulin therapy can have metabolic effects that lead to weight gain, adding to the already heightened cardiovascular risk given the patient's minimal control on insulin resulting in his later myocardial infarction.
- Given these clear and serious risks, it is highly beneficial to manage diabetes without resorting to insulin injections, especially in patients with high cardiovascular risk profiles such as the one presented in this case.
- Through this case study, we were able to provide an exemplary demonstration of how to discontinue the use of injected insulin quickly, effectively, and safely in a post-operative patient with high cardiovascular risk factors.

## Conclusion

- Our approach resulted in remarkable improvements in the patient's glycemic control, along with significant reductions in their A1C levels, all achieved without the continued use of insulin.
- By doing so, we minimized the cardiovascular risks associated with insulin therapy and helped the patient achieve better overall health outcomes.

## References

1. Association Between Hemoglobin A1c and Major Adverse Coronary Events in Patients with Diabetes Following Coronary Artery Bypass Surgery Ricky D. Turgeon, Sheri L. Koshman, Erik Youngson, Glen J. Pearson First published: 28 December 2019 https://doi.org/10.1002/phar.2359
2. Low-Carb and Ketogenic Diets in Type 1 and Type 2 Diabetes Andrea Mario Bolla , Amelia Caretto , Andrea Laurenzi, Marina Scavini and Lorenzo Piemonti * Diabetes Research Institute, IRCCS San Raffaele Scientific Institute, Milan 20132, Italy;

*This research was supported (in whole or in part) by HCA Healthcare and/or an HCA Healthcare affiliated entity. The views expressed in this publication represent those of the author(s) and do not necessarily represent the official views of HCA Healthcare or any of its affiliated entities.*

HCA Healthcare®