

中文題目：特殊胰島素幫浦設定來達到積極血糖控制與對付黎明現象

英文題目：An unusual insulin pump setting in management of type 1 diabetes with dawn phenomenon and poor glyceemic control

作者：黃欣寧^{1,2}，陳品汎^{1,2}，連偉成^{1,2}

服務單位：大林慈濟醫院¹內科部，²新陳代謝科

Introduction:

Dawn phenomenon, defined as early morning hyperglycemia due to a surge in growth hormone and cortisol production, is a well-recognized condition that could occur in both types of diabetes. The optimal management of dawn phenomenon remains controversial. Continuous subcutaneous insulin infusion (CSII) by insulin pump mimics the physiological secretion of insulin, is one of the recommendations to counteract Dawn phenomenon, and reducing the frequency of hypoglycemia. We hereby demonstrated an unusual basal setting of CSII programming that successfully controlled the midnight hypoglycemic-prone dawn phenomenon in type 1 diabetes.

Case report:

This 58-year-old lady with a 21-year history of type 1 diabetes, has had good glyceemic control, as determined by HbA1c levels averaging 6-7% over the past 20 years. In recent one year, however her HbA1c increased to 9%. She was under multiple daily insulin injections (MDI) and had frequent self-monitoring of blood glucose (SMBG) at home. She was very disturbed that she was experiencing blood glucose fluctuations, especially nocturnal hypoglycemia that results in daytime somnolence.

Continuous glucose monitoring (CGM) revealed lower requirement of basal rate from 9pm to 3am, nocturnal hypoglycemia and prolonged postprandial glucose excursions (Figure 1). The patient was educated to increase amount of exercise in the evening and increasing protein to carbohydrate ratio of the evening meal. Metoclopramide was prescribed in attempt to improve gastroparesis as observed on CGMS. Time of delivery of Glargine was shifted to morning administration, and was later replaced by Detemir with dose titration, without any positive results.

She was then admitted for CSII programming, with final setting as: 0.05U/hr (00:00-02:30), 2.5U/hr (02:30-03:30), 0.8U/hr (03:30-04:30), 1.5 U/hr (04:30-06:00), 1.3U/hr (06:00-12:00),

0.8U/hr (12:00-18:00), 0.6 U/hr (18:00-24:00). We observed an improvement in real-time readings of time-in-range (Figure 2) after CSII programming in compared to baseline, without the occurrence of nocturnal hypoglycemia.

Discussion:

Dawn phenomenon could be difficult to manage especially in type 1 diabetes. CSII is the best insulin delivery method in highly motivated patients with type 1 diabetes and its usefulness is more demonstrated in patients who experience wide fluctuations in blood glucose throughout the day or who experience severe hypoglycemia. CSII provides precise calculation of basal dose delivery, thereby achieving improved glycemic control with less frequent hypoglycemic episodes. CSII programming allows to provide a bolus dose in the early morning hours to counteract dawn phenomenon. Step-up early morning basal insulin setting in CSII programming was shown effective in control of dawn phenomenon in this patient with a reduction in hypoglycemia.

Conclusions:

For optimization of glycemic control, CSII can be initiated and used effectively in management of nocturnal hypoglycemic-prone dawn phenomenon in patients with type 1 diabetes. Individualized insulin pump setting may be the ideal therapy for achievement of glycemic control. Further studies regarding the implementation of our basal setting of CSII programming in similar patient characteristics would be clinically relevant.

References:

1. <https://pubmed.ncbi.nlm.nih.gov/3510143/>
2. <https://pubmed.ncbi.nlm.nih.gov/3971844/>
3. <https://journals.aace.com/doi/pdf/10.4158/EP14198.OR>
4. https://journals.viamedica.pl/endokrynologia_polska/article/viewFile/25278/20107
5. <http://journal.diabetes.org/clinicaldiabetes/v18n42000/pg181.htm>
6. <https://care.diabetesjournals.org/content/36/12/3860>