

# Improved Glycemic Control Promotes Compliance with Insulin Treatment After Changing to Jet Injection in a Middle-aged Woman with Type II Diabetes

## Patient Profile

A 47-year-old woman with a 26-year history of type II diabetes was experiencing extreme fluctuations in her blood glucose profile, resulting in neuropathy, hypertension, significant weight loss (30 lbs.), and associated depression. Management of blood glucose has progressed from diet control, to use of oral antihyperglycemic agents, and finally in the last 10 years, insulin administered via a needle and syringe.

The patient's work is sedentary in nature as she adjudicates claims for an insurance carrier, often putting in 10-11 hour days. In addition, the patient has recently experienced multiple life events that have been very stressful (i.e. divorce, death of a parent), likely impacting her poor blood glucose response to insulin treatment.

## Assessment

On physical examination, the patient was found to have:

- Hypertension
- Complaints of:
  - Neuropathy in her feet making walking difficult
  - Tingling in fingers
  - Depression
  - Generalized ill feeling associated with much fatigue
- Tissue scarring was particularly evident on the abdomen from multiple needle sticks
- Her average blood glucose level was 207 mg/dl, with a widely variable range of 92 – 390 mg/dl (Table I)
- Height = 5'4"; weight = 200 lbs.; BMI = 34

The patient was using a combination of Humulin® R insulin and Humulin® N and was to receive 4 daily injections. However, she admits to only taking 2 injections a day because she didn't want to give herself the injections due to the pain and anxiety she associates with the needle and syringe. She claims her noncompliance with insulin treatment is directly related to the fact that she doesn't want to stick herself with a needle.

*"I didn't want to give myself injections because I knew it would hurt. It hurt bad when you hit the wrong place and it hurt for a few days. I was supposed to take more injections than I was. I was only taking injections twice a day, when I knew I was supposed to take them 4 times a day."*

**Table I.** Meter blood glucose levels achieved with needle and syringe.

<b>Day</b>	<b>Average (mg/dl)</b>	<b>Range (mg/dl)</b>
1	175	133 - 266
2	302	215 - 390
3	309	238 - 356
4	204	143 - 280
5	184	114 – 233
6	145	92 – 209
7	129	103 - 161
All days	207	92 – 390

**Treatment**

The patient was recommended for entry into a trial using the Medi-Jector VISION® for Insulin delivery. The prospect of a needle-free system for insulin administration was very attractive to the patient.

Initially, the insulin treatment recommended for the patient was a combination of Humulin® R (35 U) at breakfast and dinnertime and Humulin® N (20 U) insulin at breakfast and bedtime. There was immediate recognition that the patient was more willing to inject herself with the Medi-Jector VISION. On day 5 of the trial, the patient was taken off of Humalin R® and prescribed a combination of Humalog® per sliding scale at meal times and continuation of Humulin® N at breakfast and bedtime.

The patient was asked to keep a daily dietary journal and to monitor blood glucose as required during the transition from needle and syringe to the Medi-Jector VISION (Table II).

**Table II.** Algorithm for transitioning from needle and syringe to Medi-Jector VISION.

<b>Objectives</b>	<b>Details</b>
<b>Visit 1</b> <ul style="list-style-type: none"><li>• Explanation of differences between needle/syringe and Medi-Jector VISION</li></ul>	<b>Patient education</b> <ul style="list-style-type: none"><li>• Teach injection technique</li><li>• Outline glucose self-monitoring</li></ul>
<b>Visit 2</b> <ul style="list-style-type: none"><li>• Initiate insulin injections with frequency Medi-Jector VISION daily</li></ul>	<b>Initiate dosing</b> <ul style="list-style-type: none"><li>• Define starting dose and</li><li>• Measure glucose multiple times</li><li>• Describe adjustments as needed</li></ul>
<b>Subsequent visits</b> <ul style="list-style-type: none"><li>• Long-term glycemic control balance</li></ul>	<b>Continued evaluation</b> <ul style="list-style-type: none"><li>• Individualize dosing/frequency</li><li>• Maintain long-term blood glucose</li></ul>

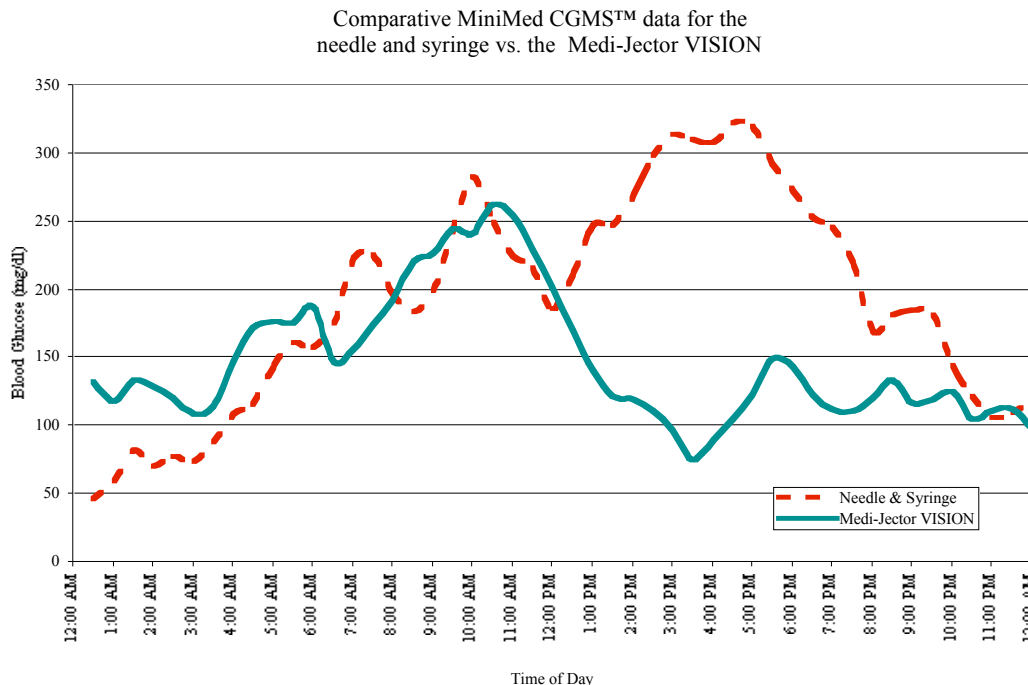
**Expectation:** Approximately 4 - 5 days to achieve blood glucose control

## **Clinical Outcome**

**Improved glycemic control.** Within days, the patient experienced improved blood glucose control with the Medi-Jector VISION. After switching to the Medi-Jector VISION, the average daily blood glucose dropped to 177 mg/dl, with a much more moderate range of 131 – 240 mg/dl, according to data collected via a glucose meter.

Comparative sensor data for the needle and syringe vs. the Medi-Jector VISION is shown in the figure, and demonstrates prolonged periods (i.e. 12 PM to 12 AM) of good glycemic control are maintained with the Medi-Jector Vision compared with needle and syringe. The improved results are likely due to the change of injection methods and the patient's willingness to increase her frequency of dosing as a result of this change.

**Figure 1.**



**Lowered insulin requirement.** The patient continued use of the Medi-Jector VISION after completion of the trial and has experienced a marked reduction in her insulin doses. The patient consistently averaged around 110 Units of insulin per day while participating in the study. Post-trial follow up interviews with the patient and clinic established the patient as having reduced her daily insulin dose to 91 Units- a 17% reduction. With the Medi-Jector VISION, insulin widely disperses into the subcutaneous tissue where it is absorbed rapidly, resulting in earlier peak levels and higher free insulin levels.<sup>1,2</sup> This has important clinical implications for this patient since insulin is known to be a potent growth factor that promotes frequent weight gain in a population of patients who are

000000453

Rev 1

often overweight. By reducing the total insulin requirement per day, the tendency to gain weight is diminished.

***Improved compliance.*** For this patient there was a psychological component to treating her diabetes without needles. She perceived the injections as painless, as well as effortless, and therefore, compliance with recommended treatment improved dramatically. The patient was diligent about taking the “prescribed” dose and frequency of insulin injections, as she was aware of the physical benefit resulting from better overall control of her diabetes.

*“My body likes the Medi-Jector VISION. I’m feeling much better because my blood sugars are in control. And, I don’t have the pain or the scarring I did with the needles. It is fantastic to not use a needle. In fact, I told my family I don’t mind being diabetic anymore.”*

### **Self-assessment of Jet Injection**

This patient perceives the opportunity to experience jet injection as pivotal in achieving better control of her diabetes. Not only did her body respond favorably, but her attitude towards diabetes was also transformed. She was more comfortable with self-injection, which led to improved compliance, thereby helping to resolve many of the problems she was attributing to “being diabetic.”

### **Clinical Implication**

The Diabetes Control and Complications Trial (DCCT)<sup>3</sup> has shown conclusively that patients need to achieve a high degree of control in order to prevent or delay long-term complications of diabetes. Chronic elevation of blood glucose concentrations, as evident in this uncontrolled diabetic, suggests that choosing the right tools to achieve good control may be critical to accomplishing that goal.

This patient was part of a study: “Evaluation of blood glucose profile using a MiniMed continuous glucose monitoring system (CGMS™): Comparison of Medi-Jector VISION® to a standard subcutaneous needle and syringe” conducted by Syed W. H. Rizvi, M.D., Dakota Clinic, LTD., and Heartland Hospital, Fargo, ND, and Odyssey Research in April/May, 2001.

Medi-Jector VISION® is a registered trademark of Antares Pharma, Inc.  
Humulin® R, Humulin® N, and Humalog® are registered trademarks of Eli Lilly and Company.  
MiniMed CGMS™ is a registered trademark of Medtronic MiniMed, Inc.

### **References**

1. Chiasson JL, Ducros F, Poliquin-Hamet M, et al. Continuous subcutaneous insulin infusion (Mill-Hill Infuser) versus multiple injections (Medi-Jector) in the treatment of insulin-dependent diabetes mellitus and the effect of metabolic control on microangiopathy. *Diabetes Care* 1984; 7: 331-337.

2. Pehling GB, Gerich JE. Comparison of plasma insulin profiles after subcutaneous administration of insulin by jet spray and conventional needle injection in patients with insulin-dependent diabetes mellitus. *Mayo Clin Proc* 1984; 59: 751-754.
3. Diabetes Control and Complications Trial (DCCT) Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complication in insulin-dependent diabetes mellitus. *N Engl J Med* 1993; 329: 977-986.

© Antares Pharma, Inc. 11/01