Comparison of Continuous Subcutaneous Insulin Infusion versus Basal/Bolus Insulin Injections for Treatment of Type 1 Diabetes in Clinical Practice

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It is now generally agreed that to achieve optimal glycemic control, patients with type 1 diabetes should be treated with intensive insulin therapy. This can be achieved by a continuous subcutaneous insulin infusion (CSII) or by multiple daily injections (MDI) using a combination of long-acting basal insulin (glargine or detemir) and a short-acting insulin (lispro, aspart, or glulisine) to control postprandial hyperglycemia. However, it remains controversial whether these two modalities are equally effective or if one is superior to the other. One meta-analysis[1] and the 5-nations trial[2] concluded that CSII resulted in better glycemic control compared to MDI. However, older insulins (neutral protamine Hagedorn or regular) and outdated pump technologies were used in these studies. Other studies have shown CSII to be equally effective[3] or CSII being superior[4] to MDI. Although a more recent meta-analysis also showed that the frequency of severe hypoglycemia in type 1 diabetes was reduced markedly in trials during CSII compared with MDI based on isophane and lente insulins, the authors acknowledged that they did not find any trials comparing CSII and MDI based on the newer long-acting insulin analogs where severe hypoglycemia could be analyzed. Moreover, their conclusions on hemoglobin A1c (HbA1c) were based on a relatively small number of trials concerning glargine and none using detemir.[5] In addition, it is not clear if one of these two treatment modalities is superior to the other in routine clinical practice.

We therefore compared the degree of glycemic control achieved, frequency and severity of hypoglycemic episodes, and perception of quality of life achieved by CSII versus MDI in our practice. We sent letters inviting all patients being treated with CSII or MDI in our practice that had been followed for at least 2 years—113 letters were sent to pump patients and 137 to patients on MDI. Fifty-three patients treated with CSII using insulin lispro or aspart and 54 patients treated with MDI therapy (glargine and either insulin lispro or aspart) agreed to participate. Hypoglycemic episodes were self-reported as mild or severe (requiring third-party help). Life satisfaction, impact, and worry related to diabetes were assessed by the diabetes quality of life questionnaire.[6]

The patient demographics and results of the study are shown in **Table 1**.

The mean HbA1c was significantly lower in the CSII group. Episodes of severe hypoglycemia were less frequent, and overall satisfaction was greater in the CSII group compared to the MDI group. These findings are similar to those seen in randomized controlled trials.[1,2,4,5]

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Abbreviations: (CSII) continuous subcutaneous insulin infusion, (HbA1c) hemoglobin A1c, (MDI) multiple daily injections

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Table 1.
Demographics and Results Comparing CSII with MDI

	CSII	MDI	*P* value
Age—years mean (SD)	43.1 (4.2)	4.65 (3.6)	0.574
Gender female/male	34/19	38/16	0.045
Duration of diabetes—years mean (SD)	23.4 (3.3)	20.7 (3.6)	0.017
HbA1c[a,b] (mean)	7.45 ± 0.25	8.14 ± 0.36	0.003
Severe hypoglycemia. *N/n*[c] (%)	12/48 (25)	23/47 (49)	0.01
Mild hypoglycemia. *N/n* (%)	34/78 (71)	37/46 (80)	0.2
Diabetes quality of life—satisfaction score[b,d]	2.06 ± 1.18	2.54 ± 1.44	<0.001
Impact score[b,e]	3.81 ± 0.10	3.48 ± 0.19	<0.004
Worry related to diabetes score[b]	2.50 ± 0.29	2.26 ± 0.33	0.294

[a] HbA1c units are in percentages.
[b] Data expressed as mean ± 2 SE (mean) (95% confidence interval).
[c] *N*, number affected; *n*, number of subjects.
[d] Scale: 1, most satisfied; 5, very unsatisfied (a lower score is better).
[e] A higher score is better.

We acknowledge that our sample was not a randomized sample and although we did not evaluate the socioeconomic status of patients, it is apparent that only those who could afford the pumps would have been on CSII therapy.

We conclude that CSII therapy is associated with better glycemic control, fewer episodes of severe hypoglycemia, and higher life satisfaction compared to MDI in patients with type 1 diabetes in a routine clinical practice.

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