Overall satisfaction increased more with inhaled insulin than with subcutaneous insulin in type 1 diabetes


**Question**
In patients with type 1 diabetes mellitus, is patient satisfaction greater with inhaled insulin use than with subcutaneous insulin injection?

**Design**
Randomized [allocation concealed]*,†, unblinded,* controlled trial with 12-week follow-up.

**Setting**
10 centers in the United States.

**Patients**
72 patients‡ who were 18 to 55 years of age and were following a stable insulin administration schedule of 2 to 3 daily injections for ≥2 months. Other inclusion criteria were screening and prerandomization glycosylated hemoglobin values between 7.0% and 11.9%, fasting plasma C-peptide level ≤0.2 pmol/mL, body weight 80% to 130% of ideal, nonsmoking for ≥6 months, normal results on chest x-ray and pulmonary function tests, and normal sinus rhythm (rate 50 to 100 beats/min). 69 patients (96%) (mean age 37 y, 54% men, 80% white) were considered for analysis.

**Intervention**
35 patients were allocated to receive prednial inhaled insulin immediately before meals using a dry-powder aerosol delivery system and subcutaneous ultralente insulin at bedtime. 37 patients were allocated to receive subcutaneous insulin (control group) 2 or 3 times/d according to each patient’s usual split or mixed insulin regimen.

**Main outcome measures**
A self-administered questionnaire (Patient Satisfaction with Insulin Therapy) developed by Pfizer Inc. was used to measure overall satisfaction (score range 15 to 75), convenience or ease of use (score range 10 to 50), and social comfort (score range 5 to 25).

**Main Results**
[Analysis was by intention to treat]†. Patients who completed all items in the overall scale or in each subscale of the questionnaire at baseline and at 12 weeks were included in the analysis (range 92% to 94%). At 12 weeks, patients in the inhaled-insulin group had greater increases in overall satisfaction and convenience or ease-of-use scores than did those in the subcutaneous-insulin group (Table). Groups did not differ for increase in social comfort (Table).

**Conclusion**
In patients with type 1 diabetes mellitus, increases in overall satisfaction and convenience or ease of use were greater with inhaled insulin than with subcutaneous insulin injection, but groups did not differ for increase in social comfort.

**Sources of funding:** Pfizer Inc.

**For correspondence:** Dr. R.A. Gerber, Pfizer Inc., Groton, CT, USA. E-mail robert_a_gerber@groton.pfizer.com.

*See Glossary.
†Information provided by author.

**Inhaled vs subcutaneous insulin in type 1 diabetes at 12 weeks**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Mean percentage increase from baseline</th>
<th>Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall satisfaction</td>
<td>35%</td>
<td>11%</td>
</tr>
<tr>
<td>Convenience or ease of use</td>
<td>41%</td>
<td>11%</td>
</tr>
<tr>
<td>Social comfort</td>
<td>28%</td>
<td>18%</td>
</tr>
</tbody>
</table>

*Outcomes measured with Patient Satisfaction with Insulin Therapy Questionnaire; higher score = greater satisfaction.
†Calculated from data in article.

**Commentary**
The core finding in the study by Gerber and colleagues was a greater improvement in overall satisfaction among patients receiving inhaled plus 1 subcutaneous injection of insulin than among those continuing 2 or 3 daily injections of insulin. Details of the insulin regimens are sparse, but patients received a mixture of short and medium-acting conventional insulins. Whether these were premixed preparations or not is unclear. These questions are not trivial because many patients with type 1 diabetes find it inconvenient to be done.

To appropriately test the hypothesis that inhaled insulin is more acceptable to patients, a crossover trial comparing it with multiple injection therapy using fast-acting analogues in patients with good glycemic control (perhaps < 8% glycosylated hemoglobin value) needs to be done.

Rudy Bilous, MD
James Cook University Hospital
Middlesbrough, England, UK

**References**