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Diabetes Technology & Therapeutics

LETTER TO THE EDITOR

Efficacy of Insulin Pump Therapy in Elderly Patients

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Dear Editor:

ALTHOUGH THE EFFICACY OF CONTINUOUS subcutaneous insulin infusion (CSII) has been proven, there are few data about its use in elderly patients. Previous studies of CSII use in elderly patients have shown an improvement in glycemic control[1,2] and severe hypoglycemia (SH) rates.[3,4] Impaired awareness of hypoglycemia (IAH), a major risk factor for SH, increases with age and duration of diabetes,[5] with over 45% of those with >15 years of diabetes duration reporting IAH.[6] Elderly people have impaired symptomatic and hormonal responses to hypoglycemia, which are activated at a lower glucose level and to a lower amplitude.[7,8] With better care and increasing life expectancy of people with type 1 diabetes mellitus (T1DM), there is the potential for increased numbers of older patients with T1DM and IAH. Large insulin pump audits conducted worldwide have shown that the mean ages of patients treated with CSII were younger, between 34 and 39 (SD 10–14) years, than those on multiple daily insulin injections.[9,10] Although this may represent the greater use of CSII in the pediatric population, it may also suggest that use is being limited in older patients. Therein lies a particularly vulnerable population of patients with increased risks of hypoglycemia and IAH, who may benefit from CSII, but for whom access to this technology may be limited by cognitive function, by manual dexterity, and potentially by healthcare professional attitudes.

A retrospective case-note audit was performed in all patients started on CSII over the past 12 years, with a minimum duration of 1 year on CSII, in our unit, a tertiary referral center with an approximate average of 50 pump starts per year over the past 3 years. Information such as age at initiation of CSII, gender, duration of diabetes prior to start of CSII, main indication for CSII, baseline glycated hemoglobin (HbA1c) level, HbA1c level at the end of year 1 of CSII therapy, and mean annual HbA1c level thereafter was obtained. In a proportion of patients, hypoglycemia history (frequency of mild/moderate hypoglycemia and SH[11]) and hypoglycemia awareness status according to physician letters and Gold score[12] were available. Rates of SH, requiring external assistance,[11] routinely reported by patients as episodes since the last clinic visit, were calculated for the 1 year prior to CSII and in the last 12 months of follow-up. Data were analyzed using SPSS software version 22.0 (SPSS, Inc., Chicago, IL). Results are reported as mean (SD) or median (interquartile range), unless otherwise stated. Groups were compared using paired t test or Wilcoxon test, as appropriate. A value of $P < 0.05$ was considered statistically significant.

From a total of 360 patients on CSII with at least 1 year of follow-up, 34 patients (9.4%) were ≥60 years of age at the time of starting CSII. Mean (SD) age at commencement of CSII was 65.4 (4.5) years, with the oldest patient being 77 years old. The majority (64.7%) were women. Diabetes duration was 30.4 (16.7) years. Thirty-one patients had T1DM, two had type 2 diabetes mellitus, and one had latent autoimmune diabetes in adults. The indication for starting CSII in this age group was disabling hypoglycemia in the majority (64.7%) and poor glycemic control in 29.4%. Median follow-up duration was 4.7 (range, 1–12.3) years.

After 1 year of CSII, HbA1c improved significantly from 8.3 ± 1.3 to 7.8 ± 0.8% (67 ± 14 to 62 ± 9 mmol/mol) ($P = 0.023$). Compared with patients 18–60 years of age started on CSII at our center ($n = 326$) in the same period, there was equivalent improvement from 8.5 ± 1.6 to 7.9 ± 1.1% (69 ± 17 to 63 ± 12 mmol/mol) ($P = 0.417$ between groups). In the elderly patient group, HbA1c showed sustained improvement up to 9 years, although statistical significance was lost from year 3 onward owing to the small numbers (only two patients had 9 years of follow-up on CSII). There was no statistical change in weight: 74.9 (12.9) kg versus 76 (15) kg ($P = 0.350$). In patients ($n = 10$) starting CSII for poor metabolic control, HbA1c fell by 1% from 9.5 ± 1.6 to 8.5 ± 0.6% (80 ± 17 to 69 ± 6 mmol/mol) ($P = 0.022$) at the end of the first year of follow-up.

In patients ($n = 28$, 82%) for whom hypoglycemia awareness status was available, the proportion reporting IAH fell from 50% (14 patients) prior to CSII to 40.6% at follow-up ($P = 0.002$). Four of the 14 (28.6%) patients with IAH at baseline regained awareness. In the group of patients starting CSII for disabling hypoglycemia ($n = 22$, 64.7%), the median SH rate fell from one (0–2.75) episodes/patient-year at baseline to zero (0–0) episodes/patient-year ($P = 0.042$). The proportion of patients reporting one or more episodes of SH decreased from 58.3% to 16.7%, although the difference was

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not statistically significant ($P = 0.377$). The reduction in SH rates occurred without a deterioration in metabolic control: from an HbA1c level of 7.9 ± 0.7 to $7.8 \pm 0.7\%$ (63 ± 8 to 62 ± 8 mmol/mol) at the end of follow-up ($P = 0.651$).

These data demonstrate that elderly patients are able to achieve an improvement in metabolic control equivalent to that seen in younger patient populations initiated on CSII and that they are able to do so despite a higher prevalence of hypoglycemia unawareness. Reduction in HbA1c level in the group was comparable to that in other published series[9,10,13] and meta-analyses comparing CSII with multiple daily insulin injections.[14,15] In a before-and-after study design similar to ours, a study with follow-up duration of 1 year showed an improvement in SH rates and glycemic control, but only seven to nine of 34 patients had SH (defined as presentation to emergency room and/or seizures), and the study did not include a comparison with younger patients.[3] Of interest to this discussion is the observation from the recently published OpT2mise study,[16] a study of CSII in type 2 diabetes mellitus patients in which the mean age was 55.5 (9.7) years, that mild cognitive impairment seen in 40% of participants did not hinder their ability to obtain benefit from CSII. These data challenge some beliefs that may be held by healthcare professionals concerning the ability of older and possibly mildly cognitively impaired patients to manage the complexities of CSII such as cannula changes, filling of the insulin reservoir, and pump technology, in addition to troubleshooting when problems arise.

Our data show that older patients can show equivalent benefits to younger ones and that in a well-selected group of elderly patients with appropriate education and the support of a multidisciplinary team of diabetologists, dietitians, and diabetes nurse educators, CSII use not only results in metabolic benefits, but more importantly also reduces the hypoglycemia burden by reducing the frequency of SH and improving hypoglycemia unawareness. This is particularly important in elderly T1DM patients with long duration of disease burden and possible multiple comorbidities.

Author Disclosure Statement

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