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Continuous subcutaneous insulin infusion in type 1 diabetes mellitus in adults

Background

Continuous subcutaneous insulin infusion (CSII) is a treatment option for patients with type 1 diabetes mellitus. It is an alternative treatment for multiple daily injections of insulin (MDI), and it can be considered for adults, adolescents and children with high HbA1c levels inspite of intensive MDI treatment or with hypoglycaemic episodes difficult to manage.

Aim

The aim of this systematic review is to compare CSII and MDI based on the results of treatment of type 1 diabetes mellitus in adults.

Methods

Literature review was conducted in October 2010 and updated September 2011 based on Medline, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, NHS Economic Evaluation Database (EED), Health Technology Assessment (HTA) and Database of Abstracts of Reviews of Effectiveness (DARE). Ongoing clinical trials were searched from the ClinicalTrials.gov registry. Searches were limited to begin from the year 2007 because development of both pumps and insulin has been rapid. Separate searches for harms and adverse effects were undertaken from the same databases.

Altogether 121 titles were found and 17 articles were chosen for inclusion. The Cochrane review from 2010 was taken as a base, and two new randomized controlled trials for effectiveness study were identified. For the effectiveness evaluation only studies with follow-up of 6 months or more were included.

Effectiveness

There were altogether seven randomized studies comparing CSII and MDI in adults. The level of glycated haemoglobin (HbA_{1c}) improved in both groups during study follow up in all studies except in one CSII and one MDI group. A statistically significant difference in HbA_{1c} reduction in the favour of CSII was noted in two studies; the magnitude of the difference in reduction was 0.2 and 0.6 percentage points. The baseline level of HbA_{1c} was over 8% in four studies and over 10% in one study. Risk of bias in all included studies was high or moderate.

Rate of severe hypoglycaemia seemed to be smaller in CSII than in MDI treatment. No difference in incidence of mild hypoglycaemia could be found. Differences in the incidence of ketoacidosis varied in studies.

Safety

Skin infections were reported as adverse events in two studies. In an FDA report, one third of announced adverse events in CSII related to malfunctioning of the pump. Problems with a pump occurred at a rate of 23 per 100 years of use.

Costs

Direct costs of MDI, excluding health care visits, were 1 779 Euros. For CSII with basic pump it was 100% higher, and with a pump equipped with glucose sensor 250% higher.

Conclusions

Evidence suggests that CSII treatment may safely result in slightly better glycaemic control than multiple daily injections in the treatment of adult patients with type 1 diabetes. Direct costs are approximately 100% higher using CSII compared to MDI. However, further evidence is needed concerning cost-effectiveness, glucose amplitude and quality of life. CSII requires specific expertise and skills from professionals throughout the whole treatment pathway, as well as a knowledgeable and motivated patient.