ISPAD-Breakthrough 2024 Research Fellowship – Progress report

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Introduction

Incidence of type 1 diabetes has doubled over the last two decades, several studies highlighted a higher rise in very young children group (i.e., below 6 years-old) (1), (2). Type 1 diabetes in very young children constitute a metabolic and psychosocial challenge for both the healthcare team and the children's families (2). Achieving glycemic targets in very young children is particularly challenging due to their unique characteristics, including highly variable and low insulin needs, as well as unpredictable eating and activity habits (2), (3), (4).

I. PROCEDE Study

PROCEDE Study is a randomized controlled trial that aims to test the effect of early treatment with an automated hybrid closed loop system (A-HCL) on (1) structural changes of grey and white matter in youth with T1D using longitudinal brain fMRI and (2) neuro-cognitive performance in youth with T1D. Since November 2024, we finalized the different organizational pipelines and opened 12 clinical centers within Ile-de-France. We started recruiting controls from March 2025 and included 11/20 patients. From June 2025, we will start including patients with type 1 diabetes.

II. Hybrid closed-loop system in very young children with type I diabetes

We retrospectively collected from seventy-two children (< 6 years-old) with T1D for ≥6 months who were switched to hybrid closed-loop (HCL) from 3 expert centers. We performed deep CGM profiles analysis before and after switch to HCL and showed an improvement of euglycemia and hyperglycemia (increase in TIR and decrease of TAR). Also, we identified morning time as a period at risk of hypoglycemia after initiation. While the coefficient of variation remained stable ($p>0.05$), a significant decrease in inter-day glucose variability (CONGA, MODD) was observed from 1 month post-HCL (all $p<0.05$). These results were presented as a poster presentation at ESPE/ESE Joint Congress 2025 in Copenhague and submitted to ISPAD 2025. Article is currently submitted to Diabetes Care.

III. Hybrid closed-loop system in very young children and diluted insulin

Although Hybrid closed-loop (HCL) has shown encouraging glycemic outcomes in very young children with type 1 diabetes (T1D), low total daily dose (TDD) remains a challenge for current systems which requires a minimal insulin dosages to achieve required precision of insulin delivery. We performed a retrospective study on 34 patients with diluted insulin from 12 expert diabetes centers in France. We found that dilution allowed a significant increase in time in range and a significant decrease in target above range. Importantly, we also observed from 1 month after dilution a significant decrease of nocturnal hypoglycemia (<70 mg/dL). These results were submitted to ISPAD 2025. Article is currently in press.

IV. Evaluation of pediatric inaugural DKA across France: data of the DKA observatory between 2010 and 2023

Diabetic ketoacidosis (DKA) is often associated with the initial presentation of type 1 diabetes (T1D) in children. Data were collected from the Aide aux Jeunes Diabetiques registry, which collects data on paediatric patients with new-onset T1D (0-15 years) between 2010 and 2023. We collected the data from 23108 children (46.7% female) which had T1D diagnosed at a mean age of 7.9±5 years. DKA occurred in 39.1% of participants and prevalence was highest among the younguest children (i.e., <3 years of age). Patients with a first degree relative (FDR) had decreased DKA rate but still experienced DKA in 20% of cases. The abstract was presented as short oral communication in ESPE/ESE Joint Meeting in 2025. These results were submitted to ISPAD 2025. Article is currently in press.

References:

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