

## Surreptitious Insulin Overdosing in Adolescents with Type 1 Diabetes

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**Background:** Hypoglycemia in children and adolescents with type 1 diabetes has diverse etiologies. **Case Characteristics:** We report recurrent hypoglycemia in three children with type 1 diabetes because of insulin overdose. **Intervention:** Hospitalization and counseling by treating team and psychologist helped in resolving the recurrent hypoglycemia. **Outcome:** Improvement in glycemic control was achieved. **Message:** Adolescents with type 1 diabetes may take extra insulin to consume more carbohydrates, or to seek attention. Parents should share the responsibility of care of adolescents during transition phase for better glycemic control.

**Keywords:** *Children, Factitious, Hypoglycemia, Recurrent.*

**H**ypoglycemia is common during the management of children with type 1 diabetes. Food-insulin mismatch, exercise, drugs, co-existing adrenal, thyroid and celiac disease, neuro-endocrine tumours and factitious hypoglycemia are the most common causes. The incidence of hypoglycemia in individuals with type 1 diabetes is about two episodes of mildly symptomatic hypoglycemia per week, and the risk is increased with the increasing duration of the disease, lower HbA1c and higher daily doses of insulin [1]. We report surreptitious insulin overdosing causing recurrent severe hypoglycemic episodes in three adolescents with type 1 diabetes.

### CASE REPORTS

*Case 1:* A 13-year-old boy with type 1 diabetes presented to us with complaint of repeated symptomatic hypoglycemic episodes for the last two weeks. Two weeks ago, his parents found him drowsy early in the morning, with blood glucose of 29 mg/dL and with cool extremities. At that time, he was on 12 U of Glargine and 13 U of Lispro per day. Parents gradually decreased and subsequently totally stopped the insulin over the next 10 days, but frequent episodes of hypoglycemia (both symptomatic and asymptomatic) persisted.

A review of the blood glucose records for the last two weeks showed multiple low readings, with few normal or mildly elevated readings. This boy had been diagnosed elsewhere with type 1 diabetes at the age of 7 years, and initiated on insulin. For the first two years after the diagnosis, the parents were poorly compliant with insulin, and tried alternative remedies. He was first brought to us three years ago with moderate diabetic ketoacidosis,

which was managed appropriately. Parents were counseled extensively and the child was initiated on multiple daily injections (MDI) regimen with Glargine and Lispro insulin. The parents regularly followed-up but the glycemic control was sub-optimal. Injection Glargine and morning and evening doses of Lispro were being given by father, but the pre-lunch dose of Lispro was injected by the child himself in the presence of the mother who was illiterate. They stored insulin in the refrigerator to which the child had easy access. Sweets and cookies were nearly always available at home. The child was underweight and stunted; he was studying in class seven, with an average scholastic performance. The parents strongly denied the possibility of child taking insulin injections without the parents' knowledge. The child was admitted for observation and evaluation of the cause. Serum cortisol was measured during hypoglycemia and noted to be normal. HbA1c was 9.6% (81 mmol/mol). Serum insulin level and C-peptide measured on the day of admission (when child had been 'off insulin' for 5 days), showed low C-peptide (0.10 ng/mL) and high insulin (16.80 mIU/mL). These findings were suggestive of surreptitious insulin dosing and induced hypoglycemia.

Subsequently, the insulin pens were taken away from the parents and strict instructions issued that the insulin had to be administered only by staff nurses. Blood glucose was between 200-350 mg/dL, and insulin that was started at 14 U/day had to be hiked to 24 U/day. The child was interviewed again and confronted with the strong opinion of the treating physicians that he had been self-administering extra insulin. The child confirmed the same. The child and parents were seen by the clinical psychologist, who found that the child was depressed and

was inducing hypoglycemia (by surreptitious insulin use) so as to have the pretence of being freed from the condition. He felt happy when he heard the parents talk that he had probably been cured and did not require insulin. The child and parents had multiple counseling sessions with the psychologist. The child has now been in follow-up for last 6 months, and is doing well.

*Case 2:* A 13-year-old boy diagnosed with type 1 diabetes at 9 years of age, presented with the complaints of frequent symptomatic hypoglycemic episodes over the last two months. He was studying in class eight, with good academic performance. He was on an MDI insulin regime with Glargine and Lispro at 0.7 U/kg/day. He had behavioral problems in the form of shouting, disrespecting parents, breaking things, fighting with sisters, and inducing injuries to self.

Blood glucose was being checked by the child, and insulin was administered by either parent. Dietary advice was not being followed. The child was hospitalized, not allowed access to insulin pens, continued on 0.7 U/Kg/day of insulin and blood glucose was monitored. Most values were found to be high (200-380 mg/dL). Serum C-peptide was 0.3 ng/mL, Hb1Ac was 9.4% (79 mmol/mol), and morning serum cortisol was 13 ug/dL. The child and parents were seen by the clinical psychologist, who found that the child was excessively pampered, and was inducing hypoglycemia (by surreptitious insulin use) so as to have access to sweets and food he liked. The parents and child had multiple counseling sessions. He is now doing well.

*Case 3:* This 14-year-old boy, diagnosed as a case of type 1 diabetes at the age of 10 years, was on a mixed split regime of NPH and regular insulin. Parents were from lower socioeconomic status, and were not taking the child for regular follow-ups. Insulin injections were administered either by the father or the child himself. The mother had recently delivered a baby, 14 years after her first child.

The adolescent was on an insulin dose of 1 U/kg/day at presentation. He had been maintaining blood glucose in a range of 150-200 mg/dL till a few months ago, but for the last two months he had frequent low blood glucose values of 30-40 mg/dL, mostly noted in early morning. A random blood glucose level in the outpatient clinic was 45 mg/dL, although the morning dose of insulin had not been given on that day. The child had a cheerful disposition and denied taking insulin surreptitiously, insisting that the refrigerator was in his mother's room and it would be impossible for him to take insulin without her knowledge. In view of hypoglycemic episodes, the dose of insulin was reduced to 0.8 U/kg/day, parents were

instructed to not allow the child to inject insulin, dietary counseling was done by our dietician, and child was asked to return after one week. However, multiple episodes of hypoglycemia were noted in the subsequent week also. His HbA1c was 10.5% (91 mmol/mol). We hospitalized him, with the strong possibility of surreptitious insulin overdosing in view of the recent stressor in the form of birth of a sibling.

During hospitalization, insulin was kept away from the reach of the child, being given by the staff nurse, and blood glucose monitored seven times daily. No episode of hypoglycemia was documented during the hospital stay. On evaluation by the clinical psychologist, the child admitted intentional overdosing of insulin to consume more sweets and extra carbohydrates in the diet, and as an attention seeking mechanism. Parents were counseled regarding his care. On follow-up, he is maintaining blood sugar within normal limits, without any hypoglycemic episodes.

## DISCUSSION

Intentional insulin overdosing as a cause of severe hypoglycemia is more prevalent in adolescents [2,3]. In a cross-sectional study from Austria involving 241 adolescents with type 1 diabetes, 22.8% admitted to intentional insulin overdosing during the preceding three months [4]. Intentional overdosing of insulin is mainly reported for attempting suicide in adults, whereas in adolescents, the main reason is to indulge in unrestrained binge eating and consuming sweets [4,5]. Other common reasons for insulin misuse in adolescents are to deny the need of insulin in front of peers [6], suicidal attempts [7], as well as attention-seeking behaviour, and to get a feeling of 'high' during the episodes of hypoglycemia [4]. This is especially common during the transition phase of transfer of care from the parents to the child [3]. Hence, 'the secret insulin-injection syndrome' should be suspected by the treating physician in adolescents with type 1 diabetes with unexplained severe hypoglycemia, especially in case of recurrence.

All three children in this series had recurrent episodes of hypoglycemia, despite being on usual doses of insulin and having high HbA1c. Hence, possibility of insulin overdosing was suspected. In all three cases, the parents did not believe in the possibility of child's deliberate overdosing and induction of hypoglycemia. They wanted to indulge in the wishful thinking that the pancreas had recovered and started producing insulin in their child, resulting in reduced/abolished need for insulin injections. Hospitalization and demonstration of consistently high blood glucose values (when the child did not have access to insulin) with the need for usual doses of insulin helped

in convincing them. The sessions with the clinical psychologist helped all the three families to improve their care-giving practices.

We conclude that one needs to be vigilant of the possibility of potentially life-threatening insulin misuse in adolescents. Parents should be counseled to remain actively involved in the care of the adolescent for better metabolic control. Wherever possible, a clinical psychologist should be a part of the team that manages children and adolescents with type 1 diabetes.

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