Technology

If insulin pump therapy is used in pregnancy, should it be continued during labour?

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Insulin pump therapy has been shown to be effective in lowering HbA_{1c} and at the same time reducing hypoglycaemia in the general population with T1D. Intuitively you would expect these advantages to be evident in pregnant women with diabetes. Furthermore, the reduced fluctuation in blood glucose levels, which can be achieved with pump therapy, could translate into less fetal glucose exposure and thus a decreased risk of excess fetal growth. However, no large randomised controlled trial of insulin pump therapy versus multiple daily injections (MDI) has been carried out in pregnancy. Over the last decade, a number of centres have compared their experience with each modality used in pregnancy and concluded that insulin pump therapy is as, but no more, effective than MDI. The caveat to this is that in most centres reporting their experience, pump therapy is commenced in women who are failing to achieve optimal glycaemic control on MDI, so it could be argued that their subsequent ability to achieve good outcomes with pump therapy suggests that this therapy may have advantages over MDI in pregnancy (Lapolla et al, 2003).

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If pump therapy is used during pregnancy, should it be continued during labour? Many centres using pump therapy during pregnancy convert women onto their standard protocol for labour, usually delivering insulin by intravenous infusion. In our experience, insulin pump therapy can be very effectively used during labour provided that midwives and partners are adequately educated in its use (Hammond et al, 2008). Fresa et al (summarised alongside) describe a protocol that has been used across four centres in Italy, allowing women to be maintained on continuous subcutaneous insulin infusion (CSII) during labour or delivery by caesarean section. Women, their partners and local obstetric teams were educated from 28 weeks of pregnancy in the use of the protocol. The ability to store several different basal rates in the pump was used to allow three different patterns to be activated at the time of delivery: a low insulin infusion rate of 0.1–0.2 units per hour for low glucose levels; a 30–70% reduction in basal rate, depending on estimated insulin sensitivity, for normal glucose levels, to be commenced at the start of active labour or induction of anaesthesia for caesarean section reflecting the fairly abrupt fall in insulin requirements; and the usual basal rate in the days prior to delivery, to be continued if glucose levels were above target. The intravenous insulin protocol could be used if glucose levels were uncontrollably high, but none of the 65 women needed this, nor did any of them experience hypoglycaemia.

All women were able to maintain glucose levels within target range, 86% using the 30–70% reduction in basal rate. Just under 30% of women were using sensor-augmented pump (SAP) therapy. They had better control in the third trimester with average HbA_{1c} which was 5.2%, compared to 6.2% for the rest of the study group, and their glucose levels during the study period were lower. There was no comparator group of women using MDI through pregnancy and intravenous insulin at the time of delivery, but rates of neonatal hypoglycaemia and neonatal respiratory distress were low, suggesting that the glycaemic control achieved, particularly in those women using SAP therapy, may reduce the risk of neonatal complications.

This study demonstrates the safety and efficacy of continuing insulin pump therapy in pregnant women at the time of delivery, and hopefully will encourage diabetes and obstetric teams to work together to ensure that this is routine practice for all women using pump therapy during pregnancy. More evidence is needed to determine whether use of pump therapy in this situation confers an advantage over MDI in reducing the risk of neonatal complications.

Hammond PJ et al (2008) An audit of pregnancy outcomes in type 1 diabetes comparing continuous subcutaneous insulin infusion with multiple daily injections. *Diabetologia* **51**: S458

Lapolla A, Dalfrà MG, Masin M et al (2003) Analysis of outcome of pregnancy in type 1 diabetics treated with insulin pump or conventional insulin therapy. *Acta Diabetol* **40**: 143–9

DIABETES TECHNOL THER

Pregnancy in T1D: Is CSII feasible during different types of delivery?

Readability	✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 Optimised metabolic control is essential during pregnancy and delivery to prevent the occurrence of adverse maternal-neonatal complications.

2 The authors performed a multicentre, retrospective study to determine the efficacy and tolerability of continuous subcutaneous insulin infusion (CSII) during delivery in pregnant women with T1D (n=65). The value of real-time continuous glucose monitoring (RT-CGM) in addition to CSII was also investigated.

3 Participants were able to activate three different insulin regimens. Insulin basal rates could be administered at the last rate used (profile A), at a 50% reduction (profile B) or at 0.1–0.2 U/h if blood glucose rose <70 mg/dL prior to anaesthesia or the initiation of labour (profile C).

4 During delivery, mean basal rate of infusion was 0.6 ± 0.4 U/h. The RT-CGM group displayed a lower mean capillary blood glucose (CBG) compared to those receiving CSII alone.

5 There were 11 incidences of transient neonatal hypoglycaemia. None of the participants developed hypoglycaemia <50 mg/dL during delivery and the alternative intravenous protocol (IVP) was not activated by any of the women.

6 The authors concluded that CSII is effective during different types of delivery and that RT-CGM can help improve maternal peripartum CBG.

Fresa R, Visalli N, Di Blasi V et al (2013) Experiences of continuous subcutaneous insulin infusion in pregnant women with type 1 diabetes during delivery from four Italian centers. *Diabetes Technol Ther* **15**: 328–34

J DIABETES SCI TECHNOL

Can one platform achieve insulin infusion and glucose sensing?

Readability	✓✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓✓✓

1 In order to prevent subcutaneously infused insulin from interfering with glucose sensors, current models of sensor-augmented pump perform glucose sensing and insulin delivery with separate processes inserted into different sites in the abdomen.

2 The aim of this study was to test the efficacy of a Combo-Set (Medtronic) prototype device which consists of both a subcutaneous insulin delivery catheter and a continuous glucose monitoring (CGM) sensor located 11 mm apart on the same platform.

3 Over 3 days, 10 people with T1D wore the subcutaneous Combo-Set and a Sof-Sensor on opposite abdominal areas for a mean of 53.25 ± 0.75 hours. Both devices were connected to an iPro recorder (Medtronic). Insulin diluent was administered by the Combo-Set except during meal tests, where an insulin meal bolus and postmeal basal was supplied.

4 The Combo-Set displayed similar glucose-sensing accuracy to the Sof-Sensor. The Combo-Set detected a postbolus insulin peak at 67 ± 9 minutes. Comparison of two distinct time points across day 1 and 3 did not reveal any worsening in performance over time. Only one episode of a "no delivery" alarm occurred throughout the duration of use.

5 The authors concluded that simultaneous insulin infusion and glucose sensing can be achieved with the use of a single platform.

O'Neal DN, Adhya S, Jenkins A et al (2013) Feasibility of adjacent insulin infusion and continuous glucose monitoring via the Medtronic Combo-Set. *J Diabetes Sci Technol* **7**: 381–8

DIABETES TECHNOL THER

T1D: CSII versus a iMDI programme

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓

1 The authors investigated the long-term effects of continuous subcutaneous insulin infusion (CSII) compared to an intensive multiple daily insulin injection (iMDI) programme.

2 A total of 247 people (126 CSII and 121 iMDI) with T1D were included in the study. Mean follow-up was 39 ± 26 months in the CSII group and 48 ± 26 months in the iMDI group.

3 At follow-up intervals before 36 months, participants in the CSII group had a significantly lower HbA_{1c} compared to baseline. The greatest HbA_{1c} reduction (6.99 mmol/mol; 0.64%) was observed at 6 months. After this, the reductions became smaller. Mean glucose was decreased and there were no changes in the incidence of hypoglycaemia.

4 In the iMDI group, HbA_{1c} was reduced (1.63 mmol/mol; 0.15%) at 6 months only. iMDI use did not alter hypoglycaemia or mean glucose.

5 The authors concluded that CSII was associated with better glycaemic control compared to iMDI.

Cohen ND, Hong ES, Van Drie C et al (2013) Long-term metabolic effects of continuous subcutaneous insulin infusion therapy in type 1 diabetes. *Diabetes Technol Ther* **15**: 544–9

J NURSES PROF DEV

Short educational intervention is beneficial for nurses managing pumps

Readability	✓✓✓
Applicability to practice	✓✓✓✓✓
WOW! factor	✓✓✓

1 In this pilot study, the authors examined the value of a 3-week teaching intervention aimed at educating nurses (n=17) on the principles of insulin pump therapy.

2 The teaching programme covered topics including patient selection and safe insulin pump use. A survey was given to participants before and on the completion of the programme.

3 The post-test analysis revealed a significant increase in total confidence and knowledge amongst nurses after the intervention (P<0.000).

4 The authors concluded that this short educational programme was highly effective in increasing nurses' confidence and knowledge of insulin pumps.

Sweeney TJ, Kenny DJ, Schubert CC (2013) Inpatient insulin pump therapy: assessing the effectiveness of an educational program. *J Nurses Prof Dev* **29**: 84–9

DIABETES TECHNOL THER

Disordered eating behaviours in young people with T1D

Readability	✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 A prospective, multicentre study was performed to investigate the eating behaviours of 43 young people (aged 10–17 years) before and 6 months after the initiation of insulin pump therapy for T1D.

2 Compared to baseline, Diabetes-specific Eating Problems Survey-Revised (DEPS-R) scores became lower throughout the study (P=0.01).

3 DEPS-R scores were correlated with BMI z-score. Overweight youth endorsed more disordered eating behaviours than those at a normal weight.

4 The authors concluded that the initiation of insulin pump therapy in young people with T1D was associated with a decreased endorsement of disordered eating behaviours.

Markowitz JT, Alleyn CA, Phillips R et al (2013) Disordered eating behaviors in youth with type 1 diabetes: prospective pilot assessment following initiation of insulin pump therapy. *Diabetes Technol Ther* **15**: 428–33

> *"The authors concluded that the initiation of insulin pump therapy in young people with T1D was associated with a decreased endorsement of disordered eating behaviours."*