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The onset of acute Charcot neuroarthropathy during pregnancy in patients with type 1 diabetes

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Summary

We report the onset of acute Charcot neuroarthropathy during pregnancy in two patients with type 1 diabetes using retrospective review of case notes. We describe for the first time the onset of acute Charcot neuroarthropathy during pregnancy in two patients with type 1 diabetes. Pregnancy may promote the onset and worsening of a number of diabetic complications. A link between pregnancy and the onset of acute Charcot neuroarthropathy is demonstrated for the first time in this report.

Learning points:

- Patients with already diagnosed sensitive neuropathy can develop an active phase of Charcot neuroarthropathy during pregnancy.
- The rapid correction of hyperglycaemia may induce an active phase of Charcot neuroarthropathy during pregnancy.

Background

Diabetic complications, such as retinopathy, may develop and worsen during pregnancy. The prognosis of pregnancy in diabetic women with microvascular disease is so poor that many physicians advise avoidance or termination of pregnancy (1). There is a universal agreement that blood glucose control throughout pregnancy is important for maternal and fetal well-being. However, intensive blood glucose control is associated with risks in diabetic mothers, particularly among those with established microvascular disease (i.e. retinopathy and nephropathy). Moreover, the rapid normalisation of hyperglycaemia may, in some cases, cause acute neuropathy affecting small peripheral nerve fibres (2). Charcot neuroarthropathy (CN) is a rare and devastating complication of diabetic neuropathy (3); the conditions required for the onset of CN are poorly understood, and its relationship with a rapid reduction in blood glucose levels is unclear. Herein, we report the onset of CN during pregnancy in two patients with type 1 diabetes.

Case presentation

The first patient was 28 years old. She has been a type I diabetic since the age of 12. Her medical follow-up for diabetes was very poor (only one consultation during the 2 years preceding pregnancy, with a HbA1c level of 9.8%). Her diabetes was complicated by sensory peripheral neuropathy, although retinopathy was not observed before or during pregnancy. She had her first pregnancy at the age of 28, after 4 weeks of amenorrhea. Her HbA1c

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level was 8.7%, microalbuminuria was <30 mg/24 h with normal GFR (91 mL/min/1.73 m²) and her BMI was 25 kg/m².

The patient had no other medical history beyond 29 weeks of amenorrhea; after consultation with a gynaecologist, she was referred to the Diabetic Foot Unit for a swollen, red foot without pain but with significant temperature difference compared to the contralateral foot. An X-ray showed no fracture, and a venous Doppler ultrasound was performed to eliminate the diagnosis of thrombophlebitis. Subsequently, the diagnosis of an active phase of CN was made with the implementation of active discharge with the use of an Aircast® removable boot. HbA1c was 6.2% vs 8.7% (−28%), and there was no indication of trauma. After 37 weeks of amenorrhea, the patient gave birth (vaginally) to a female baby (birth weight was 3476 g). MRI was performed 4 weeks after childbirth, indicating the active phase of CN with regard to the medio-tarsal joint (i.e. zone III according to the Frykberg classification) (4). Other than vitamin and iron supplementation, the patient had not received any treatment during this period. Nephropathy and postpartum retinopathy were controlled 6 weeks after delivery, and the results were normal.

The second patient was 25 years old and was being treated for type I diabetes, diagnosed at the age of 9. She shared the same history of precarious medical follow-up as the first patient (i.e. a single consultation in the 2 years preceding her pregnancy). She had no other medical history. She was initially hospitalized in 2017 for the management of major glycaemic imbalance with an HbA1c value of 12%. The BMI was 22.2. Clinical examination revealed sensory peripheral neuropathy and the patient also reported the presence of paraesthesia in the lower limbs and pathological results on the monofilament test (not felt on two sites at each foot); laboratory tests showed microalbuminuria (289 mg/L) with normal GFR (80 mL/min/1.73 m²), suggesting incipient nephropathy. Her sole treatment consisted of insulin (via a s.c. insulin pump). Two months later, she consulted for an unplanned pregnancy after 6 weeks of amenorrhea. Her HbA1c at this point was 9%. Ophthalmology results were normal (no diabetic retinopathy). Intensive glycaemic management was initiated. At 24 weeks of amenorrhea, the patient was hospitalized due to vomiting and suspected pregnancy-related thyroiditis. Her HbA1c at this time was 7.4% (60% reduction over a 6-month period). The BMI was 23.8 kg/m².

Corticosteroids (Prednisone® 40 mg/day) were given intravenously for 3 days. The patient reported an injury to her right ankle 3 weeks earlier with the presence of untreated peri-malleolar swelling; this edema of the right ankle and foot was still present with significant temperature difference compared to the contralateral joints. Thrombophlebitis was ruled out by venous Doppler ultrasound. X-ray showed no fractures, but rather dislocation of Chopart's joint, highly evocative of acute CN of foot zone III (4). Ultrasound of the ankle showed no signs suggestive of a ruptured ligament. An Aircast® pneumatic boot was prescribed with reduced weight-bearing. Ten weeks later, the patient underwent an emergency Caesarean delivery because of impaired fetal cardiac rhythm at 34 weeks of amenorrhea (male baby weighing 2560 g). At this time, the mother's HbA1c level was 7.1%. MRI performed 2 months after childbirth for persistent foot edema showed a specific and typical image of active CN in the mid-tarsal zone with the appearance of a displaced joint fracture of the navicular bone, talonavicular luxation and fracture of the cuboid joint. This patient developed an active focus of CN on the knee 2 weeks after delivery (5). This was confirmed using a knee scanner, which showed edema in the tibial plateau with a displaced fracture of this bone structure; however, the patient did not describe any trauma to this joint.

Also, the ophthalmological control after childbirth did not show the presence of retinopathy. Microalbuminuria measured at the end of her pregnancy was 289 mg/L (i.e. stabilisation of diabetic nephropathy).

Treatment

The implementation of active discharge with the use of an Aircast® removable boot was indicated for both patients.

Outcome and follow-up

Both patients were followed-up for 12 months at the Diabetic Department of Centre Hopitalier Sud Francilien, Corbeil-Essonne France.

Discussion

The prevalence of CN varies between 0.1 and 0.4% in the diabetic population (6). This prevalence increases to 35% in patients with peripheral neuropathy (7). However, few studies have linked the appearance of CN to glycaemic control. An evaluation carried out in 164 patients showed that the presence of microalbuminuria is a predictive factor, which is more sensitive to the appearance of CN than the HbA1c level (8). Cases of

CN in the foot have been seen following combined kidney–pancreas transplantation (9). Indeed, our two patients had reduced their HbA1c level by 28 and 60%, respectively, in less than 6 months. Rapid normalisation of hyperglycaemia may, in some cases, cause acute neuropathy affecting small peripheral nerve fibres (2). Such neuropathy generally presents as a diffuse disorder of the sympathetic and parasympathetic fibres in the form of pain characteristic of small neurological fibres (electric discharges and/or burning sensation), cardiovascular signs, orthostatic hypotension, tachycardia or diarrhea associated with colonic activity. Pregnancy increases the risk of diabetic complications and the progression of these complications (i.e. nephropathy and retinopathy) (10). Factors that increase the risk of retinopathy progression include a longer duration of diabetes (>10 years) and the presence of moderate-to-severe retinopathy before pregnancy. During pregnancy, rapid improvement in glycaemic control in those with poor glucose control and known retinopathy has been shown to worsen diabetic retinopathy. Therefore, and for the first time, the appearance of the active phase of CN is described here as a complication detected in a pregnant patient with diabetes. The development of the active phase of CN seems to be multifactorial, in connection with both the rapid reduction in hyperglycaemia found in these patients and possibly linked to the impact of pregnancy on the microvascular complications of diabetes.

The precariousness of initial medical follow-up is not linked to the non-screening of CN, as the symptoms started during pregnancy; however, the lack of follow-up is probably responsible for the elevated levels of HbA1c in the pre-pregnancy period.

In conclusion, the appearance of the active phase of CN, like the other microangiopathic complications of diabetes, seems to be disturbed during pregnancy in patients with type 1 diabetes and with poor glycaemic balance.

Declaration of interest
The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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