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LETTER TO THE EDITOR

Improvement of glycemic control without severe hypoglycemia in a type 1 diabetes patient undergoing hemodialysis after a change from insulin glargine to insulin degludec

A 61-year-old woman was diagnosed with type 1 diabetes at 24 years-of-age and began hemodialysis at 56 years, owing to diabetic nephropathy. She injected insulin lispro at 5 U before breakfast, 12 U before lunch and 2 U before dinner, and insulin glargine at 4 U before breakfast on hemodialysis and non-hemodialysis days. Although her glycated hemoglobin and glycated albumin could not completely explain her glucose level, because she also had renal anemia and hypoalbuminemia, her daily glucose level fluctuated from 30 mg/dL to over 400 mg/dL. She was transferred to Center Hospital, National Center for Global Health and Medicine, Tokyo, Japan, by ambulance because of severe hypoglycemia four times in 6 months, and was admitted to improve her glycemic control. To investigate the cause of unstable glycemic control, we checked insulin antibodies, which were negative. The patient was attached to a continuous glucose monitoring system. Her basal insulin was changed from insulin glargine to insulin degludec. Approximately 3 weeks later, mean glucose levels ± standard deviation (mg/dL), mean amplitude of glycemic excursion, and *M*-value improved from 285.5 ± 58.1, 115.7 and 100.2 to 125.9 ± 32.6, 82.1 and 4.2, respectively, with insulin lispro (5 U before breakfast, 9 U before lunch, 2 U before dinner) and insulin degludec (7 U before lunch; Figure 1). Six months after discharge, her glucose level is still stable between 90 and 200 mg/dL, and she has had no severe hypoglycemia.

Glycemic control is essential for prevention of diabetic complications in patients with type 1 diabetes[1]. Poor glycemic control of patients with maintenance hemodialysis is associated with all-causes and cardiovascular death, and appropriate glycemic control appears to be required[2]. However, these patients' glucose levels are unstable, and often lead to hyper- and hypoglycemia. Possible explanations were increased insulin resistance and reduced gluconeogenesis in diabetes with renal insufficiency. In the present case, unstable glucose level and severe hypoglycemia improved after a change of basal insulin from insulin glargine to insulin degludec without a change in total insulin dose. This result might be attributed to the different

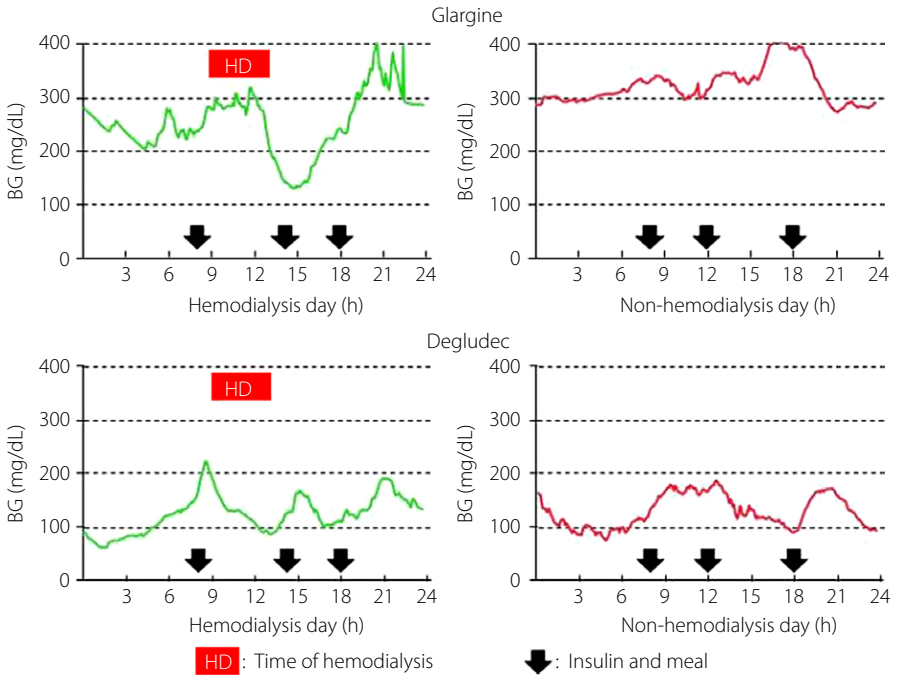

Figure 1 | Continuous glucose monitoring results on hemodialysis day and non-hemodialysis day after a change from insulin glargine to insulin degludec. Black arrow, time of insulin injection and meal. BG, blood glucose; HD, time of hemodialysis.

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mechanisms of insulin glargine and insulin degludec. Insulin glargine has low solubility at neutral pH and complete solubility at acidic pH (pH 4). It forms microprecipitates, and is released continuously into circulation after subcutaneous injection. In contrast, insulin degludec forms soluble multihexamers on subcutaneous injection, resulting in a depot from which insulin degludec is continuously and slowly absorbed into circulation, leading to a flat and stable glucose-lowering effect. The unique mechanism of insulin degludec provides a buffering effect against changes in absorption rate, contributing to a stable and more consistent activity. In recent studies, insulin degludec improved daily and nocturnal hypoglycemia in patients with type 1 diabetes[3], and the pharmacokinetic properties of insulin degludec were preserved in patients with renal impairment[4]. This case report might contribute to the improvement in glucose control and hypoglycemia in type 1 diabetes in patients undergoing hemodialysis. Further research on the effect of insulin degludec in such patients is desirable.

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DISCLOSURE

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