

Case Report

Efficacy of crushed lanthanum carbonate for hyperphosphatemia in hemodialysis patients undergoing tube feeding

Yukie Kitajima^{1,2}, Taeko Takahashi², Yuzuru Sato² and Yutaka Nakaya³

¹Department of Nutrition and Health Promotion, Hiroshima Jogakuin University, Hiroshima, Japan, ²Sato Junkanki Hospital, Matsuyama, Japan and ³Department of Nutrition and Metabolism Institute of Health Biosciences, the University of Tokushima Graduate School, Tokushima, Japan

Correspondence and offprint requests to: Yukie Kitajima; E-mail: myuki92@mocha.ocn.ne.jp

Abstract

Lanthanum carbonate (LaC) is a non-calcium-based phosphate binder used to treat hyperphosphatemia in patients with chronic kidney disease. Oral administration of LaC is difficult in patients undergoing tube feeding or those who are of advanced age because it is essential to chew the LaC tablet sufficiently before swallowing it. We report two cases in whom crushed LaC was used in hemodialysis patients undergoing tube feeding. In both cases, previously crushed LaC was mixed into enteral nutrients. We found that LaC administered this way was effective for decreasing serum phosphorus levels.

Keywords: hyperphosphatemia; lanthanum carbonate; phosphate binder

Introduction

Hyperphosphatemia is a risk factor for secondary hyperparathyroidism, a serious complication that increases the risk of cardiovascular diseases in hemodialysis patients [1,2]. Lanthanum carbonate (LaC), a phosphate binder that does not contain calcium, has been reported to decrease serum phosphorus levels. It has been reported to be approximately twice as effective as calcium carbonate, thus limiting the incidence of hypercalcemia [3,4]. However, oral administration of LaC is difficult in cases undergoing tube feeding in those patients who are of advanced age because it is essential to chew LaC tablets sufficiently before swallowing. We describe two patients for whom LaC that had already been crushed and mixed into enteral nutrients was effective for decreasing serum phosphorus levels.

Case reports

We show the following two cases. In each case, serum total calcium level was corrected for serum albumin level. We used the following formula for the corrected calcium level. Corrected-calcium level = serum total calcium + (4 – serum albumin level).

Case 1

A 47-year-old woman with end-stage renal disease due to IgA nephropathy was started on hemodialysis in December 1994. She had anorexia and dysphagia resulting from an intracranial hemorrhage that had occurred in August 2007, making dietary intake difficult. Consequently, she underwent tube feeding with enteral nutrients. The daily nutrition quantities given were as follows: energy, 1200 kcal; protein, 42.0 g; lipids, 34.0 g; carbohydrate, 179 g; potassium, 360 mg; phosphorus, 420 mg and calcium, 360 mg. We began administering crushed LaC in July 2009 at a dose of 750 mg/day (0 point on the x-axis, Figure 1). Prior to LaC administration, her average serum phosphorus level was 6.3 mg/dL and the corrected calcium level was 10.1 mg/dL. Subsequent to LaC administration, while the average serum phosphorus level decreased to 4.9 mg/dL, no major change was observed in the corrected calcium level, which remained at 9.8 mg/dL. In addition, with regard to the phosphate binder, although the average dosage of calcium carbonate for the half-year period was 1.4 g/day prior to LaC administration, its use was discontinued upon the introduction of LaC into the tube feed. The dosage of LaC reached its maximal level of 1500 mg/day 5 months after the administration began. Subsequently, the dosage was gradually reduced as serum phosphorus levels decreased. Currently, no LaC is being administered (Figure 1). No occlusion of tube was observed during LaC administration. And serum albumin levels were maintained.

Case 2

A 64-year-old man with end-stage renal disease due to diabetic nephropathy began hemodialysis in December 2005. He developed cerebral infarction in July 2007 and thereafter underwent feeding/swallowing rehabilitation. However, he has been under nasogastric tube management with the enteral nutrients since February 2008. The daily nutrition quantities given were as follows: energy, 1600 kcal; protein, 54.4 g; lipids, 52.8 g; carbohydrate, 223 g; potassium, 800 mg; phosphorus, 800 mg and calcium, 720 mg. We began administering crushed LaC in November 2009 (0 point on the x-axis, Figure 2) with a dosage of

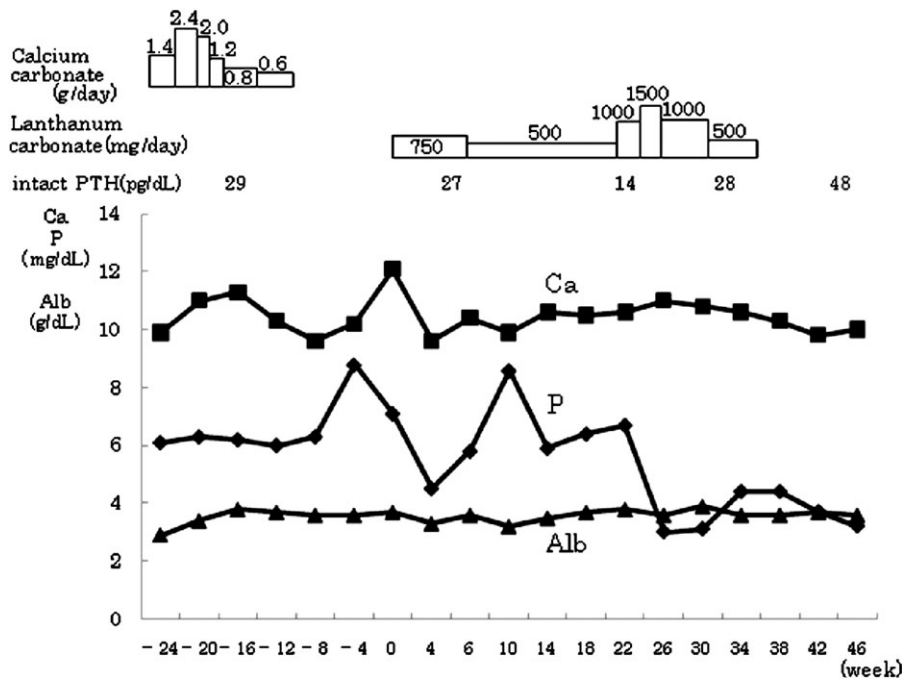


Fig. 1. Intact parathyroid hormone (intact PTH) levels, corrected calcium levels, serum phosphorus levels and serum albumin levels during treatment with each phosphate binder in Case 1. Crushed LaC (750 mg/day) was started from the 0 point on the x-axis. It was difficult to control serum phosphorus levels and corrected calcium levels (upper line) during treatment with calcium carbonate. During treatment with LaC serum phosphorus levels (lower line) decreased. Currently, LaC is not being administered. Doses of calcium carbonate and LaC are shown in the bar graphs. There was no change in intact PTH levels and serum albumin levels.

750 mg/day (250 mg/meal). Prior to LaC administration, the average serum phosphorus level was 6.0 mg/dL and the corrected calcium level was 9.7 mg/dL. Subsequent to LaC administration, while the average serum phosphorus level decreased to 4.6 mg/dL, no major change was observed in the corrected calcium level, which remained at 9.9 mg/dL. In addition, with regard to the phosphate binder, although the average dosage of calcium carbonate for the half-year period was ~1.9 g/day prior to LaC administration, its use was discontinued upon the initiation of LaC administration. Although LaC dosage was initially maintained at 750 mg/day, it was reduced to 375 mg/day as serum phosphorus levels decreased 3 months after the administration began. This dosage is currently being maintained (Figure 2). There were no significant complications due to LaC administration and the tube has been patent during treatment and serum albumin levels were maintained.

Discussion

For hemodialysis patients, the management of serum phosphorus and calcium levels is essential to prevent the development of secondary hyperparathyroidism, cardiovascular diseases and vascular calcification [1,2]. It also affects prognosis. The use of calcium carbonate to decrease serum phosphorus levels also means administering calcium to the patient, thereby presenting a risk of hypercalcemia. In these two cases, intact parathyroid hormone levels did not change. Moreover, because they were already hypercalcemic, they could not use an adequate amount of calcium carbonate. Thus, no adequate amount of calcium carbonate can be used

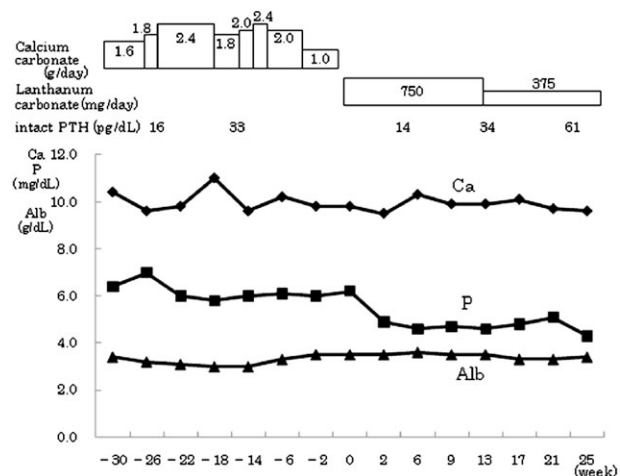


Fig. 2. Intact parathyroid hormone (intact PTH) levels, corrected calcium levels, serum phosphorus levels and serum albumin levels during treatment with each phosphate binder in Case 2. Crushed LaC (750 mg/day) was started from the 0 point on the x-axis. It was difficult to control serum phosphorus levels and corrected calcium levels during treatment with calcium carbonate. However, after treatment using crushed LaC, serum phosphorus levels decreased. Currently, the dosage of LaC is 375 mg/day. Doses of calcium carbonate and LaC are shown in the bar graphs. There was no change in intact PTH levels and serum albumin levels.

as a phosphate binder on hemodialysis patients, when the patients are already hypercalcemic [5, 6]. In those cases, it is difficult to manage serum phosphorus levels. Conversely, LaC is extremely useful in managing serum phosphorus levels in hemodialysis patients having hypercalcemia because it is a phosphate binder that does not contain calcium [3,4].

Nevertheless, since LaC must be crushed in the mouth for oral administration, patients with tube feeding, those who are of advanced age or those who wear dentures cannot consume it because of their inability to crush the tablet sufficiently. Therefore, LaC was administered to the patients after powdering and mixing it into enteral nutrients. As shown in the above two cases, by administering powdered LaC to the patients, serum phosphorus levels could be substantially decreased without increasing serum calcium levels.

It can therefore be concluded that LaC, even in the crushed state, remains effective in decreasing serum phosphorus levels. Because this study has shown the possibility of administering LaC in a powder form to patients who cannot chew tablets, it is possible that it could be more widely used for the management of serum phosphorus and calcium levels in the future.

Conflict of interest statement. None declared.

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