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CASE REPORT

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Fewer injections, less pain: Successful cyanocobalamin desensitization

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Abstract

Vitamin B12 (cobalamin) is a water-soluble vitamin that is derived from animal products such as red meat, dairy, and eggs. Cobalamin deficiency can be frequently seen in people all around the world. Desensitization is a treatment option if drug hypersensitivity develops and treatment is necessary. But intramuscular applications may cause treatment difficulties in such patients. A patient who developed cyanocobalamin deficiency due to pernicious anemia was shared. First, this patient was treated with cyanocobalamin. After treatment drug-induced hypersensitivity reaction developed. Desensitization was applied to the patient. Successful desensitization scheme was shared. Desensitization is of great value, as there are very limited treatment options in the literature on this subject, and it brings about a different option.

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Introduction

Vitamin B12 (cobalamin) is a water-soluble vitamin that is derived from animal products such as red meat, dairy, and eggs.¹ Cobalamin deficiency can be frequently seen in people all around the world. Pernicious anemia used to be the main cause of deficiency. Its management typically involves regular and lifelong intramuscular injections of cobalamin because of gastric atrophy.² Early diagnosis and appropriate management are crucial to avoid severe complications like spinal cord degeneration and pancytopenia.³

Regardless of the cause of the deficiency, initial treatment with parenteral B12 was regarded as the first choice for patients with acute and severe manifestations of B12 deficiency. The use of high-dose oral B12 at different frequencies may be considered for long-term treatment. Although monthly treatment is recommended initially, two to three monthly injections are considered sufficient for follow-up.⁴ When we compare the parenteral route with the oral route, higher serum vitamin B12 and hemoglobin concentrations are achieved with the parenteral route after 3 months of treatment.⁵ According to the British Committee

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for Standards in Haematology guideline (2014), if a rapid increase in treatment is not necessary, the oral route can also be preferred.⁶ According to the NICE (2024) guideline, the cause of vitamin B12 deficiency is important in shaping the treatment. If not consuming meat for a reason such as veganism, the oral route should be chosen; however, if there is malabsorption, the intramuscular route should be chosen.² Therefore, in patients diagnosed with pernicious anemia, the parenteral route should be preferred rather than the oral route. Intramuscular applications may cause treatment difficulties in patients requiring desensitization when hypersensitivity develops. The successful desensitization scheme applied to a patient who developed drug-induced hypersensitivity reactions because of cobalamin deficiency as a result of pernicious anemia is shared.

Case

A 56-year-old woman presented at our referral center. She was evaluated for pernicious anemia in the internal medicine clinic, and cyanocobalamin was prescribed intramuscularly (1000 mcg). One hour later after taking the first dose of the drug, redness, itching in the palms, and dizziness developed. The patient was admitted to the emergency room and was observed to have hypotension (80/50 mmHg). The patient, who was considered to have anaphylaxis, was given intramuscular adrenaline, methylprednisolone, and antihistamines. The patient, who required cobalamin treatment, was referred to our outpatient clinic. The serum vitamin B12 level was 20 pg/mL (160-950 pg/mL); serum tryptase level was 4 µg/L. She had no disease other than hypertension. It was stated that parenteral treatment was necessary because the serum B12 level was very low, and she had pernicious anemia. First, a skin prick test with nondiluted cyanocobalamin was performed on 10 healthy volunteers and was found to be negative. The patient underwent a skin prick test. Prick test performed with cyanocobalamin was 4 × 4 mm positive. Desensitization with hydroxycobalamin was planned for the patient, but when it could not be obtained, desensitization with cyanocobalamin was started. During the desensitization, the drug was administered in at least six steps where the drug dosage did not exceed 2.5 times and the drug administration time did not exceed 15 min. The drugs were administered under the supervision of a physician and nurse. Vital signs were checked at 15-min intervals, and

desensitization was performed. Informed consent was previously signed by the patient.

Patient was applied a one bag, seven-step desensitization with cyanocobalamin. The first six steps were started with oral administration and then switched to intramuscular administration. Cyanocobalamin ampoule (1mL/1000 mcg) was diluted with 50 cc physiological saline. Twenty mcg/cc solution was administered at 15-min intervals without premedication.

The diluted drug was given orally to the patient in six steps. One ampoule of cyanocobalamin was administered intramuscularly 30 minutes after the last step. Total desensitization was completed in 105 min (Table 1). This treatment was applied to the patient for 3 months. The patient did not develop any hypersensitivity reactions. When we checked the serum vitamin B12 level after three rounds of desensitization, it was above 1500 pg/mL. Therefore, injection intervals were increased to 2 months.

There are limited data on cyanocobalamin desensitization in the literature. In a retrospective study of patients with B12 hypersensitivity, the skin prick test was positive in four patients who developed anaphylaxis because of medication.⁷ Our patient also previously developed anaphylaxis, and the nondilute skin prick test was positive. Intramuscular administration of parenteral products for desensitization is painful; hence, subcutaneous desensitization is often applied.^{8,9} Oral desensitization with a parenteral product has been reported for the first time in the literature. This less painful method can be tried in patients with B12 deficiency and hypersensitivity. There is also a case in the literature in which subcutaneous desensitization was performed differently from the oral or intramuscular route.⁸ However, this method seems to be practical and successful considering that our desensitization is less painful and improves serum vitamin b12 level very rapidly.

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Authors' Consent for Publication

All authors approved this manuscript to be submitted to the journal.

Table 1 Desensitization scheme.

Step	Dose	Application	Cumulative drug dose
1	1cc (20 mcg)	Oral	20 mcg
2	2cc (40 mcg)	Oral	60 mcg
3	4 cc (80 mcg)	Oral	140 mcg
4	8 cc (160 mcg)	Oral	300 mcg
5	16 cc (320 mcg)	Oral	620 mcg
6	19 cc (380 mcg)	Oral	1000 mcg oral
7	1 ampoule	Intramuscular	1000 mcg intramuscular

Availability of Data and Materials

The data that support the findings of this study are not publicly available as they contain information that could compromise the privacy of research participants but are available from IB, ZYK.

Ethics Approval and Consent to Participate

This is a retrospective study with no ethics approval required.

Authors Contributions

All authors took part in the conceptualization, data curation, formal analysis, investigation, methodology, validation, visualization, and writing-original draft.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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