CASE REPORT
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A Case of Anaphylaxis to Intramuscular but Not to Oral Application of Thiamine (Vitamin B1)

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ABSTRACT

We report a 78 year-old non-atopic female with polyneuropathy who started to receive monthly intramuscular injections of thiamine hydrochloride. She had an anaphylaxis after the fourth injection. Skin prick test (SPT) with pure commercially available aqueous preparations was positive for thiamine hydrochloride. A titrated, single blinded, placebo-controlled oral provocation test with thiamine hydrochloride was well tolerated. The patient was then diagnosed as compartment allergy with hypersensitivity to parenteral but not to oral thiamine; because in our patient, oral intake of thiamine has never been reported to lead to any adverse reaction. Oral tolerability might be due to the uptake mechanism of thiamine in the gastrointestinal system.

Keywords: Anaphylaxis; Hypersensitivity; Thiamine; Thiamine deficiency; Vitamin B1

INTRODUCTION

In polyneuropathy, vitamin B1 (thiamine hydrochloride) and B12 (cyanocobalamin) application is supposed to alleviate symptoms.

CASE REPORTS

We report a 78 year old non-atopic female with polyneuropathy who was started on monthly intramuscular injections of both thiamine hydrochloride (Vitamin B1- Hevert, Hevert-Arzneimittel GmbH, Nussbaum, Germany; ingredients: Thiamine hydrochloride, NaOH) and cyanocobalamin (Vitamin B12- Lichtenstein, Winthrop Arzneimittel GmbH, Frankfurt am Main, Germany; ingredients: cyanocobalamin, NaCl, NaH_2PO_4, NaOH).

Within five minutes after the fourth parallel injection of both drugs she presented with generalized flush, nausea, tremor, vertigo, as well as urine loss and loose bowels. The reaction resolved after administration of prednisolone and clemastine intravenously. At that time she admitted that she had suffered from vertigo and chest pressure a few minutes after the last injection already.

Therapy was stopped and she presented in our university allergy department six weeks later. There was no other history of hypersensitivity reactions. Her past medical history included arterial hypertension, left heart failure, absolute arrhythmia and non-insulin dependent diabetes. She was under treatment with

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perindopril, indapamid, metformin, bisoprolol, gabapentin and phenprocoumon.

Total serum IgE (26,9 kU/L) and serum tryptase levels (8,7µg/l) were within normal range. Skin prick test (SPT) with pure commercially available aqueous preparations was positive for thiamine hydrochloride (Vitamin B1-Hevert, Hevert-Arzneimittel GmbH, Nussbaum, Germany, 8/20 mm; wheal/flare), negative for cyanocobalamin (Vitamin B12 Lichtenstein, Winthrop Arzneimittel GmbH, Frankfurt am Main, Germany). SPT with oral preparation of hydroxycobalamin (Vitamin B12-Hevert, Hevert-Arzneimittel GmbH, Nussbaum, Germany) was negative. A titrated, single blinded, placebo-controlled oral provocation test with thiamine hydrochloride (maximum single dose of 100 mg, cumulative dose of 187.5 mg) and with cyanocobalamin (1 mg and 1.875 mg, respectively), was well tolerated. Patient denied parenteral provocation with thiamine. Written informed consent was obtained from the patient for reporting the case.

Based on these results we diagnosed compartment allergy with hypersensitivity to parenteral but not to oral thiamine.[1]

DISCUSSION

Two types of adverse reactions to thiamine are reported, (i) an overdose reaction resembling hyperthyroidism with nervousness, insomnia, tremor, palpitations, anorexia, vomiting and nausea or (ii) an immediate type reaction with pruritus, urticaria, respiratory distress, abdominal symptoms, nausea and cardiovascular symptoms like in our patient. The overdosage type typically occurs at large doses, often oral, after a long period of treatment. The symptoms typically resolve after cessation of the drug.[2] Several cases of anaphylactic reactions to intravenously applied thiamine have been reported (Table 1) and raised the question about the safety of parenteral administration of thiamine hydrochloride.

Mainly in the 1940s and 50s, even lethal cases occurred.[8] The mechanisms of immediate type reactions to thiamine are still a matter of debate. In our case, an IgE mediated reaction may be discussed since SPT to thiamine was positive. An irritating effect of thiamine seems to be unlikely as there are literature reports negative SPT with the same concentration as we used in control groups.[5,6] Few authors detected specific IgE against thiamine using a self-designed ELISA in patients with history of anaphylaxis to thiamine.[5,6] Another author suggested that thiamine´s quaternary amine structure binds specific IgE, as it is proposed for muscle relaxants.[9]

Considering that oral intake of thiamine in our patient has never been reported to lead to any adverse reaction. Oral tolerability might be due to the uptake mechanism of thiamine in the gastrointestinal system, where phosphorylation at the resorption site in the intestinal mucosa plays a significant role.[10]

In summary, we report on a potentially life-threatening anaphylactic reaction after intramuscular administrations of thiamine while an oral preparation was well tolerated.

Table 1. Literature case reports of hypersensitivity reactions to parenteral thiamine

Reference	Age in years	Gender	Number of injections until immediate type reaction occured	Skin testing	Reaction*	Outcome
Juel J et al.[3]	44	m	Several previous injections tolerated	Not done	IV	Discharged in good health
Morinville V et al.[4]	28	f	Third injection	IDT positive	II	Discharged in good health
Fernandez M et al.[5]	52	f	Several previous injections tolerated	SPT positive	II	Discharged in good health
Proebstle TM et al.[6]	47	m	Second injection	SPT positive	III	Discharged in good health
Van Haecke P et al.[7]	86	f	unknown	Not done	IV	died

*Ring and Messmer classification; f: female, m-male; SPT: skin-prick-test; IDT: intradermal test

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