

Case Report

Tea Tree Oil (*Malaleuca Alternifolia*): Chronic Misuse and Neurological Toxicity in a 33-Year- Old Woman

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Abstract

Tea tree oil (TTO) is a very popular ingredient of many over-the-counter healthcare products known to be effective against a variety of infections. In topical products, it is used at a concentration of 5% to 10%.

A 33-year-old woman suffered TTO chronic intoxication as she improperly used 100% pure TTO for one year. She complained of symptoms of neurological toxicity: accompanied by nausea, diarrhea and severe weight loss. All clinical tests resulted negative. Her health improved when she stopped using TTO.

This is the first report on chronic TTO intoxication. The clinical presentation is similar to others described in literature could have been avoided with correct information on the use of this herbal remedy.

ABBREVIATIONS

TTO: Tea Tree Oil; AOUC: Azienda Ospedaliero Universitaria Careggi; SSRI: Selective Serotonin Reuptake Inhibitors

INTRODUCTION

Tea tree oil (TTO) is an essential oil obtained by steam distillation from Australian *Melaleuca alternifolia* leaves [1]. It is a popular ingredient of many over-the-counter healthcare products. It contains terpenes, sesquiterpenes, hydrocarbons and related oils with a minimum content of 30% of terpinen-4-ol and a maximum of 15% of 1, 8-cineole [2]. Adverse reactions to TTO decrease with the minimization of 1, 8-cineole content that usually inverts the proportion of terpinen-4-ol [2]. The latter component exerts antioxidant activity and has a broad spectrum of antimicrobial activity against bacterial, viral, fungal, and protozoan infections [2] and it has the same activity as conventional treatment for cutaneous methicillin-resistant *Staphylococcus aureus* infections [3]. Loss of intracellular material, inability to maintain homeostasis, and inhibition of cellular respiration after treatment with TTO and/or its components is consistent with a mechanism of action involving the loss of membrane integrity and function [2]. Notably, TTO exerts anti-cancer properties by

inducing caspase-dependent apoptosis of human melanoma cells [4]. It is also successfully used to treat chronic gingivitis [5]. TTO, and similar plant-derived oils, tend to be considered safe by consumers. They are available over-the-counter with limited associated dosage and safety advice. Self-medication has resulted in several cases of inappropriate use and toxicity [6]. A 4-year-old boy ingested a small quantity of TTO and became ataxic and progressed to unresponsiveness [9]. A 17-month-old male child developed ataxia and drowsiness following less than 10 ml TTO ingestion [10]. A 23-month-old boy became confused and was unable to walk 30 minutes after ingesting less than 10 ml of a commercial product containing 100 % *Melaleuca* oil and 5 hours following ingestion the child was asymptomatic [11]. A 60-year-old man swallowed about half a teaspoonful of tea tree oil and had a severe rash accompanied by leukocytosis [12]. A man lapsed into a coma for 12 hours after ingesting half a cup of pure TTO and suffered disturbances of consciousness for another 36 hours [13].

CASE PRESENTATION

A 33-year-old woman presented on November 2012 for a consultation at the Toxicology Outpatient Clinic of Azienda

Ospedaliero Universitaria Careggi (AOUC), Florence, Italy, reporting a history of ataxia, nystagmus, tremors, concentration deficit and diarrhea with weight loss of 12 kg in 6 months. The patient was a highly educated, Caucasian woman with no significant previous clinical records. She gave written consent for the publication for this case. After August 2011 the patient started experiencing recurrent urticarial rash episodes and gastrointestinal symptoms like severe diarrhea and nausea with abdominal pain. She first went to see her general practitioner who prescribed antihistamines and corticosteroids with partial clinical amelioration. In November 2011 she started complaining of tremors, concentration deficits, nystagmus and ataxia. By that time she had been using 100% pure TTO on oral mucosa to treat chronic gingivitis for about two months. For the persistence of episodes of urticarial rash and asthma attacks she was referred to an allergy and immunology specialist who prescribed dietary restrictions and blood test to find a possible cause for recurrent allergic reactions. No diagnosis was possible. She went to see a gastroenterologist who performed a total colonoscopy: intestinal mucosa did not show any pathological alteration. Blood test for celiac disease resulted negative. Meanwhile the patient continued treating her chronic, recurrent gingivitis, on and off, with the same undiluted product. While she was using the TTO she continued to experience the same symptoms until October 2012, at which point a severe allergic reaction with angioedema forced her to go to the AOUC emergency department. There she was treated with 40 mg methylprednisolone and 10 mg clorfenamine injections and advised to stop using 100% pure TTO. Soon after, she returned to see her Allergy and Immunology specialist who suspected a toxicological cause for her symptoms and referred the patient to the Toxicology Outpatient Clinic. A clinical toxicologist took an in-depth clinical interview and established a link between the patient's symptoms and the 12-month-long misuse of TTO. From October 2011 to October 2012 she had used about 30 mL of TTO, three small bottles containing 100% pure TTO, manufactured by Named S.P.A (Lesmo, Lombardy, Italy), to treat chronic gingivitis, applied directly on oral mucosa to perform topical treatment once a day. She believed that she was using a solution and not 100% TTO. By the time of this consultation she had lost 12 kg. A month before she had stopped TTO with complete absence of nausea and diarrhea, no more allergy episodes and almost complete remission of neurological symptoms. A magnetic resonance scan was performed on December 2012 to exclude a possible organic cause for her neurological symptoms and it resulted negative. She continued to complain of concentration deficit, intolerance to stressful situations, and hypersensitivity to noises and was therefore diagnosed with post-traumatic-stress-disorder by a psychiatrist. He prescribed pharmacological treatment with SSRIs, which she never took. Currently, the patient has fully recovered and no longer presents any symptoms.

DISCUSSION

Tea tree oil is a very popular herbal remedy, it is effective against a variety of infections [2,3,5]; skin and mucosal conditions [3,5,7]. It is used in topical products at a concentration of 5% to 10% [3]. Even at this concentration, it has been reported to

induce allergic contact dermatitis reactions [8].TTO intoxications have been described [6] and can be responsible for neurological manifestations as seen in some intentional or unintentional intoxication cases of children [9,10,11] and adults [12,13].

This is the first report on a chronic intoxication with pure TTO, improperly utilized on oral mucosa. It is well known that TTO products may oxidize during storage creating a changed toxicity profile of the oil. As there was neither access to the product used nor knowledge on age and storage conditions applied, we cannot exclude that the degradation products of TTO in the product may have influenced the observed toxicity. We cannot exclude possible contaminations as well, since the product taken was not available for analysis. Nevertheless the referred symptoms (allergic reactions, nausea, diarrhea and severe neurologic symptoms) are compatible with known features of TTO toxicity.

Making a final clinical evaluation and in accordance with the objective causality assessment performed using the Naranjo Scale [14], our case was defined as 'probable' with a score of 8 as temporal association of drug administration and event occurred, no alternative causes for the event were found and symptoms improved and then disappeared with drug cessation.

It is worth note that all these severe clinical manifestations could have been avoided with correct information about the use and conservation of this herbal remedy (i.e. application of diluted solution instead of essential oil).

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