Clinical Case Reports

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CASE REPORT

Case report: a new method for treatment of permethrin – resistant head lice

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Key Clinical Message

Head lice (*Pediculus humanus capitis*) infestation is an important disease worldwide, especially in children under 11 years old. Permethrin is the most common insecticide for treatment of human pediculosis, but nowadays resistance to permethrin and other pyrethroids has caused many treatment failures. The second treatment of choice is malathion.

Keywords

Head lice, malathion, pyrethroids.

Introduction

Lice are blood-sucking insects of the order Anoplura. Each species of lice dwell in a particular host and a particular part of body [1]. Each louse survives for about 30 days [2]. The female louse produces about 130 eggs (nits) in its life. After about 9 days, the eggs hatch to nymph. The nymph molts several times over the course of 15 days and becomes an adult louse [3]. Away from host, mature lice survive just for 3 days, but this survival time is about 10 days for nits [2, 4]. Lice spread from person to person when people's heads touch or after sharing things such as hats, combs, clothing, headbands, brushes, or barrettes [4–6]. Control of this insect worldwide depends on the repeated or continued applications of pyrethroids (permethrin), organophosphates (malathion), carbamate (carbaryl), organochlorine pesticides (lindane), and in some countries ivermectin, benzyl alcohol (Ulesfia), and spinosad (Natroba) [7, 8]. Resistance to the common pediculicides may have contributed to the recent surge in head lice infestations [4, 9]. Although *Pediculus humanus capitis* (head lice) is not an important vector of microorganisms, it is a major social and economic concern in North America and worldwide [10]. Infestation with head lice has been a chronic problem throughout the world for thousands of years, with an estimated 6–12 million cases of pediculosis occurring each year in the United States alone, most of which affect girls [1, 11]. The annual cost of head lice in the United States may be as high as 1 billion $ because of costs for treatment, appointments with a provider, prescription medications, time spent by school nurses to inspect students, and time of work for caregivers who must stay home with their children during the infestation [12].

Case Report

Recently, we were confronted with some permethrin – resistant pediculosis in a large family. There were 13 females and seven males in this family. All of the females were infested but the males were not. Lice were present just on the head, and no lice were found in body inspection. Patients ranged in age from 3 to 60 years old. All of the patients of the family had already been treated by permethrin with no satisfactory result. Patients had just primary clinical signs of itching, and there were no other clinical or biological signs.

The second treatment of choice for human pediculosis is malathion, but because of poisoning probability in children, attempts were made to find a replacement for malathion. Ultimately, ethanol was chosen and applied to the hair of the family members. 96% ethanol was sprayed on to the patient's hair. After ethanol spraying, a nylon bag was used to cover the patient's hair. The plastic cover was removed after 10 min and the hair washed. Three days after treatment, all patients were considered completely treated, and there were no lice and clinical signs of infestation. Based on life cycle of the lice, treatment was repeated 2 weeks later.

Results and Discussion

Contrary to the first treatment with permethrin, 3 days after alcohol application there was no live nit or louse on the heads of patients, all of the patients were satisfied, and they had no itching or other clinical signs on the head.

In treatment of infective diseases, it is important to consider safety, efficacy, availability, expense, and ease of application [7]. Permethrin, malathion, and lindane are usual insecticides for treatment of head lice in the world [7]. In treatment failure with pyrethrin or permethrin, malathion is the second treatment of choice. Orally administered ivermectin has been reported to be efficacious, but it is not currently a US Food and Drug Administration – approved pediculicide [7, 13]. Ivermectin 0.5% lotion (Sklice) was approved by the FDA in 2012. It is indicated for the treatment of head lice in patients aged 6 months and older [14]. Benzyl alcohol 5% lotion (Ulesfia) was approved in 2009 by the FDA for the treatment of head lice in patients aged 6 months and older [15]. It is the first non-neurotoxic agent and has a unique mechanism of action. Benzyl alcohol works by "suffocating" lice because it prevents the closing of the respiratory spiracles via obstruction, leading to asphyxiation. It does not have ovicidal activity [15]. Spinosad 0.9% topical suspension (Natroba) is a new pediculicide that was approved in January 2011 for treatment in patients aged 4 years and older. Although the suspension has been shown to be effective in patients as young as 6 months of age, systemic safety has not been evaluated for subjects younger than 4 years [16]. Many researches have been carried out for finding an effective and safe treatment for head lice. For example, Plant oils have been suggested as an alternative source of materials for insect control because they constitute a potential source of bioactive chemicals and are commonly used as fragrances and as flavoring agents for foods and beverages [17–19], but till now, an effective commercial result has not been found.

Insecticides are usually applied in very low dosage, about 1%, because they have a narrow safety border. This application at low dosage creates a drug resistance field. Also, some of the treatments, for example, permethrin in treatment recommended dosage has a slight ovicidal effect that increases the probability of resistance occurrence. On the other hand, increasing the dosage of drug can cause poisoning in patients. Lindane is effective on eggs of lice, but lindane resistance among head lice has been reported in the United Kingdom, the Netherlands, Panama, and the United States [4, 20, 21]. Easy absorption of lindane to skin can cause neurotoxicity and anemia in patients [22–24]. For this reason, this treatment should be applied with extreme caution in patients with a history of seizure and in HIV infected patients [24–26]. Other side effects of Lindan are mild edema, pruritus, stinging, burning, rash, erythema, and tingling [6]. Malathion has been distributed in a 0.5% formulation as Ovide (Medicis). Malathion resistance has also been reported [24, 27]. Malathion can cause neurotoxicity in humans [28]. Use of malathion in patients younger than 6 years is not recommended, and its use is contraindicated for neonates and infants because of increased permeability of the scalp [29]. Ivermectin, benzyl alcohol (Ulesfia), and spinosad (Natroba) are new approved drugs, but they are not available for human use in all countries. Benzyl alcohol can be used in patients aged 6 months, but it does not have ovicidal activity [15]. Also, the cost of new treatments (ivermectin, benzyl alcohol, and spinosad) is much greater than that of old treatments [30]. Generally, the majority of new and old mentioned treatments have resistant probability problem in low dosage and poisoning probability problem in high dosage. Another property of insecticides is poison durability. For treatment of many of the external arthropod infestations, especially in animals, a chemical poison with high residual protection is a good and necessary property of pesticide; but in head lice infestation, this is not necessary or good property because durability of the poison can aggravate the risk of poisoning especially in children.

Ethanol, which is commonly called drinking alcohol, has many good properties regarding the efficacy, safety, cheapness, availability, patient preference, and ease of application features that are important factors for treatment selection. High percentage usage of spraying ethanol (even to 100%) bring many benefits. The first is its fast effect. The second is its ovicidal effect [31, 32]. The third benefit is the very low probability of resistance occurrence. Ethanol has very low risk of poisoning occurrence because it evaporates rapidly and its pharmaceutical residues are very low. So this treatment can be applied to children up to 3 years old with exact monitoring till alcohol evaporation. Although some side effects, especially

carcinogenicity, have been expressed for ethanol [33], topical usage of ethanol once or twice could not provoke such problems. While many kinds of alcoholic drinks are available in markets, alcohol is cheaper than other treatments and can be the treatment of choice for head lice in epidemic conditions or outbreaks of head lice infestation.

Authorship

FJ: performed all the work.

Conflict of Interest

None declared.

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