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Karen Olshanskaya
Philadelphia College of Osteopathic Medicine

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Does coconut oil aid in improving the outcome of dermatologic conditions, particularly acute tungiasis and atopic dermatitis, by improving lesions and lessening discomfort?

Karen Olshanskaya, PA-S

A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

In Partial Fulfillment of the Requirements For

The Degree of Masters of Science

In

Health Sciences – Physician Assistant

Department of Physician Assistant Studies
Philadelphia College of Osteopathic Medicine
Philadelphia, Pennsylvania

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Abstract

Objective: The objective of this selective EBM review is to determine whether or not coconut oil is effective in treating dermatologic conditions, particularly acute tungiasis and atopic dermatitis, which cause xerosis, skin atrophy, and lesions.

Study Design: This is a systematic review of a cohort study and two double blind randomized control trials written in English, published between 2008 – 2015.

Data Sources: Resources for this review were found through peer reviewed articles published on PubMed databases

Outcomes Measured: Appearance of the lesions caused by atopic dermatitis or acute tungiasis were assessed in regards to size, erythema, edema, and oozing, as well as subjective factors such as the intensity of the pruritis, sleep loss, and pain.

Results: Out of the three studies analyzing the effects of coconut oil, all found that coconut oil is effective in improving dermatologic conditions. In Evangelista et al.'s study, using a SCORAD (scoring atopic dermatitis), significant improvements (CI=95%; p=0.001) in pediatric atopic dermatitis group using coconut oil were noted. There was a 68.23% and 38.13% improvement in the coconut oil group and mineral oil group respectively¹. In Verallo-Rowell et al.'s study, there was a significant improvement (CI=95%, p=0.004) in the SCORAD for adult atopic dermatitis, with a 46.8% and 30.% improvement in the coconut oil group and the control mineral oil group respectively⁶. In Gitau et al.'s cohort study, from baseline, there was a significant improvement (p=0.001) in acute tungiasis symptoms by 67.8% from baseline².

Conclusions: These studies show that coconut oil can significantly improve symptoms of atopic dermatitis and acute tungiasis. Though studies did not include several other dermatologic conditions, coconut oil shows to improve lesions and discomfort.

Key Words: dermatology; skin; coconut oil; improvement

Introduction

Dermatologic conditions are not only uncomfortable to the patient, causing pain, pruritis, distress, etc., but there is a cosmetic component to them too. Each condition affects the skin in a different manner, which causes various discomforts and can make an individual self-conscious. Furthermore, conditions such as atopic dermatitis can become scabbed if not taken care of properly, causing it to colonize bacteria such as *Staphylococcus aureus*, and leading to further infection¹. Tungiasis has a similar cosmetic effect with discomfort, however this is manifested due to a type of flea². The studies reviewed in this article evaluate the effectiveness of coconut oil on alleviating the symptoms caused by these conditions, as well as the appearance of the lesions.

Though tungiasis is not very commonly seen in the United States, assessing this article could evaluate the effect of coconut oil on this parasite caused dermatologic condition². Evaluating the results could promote efforts to get this easily accessible product available to third world countries where the tungiasis flea, as well as other dermatologic conditions, are a major issue. On the contrary, atopic dermatitis is very prevalent in the United States with about 10-20% of children and about 1-3% of adults diagnosed⁴. Because of the prevalence, any sort of clinician, especially one working with the pediatric population, is very to be likely exposed to this.

Coconut oil is a very accessible product that can be ordered online, or found at drug stores and various supercenters. It is an affordable product that can be purchased over the counter, and therefore does not need to go through insurance and a clinician.

About 12% of all family practice visits are dermatology related, which on average would have doctors seeing skin related issues daily⁴. Tungiasis is rarely seen in the United States, but is fairly common in rural, impoverished places in Africa and South America where the Tunga

penetrans flea is native². Individuals who commonly come in close contact with animals, do not have proper foot attire, or walk barefoot are at a greater risk for infection². On the contrary, a significant amount of people are affected by atopic dermatitis, and though several cases do not require consistent doctor's visits, individuals still need to find a way to keep the ailment under control.

Atopic dermatitis is a condition that causes weakness and decreased effectiveness of the epithelial layer of the skin¹. This often causes bacterial colonization as well as dryness, discomfort, xerosis and more progressive lesions. The reason this process occurs is still unknown.¹ Tungiasis is caused by a flea that results in skin atrophy, pain, and itchiness². Extensive data has not been conducted to analyze the long term effects, but cases of septicemia and lymphangitis have been noted as complications⁵.

Usually chemotherapy type drugs, such as hydrogen peroxide and potassium permanganate, are the treatment of choice for acute tungiasis. Unfortunately these are expensive and hard to attain in impoverished areas such as the ones affected by this flea. For atopic dermatitis, various moisturizers, eucerin, and aquaphor are the treatment of choice for mild cases, with antihistamine creams or pills to alleviate itching. Steroidal and nonsteroid creams (for atopic dermatitis on the face) are typically used when basic moisturizers are not enough¹.

Topical coconut oil is the proposed treatment for these conditions that causes visible lesions and discomfort. Coconut oil has shown to decrease itching, erythema, and other signs and symptoms of the problem^{1,2,6}. Coconut oil also decreased bacterial and parasitic colonization, which in turn would cause less discomfort and infection in participants^{2,6}.

Objective

The objective of this selective EBM review is to determine whether or not coconut oil is effective in treating dermatologic conditions, particularly acute tungiasis and atopic dermatitis, which cause xerosis, skin atrophy, and lesions.

Methods

Two double blind, randomized control trials were used to evaluate atopic dermatitis, while a cohort study was used to evaluate the effects of coconut oil on acute tungiasis^{1,2,6}. Individuals with the dermatologic condition of choice that have visible lesions which cause discomfort are recruited for the study. In the atopic dermatitis studies, patients with infected lesions, more complicated underlying diseases, or requiring antibiotics were not used in these trials^{1,6}. Coconut oil was used as the intervention and applied on the affected area. These results were compared to the control group treated either with olive oil or mineral oil^{1,6}. The results of the acute tungiasis cohort study were compared to the status of the lesion and infestation prior to the application of coconut oil². Those under two years old or with ulcerated lesions were not included in this study, and were sent to a hospital². Objective and subjective results were evaluated, including pruritis, size of lesion, crusting, weeping of the lesion, and pain.

When searching for the articles, the key words were “coconut oil” and after a basis of what kind of studies had been established, “dermatology” was another key word. All information that was even considered needed to be written in English. The articles used were published in journals and found through PubMed, and evaluated the effect of coconut oil on a specific condition. The articles were selected based on how relative they were to the research topic and whether or not they were measuring patient oriented outcomes (POEMS). Studies found before

2007 were excluded. Articles that only analyzed disease oriented outcomes (DOES) were also not selected in this review. The selected studies reported the results through a Z score, NNT and p-value.

Table 1: Study generalizations

Study	Type	#Pts	Age (years)	Inclusion Criteria	Exclusion Criteria	w/d	Interventions
Evangelista ¹ 2013	Double blind randomized control trial	117	1-13	Pt has history of <u>pruritis</u> , redness, discomfort	Severe atopic dermatitis, concurrent dermatologic conditions, lesions that require antibiotic therapy or have used antibiotics in the last 2 weeks, hypersensitivity to coconut or mineral oil, need systemic therapy to control flares, genetic skin disorders or <u>immunocompromised</u> status	12	Topical coconut oil <u>vs</u> topical mineral oil
Verallo-Rowell ² 2008	Double blind randomized control trial	26	18-40	New or previously diagnosed low to high-moderate atopic dermatitis	Using topical or oral steroids, lesions requiring antibiotics, concurrent dermatologic conditions, hypersensitivity to <u>cocounut</u> or olive oil, <u>immunocompromised</u> status or diabetes	0	Topical coconut oil <u>vs</u> topical olive oil
Gitau ³ 2015	Cohort	39	3-60	People currently with Acute <u>Tungiasis</u> , having 10 or more lesions	Children under 2 years old, individuals with ulcerated lesions	0	Topical coconut oil

Outcomes Measured

The outcomes for the atopic dermatitis studies were measured through a SCORAD (scoring atopic dermatitis), which assess objective and subjective improvement. It assessed lesion appearance, pruritis, intensity, sleep loss, and lesion morphology. A study even correlated the results if the SCORAD with *Staph aureus* colonization via culture^{1,7}. Gitau *et al.*'s study uses before and after objective and subjective measurements regarding difficulty walking due to the tungiasis manifestation, inflammation measurements, pustules, abscesses, ulceration, and flea infestation. The initial assessments were given a score and compared to the results after the treatment².

Results

Three studies were used to examine the effects of coconut oil on dermatologic conditions^{1,2,6}. One study examined patients under 13 years old¹, another examined adults between the ages of 18-40 years old⁶, and the last examined a large age range of patients 2-60 years old². The effects of the coconut oil were either compared to a control group using a different type of oil^{1,6}, or to the subjective and objective measurements recorded before the treatment was initiated². The results of the following three studies showed no significant difference in the results between age and sex.

In the study by Evangelista *et al*, pediatric patients between the ages of 1 and 13 with uncomplicated atopic dermatitis were included in the double blind randomized control trial¹. Excluded were children with severe atopic dermatitis, required antibiotics, have concurrent dermatology problems, or had a hypersensitivity reaction to coconut or mineral oil. 117 of 132

children that fit the inclusion criteria were randomly split into groups that would receive the mineral oil or coconut oil. 4 children were considered drop outs because of poor compliance, and 8 children had to be withdrawn due to adverse effects (which were not discussed in the article), applying addition emollients, and poor compliance. At baseline, there were no statistically significant differences in average age, number of years with atopic dermatitis, sex, SCORAD, sex, or lesion morphology. After 8 weeks of treatment, the SCORAD reduction in the virgin coconut oil group (VCO) was 68.23%, which was significant higher (p value < 0.001) compared to the mineral oil group, which had a SCORAD reduction of 38.13%. Overall, 93% of the patients in the VCO group improved, compared to the 53% of he patients in the mineral oil group. The VCO group had 47% (28/59 patients) achieve moderate improvement and 46% (27/59 patients) have an excellent response. With mineral oil, 34% (20/58 patients) had moderate improvement, and 19% (11/58 patients) had excellent improvement. Relative risk reduction (RRR) showed that VCO improved SCORAD values 85.44% more than mineral oil with a 95% confidence interval. The number needed to treat (NNT) was 3 and 4 patients to have moderate and excellent improvement respectively. This would show a large effect, which this study absolutely does. Absolute risk reduction is 39.77%, favoring VCO with a 95% confidence interval.

In the study by Verallo-Rowell et al., 52 participants between the ages of 18 and 40 with atopic dermatitis were assessed and placed in a double blind randomized control trial evaluating the effect of virgin coconut oil (VCO) and virgin olive oil (VOO)⁶. Between the two randomized groups, there was no significant difference between age, sex, pruritis, how many years/months the patient has had the illness, and lesion morphology. There was also no significant difference in SCORAD scores between the two groups prior to intervention (p = 0.15). Individuals who

were taking steroids or antibiotics 2 weeks prior, had severe disease state or concurrent dermatologic conditions, immunocompromised, diabetic, or had an allergy to VOO or VCO, were not invited to participate in the study. There were no withdrawals for any reason in this trial. Patients were given 5ml bottles of either VCO or VOO everyday and were told to apply to the affected area. They were also given soap that they were told to use in shower. After 4 weeks, the SCORAD scored decreased 46.8% in the VCO group, and 30.1% in the VOO. The p value = 0.004 and a 95% confidence interval in that there is a significant difference between the outcomes. The NNT here was 3, so the results prove that the treatment has a large effect. The numbers needed to harm (NNH) for this study was 2⁶.

In Gitau et al.'s article, a cohort study of 39 individuals between the ages of 3 and 60 were used to study the effects coconut oil on the lesions caused by the Tunga Penetrans flea². Individuals under 2 years old or with severe ulcerations were excluded from the study. To be included, one must currently have more than 10 lesions. About 2ml of coconut oil was applied twice a day for 30 days by community health workers. Signs and symptoms such as erythema, edema, warmth, pustules, suppuration, and itching, as well as flea manifestation levels were assessed before and after the intervention. The signs and symptoms caused by the fleas were referred to as the severity scores. These severity scores were shown to statistically significantly decrease after the 10 week long intervention. The study used a mean change from baseline for the severity score, which turned out to be -2.17 (decreasing from a value of 3.2 to 1.03), a 67.8% decrease. This translates to a Z score of -3.946 and a p value of 0.001. No participants withdrew from the study, nor were there adverse effects from the treatment noted in the article².

Table 2: Statistical values

	SCORAD/severity improvement w coconut oil	SCORAD/severity improvement with control	RRR	ARR	NNT	NNH	CI	p value
Evangelista et al.	68.23%	38.13%	85.4%	39.7%	3: moderate improvement 4: excellent improvement	-	95%	0.001
Verallo-Rowell et al.	48.6%	30.1%	-	-	3	2	95%	0.004
Gitau et al.	67.8%	-	-	-	-	-	-	0.001

Discussion

In the Evangelist et al study, parents were given the oil treatments in a bottle, and were told to apply it to their child after a 5-10 minute long bath each night¹. This leaves room for some error in the fact that some children may have had a longer baths, which could dry out their skin more, or some parents may have applied the treatment more generously than others.

Furthermore, the SCORAD analyzes disease oriented outcomes as well patient oriented outcomes, which could slightly skew the results for how effective coconut oil is just for the patient oriented outcomes. This study only looks at pediatric patients, which would not necessarily allow the results to be generalized. The adverse reactions were not elaborated upon in the study, so it is unknown if it was due to the treatment or not.

Once again, in Verallo-Rowell et al.'s study, participants applied the treatments to themselves, so the application may have differed between the groups. Furthermore, participants may have applied additional emollients without letting the researchers know, which would alter results of the effectiveness as well⁶.

Coconut oil is not a drug that is regulated by pharmaceutical companies and is easily accessible in places like the United States, unlike other third world countries where acute tungiasis is a problem. Unless the product is brought, and distributed there, individuals will most likely not be able to acquire the coconut oil. Though the results did show coconut oil to significantly improve lesions and symptoms caused by the flea, the study did not have a control group to compare the results of coconut oil against the natural process². This study had further limitations in that the people in Kenya, where this study was performed, typically walk around barefoot, so aiding in the recovery is generally difficult since participants are exposed to bacteria that may prevent the coconut oil from being fully effective. Many of the fleas manifest on the feet and between the toes, which makes not wearing shoes very relevant to the healing process².

Coconut oil has been shown to have antimicrobial and antibacterial properties, which would decrease the level of the inflammation and infection as well as the symptoms caused by the infection². A study that compares the efficacy of coconut oil of severe disease states to mild/moderate states would be beneficial for the population to further determine exactly how effective coconut oil is as a treatment, or up to what point on the severity scale it would be effective.

Conclusion

Since the studies only included individuals without severe disease or complications, coconut oil can be used as an effective first line treatment in dermatologic conditions before advancing to more serious medications with potentially harmful side effects. The studies all showed significant improvement with coconut oil with a p value of 0.004 or less, even when compared to another oil product, which would also help moisturize and potentially treat a

dermatologic condition¹. But regardless, coconut oil would be a great treatment, or “add on” treatment for dermatologic conditions, particularly those causing itching, ulceration, and lesions, since each of the studies showed improvement in those regards. Later studies should evaluate the effects of coconut oil on various other dermatologic conditions such as psoriasis, rosacea and lichen simplex chronicus, to evaluate the pattern of what coconut oil is most effective against. The three analyzed studies had compared the results between various age groups and genders, which showed no difference in the improvement. However, there was no comparison between the ethnicities. Although radical differences are not expected, this could reaffirm that coconut oil has equal effects with not only age and gender, but ethnicity and different skin types as well.

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