



The Use of Natural Ingredients in the Treatment of Alopecias with an Emphasis on Central Centrifugal Cicatricial Alopecia: A Systematic Review

ABSTRACT

BACKGROUND: Central centrifugal cicatricial alopecia (CCCA), a scarring alopecia that commonly affects women of African descent, can be challenging to manage, and there are limited treatment modalities available. The use of natural ingredients for nonscarring hair loss has gained popularity among patients, but has not been previously studied for CCCA. **OBJECTIVE:** We sought to review clinical studies evaluating the use of natural ingredients in the treatment of CCCA. **METHODS:** Systematic searches of the PubMed and SCOPUS databases were performed in March 2018 using various ingredient names and the terms *alopecia*, *scarring alopecia*, *Central Centrifugal Cicatricial alopecia*, and *CCCA*. Specific ingredients included azelaic acid, peppermint oil, pumpkin seed oil, garlic supplements/shampoo, Black castor oil, jojoba oil, argan oil, olive oil, horsetail plant oil, lavender oil, coconut oil, chamomile oil, thyme oil, tea tree oil, sulfur oil, menthol, and rosemary oil. Two reviewers independently screened titles, leading to the selection of eight clinical studies. **RESULTS:** A review of the literature revealed no clinical trials that evaluated the treatment of CCCA with natural ingredients. Despite limited evidence-based research for CCCA, several natural ingredients showed efficacy in alopecia areata, androgenetic alopecia, and psoriatic alopecia. **CONCLUSION:** Upon review of the literature, there were no randomized, controlled studies evaluating the use of natural ingredients or aromatherapy in the management of CCCA. Despite this, several botanical and natural ingredients do show promise in treating androgenetic alopecia and alopecia areata. More clinical studies need to be performed to evaluate treatment options as a whole, including natural modalities, to better serve these patients. **KEY WORDS:** Black, central centrifugal cicatricial alopecia, hair loss

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Central centrifugal cicatricial alopecia (CCCA) is a scarring alopecia that classically presents as permanent hair loss on the crown or vertex of the scalp most commonly in women of African descent. CCCA, previously referred to as hot comb alopecia and follicular degeneration syndrome, was first reported by Dr. Philip LoPresti in 1968.¹ He noted hair straightening with a hot comb, which required the application of hot petroleum over the crown, resulted in hair loss. He theorized that this process created an inflammatory reaction around the upper portion of the follicle, leading to degeneration of the inner root sheath and hair follicle. This eventually led to marked fibrosis and permanent hair loss.¹ Replacement of the term *hot comb alopecia* with *follicular degeneration syndrome* was proposed in 1992 based on a study reporting African American women with cicatricial alopecia with an equivocal association between the use of a hot comb and hair loss.² Later, the terms *central centrifugal scarring alopecia* and *central centrifugal cicatricial alopecia* (CCCA) evolved.

Although the exact etiology of CCCA remains unknown and is thought to be multifactorial, it has been suggested that one contributing factor is hair-styling techniques that predispose

abnormal follicles to injury. Such practices include tight braiding with excessive tension, heavy extensions, chemical relaxers, dyes, heat, and styling products.² Other proposed etiologies include an autosomal dominant inheritance pattern and the intrinsically curly nature of Black hair that is finer and more delicate due to the structure.³ Although the epidemiology and prevalence have yet to be clearly defined due to a lack of well-designed, population-based studies, the current literature suggest that the disease primarily affects adult women of African descent.^{4–6}

Treatment goals for CCCA are to minimize hair loss and halt disease progression, while promoting hair regrowth in affected areas. Hair will not regrow in permanently damaged follicles, making early therapeutic intervention necessary for optimal treatment results. Due to a lack of data on the efficacy of available treatment options for CCCA, current mainstay treatment options have been implemented largely due to clinician experience. First-line therapies include local, topical, and intralesional corticosteroids along with oral tetracyclines for more severe cases.⁷ In refractory cases, hydroxychloroquine and immunosuppressants have been used, but are limited due to adverse

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drug side effects.⁷ Minoxidil and tacrolimus have also been used.^{8,9}

Patients with CCCA, who are predominantly African American, often times find over-the-counter products for hair loss touting their use of natural ingredients. As one of the maintenance therapies for CCCA includes stopping the use of chemical relaxers and straighteners, patients are motivated to find alternative hair styling options and hair care products to get their desired appearance. Within the same spectrum, a fairly new enthusiasm for African American women to return to their natural, unprocessed hair, colloquially named the Natural Hair Movement, has not only given this particular subset of women a new sense of identity, but has spiked the hair care industry to drive the promotion and sale of organic hair products. Consumers with natural hair drive a lucrative market for hair products. The 2018 African American hair care market was estimated at US\$2.51 billion.¹⁰ Well known companies and brands are eager to cater to customers with a goal of going natural. The combination of the rise of the natural hair movement along with poorly understood treatment options for hair loss disorders with no definitive cure, including scarring alopecias like CCCA, have provided motivation for patients to find alternative modalities for treatment. However, randomized, controlled studies to validate the efficacy of such agents are lacking in the current literature. The purpose of this review is to examine the literary evidence supporting the efficacy of natural ingredients for the treatment of CCCA.

METHODS

In March 2018, systematic searches of PubMed and SCOPUS databases were performed using *alopecia*, *scarring alopecia*, *central centrifugal cicatricial alopecia*, and *CCCA* in addition to an ingredients list of botanical products that patients from our dermatology practice at the University of Mississippi Medical Center in Jackson, Mississippi have previously recommended for increased hair retention and/or growth. The ingredients from a popular commercial oil among African American women were extracted together with other botanical ingredients, including *argan oil*, *azelaic acid*, *black castor oil*, *chamomile oil*, *coconut oil*, *garlic supplements/shampoo*, *horsetail plant oil*, *jojoba oil*, *lavender oil*, *menthol olive oil*, *peppermint oil*, *pumpkin seed oil (PSO)*, *rosemary oil*, *sulfur*

oil, *tea tree oil*, and *thyme oil*. Clinical studies that evaluated the effect of herbal and natural supplements as a supporting ingredient or main ingredient in a treatment plan of alopecia were included.

RESULTS

Two reviewers independently screened titles, leading to the selection of eight clinical studies based on inclusion criteria. Studies that met inclusion criteria are summarized in Table 1.^{10–17} Table 2 presents the United States Preventive Services Task Force levels of evidence for grading clinical trials.¹⁸

DISCUSSION

Azelaic acid. Azelaic acid is a dicarboxylic acid, derived from the fungus *Pityrosporum ovale*, that is naturally derived from grains such as wheat and barley.¹⁹ A single randomized controlled study in the current literature assessed the effects of azelaic acid on hair growth in patchy androgenetic alopecia (AGA), where anthralin was set as the positive control.¹¹ The mechanism of action is thought to be attributed to irritant contact dermatitis and hypertrichosis of the hair follicle. Azelaic acid affects the cornification process of the epidermal cells and appears to normalize the keratinization of cells in the skin and hair. Azelaic acid also appears to act as an antiandrogen by blocking the activity of 5 α -reductase.^{20,21} The pilot study showed comparable results for azelaic acid and anthralin in the treatment of patchy AGA. Evidence for azelaic acid against hair loss is limited and the only study that evaluated its therapeutic effects was not a placebo-controlled trial.²²

Garlic. Garlic (*Allium sativum*) is a widely used medicinal plant that has been adopted for centuries. Different compounds in garlic are thought to reduce the risk for cardiovascular diseases, display antitumor and antimicrobial effects, and have been shown to decrease blood glucose concentration.²³ However, the exact mechanism and long-term benefit, particularly involving skin and hair disease processes, are not fully understood. One double-blind, randomized control study showed a significant increase in capillary skin perfusion by 55 percent in healthy volunteers.^{24,25} Vasodilation of precapillary arterioles could explain therapeutic effects on hair growth by increasing blood circulation to the scalp. A randomized, double-blind,

controlled clinical trial of the efficacy of 5% garlic gel in combination with betamethasone cream for three months in patients with alopecia areata showed that the use of garlic gel significantly added to the therapeutic efficacy of topical betamethasone valerate starting the second month of application as compared with in the control group.

Olive oil. Olive oil is a liquid fat obtained from olives, a traditional tree crop of the Mediterranean Basin. The oil is produced by pressing whole olives.²⁶ Although there are no known controlled trials confirming the efficacy of olive oil in treating hair loss, a case report did demonstrate clinically significant improvements in psoriatic alopecia when olive oil was used as a supplement to treatment. Dexamethasone 0.25% lotion applied twice daily, with a combination of tar shampoo and olive oil applied before shampooing daily, showed a significant improvement in the reduction of scales and the stabilization of hair shedding. Seventy-five percent of hair regrowth was achieved three months after therapy and there was no recurrence in study participants at one year of follow-up.¹³

PSO. PSO is rich in beneficial nutrients, such as essential fatty acids, β -carotenes, lutein, γ - and β -tocopherols, and phytosterols.²⁷ Pumpkin seed oil has also been reported to be an effective treatment for symptomatic benign prostate hyperplasia (BPH).²⁸ Specifically, it has been shown to block the action of 5-alpha reductase and to have antiandrogenic effects in BPH.²⁹ In one randomized, double-blind, placebo-controlled trial,²⁷ the effects of pumpkin seed oil on AGA were studied to investigate the efficacy and tolerability of PSO for the treatment of hair growth in male patients with mild to moderate AGA. Seventy-six male patients with AGA received 400mg of PSO per day or a placebo for 24 weeks. Change over time in scalp hair growth was evaluated by four outcomes: assessment of standardized clinical photographs by a blinded investigator, patient self-assessment scores, scalp hair thickness, and scalp hair count. After 24 weeks of treatment, self-rated improvement score and self-rated satisfaction scores in the PSO-treated group were higher than in the placebo group ($p=0.013$ and 0.003). The PSO-treated group had more hair after treatment than at baseline relative to in the placebo group ($p<0.001$). Mean hair count increases of 40 percent were observed in PSO-treated men at

TABLE 1. Summary of clinical studies evaluating the efficacy of natural ingredients in the treatment of alopecias

NATURAL INGREDIENTS	STUDY	MECHANISM	COMPARISON	ALOPECIA VARIANT	CONCLUSION	LEVEL OF EVIDENCE
Azelaic acid	Randomized, controlled trial ¹¹	Hypertrichosis and irritant contact dermatitis	Azelaic acid vs. anthralin	Alopecia areata	The use of azelaic acid gave similar results to anthralin with regard to hair regrowth, and can be an effective topical therapy for patchy AA.	IA
Garlic gel	Double blind randomized controlled study ¹²	Unknown	Combination of garlic and betamethasone valerate cream vs. placebo group (only betamethasone valerate cream)	Alopecia areata	The number of total hair, terminal hairs, and size of hair patches were measured quantitatively. The use of garlic gel significantly added to the therapeutic efficacy of topical betamethasone valerate starting the second month of application.	1
Olive oil	Case report ¹³	Unknown	None	Psoriatic Alopecia	Dexamethasone 0.25% lotion applied BID, with combo of tar shampoo and olive oil applied before shampooing daily showed a significant improvement in reduction of scales and stabilization of hair shedding. 75% hair regrowth was achieved by 3 months after therapy and had no recurrence of alopecia at the 1-year follow-up.	IIIC
Pumpkin Seed Oil	Randomized, double blind, placebo-controlled trial ²³	5- alpha reductase antagonist, antiandrogenetic effect	Pumpkin seed oil vs. placebo	Androgenic Alopecia	At 12 and 24 weeks, there were 30% and 40% mean increases in hair counts from baseline in PSO-treated men and 5% and 10% increases in hair count in placebo-treated men, which resulted in significant net increase of 25% and 30% (both, $P < 0.001$) at Weeks 12 and 24, respectively, in the intervention group as compared with the placebo group using phototrichography for comparison.	IA
Rosemary oil	Single-blind, randomized clinical trial ¹⁴	Enhance microcapillary perfusion	Rosemary oil vs. 2% minoxidil ointment	Androgenic Alopecia	Application of rosemary oil was as effective as 2% minoxidil ointment. In addition, there was better treatment adherence in the rosemary group compared to the minoxidil group.	IA
Tea tree oil	Double-blind, randomized, placebo controlled study ¹⁵	Anti-inflammatory properties	Formulation containing minoxidil, diclofenac, and tea tree oil vs. minoxidil alone vs. placebo group	Androgenic Alopecia	A multimodal microemulsion comprising minoxidil, diclofenac, and tea tree oil was significantly superior to minoxidil alone and placebo in terms of stability, safety, and efficacy, and achieved an earlier response in the treatment of androgenic alopecia compared with minoxidil alone in this 32-week pilot study.	1

COMBINATION AROMATHERAPY

NATURAL INGREDIENTS	STUDY	MECHANISM	COMPARISON	ALOPECIA VARIANT	CONCLUSION	LEVEL OF EVIDENCE
Thyme oil, rosemary oil, lavender oil, evening Primrose oil, atlas cedarwood oil	Double-blind placebo controlled study ¹⁶	Unknown	A combination of the oils was mixed with the carrier oils, jojoba and grapeseed oils vs. placebo group (only carrier oils)	Alopecia areata	Led to clinically significant (moderate to dense) hair growth in up to 75% of patients, where placebo (same carrier oils without the aromatherapy) led to hair growth in up to 30% of patients. Hair regrowth was observed in 37 patients (93%) in both treatment and the control groups. However the response rate in the aromatherapy group was significantly higher than placebo group.	IA
Thyme oil, rosemary oil, lavender oil, cedarwood oil	Double-blind, randomized controlled study ¹⁷	Unknown	A combination of the oils was mixed with the carrier oils, jojoba and grapeseed oils vs. control group (only carrier oils)	Alopecia areata	Nineteen (44%) of 43 patients in the active group showed improvement compared with 6 (15%) of 41 patients in the control group. Treatment with these essential oils was significantly more effective than treatment with the carrier oil alone.	IA

AA: alopecia areata; BID: twice daily

TABLE 2. United States Preventive Services Task Force levels of evidence for grading clinical trials

LEVEL OF EVIDENCE	QUALITY OF EVIDENCE ¹⁸
I	Evidence obtained from at least one properly designed, randomized, controlled trial
II-i	Evidence obtained from well designed controlled trials without randomization
II-ii	Evidence obtained from well designed cohort or case control analytical studies, preferably from more than one center or research group
II-iii	Evidence obtained from multiple time series with or without the intervention; dramatic results in uncontrolled experiments could also be regarded as this type of evidence
III	Opinions of respected authorities based on clinical experience, descriptive studies, or reports of expert committees
IV	Evidence inadequate because of problems of methodology (eg, sample size or length of comprehensiveness of follow-up or conflicts in evidence)
STRENGTH OF RECOMMENDATIONS	
A	There is good evidence to support the use of the procedure
B	There is fair evidence to support the use of the procedure
C	There is poor evidence to support the use of the procedure
D	There is fair evidence to support the rejection of the use of the procedure
E	There is good evidence to support the rejection of the use of the procedure

24 weeks, whereas increases of 10 percent were observed in placebo-treated men ($p < 0.001$).²⁷ The study concluded that PSO could improve AGA and that it should be considered as a potential alternative treatment.

Rosemary oil. Rosemary oil (*Rosmarinus officinalis L.*) is a medicinal plant with diverse actions, including enhancing microcapillary perfusion, which might explain its usefulness in reducing hair loss and increasing hair growth. It has also been shown to increase the production of prostaglandin E2 and reduce the production of leukotriene B4 in human polymorphonuclear leukocytes. Further, it inhibits the complement system.³⁰ A single-blind, randomized clinical trial investigated the clinical efficacy of rosemary oil in the treatment of AGA and compared its effects to minoxidil 2% ointment. The study showed that application of rosemary oil was as effective as minoxidil 2% ointment. In addition, there was better treatment adherence in the rosemary group as compared with in the minoxidil group.¹⁴ The study provided evidence with respect to the efficacy of rosemary oil as an alternative treatment option for AGA.

Tea tree oil. Tea tree oil is an essential oil, steam-distilled from the Australian native plant *Melaleuca alternifolia*. It has a minimum content of terpinen-4-ol and a maximum content of 1, 8-cineole. Terpinen-4-ol is a major tea tree oil component and exhibits strong antimicrobial and anti-inflammatory properties.³¹ These properties have shown therapeutic benefit in dermatological disorders, such as acne and other

inflammatory skin diseases.³² A double-blind, randomized, placebo-controlled study assessed the effects of tea tree oil in a microemulsion with diclofenac and minoxidil versus minoxidil alone versus a control group. A multimodal microemulsion composed of minoxidil, diclofenac, and tea tree oil was significantly superior to minoxidil alone and placebo in terms of stability, safety, and efficacy and achieved an earlier response in the treatment of AGA as compared with minoxidil alone in this 32-week pilot study.¹⁵

Thyme, rosemary, lavender, and cedarwood oil. A combination of thyme, rosemary, lavender, and cedarwood oil (aromatherapy) was used in conjunction with carrier oils (jojoba and grapeseed oil) to evaluate the effectiveness of aromatherapy in alopecia areata. The double-blind, randomized, controlled study of seven months compared aromatherapy and carrier oils against the control group that used carrier oils alone. Nineteen (44%) of 43 patients in the aromatherapy group showed improvement compared to six (15%) of 41 patients in the control group. The growth of participants was measured on a scale from 1 to 6 points, with one point indicating hair regrowth worse than without treatment and six points indicating 81- to 100-percent hair regrowth. Although treatment with these essential oils was significantly more effective than treatment with the carrier oil alone, the majority of patients in the study showed no growth (two points) in both the active and

control groups.¹⁷

Thyme, rosemary, lavender, *Cedrus atlantica* (type of cedarwood oil), and evening primrose oil. Similarly, a double-blind, placebo-controlled study was performed to assess the effects of thyme, rosemary, lavender, *Cedrus atlantica* (a type of cedarwood oil), and evening primrose oil mixed with the carrier oils jojoba and grapeseed oil versus a placebo group of carrier oils on alopecia areata. The 12-week study led to clinically significant (moderate to dense) hair growth in up to 75 percent of patients treated with aromatherapy oils, whereas the placebo arm showed hair growth in up to 30 percent of patients. Hair regrowth was observed in 37 patients (93%) in both the treatment and the control groups. However, the response rate in the aromatherapy group was significantly higher than in the placebo group.¹⁶ Although further studies regarding the safety and efficacy are needed, aromatherapy appears to be a viable option for adjuvant therapies.

CONCLUSION

The use of natural ingredients in dermatology has become a growing trend, one that clinicians should be aware of with respect to the ingredients' utility in the management of skin diseases, including hair loss. Our literature search yielded no clinical evidence to support the use of the following botanical products: argan oil, black castor oil, chamomile oil, coconut oil, horsetail plant oil, jojoba oil, menthol, peppermint oil, and sulfur oil. Underwhelmingly, there were no randomized controlled studies assessing aromatherapy or other natural ingredients in the treatment of CCCA in the current literature. There were less than 10 studies that evaluated natural ingredients and aromatherapy as an independent treatment option relative to a control. Despite the need for more long-term, well-designed, randomized, controlled studies, several botanical and natural ingredients do show promise in treating the nonscarring alopecias AGA and alopecia areata based on the results of clinical trials. CCCA, a type of scarring alopecia, is still among the top five reasons for why African Americans seek dermatologic evaluation.^{3,33,34} With no definitive treatment modality or cure for the disorder, additional studies are needed in the literature to assess the efficacy of more treatment options, including

the use of natural-based treatments. Recent changes in the cultural norms of African American women are starting to favor natural hair styles requiring less chemical and thermal intervention, with a shift toward botanical and natural hair products. Within the same ethnic group primarily lies a hair loss disorder with poorly studied pathophysiology and treatment options that has only produced less than 100 evidence-based manuscripts since its induction in the 1960s. With these current hair trends, aromatherapy and natural hair ingredients appear to be promising alternative treatment options that provide a noninvasive and cost-effective method of treating hair loss including CCCA.

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