Comparing the Effectiveness of Topical Treatments for Acne Vulgaris

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Abstract

Acne vulgaris is a common skin condition that affects many adolescents and young adults and can significantly impact both physical appearance and psychological well-being. It develops when hair follicles become clogged with excess sebum and dead skin cells, allowing *Cutibacterium acnes* bacteria to grow and trigger inflammation. This paper reviews the effectiveness of several topical treatments for mild to moderate acne, including benzoyl peroxide, salicylic acid, topical antibiotics such as clindamycin, retinoids, and combination therapies. A literature review of peer-reviewed clinical studies and meta-analyses was conducted to compare treatment outcomes based on reductions in acne lesions and bacterial growth. The findings suggest that while individual treatments can improve acne symptoms, combination therapies that target multiple causes of acne are generally the most effective. These results highlight the importance of multi-mechanism topical treatments in managing acne vulgaris.

Introduction

Acne vulgaris is one of the most common dermatological conditions worldwide, affecting an estimated range from 35% to over 90% of adolescents and young adults at some point of their lives (StatPearls, 2024). Beyond its prevalence, acne has a significant impact on quality of life, including emotional distress, social anxiety, and lowered self-esteem. Severe acne can also cause permanent scarring, which may affect individuals into adulthood. Because acne is both widespread and potentially damaging to mental health, understanding the effectiveness of different treatments is essential.

What is Acne Vulgaris?

Acne vulgaris, more commonly known as acne,is a complex skin condition that develops when sebaceous glands overproduce sebum and hair follicles become clogged with dead skin cells. This creates a favorable environment for the growth of Cutibacterium acnes, a bacterium naturally present on human skin. When these bacteria multiply, they trigger an inflammatory response that leads to the formation of various types of acne lesions (EMJ Reviews, 2024). Acne lesions range from non-inflammatory comedones- blackheads and whiteheads- to inflamed papules, pustules, and nodules that can result in scarring if left untreated. Hormonal fluctuations, particularly during puberty, stimulate excess sebum production, which is a major factor in acne development. Other contributing factors include genetic predisposition, stress, diet, and the use of certain medications (Yale Medicine, 2024). Acne most commonly appears on the face, chest, and back, areas with high concentrations of sebaceous glands. Although it is often associated with teenagers, many adults experience persistent or adult-onset acne, making effective treatment important across age groups (StatPearls, 2024).

Methods for Literature Review

To evaluate the effectiveness of topical acne treatments, this paper reviewed peer-reviewed clinical trials, systematic reviews, and meta-analyses froC.Cm databases including PubMed, ScienceDirect, and Google Scholar. Studies were selected based on their relevance to topical interventions for mild to moderate acne, including their ability to reduce *C. acnes* populations, inflammatory lesions, and non-inflammatory lesions. Eight key studies were chosen, representing a range of treatment types and evidence quality, from randomized controlled trials to large meta-analyses. These sources provide data on efficacy, safety and side effect profiles, allowing for a comprehensive comparison of available topical therapies.

Benzoyl Peroxide

Benzoyl peroxide is a widely used topical treatment that functions as both an antibacterial and anti-inflammatory agent. It releases free-radical oxygen that kills *C. acnes* within hair follicles, reducing bacterial growth and the inflammatory response (Stein Gold et al., 2024). Clinical trials have consistently shown that benzoyl peroxide significantly reduces lesion counts, particularly inflammatory lesions, within weeks of consistent use. Patients typically apply it once or twice daily, and treatment adherence is crucial for optimal results. Common side effects of this treatment include skin dryness, peeling, redness and mild irritation, particularly in the first two weeks of use. Despite these mild unfavorable effects, benzoyl peroxide remains highly effective as a monotherapy and is often incorporated into combination regimens to enhance efficacy and reduce the risk of bacterial resistance when antibiotics are used.

Salicylic Acid

Salicylic acid, a beta hydroxy acid, primarily targets non-inflammatory acne lesions by promoting exfoliation and preventing follicular plugging. Its mechanisms differ from benzoyl peroxide in that it does not directly kill *C. acnes* but instead helps maintain clear pores and reduce the formations of microcomedones. Research indicates that salicylic acid is effective in reducing blackheads and whiteheads, but its impact on inflammatory lesions is less pronounced than benzoyl peroxide or topical antibiotics. Salicylic acid is generally well tolerated, causing minimal irritation and dryness, which makes it suitable for sensitive skin. Because of its limited antibacterial activity, salicylic acid is often included in over-the-counter cleansers or adjunctive therapy rather than as a primary treatment for moderate acne (EMJ Reviews, 2024).

Topical Antibiotics (Clindamycin)

Topical antibiotics, particularly clindamycin, reduce *C. acnes* populations by inhibiting bacterial protein synthesis. Clinical evidence shows that clindamycin effectively decreases inflammatory lesions and improves acne severity scores. However, studies indicate that using clindamycin alone may lead to the development of antibiotic resistance over time, which can reduce long-term effectiveness (Aleid et al., 2024). Combining clindamycin with benzoyl peroxide enhances treatment efficacy and significantly reduces the risk of resistance. Patients using combination therapy typically see a faster reduction in lesions compared to antibiotic

monotherapy, highlighting the importance of multi-mechanism approaches in acne management.

Retinoids (Adapalene/ Tretinoin)

Topical retinoids normalize follicular epithelial cell turnover, preventing the formation of microcomedones, which are the earliest precursor to acne lesions. Adapalene and tretinoin are effective for both inflammatory and non-inflammatory lesions, and they are frequently recommended as part of combination of regimens. Retinoids may cause initial irritation, including redness, peeling, and sensitivity to sunlight, which can affect patient adherence. However, clinical studies show that combining retinoids with benzoyl peroxide or antibiotics enhances lesions reduction and accelerates treatment outcomes compared to using retinoids alone (Luan et al., 2006). Additionally, retinoids help prevent the development of new lesions over time, making them a cornerstone of acne maintenance therapy.

Combination Therapies

Many clinical studies show that combination therapies consistently outperform single-agent treatments. Fixed-dose combinations, such as clindamycin phosphate 1.2% with adapalene 0.15% and benzoyl peroxide 3.1%, have been shown to significantly reduce both inflammatory and non-inflammatory lesions in clinical trials (Stein Gold et al., 2025; Lain et al., 2024). These therapies work by simultaneously targeting multiple pathways of acne pathogenesis: bacterial overgrowth, inflammation, and clogged follicles. Combination therapies also improve patient outcomes by decreasing treatment duration and enhancing adherence due to simplified dosing schedules. Meta-analyses confirm that these combinations produce faster and more pronounced lesions clearance than monotherapy, while also reducing the risk of antibiotic resistance when topical antibiotics are included (Kakpovbia et al., 2024; Stuart et al., 2024).

Discussion

This evidence indicates that multi-mechanism combination therapies are the most effective topical treatment for mild to moderate acne. By simultaneously reducing bacterial growth, inflammation, and follicular obstruction, combination therapy provides faster, more complete lesion clearance than single agents. Benzoyl peroxide is a particularly important component, both for its antibacterial effects and for minimizing the risk of antibiotic resistance when used with clindamycin. While all treatments are generally well tolerated, side effects such as irritation, dryness, and peeling must be managed to maintain patient adherence.

Limitations in the research include variability in study designs, patient populations, and follow-up durations, which can make comparisons across studies challenging. Additionally, many trials focus on short-term efficacy rather than long-term maintenance. Future research could explore the long-term effectiveness of topical regimens, strategies to improve adherence, and potential benefits of natural or emerging therapies. Studies including patient-reported outcomes and quality of life measures would also provide valuable insight into the holistic impact of acne treatment.

Conclusion

Acne vulgaris is a complex condition that affects millions of people worldwide. While a variety of topical treatments exist, combination therapies- especially those incorporating benzoyl peroxide with antibiotics or retinoids- have been shown to provide the greatest reduction in lesions and bacterial load. Effective treatment requires addressing multiple mechanisms of acne pathogenesis simultaneously, and combination therapy meets this need. Understanding the comparative effectiveness of treatments allows clinicians and patients to make informed choices and achieve better long-term outcomes. Continued research into adherence, maintenance therapy, and emerging treatments will help improve both skin health and quality of life for individuals.

Works Cited

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