Rosin-based ointment for treating Psoriasis

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Abstract

Psoriasis is a chronic, immune-mediated skin disorder characterized by the overproduction of keratinocytes and inflammation, resulting in scaly, erythematous plaques that significantly impact quality of life. Conventional treatments, such as topical agents, phototherapy, and systemic therapies, often have side effects or limited long-term efficacy, highlighting the need for safer and more effective alternatives. This study investigates the formulation of a novel topical ointment using gum rosin, salicylic acid, glycerol, olive oil, and vitamin E to address the key pathological features of psoriasis. Gum rosin's anti-inflammatory properties, combined with the keratolytic effects of salicylic acid and the emollient benefits of glycerol and olive oil, offer a multifaceted approach to psoriasis treatment. Three volunteers with mild to moderate psoriasis applied the ointment twice daily over four weeks, with all showing marked clinical improvement, particularly in reducing erythema, scaling, and improving skin texture within two weeks. One participant, whose symptoms had worsened from cortisone-based treatment, experienced rapid symptom relief with the ointment. No adverse effects were reported, suggesting the ointment's safety and efficacy. While the results are promising, the small sample size and short duration underscore the need for larger-scale clinical trials to confirm its potential as a cost-effective, safe alternative for long-term management of psoriasis.

1. Introduction

Psoriasis is a chronic, immune-mediated inflammatory disorder that affects approximately 2–3% of the global population. It is characterized by the formation of erythematous plaques covered with thick, silvery scales, which not only compromise aesthetic appearance but also significantly impair patients' quality of life. Beyond the visible skin manifestations, psoriasis is often associated with a range of systemic comorbidities, including psoriatic arthritis, cardiovascular disease, metabolic syndrome, and psychological disorders such as depression and anxiety. These comorbidities highlight the complex, multi-system nature of the disease, underscoring the need for comprehensive treatment approaches. The pathogenesis of psoriasis is multifactorial, involving a complex interplay of genetic predisposition, immune dysregulation, and environmental triggers. Central to its development is the hyperactivation of T-cells, particularly Th1 and Th17 subsets, which drive keratinocyte hyperproliferation and the subsequent inflammatory cascade, resulting in the hallmark thickened plaques and chronic inflammation. *(Lowes et al., 2014)*

Current treatment strategies for psoriasis are typically categorized into three main approaches: topical therapies, systemic treatments, and phototherapy. For mild to moderate psoriasis, topical treatments remain the first line of defense, with corticosteroids and vitamin D analogs being the most commonly prescribed options. However, long-term use of corticosteroids is associated with significant adverse effects, including skin atrophy, striae, telangiectasia, and tachyphylaxis. Additionally, corticosteroid withdrawal can trigger rebound flares, which often exacerbate the disease. Vitamin D analogs, while effective, can cause irritation and are typically used in combination with other agents. For moderate to severe psoriasis, systemic therapies, particularly biologics targeting specific immune pathways, have shown significant efficacy. However, these treatments are often costly, require ongoing medical supervision, and carry risks related to immunosuppression, such as increased susceptibility to infections and malignancies. Moreover, biologics are typically reserved for patients with more severe disease, leaving those with mild to moderate psoriasis in need of safer, more accessible alternatives. *(Uva et al., 2012)*

Given these limitations, there is a growing demand for novel topical formulations that provide effective symptom relief without the adverse effects associated with long-term corticosteroid use. Ideally, such formulations would target multiple aspects of psoriasis pathophysiology, including inflammation, keratinocyte hyperproliferation, and barrier dysfunction, to optimize therapeutic outcomes while minimizing side effects. The present study introduces a novel ointment formulation designed to meet these criteria, combining several active ingredients known for their individual therapeutic benefits in dermatology.

The novel formulation includes gum rosin, salicylic acid, glycerol, olive oil, and vitamin E, each chosen for their specific pharmacological actions that collectively target the key processes involved in psoriasis. Gum rosin, a natural resin obtained from pine trees, has been recognized for its potent anti-inflammatory, antimicrobial, and skin-protective properties. These properties are particularly relevant in the context of psoriasis, where inflammation and barrier dysfunction play central roles. Rosin has been shown to inhibit pro-inflammatory cytokines, which are critically involved in the immune-mediated pathways of psoriasis. Salicylic acid, a well-established keratolytic agent, promotes desquamation by breaking down the intercellular adhesion between keratinocytes, facilitating the removal of psoriatic scales and enhancing the penetration of other active ingredients. Glycerol and olive oil act as humectants and emollients, restoring moisture and reinforcing the skin's barrier function, which is often compromised in psoriasis. Vitamin E, a powerful antioxidant, provides additional protective effects by mitigating oxidative stress, which is known to exacerbate inflammation and skin damage in psoriasis.

The ointment was evaluated in a preliminary study involving three patients with clinically diagnosed mild to moderate psoriasis. Notably, one participant had experienced a worsening of symptoms following the use of a cortisone-based treatment, highlighting the need for effective, steroid-free alternatives in psoriasis management. The primary objective of this study was to assess the clinical efficacy and safety of this novel ointment over a four-week treatment period. The endpoints included

reductions in erythema, scaling, and plaque thickness, as well as improvements in overall skin texture and patient-reported outcomes, including tolerability and satisfaction.

By integrating multiple active ingredients with distinct but complementary mechanisms of action, this formulation aims to provide a multi-targeted therapeutic approach to psoriasis. This study represents an important step toward developing safer, more effective topical treatments for mild to moderate psoriasis, addressing an unmet need in the current therapeutic landscape. Further research will be required to confirm the long-term efficacy and safety of the ointment and to explore its potential role in combination with existing treatments.

2. Materials and Methods

2.1 Formulation Development:

The ointment was formulated using five key ingredients: gum rosin (30%), salicylic acid (1%), glycerol (10%), olive oil (20%), and vitamin E (1%) in a water. The rationale for the selection of these ingredients was based on their individual and synergistic pharmacological properties that target the underlying pathophysiology of psoriasis.

Gum Rosin (30%): Gum rosin, derived from the resin of pine trees, possesses anti-inflammatory and antimicrobial properties. Its capacity to inhibit pro-inflammatory cytokines makes it suitable for treating inflammatory skin conditions. Additionally, rosin creates a protective film on the skin, helping to restore the skin barrier and prevent further irritation. *(Li & Chen, 2024)*

Salicylic Acid (1%): As a well-known keratolytic agent, salicylic acid helps break down the thickened stratum corneum, facilitating the removal of scales and reducing plaque buildup. It also improves the penetration of other active ingredients into the skin. *(Torsekar & Gautam, 2017)*

Glycerol (10%): Glycerol is a humectant that draws moisture into the skin, improving hydration and supporting the restoration of the skin's protective barrier. This is especially important in psoriasis, where the skin tends to be dry and prone to scaling. *(Baker, 2022)*

Olive Oil (20%): Olive oil, known for its emollient properties, helps soften the skin, preventing trans-epidermal water loss (TEWL) and providing a lipid-rich barrier that supports the healing process in psoriatic lesions.

Vitamin E (1%): Vitamin E acts as an antioxidant, protecting the skin from oxidative damage and promoting skin repair.

2.2 Preparation Method:

The ointment formulation was prepared using a two-phase oil-in-water emulsion technique, which is commonly employed in pharmaceutical compounding to ensure the stable dispersion of hydrophobic

and hydrophilic components. The preparation involved distinct oil and water phases, each containing specific active and excipient ingredients.

Oil Phase:

The oil phase comprised gum rosin (30%), salicylic acid (1%), and olive oil (20%). Gum rosin was selected for its anti-inflammatory properties, while salicylic acid served as a keratolytic agent to aid in the exfoliation of hyperkeratotic skin. Olive oil was included for its emollient effects and to facilitate the dispersion of the active ingredients. The mixture was then heated in a water bath to approximately 70°C to ensure the complete melting of the rosin and solubilization of salicylic acid, promoting an even dispersion of the active ingredients. To protect vitamin E from potential thermal degradation, it was added to the formulation after the heating process.

Water Phase:

The water phase was prepared by dissolving glycerol (10%) in pre-boiled, deionized water under constant stirring to ensure complete solubilization. Glycerol acted as a humectant to enhance skin hydration and stabilize the emulsion. The water phase was also heated to 70°C to match the temperature of the oil phase, ensuring both phases were at an equivalent temperature prior to emulsification.

Emulsification Process:

Once both the oil and water phases reached 70°C, the oil phase was gradually added to the water phase in existing of emulsifying agent. This addition was performed dropwise over several minutes under continuous high-shear mixing using a mechanical stirrer set to 800–1000 rpm, which facilitated the formation of a stable oil-in-water emulsion. After the oil phase was completely incorporated, the emulsion was maintained at 70°C with continuous stirring for an additional 15 minutes to promote homogeneity.

Cooling and Addition of Vitamin E:

After thorough mixing, the emulsion was allowed to cool to room temperature while still being stirred to maintain uniformity. Once the temperature reached approximately 25°C, vitamin E (1%) was incorporated into the formulation. This step was essential to preserve the antioxidant properties of vitamin E, ensuring maximum efficacy.

This preparation method ensured a stable, homogeneous ointment suitable for topical application, effectively combining both hydrophilic and lipophilic therapeutic agents in a formulation that could be readily absorbed by the skin. The stability of the ointment was visually assessed for phase separation or crystallization over a period of 10 days before patient application, confirming its suitability for clinical use.

2.3 Study Design:

This study was conducted as an open-label trial over a four-week period to evaluate the clinical efficacy and safety of the formulated ointment in individuals with mild to moderate psoriasis. Three adult volunteers, aged 18 to 60 years, were recruited based on clinical examination and diagnosed with mild to moderate psoriasis, defined by lesions affecting less than 10% of total body surface area. Participants had not received systemic treatment within the previous three months, and those with secondary skin conditions or known hypersensitivity to the formulation components were excluded. Each participant applied the ointment topically to affected areas twice daily for the duration of the study, with application techniques standardized and monitored through daily diaries. Primary outcome measures included visual assessments of lesion size, erythema, scaling, and skin texture, evaluated by a blinded dermatologist at baseline and after two weeks. Secondary outcomes comprised participant-reported symptom relief and tolerability, captured through structured questionnaires. This design aimed to comprehensively assess the ointment's efficacy and safety while providing a foundation for future, larger-scale studies.

3. Results

3.1 Clinical Outcomes:

This study assessed three volunteers with mild to moderate psoriasis, focusing on lesion size reduction, improvements in scaling, erythema reduction, and patient-reported feedback. All participants exhibited rapid and significant improvements within the first two weeks of treatment, with near-complete resolution of symptoms by the fourth week. No adverse effects were reported, and the ointment was well-tolerated throughout the study period.

3.2 Visual Documentation:

Photographic evidence was collected at baseline (week 0), week 2, and week 4 to document changes in psoriatic lesions. Significant reductions in plaque size, scaling, and erythema were observed in all volunteers, particularly after the first two weeks. The visual improvements supported the clinical assessments, showcasing the efficacy of the ointment in reducing psoriasis symptoms.

Volunteer 1:

Baseline: Presented with thick plaques on the elbows, severe scaling, and pronounced erythema.

Week 2: Scaling was reduced by approximately 72%, plaque thickness had diminished significantly, and erythema was visibly reduced.

Week 4: Complete resolution of erythema and a 87% reduction in plaque size, with smooth, clear skin restored.

Volunteer 2:

Baseline: Moderate psoriatic plaques on the scalp and behind the ears, accompanied by severe scaling and itching.

Week 2: Scaling reduced by around 62%, plaque thickness decreased significantly, and itching was almost completely resolved.

Week 4: Plaques had reduced by 82%, with minimal scaling and complete relief from itching.

Volunteer 3:

Baseline: Psoriatic plaques on the knees and shins with moderate erythema and scaling.

Week 2: 55% reduction in plaque size, significant scaling improvement, and noticeable erythema reduction.

Week 4: Plaques diminished by 78%, with smooth skin and minimal residual erythema.

3.3 Quantitative Analysis:

Quantitative assessments demonstrated rapid improvements, particularly by week 2, with continued progress through week 4.

3.3.1 Lesion Size Reduction:

Lesion size was measured using digital calipers, and percentage reductions were calculated relative to baseline measurements.

Week 2: Average reduction of 64% (± 5%)

Week 4: Average reduction of 81% (± 6%)

Volunteer 1 showed the greatest reduction of 87% by week 4, while Volunteer 3 showed a 78% reduction, and Volunteer 2 showed an 82% reduction by the end of the study.

3.3.2 Improvement in Scaling:

Scaling was evaluated using a semi-quantitative scale (0-4).

Week 2: Average improvement of 68% (± 3%)

Week 4: Average improvement of 82% (± 4%)

Minimal scaling remained by week 4, with Volunteers 1 and 2 experiencing near-complete resolution of scaling by the end of the treatment.

3.3.3 Erythema Reduction:

Erythema was graded on a scale from 0 to 4.

Week 2: Average reduction of 52% (± 4%)

Week 4: Average reduction of 79% (± 5%)

Volunteer 1 experienced complete erythema resolution by week 4, while Volunteers 2 and 3 had significant reductions by week 2, with continued improvements.

3.4 Patient Feedback:

All participants provided overwhelmingly positive feedback, reporting substantial relief from symptoms and improved skin condition.

Symptom Relief: All participants reported significant relief from itching, burning, and general discomfort. By week 2, Volunteer 2, who had scalp psoriasis, noted a complete cessation of itching, while Volunteers 1 and 3 reported markedly reduced burning sensations.

Skin Texture and Hydration: By week 4, participants described their skin as smoother and more hydrated. Volunteer 3 highlighted the ointment's excellent moisturizing properties, which helped alleviate dryness and scaling. Noticeable feedback from volunteer 3 that his skin in week 3 got much red, this is because the salicylic acid concentration was high according to his skin condition since it was already necrosis, so it was near to the blood causing much red skin appearance.

Overall Satisfaction: On a Visual Analog Scale (VAS), where 0 represented no improvement and 10 represented complete satisfaction, the average score was 9.3 (± 0.4). Volunteer 1 rated their satisfaction at 9.7, while Volunteers 2 and 3 rated their satisfaction at 9.2 and 9.0, respectively. All participants expressed strong interest in continuing the use of the ointment post-trial.

These results confirm the significant and rapid efficacy of the ointment in reducing psoriasis symptoms within a short time frame, with the most notable improvements occurring by the second week of treatment.

4. Discussion:

4.1 Comparison with Existing Treatments:

The results of this study demonstrate the potential effectiveness of the rosin-based ointment in treating mild to moderate psoriasis, particularly by reducing lesion size, scaling, and erythema. In comparison with existing treatments such as corticosteroids, coal tar, and biologics, the formulation shows significant advantages while also posing certain challenges that need to be addressed.

Corticosteroids:

Corticosteroids are among the most prescribed treatments for psoriasis due to their potent anti-inflammatory effects. However, their prolonged use often leads to several adverse outcomes, such as skin atrophy, tachyphylaxis (where the effectiveness decreases over time), and the risk of rebound flares upon discontinuation. The rosin-based ointment appears to provide similar anti-inflammatory and

keratolytic benefits, but without the severe side effects commonly associated with corticosteroid use. In this study, participants who used the ointment reported substantial symptom relief, including reduced scaling and erythema, without experiencing skin thinning or irritation, suggesting a more favorable safety profile compared to corticosteroids. This positions the ointment as a viable alternative for patients seeking safer, long-term management of psoriasis. *(Psoriasis Treatment: Corticosteroids You Apply to the Skin, n.d.)*

Coal Tar:

Coal tar is an older treatment modality for psoriasis and has been valued for its antipruritic (itch-relieving) and anti-inflammatory effects. However, its application is cumbersome due to its thick consistency, sticky residue, and strong, unpleasant odor. These factors often contribute to poor patient adherence. The rosin-based ointment, in contrast, offers a smoother, more user-friendly application with a neutral scent and pleasant texture. This advantage potentially enhances patient compliance, making it a more attractive option for daily use. Additionally, the inclusion of salicylic acid in the formulation complements its keratolytic action, helping to clear plaques and restore smoother skin. Therefore, while coal tar remains effective, the rosin-based ointment presents a more patient-centric solution without compromising efficacy. *(Psoriasis Treatment: Coal Tar, n.d.)*

Biologics:

Biologic therapies have transformed the management of moderate to severe psoriasis by targeting specific molecular pathways involved in the disease's inflammatory process. However, biologics are generally reserved for more severe cases due to their high cost, the potential for significant systemic side effects, and the necessity for injections or infusions. They are not typically recommended for mild to moderate psoriasis, which represents the target population for the rosin-based ointment. Given the positive outcomes in terms of symptom reduction seen in this study, the ointment offers an appealing topical alternative for patients who may not require or have access to biologic therapies. Additionally, the rosin-based ointment could potentially be used as an adjunct to systemic therapies, helping to improve localized lesions in a cost-effective and low-risk manner. *(Ruffing, 2020)*

In summary, while traditional therapies such as corticosteroids and coal tar have proven efficacy, their adverse effects, patient inconvenience, and costs can restrict their utility. The rosin-based ointment formulated in this study demonstrates a promising, safer, and more convenient approach for individuals seeking effective management of mild to moderate psoriasis.

4.2 Mechanism of Action of the Ingredients:

The therapeutic efficacy of the formulated rosin-based ointment can be attributed to the individual and synergistic actions of its key ingredients. Each component plays a distinct role in addressing the symptoms and pathophysiology of psoriasis.

Anti-inflammatory Effects of Rosin: Rosin, a natural resin derived from pine trees, has demonstrated anti-inflammatory properties by inhibiting the production of pro-inflammatory cytokines—key mediators

in psoriasis. By suppressing these cytokines, rosin helps to reduce the inflammation and redness associated with psoriatic lesions. Moreover, rosin's ability to form a protective layer on the skin enhances the skin barrier function, shielding the skin from external irritants and reducing irritation. This dual action of reducing inflammation and strengthening the skin barrier makes rosin a valuable ingredient in the topical treatment of psoriasis. *(Li et al., 2019)*

Keratolytic Action of Salicylic Acid: Salicylic acid is a well-established keratolytic agent that promotes the shedding of dead skin cells by breaking down the intercellular bonds that hold them together. This action is critical for managing the thick, scaly plaques characteristic of psoriasis. By thinning the plaques, salicylic acid helps to smooth the skin and improve its overall appearance. Furthermore, its keratolytic properties enhance the penetration of other active ingredients in the ointment, such as rosin, thereby improving the overall effectiveness of the treatment. The inclusion of salicylic acid also aids in reducing the scaling, one of the most visually distressing symptoms for psoriasis patients.

Emollient and Barrier-forming Properties of Glycerol: Glycerol monostearate, a well-known emollient, plays a critical role in moisturizing the skin. Psoriasis often leads to dry, flaky skin, and restoring moisture is essential for relieving discomfort and promoting healing. By forming a protective layer over the skin, glycerol monostearate helps to prevent trans-epidermal water loss (TEWL), thereby maintaining hydration and skin elasticity. *(Choudhary et al., 2021)*

4.3 Limitations of the Study:

Despite the encouraging results, several limitations of the study must be acknowledged to ensure a balanced interpretation of the findings and guide future research.

Small Sample Size: This study was conducted with only three participants, which significantly limits the generalizability of the results. The small sample size makes it difficult to draw broad conclusions about the efficacy and safety of the ointment. Larger, multicenter studies with diverse participant demographics are necessary to validate the results and ensure they apply to the wider psoriasis population.

Lack of Control Group: The study did not include a control group, making it difficult to establish whether the observed effects were due to the formulation itself or potential placebo effects.

Short Study Duration: The study duration was only four weeks, which may not be sufficient to assess the long-term effects or sustainability of the treatment. Psoriasis is a chronic condition, and understanding the long-term impact of this formulation, including the potential for relapse or recurrence of symptoms, is critical. Future studies should involve a longer follow-up period to monitor for sustained efficacy and any delayed adverse effects.

Patient-Reported Outcomes: While patient-reported outcomes were valuable for understanding symptom relief, the subjective nature of these reports can introduce variability. Future studies should incorporate validated psoriasis scoring systems, such as the Psoriasis Area and Severity Index (PASI)

or Dermatology Life Quality Index (DLQI), to quantify improvements and ensure consistency in evaluating the results.

4.4 Recommendations for Future Research:

Future research should aim to address the limitations of this initial study by implementing a larger sample size, randomized controlled design, and extended follow-up periods. Furthermore, exploring potential modifications to the ointment, such as optimizing the concentration of active ingredients or combining the ointment with other therapies, could enhance its efficacy and expand its potential applications in psoriasis management. Developing a more standardized assessment protocol, including both objective clinical measures and patient-reported outcomes, would also provide a more comprehensive understanding of the ointment's impact. Finally, additional research could explore the formulation's effectiveness in other inflammatory skin conditions, broadening its potential therapeutic applications.

5. Conclusions:

This study provides a comprehensive evaluation of a novel topical ointment formulated for the treatment of mild to moderate psoriasis. The pilot trial, conducted on three volunteers over a four-week period, revealed significant improvements in key clinical parameters such as lesion size, scaling, and erythema, as well as favorable patient-reported outcomes regarding the ointment's usability, tolerability, and efficacy. These preliminary findings suggest that the formulation has potential as an alternative or adjunct therapy for psoriasis management, especially for patients seeking safer, non-steroidal treatment options.

The therapeutic benefits observed in this study are attributed to the unique combination of ingredients that target the multifaceted pathophysiology of psoriasis. Rosin, a natural resin, demonstrated potent anti-inflammatory properties, likely due to its ability to inhibit pro-inflammatory cytokines, which are central to the immune response driving psoriasis. This reduction in cytokine activity helps alleviate erythema and inflammation, offering a critical advantage in psoriasis treatment. Salicylic acid, with its well-documented keratolytic properties, effectively aided in the desquamation of hyperkeratotic plaques, promoting smoother skin and enhanced absorption of the other active ingredients. The inclusion of emollients like glycerol monostearate provided essential moisture retention and barrier reinforcement, which are vital in mitigating the dryness and irritation commonly associated with psoriatic lesions. The synergy between these components addresses not only the visible symptoms of psoriasis but also some of its underlying inflammatory mechanisms.

One of the most notable advantages of this formulation is its favorable safety profile compared to more conventional treatments like corticosteroids and coal tar. Corticosteroids, while effective, are associated with a range of side effects, including skin thinning, tachyphylaxis, and the risk of rebound flares upon cessation of use. Coal tar, although it has historical use in psoriasis management, is often

avoided by patients due to its unpleasant odor and difficult application. In contrast, the rosin-based ointment used in this study appears to offer a well-tolerated, non-irritating, and easy-to-apply alternative that does not pose the same risk of side effects as long-term corticosteroid use. This makes it an appealing option for chronic psoriasis management, where long-term treatment without adverse outcomes is critical to improving patients' quality of life.

However, despite the promising results, this study has several limitations that must be acknowledged. First and foremost, the small sample size (n=3) precludes any definitive conclusions regarding the generalizability of the findings. A larger cohort is essential to validate the results and to ensure that the treatment is effective across diverse patient populations. Furthermore, the lack of a control group limits the ability to make direct comparisons with standard treatments, coal tar, and biologics. Another limitation is the relatively short duration of the trial (four weeks), which may not provide sufficient insight into the long-term efficacy and safety of the formulation. Psoriasis is a chronic condition, and it is crucial to assess whether the improvements observed in this study can be sustained over longer periods of treatment and whether the ointment continues to be effective without inducing tolerance or adverse effects.

In addition to addressing these methodological limitations, future research could explore optimization of the formulation itself. Increasing the concentration of active ingredients such as rosin or salicylic acid could potentially enhance the therapeutic effects, particularly in patients with more resistant forms of psoriasis. Moreover, incorporating other complementary agents, such as antioxidants, ceramides, or additional anti-inflammatory compounds, may provide a more holistic approach to managing the diverse symptoms of psoriasis.

In conclusion, this study provides encouraging evidence that the rosin-based ointment has the potential to be a highly effective treatment for mild to moderate psoriasis. Its combination of anti-inflammatory, keratolytic, and emollient actions addresses both the visible symptoms and the underlying inflammatory processes of the disease. While the small sample size and short trial duration highlight the need for further research, the positive outcomes observed suggest that this formulation could offer a safer, more convenient alternative to conventional treatments. By continuing to investigate its efficacy in larger, more diverse populations and refining its formulation, this ointment may emerge as a valuable therapeutic option in the evolving field of psoriasis management. If validated by future studies, it could improve the quality of life for many patients who struggle with the daily burden of this chronic and often debilitating condition.

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