

Video Article

The Goeckerman Regimen for the Treatment of Moderate to Severe Psoriasis

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Keywords: Medicine, Issue 77, Infection, Biomedical Engineering, Anatomy, Physiology, Immunology, Dermatology, Skin, Dermis, Epidermis, Skin Diseases, Skin Diseases, Eczematous, Goeckerman, Crude Coal Tar, phototherapy, psoriasis, Eczema, Goeckerman regimen, clinical techniques

Date Published: 7/11/2013

Citation: Gupta, R., Debbaneh, M., Butler, D., Huynh, M., Levin, E., Leon, A., Koo, J., Liao, W. The Goeckerman Regimen for the Treatment of Moderate to Severe Psoriasis. *J. Vis. Exp.* (77), e50509, doi:10.3791/50509 (2013).

Abstract

Psoriasis is a chronic, immune-mediated inflammatory skin disease affecting approximately 2-3% of the population. The Goeckerman regimen consists of exposure to ultraviolet B (UVB) light and application of crude coal tar (CCT). Goeckerman therapy is extremely effective and relatively safe for the treatment of psoriasis and for improving a patient's quality of life. In the following article, we present our protocol for the Goeckerman therapy that is utilized specifically at the University of California, San Francisco. This protocol details the preparation of supplies, administration of phototherapy and application of topical tar. This protocol also describes how to assess the patient daily, monitor for adverse effects (including pruritus and burning), and adjust the treatment based on the patient's response. Though it is one of the oldest therapies available for psoriasis, there is an absence of any published videos demonstrating the process in detail. The video is beneficial for healthcare providers who want to administer the therapy, for trainees who want to learn more about the process, and for prospective patients who want to undergo treatment for their cutaneous disease.

Video Link

The video component of this article can be found at <http://www.jove.com/video/50509/>

Introduction

Psoriasis is a chronic, immune-mediated inflammatory skin disease affecting approximately 2-3% of the population.¹ One-third of the patients experience generalized psoriasis that causes debilitating physical and psychological effects. The Goeckerman regimen, first published in 1925 for the treatment of generalized psoriasis, consists of exposure to ultraviolet B (UVB) light and application of crude coal tar (CCT).² Though newer internal agents such as biologics have enhanced the treatment of psoriasis, Goeckerman therapy remains as an extremely effective option, while providing a long duration of remission.^{3,4} In a published study conducted at UCSF, 100% of patients on Goeckerman therapy achieved PASI75 (75% improvement of Psoriasis Assessment of Severity Index [PASI] from baseline) by 3 months.⁵ In comparison (though not head to head), patients on the most potent biologics achieved only 67-68% PASI75 in 3 months.⁶ The Goeckerman regimen has a quick onset and has been utilized with success in patients with treatment-resistant psoriasis refractory to phototherapy or internal medications.⁷ The Goeckerman regimen also has an extremely safe toxicity profile with essentially no internal side effects, which are the more serious risks associated with other psoriasis treatments. Furthermore, the therapy has been shown to have a significant and positive effect on the quality of life of patients with generalized psoriasis.⁸

Goeckerman regimen was formerly administered 24 hr a day at an inpatient facility until the patient was cleared of their psoriasis. However, due to changes in reimbursements and managed care, patients are now treated in daycare facilities for a minimum of 4-8 hr/day and 5 days/week until their disease clears. Goeckerman therapy was initially formulated for the treatment of psoriasis, but a modified version has recently been used for the treatment of other skin conditions such as eczema with success. The following protocol is utilized at UCSF specifically for psoriasis, but slight changes in the procedures can be tailored for eczema, generalized pruritus, prurigo nodularis, pityriasis lichenoides chronica, erythroderma, and other related skin disorders.⁹

Though it is one of the oldest therapies available for psoriasis, there is an absence of any published videos demonstrating the process. A video can have a broad appeal as it can be used as a resource for referring healthcare practitioners (primary care physicians and dermatologists) to understand the process and feel comfortable recommending the therapy. A video demonstrating the Goeckerman process will also be instrumental for educating residents and medical students who are not exposed to the regimen since there are only a few institutions left

that continue to provide this type of intensive therapy. A video will also be beneficial for prospective patients who are interested in receiving Goeckerman therapy.

Protocol

1. Evaluation and Preparation

1. Perform a complete history and physical prior to initiating therapy. In the history and physical, document important information such as current/past medications, response to past psoriasis therapies, any history of adverse reactions to ambient sunlight or phototherapy, severity of pruritus, and sleep quality.
2. Set up a clinic room with all the necessary material for dermal application of medications and occlusion [See **Materials Section** and **Figure 1**]. Also, place other materials in the room such as gloves, plastic wrap, socks, and scrubs/pajama gowns.
3. Assess the patient for diffuse and intense erythema prior to starting therapy.
4. If the patient exhibits widespread or intense erythema, perform a "cool down" procedure (see below) until the erythema is significantly reduced. If no widespread or intense erythema is seen, proceed to the "phototherapy + tar" step.

2. Cool Down (If Needed)

1. Apply topical corticosteroids to the affected areas. Apply triamcinolone 0.1% ointment to the trunk and extremities, desonide 0.05% cream/ointment to the face/axillae/groin, and fluocinonone 0.01% oil or triamcinolone 0.1% lotion to the scalp. Reserve clobetasol 0.05% ointment for areas with the most intense inflammation.
2. Occlude the topical medications with plastic wrap for the trunk and extremities, impermeable gloves for the hand and shower caps inside socks for the feet, and a shower cap for the scalp.
3. Cool down the patient until the erythema is significantly reduced (range from 3-14 days).

3. Phototherapy + Tar

1. After the patient finishes the cool down period, administer phototherapy daily in the morning prior to the application of crude coal tar [**Figure 2**]. Phototherapy options include narrowband UVB (most commonly used in psoriasis) or broadband UVB (most commonly used in eczema). Determine the initial phototherapy dose by Fitzpatrick skin type [see **Table 1** and **Table 2**].
2. Slowly titrate the subsequent phototherapy doses upwards as tolerated. Dosing regimen and schedule need to be individualized based on patient response to phototherapy.
3. After phototherapy, apply 2% crude coal tar (CCT) in aquaphor topically to affected areas of the body [**Figure 3**]. If patient has scalp involvement, apply 20% liquid carbonis detergens (LCD) in nutraderm to the scalp.
4. Initially, use 2% CCT (lowest strength). On subsequent treatment days, increase the strength of the tar as tolerated by the patient from 2% to 5% and then to 10% to achieve better results.
5. For thickened areas of psoriasis, use tar compounded with salicylic acid (2%/5%/10% salicylic acid) to help reduce the scaling and induration of the plaques. Initially use preparations of 2% salicylic acid with 10% CCT, and titrate the percentage of salicylic acid up as tolerated by the patient on subsequent days. Salicylic acid may be contraindicated in patients with diabetes or gastric ulcers.
6. Occlude topical tar in the same manner as described in step 2.2 for the cooling down procedure.
7. Keep topical medications on the skin for at least 4 hr. After a minimum of 4 hr, remove the occlusion materials and wash off the tar in the shower with mineral oil and soap [**Figure 4**].
8. Give the patient 20% LCD in aquaphor and 20% LCD in nutraderm to apply on the body and scalp, respectively, at home.
9. Patients with eczema tend to have sensitive skin. Use 2% CCT initially for eczema patients. Be careful when titrating up to 5% CCT, as patients with eczema tend to have sensitive skin. Do not use 10% CCT (or any percentage of CCT higher than 5%) and do not use any preparations with salicylic acid.

4. Daily Assessment

1. Each day, perform an evaluation and assess the patient's skin and response to treatment. Evaluate specifically for sensations of **burning**, which can indicate the patient's inability to tolerate light therapy, or **itching**, which can indicate irritation from the tar and/or plastic wrap.
2. If a patient exhibited signs of burning (burning sensation, significant increasing erythema, or rarely increased itch as a harbinger of impending burn if dosimetry is increased further), decrease phototherapy dose or do not give phototherapy that day, as it may have been caused by a phototoxic reaction to the previous UV light dose.
3. It is not uncommon for patients to have different regional anatomical responses and tolerability to phototherapy. For optimal treatment, adjust the amount of phototherapy dose exposed to different regions of the body according to patient's response. For example, if a patient experiences mild burning of the trunk, then first treat the entire body with the lowered phototherapy dose, then cover the trunk, and give additional light to the extremities.

5. Discharge Planning and Maintenance

1. Continue Goeckerman therapy until disease is cleared and patient is ready to be discharged.
2. Place patients on a maintenance program, which can include outpatient phototherapy and topical medications
3. Administer outpatient phototherapy three times a week (for at least the first month). Eventually the frequency is gradually tapered down to twice a week and then once a week

4. Outpatient topical medications include: Triamcinolone cream/ointment to the body twice daily, Clobetasol to recalcitrant lesions (if needed) twice daily, 20% LCD in aquaphor to the body and 20% LCD in nutraderm to the scalp.
5. Within a month of discharge, schedule a follow up physician visit with the patient to monitor disease state.

Representative Results

In a study performed at our center at the University of California San Francisco, PASI75 response (a 75% improvement in the Psoriasis Assessment Severity Index) was achieved in 100% of patients receiving Goeckerman (n = 25) over a 3-month time period.⁵ 24/25 patients needed only 2 months to achieve PASI75, while the remaining patient obtained a PASI75 response at 3 months. In another study, Menter *et al.* administered the Goeckerman regimen for 300 patients and 100% of the patients achieved 90% or more clearing of their baseline psoriasis lesions. The average amount of treatment days for patients to achieve more than 90% clearing in the second study was only 18 days.⁴ PAS75 response by 3 months of therapy is considered the standard tool to assess the efficacy of a treatment modality for psoriasis. Though biologics are the new development in psoriasis treatment, their reported efficacy is 67-68% of patients achieving PASI75 at 3 months.⁶ Furthermore, biologics are associated with potential serious internal risks such as internal cancer, serious infections (tuberculosis, coccidioidomycosis, histoplasmosis, etc.) and cardiovascular risk.¹⁰ Goeckerman therapy avoids any of these serious internal risks while still being extremely efficacious. The use of topical tar and phototherapy has a synergistic effect. The synergism is a result of tar, being a photo sensitizer, and is supported by studies documenting a higher efficacy of combination therapy in comparison to phototherapy alone.¹¹

The Goeckerman regimen usually proceeds for 20-30 sessions, resulting in clearing or more clearing of psoriasis. Although individual results may vary, typically after ten days of treatment we observe that patients experience decreased scaling and induration of their plaques. After twenty treatments we typically observe complete flattening of the plaques with only the presence of residual erythema. After 30 treatments, we observe complete clearance of the psoriasis lesions, including residual erythema, with only the presence of possible post-inflammatory pigmentation alterations. Patients also experience a significant improvement of their itch during the therapy. If a patient has recalcitrant psoriasis and is not showing improvement of their plaques, the therapy can be extended as needed. Furthermore, if a patient does not respond at all with topical CCT and phototherapy, the diagnosis of psoriasis should be reevaluated and confirmed by a skin biopsy (especially to rule out mycosis fungoides and pityriasis rubra pilaris).

Goeckerman therapy has one of the longest reported remission times of any psoriasis treatments. After completing Goeckerman therapy, the average length of remission can be anywhere from 9.5 months to over a year.^{4,12} Therefore patients can expect to maintain a response to the therapy for up to a year. However, since psoriasis is a chronic, life-long disease, the disease tends to recur in patients, especially in those who discontinue any type of therapy including topical medications and/or outpatient phototherapy. Patients who have severe, recurrent psoriasis repeat the Goeckerman regimen as needed, which is usually on a yearly (or longer) basis. Repeated admissions often require fewer treatment days to achieve clearance as patients tend to become more prompt in seeking help and patients also do not develop physiological resistance (tachyphylaxis) to the therapy

Attached are photos of a patient with severe psoriasis plaques prior to being treated with Goeckerman therapy [Figure 5a]. Though his mild erythema is still present, there is significant decrease in scale and induration of his plaques after 4 weeks of treatment [Figure 5b]. After completing a full course of therapy, patients can expect a complete clearance of their lesions [Figure 6a and 6b].

Skin Type	Initial Dose	Subsequent Increase	Missed Visit Dosing	All Skin Types
I	130 mJ*	15 mJ	1-7 days	Increase per skin type
II	220 mJ	25 mJ	8-11 days	Hold dose constant
III	260 mJ	40 mJ	12-20 days	Decrease by 25%
IV	330 mJ	45 mJ	21-27 days	Decrease by 50%
V	350 mJ	60 mJ	28 or more days	Start over
VI	400 mJ	65 mJ		

Table 1. Narrow Band UVB dosing protocol for Psoriasis. Guidelines for initial dosing, dosing increases on subsequent visits, and dosing adjustments for missed visits *mJ = millijoules.

Skin Type	Start Dose Range	Subsequent Increase	Missed Visit Dosing	All Skin Types
I	10-20 mJ*	10-20 mJ	1-7 days	Increase per skin type
II	20-30 mJ	20-30 mJ	8-11 days	Hold dose constant
III	30-50 mJ	30-50 mJ	12-20 days	Decrease by 25%
IV	40-60 mJ	40-60 mJ	21-27 days	Decrease by 50%
V	40-60 mJ	40-60 mJ	28 or more days	Start over
VI	50-100 mJ	50-100 mJ		

Table 2. Broadband UVB dosing protocol for Psoriasis. Guidelines for initial dosing, dosing increases on subsequent visits and dosing adjustments for missed visits *mJ = millijoules.



Figure 1. The Supplies for Goeckerman Therapy. The medications and supplies needed for the topical application of tar and corticosteroids (Clockwise). Front Middle: Clobetasol Propionate 0.05%; Front Left: Fluocinolone Acetonide 0.01% Oil; Left: Hydrophillic Ointment; Top Left: Moisturizing Lotion; Middle Left: Jar of 20% Liquid Carbonis Detergens in Aquaphor Ointment with the cap open; Back Middle: Plastic wrap for the occlusion of topical medications; Middle Right: Jar of Crude Coal Tar 2% in White Petrolatum Ointment with the cap open; Ointment; Bottom Middle Right: Triamcinolone 0.01% Ointment; Top Right: Mineral Oil for washing topical medications off; Front Right: 20% LCD lotion.



Figure 2. Narrowband UVB Station. Left is the narrowband UVB light box where patients enter and receive UVB phototherapy. Right is the attached computer station for the charting of phototherapy dosing and patient's response to phototherapy.



Figure 3. Application of Crude Coal Tar. The nurse is applying crude coal tar to the entire body prior to occlusion with plastic wrap.



Figure 4. Shower. The shower for washing off the topical medications with mineral oil and soap. Shower is equipped with safety mats to prevent the floor from getting slippery. Safety handles are also present and important, especially for the elderly.

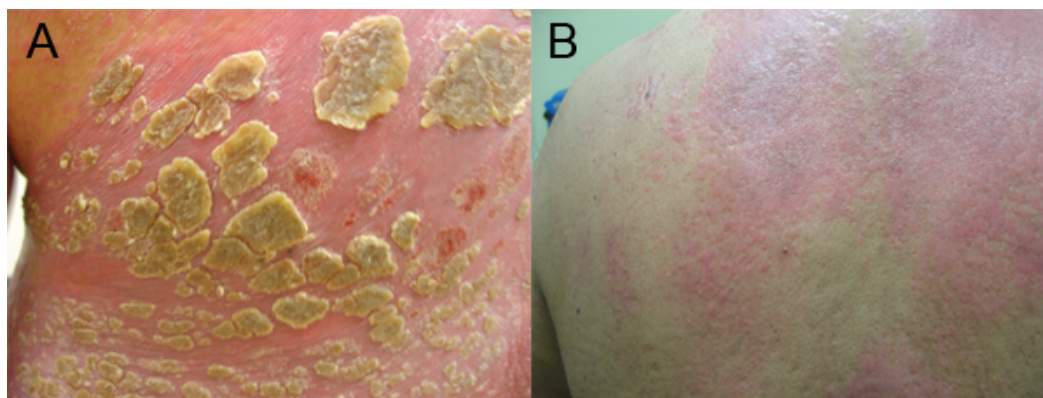


Figure 5. Response to Goeckerman Therapy After Four Weeks. (A) Prior to treatment, the patient with thick plaque type psoriasis over the upper back. Notice the induration, thick scale, and prominent erythema of the plaques. (B) After 4 weeks of Goeckerman treatment, the patient with decreased scale and induration as a result of therapy. Residual erythema is still present.



Figure 6. Response to Goeckerman Therapy After Six Weeks. (A) Prior to treatment, the patient with severe plaque type psoriasis over the back. (B) Clearance of psoriasis lesions after completing Goeckerman therapy.

Discussion

The Goeckerman Regimen protocol outlined above is utilized at UCSF and can be varied in multiple ways according to the patient's response to therapy. Since the patient is seen and examined every day, the protocol can be individualized for each patient to ensure maximum efficacy. The traditional Goeckerman treatment solely consisted of the use of CCT and UVB phototherapy.² However, the regimen has been modified to include the use of topical corticosteroids (and at times other topical medications such as calcipotriene, anthralin and tazarotene).⁵ Pre-existing medications for psoriasis can be continued and can also be beneficial in combination with Goeckerman therapy in helping patients achieve remission with less treatment days. If patients are not responding to the optimal therapy for Goeckerman, patients can be given adjunct systemic medications such as acitretin. Pre-treatment with acitretin (10-25 mg) prior to starting Goeckerman therapy can help decrease the amount of days needed to clear the psoriasis lesions with CCT + phototherapy. It should be noted that acitretin can make a patient photosensitive and the phototherapy dose should be decreased upon initiating acitretin.¹³

Patients who come in with diffuse erythema should be cooled down prior to any topical tar or phototherapy. It is imperative to not give either of those therapies until the erythema has been significantly reduced and the patient does not show signs of intense erythema of the skin. Furthermore, when a patient experiences burning or discomfort secondary to UV exposure, it is important to stop further UV exposure until the patient's symptoms and any visible inflammation has been greatly reduced. UVB and/or tar can exacerbate the disease and worsen the inflammation if caution is not taken in assessing the patient to make sure that the inflammation is not extreme.

The topical application of tar typically starts at 2% CCT. However, if patients do not have any adverse reactions to the tar, then a stronger tar preparation (5% and then 10%) can be applied topically. CCT compounded with salicylic acid can be used if recalcitrant plaques have significant scaling and induration that is not achieving adequate response to the tar alone. 2% salicylic acid is initially used with 10% CCT, and then increased (to 5% and 10% with 10% CCT) as tolerated. Serious adverse reactions to tar or salicylic acid are extremely rare. If adverse reactions, generally limited to local irritation, do occur, patients are switched to a lower strength of tar or held off of tar. Topical corticosteroids are used to decrease the skin inflammation. If the skin irritation is localized, then the topical steroids can be applied to the localized area and CCT can be applied on the rest of the areas.

The safety profile of Goeckerman therapy is excellent in comparison to oral systemic therapies such as cyclosporine, methotrexate or biologics. As previously noted, Goeckerman therapy also does not carry the same internal risks as biologics such as cancer, serious infections, and

increased cardiovascular risk.¹⁰ Since the side effects of Goeckerman therapy are minimal, especially in comparison to other systemic medications, the regimen can be used in everyone including the elderly, children, patients with history of cancer, immunosuppressed patients, and patients with other comorbidities. The milder but more common side effects of Goeckerman therapy are folliculitis and phototoxic reactions. Although there may be a concern about the potential carcinogenic effects of topical application of coal tar, clinical studies examining patients on CCT for an extended period of time have not shown an increased risk of skin cancer. In multiple reviews and follow-up studies, there was no increased risk of cancer associated with the use of CCT in comparison to topical steroids in patients with psoriasis or eczema.¹⁴⁻¹⁶ Based on the safety and efficacy of the therapy, the Goeckerman regimen is an excellent treatment modality for any patient with moderate to severe psoriasis, eczema, and other severe pruritic and/or inflammatory skin conditions.

Disclosures

Dr. Koo is a speaker for Abbott, Leo, and Stiefel-GSK. Dr. Koo conducts research for Amgen, Janssen, Novartis, Photomedex, Galderma, and Pfizer. Dr. Koo has no stocks, employment, or board memberships with any pharmaceutical company. No conflicts of interest disclosed for any other authors.

Acknowledgements

We would like to thank the staff of the UCSF Psoriasis and Skin Treatment Center for their work especially our Goeckerman Coordinator, Sarah Hulse R.N.

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