Benefit of different concentrations of intralesional triamcinolone acetonide in the treatment of nail psoriasis

Protocol Version Date: 17 October 2018

[redacted]

[redacted]

INVESTIGATOR RESPONSIBILITY/SIGNATURE PAGE

Prior to participating in this clinical trial, the Principal Investigator must obtain written approval from his/her Institutional Review Board (IRB).

The Principal Investigator must also agree to:

- Conduct the trial in accordance with the protocol, the signed Clinical Study Agreement, the International Conference of Harmonization Good Clinical Practice (GCP) guidelines, and all applicable FDA clinical trial/device trial regulations.
- Participate in all sponsor-required training prior to study initiation.
- Not begin the study until IRB approval is secured.
- Obtain informed consent as well as authorization for utilization of study data including photographic images from each prospective subject prior to enrollment, using IRB-approved forms.
- Provide all required data and permit source document verification of study data with subjects' medical records.
- Permit representatives of FDA to review, inspect and copy any documents pertaining to this clinical study.
- Retain all case report forms (CRF) and study documentation for the required number of years after study completion in accordance with the appropriate legislation.

The Principal Investigator may delegate one or more of the above functions to another qualified member of the site study team. However, the Principal Investigator retains overall responsibility for proper conduct of the study, including obtaining and documenting subject informed consent, compliance with the study protocol, and the collection of all required data.

I have read and understand the contents of the protocol. I agree to meet all the expectations outlined above.

_____
Investigator Name (print)

_____ _____
Investigator Signature Date

TABLE OF CONTENTS

INTRODUCTION/BACKGROUND

Psoriasis is a chronic, inflammatory disease that affects the skin, joints and nails. The condition affects as many as 7 million people in the United States, approximately 50% of whom are estimated to have nail involvement.[1, 2] The effects of psoriasis on the nail are often overlooked in light of cutaneous manifestations. However, the lifetime incidence of nail involvement is 80-90% among patients with cutaneous psoriasis.[2] In some cases, nail psoriasis is the only manifestation of the disease.[3] Nail psoriasis can also be a marker of psoriatic arthritis, which coexists in 80% of cases and can have debilitating consequences.[2]

Nail psoriasis results in pitting of the nail, separation of the nail from the nail bed, thickening of the skin under the nail, nail discoloration and other abnormalities.[2] Left untreated, nail psoriasis progresses and can result in social stigma, pain, and loss of manual dexterity, which may affect typing, computer work, and many other activities requiring the use of hands. The disorder is diagnosed clinically through physical examination of the nails. A supporting history of cutaneous psoriasis is helpful, though not necessary, in making the diagnosis. Tissue sampling and histological examination can also support the diagnosis, and x-rays of the hand may be used to check for the presence of psoriatic arthritis, which commonly coexists with nail psoriasis.[2, 4]

Current treatments for nail psoriasis include topical therapies, systemic medications, intralesionals, and biologics. The treatment of nail psoriasis is challenging because few guidelines exist; treatment regimens are clinician-dependent and are tailored to the patient's needs.[5] Topical therapy is typically used for mild cases of nail psoriasis. Topical steroids are commonly used as "first-line" therapy. The advantages of topical steroids include low cost and low rate of adverse effects (when not used for prolonged periods).[5] Other topical therapies such as vitamin D analogs, retinoids, fluorouracil, anthralin and tacrolimus are also used. Though many of the therapies listed above are effective in the treatment of nail psoriasis, as topical medications they have several important limitations.[5] The major limitation of all topical medicines is reliance on

patient compliance. The medications must be applied up to two times a day for as long as 2-12 months. Another limitation is limited penetration into the affected part of the nail unit. The therapies are not effective on all nail changes associated with nail psoriasis, and may have poor absorption into the parts of the nail unit responsible for different features of the disease. Systemic therapies such as acitretin, cyclosporin A, and methotrexate are also sometimes used. Good results have been reported with the use of systemics, though they also require strict patient compliance. Biologic drugs such as alefacept, etanercept, infliximab are newer therapies in the treatment of nail psoriasis. They too, have shown to be effective, though confer a risk of severe immunosuppression.

Intralesional corticosteroids, most commonly triamcinolone acetonide (ITA), are often used in the treatment of nail psoriasis. TA is a corticosteroid that is FDA approved for the treatment of psoriasis via intralesional injection. Corticosteroids are used in the treatment of many inflammatory dermatologic diseases. Briefly, they work by inhibiting the body's inflammatory response. At higher doses, the response is more inhibited.

ITA is used in concentrations ranging from 2.5mg/mL - 10mg/mL in the treatment of nail psoriasis.[1, 3] There is debate in the literature regarding the ideal concentration of ITA to treat nail psoriasis.[1] That is, the dose that gives the best efficacy while limiting side effects. No randomized prospective studies investigating this question exist. A number of authors have conducted studies on the efficacy of ITA in the treatment of nail psoriasis using specific concentrations of ITA (most commonly 5mg/mL or 10mg/mL).[6-10] To our knowledge, no authors have directly compared the concentrations to one another. Determining the lowest effective concentration of ITA is important because patients receiving higher than necessary concentrations may experience an increase in side effects. The side effects of corticosteroids such as TA are numerous, and include thinning of the skin at the site of injection, thinning along the lymphatic vessels draining the injection site, allergic reactions, infection, and pituitary suppression.[11]

Previous studies have demonstrated the efficacy of ITA, at different concentrations ranging from 0.1 to 10 mg/mL at 0.1-0.2mL volumes.[6-8, 12] In these studies, nail psoriasis has been shown to significantly clinically improve with the treatment. The studies cited occurred mostly before the year 2000. In no studies to our knowledge were the concentrations compared directly. In 2000, the Nail Psoriasis Severity Index (NaPSI) was developed. The NaPSI is a nail psoriasis assessment tool developed by one of the leaders in the field of nail pathologies, Dr. Richard Scher. This tool, detailed in Appendix A, allows researchers and clinicians to objectively quantify changes in psoriatic nails following treatments and study interventions.[13] Prior to 2000, authors used different methods to assess change following the study intervention, but most of these were qualitative. For example, Peachey et al. used a qualitative assessment (i.e. no improvement versus slight improvement versus marked improvement.) De Berker also used a qualitative assessment, but graded each feature of nail psoriasis (i.e. ridging, pitting, etc.) separately. The most recent study cited by Nantel-Battista et al., did use the NaPSI score. This score is increasingly widely used in studies of nail psoriasis.

The frequency and length of time that injections were administered in the cited studies varied between studies, but in most occurred at monthly intervals for 4-6 months. Four to six months is approximately the amount of time needed for the nail to completely grow, and therefore the amount of time necessary to see results from the study intervention.

Our approach is to investigate different concentrations of ITA in the treatment of nail psoriasis to determine which is the lowest effective concentration. All concentrations under investigation are part of standard clinical practice, as there is no consensus in the literature on the lowest effective concentration. Our study will consider only the fingernails, and not the toenails, of subjects with nail involvement for two reasons. First, toenail psoriasis is less common compared to fingernail psoriasis.[2] Second, in our clinical experience, patients are more motivated to treat fingernails, due to their important functions in daily activities, and for cosmetics. Thus, the treatment of fingernail psoriasis with ITA is most clinically relevant.

Our study will enroll participants with at least two fingernails involved. This will allow us to use placebo in one fingernail of every participant, thus establishing the efficacy of ITA in our study by allowing us to compare placebo to ITA. In addition to efficacy assessments, we will measure changes in quality of life due to the study intervention as an outcome. Quality of life assessments will be done with the NPQ10 assessment, which is a validated assessment tool developed to measure quality of life in nail psoriasis.[14] This tool is included in Appendix B.

All fingernails not treated with placebo will undergo randomization to four groups corresponding to four concentrations of ITA under investigation (2.5, 5.0, 7.5, 10.0 mg/mL). Thus, a participant with five affected fingernails may have a different concentration of ITA used as the study intervention in each fingernail. This approach has been used in studies of ITA in other dermatologic diseases such as alopecia areata.[15] In the cited study, the lesions of subjects with alopecia areata were divided into four quadrants, corresponding to four concentrations of ITA that were injected. We believe this approach will be helpful in comparing the efficacy of different concentrations in the same patient.

SIGNIFICANCE

Psoriasis is a chronic, inflammatory condition that affects millions of people in the United States. Approximately 50% of patients with cutaneous psoriasis have nail involvement; nail psoriasis causes significant pain, and can lead to loss of manual dexterity, therefore impairing the ability to use the hands or perform work. Intralesional triamcinolone acetonide is considered one of the mainstays of treatment for nail psoriasis. By determining the lowest effective concentration of this medication for nail psoriasis, we can minimize side effects for millions of people affected with nail psoriasis worldwide.

OBJECTIVES

The primary objective of this study is to determine the lowest effective concentration of intralesional triamcinolone acetonide in the treatment of nail psoriasis.

The secondary objective is to determine that intralesional triamcinolone acetonide is effective in the treatment of nail psoriasis when compared to placebo, using the Nail Psoriasis Severity Index as a measure of improvement.

Another secondary objective is to determine the rate and nature of side effects experienced by patients using different concentrations of intralesional triamcinolone acetonide for the treatment of nail psoriasis.

Another secondary objective is to assess baseline quality of life in patients with nail psoriasis and determine if there is a change in quality of life with the study intervention.

SUBJECT POPULATION

Inclusion Criteria:

The subject must meet ALL the criteria listed below for entry:

1. Subject must be at least 18 years of age, of either sex or transgendered individuals, and of any race;
2. Subject must have nail psoriasis that is clinically diagnosed of at least 2 fingernails.
3. Subject must be willing to give written informed consent and able to adhere to procedures and visit schedules;
4. Subject must consent to having the fingernails photographed during the study period

Exclusion Criteria:

The subject will be excluded from entry if ANY of the criteria listed below are met:

1. Subject with any clinically significant condition or situation, other than the condition being studied that, in the opinion of the investigator, would interfere with study evaluations or optimal participation in the study. This is including, but not limited to: immunodeficiency, onychomycosis, any other nail condition other than psoriasis, allergy to triamcinolone acetonide, local anesthetic, normal saline, or any other material used for procedures.
2. Subject who has received radiation therapy, chemotherapy, and/or immunosuppressive drugs within 6 months of study, and/or oral corticosteroids for >1 month within the 6 months of study (exception: inhaled steroids);
3. Subject known to have received treatment with investigational drugs or devices within 30 days prior to enrollment into this study;
4. Subject who is unwilling to abstain from any cosmetic nail treatments outside those provided by the study clinic, beyond basic nail trimming (i.e. no spa nail treatments, no nail polish use, no other topical prescription nail medication);

5. Subject who is unwilling to abstain from any medical nail treatments on their nails other than the study intervention (i.e. topical steroids, antifungal creams) for the duration of the study intervention and for duration of the washout period (if applicable);
6. Subject who is part of the staff personnel directly involved with this study or a family member of the investigational study staff

CONCOMITANT MEDICATIONS

All concomitant medication usage from the period of 60 days prior to the trial through the trial period shall be documented and include the following information:

1. Medication
2. Indication
3. Dosage (including frequency)
4. Start / Stop date

All concomitant medication usage will be checked with respect to exclusion criteria and cross-referenced to adverse events (if any).

RESEARCH DESIGN / METHODS

Our approach is to assess the efficacy and safety of different concentrations of ITA in the treatment of nail psoriasis. A similar approach has been taken with psoriasis of the skin, and alopecia areata.[15, 16]

Hypothesis: The lowest concentration of ITA tested offers the best ratio of efficacy to safety.

Study Design: A total of 10 subjects who have nail psoriasis of at least two fingernails will be enrolled. During the screening visit, the investigator will discuss with each subject the nature of the study, its requirements and its restrictions during the Informed Consent Process.

The following will be performed at the screening visit:

- Review of inclusion/exclusion criteria
- Medical history and demographics including age, gender, history of psoriasis
- Review of medications
- Examination of the fingernails
- Possible tissue sampling (clipping the nail) to rule out onychomycosis
- X-ray of the affected hand
- Administration of a survey assessing quality of life at baseline.
- Use the study intervention (intralesional triamcinolone acetonide injections) on your fingernail(s)

Eliciting the patient history and physical exam are part of standard clinical practice. Nail psoriasis is a clinical diagnosis. Tissue sampling may be taken if there is a question about diagnosis, or if there is a possible confounding diagnosis such as onychomycosis. X-rays of the hand may also be taken to determine if there is co-existing arthritic involvement, which is very common in nail psoriasis. Both of these events are part of standard clinical practice and are not research-related procedures. Patients who only decline to obtain x-rays won't be excluded from the study.

After completion of the informed consent process, the study site will take photos of the affected fingernails proposed for enrollment.

Washout Period: Subjects who are using any form of treatment on their nails at the time of the screening visit may participate in the study provided that they are willing to undergo a two-month washout period. During this time, they must abstain from using any nail treatments (including, but not limited to: spa nail treatments, nail polish use, prescribed topical or systemic medications indicated for the nails, over the counter nail treatments, or any other nail intervention with the exception of routine clipping and washing.) After the washout period, the subject may be re-evaluated for participation in the study.

Enrollment and Randomization: Patients with at least two affected fingernails will be enrolled. For each participant, one fingernail will receive an intralesional injection of 0.1-0.2 mL of normal saline (placebo). The other affected fingernail(s) will receive an injection of 0.1-0.2mL of a pre-determined concentration of ITA. Four concentrations of ITA will correspond to four study groups: 2.5mg/mL, 5mg/mL, 7.5mg/mL and 10mg/mL. Participants' fingernails will be randomized such that there are approximately equal numbers of fingernails in each of the five groups (four study interventions, one placebo). To avoid bias, fingernails will be assigned to groups systematically. Fingernails will be assigned to groups in order of anatomical convention. For example, if the subject has involvement of both the thumb, forefinger and third finger of the right hand, the thumb is the first digit, so, if involved, it will be assigned first according to the table below. If a subject has involvement of fingernails of both the right and left hand, the fingernails of the right hand will be assigned before the left. The table assumes that up to 50 nails will be affected between the 10 subjects enrolled. In our clinical experience, this is a reasonable expectation. If more or fewer fingernails are involved during the enrollment period, the randomization table will be adjusted accordingly. The concentration of ITA injected will be different for each group. All other study procedures will be the same between groups.

Fingernail	Group
1	5
2	3
3	4
4	1
5	2
6	4
7	5
8	1
9	3
10	2
11	3
12	4
13	5
14	1
15	2

16	2
17	1
18	3
19	5
20	4
21	5
22	4
23	3
24	2
25	1
26	1
27	2
28	3
29	4
30	5
31	1
32	2
33	4
34	3
35	5
36	5
37	3
38	4
39	2
40	1
41	1
42	3
43	4
44	2
45	5
46	1
47	5
48	2
49	4
50	3

Table 1: Randomization of subjects' fingernails to groups. Groups are numbered 1-5 and correspond to concentrations of ITA such that 1=2.5mg/mL; 2=5.0mg/mL; 3=7.5mg/mL; 4=10.0mg/mL; 5=placebo.

Procedures: Injections of ITA will be administered using standard methods. Hand hygiene procedures will be performed and the administrator will use gloves. Triamcinolone acetonide, at the determined dose, will be drawn into a solution of 1% lidocaine. The nail fold of the affected nail will be cleaned with an alcohol swab. In addition to the local anesthetic given as part of the injection, the area will be anesthetized with an ethyl chloride spray immediately prior to injection using a 30 gauge needle. During injection, the participant may experience light pressure. Following injection, the wound will be covered with a bandage. A board-certified dermatologist will perform all procedures and will be present to monitor for unlikely adverse events, such as excessive bleeding.

None of these procedures differ from the current standard of care. The only aspect that will differ in the treatment of affected nails is the concentration of ITA used. However, there is no current standard of care regarding the concentration; all concentrations under investigation are part of typical clinical practice and have been validated in studies.[1] The purpose of this study is to determine the lowest effective concentration of ITA in the treatment of nail psoriasis.

The schedule of treatments is as follows:
Treatment will be performed using ITA with a frequency of once per 6 weeks +/- 1 week. A follow-up visit will be performed at 24 weeks, ending the study period.

The following will be performed at the first visit:

- Completion of Nail Psoriasis Severity Index
- Collection of survey to document subject's quality of life
- Use the study intervention (intralesional triamcinolone acetonide injections) on the subject’s fingernail(s)
- Take pictures of subject’s nails before and possibly after treatment
- Take an X-ray of the affected hand

The following procedures will be performed at every treatment visit after the first, and at the follow-up visit:

- Measurements of clear nail growth (in millimeters), clear nail area (in mm2)
- Completion of Nail Psoriasis Severity Index.
- Use the study intervention (intralesional triamcinolone acetonide injections) on the subject's fingernail(s)
- Take pictures of subject's nails before and possibly after treatment
- Collection of adverse events, if there are any

The following procedures will be performed at the follow-up visit only:

- Measurements of clear nail growth (in millimeters), clear nail area (in mm2)
- Completion of Nail Psoriasis Severity Index.
- Take pictures of subject's nails
- Collection of survey to document subject's changes in quality of life since the beginning of the study intervention and subjective assessment of nail since the beginning of the study intervention

ADVERSE EVENTS AND REPORTING

Adverse event/effect (AE) assessment will be ongoing throughout the study. All adverse events shall be reported by the clinical Investigator to the Sponsor and IRB following WCMC's reporting policies.

Unanticipated Adverse Effect (UAE)

An unanticipated adverse effect is an adverse effect on health and safety caused by, or associated with, the study intervention, if that problem was not previously identified in nature, severity, or degree of incidence in the investigational plan or application, or any other unanticipated problem that relates to the rights, safety, or welfare of subjects.

The Investigator shall be responsible for determination of the causal relationship of all adverse events to the study intervention and/or procedure. The Principal Investigator is responsible for monitoring the safety of the subjects enrolled.

Any adverse events will be reviewed and analyzed by the Principal Investigator as soon as the event occurs and will be documented in the subject's binder. Any unexpected adverse reactions will be reported by telephone to the IRB within 48 hours of observing the event.

No major adverse effects are anticipated during this study; however, we will screen for severe pain (Pain ≥ 8/10 on self-reported scale).

The following minor adverse effects are anticipated: cold/burning sensation, minor to moderate pain (Pain ≤7 on VAS scale), minor swelling (edema), minor hematomas, and temporary erythema (redness). We will screen for additional possible but not expected adverse effects. If the minute treatment reaches an intolerable threshold of pain >7, the study intervention will be stopped and more anesthetic may be applied if appropriate. Such pain could result from local injection of the skin. A physician will be on site for the to assess for adverse events as needed.

POTENTIAL ADVERSE EFFECTS:	
Epidermal/Nail Response Assessed	**Grading**
Pain	0 = none 1 2 3 = extreme
Persistent Erythema	0 = none 1 2 3 = extreme
Skin atrophy	0 = none 1 2 3 = extreme
Bleeding	0 = none 1 2 3 = extreme
Burning/cold sensation	0 = none 1 2 3 = extreme
Hematoma	0 = none 1 2 3 = extreme

Other (please describe and grade, or enter ‘0’ for none)	

Table 1. The physician shall evaluate the patient’s response to the treatment and screen for possible side effects as listed. 0 = none, 1 = mild, 2 = moderate and 3 = extreme.

Photos shall be taken of any visible treatment effects.

EFFICACY EVALUATIONS

The primary endpoint of this study is to assess the lowest effective concentration of intralesional triamcinolone acetonide in the treatment of nail psoriasis. Safety and tolerability shall be determined based on the reported number of adverse events as outlined in the Adverse Events Section and subject-reported symptoms (if any).

In order to evaluate the efficacy of the proposed treatment, high quality photographs will be taken before and after treatment using standardized lighting, exposure settings, and subject positioning. Trained individuals shall assess the changes in the photographs as outlined in the following paragraphs.

Preliminary assessment of the efficacy of the study intervention will be determined by measuring the amount of clear nail growth. This growth will be compared to the initial amount of clear nail recorded at baseline. Changes in clear area and NaPSI will also be reviewed as study intervention progresses and compared to baseline values.

INSTITUTIONAL REVIEW BOARD

Prior to beginning this study, approval for all study related documents (protocol, consent form, advertising) will be obtained from the Weill Cornell Medical College IRB.

DATA ANALYSIS

Efficacy will be evaluated using nail plate measurements to assess clear nail plate growth and rates of clinical improvement. Clinical improvement will be assessed using the NaPSI, an objective validated measuring tool developed by one of the leaders in the field of nail pathology for use in clinical trials on treatment of nail psoriasis.

Adverse effect intensity will be assessed at each of the treatment visits using a 0-3 scale (0=none, 1=mild, 2=moderate, 3=severe) for each side effect with changes from baseline analyzed using the Wilcoxon signed-ranks test and presented as medians and ranges.

Statistical analysis will be performed using SAS version 9.2 (SAS Institute, Cary, NC). Two-tailed $P < 0.05$ will be considered statistically significant.

MONITORING AND QUALITY ASSURANCE

Site Monitoring

The Principal Investigator will evaluate compliance with the protocol, FDA regulations, IRB and the signed investigator agreement. The study will be monitored according to applicable provisions and applicable national law/regulations.

The Principal Investigator will be reviewing data on an ongoing and consistent basis throughout the duration of the study. The Principal Investigator will review data weekly. The Principal Investigator is responsible for protecting the rights, safety, and welfare of subjects under his/her care. Principal Investigator will be responsible for this review and for determining whether the research should be altered or stopped. If any severe adverse effect directly related to the study intervention occurs, Principal Investigator will report to the IRB or others who might be assigned primary responsibility for this monitoring activity.

Monitoring will include a verification that informed consent was properly obtained for all enrolled study participants, a review of clinical records for accuracy and completeness, resolution of missing or inconsistent results and a review of source documents.

Protocol Adherence

The study investigators are responsible for performing the study in compliance with the protocol. All deviations to the protocol are to be documented in the study records. Any protocol violation that may result in significant additional risk to the subject or that may impact subject safety should be reported to the IRB within 5 working days if they occur. Protocol deviations that do not result in additional risk to the subject (e.g., subject missed visit), are not required to be reported to the IRB; however, they must be documented on the study case report forms and may be reported as part of the annual review process.

Data Management and Collection

Data will be recorded and retrieved via REDCap software. Missing or unclear data will be investigated by the investigators and will be retrieved and clarified by study personnel as necessary throughout the study.

PRIVACY AND CONFIDENTIALITY

All source data will be organized and filed into individual subject binders. Any pertinent notes to file regarding the subject and their study visit will be documented by the study coordinator and kept in the applicable subject binder. All subjects will be assigned a study identification number, which is the only item that will appear on the subject binder. All data used in the analysis and reporting of this evaluation will be used in a manner without identifiable reference to the subject.

Personnel associated with the Investigator's office, the U.S. Food and Drug Administration (FDA), and the Institutional Review Board, have the right to review the data, including photographs, collected during this study. They are also required to maintain confidentiality.

EARLY TERMINATION

If a subject decides to stop taking part in the study for any reason, the subject will be asked to make a final study visit. At this visit, same procedures of the Follow-up visit will be performed. Trial sponsor and trial site shall review the rate of unanticipated adverse events and determine whether to terminate the trial early.

Subjects may also be terminated at the request of the Principal Investigator for such reasons as unanticipated changes in the Protocol that require an Amendment and make the original research methods no longer desirable. In such instances, the subjects may be invited to re-consent and re-enroll in the Amended study.

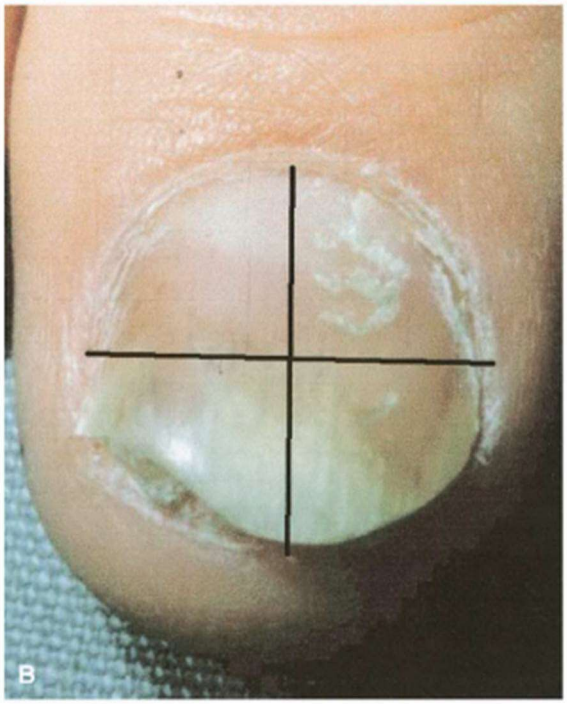
References

1. Jiaravuthisan, M.M., et al., *Psoriasis of the nail: anatomy, pathology, clinical presentation, and a review of the literature on therapy.* J Am Acad Dermatol, 2007. **57**(1): p. 1-27.
2. Baran, R., *The burden of nail psoriasis: an introduction.* Dermatology, 2010. **221 Suppl 1**: p. 1-5.
3. Tan, E.S., W.S. Chong, and H.L. Tey, *Nail psoriasis: a review.* Am J Clin Dermatol, 2012. **13**(6): p. 375-88.
4. Grover, C., B.S. Reddy, and K. Uma Chaturvedi, *Diagnosis of nail psoriasis: importance of biopsy and histopathology.* Br J Dermatol, 2005. **153**(6): p. 1153-8.
5. Rigopoulos, D., *Treatment of Nail Psoriasis*, in *Nail Psoriasis: From A to Z*, D. Rigopoulos and A. Tosti, Editors. 2014, Springer International Publishing: Cham. p. 111-130.
6. Peachey, R.D., R.J. Pye, and R.R. Harman, *The treatment of psoriatic nail dystrophy with intradermal steroid injections.* Br J Dermatol, 1976. **95**(1): p. 75-8.
7. Abell, E. and P.D. Samman, *Intradermal triamcinolone treatment of nail dystrophies.* Br J Dermatol, 1973. **89**(2): p. 191-7.
8. Bleeker, J.J., *Letter: Intradermal triamcinolone acetonide treatment of psoriatic nail dystrophy with Port-o-Jet.* Br J Dermatol, 1975. **92**(4): p. 479.
9. de Berker, D.A. and C.M. Lawrence, *A simplified protocol of steroid injection for psoriatic nail dystrophy.* Br J Dermatol, 1998. **138**(1): p. 90-5.
10. Nantel-Battista, M., et al., *Treatment of nail psoriasis with intralesional triamcinolone acetonide using a needle-free jet injector: a prospective trial.* J Cutan Med Surg, 2014. **18**(1): p. 38-42.
11. Coskey, R.J., *Adverse effects of corticosteroids: I. Topical and intralesional.* Clin Dermatol, 1986. **4**(1): p. 155-60.
12. Scher, R.K. and C.R. Daniel, *Nails : therapy, diagnosis, surgery*. 1990, Philadelphia: Saunders. xv, 320 p.
13. Rich, P. and R.K. Scher, *Nail Psoriasis Severity Index: a useful tool for evaluation of nail psoriasis.* J Am Acad Dermatol, 2003. **49**(2): p. 206-12.

14. Ortonne, J.P., et al., *Development and validation of nail psoriasis quality of life scale (NPQ10).* J Eur Acad Dermatol Venereol, 2010. **24**(1): p. 22-7.
15. Chu, T.W., et al., *Benefit of different concentrations of intralesional triamcinolone acetonide in alopecia areata: An intrasubject pilot study.* J Am Acad Dermatol, 2015. **73**(2): p. 338-40.
16. Readett, M.D., *Intralesional triamcinolone acetonide in the treatment of psoriasis.* Br J Dermatol, 1961. **73**: p. 107-9.

APPENDIX A

Nail Psoriasis Severity Index



Nail Psoriasis Severity Index (NAPSI)
The target nail is graded for nail matrix psoriasis and nail bed psoriasis. The sum of these two scores is the total score for that nail.
Nail Matrix Psoriasis consists of **any** the following: pitting, leukonychia, red spots in the lunula, and nail plate crumbling.

score for **matrix** psoriasis **2**
0=none
1=present in 1/4 nail
2=present in 2/4
3=present in 3/4
4=present in 4/4

Nail Bed Psoriasis is the presence or absence of any of the following: onycholysis, splinter hemorrhages, oil drop (salmon patch) discoloration, and nail bed hyperkeratosis.

Score for **nail bed** psoriasis **3**
0=none
1=present in 1/4 nail
2=present in 2/4
3=present in 3/4
4=present in 4/4

Total for nail 5 (0-8)

C

From Rich, P. and R.K. Scher, *Nail Psoriasis Severity Index: a useful tool for evaluation of nail psoriasis.* J Am Acad Dermatol, 2003. **49**(2): p. 206-12.

Table I. Instructions for grading psoriatic nails using NAPSI*

The nail is divided with imaginary horizontal and longitudinal lines into quadrants. Each nail is given a score for nail bed psoriasis (0-4) and nail matrix psoriasis (0-4) depending on the presence of *any* of the features of nail psoriasis in that quadrant.

1. Evaluation 1: Nail matrix. In each quadrant of the nail, nail matrix psoriasis is evaluated by presence of *any* of the nail matrix features (pitting, leukonychia red spots in the lunula, crumbling): 0 for none, 1 if present in 1 quadrant of the nail, 2 if present in 2 quadrants of the nail, 3 if present in 3 quadrants of the nail, and 4 if present in 4 quadrants of the nail.
2. Evaluation 2: Nail bed. Nail bed psoriasis is evaluated by the presence of *any* of the nail bed features (onycholysis, splinter hemorrhages, subungual hyperkeratosis, "oil drop" (salmon patch dyschroma): 0 for none, 1 for 1 quadrant only, 2 for 2 quadrants, 3 for 3 quadrants, and 4 for 4 quadrants.
3. Each nail gets a matrix score and a nail bed score, the total of which is the score for that nail (0-8).
4. Each nail is evaluated, and the sum of all the nails is the total NAPSI score. The sum of the scores from all nails is 0-80; or 0-160 if toenails are included. At any time the matrix or nail bed score can be assessed independently if desired.

If a target nail scale is desired, the same technique can be used to evaluate all 8 parameters (pitting, leukonychia, red spots in lunula, crumbling, oil drop, onycholysis, hyperkeratosis, and splinter hemorrhages) in each quadrant of the nail, giving that 1 nail a score of 0-32.

From Rich, P. and R.K. Scher, *Nail Psoriasis Severity Index: a useful tool for evaluation of nail psoriasis.* J Am Acad Dermatol, 2003. **49**(2): p. 206-12.

APPENDIX B

NPQ10

Directions: Below is a series of statements. Read each statement. Then, circle the answer choice that best describes your experience with nail psoriasis.

1. State the location of your psoriasis of the nails.
    a. Fingernails
    b. Toenails
    c. Both
2. Would you say that your psoriasis of the nails is mostly:
    a. Very painful
    b. Somewhat painful
    c. Not painful
3. Because of my psoriasis of the nails, I have difficulty putting my shoes on.
    a. Always
    b. Sometimes
    c. Never
4. Because of my psoriasis of the nails, I don't do any of the jobs I usually do around the house.
    a. Always
    b. Sometimes
    c. Never
5. Because of my psoriasis of the nails, I get dressed more slowly than usual.
    a. Always
    b. Sometimes
    c. Never
6. Because of my psoriasis of the nails, I have trouble putting on my socks (or stockings or tights).
    a. Always
    b. Sometimes
    c. Never
7. Because of my psoriasis of the nails, I have trouble turning my door key.
    a. Always
    b. Sometimes
    c. Never
8. Because of my psoriasis of the nails, I have trouble driving my car.
    a. Always
    b. Sometimes
    c. Never
9. Because of my psoriasis of the nails, someone helps me to get dressed.
    a. Always
    b. Sometimes
    c. Never
10. Because of my psoriasis of the nails, I avoid doing big jobs around the house:

a. Always
b. Sometimes
c. Never

11. Because of my psoriasis of the nails, I am more irritable than usual, and bad-tempered with people:
    a. Always
    b. Sometimes
    c. Never

Adapted from Ortonne, J.P., et al., *Development and validation of nail psoriasis quality of life scale (NPQ10).* J Eur Acad Dermatol Venereol, 2010. **24**(1): p. 22-7.