Therapeutic options for erosive pustular dermatosis of the scalp: a systematic review*

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Summary

Background Erosive pustular dermatosis of the scalp (EPDS) is a chronic condition characterized by erosive plaques and subsequent scarring alopecia as a result of local trauma or inflammation. A number of therapeutic approaches have been described in the literature but there is no consensus of opinion on optimal treatment of the disease. Objectives To provide evidence-based recommendations for topical and systemic treatment of adult patients with EPDS by performing a systematic review.

Methods The MEDLINE, MEDLINE In-Process, Embase and Cochrane databases were searched from inception to 26 June 2019 in accordance with the PRISMA guidelines for studies involving adult patients treated for EPDS with at least one reported response to treatment. The study was registered on PROSPERO. Texts were reviewed independently by two authors. The risk of bias and quality of the studies were assessed using the Quality Appraisal Checklist for Case Series Studies.

Results In total 75 studies were included, involving 168 patients. Many treatments have been reported in the literature, with varying degrees of therapeutic success. The results were highly heterogeneous and methodological quality was very low. We were unable to perform a meta-analysis on the data.

Conclusions The limited available evidence supports use of topical corticosteroids, with or without oral zinc, followed by maintenance therapy with topical calcineurin inhibitors as being effective in managing this condition. Topical photodynamic therapy is also potentially beneficial in the management of EPDS. Prospective, comparative, randomized controlled trials are required in order to provide further evidence to guide treatment.

What is already known about this topic?

- Erosive pustular dermatosis of the scalp (EPDS) is a chronic skin condition affecting elderly patients with actinic damage, and may lead to significant morbidity.
- EPDS is frequently caused by iatrogenic injury from medical treatments and is increasingly recognized in the literature.
- No guidelines on optimal treatment of patients with EPDS exist.

What does this study add?

- There is little evidence to support decisions on treatment of EPDS in the literature.
- Clinicians might use topical corticosteroids followed by topical calcineurin inhibitors, and consider topical photodynamic therapy.
- Further studies are needed to improve the evidence base underpinning treatment decisions.
Erosive pustular dermatosis of the scalp (EPDS) is an inflammatory skin disease first described in 1979 by Pye et al. Although it is considered to be uncommon, recent literature has suggested that the condition is simply under-recognized in clinical practice. EPDS is characterized by skin atrophy, erosions and thick crusts with chronic inflammatory changes histologically, resulting in destruction of hair follicles and scarring alopecia. The diagnosis is commonly overlooked and patients may be misdiagnosed with inflammatory dermatoses, cutaneous malignancy or immunobullous disease. Misdiagnosis as actinic field change or skin cancer may be particularly problematic, as treatment with surgery, topical 5-fluorouracil, imiquimod and cryotherapy are all reported to precipitate EPDS.

EPDS is reported to have a propensity towards elderly white women; however, recent studies have reported that male patients are more frequently affected. The pathogenesis of the condition is yet to be fully elucidated, but it is thought to be the result of local trauma on the background of actinic damage and atrophy leading to chronic inflammation and impaired wound healing. When specimens from hair-bearing scalp have been examined microscopically, a spongiotic and pustular superficial folliculitis has been observed. For this reason, it has been suggested that EPDS may fall into the spectrum of neutrophilic dermatoses displaying pathergy at sites of local trauma.

A number of therapeutic approaches for EPDS have been reported in the literature. Topical corticosteroids (TCS) have been used since the condition was first recognized. Other therapeutic strategies have also been described. Topical calcineurin inhibitors (TCIs) are often used as steroid-sparing agents, in addition to topical calcipotriol and retinoids. Antibiotics are often administered due to the clinical appearance of EPDS mimicking infection, but they are felt to be unnecessary. Nevertheless, dapsone has been reported to be effective due to its antineutrophilic action. Surgical approaches, including deep excision and grafting, have also been reported.

To date, no systematic review has been conducted on therapeutic options for EPDS. The current data available on the management of EPDS are based largely on case reports and case series. To our knowledge, no evidence-based clinical guideline currently exists in the UK or internationally for the treatment for EPDS.

Objective

The objective of this study was to perform a systematic review of adult patients diagnosed with EPDS in order to ascertain which topical or systemic treatments are most effective, when compared with each other, in obtaining complete resolution of disease.

Methods

Protocol and registration

The protocol for this review was defined a priori and registered online in the PROSPERO international prospective register of systematic reviews. The register ID was 126865. This review was conducted in accordance with PRISMA and the Cochrane Handbook for Systematic Reviews.

Eligibility criteria

Studies were included if (i) patients were ≥18 years old and diagnosed either clinically, histologically or both; (ii) they were randomized controlled trials, cohort studies, case–control studies, case series, case reports or letters; (iii) they were published in the English language and (iv) they reported at least one outcome of treatment.

Studies were excluded if (i) a diagnosis of EPDS was not made; (ii) participants were <18 years old; (iii) patients had nonscalp disease and (iv) they were abstract or poster presentations. No restrictions were set on the number of patients included in a study.

Information sources

The MEDLINE, MEDLINE In-Process, Embase and Cochrane databases were searched from inception to 26 June 2019 using the search terms (i) ‘erosive pustular dermatosis.mp.’ OR ‘erosive pustulosis.mp.’; AND (ii) ‘therapy.mp. or exp Therapeutics/’; (iii) surg$.mp. Restriction to the English language was set. The reference lists of the shortlisted studies were then screened. The PRISMA statement was followed and the checklist completed. Note that mp = title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier.

Study selection

Following the database search, studies were compiled into a single list with all duplicates removed. Titles and abstracts were then screened for initial eligibility by two reviewers independently (M.H.J. and J.K.) and conflicts were resolved by a third independent reviewer (M.R.). Full-text publications were retrieved and assessed using the complete eligibility criteria in a similar fashion. Reference lists of included publications were screened, and citation tracking was completed on Google Scholar. Other relevant systematic reviews were also screened for further relevant studies that might have been missed. Figure 1 outlines the study selection process.

Outcomes

The primary outcome was response to treatment, defined as complete resolution, partial resolution, stable disease, progressive disease or recurrent disease. Secondary outcome measures were duration of treatment, side-effects of therapy, cosmetic outcome, pain, volume of pus and impact on quality of life.

Data collection, synthesis and management

Data were extracted independently by two authors into a Microsoft Excel spreadsheet. The information extracted from eligible studies included general information (first author’s name, year of publication); study characteristics (study type,
number of patients); participant characteristics (age, sex); disease characteristics (predisposing factors); outcome measures (outcome following treatment for EPDS and duration of treatment); and duration of follow-up. The primary outcome of response to treatment was classified into one of the five outcome categories. Any differences were discussed. If primary outcomes were missing, the corresponding author was contacted and requested to provide further information.

Therapies were grouped according to drug class and route of administration. The following categories were included: (i) TCS, (ii) systemic steroids, (iii) topical antibiotics, (iv) systemic antibiotics, (v) TCIs, (vi) systemic calcineurin inhibitors, (vii) nonsteroidal anti-inflammatory drugs (NSAIDs), (viii) oral zinc, (ix) topical calcipotriol, (x) antifungals, (xi) oral retinoids, (xii) topical retinoids, (xiii) topical photodynamic therapy (PDT), (xiv) dressings, (xv) allografts, (xvi) methotrexate, (xvii) laser and (xviii) tofacitinib. Analysis using $\chi^2$-tests was used to determine whether any statistical significance existed between outcomes for different potencies of TCS used.

The primary analysis was the proportion of patients who achieved complete resolution following treatment. If necessary, a random effects meta-analysis was to be performed to incorporate heterogeneity. If there was considerable variation in results or inconsistency, meta-analysis would not be performed and the data would be presented in narrative review only. All monotherapies are described in the narratives below and are presented in a table. All combination therapies are presented in a table.

Figure 1 PRISMA flowchart of the study. The selection process for study inclusion in the systematic review and meta-analysis according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis.
Quality and risk of bias in individual studies

Two reviewers (J.K. and X.L.T.) assessed the methodological quality of the evidence and the risk of bias of the included studies independently using the 20-item Quality Appraisal Checklist for Case Series Studies, developed by the Institute of Health Economics using the Delphi method. Any uncertainty was resolved through discussion with a third reviewer (M.R.).

Results

Study identification

The literature search identified 137 references (Figure 1). After title and abstract screening and removal of duplicates, 89 records underwent full-text review. Fourteen records were excluded: eight did not discuss treatment of EPDS, a further four did not report any quantitative data and two studies discussed an alternative diagnosis to EPDS.

Description of studies

The studies included 56 case reports and 19 case series (Table S1; see Supporting Information). Of the 168 patients included across all studies, 97 were male and 70 were female (one unspecified). From the data available, the median age of patients included in all studies was 76 years [interquartile range (IQR) 62–81]. Two patients in one study were excluded from the analysis as they were under the age of 18 years, and four other patients were included from the same study. Thirty-seven studies reported follow-up periods; the median follow-up period was 10 months (IQR 4–24).

Bias and quality assessment

The sample sizes of all studies were small; most were case reports and some were case series. All studies were noncontrolled, leading to a high risk of confounding. The risk of selection bias was high due to lack of randomization. Risk of reporting bias was high due to lack of blinding in all studies. Only four studies measured outcomes using an appropriate objective method. All studies were deemed to be of very low quality (Table S2; see Supporting Information). No confidence intervals were stated so the authors cannot comment on precision. Although it is difficult to evaluate fully, the reported efficacy of treatments appeared to be relatively consistent between studies. Due to the nature of case reports, as an uncontrolled observation, a cause effect between treatment and disease outcome cannot be inferred. It is challenging to comment on publication bias; however, as the body of evidence is from case reports, it would seem unlikely that ineffective treatments would have been reported.

Outcomes

A number of factors were reported to precipitate EPDS (Table 1). The most commonly reported cosmetic outcome was scarring alopecia, which was reported in 38 patients.

Effect of interventions

The effects of treatments administered as monotherapy are presented in Table 2.

Topical corticosteroids

TCS were the most frequently used treatment for EPDS. Very potent TCS were used in 78 cases (clobetasol 77 cases, unspecified one case) and potent TCS were used in 25 cases (betamethasone 14 cases, unspecified five cases, fluocinolone two cases, mometasone two cases, halometasone one case, desoximetasone one case). Mild TCS were used in one case (hydrocortisone), and 25 cases did not report the potency of the TCS used.

Twenty-two studies, involving 79 patients, reported outcomes for TCS used as monotherapy. Where stated, the median duration of treatment was 6 weeks (IQR 3–10). Complete resolution was achieved in 32 patients (41%). Partial resolution occurred in 38 (48%) and stable disease was observed in eight patients (10%). One patient had disease recurrence. Secondary outcomes included the presence of steroid-related skin atrophy, in seven patients (9%). TCS were also used as part of combination therapy in 34 studies involving 50 patients. There was no significant difference in the outcome associated with the potency of TCS used (P = 0.47).
Systemic corticosteroids

Four studies, involving eight patients, reported outcomes for systemic corticosteroids used as monotherapy.⁶,¹⁶,²⁰,⁶⁵ One study reported the treatment duration, which was 5 weeks. Complete resolution was achieved in four patients (50%); three (38%) had partial resolution and one patient had stable disease. Systemic corticosteroids were used as part of combination therapy in 10 studies involving 11 patients.¹⁴,³⁷,⁵¹–⁵³,⁶⁶ The most commonly used topical antibiotics were dapsone (five cases) and gentamicin (five cases).

Topical antibiotics

Two studies, involving five patients, reported outcomes for topical antibiotics used as monotherapy.⁹,³³ One study reported the treatment duration, which was 13-6 weeks. Complete resolution was achieved in four patients (80%) and one patient had stable disease. Topical antibiotics were used as part of combination therapy in 16 studies involving 17 patients.³¹,³⁴,³⁶,³⁸,⁴⁷,⁵⁵,⁵⁷,⁶¹,⁶⁷,⁶⁹ The most commonly used topical antibiotics were dapsone (three cases) and gentamicin (five cases).

Systemic antibiotics

Two studies, involving two patients, reported outcomes for oral antibiotics used as monotherapy.⁴⁶,⁶⁰ The median duration of treatment was 10 weeks. One patient had partial resolution and one had progressive disease. Systemic antibiotics were used as part of combination therapy in 10 studies involving 12 patients.¹⁵,³¹,³⁶,³⁸,⁴⁷,⁵⁵,⁵⁷,⁶¹,⁶⁷,⁷⁰ The most commonly used systemic antibiotics were dapsone (three cases) and minocycline (three cases).

Topical calcineurin inhibitors

Twelve studies, involving 14 patients, reported outcomes for TCIs used as monotherapy.⁷,²⁰,²⁵–²⁸,³⁰,³⁹,⁴³,⁵⁵,⁵⁷,⁷¹ All studies used topical tacrolimus 0.¹%. From the data available, the median duration of therapy was 8 weeks (IQR 4–15). Complete resolution was achieved in 10 patients (⁷¹%). Three patients (21%) had partial resolution and one had disease recurrence. Secondary outcomes included burning pain in two patients, partial hair regrowth in one patient and recovery of skin atrophy in one patient. TCIs were used as part of combination therapy in eight studies involving 16 patients.⁴,¹⁴,³⁵,⁵⁰,⁶⁶–⁶⁸,⁷²

Systemic calcineurin inhibitors

Systemic calcineurin inhibitors (ciclosporin) were used in one patient, who achieved complete resolution. The patient developed hypertension and renal impairment and treatment was stopped.²¹

Table 2 Monotherapies used in the treatment of erosive pustular dermatosis of the scalp

| Therapy                        | Number of studies | Number of patients | Duration of treatment (weeks), median (IQR) | Primary outcomes | Secondary outcomes |
|--------------------------------|-------------------|--------------------|---------------------------------------------|------------------|-------------------|
| TCS                            | 22                | 79                 | 6 (3–10)                                    | 32 38 8 1        | Skin atrophy (7)   |
| Systemic steroids              | 4                 | 8                  | 5                                            | 4 3 1            |                   |
| Topical antibiotic             | 2                 | 5                  | 13.6                                         | 4 1              |                   |
| Systemic antibiotic            | 2                 | 2                  | 10                                           | 1 1              |                   |
| TCI                            | 12                | 14                 | 8 (4–15)                                    | 10 3 1           |                   |
| Systemic calcineurin inhibitors| 1                 | 1                  |                                               | 1                |                   |
| NSAID                          | 1                 | 1                  | 6                                            | 1                |                   |
| Oral zinc                      | 1                 | 1                  |                                               | 1                |                   |
| Topical calcipotriol           | 1                 | 1                  | 8                                            | 1                |                   |
| Antifungal                     | 1                 | 1                  |                                               | 1                |                   |
| Oral retinoid                  | 2                 | 3                  | 12                                           | 1 1 1            |                   |
| Topical retinoid               | 1                 | 1                  | 52                                           | 1                |                   |
| Topical PDT                    | 4                 | 15                 |                                               | 14 1             | Pain, erythema (1) |
| Dressing                       | 1                 | 1                  | 2                                            | 1                |                   |
| Human amnion/choroid allograft | 1                 | 1                  |                                               | 1                |                   |
| Methotrexate                   | 1                 | 1                  |                                               | 1                | Headache, nausea  |
| Er:YAG laser                   | 1                 | 1                  |                                               | 1                |                   |
| Oral tofacitinib               | 1                 | 1                  |                                               | 1                |                   |

CR, complete resolution; Er:YAG, erbium–yttrium aluminium garnet; IQR, interquartile range; NSAID, nonsteroidal anti-inflammatory drug; PD, progressive disease; PDT, photodynamic therapy; PR, partial resolution; RD, recurrent disease; SD, stable disease; TCI, topical calcineurin inhibitor; TCS, topical corticosteroid.

CR, complete resolution; Er:YAG, erbium–yttrium aluminium garnet; IQR, interquartile range; NSAID, nonsteroidal anti-inflammatory drug; PD, progressive disease; PDT, photodynamic therapy; PR, partial resolution; RD, recurrent disease; SD, stable disease; TCI, topical calcineurin inhibitor; TCS, topical corticosteroid.
Nonsteroidal anti-inflammatory drugs

Oral NSAIDs were used as monotherapy for 6 weeks in one patient, who achieved complete resolution. Oral NSAIDs were used as part of combination therapy in one study involving two patients. Nimesulide was used in all cases.

Oral zinc

Oral zinc was used as monotherapy in one patient, who achieved complete resolution. Oral zinc was used as part of combination therapy in eight studies involving nine patients.

Topical calcipotriol

Topical calcipotriol was used as monotherapy for 8 weeks in one patient, who achieved complete resolution. Hair regrowth was reported. Topical calcipotriol was used as part of combination therapy in three studies with a total of three patients.

Antifungals

One study of one patient reported outcomes for oral antifungal agents; the patient had stable disease. Topical antifungals were used as part of combination therapy in four studies with a total of four patients.

Retinoids

Two studies, involving three patients, reported outcomes for oral retinoids used as monotherapy. Where stated, the median duration of therapy was 12 weeks. Complete resolution was achieved in one patient, one patient had partial resolution and one patient had stable disease. Oral retinoids were used as part of combination therapy in four studies involving four patients. Topical retinoids were used as monotherapy in one study of one patient for 52 weeks, with the patient developing progressive disease.

Topical photodynamic therapy

Four studies, involving 15 patients, reported outcomes for topical PDT (all using aminolaevulinic acid). Complete resolution was achieved in 14 patients, and one patient had recurrent disease (with subsequent complete resolution following a second course of treatment). Secondary outcomes reported included pain and erythema. Topical PDT was used as part of combination therapy in one study of one patient.

Dressings

Wound dressing was used as monotherapy for 2 weeks in one patient, who achieved complete resolution.

Allografts

One study evaluated the use of a human amnion/choroid allograft in one patient, who achieved complete resolution.

Methotrexate

Oral methotrexate was used in one patient, but was stopped due to adverse effects.

Laser

Erbium–yttrium aluminium garnet laser was used in one patient, achieving complete resolution.

Tofacitinib

The oral Janus kinase inhibitor, tofacitinib, was used in one patient for the treatment of both rheumatoid arthritis and EPDS. The patient achieved partial resolution of both conditions.

Combination therapies

Many therapies were administered in combination in an attempt to improve efficacy (Table 3). The overall rate of complete resolution in patients receiving combination therapies was 23 of 55 (42%), compared with 72 of 143 (50.3%) patients receiving monotherapy. The majority of reported cases used TCS in combination with other agents. When TCS were administered alone, the complete resolution rate was 32 of 79 (41%). When TCS were administered as part of combination therapy the complete resolution rate was 28 of 50 (56%).

Discussion

There is insufficient evidence to make conclusions on the demographics of patients with EPDS; however, there appeared to be a tendency towards older patients, with the median age of those affected by EPDS being 76 years. In contrast to previous published studies, we observed that men were more frequently affected than women. The studies highlighted that EPDS may be caused by a number of factors, often iatrogenic (surgery or inflammation provoked by topical medication).

Each included study stated at least one of this review’s primary outcomes. Not all studies provided data for secondary outcomes, particularly adverse effects of therapy. No studies commented on effects on quality of life.

All studies contained small numbers of patients and had no rigorous methodological procedures to prevent bias. All studies were single arm in design, except for one, which was a split-scalp study. We attempted to limit bias in the review process by designating qualitative data regarding response to treatment into one of our five outcome categories. When there were discrepancies between reviewers, these were discussed.
and consensus was achieved. Nonetheless, the significant limitations of the studies resulted in levels of heterogeneity too high to allow pooling of data for meta-analysis. The authors acknowledge the introduction of language bias by including only English-language studies.

It is therefore challenging to draw definitive conclusions regarding the comparative efficacy of individual treatment approaches. The greatest body of evidence exists for the use of TCS, either alone or in combination. TCS may be used first line due to their low cost. A number of studies reported adverse events related to steroid therapy, namely skin atrophy. As atrophy is described to play a key part in the pathogenesis of EPDS, long-term therapy with high-potency TCS should be given careful consideration. Studies have reported relapse following cessation of TCS, and so intermittent treatment as maintenance therapy may be advised.

TCIs were used as steroid-sparing agents in a number of studies, and complete resolution was achieved in more than 70% of cases. While topical PDT was used in only 15 cases, a high proportion of these patients achieved complete resolution of EPDS. However, there are reports of PDT precipitating EPDS. Both TCIs and topical PDT were reported to cause discomfort in patients.

Therapeutic agents were frequently used in combination. It is similarly challenging to draw conclusions regarding the effectiveness of combined treatments due to the low number of studies reporting each combination. Furthermore, the relative contributions of each of the individual agents to the overall therapeutic effect are difficult to deduce, and our results suggest that combining therapies had no effect on clinical outcomes. Among these combination studies, there was some evidence to support the use of oral zinc in combination with TCS. The rationale behind oral zinc supplementation arose from a 1982 case report by Ikeda et al., who supplemented the borderline-low zinc level of a patient with EPDS, resulting in disease resolution. Overall, seven of nine patients (78%) who received TCS and zinc achieved complete remission.

### Table 3 Combination therapies used in the treatment of erosive pustular dermatosis of the scalp

| Therapies | Study characteristics |
|-----------|-----------------------|
|           | No. studies | No. patients | Duration (weeks) | CR | PR | SD | PD | RD |
| TCS, topical abx | 5 | 6 | 8* | 3 | 2 | 1 |   |   |
| TCS, oral abx | 2 | 2 | 16 | 1 | 1 |   |   |   |
| TCS, systemic steroid | 2 | 3 | 2 | 2 |   | 1 |   |   |
| TCS, oral zinc | 3 | 3 | 9* | 2 | 1 |   |   |   |
| TCS, topical calcipotriol | 1 | 1 | 16 | 1 |   |   |   |   |
| TCS, boric acid rinse | 1 | 2 | 5 | 1 | 1 |   |   |   |
| TCS, topical calcineurin inhibitor | 1 | 1 |   |   |   |   |   |   |
| TCS, topical collagenase, topical calcipotriol, oral (abx, retinoid, zinc, vitamin C) | 1 | 1 | 12 | 1 |   |   |   |   |
| TCS, PDT | 1 | 1 |   |   |   |   |   |   |
| TCS, systemic steroid, topical abx | 3 | 3 | 1 | 2 |   |   |   |   |
| TCS, oral abx, topical calcipotriol | 1 | 1 |   |   |   |   |   |   |
| TCS, systemic steroid, oral zinc | 2 | 2 | 7* | 2 |   |   |   |   |
| TCS, oral zinc, oral retinoid | 1 | 1 | 1 |   |   |   |   |   |
| TCS, topical abx, topical antifungal | 2 | 2 | 1 | 1 |   |   |   |   |
| TCS, systemic steroid, topical abx, oral zinc | 1 | 2 | 2 |   |   |   |   |   |
| TCS, topical collagenase, topical calcipotriol, oral (abx, retinoid, zinc, vitamin C) | 1 | 1 | 1 |   |   |   |   |   |
| TCI, systemic steroid | 2 | 2 |   | 2 |   |   |   |   |
| TCI, topical abx | 1 | 1 | 4 | 1 |   |   |   |   |
| TCI, topical abx | 1 | 1 |   |   |   |   |   |   |
| TCI, topical abx, topical abx | 1 | 1 | 32 | 1 |   |   |   |   |
| Topical abx, systemic abx, debridement | 1 | 1 |   |   |   |   |   |   |
| Topical abx, intralesional steroid | 1 | 1 | 1 |   |   |   |   |   |
| Topical abx, oral retinoid | 1 | 1 | 16 | 1 |   |   |   |   |
| Topical abx, systemic abx | 1 | 1 | 1 |   |   |   |   |   |
| Oral abx, topical calcipotriol | 1 | 1 | 6 | 1 |   |   |   |   |
| Oral NSAID, topical antifungal | 1 | 1 | 8 | 1 |   |   |   |   |

abx, antibiotics; CR, complete resolution; NSAID, nonsteroidal anti-inflammatory drug; PD, progressive disease; PR, partial resolution; RD, recurrent disease; SD, stable disease; TCI, topical calcineurin inhibitor; TCS, topical corticosteroid. *Median duration.
In conclusion, despite the considerable limitations of the currently available clinical data, this systematic review suggests that the use of TCS to achieve disease control, with or without the addition of oral zinc, followed by TCIs to maintain remission, may be an effective treatment strategy for EPDS. Topical PDT may also have a role as a primary therapeutic approach. However, clinicians should be aware of the possibility that treatments may potentially exacerbate disease. Prospective, comparative, randomized controlled trials are now required to improve the evidence base for this increasingly common condition.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher’s website:

Table S1 Summary of studies reporting treatment of erosive pustular dermatosis of the scalp.

Table S2 Risk of bias and quality of the studies.

Powerpoint S1 Journal Club Slide Set.