

Evaluating Psoriasis: A Review of the Assessments Most Commonly Used in Clinical Trials

Rita V. Patel, M.D.,¹ Cindy L. Tsui, B.S.²

ABSTRACT

Psoriasis is a chronic autoimmune inflammatory skin disease that affects 1% to 3% of the global population. Because no psoriasis biomarkers are available to assess disease severity, clinical measures are used in daily practice and in research to measure both severity and treatment response. In the clinic, psoriasis may be graded by the dermatologist as mild to severe and improvement measured as worse, unchanged, better, much better, or clear. However, these scales are insufficient for clinical trials, where objective tools that are reliable, valid, and consistent from investigator to investigator are needed to quantify disease activity more precisely. The aim of this research is to update the reader on how to assess the major evaluation components of psoriasis severity and to review the most common global and local psoriasis scales used by the clinical trial physician (Psoriasis Area and Severity Index, Physician's Global Assessment, Target Lesion Psoriasis Severity Scale, Lattice System Physician's Global Assessment).

INTRODUCTION

Psoriasis is a chronic autoimmune inflammatory skin disease that affects 1% to 3% of the global population.¹ The substantial impact on quality of life and disability secondary to psoriasis parallels that of heart disease and arthritis.² Because no psoriasis biomarkers are available to assess disease severity, clinical measures are used in daily practice and in research to measure both severity and treatment response. In the clinic, psoriasis may be graded by the dermatologist as mild to severe and improvement measured as worse, unchanged, better, much better, or clear. However, these scales are insufficient for clinical trials where objective tools that are reliable, valid, and consistent from investigator to investigator are needed to quantify more precisely disease activity.³ The focus

of a severity measure is to discriminate between levels of psoriasis, whereas outcome measures detect changes secondary to treatment. The ideal scale is clearly defined with universal applicability, ease of use, flexibility, and clinical significance.^{4,5}

The aim of this research is to update the reader on how to assess the major evaluation components of psoriasis severity and to review the most common global and local psoriasis scales used by the clinical trial physician. This article focuses on three global scoring methods: Psoriasis Area and Severity Index (PASI), Physician's Global Assessment (PGA), and Lattice System Physician's Global Assessment (LS-PGA). The PASI is a quantitative, objective method of assessing psoriasis; it uses a mathematical equation to combine percentage body surface

¹Miller School of Medicine, University of Miami, Miami, Florida; ²Mount Sinai School of Medicine, New York, New York

Corresponding author

Rita V. Patel, M.D.
Department of Dermatology
Miller School of Medicine
University of Miami
1295 NW 14th St., Suite K-M
Miami, FL 33136
Tel: 305.243-6704
Fax: 305.243.3503
E-mail: ritavpatel@gmail.com

Disclosures

Dr. Rita V. Patel and Cindy L. Tsui have no conflicts of interest to declare.

Key words: Psoriasis, Psoriasis Area and Severity Index, Physician Global Assessment, Lattice System Physician's Global Assessment, Target Lesion Psoriasis Severity Scale

area (BSA) affected and measures of erythema, induration, and desquamation of different lesions into one value.¹ In clinical trials, the PASI is used most often; in clinical practice, on the other hand, the PASI is time consuming and impractical. The PGA (also known as Psoriasis Global Assessment or the Investigator's Global Assessment) has a subjective, intuitive nature that does not require calculations.³ The PGA is the most commonly used scoring method in clinical trials after the PASI.⁶ The LS-PGA, the "lattice system" for short, was recently developed to address the shortcomings of the PASI and PGA scoring methods.⁷ Finally, this article reviews the target lesion psoriasis severity scale (TLPSS), which is commonly used in treatment studies for localized plaques.

BODY SURFACE AREA

The BSA is commonly incorporated in various scales used for psoriasis severity. It can be estimated by the number of the patient's hand areas affected, assuming that one "handprint" reflects approximately 1% of the BSA.⁸⁻¹⁰ In one study, as compared with the other psoriasis parameters (erythema, scale, thickness of plaques), BSA was least improved after 2 weeks of treatment.¹¹ Although clinically assessed, BSA did not differ statistically from objectively assessed BSA in two computer-based image analysis studies,^{11,12} several other studies have shown that patients and clinicians significantly overestimate the affected area, especially in mild cases or when the assessor is untrained.⁸⁻¹⁰

ERYTHEMA, SCALING, AND INDURATION

Erythema, scaliness, and thickness are the three main plaque components that are widely integrated into psoriasis scales. Redness assessment is likely to be affected by ambient illumination, tanning of the surrounding skin, edema, and the experience as well as visual acuity of the observer. In various studies, the correlation coefficient between erythema assessed by dermatologists and patients was found to be moderate ($r = -0.37-0.4$).¹³⁻¹⁵

Overall, patients rate the degree of scaling as the strongest indicator of disease severity. However, the application of moisturizers rapidly affects scaling, making it an unstable parameter.¹⁶ Although clinical measurement of scaling correlated moderately to ultrasound echo measurements in one trial ($r = 0.53$),¹¹

patient versus dermatologist scaling assessments were shown not to correlate at all ($r = 0$).¹⁴

Induration is regarded by some to be the most specific parameter of psoriasis activity.¹⁷ Clinical measurement of thickness has been shown to correlate moderately to ultrasound measured thickness ($r = 0.58$)¹¹; however, similar to desquamation validation evaluations, patient versus dermatologist induration assessments ranged from weak to no correlation at all ($r = 0-0.24$).^{13,14}

PSORIASIS AREA AND SEVERITY INDEX

The PASI is the current gold standard for assessment of psoriasis.¹⁸ A systematic review of clinical psoriasis scales used in randomized, controlled trials up to the year 2000 identified no fewer than 44 different tools used for psoriasis and reported that half the time the PASI scoring system was employed.¹⁹ Introduced in 1978 by Fredricksson and Pettersson, the PASI combines measures of redness, thickness, and scaliness of lesions (each on a 0-4 scale: none, slight, mild, moderate, and severe) with the amount of BSA affected (on a 1-6 scales 1 < 10%, 2 = 10%-30%, 3 = 30%-50%, 4 = 50%-70%, 5 = 70%-90%, and 6 > 90%). The lesional characteristics and the BSA involved are measured separately for the head, upper extremities, trunk, and lower extremities. The resulting scale runs from 0 to 72 (Figure 1).²⁰ BSA involvement greater than 10% or a PASI score greater than 12 is frequently used as a criterion for severe disease.²¹

To be considered for approval, a psoriasis drug must show clinical improvement with statistical significance more often than placebo does. In recent years, the U.S. Food and Drug Administration and pharmaceutical companies have used a reduction from baseline PASI score of 75% or greater, termed PASI 75, as the benchmark of primary endpoints in assessing therapies for psoriasis. Secondary endpoints, such as a reduction from baseline PASI score of 50% or greater (PASI 50), PASI 90, and PASI 100, are often reported in literature as well.^{22,23} Thus, starting with a PASI score of 16 would require a final PASI score lower than 4 to be considered 75% improvement.

However, psoriasis can almost clear without the subject achieving PASI 75. Some believe that the

Figure 1. Calculating the Psoriasis Area and Severity Index (PASI)

Table 1. Erythema, Thickness, and Scale

Degree of Severity (Per Body Region)	Value Given
No symptoms	0
Slight	1
Moderate	2
Marked	3
Very marked	4

Table 2. Body Surface Area (BSA)

Surface Involved (Per Body Region)*	Value Given
<10%	1
10%-29%	2
30%-49%	3
50%-69%	4
70%-89%	5
90%-100%	6

*Estimating BSA

The subject's handprint is a rough estimate of 1% BSA. For example, the subject's head and neck is considered to be 10% BSA; therefore, if the subject has one handprint of psoriasis on the scalp then 1/10th or 10% of the head is covered and the BSA score is a 2 for the head.

Another example, the subject's trunk/axillae/genitalia is considered to be 30% BSA; therefore, if the subject has 10 handprints of psoriasis on the trunk then 10/30 or 33% of the trunk is covered and the BSA score is a 3 for the trunk.

Because the head (h), upper extremities (u), trunk (t), and lower extremities (l) correspond approximately to 10%, 20%, 30% and 40% of the BSA, respectively, the PASI score is calculated by the formula:

$$PASI = 0.1(Eh + Ih + Dh)Ah + 0.2(Eu + Iu + Du)Au + 0.3(Et + It + Dt)At + 0.4(El + Il + Dl)Al$$

Table 3. How to Complete the PASI

		Head/ Neck	Upper Extremities	Trunk/Axillae/ Genitalia	Lower Extremities/ Buttocks
1	Redness	3	2	3	2
2	Thickness	2	2	3	3
3	Scale	2	2	1	1
4	Sum rows 1+2+3	7	6	7	6
5	Area score	1	2	3	4
6	Row 4 x row 5 x area multiplier	7 x 1 x 0.1	6 x 2 x 0.2	7 x 3 x 0.3	6 x 4 x 0.4
	PASI = sum of row 6 for each column = 19	0.7	2.4	6.3	9.6

A. Divide the body in four regions: head/neck, upper extremities, trunk (includes genitalia), lower extremities (includes buttocks).

B. Generate an average score for the erythema, thickness, and scale for each of the 4 regions using Table 1.

C. Sum scores of erythema, thickness, and scale for each region.

D. Generate an average score for the BSA for each region and convert to the 0-6 nonlinear scale (1 < 10%, 2 = 10%-30%, 3 = 30%-50%, 4 = 50%-70%, 5 = 70%-90%, and 6 > 90%-100%).

E. Multiple score of item (C) above times item (D) for each area and multiply that by the proportionate area multiplier (0.1, 0.2, 0.3, and 0.4 for the head, arms, trunk, and legs, respectively).

F. Add these scores together to get the PASI score.

Figure 2. Psoriasis Global Assessment (PGA)*

6	Severe	Very marked plaque elevation, scaling, and/or erythema
5	Moderate to severe	Marked plaque elevation, scaling, and/or erythema
4	Moderate	Moderate plaque elevation, scaling, and/or erythema
3	Mild to moderate	Intermediate between moderate and mild
2	Mild	Slight plaque elevation, scaling, and/or erythema
1	Almost clear	Intermediate between mild and clear
0	Clear	No signs of psoriasis, post-inflammatory hyperpigmentation may be present

*Various PGAs have been used with different descriptions and scores.

Assesment 1



		Lower Extremities/ Buttocks
1	Redness	3
2	Thickness	2
3	Scale	2
4	Sum rows 1+2+3	7
5	Area score	2
6	Row 4 x row 5 x area multiplier	7 x 2 x 0.4
PASI		5.6

6	Severe	Very marked plaque elevation, scaling, and/or erythema
5	Moderate to Severe	Marked plaque elevation, scaling, and/or erythema
4	Moderate	Moderate plaque elevation, scaling, and/or erythema
3	Mild to Moderate	Intermediate between moderate and mild
2	Mild	Slight plaque elevation, scaling, and/or erythema
1	Almost clear	Intermediate between mild and clear
0	Clear	No signs of psoriasis, post-inflammatory hyperpigmentation may be present

Assesment 2



		Trunk/ Axillae/ Genitalia
1	Redness	2
2	Thickness	1
3	Scale	1
4	Sum rows 1+2+3	4
5	Area score	4
6	Row 4 x row 5 x area multiplier	4 x 4 x 0.3
PASI		4.8

6	Severe	Very marked plaque elevation, scaling, and/or erythema
5	Moderate to Severe	Marked plaque elevation, scaling, and/or erythema
4	Moderate	Moderate plaque elevation, scaling, and/or erythema
3	Mild to Moderate	Intermediate between moderate and mild
2	Mild	Slight plaque elevation, scaling, and/or erythema
1	Almost clear	Intermediate between mild and clear
0	Clear	No signs of psoriasis, post-inflammatory hyperpigmentation may be present

currently accepted benchmark of PASI 75 is too stringent because it places potentially useful therapies at risk of failing to demonstrate efficacy. Carlin and colleagues conducted an analysis of PASI scores and quality-of-life data from a number of clinical trials to show that the PASI score is not linearly reflective of psoriasis severity.²⁴ For instance, a reduction in area of 95% without a change in redness, scaliness, and induration translates to only a 66% reduction in PASI. Conversely, a drop in erythema, scale, and induration from an average of 3 to 1 would not lead to a 75% reduction in PASI. This degree of improvement would certainly be seen as excellent by both the physician and the patient, but for the purposes of the study, it would be counted as a failure.²¹ Additionally, this group's analysis showed that effective, meaningful therapies are consistently differentiated from placebo at PASI 50 as evidence by histologic and photographic parameters of clinical trials using alefacept, efalizumab, and etanercept.²⁴

The PASI is also criticized for being resource intensive, complex, low in accuracy, and having a nonlinear scale.^{7,25,26} Response distribution is low because practically only half the scale is used.²⁵⁻²⁷ Additionally, PASI responsiveness is weak and lacks sensitivity when patients reach BSA less than 10% in any body region because changes in the PASI depend entirely on plaque severity score improvement, which may underestimate the general degree of improvement.⁶ Erythema, desquamation, and induration are scored with equal weight within each of the four body regions. Thus, a reduction in scaling with a concomitant increase in skin erythema could be recorded with the same PASI score. Similarly, a case of psoriatic erythroderma with moderate erythema, slight induration, and mild scaling could have an identical score to a case of chronic plaque psoriasis involving 10% BSA with marked erythema, induration, and desquamation. Whereas the former condition is particularly severe and difficult to treat, the latter usually responds to many forms of treatment.²⁰

Despite its widespread use, limited attention has been directed to the clinical relevance of derived PASI scores. This scale is not routinely used in the clinic and therefore remains poorly understood by clinicians and patients.^{20,21} For example, a change in score from 38 to 32 may be statistically significant, but the clinical significance may not always be

apparent. Similarly, does a change from 48 to 38 correspond to change from 28 to 18? Until these properties are “fleshed out,” such scores should be interpreted cautiously.²⁰

PHYSICIAN'S GLOBAL ASSESSMENT

Another key tool used in psoriasis clinical trials is the PGA (**Figure 2**). Typically, the PGA is a 5-, 6-, or 7-point ordinal rating ranging from “clear” to “very severe psoriasis.” The PGA can be used to show improvement by a comparison with baseline disease severity (dynamic PGA), or it can be an assessment made at one point in time (static PGA).¹⁶ The static PGA is considered the standard form used in clinical trials because it is less dependent on the physician's memory of the subject's baseline psoriasis severity. The PGA evaluates disease severity in a more intuitive way than does the 0 to 72 score of the PASI, and yet PGA scores correlate well with PASI scores. However, as opposed to the PASI, reliability in using this tool was calculated to be good, and experience appeared to have a negligible effect on PGA assessment. An additional benefit of the PGA is that most of the scale is used. The PGA does not take into account BSA and can be used to assess in both localized and global affected areas.^{6,7,17}

LATTICE SYSTEM PHYSICIAN'S GLOBAL ASSESSMENT

The Lattice System PGA (LS-PGA) was developed to address various deficiencies in other assessments of psoriasis, considering that the PASI can be challenging to use and the PGA is described differently across various clinical trials (**Figure 3**). The LS-PGA is similar to the PGA, but it takes a quantitative approach by integrating BSA with the overall plaque morphology. The BSA percentage involved is measured in categories of 0, 1 to 3, 4 to 9, 10 to 20, 21 to 29, 30 to 50, and 51 to 100. The final LS-PGA score has eight points: clear, almost clear, mild, mild to moderate, moderate, moderate to severe, severe, and very severe. It can be obtained either by inputting percent BSA and plaque quality scores into LS-PGA experimental version 3.0 software or by comparing the figures with an LS-PGA reference chart.³

The LS-PGA gives more weight to plaque elevation than to scale or erythema in determining the final clinical score. In part, this is because the degree

of scale can vary with hydration or emollients, and the appearance of redness may vary depending on ambient conditions and other factors. Validity and reliability of this scale are very good, and most of the scale is used. The LS-PGA acts as a compromise between the PASI score and PGA.^{3,7}

Lagley and Ellis conducted a study of 17 physicians who were either experienced or inexperienced using the PASI, PGA, or LS-PGA and were asked to assess 35 psoriasis patients in random order using the three scales. Overall, scores were highly correlated ($r > 0.8$ for all comparisons) and had high overall reliability. The PGA and LS-PGA had a lower intrarater variation than did the PASI, and experience was

beneficial in reducing variation in PASI scores but was not required with PGA or LS-PGA.⁶

The lattice system does not involve time-consuming and complicated calculations. It is also more objective than the PGA in that it takes into account both the BSA and the appearance (induration, erythema, and scaling) of the lesions.⁶

TARGET LESION PSORIASIS SEVERITY SCALE

In studies involving treatment for localized plaques of psoriasis, the TLPSS can be used to measure the redness, thickness, and scaliness of target plaques (**Figure 4**). Each parameter is graded on a 0 to 4 scale (0 = clear, 1 = slight, 2 = mild, 3 = moderate, 4 = severe),

Figure 3. The Lattice System Physician's Global Assessment (LS-PGA) consists of two steps. In the first step, the percentage of body surface involved is assessed using a 7-point scale. In the second step, average plaque qualities of thickness, erythema, and scale are assessed using a 4-point scale. Then scores for percentage of body surface and average plaque qualities are combined in a lattice to determine a final rating from clear to very severe. The lattice portion is typically performed by computerized algorithm. LS-PGA experimental version 3.0 was used. Although not used in this study, an instruction booklet with reference pictures accompanies the LS-PGA. (Pat. Pend. No aspect of the system may be reproduced without permission; all rights, including copyright, for all uses reserved.)

LATTICE SYSTEM PHYSICIAN'S GLOBAL ASSESSMENT

1. INDICATE PERCENT BODY SURFACE INVOLVED (do not include areas with only post-inflammatory pigmentation) *The patient's palm and thumb together approximate a body surface area of 1%.*

☐ 0% ☐ 1-3% ☐ 4-9% ☐ 10-20% ☐ 21-29% ☐ 30-50% ☐ 51-100%

2. CHECK ONE AND ONLY ONE BOX IN **EACH ROW** BELOW. INDICATE AVERAGE QUALITIES ACROSS ALL INVOLVED AREAS

Plaque Quality	NONE	MILD	MODERATE	MARKED
ELEVATION *Ignore scale in determining plaque elevation	☐ No elevation above normal skin*	☐ Slight but definite elevation above surrounding normal skin; the edges are typically more easily palpated than seen*	☐ Visually apparent elevation in plaque edges; readily palpated edges with rounded or sloped edges*	☐ Visually obvious elevation in plaque edges; easily palpated with sharp edges that provide a discernible bump when sliding the finger from normal skin to the plaque*
ERYTHEMA	☐ Normal skin color or post-inflammatory color change; no erythema	☐ Pink color, including "residual hyperemia" ("end of therapy hyperemia")	☐ Light to medium red color	☐ Bright, full, or deep red color
SCALE	☐ No scales	☐ Fine scales looking like dust	☐ Individual scales discernible with yellow to silver color	☐ Coarse, thick scales, yellow to silver in color; plaque has rough surface; gives impression that scales could be lifted with fingernail

When the 3 plaque qualities are used in the Lattice, the most severe score that results is the LS-PGA. (©2004 DATAAcquire, Inc. All Rights Reserved. Pat. Pend.)

All rights reserved by DATAAcquire, Inc. May not be reproduced in whole or part without permission. This notice must be retained in all reproductions. For information, contact DATAAcquire@aol.com or 734.665.0493. Research Ver 3.0.

and the sum of the individual scores provides the practitioner with the overall TLPSS. The TLPSS is most commonly used in bilateral comparison studies involving topical medications or in studies of topical therapies directed at localized lesions.^{28,29}

CONCLUSION

Thus far, no single psoriasis assessment tool can be considered the “most valid” clinical measure. It is important to take into account the benefits and shortcomings of each measure before implementing it. The PASI remains the gold standard and has been

Figure 4. Target Lesion Psoriasis Severity Scale

A- Scaling	B- Erythema	C- Plaque Elevation
0 – Clear: no scale	0 – No erythema: hyperpigmentation, diffused faint pink or red coloration	0 – No plaque elevation: no elevation above normal skin
1 – Slight scaling: surface dryness with some white coloration	1 – Slight: up to moderate, up to definite red coloration	1 – Slight: difficult to ascertain whether there is a slight elevation above normal skin
2 – Mild scaling: fine scales partially or mostly covering lesions	2 – Mild: up to moderate, up to definite red coloration	2 – Mild: light but definite elevation; typically edges are indistinct or sloped
3 – Moderate scaling: coarse scales, covering most or all the lesions	3 – Moderate: moderate, definite red coloration	3 – Moderate: moderate elevation with rough or sloped edges
4 – Severe scaling: coarse; tenacious scale predominates covering most or all lesions	4 – Severe: severe, very bright red coloration	4 – Severe: marked elevation typically with hard or sharp edges

Target Lesions Psoriasis Severity Score = A + B + C

Adapted from Fredriksson T, Pettersson U. Severe psoriasis—oral therapy with a new retinoid. Dermatologica. 1978;157(4):238-44.

Assesment 3



A- Scaling	B- Erythema	C- Plaque Elevation
0 – Clear: no scale	0 – No erythema: hyperpigmentation, diffused faint pink or red coloration	0 – No plaque elevation: no elevation above normal skin
1 – Slight scaling: surface dryness with some white coloration	1 – Slight: up to moderate, up to definite red coloration	1 – Slight: difficult to ascertain whether there is a slight elevation above normal skin
2 – Mild scaling: fine scales partially or mostly covering lesions	2 – Mild: up to moderate, up to definite red coloration	2 – Mild: light but definite elevation; typically edges are indistinct or sloped
3 – Moderate scaling: coarse scales, covering most or all the lesions	3 – Moderate: moderate, definite red coloration	3 – Moderate: moderate elevation with rough or sloped edges
4 – Severe scaling: coarse; tenacious scale predominates covering most or all lesions	4 – Severe: severe, very bright red coloration	4 – Severe: marked elevation typically with hard or sharp edges

Target Lesions Psoriasis Severity Score = A + B + C = 4 + 3 + 3 = 10

used in efficacy trials for most of the pharmaceutical agents that are currently marketed. However, for the purpose of cross-sectional studies where interpretability is important, the PGA and LS-PGA are gaining favor. Future validation studies are needed to categorize where each psoriasis scale would be best used. Familiarity with the everyday assessment tools used by the psoriasis researcher can only strengthen a clinician's ability to discern between levels of psoriasis severity.

ACKNOWLEDGMENTS

All photographs were provided by Jason Emer, M.D.

REFERENCES

- Kaufmann R, Bibby AJ, Bissonnette R, et al. A new calcipotriol/betamethasone dipropionate formulation (Daivobet) is an effective once-daily treatment for psoriasis vulgaris. *Dermatology*. 2002;205(4):389-93.
- Rapp SR, Feldman SR, Exum ML, Fleischer AB Jr, Reboussin DM. Psoriasis causes as much disability as other major medical diseases. *J Am Acad Dermatol*. 1999;41(3 Pt 1):401-7.
- Feldman SR, Krueger GG. Psoriasis assessment tools in clinical trials. *Ann Rheum Dis*. 2005;64(suppl 2):ii, 65-8.
- Bigby M, Gadenne AS. Understanding and evaluating clinical trials. *J Am Acad Dermatol*. 1996;34(4):555-590.
- Jemec GB, Wulf HC. The applicability of clinical scoring systems: SCORAD and PASI in psoriasis and atopic dermatitis. *Acta Derm Venerol*. 1997;77(5):392-3.
- Langley RG, Ellis CN. Evaluating psoriasis with Psoriasis Area and Severity Index, Psoriasis Global Assessment, and Lattice System Physician's Global Assessment. *J Am Acad Dermatol*. 2004;51(4):563-9.
- Berth-Jones J, Thompson J, Papp K. A study examining inter-rater and intrarater reliability of a novel instrument for assessment of psoriasis: the Copenhagen Psoriasis Severity Index. *Br J Dermatol*. 2008;159(2):407-12.
- Ramsay B, Lawrence CM. Measurement of involved surface area in patients with psoriasis. *Br J Dermatol*. 1991;124:565-70.
- Savolainen L, Kontinen J, Rönning J, Oikarinen A. Application of machine vision to assess involved surface in patients with psoriasis. *Br J Dermatol*. 1997;137(3):395-400.
- Savolainen L, Kontinen J, Alatalo E, Rönning J, Oikarinen A. Comparison of actual psoriasis surface area and the psoriasis area and severity index by the human eye and machine vision methods in following the treatment of psoriasis. *Acta Derm Venerol*. 1998;78(6):466-7.
- Ormerod AD, Dwyer CM, Weller R, Cox DH, Price R. A comparison of subjective and objective measures of reduction of psoriasis with the use of ultrasound, reflectance colorimetry, computerized video image analysis, and nitric oxide production. *J Am Acad Dermatol*. 1997;37(1):51-7.
- Kanthraj GR, Srinivas CR, Sheno SD, Deshmukh RP, Suresh B. Comparison of computer-aided design and rule of nines methods in the evaluation of the extent of body involvement in cutaneous lesions. *Arch Dermatol*. 1997;133(7):922-3.
- Feldman SR, Fleischer AB Jr, Reboussin DM, et al. The self-administered psoriasis area and severity index is valid and reliable. *J Invest Dermatol*. 1996;106(1):183-6.
- Fleischer AB Jr, Feldman SR, Dekle CL. The SAPASI is valid and responsive to psoriasis disease severity changes in a multi-center clinical trial. *J Dermatol*. 1999;26(4):210-15.
- Sampogna F, Fleischer AB Jr, Reboussin RM, et al. Performance of the self-administered psoriasis area and severity index in evaluating clinical and sociodemographic subgroups of patients with psoriasis. *Arch Dermatol*. 2003;139(3):353-8.
- Spuls PI, Lecluse LL, Poulsen ML, Box JD, Stern RS, Nijsten T. How good are clinical severity and outcome measures for psoriasis?: quantitative evaluation in a systematic review. *J Invest Dermatol*. 2010;130(4):933-43.
- Gottlieb AB, Chaudhari U, Baker DG, Perate M, Dooley LT. The National Psoriasis Foundation Psoriasis Score (NPF-PS) system versus the Psoriasis Area Severity Index (PASI) and Physician's Global Assessment (PGA): a comparison. *J Drugs Dermatol*. 2003;2(3):260-6.
- Fredriksson T, Pettersson U. Severe psoriasis—oral therapy with a new retinoid. *Dermatologica*. 1978;157(4):238-44.
- Naldi L, Svensson A, Diepgen T, et al. Randomized clinical trials for psoriasis 1977-2000: The EDEN survey. *J Invest Dermatol*. 2003;120(5):738-41.
- Ashcroft DM, Wan Po AL, Williams HC, Griffiths CE. Clinical measures of disease severity and outcome in psoriasis: a critical appraisal of their quality. *Br J Dermatol*. 1999;141(2):185-91.
- Feldman SR. The design of clinical trials in psoriasis: lessons for clinical practice. *J Am Acad Dermatol*. 2003;49(2):S62-5.
- Ellis CN, Krueger GG, Alefacept Clinical Study Group. Treatment of chronic plaque psoriasis by selective targeting of memory effector T lymphocytes. *N Engl J Med*. 2001;345(4):248-55.
- Bhushan M, Bleiker TO, Ballsdon AE, et al. Anti-E-selectin is ineffective in the treatment of psoriasis: a randomized trial. *Br J Dermatol*. 2002;146(5):824-31.
- Carlin CS, Feldman SR, Krueger JG, Menter A, Krueger GG. A 50% reduction in the Psoriasis Area and Severity Index (PASI 50) is a clinically significant endpoint in the assessment of psoriasis. *J Am Acad Dermatol*. 2004;50(6):859-66.
- Harari M, Shani J, Hristakieva E, Staninovic A, Seidl W, Burdo A. Clinical evaluation of a more rapid and sensitive Psoriasis Assessment Severity Score (PASS), and its comparison with the classic method of Psoriasis Area and Severity Index (PASI), before and after climatotherapy at the Dead-Sea. *Int J Dermatol*. 2000;39(12):913-8.
- Marks R. Measurement of the response to treatment in psoriasis. *J Dermatol Treat*. 1996;7(1)(suppl):S7-10.
- Jacobson CC, Kimball AB. Rethinking the Psoriasis Area and Severity Index: the impact of area should be increased. *Br J Dermatol*. 2004;151(2):381-7.
- Beutner K, Chakrabarty A, Lemke S, Yu K. An intra-individual randomized safety and efficacy comparison of clobetasol propionate 0.05% spray and its vehicle in the treatment of plaque psoriasis. *J Drugs Dermatol*. 2006;5(4):357-60.
- Weinstein GD, Krueger GG, Lowe NJ, et al. Tazarotene gel, a new retinoid, for topical therapy of psoriasis: vehicle-controlled study of safety, efficacy, and duration of therapeutic effect. *J Am Acad Dermatol*. 1997;37(1):85-92.