Veterinary Dermatology

Vet Dermatol 2012; **23**: 515–e103 DOI: 10.1111/j.1365-3164.2012.01113.x

Development and validation of the Canine Atopic Dermatitis Lesion Index, a scale for the rapid scoring of lesion severity in canine atopic dermatitis

Jon D. Plant*, Kinga Gortel†, Marcel Kovalik‡, Nayak L. Polissar§ and Moni B. Neradilek§

*SkinVet Clinic, 15800 SW Upper Boones Ferry Road, Suite 120, Lake Oswego, OR 97035, USA
†Lake Country Veterinary Specialist Hospital, 10564 Powley Court, Unit A, Lake Country, BC, Canada V4V 1V5
‡Division of Veterinary Clinical Sciences, The Royal (Dick) School of Veterinary Studies and The Roslin Institute, The Hospital for Small Animals, Easter Bush Veterinary Centre, The University of Edinburgh, Roslin, Midlothian EH25 9RG, UK
§The Mountain-Whisper-Light Statistics, 1827 23rd Ave. East, Seattle, WA 98112, USA

Correspondence: Jon D. Plant, SkinVet Clinic, 15800 SW Upper Boones Ferry Road, Suite 120, Lake Oswego, OR 97035, USA.
E-mail: jon.plant@skinvetclinic.com

Background – The third iteration of the Canine Atopic Dermatitis Extent and Severity Index (CADESI-03) is the only tool rigorously validated for canine atopic dermatitis (CAD) lesion scoring. The CADESI-03 requires 248 evaluations, limiting its widespread use.

Hypothesis/Objectives – The goal of the study was to develop and validate a practical method of grading CAD lesions that requires scoring only the frequently affected body regions.

Animals – Fifty-seven privately owned atopic dogs were used in the study.

Methods – The Canine Atopic Dermatitis Lesion Index (CADLI) was evaluated in an open, multicentre reliability study. Validity was assessed with expert opinion (content validity) and comparison of CADLI with existing disease severity measures (construct and criterion validity). Reliability was evaluated by analysing repeated observations of each dog. Convenience was assessed in terms of the time required to complete the scale.

Results – The CADLI scores correlated with overall assessment scores ($r = 0.60$, $P < 0.001$, linear mixed model) and pruritus severity scores ($r = 0.53$, $P < 0.001$, linear mixed model), establishing construct validity. The CADLI was strongly correlated with CADESI-03 ($r = 0.84$, $P < 0.001$, linear mixed model), establishing criterion validity. The CADLI values obtained by two observers correlated very strongly ($r = 0.91$, $P < 0.001$), as did the repeat values for the same observer ($r = 0.98$, $P < 0.001$). The mean time to complete the CADLI was less than that required for CADESI-03 (1.9 and 12.6 min, respectively), a highly significant difference ($P < 0.001$).

Conclusion and clinical importance – The CADLI was found to be an effective measure of CAD lesion severity, strongly correlating with CADESI-03. The convenience of CADLI makes it suitable for use in both clinical research and practice.

Introduction

Canine atopic dermatitis (CAD) is an inflammatory and pruritic condition with characteristic clinical features, most often associated with IgE antibodies directed against environmental allergens.[1] Cutaneous lesions often reflect the severity and chronicity of the disease and associated bacterial or yeast infections, although some atopic dogs are pruritic but do not have visible lesions (pruritus sine materia),[2] and erythema correlates only moderately with pruritus severity.[3] Body regions that are frequently affected in CAD include the head, pinnae, feet, ventral abdomen and axillae.[2] Common lesions associated with CAD include some that respond relatively quickly to effective therapy (e.g. erythema, excoriations and erosions), as well as some that improve slowly (e.g. alopecia, lichenification and hyperpigmentation). Assessment of changes in the lesion type, severity and distribution is a common method used to evaluate the efficacy of CAD interventions in practice and clinical trials.[4–14]

Selection of an accurate and reliable disease severity scale is an important aspect of generating high-quality medical evidence.[15] In the past, a common outcome measure reported in the veterinary dermatology literature was the owner's assessment of a pet's improvement following an intervention.[16–19] However, estimations of change that rely primarily on a person's recall of a previous disease state are generally unreliable.[20] Beginning in 1997, several iterations of the Canine Atopic Dermatitis Extent and Severity Index (CADESI) have been utilized in clinical trials.[12,21,22] The first two versions (CADESI and CADESI-02) were not thoroughly evaluated for reliability prior to their use. The reliability of the CADESI-02 was later found to be less than desirable for a health measurement scale.[23] The third version (CADESI-03) is the only scale to have been rigorously validated for evaluation of the severity of lesions associated with CAD.[24,25] It possesses most of the desirable features of a disease

Accepted 16 August 2012
Sources of Funding: This study was self-funded.
Conflict of Interest: No conflicts of interest have been declared.

Canine Atopic Dermatitis Lesion Index (CADLI)

Score each of the indicated body regions, integrating the severity and extent of the lesion(s) in the area.
(0 = none; 1 = mild; 2, 3 = moderate; 4, 5 = severe and extensive lesions)
Consult the CADLI Guide for examples of lesion scoring.

Body region	Erythema excoriation erosion 0-5	Alopecia lichenification hyperpigmentation 0-5
Head & Pinnae		
Forefeet		
Hind feet		
Ventral thorax & Axillae		
Ventral abdomen & Inguinal		
Sub-totals 0-25		
Total 0-50		

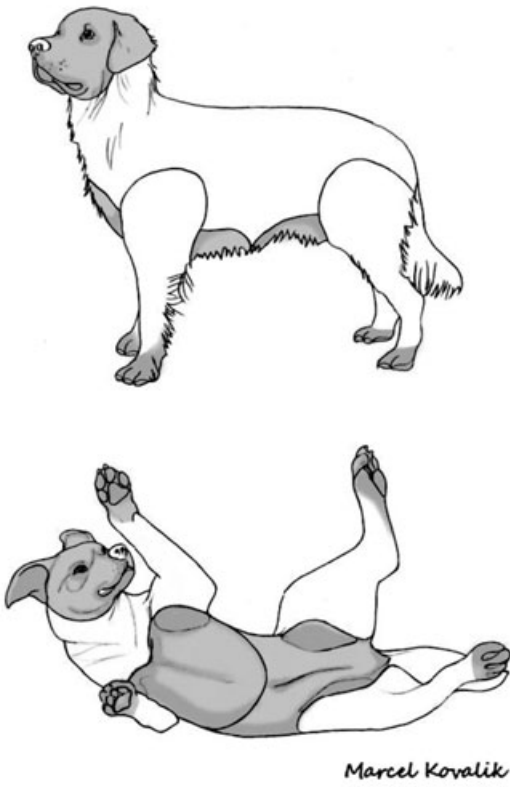

Figure 1. Final construct of the Canine Atopic Dermatitis Lesion Index (CADLI), a disease severity scale for canine atopic dermatitis.

Statistics

Histograms were produced for all data collected in order to evaluate the distribution of the variables visually and to look for outliers or data problems.

Content and criterion validity.
Content and criterion validity were assessed by Pearson and Spearman correlation coefficients of the CADLI scores with the OA and PVAS scores (content validity) and with the CADESI-03 score (criterion validity). A linear mixed model of these scores on the CADLI score with a random intercept for the site was used to assess the statistical significance of these correlations while accounting for the possible correlation of values within the same site. Given that the Pearson and Spearman correlation coefficients yielded similar results, only the Pearson correlations (r) are presented.

Reproducibility.
Reproducibility of the CADLI measurements was evaluated graphically by Bland–Altman plots and numerically as follows: (i) by the relative bias and precision of the repeated measurements; (ii) by the intraclass correlation; and (iii) by a variance components model that separated the overall variance into between-patient variance, between-observer variance and within-observer variance. Results for each of the sources of variance are presented as a standard deviation and as the percentage of total variance due to each source of variance. In addition to these reproducibility analyses for the CADLI scale, we also created scatterplots to display reproducibility visually (for all patients, observer A versus observer B; and, for all patients, observer B's first CADLI score versus observer B's second CADLI score). We calculated the Pearson correlation (r) of the paired values used in the scatterplots to describe numerically the correlation of values between different observers and of repeated values for the same observer.

Internal consistency.
Internal consistency was evaluated with Cronbach's α for the individual CADLI items. Cronbach's α is a measure of how well the scale items reflect the composite score. A value of Cronbach's α of at least 0.9 is considered to be excellent; a value between 0.8 and 0.9, good; 0.7–0.8, acceptable; 0.6–0.7, questionable; 0.5–0.6, poor; and <0.5, unacceptable. [29,30]

Responsiveness to change.
The term 'responsiveness to change' refers to an instrument's ability to detect a clinically meaningful change, whereas the term 'sensitivity to change' refers to an instrument's ability to measure any