Clinical Scoring System for Vulvar Lichen Sclerosus

Andreas R. Günthert, MD,*§ Kathleen Duclos,†‡§ Boriana G. Jahns, MD,* Elke Krause, MD,* Esther Amann, MD,* Andreas Limacher, PhD,‡ Michael D. Mueller, MD,* and Peter Jüni, MD†‡

*Department of Gynecology and Obstetrics, Inselspital, Bern University Hospital, and University of Bern, Bern, Switzerland; †Division of Clinical Epidemiology and Biostatistics, Institute of Social and Preventive Medicine, University of Bern, Bern, Switzerland; ‡CTU Bern, Bern University Hospital, Bern, Switzerland

DOI: 10.1111/j.1743-6109.2012.02814.x

ABSTRACT

Introduction. Vulvar lichen sclerosus (LS) is a chronic inflammatory and mutilating disease, which goes often undetected for years. Advanced disease severely affects quality of life like sexual disorders and is also associated with an increased risk of vulvar cancer.

Aim. To develop and validate a patient-administered symptom score and a physician-administered clinical score for the diagnosis and evaluation of vulvar LS.

Methods. We included 24 patients with established LS diagnosis and 49 with other vulvar disease. The physician-administered score was based on six clinical features and the patient-administered score was a symptom-based four-item composite score. We determined inter-item correlations and internal consistency of both scores, and estimated sensitivities, specificities, likelihood ratios, and posttest probabilities for different cutoffs of the physician-administered score.

Main Outcome Measures. Characteristics of patients with and without LS were compared using χ^2 and unpaired *t*-test as required. We then determined Cronbach's alpha as a measure of the overall consistency of scores and calculated positive and negative likelihoods.

Results. Lack of redundancy of items (correlation coefficients < 0.90) and internal consistency (Cronbach's $\alpha \geq 0.70$) suggested that final composite scores were valid and yielded excellent power to rule in LS.

Conclusion. Scores may be useful for assessing symptoms of vulvar disorders, to ease diagnosis of LS and to evaluate treatment response over time. **Günthert AR, Duclos K, Jahns BG, Krause E, Amann E, Limacher A, Mueller MD, and Jüni P. Clinical scoring system for vulvar lichen sclerosus. J Sex Med 2012;9:2342–2350.**

Key Words. Dyspareunia; Lichen Sclerosus; Sexual Pain Disorders; Vulva; Vulvar Intraepithelial Neoplasia

Introduction

Lichen sclerosus (LS) is a chronic localized lymphocyte-mediated inflammatory skin disease, which predominantly affects the anogenital region and is more common in women, with extragenital lesions in 15–20% of cases [1–4]. The estimated prevalence of LS in a gynecology private practice in Baltimore was reported at approximately 1.7% and it is usually diagnosed in peri- or postmenopausal women [5]. Many patients present with advanced disease at time of diagnosis. Therefore, the disease onset is likely to be at premenopausal stage in many women [5–7]. A minority of patients with LS present at childhood and the high rate of familial LS suggests a genetic contribution [8,9]. The etiology is probably multifactorial, but individual factors have not been established yet. The Koebner phenomenon (triggered disease progression and ulceration) is known to occur, so trauma, injury, and sexual abuse have been suggested as possible triggers of symptoms in genetically predisposed people [2,10]. Many investigators reported on the association of LS and autoimmune disorders, especially thyroid disease, but extensive evaluation of immunological parameters failed to show any consistent pattern [2,11–13]. Lacking awareness for LS, in physicians and patients, and failure to examine the genital skin

§Both authors contributed equally to this work.

properly, as well as reticence and embarrassment of patients can lead to considerable delays in diagnosis [6]. Patients with LS typically present with pruritus, dyspareunia, or postcoital soreness, but may be symptom free during periods of remission. Common mistaken diagnoses in women are candida infection and postmenopausal vulvar atrophy. Clinical features of LS are pallor or parchment-like skin, purpura or flare, erosions, fissures, telangiectasia, hyperkeratosis, and sclerosis. Genital lesions often occur in a figure-of-eight pattern around the vulva and anus. The labia minora fuse or disappear completely, the clitoris shrinks and may become buried (clitoral phimosis), and in advanced disease the introitus is narrowed, so that sexual intercourse becomes impossible. Early onset LS may be difficult to diagnose for clinicians, and it is a challenge for pathologists to histologically establish the diagnosis of early LS [14]. LS affects the quality of life of patients and is also associated with an increased risk of squamous cell cancer (SCC) of the vulva [1,2]. Biopsy is recommended to confirm LS and to exclude any other disease, in particular the presence of vulvar intraepithelial neoplasia. However, until now no established clinical scoring system to indicate LS disease probability, to assess symptoms, or to evaluate treatment response is available. In addition, the impact of LS on quality of life by inducing dyspareunia and reducing interest for sexual engagement because of postcoital soreness, as well as lacking awareness by physicians to assess symptoms and discuss these issues with the patient, requires further investigation, in particular at early onset of disease [15]. The objective of this study was therefore to develop and validate a patient-administered symptom score and a physician-administered clinical score in patients with symptomatic LS in comparison with other vulvar disorders.

Patients and Methods

Patients

We included 73 consecutive patients referred with vulvar disorders during 2009 to the outpatient clinic of the Department of Obstetrics and Gynecology, Inselspital Bern. We identified 24 patients with an established diagnosis of previous untreated LS, and 49 patients with any other untreated vulvar disease including bacterial, viral, or fungal infection, psoriasis, or lichen simplex. LS was confirmed or excluded by histopathology in all 73 patients at different institutions of pathology. All patients gave written informed consent. The study was approved by the research ethics committee of the Canton of Bern, Switzerland.

Item Selection and Procedures

Items were selected by a panel of two senior consulting physicians (ARG, MDM) based on clinical expertise and a review of the literature. Four items were considered for the patient-administered symptom score: pruritus, burning, soreness, and dyspareunia (Supporting Information Appendix S1). Each item was scored on a numeric rating scale ranging from 0 (no complaints) to 10 (extreme complaints) with a minimum of 0 and a maximum of 40 for the total score. Six items were considered for the physician-administered clinical score: erosions, hyperkeratosis, fissures, agglutination, stenosis, and atrophy (Supporting Information Appendix S2). Each item was scored on a three-point Likert scale ranging from 0 to 2, with 0 representing normal findings, 1 moderate changes, and 2 severe changes. The range of the physician-administered score was therefore 0 at minimum and 12 at maximum in total. Grade 1 erosions were defined by 1–2 small erosions, almost not macroscopically visible, grade 2 erosions by macroscopically visible and/or more than 2 or confluent lesions. Hyperkeratosis grade 1 was defined by affecting the vulva and perineum up to 10%, grade 2 by more than 10%. Grade 1 fissures were defined by rhagades affecting the posterior introitus, grade 2 by generalized vulvar rhagades. Agglutination grade 1 was defined by partially affecting the preputium clitoridis and the labia minora, grade 2 by complete agglutination of both. Stenosis grade 1 meant a narrowing of the introitus, which could still be passed by two fingers, grade 2 a narrowing, which could be passed by less than two fingers. Atrophy grade 1 was defined by shrinkage of small labia and clitoris; in grade 2 atrophy labia minora and clitoris were no longer visible. Patient-administered questionnaires were distributed by nurses of the outpatient clinic and completed while patients were awaiting clinical examination. The clinical score was administered by one out of three clinical research fellows (EA, BGJ, EK), having at least 4 years of clinical expertise in obstetrics and gynecology, supervised by a senior consulting physician (ARG) during routine clinical examination at the outpatient clinic. The nature of the study did not allow blinding of research fellows as to the presence or absence of LS.

Statistical Analysis

Characteristics of patients with and without LS were compared using χ^2 and unpaired *t*-tests as required. Composite symptom and clinical scores were derived by adding up scores of individual items. We separately constructed symptom scores for sexually active and inactive women, omitting the item dyspareunia for the construction of the composite score to be distributed to sexually inactive women. A prespecified stepwise approach was used to evaluate items considered for the two composite scores [16]. To identify potential redundancy between items, we assessed their correlation. If Pearson's product–moment correlation between any two items was greater than 0.9, we considered discarding one of the items based on clinical reasoning. For each of scores the item–rest correlations were calculated as a measure of the correlation of an individual item with the score total omitting that item. Items were considered to be discarded if the item–rest correlation was below 0.20 [15]. Then, we determined Cronbach's α as a measure of the overall consistency of scores. Calculations of item–rest correlations and Cronbach's α were performed in all patients and in an analysis restricted to LS patients only.

To evaluate the diagnostic accuracy of the physician-administered clinical score we constructed 2 by 2 contingency tables using 12 different cutoff values, and calculated the corresponding sensitivities and specificities. We then used a maximum likelihood logistic regression model to fit a receiver operating characteristic (ROC) curve. Fitted sensitivities and specificities were estimated from the fitted ROC curve. Positive and negative likelihood ratios (LRs) were then calculated from both, crude and fitted sensitivities and specificities. The negative LR indicates how much less likely it is to find a score smaller than a given cutoff in patients with LS (1—sensitivity) as compared with those without LS (specificity) [17]. Conversely, the positive LR specifies how much more likely it is to find score equal to or larger than a given cutoff in patients with LS (sensitivity) as compared with those without (1—specificity) [16]. A test is considered to provide clinically relevant power to rule in or out the disease if the positive and negative LRs are above 5 or below 0.2, respectively, and strong power if LRs are above 10 or below 0.1 [17]. Finally, we calculated pretest and posttest probabilities for different cutoffs based on the fitted LRs and determined the relationship between pretest and posttest probabilities of LS for these cutoffs. All analyses were done using Stata Statistical Software: Release 11 (Stata Corp LP, College Station, TX, USA; analyses were done by KD, AL, and PJ).

Results

A total of 73 women were included in this study. Table 1 presents a comparison of characteristics of patients with and patients without LS. Patients with LS were older, more likely to experience pruritus, burning sensations, and soreness ($P \leq 0.04$). Patients with LS more likely showed erosions, hyperkeratosis, fissures, agglutination, stenosis, and atrophy ($P \leq 0.001$). Figure 1 gives representative examples for physician-administered clinical score of LS patients.

Table 2 presents inter-item correlations for the patient-administered symptom score. Correlations ranged from 0.55 to 0.86 (median 0.41) and suggested no redundancy of items. Table 3 presents item–rest correlations of each item with the patient-administered symptom score total after omitting that item and Cronbach's α separately for sexually active (top) and inactive women (bottom). Item–rest correlations ranged from 0.65 to 0.90 for scores in all sexually active women (median 0.81), and from 0.44 to 0.86 for scores in sexually active women with LS (median 0.82). Cronbach's α was 0.91 in the analysis of all women, and 0.87 in the analysis of women with LS. For all sexually inactive women, item–rest correlations ranged from 0.65 to 0.85 for scores (median 0.73); for sexually inactive women with LS correlation ranged from 0.46 to 0.78 (median 0.65).

Table 1 Characteristics of included patients

	Patients diagnosed with lichen sclerosus (N = 24)	Patients diagnosed with other vulvar diseases (N = 49)	*P* value
Age	53.3 (19.4)	37.7 (13.5)	<0.001
Symptoms			
Pruritus	18 (75.0%)	18 (36.7%)	<0.001
Burning	16 (66.7%)	20 (40.8%)	0.040
Soreness	15 (62.5%)	18 (36.7%)	0.040
Dyspareunia	12 (50.0%)	17 (34.7%)	0.210
Signs			
Erosions	17 (70.8%)	12 (24.5%)	<0.001
Hyperkeratosis	19 (79.2%)	5 (10.2%)	<0.001
Fissures	13 (54.2%)	7 (14.3%)	<0.001
Agglutination	14 (58.3%)	1 (2.0%)	<0.001
Stenosis	12 (50.0%)	4 (8.2%)	<0.001
Atrophy	19 (79.2%)	7 (14.3%)	<0.001

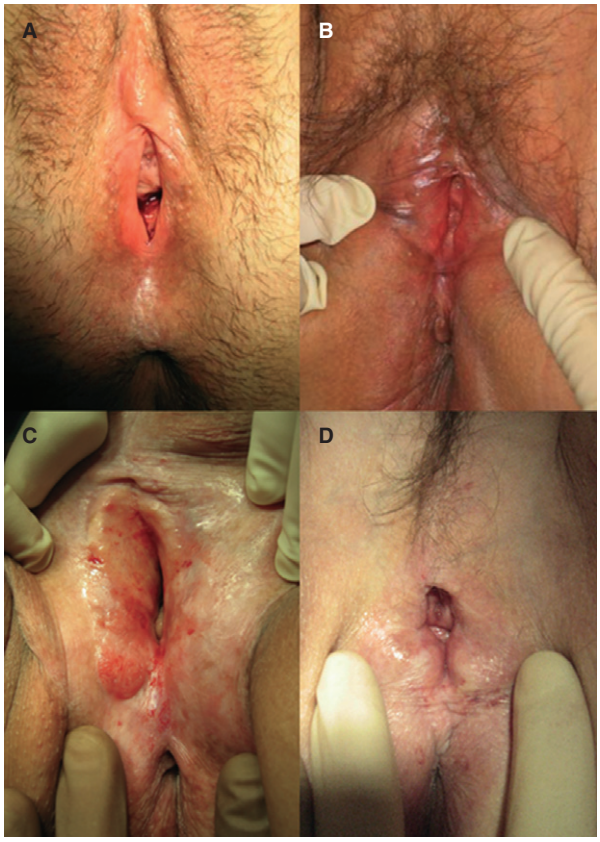

Figure 1 Representative examples of physician-administered clinical score of patients with lichen sclerosus (LS). (A) Twenty-two-year-old patient with LS score 4 showing grade 1 atrophy, grade 1 stenosis, grade 1 fissures, and grade 1 agglutination. (B) Forty-two-year-old patient with LS score 5 showing grade 1 atrophy, grade 1 stenosis, grade 1 agglutination, grade 1 erosions, and grade 1 hyperkeratosis. (C) Sixty-eight-year-old patient with LS score 11 showing grade 1 fissures, grade 2 hyperkeratosis, grade 2 erosions, grade 2 atrophy, and grade 2 stenosis. Additionally, the patient presents with differentiated vulvar intraepithelial neoplasia at the right posterior introitus. (D) Seventy-five-year-old patient with LS score 10 showing grade 1 fissures, grade 1 hyperkeratosis, grade 2 erosions, grade 2 atrophy, and grade 2 stenosis.

Cronbach's α was 0.86 in the analysis of all women, and 0.78 in the analysis of women with LS. All items were retained to be included in the final composite scores (see Supporting Information Appendix S1 for final patient-administered questionnaire). Means of the final composite scores for sexually active women were 14.6 in patients with LS (standard deviation [SD] 12.5) and 6.6 in patients without LS (SD 9.5). Means of the final composite scores for sexually inactive women were 11.2 in patients with LS (SD 8.9) and 5.0 in patients without LS (SD 7.3).

Table 4 presents inter-item correlations for the physician-administered clinical score. Correlations were generally lower than those of the patient-administered symptom score and ranged from 0.20 to 0.76 (median 0.40), suggesting no redundancy of items. Table 5 presents item–rest correlations of each item with the score total after omitting that item and Cronbach's α. Results are given for all patients (left) and patients with LS (right), with item–rest correlations ranging from 0.52 to 0.79 for scores in all women (median 0.63), and from 0.22 to 0.63 for scores in women with LS (median 0.42). Cronbach's α was 0.84 in the analysis of all women, and 0.70 in the analysis of women with LS. All items were retained to be included in the final composite score (see Supporting Information Appendix S2 for final physician-administered clinical questionnaire). Means of the final composite scores were of 5.5 in patients with LS (SD 2.9) and of 0.8 in patients without LS (SD 1.2).

Figure 2 shows the ROC curve of false-positive rate (1—specificity) on the x-axis vs. the true positive rate (sensitivity) on the y-axis fitted for different cutoffs used to define test positives for the physician-administered clinical score. The

Table 2 Inter-item correlation of items considered for patient-administered symptom score

	Pruritus	Burning	Soreness	Dyspareunia
Pruritus	1			
Burning	0.70	1		
Soreness	0.55	0.80	1	
Dyspareunia	0.57	0.86	0.78	1

Table 3 Item–rest correlation of each item with the patient-administered symptom score total after omitting that item and Cronbach's α for sexually active (top) and inactive women (bottom)

	All (N = 73)		Patients with lichen sclerosus (N = 24)	
	Item–rest correlation	Cronbach's α	Item–rest correlation	Cronbach's α
Sexually active women		0.91		0.87
Pruritus	0.65		0.44	
Burning	0.90		0.86	
Soreness	0.79		0.79	
Dyspareunia	0.83		0.86	
Sexually inactive women		0.86		0.78
Pruritus	0.65		0.46	
Burning	0.85		0.78	
Soreness	0.73		0.65	

Results are given for all patients (left) and patients with lichen sclerosus (right).

Table 4 Inter-item correlation of items considered for physician-administered clinical score

	Erosions	Hyperkeratosis	Fissures	Agglutination	Stenosis	Atrophy
Erosions	1					
Hyperkeratosis	0.39	1				
Fissures	0.48	0.35	1			
Agglutination	0.40	0.65	0.33	1		
Stenosis	0.25	0.43	0.27	0.55	1	
Atrophy	0.46	0.76	0.31	0.69	0.64	1

Table 5 Item–rest correlation of each item with the physician-administered clinical score total after omitting that item and Cronbach's α

	All (N = 73)		Patients with lichen sclerosus (N = 24)	
	Item–rest correlation	Cronbach's α	Item–rest correlation	Cronbach's α
Signs		0.84		0.70
Erosions	0.52		0.46	
Hyperkeratosis	0.69		0.37	
Fissures	0.45		0.22	
Agglutination	0.71		0.57	
Stenosis	0.56		0.34	
Atrophy	0.79		0.63	

Results are given for all patients (left) and patients with lichen sclerosus (right).

false-positive rate was near zero for cutoffs of 4 and above, suggesting almost perfect specificity for these cutoffs. The rise of the ROC curve was sharp up to a cutoff of 2, and the point of equal sensitivity and specificity was between cutoff values of 2 and 1. Accordingly, the area under the curve was 0.98 (95% confidence interval 0.96 to 0.99). Table 6 presents both crude and fitted sensitivities, specificities, and LRs for positive and negative tests according to different cutoff values. A cutoff of 2 yielded clinically relevant power to rule in or out LS with a fitted LR of 14.9 for a positive test and 0.11 for a negative test. A cutoff value of 4 resulted in excellent power to rule in LS, with an LR for a positive test of 33.7.

Figure 3 shows nomograms on the relationship between pretest and posttest probabilities of LS for positive and negative tests according to cutoffs of 2 or 4. For scenario one, a patient with chronic pruritus of non-fungal origin lasting more than 1 year but no additional complaints, we would expect a probability of LS of approximately 30%. Point A on the nomogram in Figure 3 indicates that this pretest probability of 30% translates into a posttest probability of 94% for a clinical score of ≥4, ruling in LS. Point B suggests, however, that the cutoff value of 4 could not be used for ruling out LS at this pretest probability, with a resulting posttest probability of 12% for scores below that cutoff. A more stringent cutoff value of 2 would yield a posttest probability of 4.5% for test negatives with scores below that cutoff (point C in Figure 3). The distribution of scores corresponding to this scenario is shown in Figure 4A.

For scenario two, a patient with chronic pruritus of non-fungal origin lasting more than 1 year, burning sensations, soreness, and dyspareunia, we would assume a typical pretest probability of about 70% based on symptom score. This pretest probability translates into a posttest probability of 99% for a clinical score of ≥4 (point D on Figure 3), and 97% for a score of ≥2, ruling in LS at both cutoffs. Ruling out LS at the assumed pretest probability of 70% does not seem possible unless completely normal clinical findings, corresponding to a score of 0, will be present. The distribution of scores corresponding to this scenario is shown in Figure 4B.

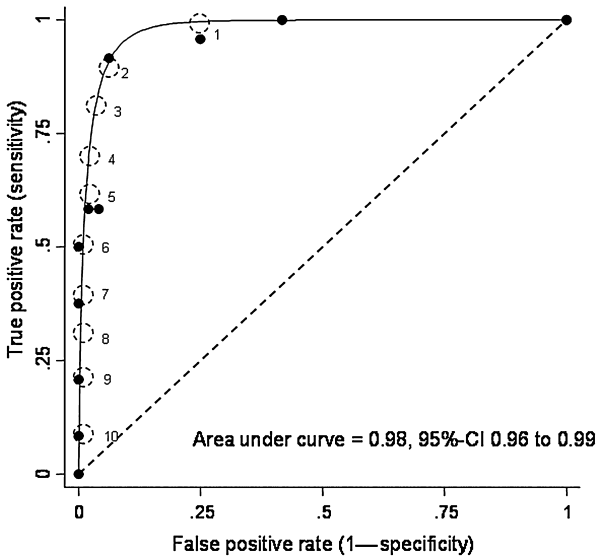

Figure 2 Fitted receiver operating characteristics (ROC) curve for the physician-administered clinical score. Open dashed circles indicate calculated corresponding cutoffs for the final composite score. The dashed diagonal line represents a hypothetical ROC curve for a test, which yields no diagnostic information. CI = confidence interval.

Table 6 Accuracy of the signs score according to different cutoff values*

Cutoff value	Number of patients				Sensitivity, %		Specificity, %		Positive LR		Negative LR	
	TP	FP	TN	FN	Calculated	Fitted	Calculated	Fitted	Calculated	Fitted	Calculated	Fitted
1	24	21	28	0	100	99	57	79	2.33	4.81	0	0.01
2	23	13	36	1	96	90	73	94	3.61	14.9	0.06	0.11
3	22	4	45	2	92	80	92	97	11.2	24.0	0.09	0.21
4	14	3	46	10	58	70	94	98	9.53	33.7	0.44	0.30
5	14	2	47	10	58	60	96	99	14.3	45.3	0.43	0.40
6	12	1	48	12	50	51	98	99	24.5	50.7	0.51	0.50
7	9	1	48	15	38	41	98	99	18.4	61.5	0.64	0.59
8	5	1	48	19	21	31	98	99	10.2	62.5	0.81	0.69
9	5	1	48	19	21	22	98	100	10.2	64.5	0.81	0.79
10	2	1	48	22	8	12	98	100	4.08	70.6	0.94	0.88
11	2	1	48	22	8	2	98	100	4.08	∞	0.94	0.98
12	0	1	48	24	0	0	98	100	0	∞	1.02	1.00

*Shown are 2 × 2 contingency tables, crude and fitted sensitivities, specificities, and positive and negative likelihood ratios for different cutoff values, with patients reaching the cutoff considered as test positives.
TP = true positive; FP = false positive; TN = true negative; FN = false negative; LR = likelihood ratio

Discussion

Main Results

We have developed and validated a patient-administered symptom score and a physician-administered clinical score, which may be useful for the diagnosis of LS and for the evaluation of treatment response. The lack of redundancy of items and the internal consistency of final composite scores suggest that these scores are valid. Our study also indicates that in the presence of typical symptoms, the diagnosis of LS can be established with clinical confidence using a cutoff value of 4 on the physician-administered clinical score. These scores are not sufficient to replace confirmation of LS by histopathology, so biopsy is still mandatory. But these scores may also provide a clinical correlation to establish a grading system for severity of disease in histopathology, which is not available yet.

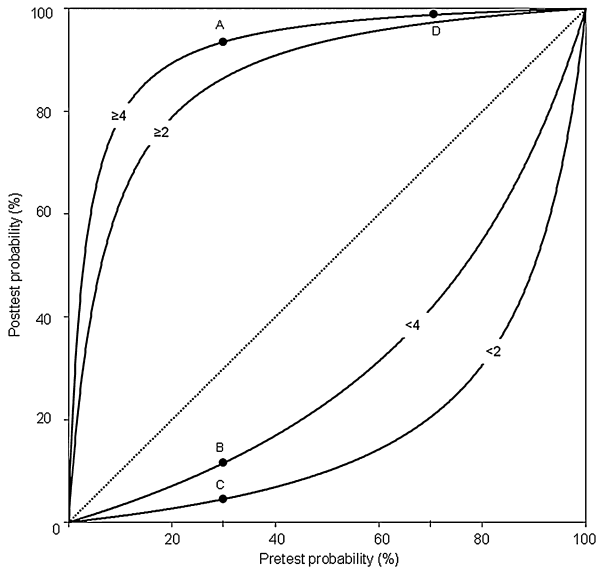

Figure 3 Relationship between pretest and posttest probabilities for different cutoffs. Curves are based on smoothed likelihood ratios (LRs) and on the assumption that LRs remain constant across different pretest probabilities for a given cutoff.

Strength and Limitations

Our study was performed in consecutive cases seen by one consultant in a tertiary care setting. To determine the diagnostic accuracy of the physician-administered clinical score, we used a case control design. These preselected cohorts of patients, with a clear distinction between cases with confirmed disease and controls without LS but another vulvar condition, minimize the amount of patients with ambiguous conditions, in whom sensitivity of specificity of such a tool is less reliable. Scoring physicians were not blinded to the patient's histopathology, which weakens the objectivity of our diagnostic scoring. Therefore, this design may overestimate the actual diagnostic accuracy. A future study in consecutive patients with clinical suspicion of LS and therefore a more realistic spectrum of diseased and non-diseased patients will be necessary. In this study, all patients should be classified irrespective of the final disease status according to the physician-administered

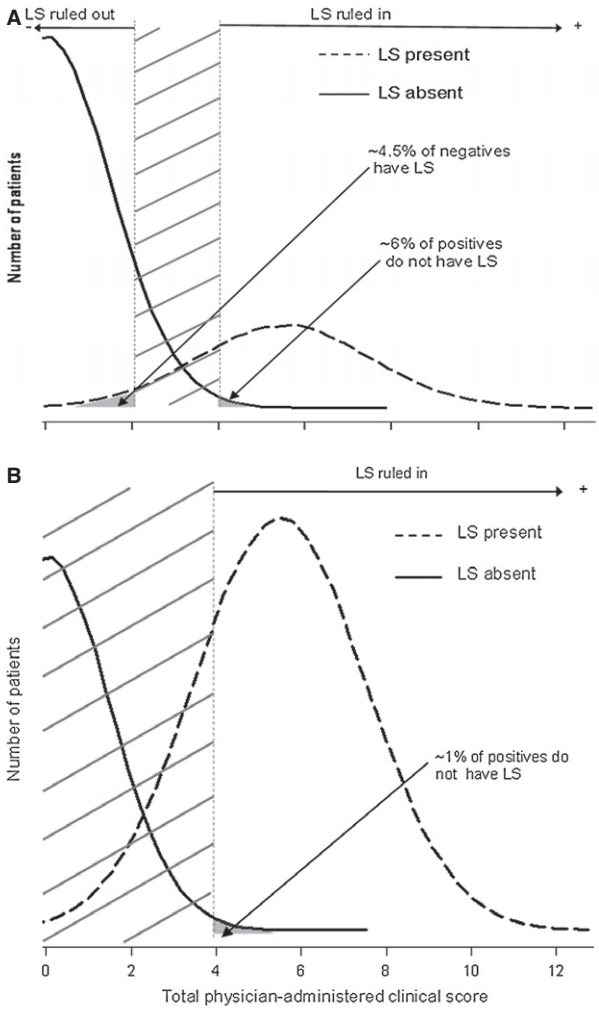

Figure 4 Approximate distributions of physician-administered clinical score totals for patients with suspected lichen sclerosus (LS). Distributions (assuming normally distributed data) are shown separately for patients with (dashed line) and without LS (bold line). Dotted lines indicate cutoffs of 4 and 2. Shaded areas represent either false negatives or false positives; hashed areas represent zones of diagnostic uncertainty where additional diagnostic workup will be necessary. (A) Scenario 1 of patients with chronic pruritus of non-fungal origin lasting more than 1 year, but no accompanying symptoms: ~30% pretest probability. In this scenario 94% of the women who test positive according to a cutoff value of 4 actually are diagnosed with LS (true positives), whereas 6% are not (false positives). (B) Scenario 2 of patients with chronic pruritus of non-fungal origin lasting more than 1 year, burning sensations, soreness, and dyspareunia: ~70% pretest probability. With this scenario, for a chosen cutoff of 4, 99% of the women who test positive actually are diagnosed with LS (true positives), whereas 1% is not (false positives). Note that for both scenarios it is assumed that there are no oral lesions present that are compatible with the diagnosis of a lichen planus.

clinical score before the presence or absence of LS is established by biopsies that are read independently by a pathologist. Of course, some patients with LS are asymptomatic for months or years, and many other vulvar diseases show different degrees of the features used in our physician-administered score, like lichen simplex chronicus, lichen planus, psoariasis, or irritant contact dermatitis. Our scores cannot discriminate between any mixed diagnosis and pure LS—asymptomatic patients with LS might even be missed—but they provide an easy tool to rule in LS as differential diagnosis for further clarification in symptomatic patients. In particular, lichen planus is considerably less frequent and often associated with oral lesions; it can appear similar to LS at the vulva or can occur concomitantly [11,18]. Our study was performed without dedicated funding; hence it was not possible to set up an inter-rater reliability study to determine the extent of variation between different observers in clinical scores. Resource limitations also meant that the number of patients and controls was limited. Thus, we used statistical modeling to obtain fitted values, and achieved satisfactory statistical precision for the estimated area under the fitted ROC curve as an established criterion of diagnostic accuracy.

Context and Implications

Recently, Goldstein et al. reported on comparable efficacy of clobetasol and primecrolimus in the treatment of LS regarding physician-administered single scores of severity, lichenification, and ulceration/fissuring, and patient-administered ratings of pruritus and burning/pain using visual analogue scales [19]. Their study confirms the necessity of a comprehensive clinical assessment in addition to a symptom score in the evaluation of treatment efficacy in patients with LS. In patients with confirmed disease our scores provide easy tools to evaluate treatment response. In addition, the patient-administered score is probably useful as reference to assess symptoms and therapy response of any symptomatic vulvar disorder. Patients with LS often require long-term treatment over months, so we recommend evaluation of symptoms and clinical features as baseline status before any treatment and reevaluation after 6 and 12 weeks. Since the physician-administered clinical score is based on visible features, response can also be evaluated independently by second reading of photographs in clinical therapy trials.

Observation of Sexual Dysfunction and High-Risk Patients

Chronic LS is mutilating and is also associated with an increased risk of vulvar cancer. Indeed, until now there is no scoring system to assess progression of the disease, which is mandatory for sufficient observation. It was shown that squamous cell cancer (SCC) did not occur in a cohort of therapy-compliant patients who underwent intermittent topical corticosteroid treatment [20]. In vulvar specimens of patients with LS complementary examinations of markers like p53 or COX-2 may define patients at risk to develop vulvar neoplasias [21,22]. Hence, our score could also be useful to evaluate outcome of long-term therapy, progression of disease, and general surveillance in these patients. Sexual dysfunction may persist despite adequate treatment in LS patients [23]. Therefore, our symptom score should also be evaluated as complementary tool to observe sexual dysfunction and symptoms in patients with symptomatic vulvar disease, in particular with LS. Thus, stratification of sexually active women with LS is not only required for adequate treatment of LS, but also essential for optimal assessment and management of sexual pain disorders [24].

Corresponding Author: Andreas R. Günthert, MD, Department of Obstetrics and Gynecology, Inselspital, Effingerstrasse 102, 3010 Bern, Switzerland. Tel: +41 (31) 632-1010; Fax: +41 (31) 632-1205; E-mail: andreas.guenthert@insel.ch

Conflict of Interest: None.

Statement of Authorship

Category 1

(a) Conception and Design
Andreas R. Günthert; Andreas Limacher; Peter Jüni

(b) Acquisition of Data
Andreas R. Günthert; Boriana G. Jahns; Elke Krause; Esther Amann

(c) Analysis and Interpretation of Data
Andreas R. Günthert; Kathleen Duclos; Andreas Limacher; Peter Jüni

Category 2

(a) Drafting the Article
Andreas R. Günthert; Kathleen Duclos; Peter Jüni

(b) Revising It for Intellectual Content
Michael D. Mueller; Kathleen Duclos

Category 3

(a) Final Approval of the Completed Article
Michael D. Mueller; Peter Jüni

References

1 Meffert JJ, Davis BM, Grimwood RE. Lichen sclerosus. J Am Acad Dermatol 1995;32:393–416.
2 Powell JJ, Wojnarowska F. Lichen sclerosus. Lancet 1999;353:1777–83.
3 Regauer S, Reich O, Beham-Schmid C. Monoclonal gamma-T-cell receptor rearrangement in vulvar lichen sclerosus and squamous cell carcinomas. Am J Pathol 2002;160:1035–45.
4 Regauer S. Immune dysregulation in lichen sclerosus. Eur J Cell Biol 2005;84:273–7.
5 Goldstein AT, Marinoff SC, Christopher K, Srodon M. Prevalence of vulvar lichen sclerosus in a general gynecology practice. J Reprod Med 2005;50:477–80.
6 Cooper SM, Gao XH, Powell JJ, Wojnarowska F. Does treatment of vulvar lichen sclerosus influence its prognosis? Arch Dermatol 2004;140:702–6.
7 Günthert AR, Faber M, Knappe G, Hellriegel S, Emons G. Early onset vulvar lichen sclerosus in premenopausal women and oral contraceptives. Eur J Obstet Gynecol Reprod Biol 2008;137:56–60.
8 Smith SD, Fischer G. Childhood onset vulvar lichen sclerosus does not resolve at puberty: A prospective case series. Pediatr Dermatol 2009;26:725–9.
9 Sherman V, McPherson T, Baldo M, Salim A, Gao XH, Wojnarowska F. The high rate of familial lichen sclerosus suggests a genetic contribution: An observational cohort study. J Eur Acad Dermatol Venereol 2010;24:1031–4.
10 Todd P, Halpern S, Kirby J, Pembroke A. Lichen sclerosus and the Köbner phenomenon. Clin Exp Dermatol 1994;19:262–3.
11 Cooper SM, Ali I, Baldo M, Wojnarowska F. The association of lichen sclerosus and erosive lichen planus of the vulva with autoimmune disease: A case-control study. Arch Dermatol 2008;144:1432–5.
12 Birenbaum DL, Young RC. High prevalence of thyroid disease in patients with lichen sclerosus. J Reprod Med 2007;52:28–30.
13 Földes-Papp Z, Reich O, Demel U, Tilz GP. Lack of specific immunological disease pattern in vulvar lichen sclerosus. Exp Mol Pathol 2005;79:176–85.
14 Regauer S, Liegl B, Reich O. Early vulvar lichen sclerosus: A histopathological challenge. Histopathology 2005;47:340–7.
15 Basson R, Wierman ME, van Lankveld J, Brotto L. Summary of the recommendations on sexual dysfunctions in women. J Sex Med 2010;7:314–26.
16 Streiner DL, Norman GR. Health measurement scales: A practical guide to their development and use. 3rd edition. Oxford: Oxford University Press; 1995.
17 Jaeschke R, Guyatt GH, Sackett DL. Users' guides to the medical literature. III. How to use an article about a diagnostic test. B. What are the results and will they help me in caring for my patients? JAMA 1994;271:703–7.
18 Saunders H, Buchanan JA, Cooper S, Hollowood K, Sherman V, Wojnarowska F. The period prevalence of oral lichen planus in a cohort of patients with vulvar lichen sclerosus. J Eur Acad Dermatol Venereol 2010;24:18–21.
19 Goldstein AT, Creasey A, Pfau R, Phillips D, Burrows LJ. A double-blind, randomized controlled trial of clobetasol vs. pimecrolimus in patients with vulvar lichen sclerosus. J Am Acad Dermatol 2011;64:e99–104.
20 Bradford J, Fischer G. Long-term management of vulval lichen sclerosus in adult women. Aust N Z J Obstet Gynaecol 2010;50:148–52.
21 Hantschmann P, Sterzer S, Jeschke U, Friese K. P53 expression in vulvar carcinoma, vulvar intraepithelial neoplasia, squamous cell hyperplasia and lichen sclerosus. Anticancer Res 2005;25:1739–45.

22 Raspollini MR, Asirelli G, Taddei GL. The role of angiogenesis and COX-2 expression in the evolution of vulvar lichen sclerosus to squamous cell carcinoma of the vulva. Gynecol Oncol 2007;106:567–71.
23 Burrows LJ, Creasey A, Goldstein AT. The treatment of vulvar lichen sclerosus and female sexual dysfunction. J Sex Med 2011;8:219–22.
24 van Lenkveld JJ, Granot M, Weijmar Schultz WC, Binik YM, Wesselmann U, Pukall CF, Bohm-Starke N, Achtrari C. Women's sexual pain disorders. J Sex Med 2010; 7:615–31.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Appendix S1 Patient administered symptom score.
Appendix S2 Physician administered clinical score.

Please note: Wiley-Blackwell are not responsible for the content or functionality of any supporting materials supplied by the authors. Any queries (other than missing material) should be directed to the corresponding author for the article.