






Determinants of Disease Specific Health-Related Quality of Life in Stroke Patients

İnmeli Hastalarda Hastalığa-Spesifik Yaşam Kalitesini Etkileyen Faktörler

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Geliş Tarihi/Received: 05.02.2018
Kabul Tarihi/Accepted: 17.05.2018

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This study was presented as a poster at
5th Medical Rehabilitation Congress,
3-6 November 2016, Ankara, Turkey
(Factors affecting quality of life in stroke patients).

ABSTRACT Objective: To assess health-related quality of life (HRQoL) in stroke patients by Stroke Impact Scale (SIS) 3.0 and to identify the factors related with HRQoL. **Material and Methods:** Sixty six stroke patients who experienced a stroke at least 1 month earlier were included to the study. HRQoL was assessed using SIS 3.0 which is a specific scale to the stroke. The patients were evaluated by Mini Mental State Evaluation (MMSE), Brunnstrom Motor Evaluation Scale (BMES), Modifiye Ashworth Scale (MAS), Functional Independence Measure (FIM), and Beck Depression Inventory (BDI). **Results:** The SIS 3.0 total scores were correlated with FIM, BMES, and MMSE positively; and with BDI negatively. The FIM and BDI were detected to be the apparent independent risk factors affecting variations in SIS 3.0 total score. The mean total SIS 3.0 scores was lower in group with ≥ 55 years old, moderate disability, and mild depression. But there was no significant difference between female and male patients in terms of total SIS 3.0 score ($p > 0.05$). **Conclusion:** The results indicated that depression and disability were consistent determinants of HRQoL assessed by SIS 3.0 in stroke patients. Also, decreased motor function and impaired cognitive status were closely associated with poor HRQoL in patients with stroke.

Keywords: Stroke; stroke impact scale 3.0; quality of life; depression

ÖZET Amaç: İnmeli hastalarda sağlıkla ilişkili yaşam kalitesi (SİYK)'ni İnme Etki Ölçeği (İEÖ) 3.0 ile değerlendirmek ve SİYK ile ilişkili faktörleri tanımlamak. **Gereç ve Yöntemler:** Çalışmaya en az 1 ay önce inme geçirmiş 66 inmeli hasta dahil edildi. SİYK, inme için spesifik bir ölçek olan İnme Etki Ölçeği (İEÖ) 3.0 kullanılarak değerlendirildi. Hastalar Mini Mental Durum Değerlendirmesi (MMDD), Brunnstrom Motor Değerlendirme Ölçeği (BMDÖ), Modifiye Ashworth Ölçeği (MAÖ), Fonksiyonel Bağımsızlık Ölçeği (FBÖ), Beck Depresyon Envanteri (BDE) ile değerlendirildi. **Bulgular:** İEÖ 3.0 toplam skorları FBÖ, BMDÖ ve MMDD ile pozitif ve BDE ile negatif korele idi ($p < 0.05$). FBÖ ve BDE, İEÖ 3.0 toplam skorundaki varyasyonları etkileyen belirgin bağımsız risk faktörleri olarak tespit edildi ($p < 0.05$). İEÖ 3.0 toplam puan ortalaması ≥ 55 yaş, orta düzeyde engellilik ve hafif depresyonlu olan grupta daha düşüktü. Ancak, kadın ve erkek hastalar arasında İEÖ 3.0 toplam puanı açısından anlamlı fark yoktu ($p > 0.05$). **Sonuç:** Sonuçlar inme hastalarında depresyon ve özürülüğün, İEÖ 3.0 ile değerlendirilen SİYK'nın tutarlı belirleyicileri olduğunu göstermiştir. Ayrıca, inmeli hastalarda azalmış motor fonksiyon ve bozulmuş bilişsel durum SİYK'deki kötüleşme ile yakından ilişkililiydi.

Anahtar Kelimeler: İnme; inme etki ölçeği 3.0; yaşam kalitesi, depresyon

Stroke is a clinical syndrome characterized by focal neurologic deficit.¹ Stroke patients commonly suffer from physical role alteration, mood disorders, cognitive impairment, and decreased social interaction in the chronic phase of stroke.² A complex network of these factors may influence the quality of life in patients with stroke.

Health-related quality of life (HRQoL) is a concept that refers to a diverse range of patient's perceptions and experiences of disease, which may be of central concern in terms of treatment goals. The HRQoL is an important outcome after stroke and it is the most important evaluation criteria during the implementation of the rehabilitation program.³ Information gained from HRQoL are useful in recognizing the patients' problems, determining treatment priorities, managing interventions, monitoring disease period, and for health economics, and identifying new ideas and solutions to the revealed problems.⁴

Many studies have evaluated the HRQoL and the factors affecting quality of life in patients with stroke.⁵⁻⁷ But the results of these studies are conflicting because of the marked heterogeneity of the stroke population, different design of the studies, and the variability in outcome measures. In most of the stroke studies, the HRQoL has been assessed by generic scales such as Short-Form Health Survey and Nottingham Health Profile.^{8,9} These instruments assess only a few areas compromised by stroke and do not provide a comprehensive and specific assessment of stroke survivors' HRQoL. Because the stroke-specific instruments are more sensitive to short-term changes in the health status of stroke survivors than generic quality of life tools, it was recommended that disease specific outcome scales should be used to evaluate the HRQoL.¹⁰ The Stroke Impact Scale (SIS) 3.0 is a specific HRQoL tool to measure multidimensional consequences of stroke.¹¹ The reliability and validity of the Turkish form of SIS 3.0 was performed by Hantal AO et al in 2014.¹² According to our knowledge, current study is the first study to assess the HRQoL using SIS 3.0 version in Turkish stroke patients. Previous studies investigating HRQoL in stroke patients usually include limited number of factors which may have impact on HRQoL.^{6,8,13} This study aimed to assess HRQoL in stroke patients by SIS 3.0 and to identify the demographic and clinical determinants that influence stroke specific HRQoL.

MATERIAL AND METHODS

The study was conducted at the Department of Physical Medicine and Rehabilitation of Medical Faculty of Ondokuz Mayıs University and local

ethics committee approved the study protocol (OMU KAEK 12. 02. 2015/60). All subjects were informed about the objectives of the study and gave their consent. The study was conducted in accordance with the principles of the Declaration of Helsinki.

STUDY PARTICIPANTS

A total of 66 patients with hemiplegia who either admitted to the outpatient or inpatient rehabilitation clinic were enrolled in cross-sectional study between March 2015 and October 2016. Stroke diagnosis was confirmed by clinical presentation, neurological examination, and imaging findings.

Criteria for selection of the patients were followings: first hemispheric stroke, stroke duration for at least 1 month, presence of unilateral damage to motor function of upper and lower extremities. Exclusion criteria included extra cerebral or sub-arachnoid hemorrhage or transient ischemic attack, brain tumor or other accompanying severe diseases and medication for emotional disorder, bilateral hemiplegia, lack of motor involvement, a history of previous stroke. As self-administered questionnaires require normal cognitive function, we excluded patients with mental disease or loss of consciousness, language disorder, and a lack of comprehension ability (motor-sensory aphasia).

EVALUATION PROCEDURE

Socio-demographic and clinical data related to hemiplegia were recorded including age, gender, body mass index (BMI), marital status, stroke etiology (ischemic/hemorrhagic), lesion side (right/left), disease duration, the duration of intensive care, the beginning time of rehabilitation, the duration of hospital stay for rehabilitation.

CLINICAL OUTCOME MEASURES

Cognitive Function

Mini Mental State Evaluation (MMSE) is a measurement that is frequently used to evaluate cognitive function. The MMSE include the assessment of memory, orientation to place and time, naming, reading, copying (visuospatial orientation), writing, and the ability to follow a

three-stage command. The MMSE has 19 items and is scored from 0 to 30 points. The reliability and validity of the Turkish version of MMSE were confirmed.¹⁴

Motor Function

Brunnstrom Motor Evaluation Scale (BMES) is a measurement that is used to assess the recovery in motor functions. The lowest stage (flaccid stage and no voluntary movement) is stage I, and the highest stage (isolated joint movement) is stage VI. Validity and reliability have been previously demonstrated.⁸

Spasticity

Modifiye Ashworth Scale (MAS): The spasticity was measured as the degree of resistance to passive movement using MAS and rated from 0 (no increase in muscle tone) to 4 (affected parts rigid in flexion or extension) according to the amount of resistance felt by the physician.¹⁵ In the present study, we tested arm abductors and adductors, elbow flexors and extensors, wrist flexors and extensors, and finger flexors, with the patient in a sitting position, if possible. We also tested hip adductors, knee flexors and extensors, and plantar flexors and extensors in supine position.

Functional Status

Functional Independence Measure (FIM) was used to assess functional disability. The reliability and validity of the Turkish version of FIM were confirmed by Kucukdeveci et al.¹⁶ The FIM is an 18-item measurement that evaluates the following parameters: self-care, sphincter control, mobility, locomotion, communication, and social cognition. The items on the FIM are scored on a 7-point ordinal scale that ranges between 1 and 7. The minimum range of the scores on the FIM is 18, which indicates a low level of functioning; the maximum range of scores is 126, which indicates a very high level of functioning. Data were collected by direct observation of the patient and, when necessary, by interview with relatives. In this study, the patients were divided into two groups according to their FIM total scores: 37 to 72 (mild), and ≥ 73 (moderate).¹⁷

Emotional status

The Beck Depression Inventory (BDI) is a self-reported questionnaire that assesses depressive symptoms during the week prior to the interview. The higher score shows increased depression of the subjects. The reliability and validity of the Turkish version of BDI were confirmed by Hisli.¹⁸ The cut off score for no depression to depression used was 9 (10 or more indicates depression). The cut off score for moderate to severe depression used was 17 (18 or more indicates moderate to severe depression).¹⁹

Stroke-specific HRQoL

Stroke Impact Scale (SIS) 3.0 is a 59-item stroke-specific outcome measure that was developed to assess several physical domains and other dimensions of HRQoL.¹¹ The SIS has 8 domains: strength, hand function, mobility, physical and instrumental activities of daily living (ADL/IADL), memory and thinking, communication, emotion and social participation. Scores for each domain range from 0 to 100, and higher scores indicate better HRQoL. The Strength items are rated in terms of strength; Memory, Communication, ADL/IADL, Mobility and Hand function items are rated in terms of amount of difficulty; Emotion and Social Participation items are rated in terms of frequency. Four of the subscales (Strength, Hand function, ADL/IADL and Mobility) can be combined into a Composite Physical Domain. The SIS 3.0 also includes a question (item 50) to assess the patient's global perception of recovery (100: full recovery, 0: no improvement). Total score is obtained by summing subscores. The reliability and validity of the Turkish version of SIS 3.0 were confirmed by Hantal AO et al.¹²

STATISTICAL ANALYSIS

The sample size for 0.90 power and $p < 0.05$ was calculated to be at least 55 for patients with stroke. However, the study was completed with a few backups by taking 66 subjects. The calculations were performed using the Statistical Package for Social Sciences software version 22.0 for Windows. Measurement variables were expressed in mean \pm

standard deviation and median (min-max), whereas categorical variables were presented in numbers and percentages (%). The Kolmogorow-Smirnow test was used to analyze normal distribution assumption of the quantitative outcomes. Data were analyzed by Student t-test and Mann-Whitney test for normal and non-normal data, respectively. Varying frequencies among the categorical groups were evaluated by Chi-square test. Spearman's correlation test was for correlation analysis. A multiple linear regression analysis was performed to identify the factors that influence the total score of the SIS 3.0. The stepwise method was used to compare the influence of different factors on SIS 3.0 total score. Statistical significance was based on a value of $p < 0.05$ with a 95% confidence interval.

RESULTS

Sociodemographic characteristics of patients and are presented in Table 1. The mean age of patients with stroke was found to be 58.86 ± 11.68 years, 61% patients were male, 85% were married. The mean duration of disease was found as 12.74 ± 16.17 months (min=1, max=70 months). The duration of hospital stay for rehabilitation was found as 27.05 ± 9.52 days. Ischemic infarct was the major etiology of stroke (88%) (Table 1).

The clinical measurements of the patients are demonstrated in Table 2. The patients had disabilities with a mean FIM score of 89.42 ± 19.17 , and had depression with a mean BDI score of 15.28 ± 6.60 (Table 2).

Significant positive correlations were found between SIS 3.0 (total and almost all subscores) and FIM, BMES, and MMSE, whereas significant negative correlations were found between SIS 3.0 (total and subscores) and, BDI and MAS ($p < 0.05$). SIS 3.0 strength and hand function domains scores were correlated mildly with upper extremity and hand MAS scores, only ($p < 0.05$) (Table 3).

As a consequence of univariate statistical assessments, stepwise multiple linear regression analyses were conducted to identify the multiple effects of independent risk factors on SIS 3.0 total score in the patients. The FIM total and BDI scores

TABLE 1: Socio-demographic characteristics of patients with stroke.

Characteristics (N=66)	Mean±SD	Med (min-max)
Age (years)	58.86±11.68	58.5 (20-79)
BMI (kg/m ²)	28.77±5.40	27.8 (18.9-45.7)
Duration of disease (month)	12.74±16.17	6 (1-72)
The duration of intensive care (day)	7.14±8.26	4 (0-30)
The beginning time of rehabilitation (day)	42.47±29.05	30 (7-180)
The duration of hospital stay for rehabilitation (day)	27.05±9.52	25 (15-60)
	N	(%)
Gender		
Female	26	39
Male	40	61
Marital status		
Married	56	85
Single	10	15
Stroke etiology		
Ischemic	58	88
Hemorrhagic	8	12
Lesion side		
Right	24	36
Left	42	64

Mean ± SD: mean ± standard deviation; Med (min-max): median (minimum-maximum); N: Number of patients; %: percentage of patients; BMI: Body mass index.

were detected to be the apparent independent risk factors affecting variations in SIS 3.0 total score ($p < 0.05$) (Table 4).

Comparison of SIS 3.0 total scores according to gender, level of disability and depression in patients are demonstrated in Table 5. The mean total score of the SIS 3.0 was significantly lower (indicating poorer HRQoL) in group with moderate disability and mild depression ($p < 0.05$). But no significant difference was found between female and male patients with stroke in terms of HRQoL (Table 5).

DISCUSSION

The objective of the current study was to identify the factors related with disease-specific HRQoL in Turkish stroke survivors. The results of the study showed that advanced age, increased disability, decreased motor function, impaired cognitive and emotional status were closely associated with poor HRQoL in patients with stroke.

There were contradictory results about the impact of gender, age and duration of disease on the

TABLE 2: Clinical measurements of the patients with stroke.

Clinical measurements (N=66)		Mean±SD	Med (min-max)
SIS 3.0	Strength (4-20)	11.34±3.74	11 (5-20)
	Memory and thinking (7-35)	26.06±5.72	28 (9-35)
	Emotion (9-45)	27.06±3.53	27 (21-36)
	Communication (7-35)	30.24±5.24	32 (13-35)
	Activities of daily living (10-50)	27.15±6.89	25 (16-47)
	Mobility (9-45)	25.43±10.27	23 (10-43)
	Hand function (5-25)	9.33±4.70	8 (5-22)
	Social participation (8-40)	18.93±6.38	17 (10-37)
	Patient's global perception of recovery (0-100)	42.87±20.94	40 (5-90)
	SIS 3.0 total score (59-295)	177.40±37.63	169 (94-261)
BMES (1-6)	Upper extremity	3.42±1.29	3 (1-6)
	Lower extremity	3.68±1.01	4 (1-6)
	Hand	3.08±1.66	3 (1-6)
MAS (0-4)	Upper extremity	1.36±1.66	1 (0-4)
	Lower extremity	0.67±0.98	0 (0-3)
	Hand	0.94±1.20	0 (0-4)
FIM	Motor score (13-91)	59.04±17.17	59 (24-88)
	Cognitive score (5-35)	30.31±4.39	31 (11-35)
	Total score (18-126)	89.42±19.17	90 (38-119)
MMSE score (0-30)		25.65±3.91	27 (12-30)
BDI score (0-63)		15.28±6.60	15 (6-32)
		N	%
Emotional status	Depressed (BDI score >10)	54	82
	Not depressed (BDI score ≤9)	12	18
Disability	Mild (FIM score ≥73)	51	77
	Moderate (FIM score= 37-72)	15	23

Mean ± SD: Mean ± standard deviation; Med (min-max): Median (minimum-maximum); N: Number of patients; %: Percentage of patients; SIS: Stroke Impact Scale; MAS Modifiye Ashworth Scale; BMES: Brunnstrom Motor Evaluation Scale; FIM: Functional Independence Measure; MMSE: Mini Mental State Evaluation; BDI: Beck Depression Index.

HRQoL in stroke patients.^{2,4,7,8,20} A number of studies demonstrated that female patients with stroke have lower HRQoL compared with males, although one study has reported no significant differences.^{4,5,8,20} Mackenzie et al. and Gokkaya et al. have stated that stroke patient's age was not related with HRQoL.^{6,8} But, Aprile et al. and Gallien et al. have observed that age was associated with HRQoL.^{7,21} The inconsistency between the studies may be related to the design of the studies, patients' characteristics, and using different scales to assess deterioration of HRQoL in stroke patients. In the current study, there was no significant gender difference in terms of HRQoL. Age and duration of disease were not detected to be the independent risk factors affecting variations in HRQoL. Ac-

cording to these results; age, gender, and duration of disease have no effect on the HRQoL in the patients with stroke. Treatment strategies to improve HRQoL in stroke survivors should be planned regardless of age, gender, and disease duration.

Several studies have shown the importance of functional status in HRQoL of stroke patients.^{6,21,22} Similarly, we found that increased disability was significantly related to low HRQoL. Furthermore, disability was detected to be the apparent independent risk factor affecting variations in HRQoL. Subgroup analysis showed that patients with moderate disability had lower HRQoL than patients with mild disability. According to these results, disability is a consistent determinant of HRQoL in stroke survivors. Therefore, rehabilitation strate-

TABLE 3: Correlations between SIS 3.0 total score, sub-scores and other clinical parameters scores in patients with stroke.

Clinical parameters (N=66)	r	SIS 3.0										Total score	
		Strength	Memory and thinking	Emotion	Communication	Activities of daily living	Mobility	Hand function	Social participation	Patients' global perception of recovery			
FIM													
Motor score	0.711**	0.478**	0.398**	0.427**	0.924**	0.919**	0.694**	0.816**	0.738**	0.906**			
Cognitive score	0.052	0.749**	0.250*	0.627**	0.379**	0.429**	0.029	0.333**	0.145	0.535**			
Total score	0.678**	0.561**	0.412**	0.502**	0.914**	0.920**	0.649**	0.802**	0.698**	0.935**			
BMES													
Upper extremity	0.860**	0.139	0.253*	0.102	0.681**	0.599**	0.854**	0.624**	0.694**	0.651**			
Lower extremity	0.787**	0.314*	0.333**	0.328**	0.778**	0.823**	0.681**	0.724**	0.739**	0.784**			
Hand	0.804**	-0.020	0.075	-0.038	0.561**	0.487**	0.895**	0.557**	0.670**	0.518**			
MAS													
Upper extremity	-0.398**	-0.145	-0.076	-0.083	-0.226	-0.139	-0.361**	-0.197	-0.156	-0.266*			
Lower extremity	-0.195	0.119	0.023	0.055	0.014	-0.026	-0.199	-0.091	-0.003	-0.068			
Hand	-0.322**	-0.071	-0.053	-0.060	-0.222	-0.118	-0.404**	-0.172	-0.181	-0.236			
MMSE	0.214	0.624**	0.321**	0.673**	0.382**	0.484**	0.129	0.339**	0.202	0.584**			
BDI	-0.366**	-0.344**	-0.685**	-0.443**	-0.551**	-0.558**	-0.346**	-0.586**	-0.458**	-0.629**			

*: p value is significant when <0.05; **: p value is significant when p<0.01; r: Spearman correlation coefficient; MAS Modified Ashworth Scale; BMES: Brunnstrom Motor Evaluation Scale; SIS: Stroke Impact Scale; SIS: Stroke Impact Scale; FIM: Functional Independence Measure; MMSE: Mini Mental State Evaluation; BDI: Beck Depression Index.

gies focusing on facilitating limitations in daily living activity may improve the HRQoL in patient with stroke.

Previous studies on post-stroke depression reported prevalence rates ranging from 25% to 79%, depending on patient selection, criteria for diagnosis of depression, and post-stroke duration.²³ In the present study, 82% of patients were noted to be depressed based on the BDI. A close association between depression and low HRQoL has been reported previously.^{2,4,5,9} Similarly, we found that higher BDI score was significantly related to lower SIS 3.0 total and all subscores. Furthermore, BDI was detected to be the apparent independent risk factor affecting variations in SIS 3.0 total score. Additionally, patients with mild depression had lower HRQoL than patients without depression. Our findings showed that emotional status is another consistent determinant of HRQoL in stroke survivors. For this reason, improving emotional status may have major importance in increasing HRQoL in these patients. Since depression could be underestimated in stroke patients, it can be suggested that patients with stroke should be closely monitored, and they should be provided with emotional support.

In previous studies, a significant relation was observed between the cognitive impairment and poor HRQoL in stroke patients.^{9,13,23} Our findings showed that cognitive impairment has a negative effect on HRQoL of stroke survivors. It can be concluded that cognitive abilities are important factors in determining QOL. As such, identifying strategies that improve cognition in stroke survivors should be a rehabilitation priority.

In the literature, there are very few studies evaluating the relationship between the HRQoL and level of spasticity, and motor recovery.^{4,5,9} Previous researchers reported that Brunnstrom motor recovery stages of patients were positively correlated with HRQoL, but there was no significant relationship between

TABLE 4: The results of multiple regression analysis for SIS 3.0 total score in the patients with stroke.

	SIS 3.0 total score		
	B	t	p
Age	-0.145	-0.859	0.394
BMI	-0.371	-1.095	0.278
Disease duration	-0.080	-0.654	0.516
The duration of intensive care	-0.221	-0.963	0.340
The beginning time of rehabilitation	-0.020	-0.316	0.753
The duration of hospital stay for rehabilitation	-0.204	-1.055	0.296
MMSE score	0.458	0.818	0.417
FIM total score	1.454	10.995	0.000*
BDI score	-1.214	-3.520	0.001*

B and t: regression coefficients; *: p value is significant when <0.05; FIM: Functional Independence Measure; SIS: Stroke Impact Scale; MMSE: Mini Mental State Evaluation; BDI: Beck Depression Index.

TABLE 5: Comparison of SIS 3.0 total scores according to gender, level of disability and depression in patients.

Subgroups	N	%	SIS 3.0 total score	
			Mean±SD	p
Gender				
Female	26	39	173.80±41.98	0.32
Male	40	61	179.75±34.88	
Disability				
Mild (FIM score ≥ 73)	51	23	190.29±32.24	0.01*
Moderate (FIM score= 37-72)	15	77	133.6±14.28	
Depression				
None (BDI ≤ 9)	12	18	217.16±31.41	0.004*
Mild (BDI=10-16)	28	42	180.67±31.79	
Mild (BDI=10-16)	28	42	180.67±31.79	0.087
Moderate (BDI=17-29)	23	35	160.39 ±27.42	
Mild (BDI=10-16)	28	42	180.67±31.79	0.006*
Severe (BDI=18-63)	3	5	118.33±22.36	

*: p value is significant when <0.05; %: percentage of patients; Mean±SD: mean±standard deviation; SIS: Stroke Impact Scale; FIM: Functional Independence Measure; BDI: Beck Depression Index.

spasticity level and QOL.^{4,5,9} Similarly, our findings showed that motor recovery stages were important for better HRQoL in stroke patients. Unlike the literature, upper extremity and hand MAS scores were mildly correlated with SIS 3.0 strength and hand function domains scores. Therefore, it is possible to conclude that the spasticity of hand and upper extremity may have role on the strength and hand function domains of HRQoL in stroke survivors. However, degree of spasticity did not seem to affect the other domains of SIS 3.0. Therefore, further studies are required to explain this association.

The current study has some limitations: First, this is a cross-sectional study, which does not provide information about changes over time in regard HRQoL in stroke patients. Secondly, the study was conducted with a relatively small numbers of stroke patients. Therefore, the results cannot be generalized to the all stroke survivors. Thirdly, lack of a comparison group is another limitation of this study. Fourthly, not all patients were assessed at the same time after stroke. The differences of time interval between stroke and outcome evaluation might affect the outcomes.

In conclusion, the reduced disease specific HRQoL after stroke appears to be related to increased disability, decreased motor function, impaired cognitive and emotional status. But the most important determinants of disease specific HRQoL were levels of depression and disability in patients with stroke. Depression and disability should be considered specifically in efforts aimed to improve HRQoL after stroke.

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