Code stroke: distinguishing stroke-mimics from cerebrovascular disease using the NIH Stroke Scale

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INTRODUCTION

It is widely known that many different conditions can present with acute neurological symptoms, the so called Stroke-mimics (SM). They are usually difficult to diagnose in emergency setting, leading up to 20-30% of misdiagnoses, and so, many of them are treated with intravenous thrombolysis. Our aim with this study was to evaluate the TeleStroke mimic (TM) score and the clinical features of the NIH Stroke Scale, in order to improve the discrimination of SM from cerebrovascular diseases (CVD), which could help for a better patient management.

MATERIAL AND METHODS

We included 494 patients from a sample of code-strokes attended in a tertiary referral hospital (Hospital Universitario Virgen del Rocío, Seville, Spain). Patients were included prospectively from May 2014 to May 2017. TM-score was evaluated in all of them. Then, a total of 108 patients with SM were selected and paired by initial NIHSS-score to another 106 patients with CVD. Basal characteristics, event information (vital signs, arrival NIHSS punctuation, NIHSS items, acute treatment) as well as TM-score were recorded. All this data was evaluated and logistic regression was made to find the best predictors of SM.

RESULTS

The most important descriptive information is resumed in the table 1. SM were more frequent young, females and with history of previous seizures and have lower vascular risk factors, NIHSS, and TM-score. 5.6% of SM received thrombolysis but there was no hemorrhagic transformation.

	CVD	SM	p
Gender (men)	**57,8%**	**45,4%**	**0.028***
Age	**72 [60-79]**	**65,5 [47-74]**	**<0,001***
Tobacco	26,2%	25,2%	0,86
Alcohol	13,6%	7,5%	0,34
Hypertension	**74,6%**	**49,1%**	**<0,001***
Diabetes	**32%**	**17,6%**	**0,015***
Dislipidemia	50%	40,2%	0,15
Previous stroke	18,1%	16,7%	0,78
Cardiopathy	20,8%	17,6%	0,55
Atrial fibrillation	**25,1%**	**8,3%**	**<0,001***
Previous seizures	**1,3%**	**4,6%**	**0,045***
NIHSS	**9 [4-16]**	**2 [1-6]**	**<0,001***
Symptoms start known	**70,5%**	**50,5%**	**0,007***
IV thrombolysis	**34,5%**	**5,6%**	**<0,001***
Mechanical thrombectomy	**10,1%**	**0%**	**<0,001***
Hemorrhagic transformation	**5,7%**	**0%**	**0,014***
TM score	**26,4 [20-31]**	**15 [11-19]**	**<0,001***

Table 1. Descriptive information.

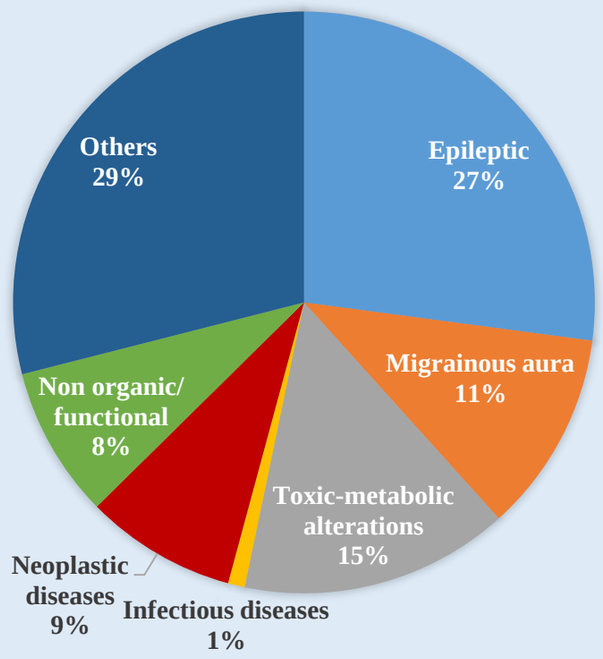


Figure 1. SM etiologies.

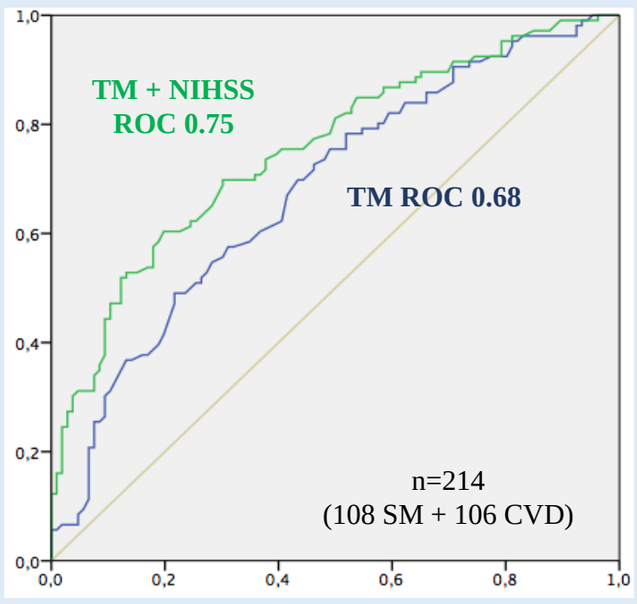
NIHSS item	CVD	SM	p
Level of consciousness	**2.8%**	**12.3%**	**0.009***
Orientation questions	**14.2%**	**31.1%**	**0.003***
Commands	11.3%	17.9%	0.17
Gaze	7.5%	9.4%	0.62
Visual fields	19.8%	11.3%	0.08
Facial palsy	**48.1%**	**23.6%**	**<0.001***
Motor right arm	20.8%	16.0%	0.37
Motor left arm	13.2%	14.2%	0.84
Motor right leg	12.3%	13.2%	0.83
Motor left leg	13.3%	9.4%	0.50
Limb ataxia	4.7%	0.9%	0.21
Sensory	36.8%	28.3%	0.18
Language	21.7%	25.5%	0.51
Dysarthria	**32.1%**	**18.9%**	**0.027***
Extinction and inattention	**9.4%**	**0%**	**0.001***

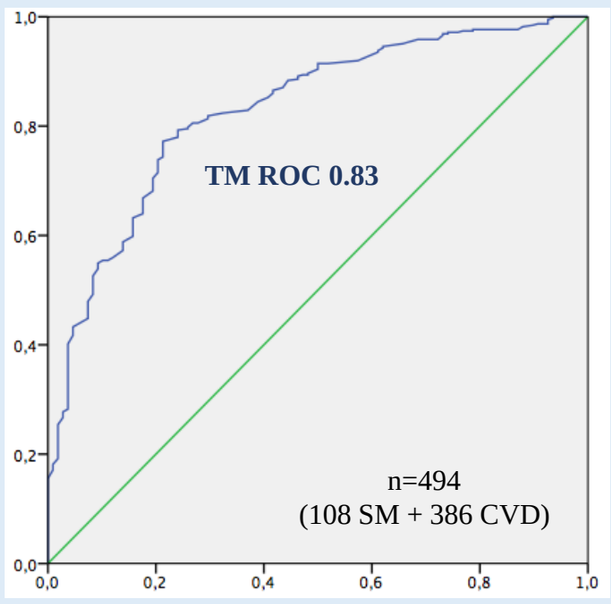
NIHSS item	OR	p
Level of consciousness	**10.89 [1.88-62.94]**	**0.008***
Orientation questions	**4.43 [1.77-11.07]**	**0.001***
TM score	**0.87 [0.81-0.93]**	**0.001***

Tables 2 (above) and 3 (below). Association of NIHSS items to each group and multivariant analysis.

On table 2, we show the different NIHSS items (dichotomized) and their association to either SM or CVD patients. The strongest relation was found in level of consciousness (LOC) and orientation questions for the SM group, and facial palsy, dysarthria and extinction for the CVD group. In the multivariant analysis (table 3) made among them to find the best predictors, statistical significance was only achieved in level of consciousness (OR 10.89 [1.88-62.94] p=0.008) and orientation questions (OR 4.43 [1.77-11.07] p=0.001) to the SM group.

Finally, we made a ROC curve (below) to complete an external validation of the TM-score (blue) with our cohort of 214 patients (108 SM + 106 CVD), which showed an area of 0.68 (lower than previously described). Adding the NIHSS items to the TM-score (green), it improved from 0.68 to 0.75 (integrated discrimination improvement p = 0.015), closer to earlier studies. Furthermore, taking into account the total sample of 494 patients (108 SM + 386 CVD), the ROC curve raised up to 0.83, perhaps proving that the TM-score is mostly useful in high NIHSS patients.





CONCLUSIONS

We found association between LOC and questions to SM, and facial palsy, dysarthria and extinction to CVD. LOC and questions act as independent predictors to SM (OR 10.89 and 4.43 respectively).

External validation of TM score was done, improving the ROC area by adding the NIHSS items.

Taking into account those NIHSS items, we can improve the predictive value of TM-score in the emergent evaluation of neurological patients.