The upgoing thumb sign

An interobserver/intraobserver reliability study

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Abstract

Background: The upgoing thumb sign as a subtle clinical finding of upper motor neuron involvement has been frequently reported in patients with TIAs and minor strokes. This study was designed to show the method of examination and interpretation and the interobserver/intraobserver reliability. **Methods:** The thumb sign was elicited in TIA/minor strokes or stroke mimics. After obtaining the participant's permission, the examinations were recorded. Two independent neurologists reviewed all patients for the possibility of an upgoing thumb sign. After 1 hour education about the definition of an upgoing thumb sign to a group of stroke fellows, nurse practitioners, and a research secretary, the videos were reviewed and the participants rated the thumb sign independently. The intraobserver reliability was assessed after 3 months by rating the same videos. **Results:** The interobserver reliability among 9 raters showed an overall agreement of 0.83 and fixed-marginal kappa of 0.66. The same videos were reviewed by the observers after 3 months with a similar level of agreement (percent of overall agreement 0.84, fixed-marginal kappa 0.66) and a substantial to almost perfect level of intraobserver concordance (mean 0.86; SD 0.08; median 0.90; interquartile range 25–75, 0.8, 0.95). **Conclusions:** The upgoing thumb sign is a subtle upper limb neurologic finding, with a high level of interobserver and intraobserver reliability. The test is easy to perform and can be interpreted accurately. *Neurol Clin Pract* 2017;7:483–487

A thorough neurologic examination is a key part of the clinical decision-making process in neurology. Regardless of the undeniable importance of modern neuroimaging studies, a thorough history-taking and clinical examination, even for subtle findings, are an indispensable part of the practice of clinical neurology. We have previously reported an upgoing thumb as a subtle clinical presentation of upper motor neuron

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(UMN) involvement in patients with minor stroke or TIA.^{1,2} UMN involvement in patients with an upgoing thumb sign has not only been proven in clinical observations, but also in one experimental study in normal healthy individuals with the inhibition of the primary motor cortex (M1) using repetitive transcranial magnetic stimulation.³

In a considerable proportion of patients with neurologic diseases, the thumb contralateral to the hemisphere or brainstem side involved showed an upgoing thumb while keeping the palm facing at the level of the shoulder, corresponding to an upgoing toe sign (Babinski sign).^{1,2} Similar clinical findings were reported by Souques⁴ (Souques sign) and Milton Alter⁵ (the digiti quinti sign).

The current study was designed to assess interobserver/intraobserver reliability for the detection of the upgoing thumb sign.

METHODS

Study area and population

This study was conducted at the Stroke Prevention Clinic at University Hospital, University of Western Ontario, Canada. Consecutive patients with a diagnosis of minor stroke or TIA and stroke mimics were examined by a clinical fellow (SA) and a faculty neurologist (VH). In all patients, a standard neurologic examination and appropriate neuroimaging studies were performed to assess any focal neurologic deficits related to stroke.

Standard protocol approvals, registrations, and patient consents

The study was approved by the Ethics Committee of the University of Western Ontario. Informed consent was obtained from all participants before conducting the neurologic examinations and video recordings.

Thumb sign examinations

To examine the thumb sign, patients were instructed to sit comfortably. After a brief description of the test, we asked our patients to first close their eyes and hold their hands in midposition over their knees, keeping palms facing together. Then we asked the patients to quickly raise their hands from the knees and hold them at shoulder level while keeping their elbow straight. The upward movement of the right or left thumb in comparison with its contralateral counterpart was considered as an upgoing thumb sign (positive thumb sign) (figure 1, video at Neurology.org/cp).

The teaching of the upgoing thumb sign

A group of 9 stroke fellows, residents, medical students, nurse practitioners, and research staff were selected as independent observers and participated in a teaching session. In a 1-hour educational session, we described the method of the thumb sign examination and interpretation in detail. All questions were answered during this session and the abilities of the participants were assessed by VH.

Interobserver and intraobserver reliability

Patients were reviewed by 2 independent neurologists (VH and SA), who scored the thumb sign as up or no change independently. Patients who had a concordant result according to the neurologists (a total of 20 videos) were selected and their videos were reviewed by 9 independent observers. After 3 months, the videos were reviewed again with the same group to assess intraobserver reliability. Observers were blind to their previous response and videos were selected in random order.

Video

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Figure 1 Left upgoing thumb sign in a patient with a history of TIA

Statistical analysis

The interobserver/intraobserver reliability was assessed using the online kappa calculator for multiple observers and multiple cases developed by Justus Randolph (justusrandolph.net/kappa/). The level of agreement in the detection of an upgoing thumb sign was defined based on the kappa result as poor (0–0.2), fair (0.21–0.4), moderate (0.41–0.6), substantial (0.61–0.8), and almost perfect concordance (0.81–0.99).⁶

RESULTS

A summary of observers' ratings for an upgoing thumb sign is shown in table e-1. Raters had an overall agreement of 0.83, fixed-marginal kappa of 0.66. The same videos were reviewed by the observers after 3 months (table e-2) with a similar level of agreement (percent of overall agreement 0.85 and fixed-marginal kappa of 0.66). Figure 2 shows an almost perfect level of intraobserver concordance after 3 months (mean 0.86; SD 0.08; median 0.90; interquartile range 25–75, 0.8, 0.95).

DISCUSSION

Clinical decision-making in neurology requires a detailed history-taking and a thorough physical examination. Previous studies showed a different level of sensitivity and specificity in the detection of focal brain lesions by clinical examination.^{7,8} Although focal major neurologic deficits are often easy to detect, subtle clinical findings are important pieces to help diagnose a neurologic disorder.^{8–11} However, in several cases, these findings were not always evaluated. We had previously proposed the upgoing thumb sign as a subtle finding of UMN involvement in several patients.^{1,2} As a new finding, it is important to show the reliability of this examination and at the same time the feasibility of teaching how the sign should be elicited. In this study, we showed a substantial level of concordance among multiple raters, emphasizing the reliability of the examination after a 1-hour training session.

Interobserver/intraobserver variation is common in neurologic examinations, which can be influenced by rater/patient factors.^{12,13} Clinicians should take into account such variations at the time of the diagnosis of neurologic diseases, such as stroke. Among 9 raters, we showed

Supplemental Data

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a substantial level of interobserver agreement (fixed-marginal kappa 0.66). After review of the same videos, a substantial level of intraobserver concordance (mean 0.86; SD 0.08; median 0.90; interquartile range 25–75, 0.8, 0.95) was again observed. The results can be comparable to or better than the majority of standard and widely accepted tests and signs in the current practice of clinical neurology, such as ankle jerks¹⁴ and the Babinski sign.^{15,16} Previous studies showed a different level of accuracy for the examination of the Babinski sign, with a relatively high specificity (77%–99%) and a wide variation in its sensitivity (35%–90%) and in its interobserver (0.09–0.3) and intraobserver concordance (0.46–0.59).^{15,17,18} In a study of 107 adult hospitalized and outpatient patients, 2 independent neurologists had an interobserver variability of 0.73 (95% confidence interval [CI] 0.598–0.858) with an intraevaluator reliability of 0.57 (95% CI 0.27–0.87) and 0.47 (95% CI 0.019–0.914).¹⁸

The interrater agreement between senior physicians and medical students has also been assessed in some studies. In a study among 10 physicians, including neurologists and non-neurologists, an almost similar interrater reliability and accuracy in terms of an agreement with known UMN weakness was reported.¹⁶ In a comparison of neurologic assessments of 12 medical students and 12 neurologists, a substantial interrater agreement within the neurologist and student groups (kappa 0.72 and 0.67, respectively) was also reported.¹⁹ In our study, despite a different level of experience among observers, an upgoing thumb was detected with a substantial level of agreement, emphasizing our ability to easily teach the examination even to lay persons.

Our study has some limitations, including a relatively small sample size. On the other hand, a blind method of detection of the thumb sign and multiple rater assessments have provided

Figure 2 Intraobserver reliability of the thumb sign after 3 months among 9 independent observers

enough evidence to assess the reliability of this new examination. The upgoing thumb sign is an easy, highly reliable test to perform. It is painless and convenient for both physicians and patients.

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AUTHOR CONTRIBUTIONS

S. Abootalebi: study design. M.R. Azarpazhooh: writing the paper. L. Sposato: data analysis. V. Hachinski: study design, supervision, and writing the paper.

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