



Contents lists available at [ScienceDirect](#)

Auris Nasus Larynx

journal homepage: www.elsevier.com/locate/anl



Review

Japanese standard for clinical stabilometry assessment: Current status and future directions

Masahiko Yamamoto^{a,*}, Kazuo Ishikawa^b, Mitsuhiro Aoki^c, Keisuke Mizuta^c,
Yatsuji Ito^c, Masatsugu Asai^d, Hideo Shojaku^d, Toshiaki Yamanaka^e,
Chisato Fujimoto^f, Toshihisa Murofushi^g, Tomoe Yoshida^a

^a Department of Otorhinolaryngology, Toho University School of Medical (Sakura) 564-1, Shimoshizu, Sakura city, Chiba Pref. 285-8741, Japan

^b Dizziness Center, Japanese Red Cross, Akita Hospital, 222-1, Naeshirozawa, Saruta, Kamikitade, Akita-city, 010-1495 Akita Pref, Japan

^c Department of Otolaryngology, Gifu University Graduate School of Medicine, 1-1 Yanagido, Gifu 501-1194, Japan

^d Department of Otolaryngology, Head and Neck Surgery, Faculty of Medicine, University of Toyama, 2630 Sugitani, Toyama city, 930-0194 Toyama Pref., Japan

^e Center for Dizziness/Department of Otolaryngology-Head and Neck Surgery, Nara Medical University Hospital, 840 Shijo Kashihara, Nara 634-8522, Japan

^f Department of Otolaryngology, Faculty of Medicine, The University of Tokyo, 7-3-1, Hongo, Bunkyo-ku, Tokyo 113-8655, Japan

^g Department of Otolaryngology, Teikyo University School of Medicine, Mizonokuchi Hospital, 3-8-3 Mizonokuchi, Takatsu-ku, Kawasaki 213-8507, Japan

ARTICLE INFO

Article history:

Received 24 April 2017

Accepted 16 June 2017

Available online xxx

Keywords:

Analysis

Clinical stabilometry

Instrumentation

International standards

Japanese standards

Recording conditions

ABSTRACT

Stabilometry is a useful tool for examining patients with functional disorders of the vestibular system. However, measurement techniques and devices vary by country. Therefore, international standardization of stabilometry is mandatory to validate the exchange of important findings. This was advocated at the 1983 Posturography Meeting in Kyoto but has not been adopted worldwide, and each country has continued to use unique regional measurement methods. In Japan, stabilometry has widespread application in medical practice in conjunction with research into its applications. With a goal of international standardization, we present details of stabilometry measurement methods and their application in Japan, together with a brief history and potential future directions of stabilometry.

© 2017 Elsevier B.V.. All rights reserved.

1. Introduction

Stabilometry is routinely used in clinical practice to study functional human equilibrium. Although the importance and clinical significance of measuring vestibular function is widely recognized, there are considerable variations across methods and devices used to measure body sway, such as measurement time, standing posture, and feet position, as well as the precision of the equipment. For knowledge to be shared effectively and productively, an international standardization

* Corresponding author.

E-mail addresses: masa@med.toho-u.ac.jp (M. Yamamoto), kazuo_ishikawa@akita-med.jrc.or.jp (K. Ishikawa), aoki@gifu-u.ac.jp (M. Aoki), kmizuta@gifu-u.ac.jp (K. Mizuta), ity@gifu-u.ac.jp (Y. Ito), masai@med.u-toyama.ac.jp (M. Asai), hshojaku@med.u-toyama.ac.jp (H. Shojaku), toshya@naramed-u.ac.jp (T. Yamanaka), toshi-ty@umin.ac.jp (T. Murofushi), tomoe@med.toho-u.ac.jp (T. Yoshida).

<http://dx.doi.org/10.1016/j.anl.2017.06.006>

0385-8146/© 2017 Elsevier B.V.. All rights reserved.

of stabilometry was proposed at an International Society for Posture and Gait Research (ISPGR) meeting, and workshops on this topic were held at the Bologna (2009), Akita (2013), Vancouver (2014), and Seville (2015) ISPGR meetings. To achieve consensus for an international standard, each country should develop a possible and realistic draft to contribute to a global measurement standard. If the clinical application of stabilometry can be developed further under the global standardization, our understanding of the vestibular system will be shared effectively and deepen, with important implications for human health. At a recent workshop meeting of the ISPGR in Seville (2015), the delphi method was introduced to obtain a possible international standard.

Against this background, we considered it important to determine the Japanese standard for stabilometry, which finds widespread clinical application in general medical practice in Japan, especially since 1994 when health insurance included coverage of this test. We provide here a brief historical background, details of the application and present status of stabilometry in Japan, and some perspectives on future applications.

2. Historical background

In 1964, it became possible to obtain a stable recording of the body's center of gravity, later defined as the center of pressure (COP), by using a presser sensor developed by Baron [1]. Subsequently, clinical studies of body sway were conducted in several countries. In 1971, researchers – mainly from Europe and Japan – formed the International Society on Posturography and organized its first meeting on posture and stabilometry in Madrid, Spain. This was the very beginning of the ISPGR. Participants noted that standardization of both the measurement method and measuring device was required; to obtain such consensus has since been the focus of this body. The 6th Meeting of the International Society of Posturography in Kyoto in 1981 was the first meeting on international standardization. At the next meeting in 1983 in Houston, chaired by Professor Makoto Igarashi, the main requirements for this standardization were defined. Accordingly, in 1983, Kapteyn et al. published their proposal for standardization, and it was anticipated that each country would submit their approval [2]. Thereafter, the Japan Society for Equilibrium Research at a domestic research meeting on posturography established this proposal as their standardized method of stabilometry [3].

In 1994, the Ministry of Health, Labour and Welfare in Japan adopted stabilometry as an insurance-covered examination of equilibrium, and it has since found widespread application in routine medical practice as well as in physiological research and rehabilitation. Stabilometric testing is generally recognized as being useful not only for clinical assessment of patients with vertigo but also for further study of the postural control system (Fig. 1). Other countries, however, have not entirely adopted the Kapteyn proposal and developed their own regional standards.

3. Current status of standard methods of stabilometry

3.1. Instruments

In 1970, the initial instrument used to measure body sway was manufactured by the San-Ei Sokki Co., Ltd., Japan and has since been manufactured in accordance with the standards reported by Kapteyn et al. and authorized by the International Society for Posturography in 1983 [2]. The instrument was registered with the Japan Industrial Standard in 1987 [4] as shown in Table 1(a). Because all instruments used for the purpose of measuring the movement of the body's center of gravity have been developed by the same standard, data obtained at each institute and/or hospital in Japan are comparable, provided other measurement protocols remain the same. The instrument should be recalibrated periodically to ensure data reliability. Recently, Scoppa et al reported accuracy that was 10-fold greater than that of the Japanese standard [5] for stabilometry (Table 1(b)).

With regard to the sampling frequency, a higher frequency is better, but has to be considered from the perspective of clinical significance and commercial availability. Asai et al. compared differences between sampling frequencies at 20 and 100 Hz, and showed that most variables did not have significant change; however, at 20 Hz, the outer circumference area decreased by 14.5% as did velocity vectors at 8 different directions by approximately 5% [6]. In Japan, normal values for each age group and sex have been reported with 20 Hz sampling [7], which improves practical convenience for clinicians and is currently considered the optimal sampling rate. However, with regard to the most pertinent sampling frequency for clinical use, there is room for further study.

3.2. Posture

The appropriate posture was determined in 1983 following several studies and discussions by Japanese specialists, mostly neuro-otologists.

3.3. Standing posture

In Japan, the effects of labyrinthine function on body equilibrium have been studied since 1940, and their contribution to postural reflexes are demonstrated in Fukuda's stepping test and writing test with blindfolding. Together with Tokita, Fukuda elucidated the importance of the deviation caused by disequilibrium [8] and, based on their research, a relaxed, natural standing posture with arms extended laterally was considered the most appropriate [9]. On the other hand, a recent study of the influence of arm position on the stabilogram showed that the folded arms posture was more stable, regardless of foot position. In addition, the velocity vector of the right-to-left direction was suppressed in the folded arms posture [10].

3.4. Position of the feet

Feet position significantly affects the stabilogram. It has been shown that stable position is with each foot placed at 30° with heels in mutual contact along with several others when

Download English Version:

<https://daneshyari.com/en/article/8754795>

Download Persian Version:

<https://daneshyari.com/article/8754795>

[Daneshyari.com](https://daneshyari.com)