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Review Article

Clinical and non-clinical initial assessment of facial nerve paralysis: A qualitative review

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ABSTRACT

This paper illustrates a brief review of some clinical and non-clinical methods to evaluate the facial nerve function in facial paralysis cases. A rigorous search of online databases such as IEEE, Springer, Elsevier, ACM digital library, Wiley online library, and Pub Med was conducted from January, 2012 to August, 2013 to discover and examine previous works on the field of facial treatment and rehabilitation. A brief introduction of facial nerve paralysis is provided. We examined the type of facial disorders, the number of subjects, and methods used to evaluate the facial nerve function. Different keywords were used to acquire the studies based on the desired criteria. A total of 80 articles were identified and were analysed for inclusion in this search. A brief discussion of both types of methods is presented. In conclusion, the review provides recommendations for further improvements.

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1. Introduction

Facial nerve paralysis is the disablement of the motor function of facial muscles due to damage to the facial nerve, which is the seventh (VII) cranial nerve, the brainstem nuclei of the facial nerve, and/or the neuromuscular system innervated by this nerve [1]. Unlike other muscles, the facial muscles are inserted directly into the skin. Contraction of the muscles will cause the skin to move. The facial nerve contains approximately 10,000 fibres, and their primary function is to operate the muscles responsible for facial expressions. Damage to any facial nerve affects all of muscles associated with facial expression; thus, facial paralysis is one of the most devastating peripheral nerve injuries [2].

Patients with this paralysis will face nasal obstruction in the affected nostril(s) and pain in the mastoid process, neck, ear, and/or face [3]. Patients commonly report personal and work-related problems, as well as limited social integration and interpersonal communications [4,5]. These problems stem from facial disfigurement and difficulties in communicating effectively in social settings. Consequently, people with facial paralysis are often introverted and can become isolated.

The face is also a crucial component of beauty, sexual attractiveness and sexual interest [6]. Therefore, patients with facial paralysis experience pronounce psychological distress.

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Often, these patients must cope with feelings of shame, decreased self-esteem, anxiety, depression, guilt, anger, and/or fear [7,8]. Nutrition may also be impaired in patients with facial paralysis. Routine and seemingly easy tasks, such as eating, can be quite challenging for patients with facial paralysis. More specifically, a survey conducted by Sjogreen and colleagues [9] revealed that these patients exhibited difficulties in the oral phase, including ''getting food off the spoon with their lips'', ''food and liquid leak out of the corners of the mouth'', and ''it takes a long time to swallow bites of food''. Verbal communication may also be impaired in this population of patients. Bilabial incompetence produces characteristics speech error patterns including substitution, distortions, and omissions of bilabial sounds (/p/, /b/, /m/) and alveolar sounds (/t/, /d/, /h/). Goldberg and colleagues [10] noted that these patients also have to compensate for /f/, /v/, /s/, /sh/, and /w/ sounds.

The annual prevalence of facial paralysis is approximately between 15 and 40 cases per 100,000 in the general population [11–13], and half of these reported cases are Bell's palsy [14–17]. Both genders are included in this approximation, and the peak ages are between 30–50 and 60–70 years [18]. Some possible causes of facial paralysis are idiopathic, birth, congenital anomalies, trauma, Bell's palsy, Ramsay Hunt Syndrome, and genetic disorder [19]. However, many works have concentrated on Bell's palsy because it is the most common cause of unilateral facial paralysis, i.e., approximately 50% of the cases [20]. Bell's palsy has been included in the idiopathic category, i. e., diseases arising from an unknown cause. Bell's palsy has many definitions, but these all have the same meaning. The simple definition is that it is a lower motor neuron facial palsy that results in muscle weakness on one side of the face (either the right side or the left side) [21,22]. Based on the International Database of the US Census Bureau [23], an extrapolation of the incidence rate of Bell's palsy has been made. The result shows that China has highest incidence rate with 191,007 cases, followed by India and USA, which have 156,628 and 43,184 cases, respectively. Those who work with facial paralysis patients are acutely aware of the uses of rehabilitating both the physiological and psychosocial aspects of this disability. Restoring the function and expression to the highest level possible will result in improved health, self-esteem, self-acceptance by others, and quality of life.

Surprisingly, to date, no standard facial assessment methods or facial grading systems have been universally accepted to provide a quantitative measurement of facial nerve function [1]. A reliable facial grading system should be continuous, should not prevent any facial movements, should be easy to handle, inexpensive, and unambiguous, should require minimum equipment, should not be time-consuming, and should be able to measure the static and dynamic functions of facial muscles [8,24,25]. A standard facial grading system is desired by clinical professionals to access the severity of facial paralysis at its first stage, and the results are consistent among different examiners who have evaluated the same patients. Moreover, facial paralysis is a time-dependent phenomenon; thus, the system should allow the examiner to follow the progress of a patient because a patient's fears may be alleviated by the recording of improvements [26–28].

Based on the above discussion, the purpose of this paper is to present a brief review of facial assessment methods in facial paralysis, which are divided into two categories; clinical and non-clinical approaches. The aim of the review is to provide researchers information on the methods proposed by previous works in order to develop a standard facial grading system that is globally acceptable.

2. Methodology

A thorough search of online databases such as IEEE, Springer, Elsevier, ACM digital library, Wiley online library and Pub Med, was conducted from January, 2012 to August, 2013 to identify and analyse the previous works on the field of facial paralysis. The search for these works was started with the keywords pertaining to facial paralysis, facial rehabilitation, Bell's palsy, facial nerve paralysis, and others combined with the medical subject or area to identify the definition, causes, reported cases, and other information related to the facial paralysis. A total of 125 articles were found based on the title, keywords, and abstract, and these appeared to be eligible for this review and were thus included in the first stage. All of these studies were then analysed based on the following desired criteria: (a) published in the English language; (b) discussed facial palsy with any cause; and (c) must discuss at least one facial nerve evaluation method for facial paralysis. If the desired criteria were met, the full text of the article was reviewed. The important references of the relevant and selected publications were also checked. All journals and conference proceedings were considered in this study. A couple of definitions and statistics were acquired through the Google search engine. Twenty studies were excluded based on irrelevant titles and abstracts, and 23 studies were screened to determine whether they met the inclusion criteria. Seven additional studies were eliminated due to duplication and insufficient information. Sixteen articles were excluded after a full evaluation of the text. After the selection process, a total of 80 studies were included and analysed in this review. All of the facial nerve evaluation methods described by the selected studies will be presented in the tables. Thus, researchers will be able to compare and find the most accurate methods for the evaluation of the facial nerve functions in order to construct an improved standard method in the future. Fig. 1 shows the flow chart of the study selection process.

3. Facial nerve assessment

The development and application of an objective and universally accepted grading system is crucial for measuring the degree of facial paralysis and to provide a standardise outcome measure of treatment and rehabilitation success [11,29]. This review found two different facial nerve assessment methods; clinical and non-clinical. There is a profound difference between the clinical method and the non-clinical method for facial paralysis. The clinical methods do not involved the use of any specialised computer equipment; most rely on subjective assessment by clinicians. In contrast, the non-clinical methods that will be discussed here utilised the