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Journal of Otology 10 (2015) 7–12

www.journals.elsevier.com/journal-of-otology/

Advances in diagnosis and non-surgical treatment of Bell's palsy

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Received 11 February 2015; revised 16 February 2015; accepted 23 February 2015

Abstract

Bell's palsy is a commonly seen cranial nerve disease and can result in compromised facial appearance and functions. Its etiology, prognosis and treatment are still being debated. This paper is a review of recent development in the understanding of etiology, diagnosis and non-surgical treatment of Bell's palsy.

Keywords: Facial paralysis; Non-surgical treatment; Steroids

1. Introduction

Facial paralysis is a common condition involving the facial nerve and can significantly impact a patient's quality of life. The facial nerve is a compound nerve comprised of motor, parasympathetic and sensory fibers. Damages to the facial nerve affect facial functions and appearance. Based on the location of the causal pathology, facial paralysis can be categorized as central or peripheral. Central facial paralysis results from disorders of the neural system above the facial nucleus, while peripheral facial paralysis is caused by damages to the facial nucleus or facial nerve. Bell's palsy is the most common peripheral facial paralysis. Diagnosis of facial paralysis is primarily based on clinical presentation, including weak eyebrow lifting, incomplete eye closure, drooping mouth corner, dry eye, loss of taste sensitivity, hyperacusis and ear pain (Stew and Williams, 2013). The etiology and degree of facial paralysis are quite variable and so are its treatment and treatment outcomes at this time (Kim and Lelli, 2013).

2. Etiology

There are roughly six types of peripheral facial paralysis: idiopathic (Bell's palsy), congenital, infection-related, traumatic, tumor-related and others (Bleicher et al., 1996). Bell's palsy has been used in lieu of "idiopathic" facial paralysis in the past, referring to idiopathic paralysis from lower facial neuron disorders and requiring exclusion of other etiologies (Dale, 1973). David proposed the hypothesis that Bell's palsy is a result of herpes virus infection, which has been supported by some studies at serology levels (Mccormick, 2000; Musani et al., 2009). Using polymerase chain reaction (PCR) technology, Murakami et al. (1996) was able to detect herpes virus genes in the geniculate ganglion area in facial paralysis patients but not in normal subjects. However, as indicated by Linder et al. (2005), detection of herpes virus in the geniculate ganglion in facial paralysis patients itself does not necessarily demonstrate the roles of the virus in the development of facial paralysis. In a prospective study involving 38 patients with Bell's palsy, specific serous IgM test showed possible infection in 11 patients, of which 6 were borrelia burgdorferi, 4 were chicken pox and only 1 was herpes virus (Imarhiagbe et al., 1993). Other reported possible etiologies include zoster sine herpete (Lee et al., 2012), Lyme disease (Oymar and Tveitnes,

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Peer review under responsibility of PLA General Hospital Department of Otolaryngology Head and Neck Surgery.

http://dx.doi.org/10.1016/j.joto.2015.02.003

2009), parotitis, rubella (Morgan and Nathwani, 1992), vaccination (Mutsch et al., 2004), etc.

In adults, of all potential facial paralysis risk factors (including diabetes and pregnancy), only aging is supported by evidence (Monini et al., 2010). In children, Bell's palsy appears to be more common in cold seasons (Tsai et al., 2009). Some have found that the incidence of Bell's palsy in pregnant women is 45.1/100,000, almost three times as high as in non-pregnant women of similar age (Hilsinger et al., 1975), and possible causes may be hypercoagulability, elevated blood pressure, increased fluid load, virus infection and suppressed immunity (Cohen et al., 2000). But an analysis of these findings by Vrabec et al. (2007) showed that the rate of facial paralysis in pregnant women was not significantly higher than in non-pregnant women and that the seemingly high rate of facial paralysis in the third month of pregnancy might be related to increased susceptibility to herpes virus infection which was associated with unfavorable prognosis due to limitations on pharmacological interventions during pregnancy.

3. Diagnosis

For comprehensive facial paralysis evaluation, a thorough history must include inquiry on exposure to various viruses (herpes, chicken pox-varicella zoster, HIV, etc) and history of stress and cold symptoms. All categories under the House-Brackmann grading system (H-BGS) must be covered in physical examination. Assessment of Bell's phenomenon and corneal reflex can help predict the risk of corneal injury. The ear should be examined for mass or herpes rash. Head and neck examination should include the parotid and the entire body should be examined for erythema migrans (Melvin and Limb, 2008). In patients with trauma to the temporal bone, audiometric tests should be performed to assess any hearing loss and its type and severity. Selection of imaging studies depends on the injury in a particular patient.

Localizing tests can help determine the location of facial nerve disorder. They are based on the fact that facial nerve functions proximal to the site of the disorder are preserved. In complete facial nerve damage, although localizing tests are reliable they may not be necessary; while in partial of mixed facial nerve injury, these tests may not be reliable and therefore their use is declining in recent years (Flint et al., 2010).

Electrophysiological tests include nerve excitability test, maximum stimulation test, electroneuronography, electromyography, etc, whose roles are limited in early stages of the condition and they should be applied at different time points (Table 1). Nerve degeneration continues in the first two weeks in most cases of Bell's palsy (Danielides et al., 1994), and it has therefore been recommended that nerve excitability test be repeated during this period. Nerve excitability test and maximum stimulation test rely on subjective observations and can be observer-biased. In contrast, electroneuronography (ENoG) and electromyography (EMG) are relative objective tests. ENoG records supra-maximum stimulation evoked compound action potentials (CAPs) from muscles and a loss of more than 90% of amplitude compared to normal side indicates poor prognosis. To avoid false positive results, ENoG should be performed a few days after facial nerve injury. EMG reflects post-synaptic potentials and can detect activities of a single motor unit. On AY et al. evaluated the consistency between EMG and clinical assessment and found they showed different validity levels for different areas on the face: *Kappa* = 0.87 for orbicularis oculi but only 0.59 for orbicularis oris. In about 65% of the cases where EMG detected no voluntary motions, their presence was reported in clinical evaluation, although EMG detected low grade synkinesis not noticeable to clinical assessment (On et al., 2007).

Table 1
Timing and interpretation in electrophysiological studies of facial nerve (Bonner et al., 1991).

Test	Time	Results	Interpretation
EMG	>2 weeks	Motor unit activities	Axon intact
		Multiphasic potentials	Nerve regeneration
		MU + fibrillation	Partial degeneration
ENoG	<3 weeks	Loss < 90%	Favorable prognosis
		Loss > 90%	Poor prognosis
Excitability Test	<3 weeks	Threshold < 3 mA	Favorable prognosis
Maximum stimulation	<3 weeks	Severely decreased or no response	Progressive degeneration

4. Management

4.1. Eye protection

Facial paralysis can lead to eye closure failure, which, without timely intervention, can result in corneal ulceration, scarring and vision loss (Lane, 2012). Intervention is based upon judgment on the prognosis of facial nerve function as well as the lagophthalmos (Lee et al., 2004). For mild lagophthalmos with optimistic prognosis, artificial tears, ointment, humidifying cover, eyelid implant, botulinum toxin or eyelid stitches can be effectively used. Artificial tears are usually the first choice measure and can be combined with ointment at night (Mavrikakis, 2008). If needed, eye patch or humidifying cover can be added, although adding humidifying cover has not been shown to significantly reduce the risk of eye complications (Sorce et al., 2009). In recent years, scleral contact lenses have been used to protect exposed cornea, including the prosthetic replacement of the ocular surface ecosystem (PROSE), which is a breathable scleral lens filled with saline. Gire et al. (2013) reported using the PROSE in patients with severe corneal complications from facial paralysis which provided vision improvement with no adverse effects. Eyelid implant can reduced eye exposure while improving appearance. Commonly used materials include gold and platinum, with the latter often being thinner with lower risk of protrusion or immune reactions (Bladen et al., 2012).

4.2. Steroids

A British study at the end of last century showed that among patients with Bell's palsy in England, about 36% used