The Journal of Medical Research

Mini Review

JMR 2015; 1(2): 68-69
March- April
ISSN: 2395-7565

www.medicinearticle.com

Percutaneous facial nerve stimulation

Jayita Poduval

Associate Professor, Department of ENT, Pondicherry Institute of Medical Sciences, Kalapet, Puducherry- 605014, India

Abstract

Introduction: Facial nerve paralysis is a commonly encountered clinical entity. Bell's palsy is the most frequently observed manifestation of facial paralysis, and is diagnosed and treated mainly on the basis of history and clinical examination. Some other cases of facial paralysis would however require more objective, intensive and reliable means of evaluation in order to facilitate optimum management. **Method:** When the diagnosis of facial paralysis is in doubt, electrodiagnostic tests are a useful method of evaluation. This paper discusses the technique by which these tests are performed using percutaneous facial nerve stimulation. It also discusses the method of interpretation of these test results. **Conclusion:** Though percutaneous facial nerve stimulation is a reliable and objective method of diagnosis, there are certain limitations to its use which must be borne in mind by the clinician.

Keywords: Facial paralysis, Electro diagnostic tests, Facial nerve stimulation.

Introduction

Electro diagnostic tests were pioneered by Duchenne in 1872 and popularized by Campbell in 1954 [1]. Electro diagnostic tests are employed for the objective evaluation of physiologic injury to nerves and to estimate the prognosis of nerve lesions. Seddon classified nerve injury into 3 broad types- neuropraxia, axonotmesis and neurotmesis [2]. This was further elaborated by Sunderland into 5 degrees- neuropraxia(electrical conduction block), axonotmesis (disruption of the axon with intact endoneurium), disruption of the axon along with perineurium, disruption of the epineurium (partial transection),and disruption of the nerve funicle (complete transection) [3]. In present usage, it is the Brackmann-House classification that is followed commonly to grade facial nerve injury [4].

Technique

Percutaneous facial nerve stimulation for electro diagnostic testing is mainly done 7 to 21 days following facial paralysis in order to predict the extent of recovery of facial nerve function. It is not very useful in the initial stages of weakness as it does not establish whether there is a conduction block or a partial or complete transection. If function is not restored within 3 weeks (21 days) Wallerian degeneration of the nerve may begin depending on the extent of injury. It is in these instances that stimulatory electrical testing can be done to determine whether surgical intervention would be useful or not.

The methods of testing are-

1. Nerve excitability test (NET)
2. Maximal stimulation test (MST)
3. Electroneuronography (ENOG) or evoked electromyography (EEMG)
4. Electromyography (EMG)

ENOG or EEMG is an objective method of electrical testing and is absolutely essential when surgical intervention is decided. It is however more complicated and laborious and may sometimes be misleading.

EMG is cost-effective but involves the placement of needle electrodes, which is disliked by the patient, and it is not very useful in recent onset of facial paralysis as the motor end-plates in the tested muscle remain active up to several days and can respond to direct stimulation, thus producing normal results.

Owing to the above reasons, MST has emerged as a more accurate assessment of total nerve function and prognosis than NET and ENOG, as concluded from various studies [5, 6]. It uses supra maximal stimulation to test the peripheral branches of the facial nerve. It is better tolerated by the patient as less energy may be supplied for testing the individual branches and pain is proportionately lesser. Also, each of the peripheral nerve branches can be tested independently. Serial testing is necessary for the prediction of

***Corresponding author:**
Dr. Jayita Poduval
Associate Professor, Department of ENT, Pondicherry Institute of Medical Sciences, Kalapet, Puducherry-605014, India

the rate and degree of recovery and is advised rather than one single sitting [7].

MST was first described by May et al in 1971[8]. It is an excellent method of evaluating facial nerve degeneration soon after onset. The instrumentation used for MST is the same as for NET. It is a simple procedure but requires some experience in locating the main trunk and the peripheral branches. The facial nerve trunk is tested by applying the stimulator probe over the area of the stylomastoid foramen-this is in front of the mastoid tip and behind the ascending ramus of the mandible [9]. Though a number of commercially available nerve stimulators are available for NET and MST, where the strength and duration of the stimulus can be varied, the most popular is the Hilger facial nerve stimulator [7] Model N 1. Percutaneous or transcutaneous facial nerve stimulation may also be used for the treatment of long-standing facial paralysis [10].

Results

Interpretation of results is based on the amount of response on the involved side as compared to that of the normal side for each area tested by MST. The response is recorded as equal, minimally decreased (50% reduction), markedly decreased (75% reduction), or absent. When the responses are equal bilaterally up to 10 days after the onset of facial palsy (Bell's palsy), about 92% of patients are found to have complete return of function. When the response is lost within 10 days, the test has been found to be 100% reliable in predicting an incomplete return of facial function. When the response is markedly decreased about 73% have been found to have incomplete recovery [7].

Patients who maintain some facial motor function as noted by physical examination recover to a satisfactory degree in the majority of cases despite marked reduction in response to MST. These results can be extrapolated to cases of traumatic facial palsy. In patients with herpes zoster cephalicus, testing is better done between 10 and 14 days after onset as the disease may progress over a longer time.

Lewis et al established mean minimal nerve excitability thresholds for each site, and also exhibited a linear rise in minimal threshold stimulus with increasing age, male gender, non white population, hypertensive, diabetic and obese individuals [9].

On EMG, at rest, the appearance, shape and size of individual motor units determine the baseline parameters. The presence of fibrillation is the strongest EMG evidence of axonal degeneration. There is a delay of 10 to 20 days after onset till fibrillation appears, depending on the distance between the site of injury and motor neurone disease [7].

Limitations

a) In a severed facial nerve, normal latency and normal muscle action potential are maintained for 48 to 72 hours on EEMG, and gradually diminish over 5 to 6 days.
b) EMG may reveal absent volitional muscle action potentials at the time of injury, but this may be true even in neuropraxia.
c) Fibrillation potentials indicating degeneration may not appear on EMG for 2-3 weeks post-injury.

References

1. Campbell EDR, Hickey RP, Nixon KH, A. T. Richardson. Value of Nerve Excitability Measurements in Prognosis of Facial Palsy. Br Med J 1962;2:7-10.
2. Seddon HJ: Three types of nerve injury. Brain 1943; 66:237-88.
3. Sunderland S: Nerves and Nerve Injuries. 2nd Ed, New York, Churchill Livingstone 1978, p 258.
4. House JW, Brackmann DE: Facial nerve grading system. Otolaryngol Head Neck Surg 1985;93:146-7.
5. Adour KK, Sheldon HI, Kahn ZM: Maximal nerve excitability testing versus neuromyography: Prognostic value in patients with facial paralysis. Laryngoscope 1980;90:1540-7.
6. May M: Nerve excitability test in facial palsy: Limitations with use, based on a study of 130 cases. Laryngoscope 1972;82:2122-28.
7. Shaitkin BM, May M, Klein SR. Topognostic, Otovestibular, and Electrical Testing: Diagnosis and Prognosis. In The Facial Nerve, Thieme 2000, p 213-28.
8. May M, Harvey JE, Marovitz WF, Stroud M. The Prognostic Accuracy of the Maximal Stimulation Test compared with that of the Nerve Excitability Test in Bell's palsy. Laryngoscope 1971; 81:931-8.
9. Lewis BI, Adour KK, Kahn JM, Lewis AJ. Hilger Facial Nerve Stimulator: A 25-year Update. Laryngoscope 1991;101:71-4.
10. Hyvärinen A, Tarkka IM, Mervaala E, Pääkkönen A, Valtonen H, Nuutinen J. Cutaneous electrical stimulation treatment in unresolved facial nerve paralysis: an exploratory study. Am J Phys Med Rehabil 2008;87(12):992-7.