Prognostic Value of Electroneurography in Bell's Palsy

رسالة

Thesis
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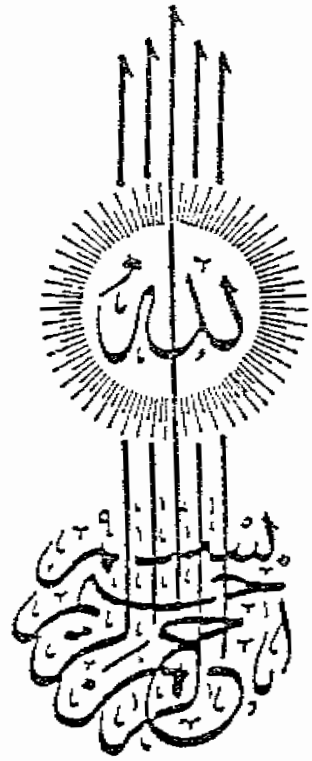

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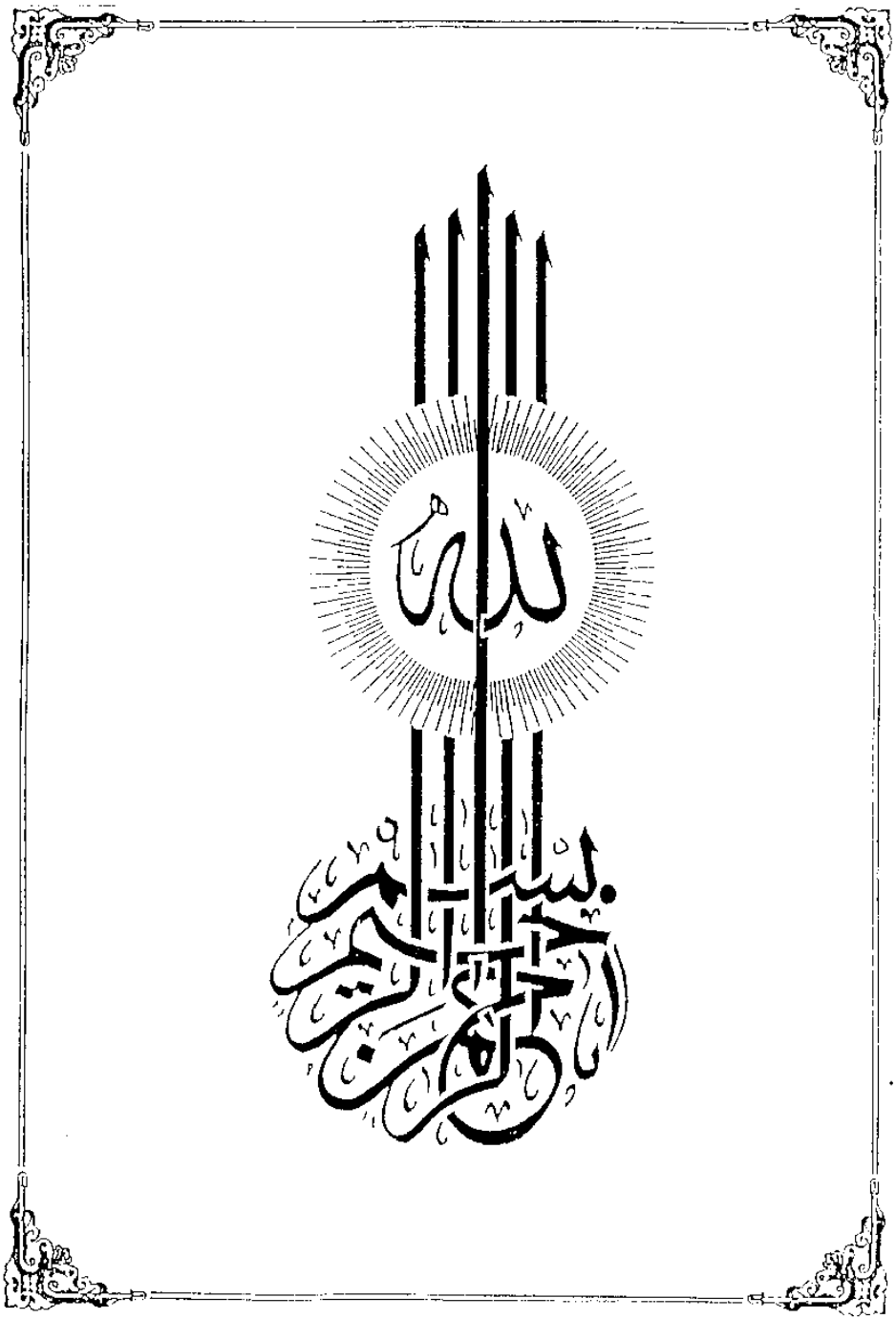

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Introduction

Bell's palsy is an acute unilateral weakness or paralysis of the face resulting from peripheral facial nerve dysfunction, while there is no readily identifible cause . This disorder affects adults commonly and usually resolves without sequalae (Moore, 1990 & Hughes, 1990) .

Bell's palsy is a common condition , and its aetiology is still obscure, but the hypothesis that hypoxia and compression of the nerve induced by edema in the fallopian canal are the main causes of Bell's palsy widely accepted (Hughes, 1990) . Autoimmune theory, autonomic dysfunction, allergy and reactivation of latent herpes simplex virus infection are the most prevalent theories of causation with the latter being the commonly accepted theory (Valne, et al., 1981) .

Bell's palsy is equally common in men and women and can be seen in patients of any age, though the incidence rises with increasing age (Adour, 1977& Peitersen, 1977) .

Facial paralysis is the main symptom of the disease . There are many associated symptoms including abnormal or decreased taste, dry eye , hyperacusis beside the other symptoms of muscular paralysis .

The prediction of the prognosis of peripheral facial nerve palsy at an early stage is very important before complete degeneration of the nerve occurs aiming to do surgery or to start massive steroid treatmant as early as possible . In recent years, the prognosis is more easily been predicted than before , by the electro-physiological methods (Hughes, 1990) .

Many electrodiagnostic tests used as a prognostic indicator for follow up of the patients with Bell's palsy (Cramer & Kartush , 1991) .

The nerve excitability test is the most commonly used electrodiagnostic test because of its ease of performance , ready availability and low cost , but it has a problem that only large myelinated fibers are stimulated because of their lower threshold (May et al , 1983) .

The maximal stimulation test avoids this disadvantage but is entirly subjective and not quantitative . The nerve conduction time (latency) test and trigemino - facial (blink) reflex test are thought to be a prognostic tests for follow up of the patients with Bell's palsy but these tests are the least reliable prognostic tests (Esslen , 1977 ; Stennert et al , 1977 and May , 1983) .

The role of electromyography test in Bell's palsy is rather limited because it dose not permit a quantitative estimation of the state of the nerve (the percntage of degenerated fibers) (Dobie , 1986) .

Facial electroneurography is an early objective reliable predictive test . It is the only electric test that gives us graphic record of the evoked integrated action of the facial muscle and permits their quantitative analysis . Also it is the only test that gives us the percentage (%) of degenerated fibres . It gives results as early as the first few days of affection , beside its reproducibility and easily application . The facial electroneurography (ENoG) was considered by Kartush, et al .,1985 the most useful test currently available .

The Aim of the work

The aim of our work was :

1 - To study the electroneurographic changes in acute Bell's palsy in order to detect the early cases of nerve degeneration and the percentage of degenerated fibers .

2 - To find out the role of electroneurography as a prognostic test in cases of nerve paralysis .

3 - To compare electroneurography with other simple electrodiagnostic tests as the nerve excitability test (NET) .

Review of Literature

Anatomy of the facial nerve

The facial nerve is the nerve of the second branchial arch , a fact which explains its complex and intimate relationshipe with the middle ear cleft and ossicular chain (fig 1 , 2) . It contains about 10.000 fibers in human .

They include :

1 - ***Motor fibers*** , numbering about 7000 to the muscles of facial expression , and the buccinator , stapedius , digastric and stylohyoid muscles .

2 - ***Secretomotor parasympathetic fibers***, to the lacrimal and nasal glands , and to the submandibular and sublingual salivary glands .

3 - ***Taste fibers*** , from the taste - buds of the palate and the anterior two - thirds of the tongue .

In addition , some evidence suggests that there may be cutaneous sensory fibers from a small area of the external ear, accounting for the distribution of the vesication in herpes oticus .

The motor fibers have their cell bodies in the facial nucleus in the pons . The nucleus recieves pyramidal fibers from the contralateral motor cortex and a smaller number from the homolateral side . In addition , fibers from the spinal tract of the trigeminal nerve and fibers from the corpus trapezoideum play upon the facial nucleus . The motor fibers sweep around the nucleus of the 6th cranial nerve and emerge from the brain stem at the lower border of the pons . Crossing the cerebellopontine angle in a lateral and forward direction , the nerve is closely

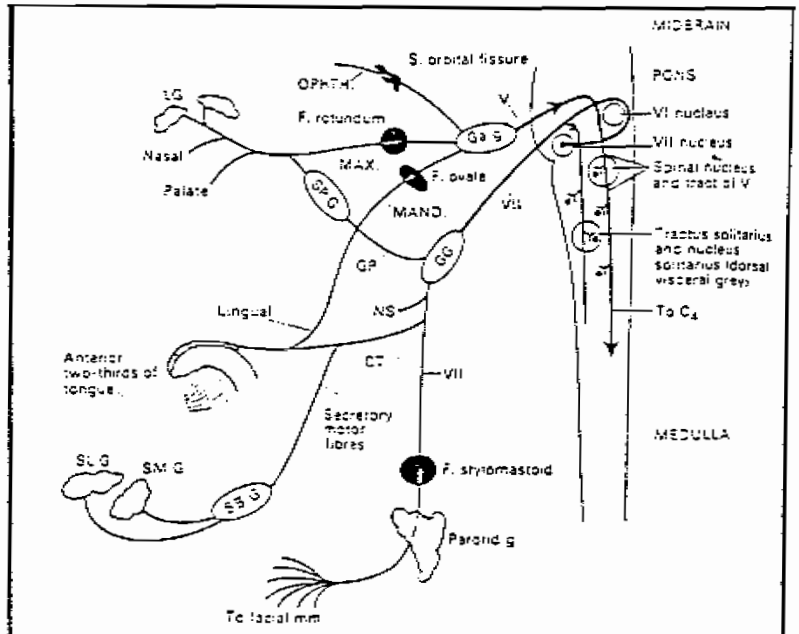

Fig. (1) Central and peripheral connections of the seventh nerve. (Brain, 1983)

CT Chorda tympani
GG Geniculate ganglion
Ga g Gasserian ganglion (semilunar ganglion)
G P Greater superficial petrosal
LG Lachrymal gland
MAX. Maxillary division of fifth
MAND. Mandibular division of fifth
SP G Sphenopalatine ganglion
NS Nerve to stapedius
SB G Submandibular ganglion
SM G Submandibular gland
SL G Sublingual gland

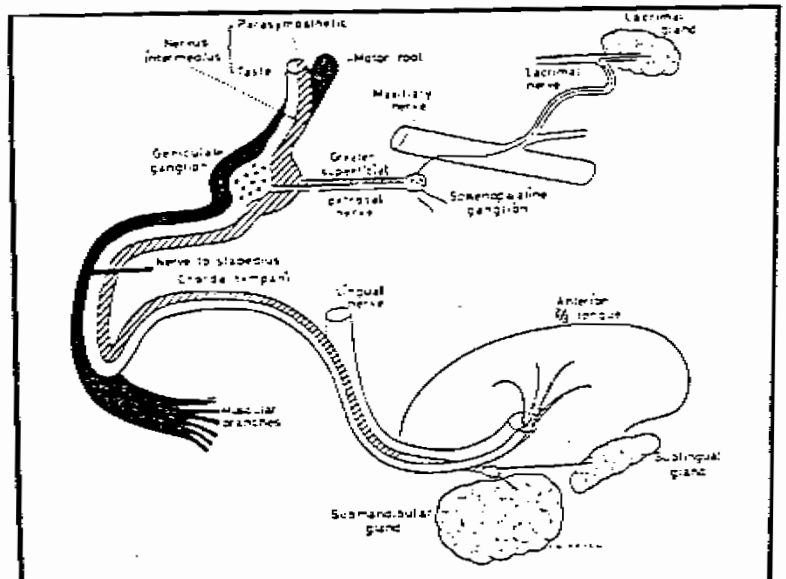

Figure (2) Plan of the facial nerve showing its constituent fibres, their relay stations, and destinations (Groves, 1975).

related to the two divisions of the auditory nerve , the nervus intermedius and posteriorly the anterior inferior cerebellar artery . The nerve enters the temporal bone through the internal auditory meatus together with the auditory nerve , nervus intermedius , and the internal auditory vessels , all these structures being sheathed in a prolongation of the subarachnoid space with its meninges . At the lateral extremity of the internal auditory meatus the nerve is above the crista falciformis and anterior to the vertical bony crest (Bell's Bar) . It continues , with the nervus intermedius , into the bony fallopian canal , which returns above the labyrinth , separated from the middle cranial fossa by a thin layer of bone (fig. 3).

After a few millimeters the nerve makes a U-turn backwards . This bend is the genu, and it is marked by a rounded swelling , the geniculate ganglion . In some cases the bony roof of the canal is absent here , so that the ganglion is directly related to the dura mater . From the genu the nerve run's backwards and slightly downwards in the medial wall of the tympanum . The anterior limit of this part of the nerve is marked by the processus cochleariformis with its emerging tensor tympani tendon , a valuble landmark (fig 4) . In the bony floor of the aditus the nerve makes a somewhat gradual bend , turning downwards 1 or 2 mm behind the pyramid to the commencement of the vertical or mastoid segment . This final part of the intratemporal course of the facial nerve runs directly downwards to the stylomastoid foramen , and is surrounded by mastoid aircells . It lies at a great depth , rarely less than 2 cm from the outer mastoid surface in the adult . From the stylomastoid foramen the nerve turns forewards , passes lateral to the base of the styloid process , and enters the parotid gland (fig 5) . Within the gland subdivision begins , usually first into upper and lower branches, and then again into the six peripheral branches . Then branches run forwards in the parotid gland , and the ramus of the mandible and masseter muscle .

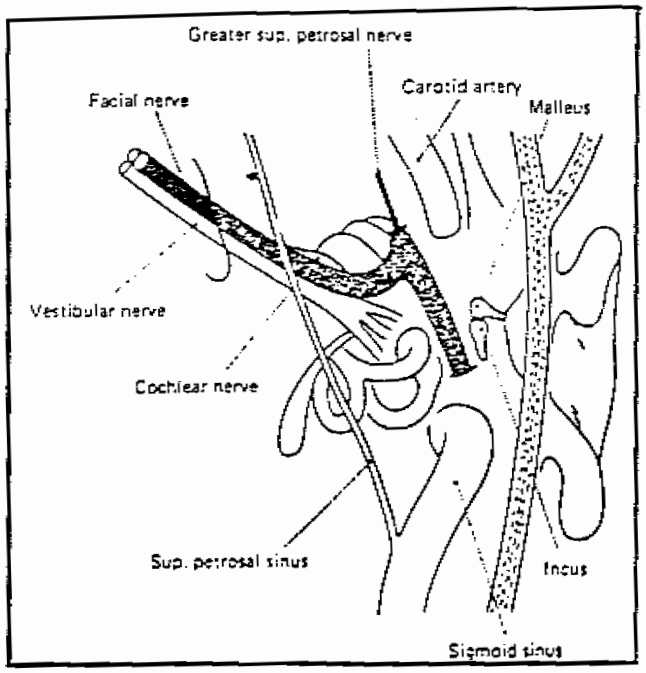

Figure (3) The facial nerve seen from above in the floor of the middle cranial fossa (Groves, 1973).

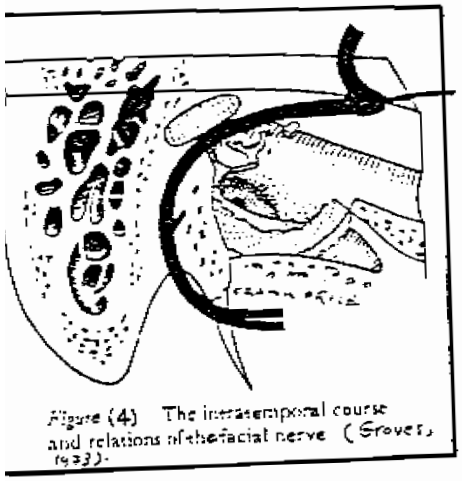

Figure (4) The intratemporal course and relations of the facial nerve (Groves, 1973).

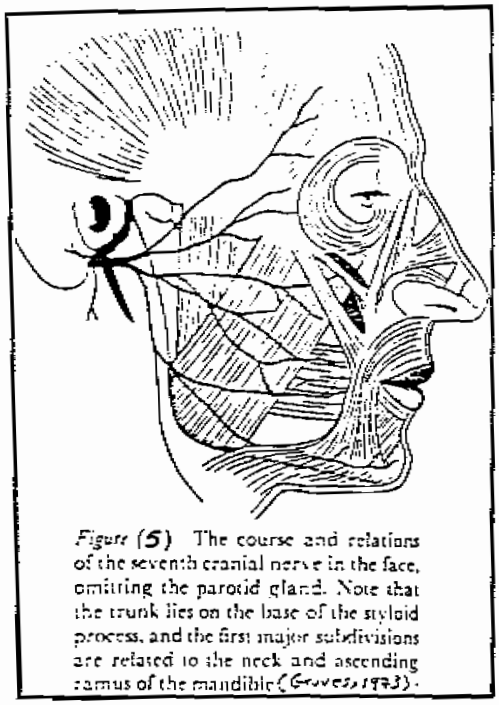

Figure (5) The course and relations of the seventh cranial nerve in the face, omitting the parotid gland. Note that the trunk lies on the base of the styloid process, and the first major subdivisions are related to the neck and ascending ramus of the mandible (Groves, 1973).

Composition and distribution of the nerve

Microscopic studies indicate that , like other peripheral nerves , the facial contains medullated axons of varying size , and presumably of varying conductivity speed . It seems possible that the larger fibers which have the faster conduction rates , are concerned with voluntary movement , while the smaller diameter " slow " fibers may be responsible for emotional and reflex movements . The question of maintenance of facial " tonus " is a little obscure . Muscle spindles- the essential stretch receptors - have been demonestrated in the facial muscles , but it is thought that their proprioceptive nerve fibers probably travel centrally in the intra - temporal course of the nerve .

May (1977) have described the spatial arrangement of the motor fibers in the intratemporal course of the nerve . Each medullated nerve fiber branches near its termination into fibrils distributed to the motor end - plates of its own motor unit . In the face , motor units have a comparatively small numbers of muscle fibers , so that the patterns of muscular activity which are possible are correspondingly large in number , and refined in detail and complexity .

The parasympathetic nerve fibers originate in the superior salivary nucleus and leave the brain stem in the nervus intermedius . At the geniculate ganglion these fibers mingle with those of the motor nerve trunk . Those destined to innervate the submandibular and sublingual glands continue in the facial nerve (fig 2) as far as the chorda tympani . They finally reach the submandibular ganglion by way of the chorda and the lingual nerve . Parasympathetic motor fibers for the lacrimal gland leave the geniculate ganglion in the greater superficial petrosal nerve , and reach their distination by way of maxillary nerve