CERVICAL ROOT STIMULATION IN THE DIAGNOSIS OF CERVICAL RADICULOPATHY

Thesis

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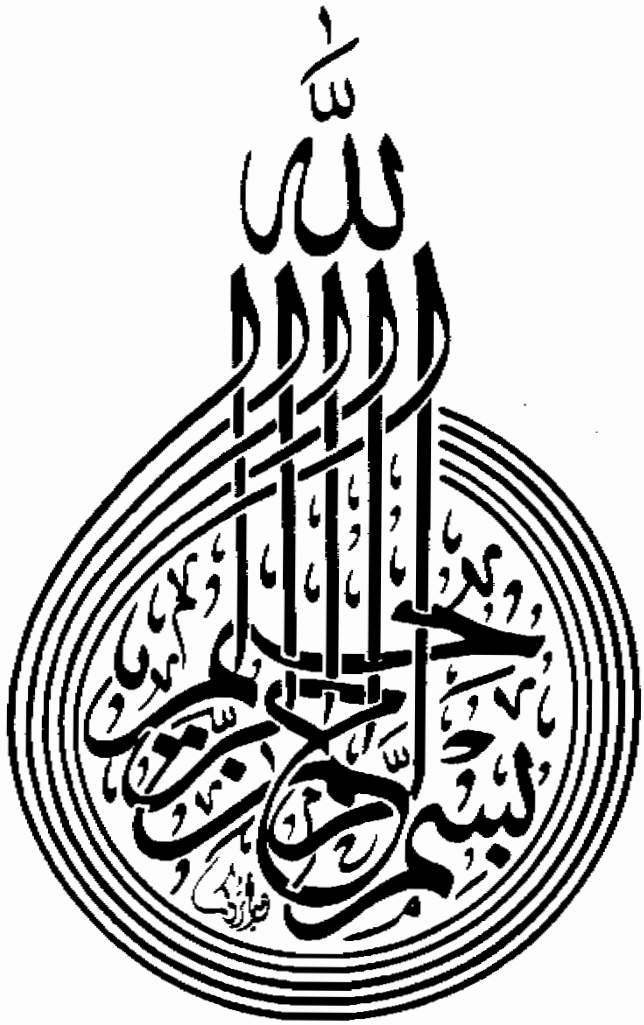
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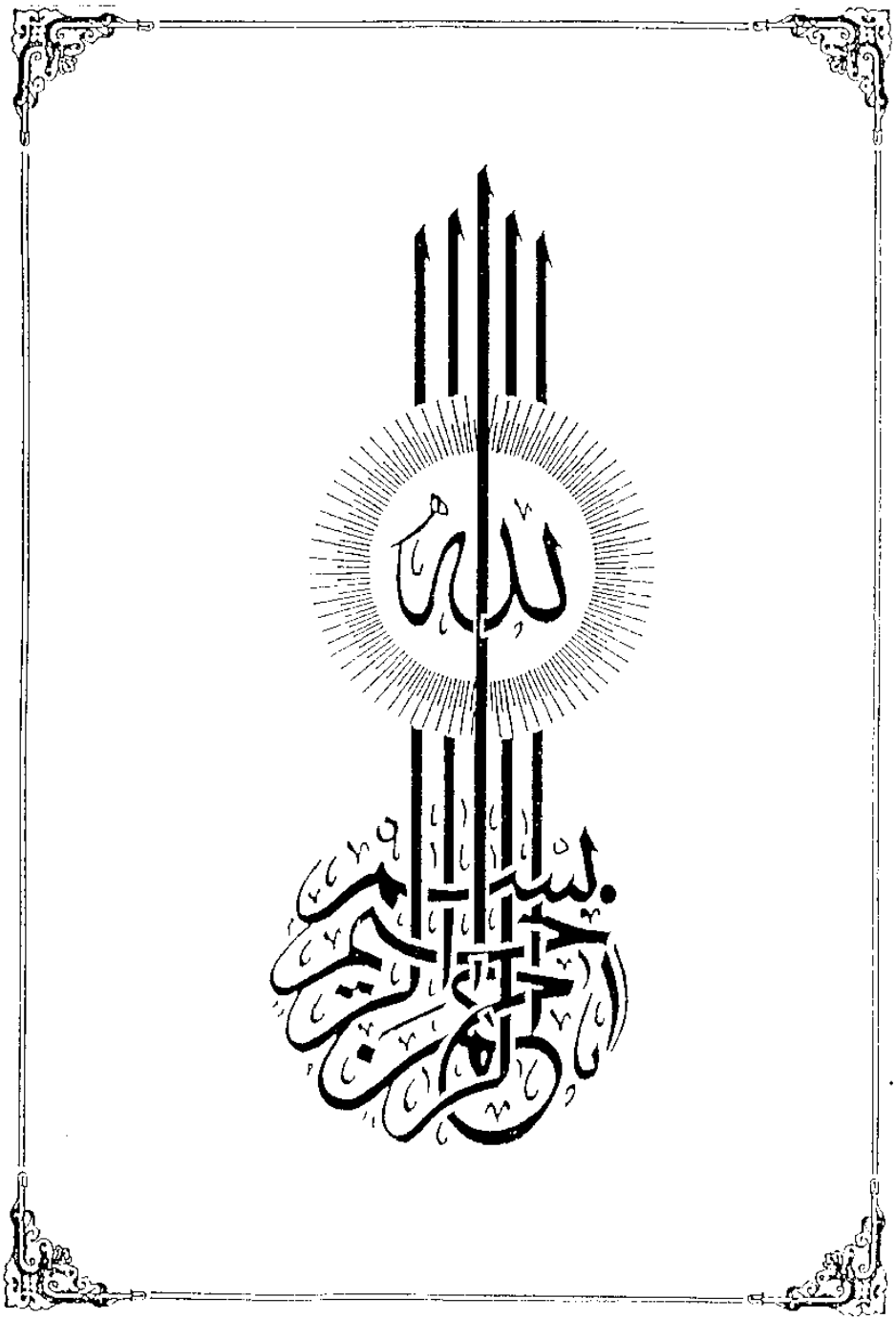

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INTRODUCTION

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A disorder of the cervical spine like cervical spondylosis and cervical disc prolapse often interferes with the roots of the brachial plexus causing radiating pain , muscle weakness or sensory impairement in the corresponding upper limb .

Indeed the clinical importance of the cervical disorder often lies in its neurological effects rather than in the local lesion itself [**Adams and Hamblen , 1990b].**

Full medical history and thorough clinical examination can not confirm the presence or absence of the cervical root compression .

The routine investigations as plain-x-ray of the cervical region can add some informations about the etiology but also it is not confirmatory as regards the presence or absence of cervical root compression plus its hazard of irradiation other radiological investigation with contrast media again are not confirmatory in addition to their disadvantages being and having the possibility of hypersensitivity reaction to the constrast media .

Conventional electrodiagnosis , including sensory and motor nerve conduction velocities and latencies , F-wave , H-reflex and somatosensory evoked potential studies have been used in determining the presence of radiculopathy [**Wilbourn and Aminoff , 1988 ; Johnson, 1988 and Kimura , 1989**] .

Each test has unique advantages and disadvantages .

The nerve conduction study has been widely used to detect and evaluate function in distal segments of peripheral nerves while the proximal segments of nerves , spinal nerve roots and intraspinal segments have being excluded **[Bhagwan T. Shahani , 1991] .**

The F-responses persistance and comparison of minimum latency on the two sides can provide useful informations regarding pathology in the appropriate root distribution **[Bhagwan T. Shahani , 1991]** .

Since root lesions are usually single and F-wave is invariably mediated by 2 or more roots so this test will not be sensitive .

Also , the H-reflex may be a useful indicator of proximal root compression.

However , the dilution factor problem is equally applied to H-reflex **[Andrew Eisen , 1991]** .

It must be recognized that neither the H-reflex nor F-response studies are specific for diagnosis of radiculopathies **[Bhagwan T. Shahani , 1991]** .

Somatosensory evoked potential and dermatomal evoked potential studies have been extensively explored in radiculopathy because they provide a technique for testing the sensory function in proximal segments **[Yiannikas et al ., 1986 ; Wilbourn and Aminoff , 1988]** but they don't test the motor function and are often difficult to elicit in other than young healthy subjects making interpretation of abnormal responses difficult **[Aminoff et al ., 1985]** .

So the sensitivity and specificity of these tests are some what limited in obtaining electrophysiologic evidence of neural dysfunction **[Aminoff et al., 1985 and Wilbourn and Aminoff , 1988]** .

Needle electromyography has been also used in determining the presence of radiculopathy , in fact , the sensitivity of the needle EMG is difficult to assess and depends upon the clinical parameters with which it is compared .

It the radiculopathy is not of sufficient severity or the motor disturbance is mild , the test may appear normal **[Chang and Lien ,1990]** .

The presence or absence of documented plotted curve for spinal nerve involvement is an important factor in the making accurate diagnosis

for proper treatment and good evaluation of prognosis **[Chang and Lien , 1990] .**

Direct spinal nerve stimulation for the brachial plexus and recording of the compound muscle action potential from myotomal muscles have been used in documenting the severity and specificity of spinal radiculopathy in suspected cases of cervical radiculopathy [**Berger et al . , 1987**] .

Berger in 1987 stated that cervical root stimulation (C.R.S) provides a sensitive method to directly evaluate the state of conduction through cervical roots when compared with conventional E.M.G , nerve conduction and late response studies in patients with possible cervical radiculopathy .

AIM OF THE WORK

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The aim of the work is to evaluate the sensitivity of direct cervical root stimulation compared to E.M.G , nerve conduction velocity and latency and F-wave tests and the possibility of using cervical root stimulation as a routine electrodiagnostic tool in the cervical radiculopathy .

REVIEW OF LITERATURE

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Applied Anatomy

The back bone or vertebral column forms the central axis of the skeleton through which many varied and complicated motions are combined . It functions as two segments :

The superior , long , flexible portion supports the head and carries the thorax and abdomen .

The inferior , short , rigid , pelvic portion carries the lower extremities [**Anson and Mc vay , 1984a**] . The great strength of the back bone comes from the size and architecture of bony elements (vertebrae), the ruggedness of the ligaments and muscles that hold them together with great flexibility [**Last , 1984**] .

The spinal column has 2 surfaces ; the visceral , anterior or flexor surface composed of the superimposed vertebral body .

The posterior or extensor surface is made up of the superimposed spinous processes , laminae , transverse processes , pedicles and articular processes of the vertebrae with their retrospinal soft parts . Between these 2 surfaces is the spinal canal , which encloses the spinal cord and its coverings [**Anson and Mc vay , 1984 a**] . The vertebral column is formed by a series of 33 vertebrae , 24 remain movable (7 cervical , 12 Thoracic and 5 lumbar) while 9 become fixed through fusion [5 sacral and 4 coccygeal] .

At the cranial end of the column less profound alteration occurs , to modify the first and second cervical vertebrae, Atlas and axis .

Articulation and ligaments of the cervical Spine

The articulations of the spine include 2 types of joints :

I - Arthrodial or gliding type which are true synovial joints formed mostly by articular processes , costovertebral joints , atlanto axial and sacroiliac articulations .

II - Amphiarthrodial which are non synovial , slightly movable connective tissue joints including 2 types : a) symphysis as fibrocartilage of the intervertebral disc .

b) Syndesmosis as represented by all the ligamentous connections between both the adjacent bodies and the adjacent arches **[Parke , 1982]** . Adjacent vertebrae are held together by strong ligaments ; these ligaments allow greater range of movement between the neural arches than between the bodies .

The vertebrae articulate between their bodies and between their neural arches . (Fig. 1)

Vertebral body articulation

The joint between the vertebral body is amphiarthrodial joint . This type of joint , of course permits only very limited movements , but when this slight degree of movement takes place in all of the cervical vertebrae , the total range of movement is considerable , the following ligaments are involved in this articulation :

1) The intervertebral disc , it is generally considered to consist of three components .

The nucleus pulposus , the surrounding thick annulus fibrosus and the two cartilaginous end plates which separate each disc from the vertebral bodies above and below it **[Morris , 1980]**

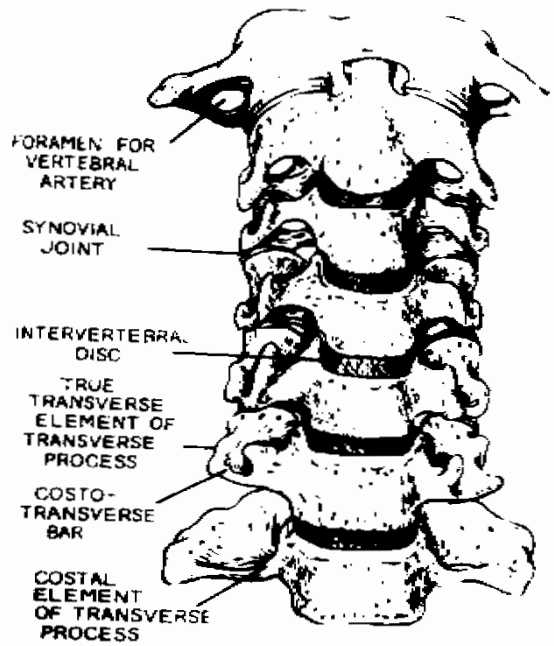

Fig (1) : Anterior view of articulated cervical vertebrae . (Nakano , 1989) .