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A REVIEW OF CLINICAL NEUROSENSORY TESTING OF TRIGEMINAL NERVE.

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ABSTRACT Trigeminal nerve injury can cause severe neurosensory disturbance of facial region. It can result from trauma in the maxillofacial region or during surgical procedures involving maxilla and mandible. This can result in significant effect on quality of life of the patient. Clinical neurosensory testing is a series of maneuvers to determine the extent of sensory nerve injury. It can provide the clinician with valuable input in diagnosing trigeminal nerve injuries. In this study we review various methods available to evaluate the presence and degree of trigeminal nerve injury.

KEYWORDS :

INTRODUCTION:

The trigeminal nerve is the fifth cranial nerve. It is the largest of all the cranial nerves. It consists of a large sensory root and a small motor root. There are three major branches of the trigeminal nerve, ophthalmic, maxillary and mandibular. The trigeminal nerve injury can occur during orthognathic surgeries, minor oral surgery, local anesthetic injections, dental implant placement, etc. Historically subjective assessments are used to determine the presence of trigeminal nerve injury. This can often be unreliable. An objective testing is recommended, particularly it is helpful in monitoring the return of function after nerve impairment[1]. There are various methods of neurosensory testing available ranging from complex and advanced methods to simple chairside techniques[2]. In this article we review various methods available for neurosensory testing.

Peripheral Nerve:

The peripheral nerve is a collection of Axons (nerve fibers) (Fig 1). Each axon is surrounded by a connective tissue sheath called the endoneurium. A bundle of axons is covered by a layer of connective tissue called the perineurium to make up a fascicle. Further, a bundle of these fascicles is bound together by a thick connective tissue layer called the epineurium to form a nerve. The peripheral nerves based on their function are classified as sensory, motor, and mixed[7]. When it comes to sensory nerves, they carry two basic types of sensation, touch-pressure, and pain-temperature. The touch-pressure sensation is carried by the generally myelinated fast-conducting A and A fibers. The pain-temperature is carried by generally unmyelinated slow-conducting A and C fibers. These aspects are important to be remembered during the neurosensory testing of the trigeminal nerve supply region[1].

Classifications:

There are many classifications of nerve injuries. The two most used classifications are Seddon and Sunderland[3]. H. Seddon in 1943 described three basic types of nerve injuries as, neurotmesis, axonotmesis, and neuropraxia[4]. Neurotmesis describes the state of a nerve that has been completely divided, Axonotmesis is when there is an axonal loss but connective tissue surrounding the nerve and nerve sheath are intact and Neuropraxia where there is temporary conduction loss with demyelination at the site of injury usually as a result of blunt trauma. S. Sunderland in 1951 described five degrees of nerve injuries[5]. The first and second degrees correspond to Seddon's neuropraxia and axonotmesis respectively. The third, fourth, and fifth degrees involve injury to endoneurium, perineurium, and epineurium, respectively. To this Mackinnon and Dellon later added a sixth degree, a mixed type[6].

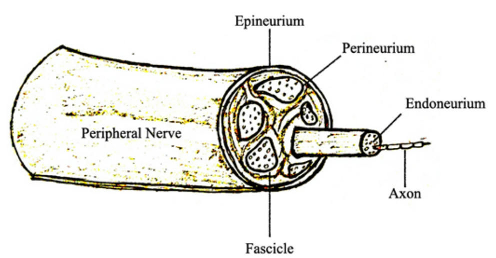

Fig 1: Peripheral Nerve

Clinical Neurosensory Testing:

Clinically there are various methods to evaluate the presence and degree of nerve injury. It can be from just asking the patient subjectively for any neurosensory deficiency to complex clinical neurosensory testing. Subjective tests are generally unreliable as they can reveal far less neurosensory deficit where objective tests demonstrate higher neurosensory deficit and vice-versa[7]. Historically various methods have been employed in clinical neurosensory testing which includes, subjective assessment using a questionnaire, mechanoceptive tests like static light touch, weber 2-point discrimination, and brush directional stroke, nociceptive tests like a pinprick and thermal discrimination, or purely objective tests like trigeminal somatosensory evoked potential (TSEP), sensory nerve action potential (SNAP) and blink reflex (BR)[8].

Zuniga and Essick in 1992 described a testing algorithm (Fig 2) for grading the trigeminal nerve injury using clinical neurosensory testing methods[9]. This testing algorithm is simple to apply and can be performed chairside with minimal equipment, making it a valuable tool in identifying and grading neurosensory deficit. It consists of three levels of testing, level A, level B, and level C. All the tests are conducted with the patient gently closing the eyes, and the lips slightly parted.

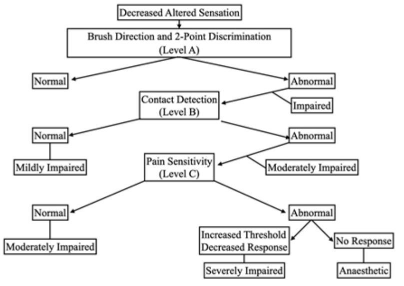

Fig 2: Zuniga and Essick (1992) Clinical Neurosensory Testing Algorithm

Level A testing includes two mechanoceptive tests, brush direction, and 2-point discrimination (2-PD). They are used to measure the function of large diameter myelinated A and B fibers. Brush directional stroke (BDS) tests the directional discrimination where a Semmes-Weinstein monofilament (SWM) or a cotton swab is used and the skin over the area to be tested is stroked in different directions and patient is asked to identify the direction of the strokes. In 2-point discrimination a millimeter caliper is used. The test is begun with the caliper closed and opened gradually at a one-millimeter gradient. The patient is asked to identify at which point they can identify the contact at two different points.

Level B testing includes contact detection using a non-noxious stimulus. Static light touch (SLT) is used to evaluate the function of smaller A and B fibers. For this test, a cotton wisp or camel hair can be used. For more accurate testing we can use a standardized calibrated SWM. The SWM is applied to the skin over the area to be tested. The test area is touched lightly with enough pressure applied to just cause the SWM to bend.

Level C testing measures response to noxious stimuli. It is used to test the function of small unmyelinated C fibers. Here a 27-gauge needle is used to elicit the response towards a painful stimulus. The test area is contacted with a 27-gauge needle until the contact or the pain is felt by the patient who is asked to indicate it by raising the hand. Alternatively, we can use an algometer, thermal discs, or a vitalometer for conducting level C testing.

Based on the response to the various levels of testing the severity of the nerve impairment can be graded according to the algorithm as mildly impaired, moderately impaired, severely impaired, or anesthetic[2]. The materials used for these are simple (Fig 3) and all these tests can be performed chairside in a minimal amount of time, making this a very valuable testing tool for the clinicians.

Fig 3: Materials Used In Clinical Neurosensory Testing – Castroviejo Caliper, Semmes-weinstein Monofilaments, Ethyl Chloride, Needle, Cotton Tipped Applicator.

Various terms are used to describe and record neurosensory deficits like paraesthesia, dysesthesia, hyperesthesia, hypoesthesia, or anesthesia. Hypoesthesia or hypesthesia is the most common[10]. But it is important to differentiate among these terminologies. *Paraesthesia* is described as an unusual or abnormal but not painful spontaneous or evoked sensation. *Dysesthesia* is an unpleasant abnormal sensation, whether spontaneous or evoked. *Hyperesthesia* is an increased sensitivity to stimulation. *Hypoesthesia* is a decreased sensitivity to stimulation. And *Anesthesia* is a complete loss of sensation.

CONCLUSION:

An easy and accurate clinical neurosensory testing algorithm reviewed in this article can be a valuable tool for clinicians. It can be quickly performed on the chairside. Using A proper systematic neurosensory can be used to accurately diagnose the trigeminal nerve injuries as well as track the recovery of the trigeminal nerve after an injury.

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