INTRODUCTION

Bell's palsy can be defined as an idiopathic, acute, facial nerve palsy. The pathogenesis of Bell's Palsy is not fully understood, however inflammation and viral infections seem to play an important role. It is the most common cause of facial paralysis ***(Hato et al., 2002).***

The incidence of Bell's palsy is 20 to 30 cases per 100,000 people per year, and both sexes are equally affected. Full recovery occurs in about 80% of the cases, 15% experience some kind of permanent nerve damage and 5% remain with severe sequalae. But Prognosis of the disease can't be predicted from the start, So that a variety of clinical tests have been introduced such as electroneuronography (ENoG), nerve excitability test (NET) & electromyography (EMG). However, these tests need to be done several times and so, not suitable for practical use. Therefore, we are in need of finding simple and reliable test for predicting prognosis and fit for patient compliance ***(Gilden et al., 2004).***

Bell's palsy assumed to be initiated by a triggering event that places physiologic stress on the body. This stressor promotes the body's protective inflammatory response with its release of acute-phase reactants causing edema of facial nerve and possible ischemia, with resulting axonal demyelination and nerve degeneration ***(Kim et al., 2014).***

White blood cell (WBC) count and its subtypes are known as classic inflammatory markers. Neutrophils comprise a major element of the innate immune system and destroy invading microbes primarily by phagocytosing bacteria ***(Yarnell et al., 1991).***

Neutrophils (also known as neutrophilic granulocytes or polymorphonuclear leukocytes [PMNs]) are the most abundant white blood cells in the human circulation, approximately 80% at any given time, mainly during infections. While the majority of these cells remain housed in the bone marrow or immune centers (e.g. spleen and lymph nodes), about 2% of the total neutrophil population circulates in the blood ***(Navarini et al., 2009).***

Also Neutrophils appear to contribute to controlling viral infections by producing reactive oxygen species and releasing antimicrobial peptides and protein-decorated chromatin known as neutrophil extracellular traps (NETs) ***(Fuchs et al., 2007; Hemmers et al., 2011).***

Neutrophil-to-lymphocyte ratio (NLR) was defined as a novel potential marker to determine inflammation, Previously there was few studies that investigated the role of NLR in Bells palsy and its possible role in the prognosis of the disease, and here we aimed to investigate the relationship between Bell's palsy and inflammation by using NLR, which is a new method being measured in CBC, so that we can identify patients with a poor recovery prognosis and look for possible additional medical treatments to prednisolone early and individualize therapy in accordance with the expected outcome ***(Marsk et al., 2012).***

AIM OF THE WORK

The aim is to study the potential role of neutrophil lymphocyte ratio (NLR) to assess the severity and prognosis of Bell's palsy.

FACIAL NERVE ANATOMY

A general knowledge of the anatomy of the seventh cranial nerve is essential for diagnosis and treatment of facial nerve disorders ***(May, 2000).***

The greater part of the facial nerve is composed of motor fibres to the facial muscles. In addition, the nerve carries secretomotor fibers for the submandibular, sublingual, and lacrimal glands. The facial nerve also has two sensory, or afferent, components. One carries taste sensation from the anterior two thirds of the tongue and the palate, while the other transmits ordinary sensation from the skin in the region of the external ear ***(Schaitkin, 2000).***

The motor face area of the cerebral cortex is situated on the pre and postcentral gyri. Discharges from this area are carried through fascicles of the corticobulbar tract to the lower brainstem where they synapse in the facial nerve nucleus located in the pons. The corticobulbar tracts arising from the upper face area cross and recross in reaching the facial motor nucleus, while the tracts to the lower face only cross. This anatomical arrangement allows the clinical distinction between a central and peripheral nerve dysfunction ***(Malone and Maisel, 1988 and May and Schaitkin, 2000).***

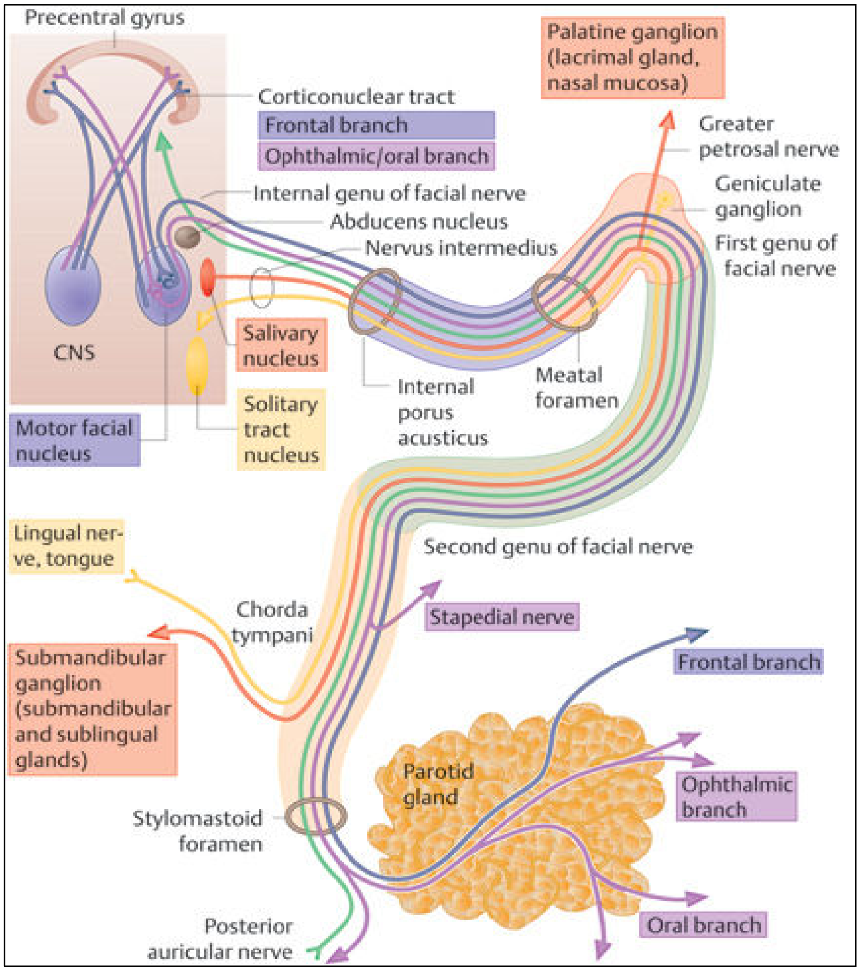

Figure (1): Course of the facial nerve.

The facial nerve emerges from the brainstem at the pontomedullary junction and enters the internal auditory meatus. It travels further into the bony fallopian canal, which is subdivided into three segments based upon changes of direction: the labyrinthine, tympanic, and mastoid segments. The labyrinthine segment lies between the vestibule and cochlea and contains the geniculate ganglion. At the geniculate ganglion, the greater and lesser petrosal nerves arise. The remaining fibers continue to the tympanic and mastoid segments before the nerve descends to the stylomastoid foramen. In the mastoid segment, the facial nerve has three branches: the nerve to the stapedius muscle, the chorda tympani nerve, and the auricular branch of the vagus nerve ***(Malone and Maisel, 1988; May and Schaitkin, 2000).***

As the nerve exits the stylomastoid foramen, the posterior auricular nerve forms the first branch. The facial nerve then passes forward to the parotid gland where it bifurcates into an upper and lower division. Within the parotid gland, the facial nerve subdivides into the five terminal branches innervating the facial muscles: the temporal, zygomatic, buccal, marginal mandibular and cervical branches ***(Malone and Maisel, 1988).***

Somatic motor component of facial nerve branches in parotid gland into:

1. temporal
2. zygomatic
3. buccal
4. mandibular
5. cervical

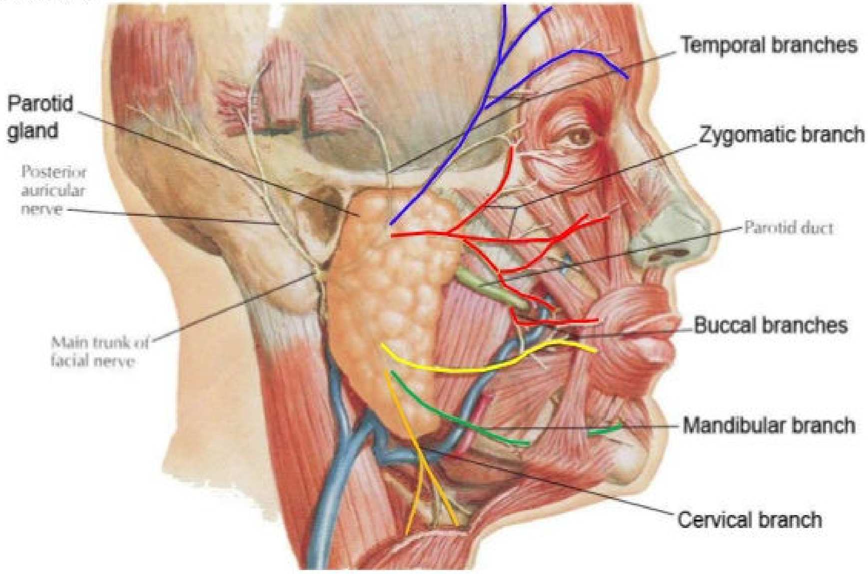

Figure (2): Distribution of the facial nerve. Branches of facial nerve after its exit from the stylomastoid foramen ***(Drake et al., 2014).***

Branches of the facial nerve:

A) ***Branches of communication:***

1. At the internal acoustic meatus, the facial nerve communicates with the vestibule-cochlear nerve.
2. At the geniculate ganglion: the main branch of the facial nerve which originates from the geniculate ganglion is the greater (superficial) petrosal nerve; it joins the deep petrosal nerve from the internal carotid sympathetic plexus, to become the nerve of the pterygoid canal (Vidian nerve).

The greater petrosal nerve contains efferent parasympathetic fibers from the special lacrimatory nucleus and the uncertain nucleus, and afferent taste fibers from the palate ***(Wright, 1997).***

3. In the facial canal, it communicates with the auricular branch of vagus.
4. On the face, it communicates with the trigeminal nerve.
5. In the neck, it communicates with the transverse cutaneous nerve of the neck ***(Proctor and Nager, 1982).***

B) ***Branches of distribution***

1. Branches within the facial canal: The facial nerve gives off 2 branches within the facial canal; the nerve to stapedius and the chorda typmani.

- The nerve to stapedius arises from the facial nerve in the facial canal behind the pyramidal eminence of the posterior wall of the tympanic cavity. It passes forwards through a small canal to reach the stapedius muscle ***(O'Flynn and Bailey, 2008).***
- Chorda tympani leaves the facial nerve about 6 mm above the stylomastoid foramen within the facial canal and runs antero-superiorly in the canal to enter the tympanic cavity via the posterior canaliculus. It then curves anteriorly in the substance of the tympanic membrane between its mucous and fibrous layers, and crosses medial to the upper part of the handle of the

malleus to the anterior wall of the tympanic cavity. It exits the skull at the petro-tympanic fissure. The chorda tympani contains parasympathetic fibers which supply the submandibular and sublingual salivary glands via the submandibular ganglion, and taste fibers from the anterior two-thirds of the tongue ***(Moschella et al., 2003).***

2. **Extra cranial branches:** the facial nerve emerges from the base of the skull at the stylomastoid foramen and immediately gives off three nerves:
   - Digastric branch which supplies the posterior belly of the digastric muscle.
   - Nerve to stylohyoid which supplies the stylohyoid muscle.
   - Posterior auricular nerve which gives off auricular and occipital branches. The auricular branches supply the auricularis posterior and intrinsic muscles of the cranial surface of the auricle. The occipital branches supply the occipital belly of the occipito-frontalis muscle ***(Porter and Tan, 2005).***
3. Terminal branches: the facial nerve gives off five terminal branches on the face: temporal, zygomatic, buccal, mandibular and cervical branches ***(Phelps and Lloyd, 1990).***

The temporal branch divides into anterior and posterior rami. Twigs from the nerve supply the intrinsic muscles on the lateral surface of the auricle, the anterior and superior auricular muscles. It also communicates with the zygomatico-temporal branch of the maxillary nerve as well as the auriculo-temporal branch of the mandibular nerve. The more anterior branches supply the frontal belly of the occipito-frontalis, orbicularis oculi and corrugator muscles, and join the supraorbital and lacrimal branches of the ophthalmic nerve ***(Yoshiura et al., 2006).***

The zygomatic branches are generally multiple and supply orbicularis oculi muscle. They also provide partial supply to the muscles innervated by the buccal branch, and communicate with filaments from the lacrimal nerve and the zygomatico-lacrimal branch of the maxillary nerve ***(Honjo, 1988).***

The buccal branch is usually single. It has a closer relationship to the parotid duct for about 2.5 cm after it emerges from the parotid gland and typically lies below the duct. Its upper deep branches supplies zygomaticus major, levator labii superioris, levator anguli oris, zygomaticus minor and the small nasal muscles. Its Lower deep branches supply the buccinator and orbicularis oris muscles, and communicate with filaments from the buccal branch of the mandibular nerve ***(Grey, 1995).***

There are usually two marginal mandibular branches, which run towards the angle of the mandible under platysma, and supply the risorius muscle, the muscles of the lower lip and chin, and communicate with the mental nerve ***(Bluestone and Klein, 2002).***

The cervical branch emerges from the lower part of the parotid gland; it supplies the platysma muscle and communicates with the transverse cutaneous cervical nerve ***(Barnes et al., 2001).***

Facial muscles that are supplied by branches of facial nerve:

1. Auricularis posterior muscle:

- **Supplied by:** posterior auricular nerve
- **Action:** Pulls ear backward

2. Occipital belly of occipito-frontalis muscle:

- **Supplied by:** posterior auricular nerve.
- **Action:** Moves scalp backward.

3. Auricularis anterior muscle:

- **Supplied by:** temporal branch
- **Action:** Pulls ear forward

4. Auricularis superior muscle:

- **Supplied by:** temporal branch
- **Action:** Raises ear

5. Frontal belly of occipito-frontalis muscle:

- **Supplied by:** temporal branch
- **Action:** Moves scalp forward

6. Corrugator supercilii muscle:

- **Supplied by:** temporal branch
- **Action:** Pulls eyebrow medially and downward

7. Procerus muscle:

- **Supplied by:** temporal branch
- **Action:** Pulls medial eyebrow

8. Orbicularis oculi muscle:

- **Supplied by:** temporal and zygomatic branches.
- **Action:** Closes eyelids and contracts skin around eye

9. Zygomaticus major muscle:

- **Supplied by:** zygomatic and buccal branches.
- **Action:** Elevates corners of mouth

10. Zygomaticus minor muscle:

- **Supplied by:** buccal branch.
- **Action:** Elevates upper lip

11. Levator labii superioris muscle:

- **Supplied by:** buccal branch.
- **Action:** Elevates upper lip and mid portion of naso-labial fold

12. Levator labii superioris alaeque nasi muscle:

- **Supplied by:** buccal branch
- **Action:** Elevates medial nasolabial fold and nasal ala

13. Risorius muscle:

- **Supplied by:** buccal branch.
- **Action:** Aids smile with lateral pull

14. Buccinator muscle:

- **Supplied by:** buccal branch.
- **Action:** Pulls corner of mouth backward and compresses cheek

15. Levator anguli oris muscle:

- **Supplied by:** buccal branch.
- **Action:** Pulls angles of mouth upward and toward midline.

16. Orbicularis oris muscle:

- **Supplied by:** buccal branch.
- **Action:** Closes and compresses lips

17. Nasalis, dilator naris muscle:

- **Supplied by:** buccal branch.
- **Action:** Flares nostrils

18. Nasalis, compressor naris muscle:

- **Supplied by:** buccal branch.
- **Action:** Compresses nostrils

19. Depressor anguli oris muscle:

- **Supplied by:** Buccal, marginal and mandibular branches.
- **Action:** Pulls corner of mouth downward

20. Depressor labii inferioris muscle:

- **Supplied by:** Buccal, marginal and mandibular branches.
- **Action:** Pulls lower lip downward

21. Mentalis muscle:

- **Supplied by:** marginal and mandibular branches.
- **Action:** Pulls skin of chin upward.

22. Platysma muscle:

- **Supplied by:** cervical branch.
- **Action:** Pulls down corners of mouth