**MEDICAL REHABILITATION IN PATIENT WITH RIGHT PERIPHERAL FACIAL NERVE PARESIS CAUSED BY PAROTIDECTOMY**

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**ABSTRACT:** The facial nerve is a seventh cranial nerve, innervates the following four components such as tactile sensation of the parts of the external ear, taste sensation to the anterior 2/3 of the tongue, muscles of facial expression and salivary and lacrimal glands.1 Peripheral facial nerve palsy (FNP) can have various causes, such as Bell‟s Palsy, which is the most common cause. Among the secondary causes, local trauma to the facial nerve, tumors, postsurgical complications, or reactivated varicella zoster virus infection of the geniculate ganglion (Ramsay Hunt‟s syndrome).2 Salivary gland tumors represent 3-10% of all head and neck neoplasms. These tumors occur predominantly in major salivary glands. The parotid gland is affected most often, ranging from 36.6 to 83%. Malignant tumors are a minority, occurring in 15-32% of cases. The deficit of the nerve function may be total (paralysis) or partial (paresis), and from injury to the main trunk or only the individual branches . 3,4,5 The first report of a parotidectomy with preservation of the facial nerve was described in 1825 by Johann Ferdinand Heyfelder.6 Therapies for peripheral facial palsy should be targeted to maximize return of facial nerve function according to the most likely cause, as well as the severity.2 . The post parotidectomy facial nerve grading system (PPFNGS) was created based on these three grading system. PPFNGS is a new grading system designed for assessing the facial nerve function after parotidectomy. This scale examines the function of four branches of facial nerve. Many techniques including exercise, electrical stimulation, biofeedback and motor re-education, have been described for the treatment of patients with facial paresis.

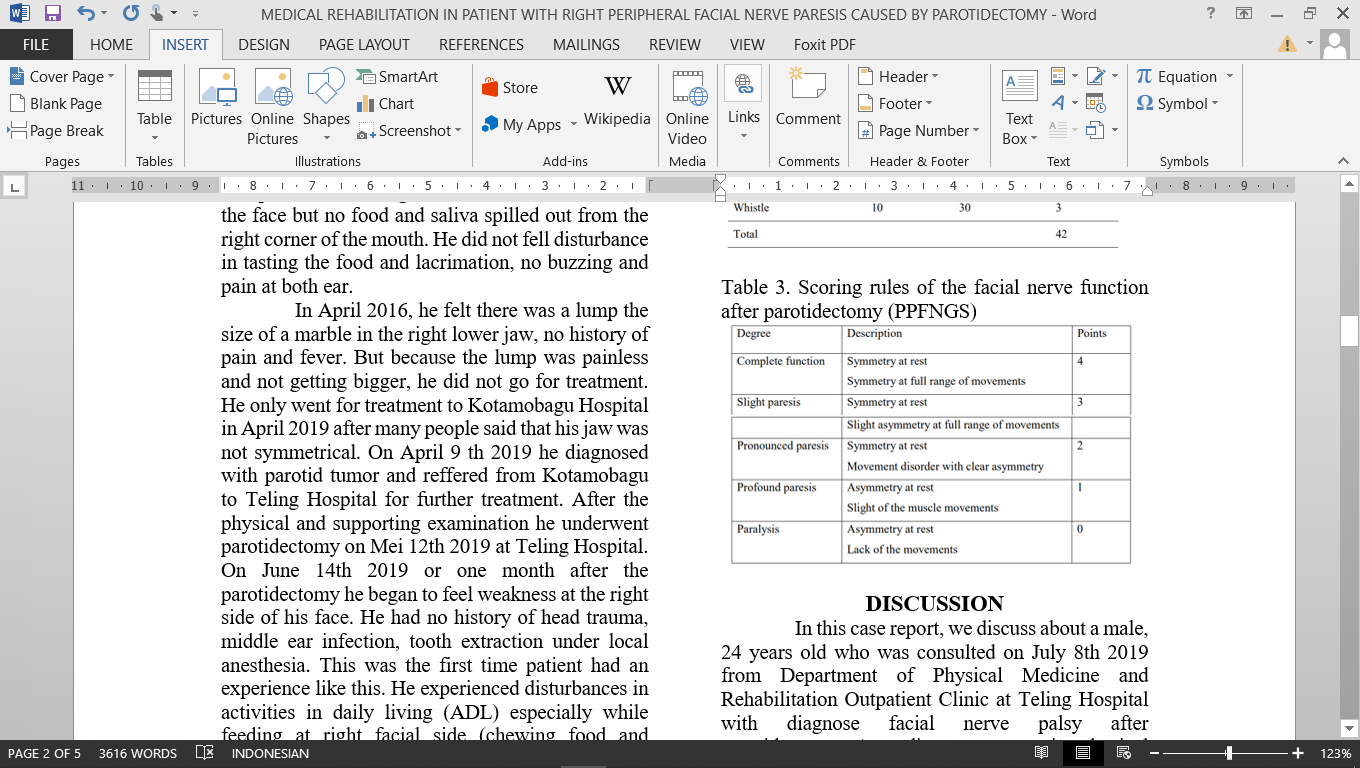
**INTRODUCTION**

The facial nerve is a seventh cranial nerve, innervates the following four components such as tactile sensation of the parts of the external ear, taste sensation to the anterior 2/3 of the tongue, muscles of facial expression and salivary and lacrimal glands.1 Peripheral facial nerve palsy (FNP) can have various causes, such as Bell‟s Palsy, which is the most common cause. Among the secondary causes, local trauma to the facial nerve, tumors, postsurgical complications, or reactivated varicella zoster virus infection of the geniculate ganglion (Ramsay Hunt‟s syndrome).2

Salivary gland tumors represent 3-10% of all head and neck neoplasms. These tumors occur predominantly in major salivary glands. The parotid gland is affected most often, ranging from 36.6 to 83%. Malignant tumors are a minority, occurring in 15-32% of cases. The deficit of the nerve function may be total (paralysis) or partial (paresis), and from injury to the main trunk or only the individual branches . 3,4,5 The first report of a parotidectomy with preservation of the facial nerve was described in 1825 by Johann Ferdinand Heyfelder.6

Therapies for peripheral facial palsy should be targeted to maximize return of facial nerve function according to the most likely cause, as well as the severity.2 The regional House Brackman, Sydney, and Yanagihara classification systems were utilized to describe the grading of facial nerve. The post parotidectomy facial nerve grading system (PPFNGS) was created based on these three grading system. PPFNGS is a new grading system designed for assessing the facial nerve function after parotidectomy in a quatitative and qualitative way and has a higher interrater agreement than other scales used to examine function of the 7 th nerve. This scale examines the function of four branches of facial nerve and it was based on the evaluation of facial symmetry at rest, during spontaneous (blinking, talking, smiling) and voluntary movement of facial muscles (forehead, eye, cheek, mouth) by performing the following steps: wrinkling the forehead and raising eyebrows (temporal branch), closing the eyes (zygomatic branch), raising the cheeks and wrinkling the nose (buccal branch), and whistling and showing the teeth (buccal branch-upper part and marginal mandibular branch-lower part of the mouth).3

Table 1. Scoring rules of the facial nerve function after parotidectomy (PPFNGS)



Many techniques including exercise, electrical stimulation, biofeedback and motor re-education, have been described for the treatment of patients with facial paresis. Recovery following a facial nerve injury depends on the degree of nerve injury. Because a Sunderland first degree nerve injury involves axonal demyelination, patients have complete recovery of facial nerve function when the nerve undergoes remyelination. This recovery may occur as early as 4 weeks but may take as long as 12 weeks following injury.7

**CASE REPORT**

A 24-years old male came to Physical Medicine and Rehabilitation Department on July 10th 2019 with chief complaint weakness at his right facial muscles since June 14th 2019 or 1 month Rafter got parotidectomy. He felt thick on his right face when he woke up in the morning, the right forehead unfurrowed, right eyelids couldn‟t close completely, right facial creases and nasolabial fold disappeared, and the right corner of the mouth drooped. While eating he must use the left side of the face but no food and saliva spilled out from the right corner of the mouth. He did not fell disturbance in tasting the food and lacrimation, no buzzing and pain at both ear. Moreover, there were no weaknesses on his arms and legs. He felt his complaint one month after he got parotidectomy.

In April 2016, he felt there was a lump the size of a marble in the right lower jaw, no history of pain and fever. But because the lump was painless and not getting bigger, he did not go for treatment. He only went for treatment to Kotamobagu Hospital in April 2019 after many people said that his jaw was not symmetrical. On April 9 th 2019 he diagnosed with parotid tumor and reffered from Kotamobagu to Teling Hospital for further treatment. After the physical and supporting examination he underwent parotidectomy on Mei 12th 2019 at Teling Hospital. On June 14th 2019 or one month after the parotidectomy he began to feel weakness at the right side of his face. He had no history of head trauma, middle ear infection, tooth extraction under local anesthesia. This was the first time patient had an experience like this. He experienced disturbances in activities in daily living (ADL) especially while feeding at right facial side (chewing food and drinking), grooming (gargling while tooth brushing), and sleeping (right eyelids couldn‟t close completely). Patient has an anxiety and feels shame about his face, he was afraid that his face was asymmetrical and could not work as before.

For the social economic history, patient is an army, single, lives in Kotamobagu, at army dormitory. He is the second of two siblings, his brother and parents live in Palembang. In the dorm room he sleeps on the bed. During the rehabilitation he lives at a boarding house in Manado but he must report his condition to his superiors every two weeks. He went to Prof Dr. R. D Kandou Manado hospital by public transportation. His hobby is soccer. He hopes his condition can recover as before.

Patient has adequate orientation to person, place, time and situation. He has good memory skills and judgment. Patient has an anxiety and feels shame about his face, he was afraid that his face was asymmetrical and could not work as before.

Functional history

* Mobility activity: Patient independent in mobility activity.
* Activities of daily living: Patient difficult to do some of his ADL because of his right facial weakness.
* Community activities: Patient usually go to the mosque for Friday service.
* Cognition: Patient has adequate orientation to person, place, time and situation. He has good memory skills, judgment and capacity of abstract thought.
* Communication: There are no problems in verbal communication.

From the physical examination, patient was compos mentis, cooperative, communication and comprehension was good and vital sign was normal. We use the Manual Muscle Test to measure the facial muscles strength. 0 if there is no contraction. Non functional if there is contraction but only slight motion detected. Weak functional if there is contraction and easily erased by gentle resistance. Functional/normal if there is complete movement, tolerates considerable resistance.8 Manual Muscle Test of patient‟s facial muscles was non functional except for orbicularis occuli muscle was weak functional (Table 2). Facial nerve function after parotidectomy (PPFNGS) score was 6 (Table 4). UGO FISCH scale was 42 (table 3).

The treatment has Short term and long term goal for the patient.

Short term goals :

1. Educate and reassure the patient about the condition.

2. Facilitate or improve right facial muscle contraction.

3. Improve right facial muscle strength.

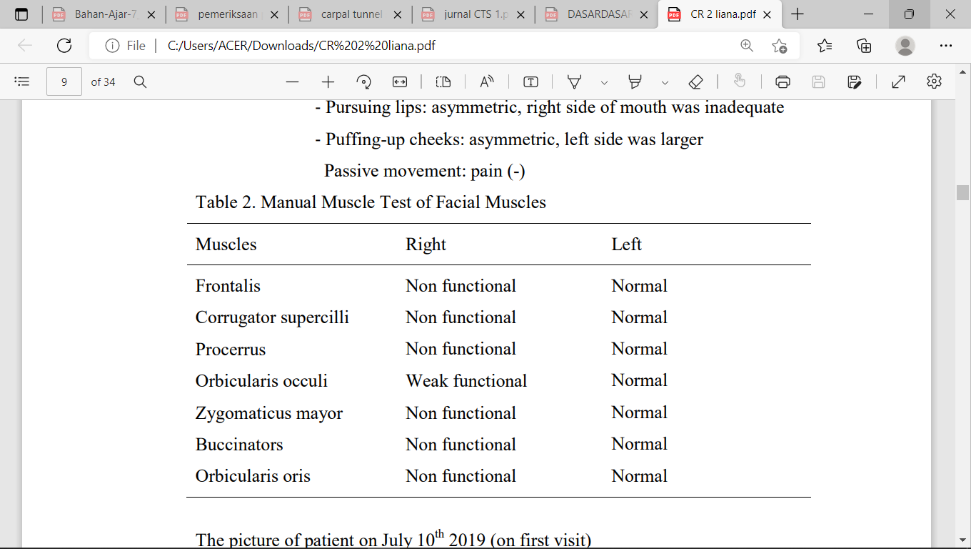
Long term goals:

1. Restore facial symmetry and function of the involved facial muscles to normal function.

2. Improvement in quality of life.

3. Prevent complications.

Table 2. Manual Muscle Test of Facial Muscle



**DISCUSSION**

In this case report, we discuss about a male, 24 years old who was consulted on July 8th 2019 from Department of Physical Medicine and Rehabilitation Outpatient Clinic at Teling Hospital with diagnose facial nerve palsy after parotidectomy. According to anamnesis, physical and supporting examination we diagnosed this patient with right peripheral facial nerve paresis caused by parotidectomy.

Table 3. UGO FISCH scale

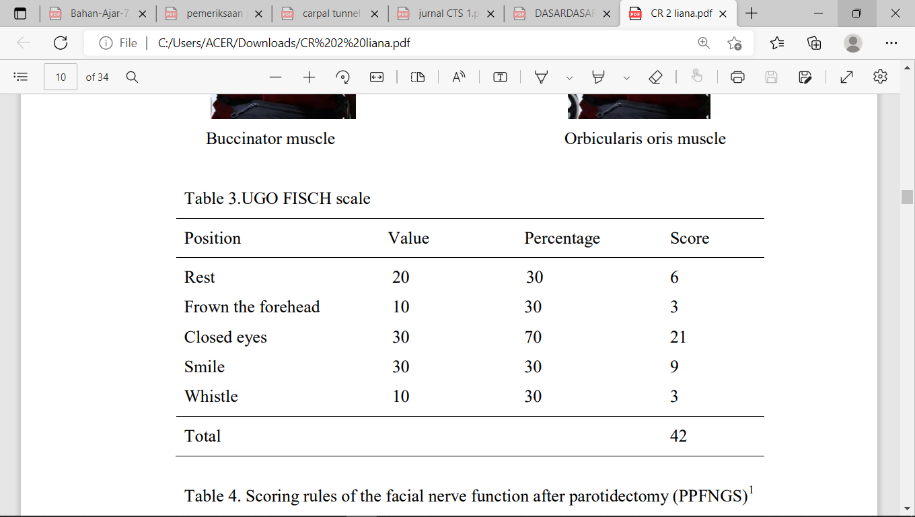
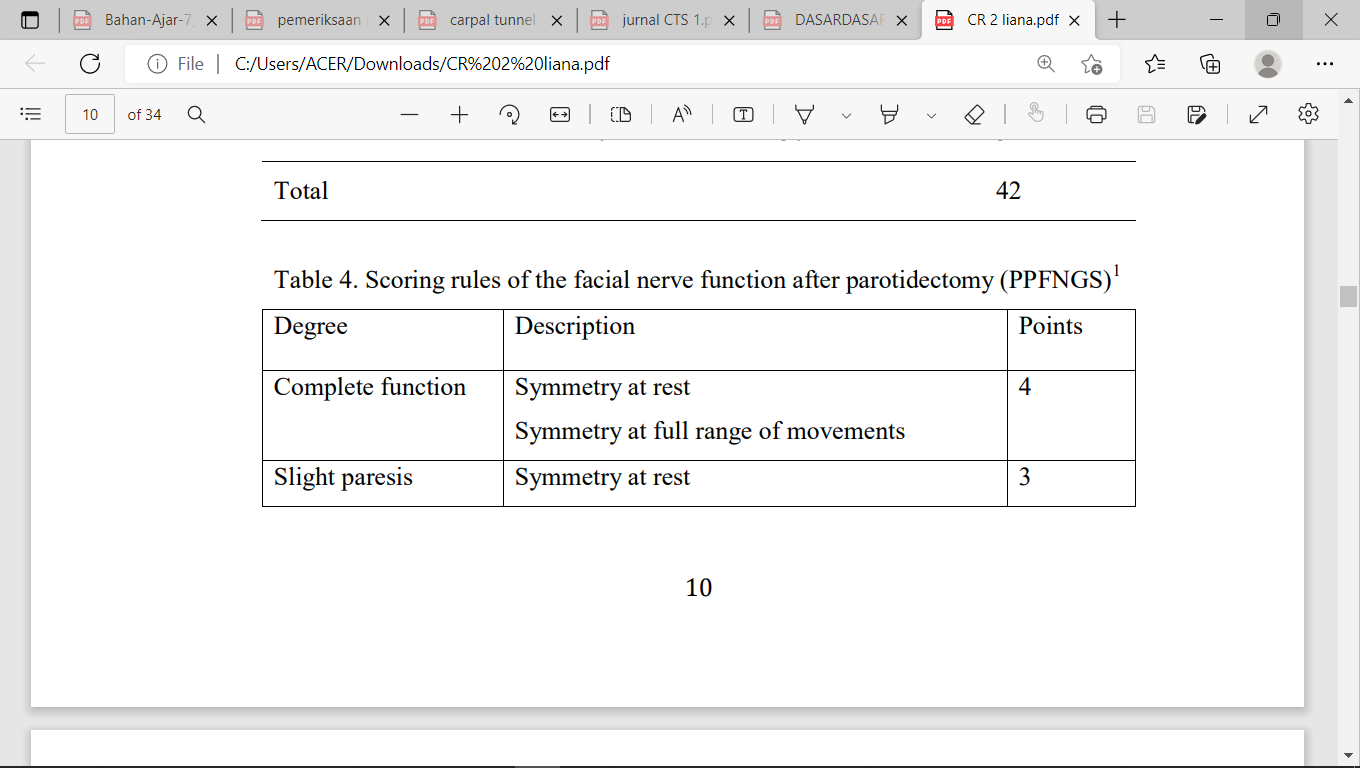
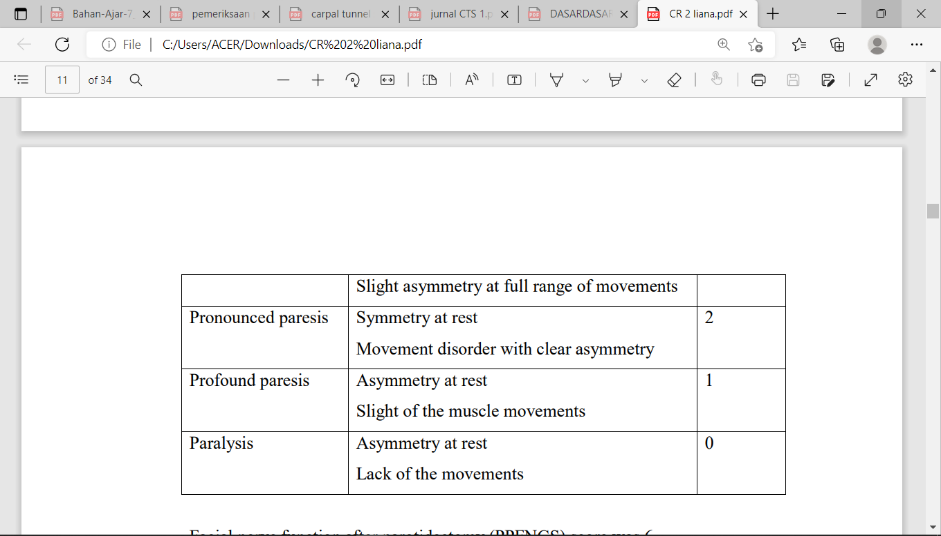


Table 4. Scoring rules of the facial nerve function after parotidectomy (PPFNGS)





From the anamnesis of this patient, there was weakness at his right facial muscles since 1 months ago (June 14th 2019). He felt thick on his right face when he woke up in the morning, the right forehead unfurrowed, right eyelids couldn‟t close completely, right facial creases and nasolabial fold disappeared, and the right corner of the mouth drooped. While eating he must use the left side of the face but no food and saliva spilled out from the right corner of the mouth. He did not fell disturbance in tasting the food, no buzzing and pain at both ear. Moreover, there were no weaknesses on his arms and legs. He felt his complaint one month after he got parotidectomy.

According to the clinical features, the facial paresis affects all the muscles on one side of the face so included in facial nerve paresis, peripheral type with parotidectomy as a cause. As we know, in addition to supplying the muscles of facial expression, the facial nerve conveys secremotor fibres to the sublingual and submandibular salivary glands and the lacrimal gland as well as the nasal mucosa; it also carries taste fibres from the anterior two-third of the tongue. The fibers innervating the facial muscles have their nucleus of origin in the ventral part of the caudal pons; the secretory fibres for the salivary glands are derived from the superior salivary nucleus. The sensory fibres associated with the nerve have their cells of origin in the facial (geniculate) ganglion. From the motor nucleus, fibres of the facial nerve run a devious course over the nucleus of the abducent nerve, where they form an elevation on the floor of the 4th ventricle knowns as the facial colliculus, then downwards and forwards to emerge from the lateral aspect of the pons together with VIII in the cerebellopontine angle. The sensory and motor fibers pass together into the internal auditory meatus, at the bottom of which they leave the 8th nerve and enter the facial canal. Here they run laterally over the vestibule before bending sharply backwards over the promontory of the middle ear. The facial nerve then passes downwards, medial to middle ear, to reach the stylomastoid foramen. Hence its taste fibres reach the anterior two-thirds of the tongue and its secremotor fibres are conveyed to the submandibular ganglion, thence to the submandibular and sublingual salivary glands.

Involvement of the facial nerve may result from a lesion that affects the nerve or the nucleus (a peripheral lesion). The peripheral lesion results in a flaccid paralysis of all the muscles of the face on the side of the lesion (occipitofrontalis, corrugator, orbicularis oculi, nose, and mouth muscles). The affected side of the face becomes smooth, the eye remains open, the lower lid sags, and blinking does not completely close the eye; the nose is depressed and may deviate to the opposite side. The cheek muscles flaccid, so the check appears hollow and the mouth is drawn to one side. Eating and drinking are difficult because chewing and retention of fluids and saliva are impaired. When the VII nerve is affected central to the nucleus, there is paresis of the muscles of the lower face but sparing of the muscles of the upper face. This occurs because the nuclear center that controls the upper face has both contralateral and ipsilateral supranuclear connections, whereas that which controls the lower face has only contralateral supranuclear innervation. For this reason, a lesion in one cerebral hemisphere causes paresis of the lower part of the face on the contralateral side and there is sparing of the upper facial muscles.8

Disease of the VII nerve include:

1. Bell‟s Palsy

2. Guillain-Barre Syndrome (also called infectious polyneuritis)

3. Sarcoidosis, vasculitis, parotid gland tumor, leprosy, and Lyme disease

4. Acute or chronic otitis media and mastoiditis

5. The cerebellar-pontine angle tumor

6. Geniculate ganglion herpes-Herpes zoster in the external ear canal, concha, and mouth.

Figure 1. Peripheral and central lesion

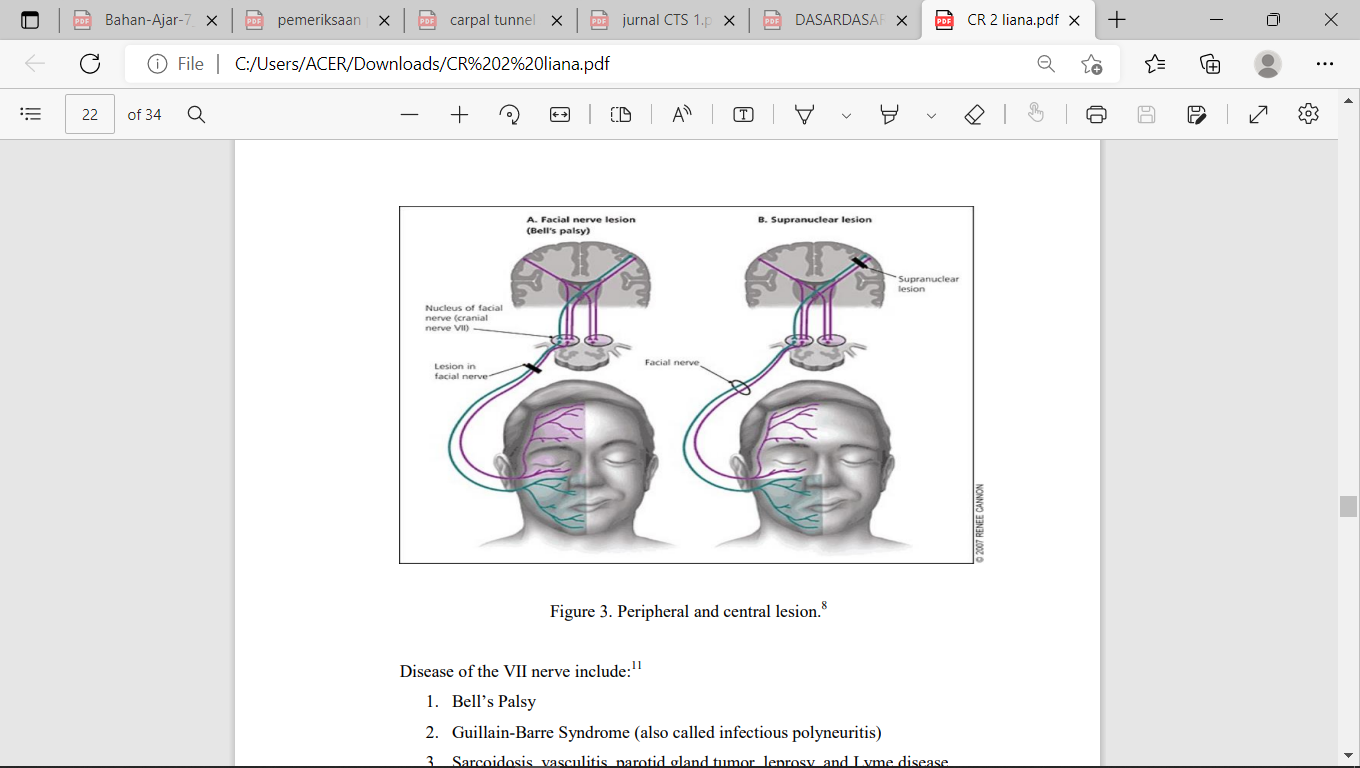
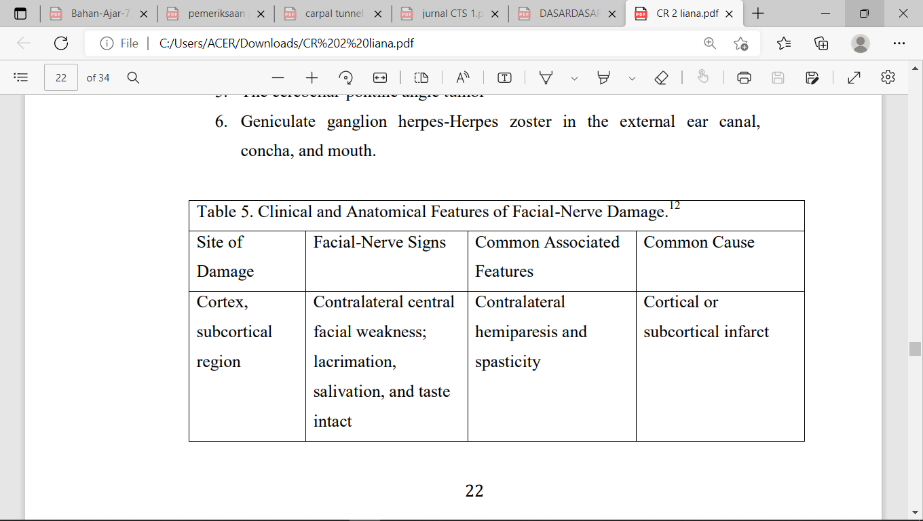
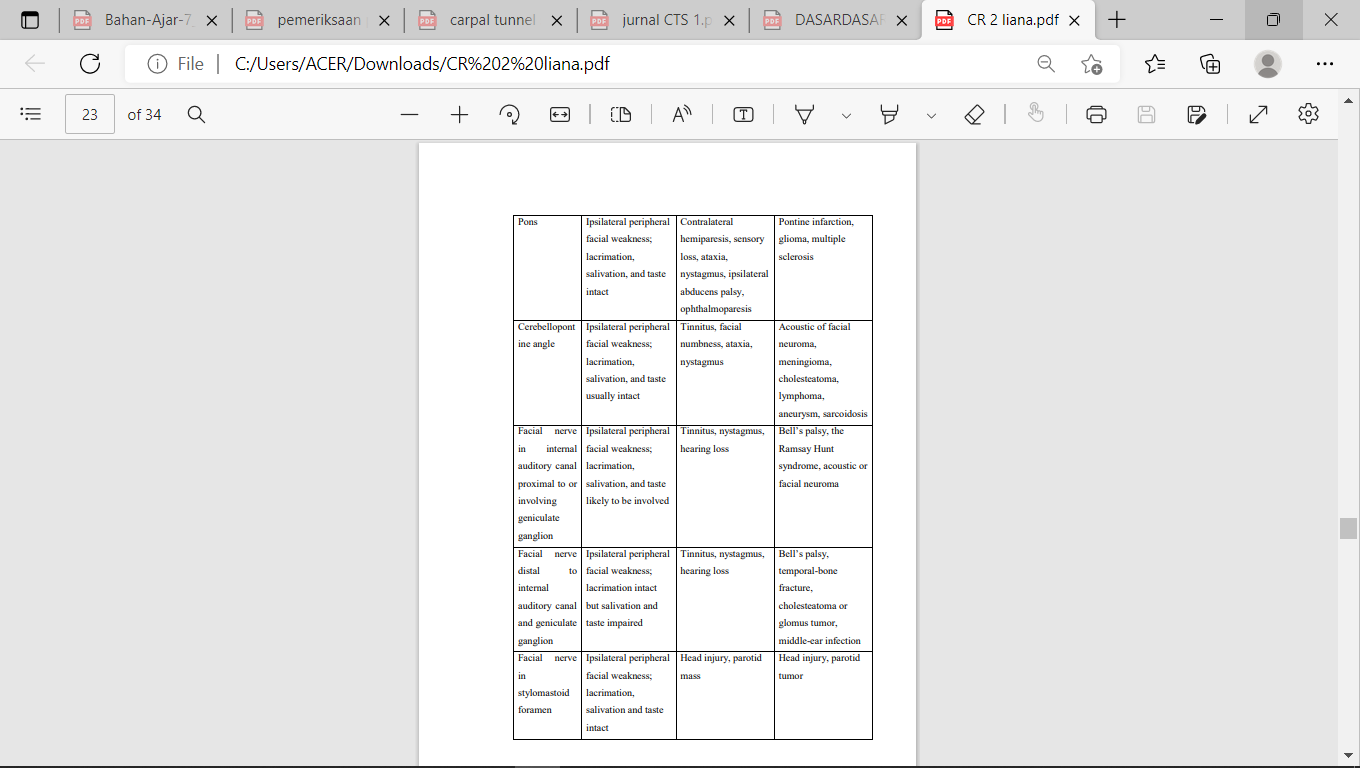


Table 5. Clinical and Anatomical Features of Facial-Nerve Damage





The patient, a male 24 years old complained right peripheral facial nerve palsy after he got parotidectomy on Mei 12th 2019 because of parotid tumor. Salivary gland tumors represent 3-10% of all head and neck neoplasms. The parotid gland is affected most often, ranging from 36.6 to 83%.3,4,5 Surgery is the first choice treatment for salivary gland tumors. Parotidectomy is a well recognized and common surgical procedure used to treat tumors in the parotid gland. Dysfunction of the facial nerve is a common and typical complication of this surgical technique even though its anatomic contuinity is preserved. It is estimated that 30-65% of all patients experience some sort of transient facial weakness with slightly higher rates for total parotidectomy than partial parotidectomy, and 3-6% evolve with permanent dysfunction resulting in significant impact in the quality of life.3,4,5

From the physical examination, patient was compos mentis, cooperative, communication and comprehension was good and vital sign was normal. We use the Manual Muscle Test to measure the facial muscles strength. 0 if there is no contraction. Non functional if there is contraction but only slight motion detected. Weak functional if there is contraction and easily erased by gentle resistance. Functional/normal if there is complete movement, tolerates considerable resistance.8 Manual Muscle Test of patient‟s facial muscles was non functional except for orbicularis occuli muscle was weak functional. Facial nerve function after parotidectomy (PPFNGS) score was 6. UGO FISCH scale was 42.

Table 3. UGO FISCH scale

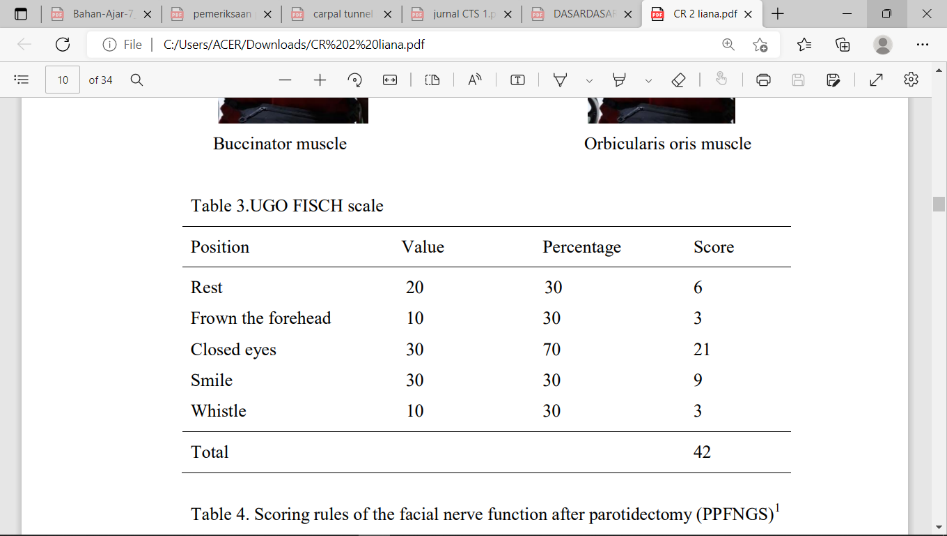
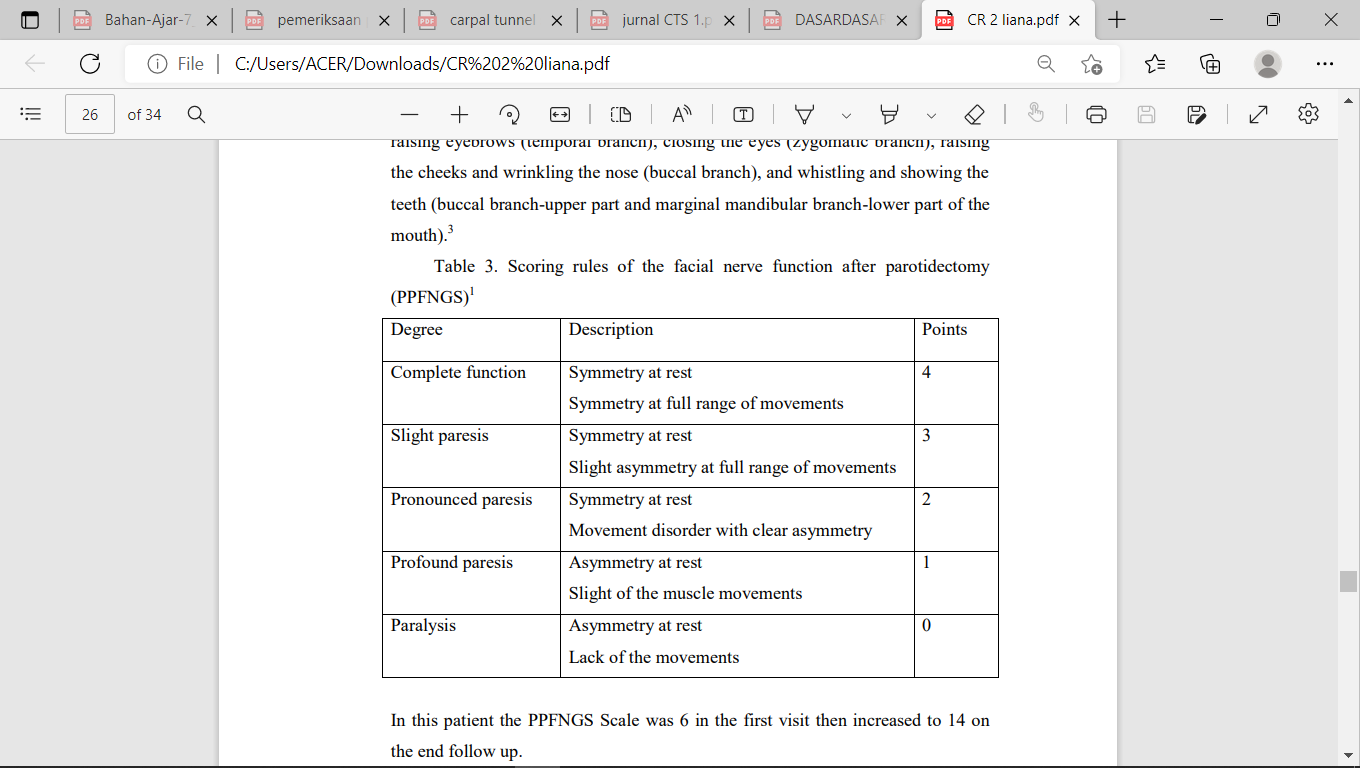


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UGO FISCH scale is used to assess the condition of symmetric or asymmetric between the healthy side and the impaired side at 5 positions: at rest, smiling, closing eyes, raising eyebrows and whistling. The assessment of percentages are 0% is complete asymmetrical, there is no voluntary movement, 30% is symmetrical, poor, the recovery is likely closer to complete asymmetrical, 70% is symmetrical, fair, partial recovery is likely closer to complete symmetrical, 100% is symmetrical, normal or complete.9 In this patient the UGO FISCH scale was 42 in the first visit then increased to 93 in the end follow up. The facial paralysis was not complete, so we did not perform electroneurography or electromyography and also there is improvement at second follow up.

We give the patient local superficial heat therapy (infrared/IR lamp and hot water compress) for right facial side and deep kneading massage on his right side of face. It has been recommended to use local superficial heat therapy for the facial muscles prior to electrical stimulation, massage or exercises.10 IR radiation has a wavelength of 770 to 106 nm.11 The physiological effects of IR lamps are vasodilation-increased blood flow, analgesia, reduce muscle spasm, reduce inflammation, increase metabolic activity, and facilitate tissue healing.11,12 The biggest advantage of an infrared lamp is that the superficial tissue temperature can be increased, even though the unit does not touch the patient. The patient who get infrared lamp treatment should be positioned 20 inchies from the source. Protective towelling should be put in place. Treatment time should be 15-20 minutes. In this patient we give infrared lamps three times a week, 15 minutes.

Massage, which has frequently been prescribed for facial palsy, improves circulation and may prevent contracture. The guideline for soft tissue massage was 10 repetitions 1 or 2 times per day.10 The basic goal of massage on muscle tissue is to maintain the muscle in the best possible state of nutrition, flexibility, and vitality so that after recovery from trauma or disease the muscle can function at its maximum.12

Facial neuromuscular re-education is a process of relearning facial movement using specific and accurate feedback to (1) facilitate facial muscle activity in functional patterns of facial movement and expression and (2) suppress abnormal muscle activity interfering with facial function.13 There are four distinct treatment based categories (initiation, facilitation, movement control and relaxation stages) matched with specific treatment techniques for each category. Surface EMG (s-EMG) has been advocated as an appropriate form of visual and/or auditory biofeedback for the re-education of muscle activity in facial movement disorders. On the first follow up, the patient was instructed on using his fingers to passively move the right corner of his mouth into a „smiling‟ posture. He was informed to then slowly release his finger pressure, all the while attempting to actively hold the „smiling‟ posture with the involved musculature. In addition to the „smiling‟ exercise, the patient was instructed to passively frown his right forehead with his finger and activate the appropriate musculature upon release of his passive support finger.When he began to able initiate slight movement at facilitation phase, the neuromuscular re-education exercises were prescribed on the basis of a participant‟s impairments of facial motor control, with emphasis on small movements to gain symmetry between the affected and unaffected sides of the face.14 The exercise consisted of active and resistive exercise to increase facial movement excursion and facilitating the affected-sided musculature.13 The patient was instructed to perform slow, controlled, graded facial expressions to generate symmetry between the sides of the face with a mirror for visual feedback, and to use his finger to provide resistance to the desire facial movements with the precaution of muscular fatigue of the involved side and over facilitation of the uninvolved side. If there were any typical abnormal movement pattern or synkinesis developed, the meditation-relaxation strategies should be initiated as well as controlling synkinetic movements in addition to neuromuscular re-education therapy at the movement control phase. In the case of severe pan-facial tightness attributable to synkinesis and hypertonicity, the meditation-relaxation was the strong focus strategies. This patient didn‟t develop any signs of synkinesis or the facial tightness at the initial examination and follow up, so the neuromuscular re-education performed at initiation and facilitation phase only. The typical guideline for neuromuscular re-education exercise was 20 to 40 repetitions 2 to 4 times per day.18 The results attained in facial training may be explained by the theory of nervous system plasticity.15

Kabat rehabilitation consists in the facilitation of the voluntary response of an impaired muscle through the global pattern of an entire muscular section that undergoes resistance. This method appears to be extremely rational for facial muscles, since most of the face muscular fibers run diagonally, with easy irradiation to the upper facial region due to the cross facial nerve innervations. Three regional fulcra were taken into consideration: the upper, intermediate and lower fulcrum. The upper fulcrum (forehead and eyes) is connected via a vertical axis to the intermediate one (nose), while the lower mimic-chewing-articulatory fulcrum lies along a horizontal axis. Hence, action on the upper fulcrum also 29 involves the other two fulcra. The manipulation of these three fulcra is carried out by utilizing both contralateral contraction and the basic proprioceptive stimulation including stretching, maximal resistance, manual contact and verbal input. In the upper fulcrum, the activation of the frontal, corrugator and orbicularis muscles is carried out by means of their upwards or downwards traction, which is always in a vertical plane depending on the specific function that needs to be activated. In the intermediate fulcrum, the activation of the common elevator muscle of the ala nasi and upper lip is also carried out using traction movements, in this case contrary to the normal direction, following a vertical line. For the lower fulcrum, the manoeuvres are carried out on the risorium and orbicularis oris muscles in a horizontal plane, and on the mental muscle in a vertical plane.16

We educate the patient to do the eye care because peripheral facial palsy impairs the patient‟s normal ability to blink. As a result, the cornea can become dry, risking injury, including corneal ulceration. If patients cannot close one of their eyes, they should be instructed to manually close it at regular intervals to stimulate blinking.2 The patient instructed to use artificial tears 1-2 drops 3 times daily at the right eye (as prescribed from ophthalmologic department) and use eyes cover while sleeping.

At first visit, this patient had an anxiety and felt shame about his face. After gave him education about this illness, re-assured and consulted him to a psycholog, the shame and anxiety was decreased gradually. In the hospital setting, medical social workers play an important role to assist patients and families, access in-home health care services, arrange for in-home medical equipment, provide for transportation, coordinate follow-up treatments with his supervisor, and refer patients to a wide variety of community social service agencies.

The prognosis of this patient, ad vitam is ad bonam because there is no complications that coud be life-threatening, and there is no sign of malignancy in the anatomic pathology results. Ad functionam is ad bonam because his illness is classified as neuropraxia that is good in prognosis and patient have a routine medical rehabilitation. Ad sanationam is dubia ad bonam because 3-6% patients with nerve palsy after parotidectomy evolve with permanent dysfunction. In the study by Peitersen, out of the 2570 cases of peripheral facial nerve palsy, in 85% of patient facial nerve function returned within 3 weeks and in the remaining 15% after 3-5 months.2 About 5% may remain with severe sequelae. Long-term sequelae of facial nerve palsy may be persisting weakness, contractures, facial spasms, synkinesis, decreased tearing, crocodile tears, or psychosocial effects. Indicators for poor prognosis include complete facial palsy, no recovery of symptoms by three weeks, age over 60 years, severe pain, herpes zoster virus, comorbid status like hypertension, diabetes, pregnancy and severe degeneration of the facial nerve shown by electrophysiological testing.17

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