

Physiotherapy Interventions For Traumatic Unilateral Facial Palsy Along With Tympanic Membrane Rupture: A Case Report

Dr.Reema Rasotra

#Assistant Professor, Lovely School of Physiotherapy, Lovely Professional University

Corresponding Author:-

Dr.Reema Rasotra (PT)

Assistant Professor,

Lovely School of Physiotherapy& Applied Medical Sciences

Lovely Professional University

Phagwara-144401

Punjab-India

Phone no:-9888706015

Email:- reema.24404@lpu.co.in

Rasotra1@gmail.com

ABSTRACT

Introduction:-Facial palsy is the most common cranial nerve disorders but facial palsy followed by traumatic tympanic membrane rupture is very rare condition. Facial palsy results in facial deviation with the involvement of affected branch of nerve. Generally this type of condition takes place due to some external Injury in external auditory canal. Tympanic membrane rupture may cause hearing problem or not that depends upon the extent of the Injury.

Case Description: A 40 years old man of 90 kg reported to clinic with right side traumatic facial paralysis along with this tympanic membrane rupture which has led to severe hearing loss of 78 d B HL with first degree of hearing loss according to audiometer and facial palsy of grade 5 according to House-Brackmann facial grading system .On examination superficial and deep sensations were affected .Reflexes were also affected with Rinnis and Weber test positive.

Cranial nerve examination depicted that CN5, CN7 and CN8 were affected rest all cranial nerves were intact. Cervical ranges of motion were affected as compared to normal.

Intervention: - Physiotherapy intervention of 8 weeks were planned for the patient .In first 2 weeks patient was given intermittent faradic muscle stimulation on right side of face with 30 repetitions followed by facial massage and facial tapping. Along with this home exercise treatment was also advised to patients, in which various face exercises such as blowing the candles, filling the balloon's, filling the air in mouth, drawing the bubbles from straw in water. After 2 weeks PNF followed by electrical stimulation were given to patient with 5 sessions in a week for 6 weeks along with home functional programs.

Outcome:-During examination NPRS value was zero but after two weeks patient got ear pain and reported of 5 value on NPRS. After complete 8 weeks of intervention NPRS value turned to zero again. House-brackmann facial grading system during assessment was grade 5 .But after complete intervention grading was improved to grade 2.Audiometer reading also improved from 78 d B HL i.e. from severe hearing loss to 45 d B HL i.e. first degree of moderate hearing loss after complete intervention program. Sensory grading's improved from grade 5 to grade 2.Along with this reflexes also improved as compare to normal.

Keywords:- Facial Palsy, Tympanic membrane rupture, Audiometer, House- brackmann facial grading System ,NPRS scale.

Introduction

The facial nerve has a close relationship with inner ear .It supplies the muscles of face which help in facial expressions. The seventh cranial nerve give rise to a number of communicating branches. In the facial canal, the facial nerve gives off the nerve to the stapedius muscle and the chorda tympani. The chorda tympani enters the tympanic cavity, passes medial to tympanic membrane and the handle of the malleus, and again enters the temporal bone.[1]

According to the anatomy of ears in humans the tympanic membrane is also known as eardrum or myringa. A thin cone like membrane separates the external ear from middle ear. There main function is to transmit sound from air to middle ear through the ossicles and after to fluid-filled cochlea through oval window. At the last it converts vibration in air to vibration in fluids by amplifying it. Traumatic rupture or perforation of tympanic membrane can lead to conductive hearing loss. Along with this Collapse or retraction of the eardrum can also cause conductive hearing loss or cholesteatoma. [2].

Mostly eardrums injuries are caused by trauma or infections. In most of the cases tympanic membrane heals itself within 10 days but in some of the cases perforation does not heal automatically it fails to heal. The acute rupture can heal naturally but chronic rupture needs surgical intervention of tympanoplasty .In most of the chronic and acute rupture it can lead to hearing loss followed by ear infections and various other complications.

Case Report

A 40 year old male weighing 90 kgs with a height of 6'2" with middle class status by occupation truck driver reported to world care physiotherapy center, Gurdaspur with a complaint of right sided traumatic facial palsy. He also reported right side tympanic membrane rupture along with hearing loss on the affected side along with mild headache all the time. The patient had a history of road traffic accident due to which he got hearing loss and facial deviation towards right side. After the accident patient was taken to hospital, where he received medical management for few days. He was diagnosed with head injury, facial palsy and tympanic membrane rupture of right ear. These findings were confirmed by MRI scan. After medical management the patient got discharged from hospital and the ENT specialist guided him to go for ear surgery to repair tympanic membrane rupture. As he was skeptical regarding the surgery he wanted to consult a Physiotherapist. Therefore, the patient consulted local physiotherapist for the management of facial palsy. He took physiotherapy management for 4 weeks but it was not helpful. Later, he consulted world care physiotherapy Center, Gurdaspur after two months of injury where he was examined and managed for facial palsy with positive recovery.

While assessing the patient complains of difficulty in opening and closing of right eye, difficulty in lifting the eyebrows, difficulty in smiling, drooling of saliva and loss of hearing on affected side. The medical history of the patient revealed that patient was under medication for hypertension and DM II since 5 years. According to surgical history patient had cholecystectomy 8 years back. Personal history of the patient states that patient is non-smoker and non-alcoholic. On observation built of the patient was ectomorphic. Along with this there was presence of swelling on right eye and deviation of face on right side. On assessing posture in standing view with the help of plumb line there was presence of forward head neck posture. On pain evaluation he complained of no pain and tenderness in right ear and face with zero NPRS score. On Sensory examination the superficial i.e. touch, pain and pressure were not intact whereas temperature was intact on face. The temperature was checked with a hot and cold test tube on both sides of face. For touch examination a camel brush was used, for pain blunt pin was used on face. On deep sensory examination proprioceptive, kinesthesia and vibration were not intact.

S.No.	Sensations	grades
1.	touch	5
2.	temperature	4
3.	Pain	5
4.	pressure	5
5.	Kinesthesia	5
6.	proprioceptive	5
7.	vibration	5

On motor examination Active range of motion of cervical movements was assessed with the help of goniometer i.e. flexion ,Extension, lateral flexion(Right side),lateral flexion(left side),Rotation(left side) and rotation (Right side).

Cervical Movements	Active Range of motion
Flexion	0-40 degree
Extension	0-30 degree
Lateral flexion(left side)	0-25 degree
Lateral flexion(Right side)	0-20 degree
Rotation(left side)	0-50 degree
Rotation(Right side)	0-60 degree

Manual muscle testing of cervical spine was cervical flexion grade 4,cervical extension grade 4,left side lateral flexion grade 4,right side lateral flexion grade 4,Right side rotation and left side rotation was also grade 4.On manual muscle testing of facial muscles according to House-Brackmann grading it was grade 4 during assessment.On palpation of facial muscles there was no pain and tenderness present .On ear palpation again there was no pain and tenderness present. On Cranial nerve examination CN 1,CN2,CN3 ,CN4,CN6,CN9,CN10,CN11,CN12 all were intact whereas CN 5,CN7,CN8 were non Intact. On assessing reflexes Jaw reflex,Biceps, triceps and supinator all presented with grade 3.

On other systemic examination of Ear by otoscope there was tympanic membrane rupture present in right ear along with fungal infection. Audiometric examination revealed severe hearing loss of 78 d BHL (first degree of severe hearing loss). Lab investigations of blood showed normal CBC count with no underlying pathology. MRI scan of head depicted the presence of hairline fracture of temporal bone on right side alongwith tympanic membrane rupture.

Physiotherapy Intervention:-

Physiotherapy treatment started from very first day after taking the complete assessment of the patient. Intervention program was set for eight weeks .In first two weeks 5 sessions of treatment was given to the patient along with this home functional program was taught to the patient. Proper eye, ear and mouth care was being taught to the patient on the very first day. Week 1 patient was given facial stimulation with 30 repetitions on all the motor points in intermittent mode with a faradic type of current. After facial stimulation patient was given facial massage for 10 minutes on affected side with tapping. In home functional program patient was taught facial exercises to be done in front of mirror. Exercises to lift eyebrows, opening and closing of eye. Flexible cheeks (hold water/air in mouth and try to force from one side to the other).Blowing the candles with air, filling the balloons with air. Making bubbles with the use of straw .This Intervention continued for one week and after one week of intervention again patient was

assessed. In which patient showed positive response towards the treatment. So, same treatment was continued in next week also.

After two weeks of intervention patient started complaining of tickling sensation and pain in right ear during facial stimulation. When asked for grading on NPRS patient reported it as 5. Then patient discontinued the treatment after two weeks for two days and on 3rd day patient reported back with a complaint of severe pain and tickling sensation in right ear with NPRS value 7. So, the patient was referred to ENT specialist for ear consultation. ENT doctor went for ear examination for pain and tickling sensation after which doctor came to conclusion that tympanic membrane of right ear has started going for healing process that why there is pain and other complaints of the patient. So, he was recommended some medication for his pain in ear and advised to continue the physiotherapy treatment. After patient got satisfied from ENT consultation again physiotherapy treatment of patient was started.

In third week the intervention program was changed as compared to first two weeks. In third week PNF along with electrical stimulation was added up in the treatment process. Techniques of PNF applied to facial muscle include pressure, stretch and resistance. For treatment the tips of fingers as manual contacts were used. Firstly, for frontalis muscle the patient was told to lift eyebrows of affected side, wrinkle your forehead-applying resistance to the forehead, pushing in caudally and medially direction. This movement was done with eye open and neck in extension. Secondly, for corrugator's supercilii muscle patient was told to look downwards toward the floor and apply resistance just above the eyebrows diagonally in a cranial and lateral deviation with eyes close. Thirdly, for orbicularis oculi ask the patient to close the eyes and different exercises for upper and lower eyelids were told to avoid pressure on the eyeballs. Fourthly, for procerus we ask the patient to wrinkle your nose or pull the both sides of nose towards the nose bridge. Put pressure near to nose in a diagonal way in down and outward directions with eyes close. Fifthly, for orbicularis oris ask the patient to try to whistle and apply pressure laterally and upward towards lower lip. Lastly, for mentalis muscle we ask the patient to wrinkle the chin by apply resistance down and out of the chin. Along with this we taught conventional exercises such as the patient was advised to gently raise eyebrows and draw eyebrows together to frown. Conventional exercises were advised in front of mirror so it can act as biofeedback.[3]

This Intervention continued for next 6 weeks with 5 days per week and total treatment session continued for 45 minutes per session.

Outcome Measures:-

After the pre-assessment and Intervention programme again complete assessment of the patient was taken to note the significant improvement in the condition of the patient.

a) After complete Intervention programme sensory examination shows following significant changes.

Serial No.	a)Superficial and b)deep sensations	grades
1.(a)	touch	2
2.	temperature	2
3.	Pain	2
4.	pressure	2
5.(b)	Kinesthesia	3
6.	proprioceptive	3
7.	vibration	3

b) There were significant changes in cervical ranges also as compared to before(during the time of assessment) which are as follows.

Cervical Movements	Active Range of motion
Flexion	0-60 degree
Extension	0-50 degree
Lateral flexion(left side)	0-30 degree
Lateral flexion(Right side)	0-30degree
Rotation(left side)	0-60 degree
Rotation(Right side)	0-60 degree

c) Cranial nerve examination shows that all the cranial nerves were intact after the intervention such as CN 5, CN7 and CN 8 which was not intact during assessment showed significant improvement after the interventions.[7]

d) On assessing reflexes Jaw reflex, Biceps, triceps and supinator all presented with grade 2.

e) At the time of pre-assessment patient reported no pain in his right ear according to NPRS. But after 2 weeks of physiotherapy treatment patient started complaining of pain his right ear. Patient rated his pain as 5 according to NPRS. Again his pain increased after 2 days day with NPRS value of 7.After complete treatment his NPRS again turned to zero.

OUTCOME MEASURES	DURING ASSESMENT	AFTER 2 WEEKS	AFTER 5 WEEKS	AFTER 8 WEEKS
Pain (NPRS)	zero	5	zero	zero
House-brackmann facial grading system	grade 5	grade 4	grade 3	grade 2
Audiometer readings	78 d B HL(First degree of severe	Not assessed	Not assessed	45 d B HL(First degree of

	hearing loss)			moderate hearing loss)
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House-brackmann facial grading system was having grade 5 during the day of assessment.[8]After 2 weeks of treatment it changed to grade 4, after 5 weeks it progressed to grade 3 and after complete intervention of 8 weeks it changed to grade 2 i.e.mild dysfunction of facial muscles.

Audiometer reading during the time of assessment was 78 d B HL Which is first degree of severe hearing loss and after complete treatment when we again assessed audiometer reading was 45 d B HL which is first degree of moderate hearing loss.

Discussion

There are many theories about the intervention of facial palsy but there are very few studies regarding traumatic facial palsy along with ruptured tympanic membrane. This was the first trial to treat tympanic membrane rupture along with facial palsy with muscle stimulation. Before this no study has been done keeping ruptured tympanic membrane in consideration for facial palsy along with hearing loss. We always pay attention towards facial stimulation for facial palsy keeping all other problems aside related to ears. Before this the only treatment for traumatic tympanic membrane rupture is the surgery. But in this study experimentally it has been proved that along with facial palsy tympanic membrane rupture could also heal by means of muscle stimulation As the basic aim for electrical stimulation is to promote good blood supply and proper nutrition .Activate specific metabolic pathways(oxygen, glycogen or both),to prevent or reverse the changes of atrophy.

As the primary aim of this study was to check experimentally whether there is any influence of muscle stimulation when we stimulate facial nerve of affected side on tympanic membrane and hearing process or not. Whether we see the results only in facial palsy recover or both (i.e. facial palsy along with tympanic membrane rupture).

In this case study, the patient showed significant improvement in sensory assessment, reflexes, pain, house-brackmann facial grading system and audiometer reading after receiving the physiotherapy management. In this case, patient's problems were given priority and on that basis treatment plan was planned.Throughout the plan of treatment patients improvement and difficulties were listed .Facial palsy is most commonly seen condition in clinical practice but facial palsy along with tympanic membrane rupture is a very rare condition. The current case study found its significance of physiotherapy treatment for facial palsy along with tympanic membrane rupture in daily practice of physiotherapy.

In one of the study named "Trans tympanic facial nerve paralysis- a review of literature" .They have taken the review that it is very uncommon that facial nerve paralysis can be due to some

external trauma also and increasing the awareness of this problem through discussion of its clinical presentation, management and prognosis but they have not discussed about the management for this type of problems. In this study only consideration is on facial paralysis.[4]

In other study named "Physiotherapy treatment of bells palsy of for a 38 years old man: A case report" the author has paid attention only to pain and facial expressions after receiving the physiotherapy intervention but no consideration on other problems of the patient. This study is only considering on the treatment of bell's palsy.[5]

In other study named "Facial Nerve Paralysis in Acute Suppurative Otitis Media":-Author proved that Facial paralysis is a rare complication of acute suppurative otitis media it requires early detection for its management. He hereby report a case which he managed conservatively. According to the author he put concentration on antibiotic therapy and corticosteroid therapy based on his experience and literature reviewed. These treatment can be done without surgery or with surgery as a first line management. Surgery can be implicated in case of acute or coalescent mastoiditis, suppurative complications and lack of clinical regression[6]

Conclusion:-

This case study depicts the outcome of physiotherapy management of a patient with tympanic membrane rupture along with the facial palsy. Based on the findings we can prove this that traumatic tympanic membrane can be treated by muscle stimulation which is helping in healing process of tympanic membrane.

Significant result has been shown from experimental outcome of this study which shows that the value of NPRS is fluctuation in full treated process. The outcome value for audiometer has showed a large change before start of treatment and at the termination of the treatment. The house-brackmann facial grading has shown a significant change after the treatment process. So, further more studies could be done to rule out some other problems related to facial palsy.

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