

## Prosthodontic Rehabilitation of Completely and Partially Edentulous Patients with Bell's Palsy

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### Abstract

Emphasis on facial esthetics has become an integral part of dental treatment. Treating patients with bell's palsy [idiopathic facial paralysis] of long term un-recovery or facial paralysis of permanent nature is challenging. Making partial and or complete dentures is not easy at all. This review is conducted to discuss various prosthodontic methods to rehabilitate Bell's palsy patients. A midline search is carried out for the time period between 1955 and 2016, to identify the most related articles published in English about prosthodontic treatment for Bell's palsy patients who have partially dentate or edentulous arches. The articles discussed the most effective methods of dental treatment for such patients.

**Keywords:** Prosthodontic Rehabilitation; Edentulous Patients; Bell's Palsy

### Introduction

Bell's palsy is the most common cause of acute unilateral facial paralysis (60 - 75% of cases). Also it is the most common cause of facial paralysis worldwide [1] and it is one of the most common neurologic disorders of the cranial nerves. The name "Bell's Palsy" was described by surgeon Sir Charles Bell. It is an idiopathic unilateral lower motor neuron paresis or paralysis of the facial nerve of sudden onset. It involves loss of muscular control on the affected side of the face [2]. The facial nerve [seventh cranial nerve] has a complex anatomy and function. This increases its susceptibility to multiple neurologic disorders based up on the location of the lesion. Scottish surgeon Sir Charles Bell, in 1821 demonstrated the separation of the motor and sensory innervation of the face and describe the function and anatomy of the facial nerve [3,4].

Facial paresis and facial paralysis are dysfunctions of different degrees of the facial nerve, ranging from partial and mild forms to complete form. Facial paralysis is defined as severe or complete loss of facial muscle motor function. This condition may result from central or peripheral lesion. In case of central lesion, which have their site in the motor cortex from the ascending frontal convolution up to the facial nerve nucleus in the pons (i.e. in case of supranuclear facial injuries), the lower branch of the facial nerve is affected because the upper part of the nucleus receives both homolateral and contralateral cortical afferent pathways and extrapyramidal ones. So in central facial paralysis, the motility of the lower face is impaired [5].

In case of peripheral lesion, it starts in the motor nucleus [namely, intra-nuclear lesions], both peripheral facial nerve branches are injured and facial palsy is located in the homolateral hemi face.

The etiology of Bell's palsy has not been definitively identified, but viral infection, vascular ischemia, or autoimmune diseases have been postulated as possible causes [6,7]. In general, Bell's palsy occurs when function of the facial nerve is disrupted by swelling, inflammation, or compression which leads to death of nerve cells due to insufficient blood or oxygen supply [8]. In some mild cases, there is only damage to the myelin sheath of the nerve.

Bell's palsy affects the unilateral facial muscles with acute onset features like; inability to blink (absence of reflex blinking), absence of wrinkles on the forehead, Hypotonia in the mimic muscles, flattening of nasolabial fold, lagophthalmus [Charls Bell's sign], ocular pain and/or blurred vision, decreased tearing, posterior auricular pain, Hyperacusis, oral commissure ptosis, displacement of the philtrum and nose tip towards the healthy side, and loss of taste in the anterior 2/3 of the tongue and reduced salivation (in case of an involvement of cordatympani nerve). All these signs become more pronounced during facial movement. When patient smiles, face becomes distorted and lateralizes to side opposite the palsy [9].

The natural course of Bell's palsy varies from early complete recovery to substantial nerve injury with permanent sequelae. Its prognosis is related to severity of lesion [10]. It would be favorable surgery is performed within the first 21 days of onset [11]. Muller found 80% of patients with Bell's Palsy recover usually without any treatment [12]. Prognostically patients fall into 3 groups [9]:

- **Group 1:** Complete recovery of facial motor function without sequelae. (80-90% of patients recover within 6 weeks to 3 months).
- **Group 2:** Incomplete or partial recovery of facial motor function, but with no cosmetic defects that are apparent to untrained eye (30% of diabetic patients are more likely to have only partial recovery than non- diabetic).
- **Group 3:** Permanent neurologic sequelae that are cosmetically and clinically apparent.

The goal of the treatment of Bell's palsy is to restore the facial symmetry, both in static and at dynamic conditions. There is no standard course of treatment or cure for Bell's palsy. While mild cases do not require treatment since the symptoms usually resolve within weeks, moderate and severe cases may need surgical intervention and/or palliative (conservative) treatment as pharmacokinetics, physiotherapy and prosthetic device therapy [13]. Therefore treatment of Bell's palsy should be conservative and guided by the severity and probable prognosis in each particular cases.

Dentists at dental clinics may have to examine patients with facial asymmetry and functional disorders caused by facial paralysis. Most patients with this disorder might have abnormal appearance because of facial asymmetry and involuntary movement leading to isolation of the patient and with psychological problems. This review shows the most effective prosthetic treatment for unilateral facial paralysis. Prosthetic treatment using modified removable Prosthesis may improve psychology and social behavior of patients with this disorder.

### Objectives of prosthetic rehabilitation

The prosthetic rehabilitation approach used alone as palliative treatment during the recovery period or for patient with permanent facial paralysis when surgery is contraindicated or has been unsuccessful.

1. To support weakened facial musculature "as buccinators, orbicularis oris and levator angulai oris".
2. To decrease amount of surgical procedures in case patient refused to have further surgery.
3. To provide comfort and esthetics to the patient.
4. To increase confidence and improve social interactions due to positive esthetic changes.

### The problems encountered during prosthodontic rehabilitation

There are many symptoms that jeopardize prosthodontic treatment for patients with Bell's palsy. They include uncontrolled flow of saliva, having mask like expressionless appearance, unpredictable and erratic mandibular movement and cheek biting [2,14]. All above features may interfere with impression taking, jaw relation recording. They also may effect on denture retention and stability [15,16].

### Prosthetic rehabilitation devices

#### Supporting prostheses

Patients with Bell's palsy experiencing difficulty with labial plosive sound (p,b) and labio-dental fricative sounds (f,v). This is Because of the bucco-labial insufficiency that results in restricted lip activity. 1976, Larsen, Carter and Abrahamian discussed in their articles a supporting prosthesis and how to use it for partially dentate and edentulous patients with Bell's palsy who have difficulty with labial plosive and labiodental fricative sound [17].

Supporting prosthesis is a modified removable prosthesis consist of cast frame work having a buccal attachment to support acrylic resin. The traditional approach is to fabricate a cast Co-Cr removable framework with a buccal attachment for partially dentate patients and to use heat cured acrylic resin complete denture for edentulous patients. For the latter, these prosthesis were easily modified by placing of (red sticks) modeling compound on buccal attachment with different amounts and ways to apply pressure in different directions. Evaluation is carried out for a period of time after insertion.

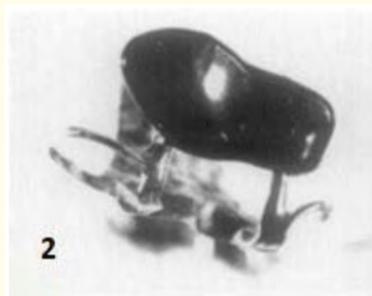
Larsen and his colleague used different modification approach to the supporting prosthesis as:

- Intraoral–extraoral approach.
- Intraoral approach with no vestibular tension.
- Intraoral approach with distosuperior tension.
- Intraoral approach with mediosuperior tension. With any modification, a functional seal is to be maintained between the lips. This is to make drinking and speaking easier.

In an intraoral approach with disto-superior tension, the procedure is to use the modeling compound placed on the buccal attachment with variable thickness, this will place tension on the vestibular fornix in superior and distal direction toward the posterior border of zygomatic process of the maxilla and provide additional support to the cheek. This change raises the commissure and straightens the lip line in addition to improvement of speech. After evaluation the effect of modification and reaching the desirable result in term of esthetics and speech, cold curing acrylic substitute the modeling compound and final prosthesis is adjusted and inserted.



**Figure 1:** The cast framework contains a buccal attachment to support modeling compound in acrylic resin.[17]



**Figure 2:** Intraoral modification with modeling compound provided support for the cheek.[17]



**Figure 3:** Use of intraoral modification with modeling compound resulted in no tension on the vestibular fornix. Only the thickness of the denture was modified.[17]

According to Larsen., *et al.* the prostheses with intraoral approach modification with disto-superior tension was the most beneficial in terms of esthetics and speech compared to other modifications used in the study. The same approach used by Elfenbaum in 1967 to rehabilitate completely edentulous patients having facial paralysis [18].

#### Face lift device

It is a removable partial prosthesis used for facial paralysis patient to support the muscles of the affected side of the face while regeneration is taking place. Face lift device is helpful in restoring aesthetics and functions of patients face while they are in recovery phase or when surgical intervention is delayed or was contraindicated for different reason. This device or prosthesis used by Dr. Syed Kazmi in 2013 [19] to treat a patient with facial nerve paralysis which compromised aesthetics and phonetics as well as mastication. Surgical intervention was contraindicated for this case. The patient refused both teeth preparation and the cross arch plate. So the buccal plate was processed in heat polymerizing pink acrylic and was retained with C clasp on tooth #17 [maxillary right second molar] and #14 [maxillary right first premolar]. The buccal plate extended from first premolar to the second molar area on the right side. Wax block was designed on the plate to camouflage the asymmetry. Wax was added and removed in segments to achieve the best aesthetic result by lifting the sagged facial muscles in upward and outward directions. Then final waxed plate was processed in heat polymerizing pink acrylic resin (Figure 4), and then inserted in the patient mouth after finishing and polishing.



**Figure 4:** Acrylic buccal plate was retained through C clasp on 17 and 14. The buccal plate extended from first premolar to the second molar area on the effected side.[19]

### Edentulous Bell's palsy patients

In addition to previously mentioned signs and symptoms of Bell's palsy, edentulous patient could suffer from:

- A deep droops the corner of the mouth, causing drooling of saliva.
- A very clear mandibular shift toward the non-affected side along with significant difficulty in pronunciation of bilabial (p,b), labiodental and fricatives (f,v) and had a slurred speech.
- They could not perform tapping movement of mandible when instructed. Rajapur, *et al.* (2015) [2] recommend a systematic stepwise approach for the rehabilitation of edentulous patient started by fabrication of interim dentures for neuromuscular training predictable mandibular movement before the fabrication of final dentures. This way familiarizes patients to the concept of mastication using dentures and improves their acceptability with less chances of rejection. Rajapur, *et al.* used "lingualized occlusion" as previous studies have shown that it has better masticatory efficiency and prevented lateral movements of dentures [20,21]. After complete denture processed, remounted laboratory and occlusal interferences were eliminated. The posterior teeth on both sides of mandibular denture were removed and flat occlusal tables were made using self-cure clear acrylic resin (Figures 5 and 6). The flat occlusal table used to analyze the occlusion and also to perform the tapping movement. Before complete curing of the resin, ensuring even contacts of all the palatal cusps on the mandibular occlusal flat table.



**Figure 5:** Maxillary palatal cusps contacting the occlusal table [2].



**Figure 6:** Indentation marks on flat occlusal table of mandibular denture [2].

This is an effective method for rehabilitation of Bell's palsy patient who has very irregular and erratic mandibular movements.

Patients need constant reassurance regarding their ability to perform better mastication the first weeks. Removal of any premature contacts must be done in every subsequent appointment and patient tapping frequency must be observed 4 - 6 times at every visit. When patient has no pain, stable interim denture in the mouth, clearly seen marks of indentations, and he can perform all mandibular movement smoothly, fabrication of final definitive complete denture will be the next step. This definitive denture should be modified to improve esthetic. Different ways of denture modification were discussed in previous articles.

**Modified complete denture**

**Denture with un detachable buccal plumper**

This way can be obtained simply by adding wax to the labial and buccal flange of maxillary complete denture in the try in visit step. The additional material could be easily added. Amount of adding wax and its direction managed by dentist until reaching a satisfied result in terms of esthetic and speech improvement. Then complete processing of denture using heat cure acrylic resin is carried out. After dentures insertion, proper post insertion instruction should be given to patient with further inforce to oral hygiene to avoid food entrapment between the dentures and the cheeks. Applying regular gum massage is crucial to maintain supporting tissues in a good health [22,23]. The main disadvantage of un-detachable cheek plumper is food impaction, due to weak buccinators that may result in candidiasis [22].

**Denture with extended buccal flange:**

This way of denture modification discussed by Godavarthi and his colleagues in 2012 [24] for management of completely edentulous patient with Bell's palsy. The procedure was as the following: after jaw relation and face bow transfer, maxillary master cast was scraped at the "affected side" from the buccal vestibule towards the land area to accommodate the modified buccal flange extension. The buccal flange was extended upwards to elevate the cheek musculature, vestibule and lips thereby improve the fullness and support the face. The buccal flange was also extended inferiorly below the occlusal plane to cover buccal surfaces of mandibular teeth almost touching the buccal flange of the mandibular denture. Then wax was added incrementally to buccal flange of maxillary trial denture from the distal surface of first premolar to the maxillary tuberosity region until the cheek raised enough to lift and hold at a reasonable and favorable position (Figures 7-9). Godavarthi and his colleagues recommended this extension to act as a curtain to prevent the food escaping into the buccal corridor and enhanced stability and retention for the mandibular denture. Denture processing is completed, using heat cured acrylic resin.



**Figure 7:** Maxillary denture showing upward and lateral extension of buccal flange [24].



**Figure 8:** Maxillary denture showing downward extension (occlusal view) [24].



**Figure 9:** Denture with extended buccal flange in occlusion [24].

### Denture with detachable buccal or cheek plumper

Also known as “cheek lifting appliance” [25]. The reasons of using this denture modification approach summarized in:

1. When the denture flanges do not give adequate support to the facial muscles. This slumped tissue needs extra support which is achieved with the help of cheek plumper [25].
2. Prosthesis has less in weight comparing to conventional method of adding excessive amount of denture base resin to buccal surface [25].
3. Detachable plumper is easy to insert and remove.
4. Prevents muscle fatigue.
5. To avoid construction of a new denture after palsy recovered.

According to Kamakshi and his colleagues [26], this cheek plumper was demonstrated during try in visit by placing wax in the premolar and first molar region. The waxed cheek plumper was superficially attached to the maxillary denture buccal flanges, in the affected (paralyzed) side. Plumper designed according to the available space intraorally necessary to enhance the appearance and supporting the sunken cheeks with proper thickness. This would not interfere with functional movement. After satisfactory denture try in, denture with cheek plumper was fabricated separately with a heat cure acrylic resin, then male and female parts of attachment (press button, or magnets, wires and buccal tube, [27,28,29], figure 10) were imbedded in denture buccal flange out surface and plumper in surface with using self-cure acrylic resin then finishing and polishing were carried out. Doddamani, *et al.* (2016) [14] used modified complete denture with detachable cheek plumper to rehabilitate their edentulous patient who had a history of unilateral left facial paralysis of unknown cause (Bell's palsy). Cheek plumper was customized to improve the affected side musculature in modeling wax. After satisfactory try in, dentures with cheek plumper was fabricated separately with heat cure acrylic resin, then male and female parts of “press button” attachment were embedded in denture using self-cure acrylic resin (Figure 11a-11c).



**Figure 10:** Different types of attachment : (press-buttons, magnets, buccal tube, wires).



**Figure 11a:** Maxillary denture with detached cheek plumper [14].



**Figure 11b:** Maxillary denture with cheek plumper in its place [14].



**Figure 11c:** Dentures with cheek plumper inserted in the patient mouth [14].

The advantages of press button stainless steel attachments include ease of replacement and cleaning, low maintenance cost, and has a good patient compliance.

#### Using of magnet attachment in detachable buccal or cheek plumper

Magnets are one of the common attachments utilized in dentistry and specially with the detachable cheek plumper. While their advantages include their small compact size, strong attractive force, simplicity of the clinical and laboratory procedures, automatic reseating, and constant retentive force with the consecutive number of insertion-removal cycles along with easy maintenance [26,28,30].

Their disadvantages include their susceptibility to corrosion, the need of frequent replacement, liable to loss of magnetic properties with time and its magnetic field may act harmfully on the health of surrounding oral tissues [26,28]. Magnet attachments are avoidable to be used with patients having pacemakers as they are surrounded by acrylic resin which act as an insulating material [26,28,30].

Using of barriers protection against corrosion has been documented in the literature such as stainless steel, titanium or palladium metal or a thin layer of coating materials like polytetrafluoroethylene, parylene, and polymeric materials [31,32]. In a case reported by Kamakshi and his colleagues, neodymium- iron- boron magnets (NdFeB) were used as an attachment imbedded in auto-polymerizing acrylic resin of denture and cheek plumper and covered with a thin layer of petroleum jelly. The latter prevented any possible corrosive action of monomer on the surface of magnet. Acrylic surface will act as a barrier between magnets and saliva.

### Conclusion

The goal of the prosthetic treatment should be to support the weakened muscles and provide stabilize, comfortable prosthesis during various functional movement and enhance the self-esteem of the patient by improving his/her appearance.

The way of prosthetic rehabilitation must be determined by considering intraoral tissue condition, severity of palsy, patient priorities and requirements.

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