



CASE STUDY

AN INNOVATIVE TECHNIQUE TO ENHANCE FACIAL AESTHETICS USING DETACHABLE CHEEK PLUMPER APPLIANCE: A CASE REPORT

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ARTICLE INFO

Article History:

Received 19th January, 2018
Received in revised form
08th February, 2018
Accepted 22nd March, 2018
Published online 30th April, 2018

Key words:

Detachable cheek Plumper, Facial Esthetics, Sunken / Slumped Cheeks, Complete denture, Aging.

ABSTRACT

Aging is associated with loss of teeth, residual ridge resorption and reduced tonicity of the facial muscles, leading to sunken cheeks causing a negative psychological impact on patient's well-being. Slumped cheeks are unaesthetic and add to the person's age. Disfigurement of face in patients in need of complete dentures can be improved with the help of cheek plumper to support the cheeks. Literature has well evidenced the extensive usage of magnets as attachments, but it has been shown that magnets lose their magnetic property over a period leading to failure of treatment, thus push buttons/press stud fasteners were used in this case, to increase the longevity and durability of the cheek plumper appliances. This article describes a simple, non-invasive technique of fabricating a complete denture with detachable cheek plumper using push buttons, thereby restoring the slumped facial musculature for the purpose of improving aesthetics, function and psychological profile in such patients

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Citation: Dr. Raghavendraswamy, K.R., Dr. Akash Puri, Dr. Anil Kumar Gujjari, Dr. Dhakshani M.R. and Dr. Akash Puri, 2018. "An innovative technique to enhance facial aesthetics using detachable cheek plumper appliance: A case report", *International Journal of Current Research*, 10, (04), 68271-68276.

INTRODUCTION

As the world is becoming more conscious about aesthetics, people are increasingly on the lookout for ways and means of enhancing their natural beauty. It is important for a prosthodontist to consider the whole face in totality when trying to work on dental aesthetics. Cheeks and facial musculature, due to their extreme visibility are important factor in determining facial esthetics and play an important role in a person's professional and social life (Saoji *et al.*, 2015). Form of cheeks is determined by the support provided by internal structures—teeth, ridges or dentures. Aging is associated with loss of teeth, resorbed alveolar ridge, reduced muscle tonicity, slumping of the cheeks, which results in their hollowed-out sunken appearance (via concavities below the malar bone of cheeks) and exaggeration of wrinkles because of tissue laxity (Waliszewski, 2005; Martone, 1964). Slumped cheeks are unaesthetic and add to the person's age.

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This aged appearance frequently causes a negative psychological impact on patient's well-being leading to feelings of social rejection and psychosocial pressures and further age-concealment procedures (Martone, 1964). *Conventional complete dentures with appropriate flange extensions* and positioned teeth adequately support the overlying lips and cheeks. However, in individuals with marked resorption of the alveolar process, conventional dentures fail to provide adequate support, necessitating additional support for the cheeks. While replacing missing teeth, it is important that the prosthesis not only replaces the missing teeth but also restore the facial contour. A "*cheek plumper*" or "*cheek lifting appliances*" specially designed for the correction of facial disfigurement and for supporting the sunken cheeks intraorally, can restore these facial contours (Lazzari, 1955; Larzen *et al.*, 1976). Slumping or sagging of cheeks can increase person's age in appearance and hence have a negative effect on the self-confidence of the patient. Thus, *purpose of this case report was to improve facial aesthetics, function and psychological profile* of completely edentulous patient by providing support to the sunken cheeks, and ultimately plumping them using a *simple, non-invasive technique* of fabricating a *detachable acrylic cheek-plumper*

appliance, which was attached to the single complete maxillary denture, using stainless steel *push button appliance/press stud fastener*.

Background

The *rationale* for providing this appliance is that some patients have sunken cheeks and need extra support for better facial aesthetics. Cheek Plumpers have been described for improving esthetics and the psychological profile of patients with maxillofacial defects and facial paralysis. Use of the plumper prosthesis in maxillofacial prosthodontics is also well documented. (Lazzari, 1955; Larzen *et al.*, 1976; Hitoshi *et al.*, 2004).

Cheek plumper can be of two types

- Un-detachable / Conventional / Fixed Cheek Plumper
- Detachable / Removable cheek plumper.

A *Conventional or a fixed cheek plumper* is a single-unit prosthesis with an extension near the premolar-molar region that supports the cheeks. Such devices are an integral part of the contour of maxillary denture flanges designed by over-contouring denture flanges in the medio-lateral and antero-posterior directions within physiologic limits. However, increased weight and bulk of conventional cheek plumpers fixed with the complete dentures make their insertion challenging and also hampers the retention of maxillary complete dentures. Moreover, their long-term use can lead to muscle fatigue (Kumar *et al.*, 2011; Verma *et al.*, 2004). Another type of cheek plumpers are *Detachable cheek plumper* where separate components attached to the denture flange and the plumper can be detached from and reattached to the complete denture by the patients themselves. Because of their detachability, they are easy to insert, remove, and clean. Most commonly used attachments in removable plumper prosthesis are magnets, ball end clasps and springs but it is seen that magnets lose their magnetism over a period leading to failure of treatment.^(9,10) Thus, push buttons/press stud fastener were used in this clinical case to increase the longevity and durability of the cheek plumpers.

Clinical case-report

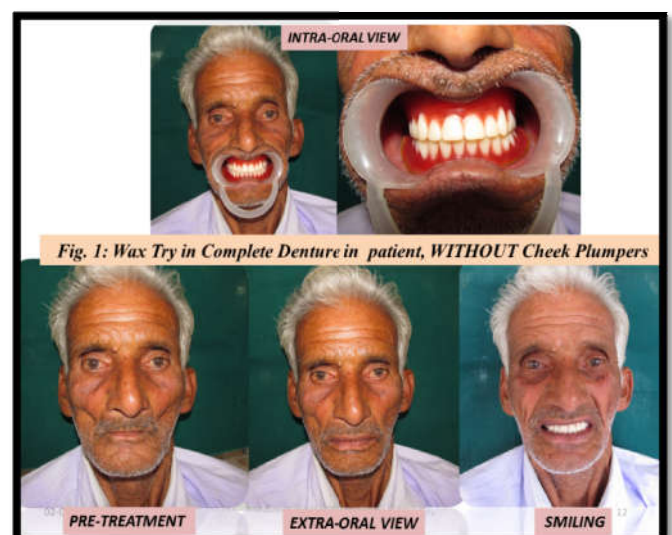
A 76-year-old male patient visited the Department of Prosthodontics, JSS Dental College & Hospital, Jagadguru Sri Shivarathreshwara University, Mysuru, Karnataka, with the chief complains of missing teeth, difficulty in chewing food and poor aesthetics and with the expectation of improving his facial appearance. (Fig.1). *History* revealed that patient was edentulous since last 2 years and had not worn denture since then. *Extra-oral examination* revealed that patient had poor aesthetics, unsupported oral musculature; findings of wrinkling of skin and flaccidity of facial muscles were noted, leading to sunken cheeks. *Intra-oral examination* revealed that completely edentulous maxillary and mandibular arches, ridges were low well rounded in both maxillary and mandibular arch. Patient was conscious of his sunken cheeks and desired a prosthesis which would make his face look fuller and healthier. Keeping in mind the needs of the patient a proper diagnosis and treatment plan was formulated involving the fabrication of conventional complete dentures for mandibular arch and with intraoral push button retained detachable cheek plumpers for maxillary dentures.

Clinical procedure

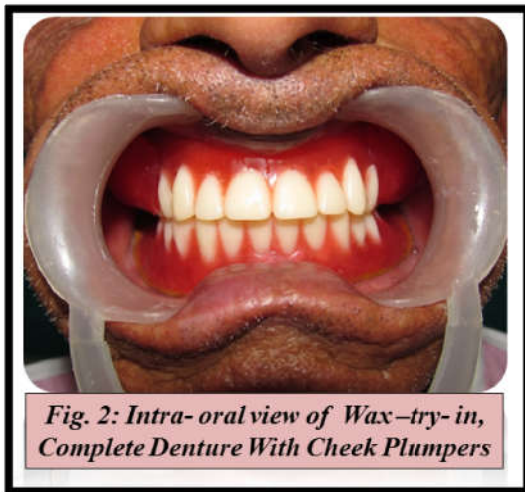
Preliminary impressions were made with modeling plastic impression compound (Pinnacle Impression Compound; Dental Products of India) and poured – in - dental plaster, after which *custom impression trays* were fabricated with auto-polymerized acrylic resin (Trevalon Dentsplyltd, Gurgaon, India). *Border molding* was done with green stick modeling plastic impression compound (Pinnacle Tracing Sticks; Dental Products of India). *Definitive/Final impressions* were made with zinc oxide eugenol impression paste (Impression Paste; Dental Products of India) and *Master casts* were poured with Type III dental stone (Kalabhai, Mumbai, India) and the *jaw relation* was recorded, thereafter the *tooth arrangement* was evaluated.

Wax -Try- in Appointment

Waxed denture were first tried for occlusion and esthetics. Wax patterns for the cheek plumpers were fabricated during the clinical evaluation stage. Cheek plumper made of softened modeling wax were adapted over the buccal flanges of the maxillary denture on either side in the premolar-molar region and were evaluated to give patient a more fuller appearance. Modeling wax was added on the cheek plumpers in incremental manner till the facial esthetics was found to be satisfactory. Border movements were done so that the wax is well adapted and repeated till the cheeks gained required fullness. Cheek plumper while on the waxed denture, were pressed medially for getting the contour of the buccal flange area and indentations of the cervical and middle 3rd of the tooth onto the waxed cheek plumpers for easy identification and adaptation of each side during push button placement stage (Fig.1-2).



The adapted wax was inspected in the medio-lateral and antero-posterior directions and also extra-orally for adequacy of cheek support and contour and modified to ensure that they did not cause occlusal interference, instability of dentures, or unnecessary tensing of facial muscles. The amount of desired cheek support, function and aesthetics was checked during the try in stage. The detachable modeling wax piece was tried along with the denture till satisfactory esthetics were achieved. A dramatic change in the appearance with and without wax-up cheek plumper was observed and it was immediately accepted by the patient.



During the procedure, no loss of retention, inconvenience or impingement was experienced by the patient (Fig. 3).



Laboratory procedure

Now, the cheek plumper made of modeling wax were separated from waxed up denture bases. Denture flasking and dewaxing procedures were finished separately for the final denture and cheek plumpers.

The resultant mold space was then packed with heat-polymerizing acrylic resin and curing procedures were completed (Fig. 4a-b). After curing, the cured final prosthesis and plumpers were retrieved. Trimming, finishing, and polishing procedures were performed (Fig.4c).



Attaching Push buttons to the Maxillary denture and the plumper

A simple stainless steel push button (5 mm in diameter and 2 mm in thickness) was used to attach the plumper to the buccal surface on both sides of a maxillary denture. Provision for the placement of button was made on the buccal surface of the flange of complete denture and the intaglio surface of the plumpers. Two 2mm deep and 5mm diameter holes were made, at two locations, one anteriorly and one posteriorly on either side, on the posterior flange of the denture base and the corresponding area of cheek plumper also. The female part of the push button was attached to the buccal surface of denture base, and male part of push button was attached to the detachable cheek plumper and sealed with the help auto-polymerizing resin (Fig. 5). This would allow the patient to keep or detach the cheek plumper at his convenience. The prosthesis along with the plumper was then checked in the patient's mouth for comfort, function and esthetics (Fig 6-7). During the insertion of the dentures, adequate clearance of the cheek plumpers from the occlusal table was also verified.



The patient was given common denture care instructions, including cleaning of the cheek plumper with mild detergent and soft brush along with instructions regarding the attachment and detachment of the cheek plumper.

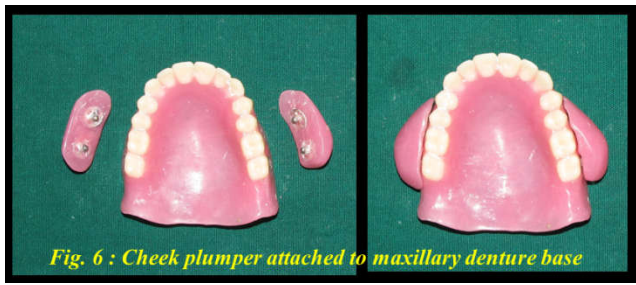


Fig. 6: Cheek plumper attached to maxillary denture base



Fig. 7: Post-insertion, intra-oral view of acrylic cheek plumper prosthesis

Patient was also encouraged to make efforts, to learn to adapt, to the new dentures and the push button retained cheek plumper and asked to present for regular follow up evaluations. Eventually complete dentures with detachable cheek plumper was delivered to the patient (Fig 8-9).



Fig 8a: Complete Denture Wax Try in, WITHOUT Cheek Plumpers

Fig. 8b: Acrylic complete denture in patient, WITH Cheek Plumpers

Recall check-ups were done after 24 hour, 1 week, 3 months, 6 months and 1 year interval. Within a week, the patient expressed satisfaction in mastication and phonetics and his esthetic dilemma was reduced with the use of detachable push button retained cheek plumper. The plumper did not impose any pressure on the vestibule, there was no muscle fatigue, no corrosion reported and the patient was contented with the retention. The cheek plumper significantly improved the profile and enhanced esthetics, masticatory efficiency and of the patient to his satisfaction.

DISCUSSION

In today’s world denture esthetics is not confined only to selection of the teeth based on factors like form, shape, color, arrangement and sex.



Fig. 9A: Pre-operative view of patient WITHOUT Cheek Plumpers

Fig. 9B: Post-prosthetic view of patient WITH Acrylic Cheek Plumpers

Instead, it is more about harmonization between the artificial and natural tissues. (Waliszewski, 2005; Clair and Picard, 1958) Facial disfigurement due to hollow or sunken cheeks can be either a result of normal physiologic process (edentulism) or pathological conditions like hemiplasia, Bell’s palsy, burn scar, maxillofacial surgery, damage to marginal branch of facial nerve. Loss of teeth in posterior region results in loss of cheek support due to which cheek tend to move medially to meet laterally expanding tongue. Also, loss of the teeth in anterior region leads to changes in cheek contour as a result of loss of vertical dimension of occlusion. The apparent loss of subcutaneous fat, buccal pad of fat and elasticity of connective tissue also produces the slumped cheeks, seen in aged (Martone, 1964). Nowadays, Corrections of slumping of cheeks can be accomplished by various methods like, reconstructive plastic surgery, injecting the botulinum toxin and different type of prosthesis.

Quick short-term results can be enhanced by using non-surgical injectable fillers such as BOTOX in the facial muscles, but long-term results are awaited (Dhaliwal and Picard, 1958; Dhaliwal and Friedman, 2008). Surgical correction like reconstructive plastic surgery, is also an available treatment modality, but it leaves behind a postsurgical scar sometimes contra-indicated in old patients suffering from systemic diseases. (Bains and Elia, 1994) Turnbull (Turnbull, 1963) advocated padding of the buccal flanges as a modification for facial support. Fickling (Fickling, 1951) advocated spring-loaded acrylic flange extensions. But these are expensive. Restoring external form of the lips and cheeks is an integral part of the dental treatment (Waliszewski, 2005; Hitoshi et al., 2004; Bains and Elia, 1994; Steven et al., 1976). A prosthesis specially designed for the correction of facial disfigurement by supporting the sunken cheeks intraorally, thereby improving facial esthetics is known as the “Cheek Plumper” or a “cheek lifting” appliance . The main advantages of cheek plumper are that it is economical, non-invasive and improves aesthetics. These plumpers used as an adjunct to the artificial dentures to support the slumped cheeks, also reduces the sagging of cheeks and improve muscle tone. These should not be visible from outside during speech and should be comfortable for the patient to justify its purpose. These prosthesis can be incorporated either as fixed/conventional or removable/detacheble and can be attached either to maxillary or mandibular denture as per the requirement of the case without compromising retention and esthetics (Riley et al., 2001).

Limitations of Conventional /Single Unit / Undetachable cheek plumper are (Saoji *et al.*, 2015; Kumar *et al.*, 2011; Fernandes *et al.*, 2002; Turnbull, 1963)

- Because of increased size and weight of conventional cheek plumpers fixed with the complete dentures make their insertion challenging and also, hampers retention and stability in patients with maxillary dentures.
- Long-term, continuous use can lead to muscle fatigue; which can be prevented if the patient has the option of removing the cheek plumpers, when experiencing discomfort.
- Moreover, and it cannot be used in patients with limited mouth opening because the additional thickness of denture and the limited medio-lateral width of the oral cavity might hinder the insertion and/or removal of the dentures.
- Muscle movements destabilize the maxillary denture. Plumpers interfere with the action of masseter muscle and coronoid process of the mandible.
- Another type of cheek plumpers are those that have separate components attached to the denture flange. In such *detachable prostheses*, the plumper can be detached from and reattached to the complete denture by the patients themselves. Most commonly used attachments in removable plumper prosthesis are ball end clasps, springs, stud attachments, press stud fasteners, magnets, orthodontic elastic modules, buccal tube and wire-retained cheek plumpers. (Lingegowda *et al.*, 2012; Shah *et al.*, 2014; Punia *et al.*, 2013; Kamakshi *et al.*, 2013; Deogade, 2014; Keni *et al.*, 2012; Sowmya *et al.*, 2015; Ahmad *et al.*, 2006)

Merits of Detachable Plumper Prostheses (Lingegowda *et al.*, 2012; Shah *et al.*, 2014; Punia *et al.*, 2013; Kamakshi *et al.*, 2013; Deogade, 2014; Keni *et al.*, 2012; Sowmya *et al.*, 2015; Ahmad *et al.*, 2006)

- Property of detachment and reattachment could facilitate the insertion of dentures in limited mouth opening patients thus increasing efficiency of denture.
- Prevention of muscle fatigue,
- Clinical magnets being out of affordability of patient, push button attachments were used to attach cheek plumper with denture base.
- Magnets have the benefit of being small, facilitating automatic reseating (Riley *et al.*, 2001) because of their strong attractive magnetic forces, and being easy to remove and clean. (Riley *et al.*, 2001; Lingegowda *et al.*, 2012)
- Demerits of Detachable cheek plumper (Saoji *et al.*, 2015; Verma *et al.*, 2004; Navitha Verma, 2004; Fernandes *et al.*, 2002; Riley *et al.*, 2001; Lingegowda *et al.*, 2012; Shah *et al.*, 2014; Punia *et al.*, 2013; Kamakshi *et al.*, 2013; Deogade, 2014; Keni *et al.*, 2012; Sowmya *et al.*, 2015; Ahmad *et al.*, 2006; Dr. Raghavendraswamy *et al.*, 2017)
- Loss of retention as it stretches the soft tissue curtain or facial seal away from denture borders and thus causing break in vacuum seal.
- Increased weight of denture, and constant strain on cheek muscles leads to muscle fatigue,
- Frequent review calls for detachable magnet prosthesis over a period of time,

- Difficult to insert in microstomia patient due to large size.
- Poor corrosion resistance within oral fluids and therefore require encapsulation with relatively inert alloy such as stainless steel or titanium;
- Has harmful effects of magnetic field on the health of the oral tissues,
- Magnets as attachments, but magnets lose their magnetism over a period leading to failure of treatment. Thus, push buttons were used in this clinical case to increase the longevity and durability of the cheek plumpers.
- Ryf *et al.* conducted an in vitro study to assess the interference of neodymium magnets with cardiac pacemakers and implantable cardioverter-defibrillators. Their study results showed that NdFeB magnets for home and office use might cause interference with cardiac pacemakers and ICDs at distances up to 24 cm. (Ryf *et al.*, 2008)

Advantages of using Push Buttons

- Increase the longevity and durability of the cheek plumpers
- Easy to insert, remove, and clean, so the patient can remove them during oral functions,
- Small & Light weight
- Corrosion not reported in this case even after 6-8 month follow up.
- Snug fit
- Improved esthetics to the desired level
- Economical,
- Non-invasive, simplicity of the clinical and laboratory procedure

However, cheek plumpers have a few drawbacks, including the accumulation of food, patient discomfort resulting from the additional weight and bulk of the dentures, the requirement of manual dexterity of patients to ensure accurate attachment, and the susceptibility of magnetic attachments to corrosion and loss of magnetism and of the press stud fasteners to breakage. (Drak and Dobrzański, 2007; Zarb *et al.*, 2013; Tautin, 1978) Therefore, periodic patient recall is necessary to assess and, when required, replace the attachments. Clinicians can choose the appropriate attachment according to the thickness and height of the denture flange and the dexterity of the patient. This innovative idea has many advantages such as *low maintenance cost, ease of replacement, cleaning, and better patient compliance*. Since the press buttons are easily corrodable, in future, there is a scope for replacing steel with fiber-reinforced material or non-corrosive inert cobalt-chromium alloy such as Vitallium. (Drak and Dobrzański, 2007)

Conclusion

Cheek plumpers are straightforward to fabricate and provide a non-invasive and cost-effective treatment option for the improvement of facial appearance in patients with sunken cheeks. In situations where the desired cheek muscle draping cannot be achieved in patients with sunken cheeks, maxillary cheek plumpers can be successfully inserted in order to improve the overall facial appearance. Detachable cheek plumpers with push buttons helps improve esthetics and the psychological well-being of patients; provide increased patient

comfort, leading to greater patient acceptance of the prosthesis. This prosthesis is not only simple in design, easy to fabricate, comfortable for the patient to insert and remove but also renders excellent esthetics (most sought after parameter) and stability during various functional movements which boosts the self-esteem of the patient by improving his appearance.

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