



Case Report

Redefining Cheek Plumper Prosthesis: A Novel Hollow Lightweight Design Using Vacuum-Formed Thermoplastic Sheet – A Case Report

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ABSTRACT

Complete denture rehabilitation should restore not only oral function but also facial support and aesthetics. Severe cheek hollowing in edentulous patients can significantly affect facial appearance and social confidence. Conventional solid cheek plumper may increase prosthesis weight and bulk, potentially compromising retention, stability, and comfort. This case report presents a novel technique for fabricating a hollow, lightweight cheek plumper using a 1-mm vacuum-formed thermoplastic sheet. A 52-year-old completely edentulous female with pronounced bilateral cheek hollowing was rehabilitated with a conventional mandibular complete denture and a maxillary complete denture incorporating hollow cheek plumper. The desired cheek contour was established clinically using modelling wax during the trial stage and subsequently transferred to a thermoplastic shell using a putty index and Type IV gypsum replica. The hollow component was adapted using a heat/vacuum-forming technique and incorporated into the processed maxillary denture. The prosthesis provided satisfactory cheek support, facial aesthetics, retention, stability, and patient comfort. Clinical follow-up over 18 months demonstrated satisfactory prosthetic performance and patient acceptance. This technique offers a simple, conservative, economical, and lightweight alternative for rehabilitation of edentulous patients with severe cheek hollowing.

Keywords: Cheek plumper, Hollow cheek plumper, Complete denture, Facial aesthetics, Vacuum-formed thermoplastic sheet.

INTRODUCTION

“Prosthodontics is a place where perfection meets beauty!”

Prosthodontic rehabilitation of a completely edentulous patient extends beyond the replacement of missing teeth. An appropriately designed complete denture should restore mastication, phonetics, oral comfort, facial support, and facial aesthetics. Loss of teeth is frequently accompanied by progressive alveolar ridge resorption, reduction in lower facial height, loss of lip and cheek support, and changes in the surrounding soft tissues. These alterations may become particularly evident in patients with prolonged edentulism, significant weight loss, or reduced facial soft-tissue volume. The resulting hollow or sunken cheeks can have a considerable effect on facial appearance and may contribute to social embarrassment and reduced self-confidence.¹⁻³

The present case report describes a novel technique for fabricating a hollow, lightweight cheek plumper using a 1-mm vacuum-formed thermoplastic sheet, incorporated into a maxillary complete denture. The technique is intended to simplify fabrication while minimizing the additional weight associated with conventional solid cheek plumper.

CASE REPORT:

A 52-year-old female patient reported to the Department of Prosthodontics, Crown and Bridge, Government Dental College and Hospital, Srinagar, with a chief complaint of completely missing teeth. The patient reported difficulty in eating and

expressed concern regarding her facial appearance and social interactions. A detailed medical and dental history was obtained.

Extraoral examination revealed marked bilateral depression of the cheeks, resulting in an appreciably sunken facial appearance. Intraoral examination demonstrated completely edentulous maxillary and mandibular arches. The residual ridges were evaluated clinically, and the available denture-bearing tissues were considered suitable for conventional complete denture rehabilitation.

The patient was counselled regarding the proposed treatment and the limitations and benefits of incorporating a cheek plumper. The treatment objectives were to restore oral function while simultaneously improving facial contour without unnecessarily increasing the weight of the maxillary prosthesis. A conventional mandibular complete denture and a maxillary complete denture incorporating hollow lightweight cheek plumper were planned.

Written informed consent for prosthetic treatment and clinical photography was obtained from the patient. Preoperative photographs were recorded for documentation and subsequent comparison (Fig 1). As the patient appeared nutritionally compromised, dietary counselling was provided, with emphasis on a balanced diet and adequate protein intake. The patient was advised to maintain a dietary chart, which was reviewed periodically and modified as required.

Clinical and Laboratory Technique:

Primary Impressions:

Primary impressions of the maxillary and mandibular arches were made using reversible hydrocolloid impression material (DPI, dental products of India, Mumbai, India). The impressions were poured using a Type III gypsum product (Kalabhai Karson pvt. Ltd., Mumbai, India) to obtain diagnostic casts.

Custom impression trays were fabricated using auto polymerizing acrylic resin (DPI RR cold cure, dental products of India, Mumbai, India).

Border Moulding and Definitive Impressions:

Border moulding was performed using green-stick impression compound (DPI, dental products of India, Mumbai, India). Definitive impressions were subsequently made using zinc oxide eugenol (DPI, dental products of India, Mumbai, India) impression paste. The impressions were inspected for completeness and accuracy and were poured using Type III dental stone (Kalabhai Karson pvt. Ltd., Mumbai, India).

Jaw Relation and Teeth Arrangement:

Trial denture bases were fabricated using auto polymerizing acrylic resin. Occlusion rims were constructed, and maxillomandibular relationships were recorded using conventional clinical procedures. Artificial teeth were selected according to the patient's facial form, age, sex, and aesthetic requirements. Teeth were arranged, and the trial dentures were evaluated intraorally for vertical dimension, centric relation, occlusion, phonetics, lip support, and facial aesthetics (Fig 2). At this stage, the cheek-plumper component was fabricated directly on the maxillary trial denture.

Fabrication of the Hollow Thermoplastic Cheek Plumper:

Establishment of Cheek fullness:

A sheet of butter paper was cut into an oval configuration with an extension corresponding approximately to the planned cheek-plumper region. The butter paper served as a separating medium between the wax cheek-plumper pattern and the trial denture. Modelling wax (DPI, dental products of India, Mumbai, India) was progressively added over the buccal aspect of the maxillary trial denture. The wax was added incrementally and evaluated intraorally after each addition. The amount and contour of wax were modified until satisfactory bilateral cheek fullness and facial harmony were achieved. Care was taken to ensure that the wax did not interfere with the denture borders and occlusal surfaces. The patient was evaluated both with and without the wax cheek plumper to assess the improvement in facial appearance.

Duplication of the cheek-plumper pattern:

Once the desired contour had been established, the wax cheek-plumper component was carefully separated from the trial denture. A putty index of the wax pattern was then fabricated using elastomeric putty impression material (aquasil, Dentsply Sirona, charlotte, NC, USA). The index reproduced the external morphology of the cheek-plumper component. The putty index was poured using Type IV dental stone (Kalabhai Karson pvt. Ltd., Mumbai, India) to obtain a rigid working replica of the cheek-plumper form.

Thermoplastic sheet adaptation:

The duplicated cheek-plumper form was used as the positive model for fabrication of the hollow shell. A 1-mm-thick thermoplastic splint sheet was positioned over the gypsum model and adapted using a heat/vacuum-forming unit according to the manufacturer's recommended temperature and forming parameters. The thermoplastic sheet closely adapted to the external contour of the cheek-plumper model, producing a thin-walled shell. After cooling, the adapted thermoplastic

component was carefully removed from the model. The margins were trimmed and rounded to eliminate sharp edges and to provide a smooth transition between the plumper and the denture base. The resulting component was hollow, with the desired external volume reproduced while avoiding the mass of a solid acrylic cheek plumper (Fig 3).

Processing of the Complete Dentures:

The maxillary and mandibular trial dentures were flaked and processed using conventional complete denture procedures. After polymerization, the processed dentures were retrieved, finished, and polished. The denture surfaces were carefully inspected for nodules, irregularities, sharp edges, and excessive flange extension. The processed maxillary denture was then evaluated extra orally to determine the exact position of the thermoplastic cheek-plumper components.

Incorporation of the Thermoplastic Cheek Plumper:

The hollow thermoplastic cheek-plumper components were positioned on the buccal aspect of the maxillary denture according to the position established during the trial stage. The components were carefully aligned with the previously established wax contours. Cyanoacrylate-based adhesive (Endocryl, medical grade n-butyl cyanoacrylate tissue adhesive) was used for fixation of the components to the denture base (Fig 4). The components were maintained in their predetermined position until adequate fixation was achieved. Following fixation, the junction between the thermoplastic component and the denture base was inspected carefully for discontinuities, sharp margins, or areas that could compromise hygiene.

Assessment of the Hollow Chamber:

The integrity of the hollow component was assessed by immersing the completed prosthesis in water and observing for evidence of air escape or water penetration. This test was used as a qualitative clinical assessment of the integrity of the thermoplastic shell. It should not be interpreted as a quantitative test of long-term hermetic sealing.

Insertion and Clinical Evaluation:

The completed maxillary and mandibular dentures were inserted intraorally. The cheek-plumper margins were examined to ensure that they did not impinge on the functional movements of the buccal musculature. The patient was instructed regarding insertion, removal, cleaning, and maintenance of the prosthesis. Particular attention was given to maintaining hygiene around the junction between the cheek plumper and denture base.

Follow-Up:

The patient was recalled at 24 hours, 1 week, and 1 month following insertion. Subsequent periodic evaluations were carried out, with a total documented follow-up period of 18 months. During the documented follow-up period, the patient demonstrated satisfactory adaptation to the prosthesis and reported improvement in facial appearance and overall satisfaction (Fig 5).

DISCUSSION:

The cheeks are particularly important in determining facial fullness. In completely edentulous individuals with severe cheek hollowing, conventional denture contours may not provide adequate support. In such situations, a cheek plumper can be incorporated into the prosthesis to restore the missing soft-tissue support. Previous clinical reports have described multiple approaches for achieving this objective, including detachable and fixed cheek plumper retained by customized attachments, magnets, friction locks, press buttons, and die-pin mechanisms.⁴⁻⁸

One of the major disadvantages of conventional solid cheek plumper is the additional weight they introduce to the denture. This becomes clinically significant when extensive facial augmentation is required. Increased prosthesis weight may compromise retention and stability, particularly in a maxillary complete denture with a relatively unfavorable denture-bearing foundation. A hollow design can provide a larger external volume without proportionally increasing the mass of the prosthesis. This principle has previously been applied to hollow cheek plumper and other maxillofacial prostheses.^{5,9,11} In the present technique, the desired facial contour was established at the trial stage rather than being predetermined from external measurements. This permitted direct intraoral assessment of the relationship between the cheek, denture flange, teeth, and proposed plumper. Such an approach is particularly important because excessive cheek support can produce an unnatural facial appearance or interfere with functional movements.

The use of a putty index provided a simple method for transferring the clinically established wax contour to a rigid working model. The 1-mm thermoplastic sheet was then adapted over this model using a heat/vacuum-forming technique. This produced a thin-walled component that reproduced the required facial contour while maintaining a hollow internal space. An important feature of the technique is the separation of contour development from prosthesis fabrication. The desired cheek fullness was first determined clinically using wax. The finalized contour was then transferred to the thermoplastic shell. This allows the prosthodontist to modify facial fullness before definitive processing, thereby reducing the need for extensive adjustment after insertion.

The present technique differs from many conventional hollow cheek-plumper methods in that the external contour is reproduced using a vacuum-formed thermoplastic sheet rather than a bulk acrylic hollow chamber. This potentially reduces laboratory complexity and material consumption while producing a lightweight prosthetic component.

Thermoplastic materials have also been used in other maxillofacial applications where reduced weight and accurate adaptation are advantageous.¹¹ Nevertheless, material selection should be based on the manufacturer's indications, mechanical properties, dimensional stability, biocompatibility, and compatibility with the adhesive or denture base material. The 18-month follow-up in the present case provides useful clinical evidence of the feasibility of the technique.

CONCLUSION:

A hollow cheek plumper fabricated using a 1-mm vacuum-formed thermoplastic sheet offers a simple and conservative alternative to conventional solid cheek-plumper designs. The technique permits individualized determination of facial contour during the trial stage, followed by accurate transfer of the established contour to a lightweight hollow shell. In the present case, the technique successfully restored cheek support while maintaining acceptable denture retention, stability, function, and aesthetics.

The principal advantage of this approach is the ability to obtain the desired cheek volume while minimizing the additional weight of the prosthesis. Although the clinical outcome is encouraging, controlled clinical studies and laboratory investigations are required to evaluate the mechanical properties, dimensional stability, bonding characteristics, hygiene, patient-reported outcomes, and long-term clinical performance of vacuum-formed thermoplastic cheek plumper.

“let’s aspire not just to succeed; but to inspire and to make a change!”

Patient Consent:

Written informed consent was obtained from the patient for prosthetic treatment, clinical photography, and publication of the case details and accompanying images. The patient was informed that identifiable clinical photographs and treatment information may be used for academic and scientific publication.

Conflict of Interest:

The authors should declare any actual or potential conflicts of interest according to the requirements of the target journal.



Fig 1: Pretreatment photographs frontal and lateral view.



Fig 2: Try – in of trial denture.



Fig 3: Butter paper, Wax pattern for cheek plumper, Putty index, cast of cheek plumper component, Thermoplastic sheet of 1 mm thickness, Adapted thermoplastic sheet.



Fig 4: Plumper attached to denture using cyanoacrylate tissue adhesive.



Fig 5: Post treatment outcome.

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