

Revitalizing Smiles: A Comprehensive Approach to Restoring Edentulous Patients with Characterized Complete Dentures – A Case Report

Arpit Sikri^{1*} | Jyotsana Sikri² | Ritika Sharda³ | Sahil Thakur³

1. Associate Professor & Post Graduate Teacher, Department of Prosthodontics, Crown & Bridge and Oral Implantology, Bhojia Dental College & Hospital, Budh (Baddi), Teh. Baddi, Distt. Solan, Himachal Pradesh, India.
2. Associate Professor & Post Graduate Teacher, Department of Conservative Dentistry & Endodontics, Bhojia Dental College & Hospital, Budh (Baddi), Teh. Baddi, Distt. Solan, Himachal Pradesh, India.
3. Senior Lecturer, Department of Prosthodontics, Crown & Bridge and Oral Implantology, Bhojia Dental College & Hospital, Budh (Baddi), Teh. Baddi, Distt. Solan, Himachal Pradesh, India.

Corresponding Author: Arpit Sikri, Associate Professor & Post Graduate Teacher, Department of Prosthodontics, Crown & Bridge and Oral Implantology, Bhojia Dental College & Hospital, Budh (Baddi), Teh. Baddi, Distt. Solan, Himachal Pradesh, India.

DOI: 10.71168/NDO.02.01.106

Received Date: January 16- 2025

Publication Date: January 31- 2025

Abstract: Contemporary prosthodontics emphasizes the vital role of aesthetics in complete denture success, moving beyond functionality and comfort. Aesthetics not only enhance physical appearance but also impact psychological well-being and quality of life. Traditional denture fabrication often leads to artificial results, highlighting the need for advanced techniques to replicate natural smiles. The goal of complete dentures is to restore both function and facial aesthetics, boosting self-confidence and satisfaction. Denture characterization, involving precise adjustments in form and color, helps achieve realistic outcomes by mimicking natural teeth and gingiva, including details like root morphology and muscle attachments. While functional and comfort-related challenges are commonly addressed, achieving optimal aesthetics remains difficult. Aesthetics, rooted in nature and individual preferences, have gained importance due to their influence on personal confidence and emotional responses.

This case report highlights a method to improve aesthetics in a completely edentulous female patient treated with conventional and custom-characterized complete dentures. The customized dentures resulted in notable improvements in facial aesthetics and social integration. The paper emphasizes the critical role of aesthetics in complete denture prosthodontics, exploring its impact on patient satisfaction and psychological comfort. It addresses challenges in managing edentulous patients and examines the interplay between aesthetics, functionality, and comfort. In conclusion, the paper advocates a patient-centered approach that combines advanced characterization techniques with personalized treatment plans to enhance denture aesthetics, ultimately improving patient satisfaction and well-being.

Keywords: Characterization, Conventional complete denture, Denture esthetics, Removable complete denture prosthesis, Removable dental prostheses, Teeth arrangement

Introduction

The depiction of teeth in complete dentures requires careful consideration of factors such as age, gender, emotional influences, and social context. Aesthetic concerns in complete dentures involve numerous elements that ensure harmony with the overall facial appearance, with the selection of teeth playing a pivotal role. Collaboration between patients and professionals during the customization and characterization of complete dentures fosters positive patient expectations, ultimately enhancing treatment outcomes. As was observed, patients with a receptive attitude tend to respond more favorably to treatment [1].

The replacement of missing teeth has been a longstanding concern throughout human history. Turano JC and Turano LM trace its origins to Phoenician and Etruscan tombs, dating back to approximately 2500 BC, where human and animal teeth were trimmed to fit and secured using metal wires [2]. Historical records from 3500 years ago indicate that Egyptians crafted teeth from mulberry wood, securing them with gold wires. Gonçalves CT highlights that the Etruscans sought more durable alternatives, utilizing bovine teeth and gold for dental replacements [3]. Similarly, ancient Romans used human and animal teeth, often prepared by specialized craftsmen.

The first recorded attempts at artificial teeth fabrication date back to 1597, when Guilhermeau employed hippopotamus ivory [4]. By 1709, England introduced the first porcelain teeth and vulcanite-based dentures. In 1774, Duchateau [5] proposed porcelain teeth and collaborated with dental surgeon Chérmant [6] to achieve improved results. Subsequent research into artificial teeth has focused on developing durable materials for posterior teeth and enhancing aesthetics for anterior teeth, alongside advancements in dental techniques.

In the fabrication of complete dentures, dental professionals must integrate scientific expertise with artistic sensibility, while considering patient preferences due to the inherently subjective nature of aesthetic perception. As Batilana noted, cultural background, social environment, and national culture significantly shape aesthetic preferences [7]. Batista et al. recommended avoiding symmetrical dental positioning to individualize prostheses for each patient [8].

The evolution of techniques and materials has addressed the growing demand for dental aesthetics. In 1692, Anton Nuck Leyden created the first complete denture using a hippopotamus molar, though it was labor-intensive and lacked durability. By contrast, Fouchard, hailed as the father of modern dentistry, crafted complete upper dentures from hippopotamus ivory. This material remained in use until vulcanized rubber was introduced, eventually replaced by acrylic resins in 1927 due to safety concerns and aesthetic enhancements [9].

Rotdembacher synthesized acrylic acid in 1834, and Kahlbaun described the first methyl methacrylate polymer in 1874. Acrylic resins became prevalent for denture bases starting in 1934. Innovations such as thermoplastic resins in 1935 and self-polymerizable resins further advanced denture fabrication. Pigmented resins, like those developed by Tomaz Gomes under the STG system, achieved high aesthetic standards by mimicking natural teeth characteristics [10]. The STG kit, featuring diverse shades, offered dental technicians greater flexibility in meeting society's increasing demand for aesthetic excellence.

The Glossary of Prosthodontic Terms (GPT, 10th edition) [11] defines aesthetics as a branch of philosophy concerned with beauty, focusing on the appearance of dental restorations achieved through their form and/or color. It encompasses both subjective and objective elements influencing the attractiveness of a design or object. Treating completely edentulous patients has historically posed challenges related to aesthetics, function, and comfort. While earlier studies on denture success predictors often emphasized function and comfort, Carlsson et al. identified aesthetics as the most crucial factor for success [12]. Similarly, Vig highlighted the psychological benefits of a pleasing denture appearance [13]. Vallittu et al.'s survey revealed that denture wearers prioritize appearance as the most important characteristic of their teeth [14].

Conventional dentures often result in smooth, featureless gingiva, giving wearers an artificial and unattractive appearance. Restoring a smile in edentulous patients is a significant achievement, as the smile is a defining aspect of facial aesthetics, reflecting beauty, personality, and youthfulness [15].

The primary goal of complete dentures is to replace missing teeth, establish normal vertical dimensions, and support facial soft tissues, thereby enhancing aesthetics and function. This approach boosts patients' self-confidence and overall quality of life. Denture characterization techniques refine the form and color of denture bases and teeth, creating a more natural appearance. Realistic tooth arrangement and gingival imitation, including details such as muscle attachments, stippling, root morphology, and base coloration, help produce lifelike prostheses that closely replicate natural teeth and gingiva, providing patients with a more authentic restoration.

Case Report

A 60-year-old female patient visited the Department of Prosthodontics, Crown & Bridge, and Oral Implantology, Bhojia Dental College & Hospital, Baddi, Solan, Himachal Pradesh, India, seeking prosthetic rehabilitation due to difficulties in chewing and dissatisfaction with her smile. She had been using dentures for the past 20 years [Figures 1, 2, 3, 4, and 5].



Figure 1: Previous prostheses (complete dentures) of the patient – Occlusal surface



Figure 2: Previous prostheses (complete dentures) of the patient – Intaglio surface



Figure 3: Previous prostheses (complete dentures) in the patient's mouth for evaluation



Figure 4: Pre-operative smile (without complete denture)

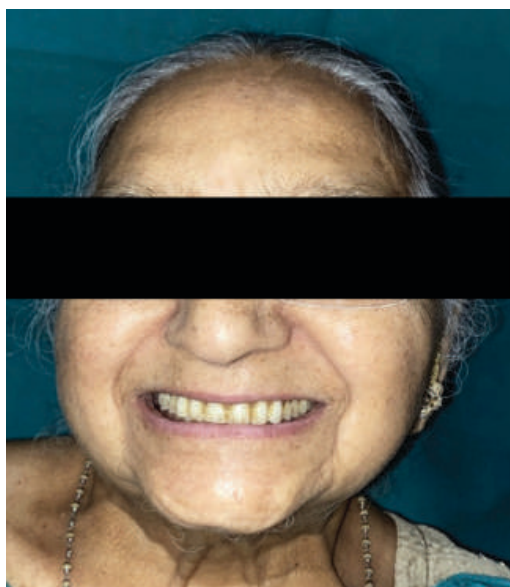


Figure 5: Pre-operative smile (with previous complete denture)

Upon intraoral examination, complete edentulism was observed in both the maxillary and mandibular arches. The treatment goals were to preserve bone structure, restore normal chewing, speaking, and swallowing functions, enhance facial aesthetics and smile, improve emotional and psychological well-being, and provide functional prostheses with sufficient retention, stability, and support.

After discussing various treatment options with the patient, it was decided to proceed with a set of complete dentures, incorporating characterization. These characterized dentures are designed to match the denture aesthetics with the patient's facial features and dentogenic concept. The treatment plan included the fabrication of both conventional and characterized complete dentures for the maxillary and mandibular arches, featuring bilaterally balanced occlusion.

Procedure

The preliminary steps involved in the fabrication of complete dentures were as follows:

- 1. Corrective Primary Impressions:** The patient's previous dentures were used to make impressions with a thin mix of irreversible hydrocolloid (Zelgan 2002, Dentsply India Pvt. Ltd., Haryana, India) [Figure 6].



Figure 6: Corrective primary impressions – maxillary and mandibula

- 2. Beading and Boxing (Primary Impressions):** Beading and boxing of the primary impressions were carried out (MAARC Dental, Maharashtra, India) to obtain an accurate primary cast using type II dental plaster (GypRock plaster, Rajkot, Gujarat, India).
- 3. Custom Tray Fabrication:** A wax spacer was conventionally applied on the primary cast, and custom trays were fabricated using autopolymerizing acrylic resin (DPI RR Cold Cure, Dental Products of India, Mumbai, India).
- 4. Border Moulding:** Border moulding was performed using low-fusing green stick compound (Pinnacle Tracing Sticks, Dental Products of India, Mumbai, India) [Figure 7].

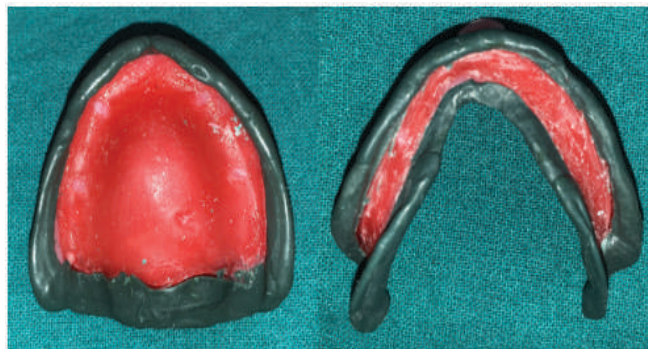


Figure 7: Border moulding – maxillary and mandibular

- 5. Final Impressions:** After border moulding, wax spacers were removed from the individual trays [Figure 8]. Final impressions were made using polyvinyl siloxane low-viscosity elastomeric impression material (Zhermack Oranwash L Refill Elastomeric Impression Material, Italy) [Figure 9].



Figure 8: Wax spacer removal after completion of border moulding

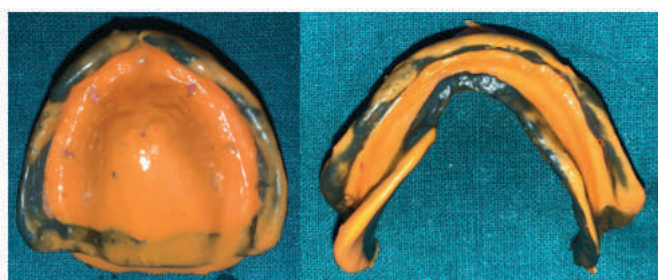


Figure 9: Final impressions – maxillary and mandibular

6. **Beading and Boxing (Final Impressions):** Beading and boxing of the final impressions (MAARC Dental, Maharashtra, India) were performed to obtain well-formed master casts.
7. **Definitive Casts:** The definitive casts were poured using type III gypsum dental stone (GypRock stone, Rajkot, Gujarat, India).
8. **Temporary Denture Bases and Occlusal Rims:** Temporary denture bases and occlusal rims were fabricated after obtaining the definitive casts.
9. **Orientation Jaw Relation and Articulator Transfer:** The orientation jaw relation was recorded using a facebow (Hanau™ Springbow, Whip Mix, Kentucky, USA) and transferred to a semi adjustable articulator (Hanau™ Wide-Vue, Whip Mix, Kentucky, USA).
10. **Tentative Jaw Relations:** Tentative jaw relations were recorded following the facebow transfer [Figure 10]. After obtaining the centric relation record, the casts were mounted on the semiadjustable articulator.



Figure 10: Jaw relations

11. **Teeth Selection:** Teeth selection was completed after occlusal registration.
12. **Teeth Arrangement:** The artificial teeth were adjusted, and their arrangement followed the ideal principles.
13. **Waxed-Up Trial Denture Assessment:** The waxed-up trial denture was assessed intraorally for function, fit, and esthetics before processing [Figures 11, 12, and 13]. The trial denture base was sealed to the definitive casts, and then de-articulated from the articulator.



Figure 11: Waxed-up try-in (left lateral view)



Figure 12: Waxed-up try-in (frontal view)



Figure 13: Waxed-up try-in (right lateral view)

14. Flasking Procedure: The flasking procedure was carried out for both arches.

15. Dewaxing and Packing: After dewaxing, the denture was packed, pressed, and processed in the conventional manner using tin foil substitute (DPI Heat Cure Cold Mould Seal, Dental Products of India, Mumbai, India) and heat cure resin (DPI Heat Cure, Dental Products of India, Mumbai, India).

16. Cleaning and Polishing: The processed dentures were cleaned using an ultrasonic cleaner.

17. Final Insertion and Occlusal Corrections: After the dentures were finished and polished, they were tried in the patient's mouth for evaluation of esthetics and occlusion [Figures 14 and 15]. Necessary occlusal corrections were made before delivering the removable characterized maxillary and mandibular complete dentures [Figure 16].



Figure 14: Final prostheses (complete dentures) of the patient – Occlusal surface



Figure 15: Final prostheses (complete dentures) of the patient – Intaglio surface



Figure 16: Complete dentures – in the patient's mouth

18. Patient Instructions and Recall Visits: The patient received instructions post-insertion of the complete dentures. Follow-up evaluations were conducted after 24 hours, 1 week, and 1 month. The patient was satisfied with the esthetics, phonetics, and function of the dentures [Figure 17]. She expressed high satisfaction with the appearance of the characterized dentures compared to her previous conventional dentures. Figure 18 depicts the happy patient with the pleased team of prosthodontics.

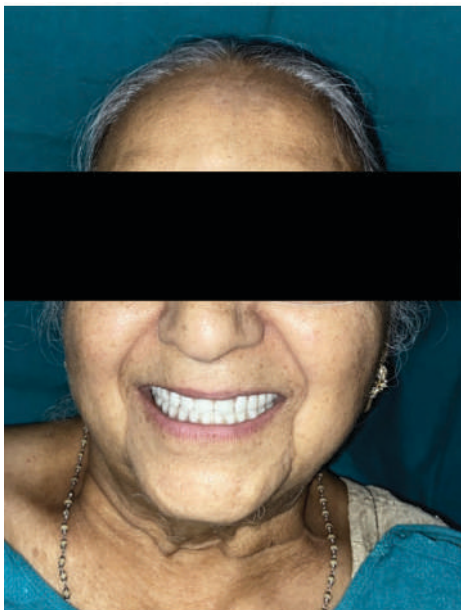


Figure 17: Post-operative smile (happy and satisfied patient)



Figure 18: Happy Patient with Happy Team of Prosthodontics

To enhance facial characteristics and smile aesthetics, the dentures were characterized as follows:

1. Characterization of denture base: Acrylic colors were added during packing to mimic natural gingiva. Three color shades were achieved for marginal gingiva, attached gingiva, and the denture base by adding acrylic color to heat-cure acrylic monomer. Packing was done in three steps, starting with light pink acrylic around the neck of the teeth, followed by darker colors to mimic attached gingiva, and finishing with normal pink for the base. The flask was closed, and the denture was processed normally.

2. Characterization in teeth arrangement: Anterior teeth were arranged with slight overlapping, mild chipping, and irregularities while maintaining balanced occlusion and phonetics.

Discussion

Complete dentures have evolved alongside advancements in dental technology, aiming to deliver prostheses that are not only functional but also as lifelike as possible, tailored to the unique characteristics of each patient. However, due to a lack of knowledge and interest in the specifics of complete dentures, many practitioners continue to offer standardized prostheses, overlooking opportunities for customization to meet individual patient needs. As Broadribb notes, it is entirely possible for a 60-year-old patient with complete dentures to have teeth resembling those of a youthful individual just returning from Disney World [16].

When aiming for aesthetic satisfaction in complete dentures, the first crucial step is to understand the patient's expectations, particularly in terms of aesthetics. The arrangement of artificial teeth should be carefully designed, considering all aesthetic factors to ensure greater patient satisfaction and acceptance of the restoration. Aesthetic improvements through complete dentures can restore the vertical dimension of the lower third of the face, contour the lips and cheeks, and soften prominent grooves and wrinkles around the mouth. Tooth characterization imparts a natural appearance to the prosthesis, improving aesthetics, function, self-esteem, and confidence - key goals in the rehabilitation of the stomatognathic system using complete dentures. In nature, there is no true standardization, and in dental practice, symmetry should be avoided. Instead, prostheses should be customized to meet each patient's individual needs. The shape of teeth should harmonize geometrically with facial contours, ranging from triangular to square to ovoid shapes. Some manufacturers offer innovative tooth models with varying shapes, textures, colors, and translucency to enhance the natural look. Artificial teeth are available in single (enamel only), double (enamel and dentin), triple (enamel, dentin, and cervical), and quadruple (enamel, dentin, cervical, and incisal) pressings. These can be customized in both shape and color by simulating wear and staining on stock teeth for more precise individualization.

Tooth color is influenced by factors such as age, gender, and skin tone. Generally, older individuals have darker upper anterior teeth with incisal edge abrasion, sometimes revealing the dentin's hue on the vestibular surface when pigmented. Tamaki T suggests that in males, upper anterior teeth often develop a brown-orange hue, while in females, a light brown-gray shade is more common. Staining and wear are indicators of age [17]. Restoring the anatomy of a lost tooth requires considering factors such as wear, abrasion, age, gender, facial pattern, and patient origin. Male dentition tends to feature square, thick teeth with flattened vestibular surfaces, resulting in a more angular appearance, while female dentition generally has rounded proximal surfaces and highly convex incisodistal angles in the upper incisors. Lee R notes that female teeth commonly display well-curved proximal surfaces in the upper canines, pronounced cusps, and highly inclined mesial and distal incisal slopes. Upper premolars generally follow the shape of the canine [18].

In complete dentures, acrylic resin teeth are commonly used for their wear resistance, facilitating the customization of color and shape. Stock teeth are typically modified in shape and contour using mounted stones and sanding discs. Tooth color characterization may involve staining, restoration simulations, and decalcifications to achieve the desired result. Kuwata M suggests that surface texture characterization, which varies in brightness and undulations, can reflect light differently and enhance the aesthetic appeal [19]. Simulated exposed roots can also be used to convey periodontal issues and an older appearance. Frush and Fisher emphasize the significance of tooth arrangement and alignment in achieving naturalness in complete dentures, aligning with the patient's age, gender, and personality [20].

For a youthful appearance, slight visibility of the incisal edge in upper anterior teeth is recommended, while tooth wear may obscure the incisal edge in older individuals. Diastemas, or tooth gaps, contribute to a more natural and harmonious appearance in complete dentures. Techniques such as simulating decalcifications, amalgam graying, dentin pigmentation, and crack replication further enhance the natural look of the teeth.

There is a marked contrast between complete dentures with characterized teeth and conventional dentures. Tamaki T advocates for accentuating features such as diastemas, incisal wear, cervical abrasions, enamel stains, and restorations to mimic natural dentition, reducing the artificial look of complete dentures [21].

Managing completely edentulous patients with characterized denture prostheses requires a comprehensive understanding to achieve a more natural appearance compared to conventional dentures, which often have an artificial appearance. This case report describes a method for fabricating a characterized complete denture prosthesis for a completely edentulous female patient. Frush and Fisher highlighted the importance of considering gender, personality, and age when selecting, arranging, and characterizing teeth to improve the individual's natural look [22]. The main objective is to achieve dynamic unity, where the entire dental composition complements the face and itself, avoiding a mechanical or uniform appearance. Principles such as proportion, line, dominance, balance, and color are applied to achieve this goal. This article is significant for its scientific approach to the artistic aspects of denture construction.

The primary objectives of complete denture prostheses in edentulous patients are to improve aesthetics, phonetics, and masticatory function. Characterized dentures were chosen for this patient to meet these objectives, as well as the patient's preference for a natural appearance. Involving the patient in treatment decisions is essential for the success of complete denture therapy. Literature confirms that tooth loss often increases awareness of dental appearance, underscoring the importance of characterizing the denture base to replicate natural oral tissues, including rugae areas, gingival sulcus, and interdental papillae.

Esthetics has become a significant focus in dentistry, with treatment planning now beginning with clear esthetic objectives. Neglecting esthetics in treatment planning can lead to undesirable outcomes. Today, treatment planning prioritizes esthetics, considering its impact on function, structure, and biology. Incorporating the dynesthetic and dentogenic concepts, along with unity and variety, results in a more natural and harmonious prosthesis that patients desire and reflects the quality of care they deserve. Simple guidelines, such as using gender-specific

tooth molds, arranging prosthetic teeth based on sex, personality, and age, and sculpting the visible denture base with natural contours, can help achieve excellent esthetics.

Conclusion

The historical development of artificial teeth emphasizes replicating nature's designs, requiring a strong collaboration between the patient, professional, and technician for successful prosthodontic outcomes. Dental professionals should document and analyze the shape, color, arrangement, and alignment of natural teeth while exploring relevant literature.

Prioritizing tooth characterization in complete dentures closely mimics natural teeth, enhancing aesthetics and boosting patients' psychological well-being and confidence, positively impacting their social interactions. Characterized dentures provide a more natural, lifelike appearance compared to conventional dentures, offering improved speech, aesthetics, and significant social and psychological benefits.

References

1. Van Waas, M.A. "The influence of psychological factors on patient satisfaction with complete dentures." *J Prosthet Dent*, 1990; 63(5): 545-8.
2. Turano, J.C., Turano, L.M. "Seleção de dentes artificiais – Estética em prótese total." In: *Fundamentos de prótese total*. 5th ed. São Paulo: Santos, 2000. p. 323-55.
3. Gonçalves, C.T. "Dentes artificiais – De peças rudimentares a reflexos da natureza." *Arq Dent Gaúcho – SEAP*, 2001; 20: 12-16.
4. Yoshizumi, D.T. "An evaluation of factors pertinent to the success of complete denture service." *J Prosthet Dent*, 1964; 14: 866-78.
5. Ruel-Kellermann, M. "What are the psychological factors involved in motivating individuals to retain their teeth? Dreams and facts." *Int Dent J*, 1984; 34: 105-109.
6. Waliszewski, M. "Restoring dentate appearance: A literature review for modern complete denture esthetics." *J Prosthet Dent*, 2005; 93: 386-94.
7. Batilana, C.D. "Selección de dientes artificiales." *Prensa Méd Argent*, 1983; 15: 659-662.
8. Batista, M.A.C., Guerra, V.V.A.S., Fonseca, D.A., Mesquita, A.E.O. "Estética em Prótese Total." *PCL: Rev Brás Prót Clín Labor*, 2000; 5: 81-86.
9. Hirsch, B., Levin, B., Tiber, N. "Effects of patient involvement and esthetic preference on denture acceptance." *J Prosthet Dent*, 1972; 28: 127-32.
10. Spear, F.M., Kokich, V.G. "A multidisciplinary approach to esthetic dentistry." *Dent Clin North Am*, 2007; 51: 487-505.
11. Gomes, Tomaz. "Site: <http://www.protesetotalclonagem.com.br>"
12. The Glossary of Prosthodontic Terms 2023: Tenth Edition. *J Prosthet Dent*. 2023 Oct;130(4 Suppl 1):e1-e3.
13. Carlsson, G.E., Otterland, A., Wennstrom, A., Odont, D. "Patient factors in appreciation of complete dentures." *J Prosthet Dent*, 1967; 17: 322-8.
14. Vig, R.G. "The denture look." *J Prosthet Dent*, 1961: 9-15.
15. Vallittu, P.K., Vallittu, A.S.J., Lassila, V.P. "Dental aesthetics – a survey of attitudes in different groups of patients." *J Dent*, 1996; 24: 335-8.
16. Broadribb, K. "Natural-looking dentures." *Dent. Tech*, 1989; 42(3): 12.
17. Tamaki, T. *Dentaduras completas*. 4th ed. São Paulo: Sarvier, 1983. p. 232.
18. Lee, R. "Esthetics and its relationship to function." In: Rufenacht, C., *Fundamentals of Esthetics*. Berlin: Quintessenz, 1990. cap. 5, p. 137-183.

19. Kuwata, M. Atlas de Metalocerâmica. Vol. 2. São Paulo: Ed. Santos, 1988. p. 397.
20. Frush, J.P., Fisher, R.D. "Dentogenic, its practical applications." J Prosthet Dent, 1959.
21. Tamaki, T. "Dentes artificiais." In: Dentaduras completas. 2nd ed. São Paulo: Sarvier, 1974. p. 191-204.
22. Frush, J.P., Fisher, R.D. "Introduction to dentogenic restorations." J Prosthet Dent, 1955; 5: 586-95.