

Aesthetic Clasps: Masking The Artificiality Of Denture

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ABSTRACT

The objective of this review is to explore the various aesthetic designs currently available in removable partial dentures (RPD) and discuss their clinical applications. Removable partial dentures are the widely accepted treatment of choice for most cases as it is both effective and affordable. Partially edentulous treatment planning includes both aesthetics and providing masticatory function. A prosthesis that is highly aesthetic will improve patient's motivation and acceptance. It is a wrong notion to expect that patients will tolerate unesthetic partial dentures because good masticatory capability has been achieved. Aesthetics plays a vital role in the success of partial dentures, and the length and mobility of the patient's lips play a significant role in achieving it. Patients with short lips or highly mobile lips pose problems as aesthetics are compromised because most clasp arms, denture borders, and other components will show when the patient smiles or speaks. RPDs can easily look artificial; hence, special emphasis should aim towards restoring function, phonetics, aesthetics with long-term benefits which require meticulous attention during fabrication. If the main reason for seeking treatment is the need for improved aesthetics, treatment should be geared towards achieving this goal. This article is the result of a literature study on Google Scholar with no publication year limit on aesthetic clasp design for the conventional RPD. In this context, the position of the clasp on the tooth, clasp types, clasp material and alternative methods of retention are reviewed.

KEY WORDS

Aesthetic clasp, cast partial denture, clasp, high lip line, low lip line, tooth coloured, aesthetic, dental prosthesis, removable partial dentures.

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INTRODUCTION

Several treatment options exist to restore a partially edentulous mouth.¹ Recently, implants and fixed prosthodontics have gained attention over removable prosthodontics as a treatment option in partially edentulous conditions. However, sometimes financial, anatomic, psychological, or medical considerations of the patients necessitate the oral rehabilitation with removable prosthesis.^{2,3} Removable partial dentures (RPD) are still an effective and affordable treatment option to restore function and aesthetics.^{1,3} Nowadays, it is unrealistic to assume that patients will tolerate a poor appearance, just because an acceptable mastication is achieved with the rehabilitation.⁴

There are some aesthetic considerations to which a clinician must place emphasis during the planning and fabrication of prosthesis to provide the desirable outcome for the patient and their expectations. In order to achieve an aesthetic RPD, the treatment can be divided in several phases: diagnosis and treatment planning, surveying, mouth preparation, framework design, prosthetic teeth and denture base resin and flanges.² Regarding the phase of framework design, which is a clinician's responsibility, there are several options and alternatives. Several techniques are available for a conventional metal framework in order to make them more aesthetic, which include: alternative path of insertion, more aesthetic position of the retainers, use of extra-coronal adhesive attachments, masking of clasps with tooth-coloured materials, and others.⁵ Non-metal materials, like flexible thermoplastic resins, can be useful in specific cases.⁶

Removable partial dentures (RPDs) patients are concerned about the metal exposure in cast partial dentures and hence worried about the aesthetic appearance.⁷ Masticatory function and aesthetics are prime considerations in developing the design of prosthesis in addition to replacing teeth, restoring function and improving aesthetic.⁴ This work aims to review the aesthetic designs currently available in RPDs and discuss their clinical applications.⁸

Removable cast partial dentures are considered as definitive removable prostheses, but the location of clasps may affect aesthetics. Hence, when the

patient is more concerned about aesthetics and appearance, flexible partial dentures which are aesthetically superior to flipper and cast partial dentures may be considered as a treatment of choice. However, for the success of flexible RPD, proper diagnosis, treatment planning, and insertion technique of this prosthesis is very important which may not be accepted by the patients because of the cost of the material. Hence, this review clears all the concerns of the patients with aesthetic clasps located in various aesthetically concerned areas which achieve excellent aesthetic outcomes.⁹

Dissatisfaction of dentures was related mainly to age, health, prior experience with a prosthesis, and the type of opposing dentition and aesthetics. Failure to recognize patient expectations can lead to noncompliance and failure of treatment. Most patients refuse to wear the cast partial dentures due to aesthetic reasons, and the treatment is therefore deemed unsuccessful. Unsuccessful treatment rate for clasp retained cast RPDs ranges from 3% to 40% (mean 26%).¹⁰

This review mainly emphasizes the aesthetic considerations during planning and fabrication of cast partial dentures. The dentist must be able to follow all the clinical considerations to achieve superior aesthetic outcomes to reach the patient's realistic expectations.¹¹ Aesthetics influence the appearance, dignity and self-esteem of an individual. The understanding of what is aesthetically acceptable, varies for different groups of people (specialists, general dentists and patients).¹⁰ The dentist has the responsibility to make recommendations to achieve the best aesthetic outcome for a particular patient.¹

A comprehensive pre-treatment clinical examination provides the clinician with all the data required for the design of a biologically and aesthetically acceptable RPD. Good communication between the dentist and the dental technician ensures that the prescribed design is executed correctly.¹⁰

MATERIALS AND METHODS

A dental literature search in Google Scholar was performed for articles published in English with no publication year limit. The articles referring to aesthetic problems and solutions in removable partial denture were included in this work.

Different types of aesthetic clasps:

Denture aesthetics is defined by the Glossary of prosthodontics terms (GPT-9) as the effect produced by a dental prosthesis that affects the beauty and attractiveness of the person.¹² Clasps or direct retainers are one of the most important components of RPD. The flexible clasp tip engages the undercut of the abutment to provide retention.¹¹ There are six

biomechanical requirements of a clasp assembly: retention, stability, support, reciprocation, encirclement and passivity. In addition, the clasp assembly must ideally not affect aesthetics of the patient. Careful selection of clasp position on the individual tooth, clasp type, clasp material, clasp location in the dentition and the number of clasps is important for maintaining proper aesthetics.¹ Shaping enamel surfaces and the use of composites can modify the convexity of a tooth surface which will allow placement of clasps into a less visible position making it a more aesthetic one.¹³ Clasps approaching the undercut from the distal aspect are less visible than mesially approaching clasps.¹⁴

Different aesthetics clasps are described in the following section: -

1. Acetal Resin clasp (Polyoxymethylene clasp):

Acetal resin (polyoxymethylene [POM]), a thermoplastic resin, can be used as an alternative denture clasp material. Acetal was first introduced as an unbreakable thermoplastic resin RPD material in 1971. These injection moulded resins have superior aesthetics, which allowed the clasps to better match the colour of abutment tooth. These clasps were developed for addressing the aesthetic concerns of patients. They are manufactured from thermoplastic acetal resin (polyoxymethylene) material with a highly crystalline structure which will give it greater flexibility, high transverse strength and radiolucency. Its major advantage is the aesthetic acceptability as several tooth shades are available for use anteriorly, but long-term studies still need to be conducted.

Disadvantages include the following: bulkiness, lack of adjustability, need for special equipment and increased cost. Research results state that deformation of acetyl resin direct retainers was significantly greater than metal clasps. This may adversely affect their clinical performance and lead to the loss of some of their retentive characteristics.¹

POM materials are formed by polymerizing formaldehyde where the homopolymer is a chain of alternating methyl groups linked to each other by an oxygen molecule. Acetal as a homopolymer has good short-term mechanical properties, on the other hand as a copolymer has better long-term stability.¹⁵ Acetal resin had increased strength, resistance to wear and fracture, flexible, high creep resistance and high



Figure : Acetal Resin clasp

fatigue endurance, being hydrophobic to water or saliva. All these characteristics make it an ideal material for preformed clasps for partial dentures, single-pressed unilateral partial dentures, partial denture frameworks, provisional bridges, occlusal splints, and even implant abutments.¹⁶

2. CAD/CAM Clasp:

A prototype nonmetal clasp denture could be fabricated using CAD/CAM technology in this digital era. At first, the cast was scanned using an optical scanner. The data were imported into the CAD software to design a removable partial denture. The virtual image of the artificial teeth was produced using CAD software, and the teeth were arranged on the scanned cast digitally on the monitor. The gingival parts of the denture were also designed on the software. The removable partial denture was milled with a five-axis milling machine mostly. CAD/CAM technology was determined to be useful for designing and fabricating a nonmetal clasp denture. The main advantage is it simplifies laboratory work and provides an excellent level of fitness of the denture for the working cast also in the patient's mouth. Furthermore, the data from the design process can be easily stored for further



Figure 2: CAD/CAM-fabricated nonmetal clasp denture on the working cast.



Figure 3: Fabricated denture parts and combined denture. (a) Milled denture parts. (b) Insertion of the labial part into the teeth and lingual part. (c, d) Combined denture.



Figure 4: A non-metal clasp denture without metal elements.

treatment procedure and as treatment record. A two-part denture was fabricated, because this allowed the use of two different kinds of denture resins; the labial part for the retentive resin clasp arms was flexible, and the lingual part of the reciprocal resin clasp arms was stiff. The joint area of denture parts is very important and should interlock to each other properly.¹⁷

The CAM clasp made by repeated laser sintering and high-speed milling can also be used effectively as an RPD component.¹⁸

3. Thermoplastic Resin Clasp:

In 1956, the US company Valplast developed super-polyamide, a type of nylon, as a material for use in dentures. Dentures for which all the structural elements other than the artificial teeth are manufactured from this thermoplastic resin without the use of metal have been mostly known by the company name, Valplast, but are also called flexible dentures or nylon dentures, and have become widely used worldwide nowadays. This type of denture is also called as non-metal clasp denture (NMCD).¹⁹

Regarding the materials used for NMCDs, 14 products made from five types of thermoplastic resin (polyamides, polyesters, polycarbonates, acrylics, and polypropylenes) have been approved for dental use in Japan as of 2012 (Table 1).²⁰

A flexible denture has aesthetic advantages over a conventional RPD with cast clasps. It is an alternative option when patients are allergic to acrylic, but it can't be used in all clinical cases. It is difficult to repair and to clean.⁶

4. Round Rest Distal Depression (RRDD = R2D2) Clasp:

A round-rest, distal depression clasp (RRDD) is presented as an aesthetic alternative to a conventional clasp for maxillary anterior teeth serving as abutments for a removable partial denture. The RRDD clasp design was developed specifically for maxillary incisors or canine abutments for RPDs when aesthetic demands are high, conventional and

Table 1 – Thermoplastic resins available for non-metal clasp dentures in Japan (December 2012).

Generic name	Product name	Manufacturer
Polyamide	Bioplast	High Dental Japan
	Valplast	UNIVAL
	Flex Star V	Nippon Dental Supply
	BIO TONE	HIGH-DENTAL-JAPAN
	Lucitone FRS	DENTSPLY International
	Ultimate	Ultimate
Polyester	EstheShot Bright	i-Cast
	EstheShot	i-Cast
Polycarbonate	Reigning N	Toushinyoukou
	Reigning	Toushinyoukou
	JET CARBO-S	HIGH-DENTAL-JAPAN
	JET CARBO RESIN	HIGH-DENTAL-JAPAN
Acrylic resin	ACRY TONE	HIGH-DENTAL-JAPAN
Polypropylene	UNIGUM	WELDENZ

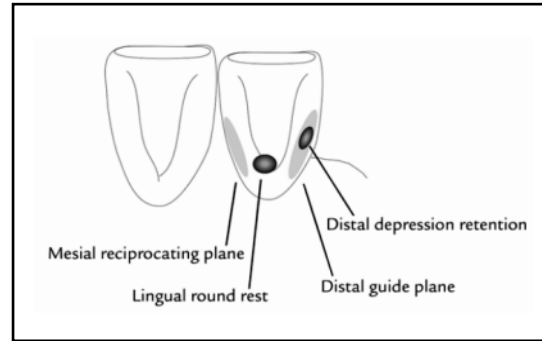


Figure 5: RRDD clasp: support is provided by lingual round rest. Mesial reciprocating plane and distal guide plane are prepared as shown. Distal depression is placed for retention. Denture tooth is placed against distal proximal contact.

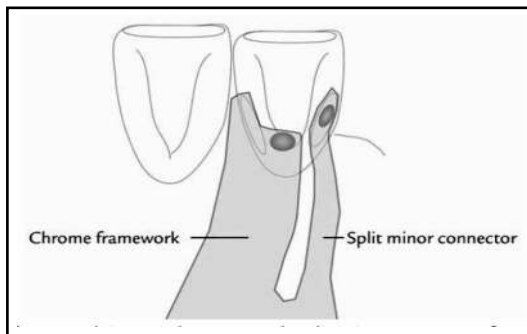


Figure 6: As framework is seated or removed, split minor connector flexes. When RPD is completely seated, split minor connector should be passive.



Figure 7: Cast chrome RPD framework with conventional cast circumferential clasps on molars and RRDD clasp on lateral incisor.

polymer clasps are unacceptable, and the patient lacks the financial capabilities for an intra- or extra-coronal clasp-retained RPD. If the edentulous residual ridge is distal to a maxillary incisor or canine, the RRDD clasp consists of a round rest seat located near the cingulum, a mesiolingual reciprocating plate, and a split minor connector engaging a distal depression for retention. On the other hand, if the edentulous ridge is mesial to a maxillary incisor or canine, this clasp design is no longer called an RRDD; it becomes a round-rest mesial depression (RRMD).²¹

5. Twin Flex Clasp or spring-clasp:

As per the name suggests this is a flexible clasp utilizing mesial-distal retention. One of the articles describing the manufacturing of the clasp reports that it is adjustable and can be used with the normal conventional path of insertion, with resultant improved aesthetics. It is made up of a wire clasp soldered into a channel that is cast within the major connector. Disadvantages include irreparability once fractured, the major connector being very thick over

the wire making it uncomfortable, increased cost due to extra laboratory procedures, and toxicity because of galvanic corrosion.

As shown in the picture a 19-gauge wrought wire is positioned in the mesial undercut of the canines adjacent to the edentulous space which should then be secured in place with wax. Additional wax is also placed along the length of wire beneath its height of contour, which will facilitate placement of the wire in the cast channel in the major connector that will house the Twin-Flex clasp. One article claims that as this clasp is not soldered onto the framework, toxicity associated with galvanic corrosion is eliminated. They further claim that the major connector is not so thick, clasps are easily adjustable and replaceable and it can be used on all RPD designs.¹

6. Rotational Path Dentures:

The path of insertion is very much important sometimes to mask the visibility of metal parts of a RPD and minimize the need of some direct retainers. Rotational, dual or curved are the described



Figure 8: An illustration of the Twin-Flex technique.



Figure 9: An AP rotational path RPD design.



Figure 10: A patient wearing the AP rotational path RPD.

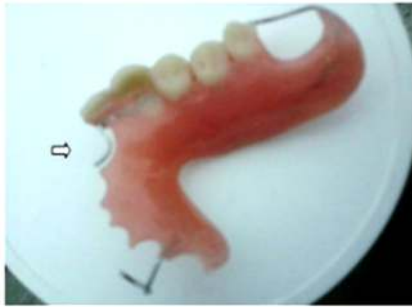


Figure 11: Lingual wrought wire clasp.

alternative paths of insertion that may suit some clinical cases. Alternative paths of insertion allow one part of the framework to be seated first within the mouth followed by the remainder, decreasing the need of clasps. Rotational path of insertion is the most used technique for masking clasp visibility. It is indicated most often in cases of missing anterior teeth, and has the advantage of not being dislodged with the force perpendicular to the plane of occlusion. Guide planes are important to establish a secure passive retention of the denture.¹

The Rotational Path of Insertion concept is one of the most appropriate designs for maintaining the aesthetics. By rotating an RPD into position, dentists can avoid using the standard number of clasps that normally are required to retain a denture. It must be remembered that this design concept is used primarily for tooth-supported RPDs, although there are a variety of ways to utilize this concept: posterior anterior (PA), anterior posterior (AP), and lateral paths of placement. The first letter indicates the initial path of placement (utilising a rigid proximal component); the second letter indicates the segment of the prosthesis after rotation has occurred. This segment has a conventional clasping system. The AP design used in Kennedy Class IV situations (that is, partially edentulous spaces that cross the midline) is the most popular rotational path design and mostly used. This design eliminates clasps on the facial surfaces of anterior teeth for the preservation of optimum aesthetics.²²

7. Lingual Wrought Clasp:

Dentures that have been treated using this method have a high level of retention while maintaining the aesthetic requirement of the patients.

Along with excellent aesthetics, this type of clasp design makes it more sanitary and more comfortable for the patient than dentures made using labial clasps. Employing a wrought wire clasp arm instead of a buccal clasp arm eliminates the need for a buccal clasp arm. Considering the importance of aesthetics, innovative clasp design allows for a reduction in the visibility of clasps assemblies, making them more patient-acceptable. If patient satisfaction is important from an aesthetic standpoint, the clasp visibility might be eliminated.

CONCLUSION

A well-designed RPD must offer good support, stability and retention to allow for comfort, masticatory function and health.³ Despite the alternative designs available for the RPD metal frameworks, the metallic components present a challenge for the clinician in order to satisfy patient's need of an aesthetic rehabilitation.^{2,5} In view of the importance of aesthetics, creative clasp design offers the possibility of reducing the visibility of clasp assemblies, thereby making them more acceptable to the patient.⁷ Several options, including the use of RPD, are available for the treatment of partial edentulism. Patient expectations need to be established before treatment, as metal components of the RPD can be visible and may not be acceptable to the patient. In view of the importance of aesthetics, creative clasp design offers the possibility of reducing the visibility of clasp assemblies, rendering them more acceptable to the patient. However, the clinician must be careful in his or her choice of clasp designs as many articles are published based on clinical experience of the authors rather than research. Therefore, readers are encouraged to be critical in their interpretation of the literature and the application of published information in their clinical practices for a better success in maintaining patient satisfaction regarding aesthetics.

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