Review Article

# Flexible Partial Dentures - A hope for the Challenged Mouth

**G.K. Thakral, Himanshu Aeran, Bhupinder Yadav, *Rashmi Thakral**

Department of Prosthodontics, *Department of Preventive Dentistry, Seema Dental College and Hospital, Rishikesh

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## Abstract:

The strong, flexible nature of flexible denture material is perfectly suited to the variety of natural conditions in the mouth, simplifying design and enabling the flexible nylon resin to act as a built-in stress-breaker that provides superior function and stress distribution. Partially edentulous patients with challenging conditions like abused ridges, allergy to denture resins, undercuts due to angulated remaining teeth, cancerous lesions and cleft palate pose a great challenge for the fabrication of a successful removable partial denture.

Flexible denture offers a simpler and cost effective treatment for the oral rehabilitation of such cases. Flexible nature of the material allows shifting of the burden of force control from the design features of the appliance to the material properties of the base material. The clinical procedures are simple not requiring any expertise. A cast model prepared from a conventional alginate impression is sent to the laboratory that fabricates the desired prosthesis.

The stress distribution of the partial denture is accomplished by flexibility of the major connector, behaving as a stress-breaker. The tissue-supported saddles float on the edentulous ridge independently, without placing a stress load on the abutment teeth. In the long term, the flexibility of the complete or partial denture also appears to act as a tissue conditioner. Flexible partial dentures certainly offer advantages over conventional partials by way of superior aesthetics, better function, durable material and longevity of the prosthesis.

**Key Words:** Flexible dentures, Removable Partial Denture (RPD), Undercuts, Acrylic clasps

## Introduction:

Modern dentistry offers many options for the restoration of partially edentulous mouth, like removable partial dentures (RPD), fixed bridges and dental implants. Removable partial dentures became very popular many decades ago with the introduction of acrylic polymers and chrome cobalt alloys in dentistry. Many patients choose removable partial dentures due to factors ranging from cost to physiology. Today, more dentists are advising flexible partial dentures because they make better and stronger appliances that are comfortable and long lasting (Naylor & Manor, 1983). The strong and flexible nature of the material is perfectly suited to the variety of natural conditions in the mouth, simplifying design and enabling the flexible nylon resin to act as a built-in stress-breaker in order to provide superior function and stress distribution in a removable partial denture.

## Prevailing Materials:

Acrylic partial dentures offer a relative ease of fabrication as compared to the metal frame fabrication. The cast partials require accurate tooth preparations for guide planes and placement of occlusal rest. Very accurate surveying is required on the diagnostic cast to help inform about the tooth preparation (Lowe, 2004). However, the main limitations from these materials come from a steady loss of function as the edentulous ridge undergoes a natural process of resorption and the obvious non-aesthetic visible metal clasps (Shamnur et al, 2005). The patient needs to maintain the partial dentures routinely in terms of clasp adjustment and relines, and if any of the requirements are slightly compromised, the design will fail to work as intended. Irrespective of the accuracy with which the metal partial denture is designed for its fit, this perfection is gradually lost after the partial denture is placed for the reasons cited above.

The need to make improvements in the lives of people using removable partial dentures, inspired further research in this particular field of dentistry. Limitations of function and cosmetics of framework supported removable part of RPDs, which created a need to fundamentally change the technique of designing and fabrication of RPD. This is what led to the introduction of Flexible Dentures in the late 1940s. Two young brothers, Arpad and Tibor Nagy, had the vision to experiment with the new polymers of the day

**Corresponding Author:** Dr. Himanshu Aeran, Director P.G. Studies, Professor & Head, Prosthodontics, Seema Dental College & Hospital, Veerbhadra, Rishikesh (Uttarakhand)
**Phone No**.: 0135-2453465 (College), 09837063005
**E-mail** : drhimanu@yahoo.com

(nylon) to create a type of partial denture that was able to address the fundamental requirements of retention, support and stability, at the same time it provides beautiful aesthetics that was far superior to their metal counterparts, (Kaplan, 2008; Fig. I).

Their research gave birth to what is known today as Valplast – a Flexible denture material. The product was introduced in order to improve upon both the aesthetic and functional limitations of conventional removable partial denture. It was also developed to give a more affordable aesthetic restoration that can be expected to provide long-term function (Goiato et al, 2008).

Fig. I: A more aesthetic clasp of Flexible RPD as compared to metal.

## Functional Benefits of the Flexible Material:

The functional advantages of the flexible materials are somewhat less obvious. The key to the functional benefit is in the flexibility of the material that helps to shift the burden of force control from the design features of the appliance to the properties of the base material. A lever is more efficient if it is made from a rigid material. Leverage is the critical component of the conventional RPD design that can be controlled using flexible materials. A flexible lever does not work well as a lever. Therefore, a flexible partial denture reduces the leverage effects of its extensions without compromising good retention and support.

## Occlusal Rests:

There is no need of an occlusal rest or vertical stop in the flexible partial denture (Zhao et al, 2003). The occlusal rest is a structural component of the rigid partial, whose specific function is to compensate for potentially damaging stresses resulting from the fulcrum effect of a rigid major connector. This function is frequently over-simplified, the idea is that the occlusal rest is designed to keep pressure off the residual ridge. Actually, this simplification may be an unintended side effect of the true function, which is to resist force imbalance due to the combination of tooth and tissue support in a rigid framework. The flexible base eliminates the need of an occlusal rest since the stress distribution is naturally in balance (Fig. II).

Fig. II: Better stress distribution of Flexible Denture Base without occlusual rests.

## Stress distribution:

The stress distribution in the rigid partial denture is controlled by structural elements of the design; specifically the cooperative relationship of the retentive clasp, occlusal rests, reciprocating clasps, minor connectors, and guide planes, if used. The stress distribution of the flexible partial is accomplished by flexibility in the major connector behaving as a stress-breaker. The tissue-supported saddles float on the edentulous ridge independently, without placing a stress load on the abutment teeth. In distal extension partials, the free end saddle equally distributes force at all points along the edentulous ridge (Fig. III, IV).

Fig. III: A bilateral lower posterior edentulous mouth.

## Preservation of tissues:

In the long term, the flexibility of the partial also appears to act as a tissue conditioner. The slight movement over the tissue stimulates the blood circulation under the partial, and dynamic transfer occlusal forces appears to reduce the atrophy that can set-in beneath a saddle that does not engage the tissue and bone (Parvizi et al, 2004). At the same time, flexibility of the major connector eliminates the fulcrum effect across the arch. The fulcrum is one of the behavioral components of the conventional rigid RPD that must be compensated for by structural design of the retention, rest, and passive retainers. We also have the concept of Wolff's Law from orthopedic theory. Wolff's Law refers to the correlation between bone regeneration and behavior with physiological force. When force applied to bone structures are within physiological norms, the bone responds by achieving and stabilizing with physiologically normal mass and density. When force is below normal, bone responds by resorbing or shrinking. When force is excessive, bone responds by growing to above-normal mass and density. We would typically expect to see atrophy in the ridge where ridge is not being engaged in mastication. When the ridge is excessively engaged, we would see re-apposition. When the ridge is engaged normally, we would expect to see normal and stable bone mass and density. This concept is actually what allows implants to work as well as they do. The implant creates a normal environment for the supporting bone (Meijer & Wolgen, 2007). While no partial will replicate this exactly, the tissue-bearing partial comes closer than the tooth-supported partial. The only factor to consider is balancing the force distribution over the edentulous ridge, not whether or not to engage it at all.

## Advantages of Flexible Partial Dentures:

Metal-free restorations and prosthesis are future of dentistry. Flexible partial is the optimal choice whenever partial is the choice of treatment or the patient prefers not to use a fixed restoration. Patients, who have used both conventional RPD and a Flexible partial, report that the later feels more natural and is more comfortable to wear. It also provides a higher standard of function by using the flexibility of the material to balance masticatory forces over the entire supporting ridge instead of individual support points (Phoenix et al, 2004). As a result, the balanced distribution of forces can often lead to longer lasting appliances that may not require frequent relines.

Following are some of the advantages of a flexible partial denture:

- More acceptable esthetics, since there are no metal clasps.
- The material has good flexibility like Titanium. Therefore, even if there is a little bit of bending, it comes back to the original shape and position.
- Ease of insertion in the mouth with alveolar undercuts because of the flexibility.
- Even if there is slight shifting of the remaining teeth over time, the flexibility of the denture material, allows the use of prosthesis with little adjustment.
- There is no need of modification of the remaining teeth to receive occlusal rests as for the metal clasps.
- In cases of undercut due to tilted teeth, flexibility of the material makes it possible to insert the prosthesis over the angulated teeth.
- The denture can be heated up in hot water for about a minute and can easily be adjusted and inserted in the undercut area.
- Rebasing (Changing the entire plastic / tissue area except the acrylic teeth) is possible.
- A real boon for patients with compromised oral conditions. Opens up scope to address the needs of such patients with ease.

## Disadvantages of Flexible Partial Dentures:

- Being a plastic material, it cannot be made into thin sections like metal. It is likely to break if cut thin sections.
- Since they need to be made bulkier than cast partials, it may take longer to get used to a flexible partial denture.
- It does not conduct heat and cold like metal. Therefore, the patient may not enjoy certain food like hot soup or ice cream.
- Since flexible dentures utilize the gaps (because of some missing teeth) for the 'Retento-Grip Tissue-bearing Technique' (Iselin et al, 1990) for retention, the remaining teeth have to be in fairly good periodontal health.
- The patients that have periodontal problem may have several teeth that are mobile due to bone loss. Therefore, the whole area keeps on flexing causing unfavorable forces that in turn result in more bone loss.
- The laboratory fee is a little higher.

7. Requires more chair-side time for adjustment.
8. Requires special instruments (knives and polishing kit) to make the adjustment.
9. A Flexible denture is very hard to repair if fractured. No additions can be made onto it. In such cases, rebasing is recommended.

## Indications for flexible partial denture:

The appropriate and acceptable uses for a flexible partial denture include all cases of conventional partial denture indications plus the areas where conventional partials are limited or contra-indicated. There are virtually no cases where a conventional partial would work better than a flexible partial. Flexible denture materials like Valplast are available in five natural tissue shades as well as in additional un-pigmented option for special applications (Iselin et al, 1990). The unique physical properties of the material also make it more adaptable in challenging cases and situations involving pediatric patients, cancerous mouths and cleft palates. Because of its excellent biocompatibility, it is also an ideal replacement for acrylic when patients are allergic to denture acrylics. Flexible partials could be a treatment of choice in cases of patients having a history of repeated partial denture frame breakage. They can also be used as an easy and affordable alternative to implants or fixed partial dentures and also for tooth or tissue-coloured clasps in high esthetic areas.

Additional applications of Flexible denture material include:

1. Cosmetic gum veneers
2. Bruxism appliances
3. Implant retained over-dentures and full dentures for patients with protuberant bony structures or large undercuts
4. Unilateral Space Maintainers (Fig. V, VI)
5. Temporary Prostheses (short and long-term)
6. Obturators and speech therapy appliances
7. Orthodontic Devices
8. Occlusal splints and sleep apnea appliances
9. Anatomical bite restorer (Used during full mouth rehabilitations)

## Flexible Partials For People With Special Needs:

The safety issue is important to many people in high physical risk exposures. Flexible Partials are ideal for people in high-risk situations like:

- Athletes
- Police and Firefighters
- Military Personnel
- Prisoners and Prison Officers
- Any person who might be exposed to physical harm or injury

Fig. IV: A Tissue supported RPD avoides stress on the remaining Teeth

Fig. V: Unilaterally missing single manibular molar.

Fig. VI: A Flexible RPD for a unilaterally missing mandibular molar serves as a satisfactary space maintainer

## Contraindications:

Contra-indications include patients who simply should not or would not wear any type of removable appliance. However, Flexible partials are not advisable in cases of:

1. Deep overbites (4mm or more) where anterior teeth can be dislodged in excursive movements
2. Little remaining dentition with minimal undercuts for retention.
3. Where there is less than 4 mm of inter-occlusal space in the posterior area.
4. Bilateral free-end distal extensions with knife-edge ridges or lingual tori in the mandible.
5. Bilateral free-end distal extension on maxilla with extremely atrophied alveolar ridges.

## Conclusion:

No product can solve all the problems associated with partial prosthesis. Nor can it meet all the requirements of a challenged mouth. The key is to solve and address as many problems and needs as possible in a simple way that is affordable for the patient. An effort has been made to focus on improvements over conventional partials in aesthetics, function, durability, and longevity of a Partial Denture made from a Flexible denture material. With further improvisations in the working techniques, adjustments and repair potential of the material, Flexible partials may become a simpler answer to complex partially edentulous oral conditions.

## Bibliography:


1. Goiato MC, Panzarini SR, Tomiko C, Luvizuto ER: Temporary flexible immediate removable partial denture: a case report. *Dentistry Today*, 2008; 27(3):114-116.
2. Iselin W, Meier C, Lufi A, Lutz F: The flexible gingival epithesis. The practical procedure, laboratory technics and clinical experience. *Schweizer Monatsschrift for Zahnmedizin*, 1990; 100(8):966-979.
3. Kaplan P: Flexible removable partial dentures- design and clasp concept. *Dentistry Today*, 2008;27(12): 120,122-123.
4. Lowe LG: Flexible denture flanges for patients exhibiting undercut tuberosities and reduced width of the buccal vestibule: a clinical report. *The Journal of Prosthetic Dentistry*, 2004;92(2):128-131.
5. Meijer GJ, Wolgen PJ: Provisional flexible denture to assist in undisturbed healing of the reconstructed maxilla. *The Journal of Prosthetic Dentistry*, 2007;98(4):327-328.
6. Naylor WP, Manor RC: Fabrication of a flexible prosthesis for the edentulous scleroderma patient with microstomia. *The Journal of Prosthetic Dentistry*, 1983;50(4):536-538.
7. Parvizi A, Lindquist T, Schneider R, Williamson D, Boyer D, Dawson DV: Comparison of the Dimensional Accuracy of Injection Molded Denture Base Material to that of Conventional Pressure-Pack Acrylic resin. *Journal of Prosthodontics*, 2004;13(2):83-89.
8. Phoenix RD, Mansueto MA, Ackerman NA, Jones RE: Evaluation of mechanical and thermal properties of commonly used denture base resins. *Journal of Prosthodontic*, 2004;13(1):17-27.
9. Shamnur SN, Jagadeesh KN, Kalavathi SD, Kashinath KR: "Flexible dentures"- an alternate for rigid dentures? *Journal of Dental Sciences & Research*, 2005; 1(1):74-79.
10. Zhao X, Cao J, Zhang Y: Clinical application of flexible gingival epithesis material. *West China Journal of Stomatology*, 2003; 21(4):324-326.


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