

# Flexible denture base material: A viable alternative to conventional acrylic denture base material

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## Abstract

Although clinician's skills and experience play a major role in designing and fabrication of the optimum prosthodontic restorations, the selection of denture resins is equally important, especially when the patient has been using the prostheses since long. Eighteen cases who were not satisfied with their conventional acrylic dentures were selected. They were provided flexible dentures along with a questionnaire to precisely evaluate the advantages of new material. Prosthodontic planning & observations regarding this material are discussed on various parameters.

**Keywords:** Acrylic dentures, denture base materials, flexible dentures

## Introduction

Loss of teeth, which may be due to trauma, dental diseases, pathology, or otherwise not only alters the psychological thought of the patients but also disturbs the esthetics, phonetics, and functional occlusion.<sup>[1]</sup> Replacement of missing teeth is highly essential in order to restore the defect and regain function as best as possible.

Since ages, polymethyl methacrylate (PMMA) has been used to fabricate the dentures and when facilities are available, metal cast / metal frame / metal base dentures are also fabricated to restore the defects. The acrylic denture base prostheses have their own advantages and disadvantages. Some problems with these prostheses are difficult to address, such as insertion in undercut areas, brittleness of methyl methacrylate which leads to fracture, and allergy to methyl methacrylate monomer.<sup>[2]</sup>

The innovation of the nylon-derived denture base material in the 1950s paved the way for a new type of dentures. Flexible dentures are an excellent alternative to conventionally used methyl methacrylate dentures, which not only provide excellent aesthetics and comfort but also adapt to the constant

movement and flexibility in partially edentulous patients.

Eighteen cases of complete / complete, complete / partial, collapsed vertical height, rehabilitated using two different types of denture base materials, are discussed.

## Materials and Methods

The present study was conducted at three dental centers, where patients selected were those who were not happy with their existing complete / complete [Figure 1], complete / partial [Figure 2], partial / partial dentures [Figures 3 and 4], made of conventionally used poly methyl-methacrylate denture base material and were in search of some substitute. The problems with their existing dentures included irritating mucosa, foul smell, difficulty to wear and remove, frequent fractures / cracks, etc.

Velplast and Flexite were the two nylon denture base materials used (as the materials were available) in the study. A total 18 cases were provided the requisite prostheses, which were observed for one and a half year for their function and acceptance by the patient as compared to their old prostheses. Usual procedure was followed for the fabrication of complete / complete and partial dentures in making the impressions and recording the jaw relations. A questionnaire was prepared, which was narrated to the patients, and their consent was taken to participate with their experiences with the new dentures [Appendix-I].

Once the maxillomandibular relations were recorded, the teeth were arranged as per directions of the manufacturer. Small-size mechanical undercuts (Diatrics) [Figure 5] were made in each tooth so that flexible denture base material could easily be injected in these areas. Wax carving was done and intraoral trial was taken for each patient to evaluate esthetics, phonetics, and functional occlusion. Any correction required was done at this stage.

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Special flasks were used for flasking, dewaxing, and injecting molten Velplast or Flexite denture material as per directions of manufacturer. Injection cast technique was used, which is

highly sensitive to the position and size of sprue placement.<sup>[3,4]</sup> Once the casting was completed, the flask was allowed to bench cool. The sprues were removed and dentures polished. Intraoral fit of the prostheses was checked for occlusal balancing, any overextension, etc., so that the functional relation of the prosthesis with intraoral structures could be established.

### Results

All the cases were evaluated for the following parameters [Tables 1 and 2]: mucosal irritation, halitosis, ease of insertion and removal and fractures / cracks frequency and comfort in function. All the patients were followed for check-ups at regular intervals of approximately 1 month. Out of 18 cases, which ranged from 37 to 82 yrs, eight were female and ten were male in the study. Only two cases (11%) reported halitosis, four cases (22.2%) reported

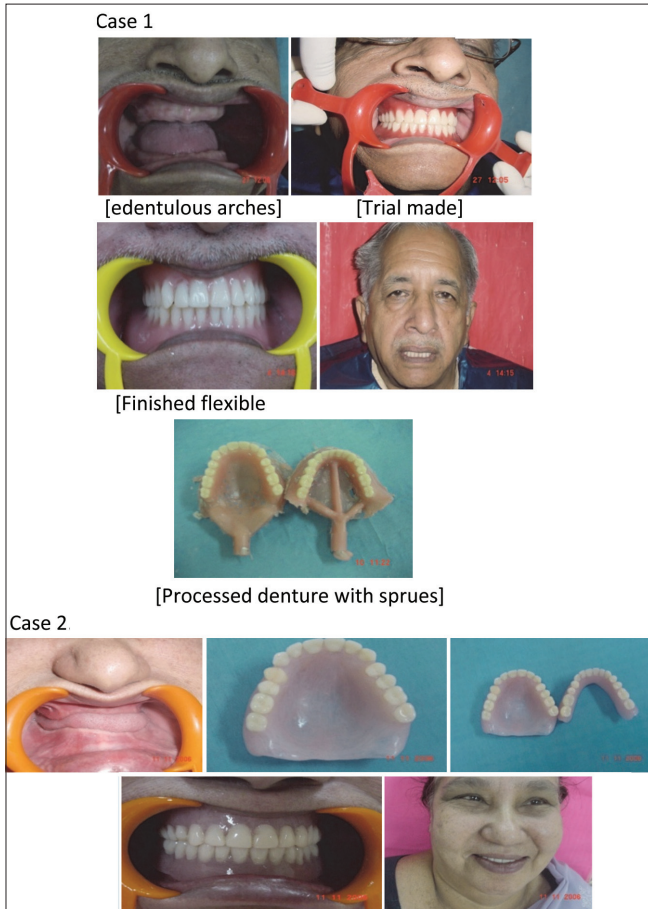


Figure 1: (Case 1 and 2) Complete/complete flexible dentures

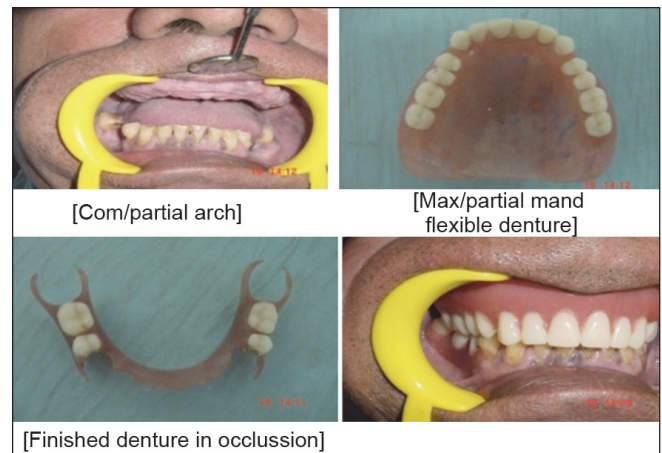


Figure 2: (Case 3) Complete / partial flexible denture

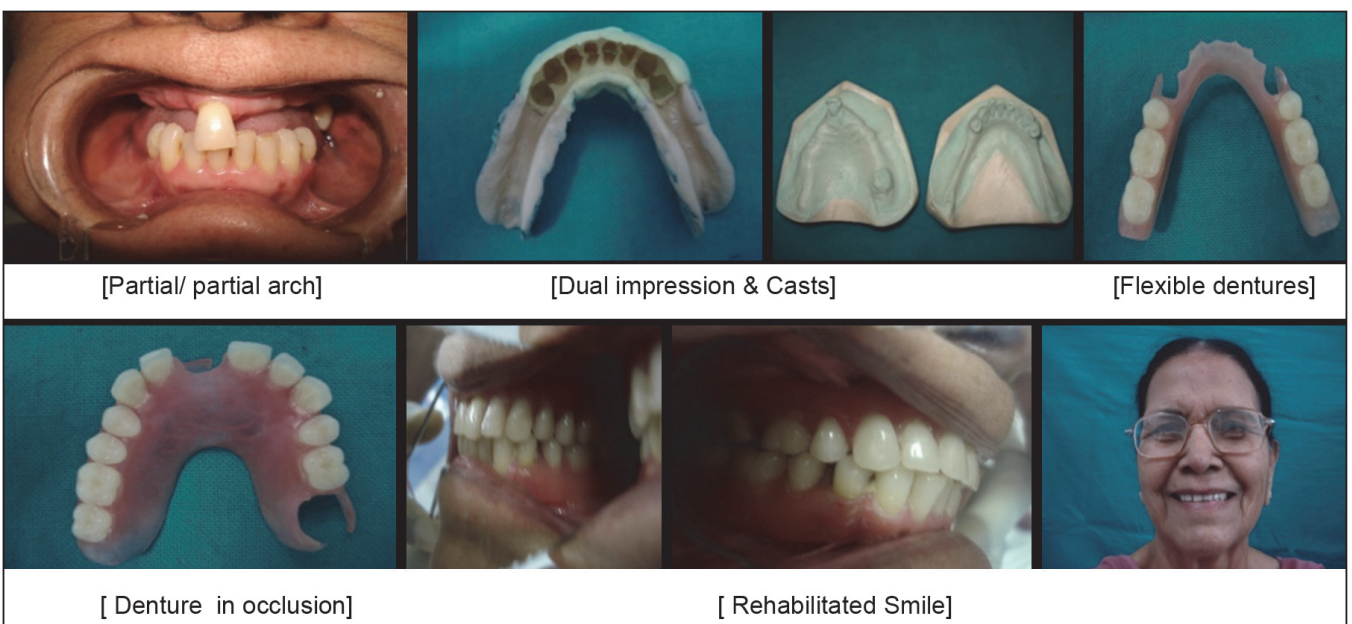
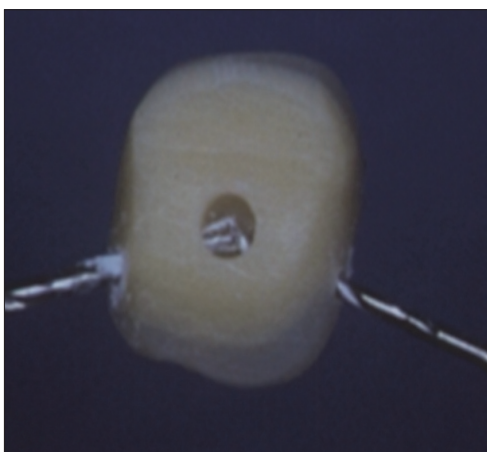


Figure 3: (Case 4) Partial / partial flexible denture



**Figure 4:** (Case-5) Partial /Partial flexible dentures



**Figure 5:** Diatorics prepared in each tooth

debonding of teeth from the dentures after 10 and 11 months, respectively. Rests of the cases were highly satisfied with the use of flexible dentures. As per questionnaire, the results were compiled and the data were analyzed by a nonparametric test, Wilcoxon signed ranks test to study the change in various indices of functional observations and to draw the conclusion. When questioned about the preference among the two types of denture base material, 100% patients preferred the flexible dentures over the customary methyl methacrylate dentures.

Table 1a shows that with old dentures seven patients observed mucosal irritation at grade 4 which was highest and seven patients observed it at grade 3. Same observation was 0 (zero) in almost all cases except one with new flexible dentures. *P* value was < 0.001 and was statistically significant.

Table 1b shows that with old dentures six patients observed halitosis at grade 4 which was highest and five patients observed it at grade 3. This observation was reported at grades 4 and 2 by one patient each, respectively, with new flexible dentures. *P* value was < 0.001 and was statistically significant.

Similarly, Table 1c, d and Table 2 show that whereas the problem of insertion and removal and fracture had been taken care of, the comfort was higher with new flexible dentures and in all parameters, the *P* value was less than 0.001 and was of great importance statistically.

It was evident that new flexible dentures were significantly better than the conventional methyl methacrylate dentures in all functional parameters observed in this study.

## Discussion

The most commonly used material for the fabrication of complete / partial dentures so far has been PMMA. This material is not ideal in every respect and it is the combination of virtues rather than one single desirable property that accounts for its popularity and usage. In spite of various advancements and research in dental materials, training, and techniques across the world, the fracture, foul smell, and allergy to PMMA could not be avoided.<sup>[2]</sup> Patients, who start wearing dentures at an early age due to various reasons, often get frustrated and start searching something better available for them.

Although, cast partial denture has been a viable substitute, the requirement of high skill in preparation, technique-sensitive casting procedure, heavy weight, and visibility of metal clasp made it more difficult and cumbersome alternative and net results have not been encouraging.<sup>[5]</sup>

The most recent preference in denture materials has been the use of nylon-like material for the fabrication of removable dental appliances. This material generally replaces the metal and the methyl methacrylate denture base material used conventionally to build the framework for standard removable partial dentures. It is nearly unbreakable, esthetically acceptable being colored like the gums, can be fabricated quite thin, and can form not only the denture base but the clasps as well.<sup>[6]</sup> Since, the clasps are built below the height of contours of teeth, they are practically indistinguishable from the gums that normally surround the teeth. It is much easier for the dentist to work with these materials while adjusting the prosthesis in patient's mouth, using slow-speed grinding tools. Also, the postinsertion maintenance is easy, which makes it a very "user- friendly" denture base material.<sup>[7,8]</sup>

In the present study, all the 18 cases were prolonged denture wearers who had undergone frequent adjustments such as relining and rebasing of their old dentures, which were not functionally comfortable. All these patients were ready to

**Table 1a: Mucosal irritation (M) count**

Grade	M		No. of cases
	Old conventional denture	New flexible denture	
1	2	0	2
2	1	1	2
3	7	0	7
4	7	0	7
Total	17	1	18

**Table 1b: Halitosis (H) count**

Grade	H		No. of cases
	Old conventional denture	New flexible denture	
1	4	0	4
2	1	1	2
3	5	0	5
4	6	1	7
Total	16	2	18

**Table 1c: Insertion and removal (I) count**

Grade	I		No. of cases
	Old conventional denture	New flexible denture	
1	3	0	3
2	4	0	4
3	3	2	5
4	5	1	6
Total	15	3	18

**Table 1d: Fracture (F) count**

Grade	F		No. of cases
	Old conventional denture	New flexible denture	
1	1	0	1
2	2	2	4
3	4	0	4
4	7	2	9
Total	14	4	18

participate in the study and all the questions were answered by them after thorough observations on a scale of 1 to 4 as compared to the same observations with their old PMMA dentures. Halitosis reported in two cases in the present study was attributable to the personal dietary and oral hygiene habits of these patients. Once trained in good oral habits, halitosis started disappearing in these two cases also.

According to Tables 1 and 2 all the patients in the study experienced highest satisfaction with the new nylon-based dentures. There was no fracture observed in new flexible dentures. However, de-bonding of the teeth was observed in four cases after 10 and 11 months of use and was attributed to faulty de-waxing procedure, where wax was not completely removed from the mechanical undercuts (Diatomics) and the molten flexible denture base material could not flow into the areas created for mechanical locking.<sup>[9]</sup>

**Table 2: Wilcoxon Signed Ranks Test (P - value)**

Index	P - value
Mucosal	<0.001
Halitosis	<0.001
Insertion	<0.001
Fracture	<0.001
Comfort	<0.001

This new-generation nylon-based thermoplastic material has a predictable long-term performance. It is stable in nature and provides resistance to polymer unzipping. It also has a high creep resistance and fatigue endurance along with the excellent wear characteristics and solvent resistance. It has no porosity, no biological material build-up, and stains.<sup>[10]</sup> It provides high dimensional stability. The material matches with the tissue and tooth color to a reasonably well extent. It has the flexibility to disengage forces on individual teeth and prevent transfer of forces to remaining natural teeth and the other side of the arch. The material is light in weight, heat resistant, and ductile and is injected at a temperature of 274° to 300°C.

All the patients in this study preferred flexible dentures over the customary methyl methacrylate dentures because they had bitter experience with their old dentures and this new material gave them hope for better quality of life. Super polyamide denture base material was found to be more flexible (low flexural modulus) than PMMA denture base, and hence seems to be promising.

## Conclusion

The rehabilitation of orofacial structures demands the restoration of esthetic and function irrespective of the individual's dietary / parafunctional habits and structure left. The flexible dentures were found to fare significantly better as compared to the conventional methyl methacrylate dentures on the parameters taken in the present study. When questioned about the preference among the two types of denture base material, 100% patients preferred the flexible dentures over customary methyl methacrylate dentures. However, further long-term studies are recommended to assess the overall usefulness of the material.

## Appx -A

### Questionnaire:

The 10 questions that made up the Oral Health Impact profile questionnaire for flexible dentures

1. Have you felt that your sense of taste has worsened because of problems with your mouth or dentures?
2. Have you had painful ache in your mouth?
3. Have you found it uncomfortable to eat any foods because of problems with your mouth or dentures?
4. Have you notice any redness or white patches on oral mucosa because of dentures?

5. How many times denture has cracked, tooth has come out of denture or you have gone for denture repair?
6. Have you found it difficult to remove and wear the denture?
7. Have you been embarrassed because of smell from your mouth because of the denture?
8. Have you been irritable with people because of problems with your mouth or dentures?
9. Have you felt that life in general was less satisfying because of problems with your mouth or dentures?
10. Have you been totally unable to function because of problems with your mouth or dentures?

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