

## Flexible dentures: A flexible option to treat edentulous patients

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### Abstract

The fabrication of prosthesis for completely edentulous or partially edentulous arches encounters a special challenge when soft tissue and bony undercuts, interferences, various paths of placement, tilted teeth and deranged occlusion are present to complicate the treatment plan. Flexible dentures have emerged as a viable option to treat various edentulous conditions. This article reviews the evolution, applications, advantages and disadvantages of flexible dentures.

**Key words:** Flexible dentures, Undercuts, Valplast, Thermoplastic resins

### Introduction

The fabrication of the optimum restoration is dependent on the clinicians' skills in selection of the type of the restoration which is required for the patient.

The fabrication of prosthesis for completely edentulous or partially edentulous arches encounters a special challenge when soft tissue and bony undercuts, interferences, various paths of placement, tilted teeth and deranged occlusion are present to complicate the treatment plan<sup>1</sup>.

Various treatment options have been suggested in literature for the management of such situations<sup>2</sup>. With recent advancements in material science flexible dentures have emerged as a viable option to treat various edentulous conditions. (Fig 1)

### Evolution

Thermoplastic materials for dental prosthesis are not a recent invention. They were first introduced in 1950's and consisted of different grades of polyamides (nylon plastics)<sup>3</sup>.

Rapid injection systems originated in 1962 introducing Flexite thermoplastic material which was a fluoro-

polymer (Teflon like)<sup>4</sup>. Next introduced nylon based resin was Valplast, a flexible, semi-translucent thermoplastic resin. While the material was not strong enough to allow for conventional tooth borne rest seat, the flexibility added to patient comfort in wearing the appliances<sup>5</sup>.

Acetal was proposed in 1971 as an unbreakable thermoplastic resin material<sup>6</sup>.

It was during this period that rapid injection systems developed the first tooth colored clasps with a thermoplastic fluoropolymer<sup>7</sup>. In 1992 the first pre-formed tooth colored clasps made of nylon were introduced.

Recently the 'Flexible Resin System' (FRS system) was introduced and is popularly used due to its excellent durability. Presently a new line of thermoplastic nylon, acetal, acrylic, and polycarbonate materials are taking a new surge in dental applications. Various commercially available nylon flexible denture base materials are now in use<sup>1</sup>.

### Applications and Advantages

Flexible denture base material is a nylon based (polyamide) thermoplastic denture base material. They

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have shown several advantages over the traditional rigid denture bases.

**Aesthetics** – Translucency of the material picks up underlying tissue tones, making it almost impossible to detect in the mouth. No clasping is visible on tooth surfaces (when used in manufacturing of clear clasps), improving aesthetics<sup>1</sup>. No metal clasps are present. (Fig 2)

**Strength** – Flexible denture material is so strong that it can be made very thin which makes it comfortable to wear and esthetically pleasing.

**Accuracy** – As the flexible dentures are fabricated using the injection molded technique, they exhibit better accuracy compared to conventional techniques<sup>8</sup>. (Fig 3)

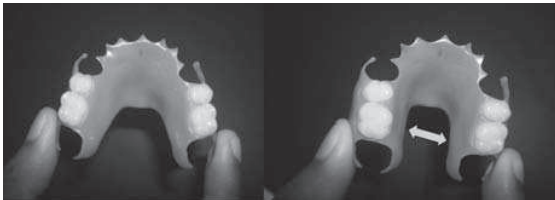


Fig 1: Flexible dentures

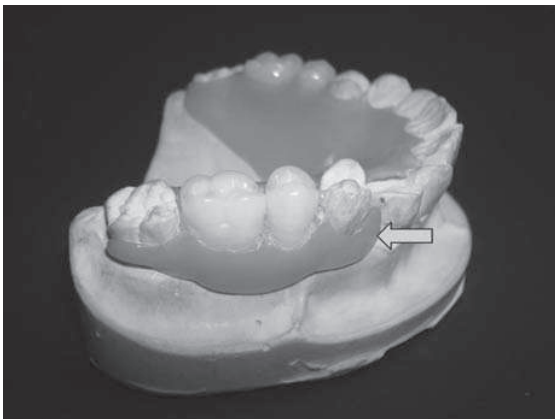


Fig 2: Esthetics enhanced due to lack of metal clasps



Fig 3: Better accuracy

**Management of undercuts** – Being flexible, the denture base adapts well in the undercut areas. The amount of adjustment required at time of denture insertion is greatly reduced. Also this reduces post insertion complaints of denture induced trauma (ulceration)<sup>1,9</sup>.

**Biocompatibility** - Complete biocompatibility is achieved because the material is free of monomer and metal, these being the principle causes of allergic reactions in conventional denture materials<sup>1</sup>.

**Provisional dentures** – Provisional dentures are advised by dentists during healing period. After surgical reconstruction of the edentulous maxilla either by alveolar augmentation or a distraction procedure and implant placement there is a need to accommodate the patient during the period between surgery and the fabrication of a definitive dental prosthesis. In this postoperative period during the consolidation phase of the reconstructed maxilla, a flexible denture offers an interim solution that allows the patient to resume daily activities.

Dentures made of flexible materials prevent peak forces and, thereby, preserve more regenerated osseous tissue than hard acrylic resin dentures. Providing a flexible dental prosthesis during the consolidation phase of grafted bone and implants enables the patient to bridge the time needed for optimal osseointegration of the dental implants and fabrication of a definitive prosthesis without jeopardizing the regenerated osseous tissue<sup>10</sup>.

**Management of midline fractures** – Midline fracture of complete dentures have been reported to be the second most common type of fracture in denture prosthesis<sup>11</sup>. Flexible denture material has been reported to have therapeutic advantage in overcoming midline denture fractures<sup>8</sup>.

**Better comfort of the patient** – Flexible dentures form an excellent alternative to traditional hard fitting denture. Patients show excellent compliance as there is no metal display. Material being soft and strong can be made thinner and are light in weight compared to conventional dentures. This promotes better adaptation of the tongue and cheek to the denture base. Flexible dentures will not cause sore spots and have better comfort level which can be attribute to low modulus of elasticity<sup>8</sup>. These dentures absorb small amounts of water to make the denture more soft tissue compatible<sup>1</sup>.

**Other applications** – Flexible dentures can also be used for fabricating night guards and sleep apnoea appliances, microstomia, scarring in the oral and facial areas due to disease, trauma, or burning injuries<sup>3,12</sup>.

## Disadvantages

**Stress distribution-** The application of flexible dentures in Kennedy's class I and II situations is not indicated as the area of the flexible dentures which is analogous to the major connector of a cast partial denture is also flexible. Hence there is actually no way of controlling and understanding the way stresses are transmitted in the flexible dentures<sup>3</sup>.

**Discoloration** – The flexible dentures have been reported with gradual fading of denture base colour over a period of 12-24 months. Further research and improvement in the material is needed to overcome this drawback<sup>8</sup>.

**Debonding of teeth** - Another major drawback observed was debonding of teeth from denture base. The polyamide denture base material has a unique property that it does not chemically bond with any of the acrylic resin / porcelain, so mechanical bonding is the only mode to use in the polyamide denture base material.

Sufficient height of the selected teeth is required for mechanical bonding. Mechanical undercuts (diatorics) should be made in the centre of each tooth so that melted fluid polyamide could flow into the undercuts so as to retain the tooth in the denture<sup>8</sup>.

**Adequate interarch space** - Patients with less vertical dimension and small crown length are unfit cases for flexible dentures. Modification in teeth design can be explored to overcome this problem<sup>8</sup>.

**Repair and relining** - Another problem faced with the material is that no repair or relining is feasible<sup>8</sup>.

**Definitive prosthesis** - Flexible dentures generally are not used for long-term restorations and are intended only for provisional or temporary applications<sup>1</sup>.

## Processing and finishing the prosthesis

When grinding this prosthesis, proper ventilation, masks, and vacuum systems should be used and the procedure is technique sensitive. Extreme caution is necessary when processing to avoid skin contact with the heated sleeve, cartridge, furnace, heating bay, hot cartridge, injection insert, piston head adapter, hot flasks, and heat lamps<sup>1</sup>.

## Conclusion

Due to their ability of excellent mouldability, light weight to density ratio and high thermal strength, thermoplastic materials have occupied an enviable place for making complete and partial dentures. However careful case selection and clinical judgment is required to use flexible dentures in appropriate situations in order to obtain a successful treatment outcome.

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