Flexible Dentures: A Boon in Compromised Conditions

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ABSTRACT:

Complete or partial denture fabrication encounters a major problem when hard and soft tissue undercuts, mandibular tori, exostosis, tilted teeth, interferences and de-arranged occlusion are seen in the oral cavity and thus complicate the treatment plan. Flexible dentures have emerged as a viable option to treat various edentulous conditions where conventional dentures have some limitations of their rigid base. The present article reviews the evolution, applications, advantages, disadvantages, indications and contraindications of flexible dentures.

Key words: Flexible denture, Valplast, Undercut, Acrylic clasps, Thermoplastic resin

INTRODUCTION:

In the days of rapid growth of living standards and widespread people's awareness of technological progress in dentistry, interest increases in production of different types of removable dentures made of thermoplastic materials, which the technology is being considered as a step-ahead solution on the way towards achievement of high-level aesthetic, comfort and function.¹

EVOLUTION OF DENTURE BASE:

Dentistry as a speciality is believed to have begun about 3000 BC. The first dental prosthesis

was believed to have been constructed in Egypt about 2500 BC. Skilfully designed dentures were made as early as 700 BC. During medieval times, dentures were seldom considered as a treatment option. They were hand carved and tied in place with silk threads and had to be removed before eating. Dentures were also made up of wood, bone, ivory in ancient times.¹⁻⁴

Alexis Duchateau (1774) was the first to fabricate porcelain dentures. In 1788 AD, a French dentist, Nicholas Dubois de Chemant, made a baked-porcelain complete denture in a single block. In 1794 AD, John Greenwood began to swage gold bases for

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dentures. Charles Goodyear, in 1839, discovered the process of dry-heat vulcanization of rubber by heating caoutchouc, sulphur and white lead together. In 1851, Goodyear used this technique to produce a highly cross-linked hard rubber named Vulcanite after the Roman god. CF Harrington (1850) introduced the first thermoplastic denture material the tortoise shell base. Edwin Truman (1851) used Gutta percha as a denture base but it was unstable. Alfred A Blandy (1856) made dentures from a low fusing alloy of silver, bismuth and antimony. Dr. Bean (1867) invented the casting machine and did the first casting of a denture base in aluminium. J. Smith Hyatt (1869) introduced celluloid that was later used as a denture base material because of its translucency and pink colour. Dr. Leo Bakeland (1909) introduced this phenol formaldehyde resin which was easily available but lacked colour quality. Ni-Cr and Co-Cr were obtained by E. Haynes (1907) but they gained popularity after 1937 because of their low density, low material cost, higher resistance to tarnish and corrosion and high modulus of elasticity. Dr. Walter Wright (1937) introduced Polymethyl methacrylate as a denture base material which became the major polymer to be used in the coming ten years.¹⁻⁴

Thermoplastic materials were first introduced in 1950's and consisted of different grades of polyamides (nylon plastics). Rapid injection systems originated in 1962 introducing Flexite thermoplastic material which was a fluouopolymer (Teflon like). 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.⁵ Acetal was proposed in 1971 as an unbreakable thermoplastic resin material.⁶ It was during this period that rapid injection systems developed the first tooth colored clasps with a thermoplastic fluouopolymer.⁷ 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.

FLEXIBLE DENTURES:

Some of the commercially available products are Proflex, Valplast, Sunflex

Proflex:

Pro-flex is the flexible denture base material which can be used for Full & Partial Flexible Dentures. Pickett Dental Laboratory has been offering Pro-flex full and partial flexible dentures since 1998. Pro-flex is easy to work with the quality, aesthetics and most importantly, the final results. Pro-flex denture material is indicated in some of the Anatomical considerations-enables the material to effectively engage tooth and tissue undercuts. Also, Pro-flex is hypoallergenic which is recommended for patients with known acrylic or metal sensitivities. Aesthetically the material is semi translucent, allowing the prosthetic to better blend with the colour of the natural gum tissue. With Pro-flex flexible partials, there are no metal clasps. Proflex full and partial flexible dentures are easily adjusted by the dentist. This material is tough, durable and dense, manufactured with thousands of pounds of pressure and vacuum formed to fit the model perfectly. The final layer is a flexible resin composite that is firm enough to hold teeth under all occlusal loads, but flexible enough to allow delivery of the dental appliance without adjusting any undercuts. Simply warm the denture with running water to bring it up to body temperature before inserting it. Pro-flex partial and full dentures can be repaired, and the full dentures can be relined here at the laboratory with Pro-flex Soft Line material. Pro-flex flexible dentures are set up with the same quality teeth used in acrylic dentures and cast partials.⁷

Valplast:

Valplast is a flexible denture base resin that is ideal for partial dentures and unilateral

restorations. The resin is a biocompatible nylon thermoplastic with unique physical and aesthetic properties that provides unlimited design versatility and eliminates the concern about acrylic allergies. The Valplast Flexible Partial allows the restoration to adapt to the constant movement and flexibility in your mouth. The flexibility, combined with strength and light weight, provides total comfort and great looks! The preparation is relatively simple. The Valplast partial is virtually invisible because there are no metal clasps and the material itself blends with the tissue in your mouth. While the cost is often higher than a partial made with visible metal clasps. The Valplast flexible partial involves only noninvasive procedures. In case of patients who have Acrylic Allergies, History of partial frame breakage, Alternative to implants or fixed products and Presence of tori valplast flexible dentures can be indicated.⁷

Sunflex:

Sunflex Partial Dentures are made from a strong biocompatible nylon thermoplastic, and are unbreakable, yet lightweight and translucent which allows natural tissue to show through. The sunflex flexible denture base materials are virtually Invisible, Unbreakable, Metal-Free, Lightweight and incredibly Comfortable. The sunflex flexible denture base materials are exclusively used in partially edentulous arches.⁷

ADVANTAGES:⁷⁻⁹

Esthetics: Metal free clasps and their pink color makes the denture look more natural in the oral cavity.

Flexible: Due to its flexibility, it helps in ease of insertion and removal from mouth in cases of deep undercuts or tori.

Preservation of tooth structure: No or little hard or soft tissues are required to modify like preparation of occlusal rest, making path of insertion by correcting angulated teeth.

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

Accuracy: Injection moulding technique makes the denture more accurate as compared to conventional denture

Biocompatibility: The material is free of monomer and metal so allergic reactions from these materials are avoided in oral cavity.⁷⁻⁹

DISADVANTAGES:^{7, 8,10}

No 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.³

Discolour: Surface discoloration is seen in the denture after about one year

Debonding of teeth: The teeth are not chemically bonded to the denture base as conventional dentures so for mechanical bonding diatoric holes are the only option to use in polyamide denture bases

Adequate inter-arch space: Adequate inter-arch space is required for the success of the denture for its success

Repair and Relining: Another problem faced with the material is that no repair or relining is feasible.⁸

Not a definitive prosthesis: Flexible dentures generally are not used for long-term restorations and are intended only for provisional or temporary applications.^{7, 8,10}

INDICATIONS:^{9,10}

1. As a provisional in lieu of restorative temporaries or a standard acrylic partial denture
2. Patients allergic to conventional acrylic dentures
3. Patients with repeated partial dentures breakage
4. Cosmetic gum veneers

5. Bruxism appliances
6. Implant retained overdentures and complete dentures for patients with protuberant bony structures or large undercuts
7. Obturators and speech therapy appliances
8. Occlusal splints and sleep apnea appliances
9. Obturators with maxillectomy procedures
10. Single complete denture
11. In challenging cases including pediatric patients, cancerous mouths or cleft palate cases
12. Microstomia

CONTRAINDICATIONS:^{9,10}

1. Deep overbite cases (4mm or more)
2. Inadequate interocclusal distance (less than 4mm)
3. Bilateral free end distal extension cases with knife edged ridges
4. Little remaining dentition with minimum undercut for retention.

CONCLUSION:

An effort has been made to focus on improvements over conventional partials in aesthetics, function, durability of a Partial Denture and excellent results are seen in regard to esthetics, function and durability in flexible partial dentures when used under right conditions. 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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