

Valplast®



Valplast Flexible Partials: Clasp Design

History

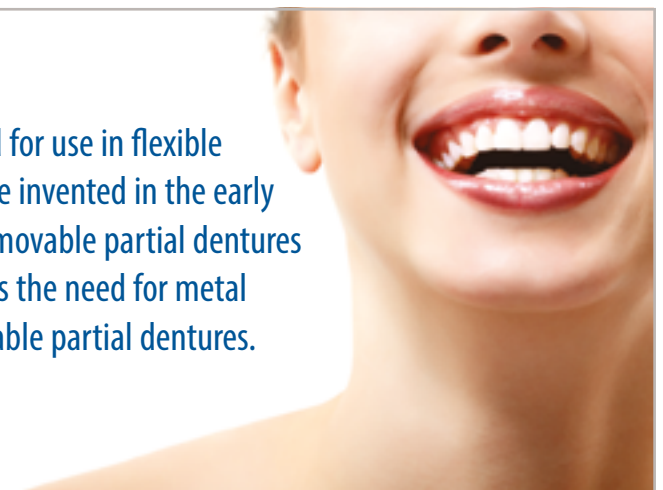
Nylon polyamides first originated in 1930 as the result of research done by Wallace Hume Carothers (1896-1937) of the DuPont Company, and his associates . Some of the earliest commercial uses of nylon include the nylon-bristled toothbrush and nylon stockings . During World War II nylon was used to replace natural silk and hemp to produce parachute canopies, tents, ropes and other military supplies.

Nylon polyamides made their way into restorative dentistry in the late 1940's in response to the high consumer demand to replace metal and provide better aesthetics in a removable partial denture . The development of Valplast® material and testing of various laboratory procedures and processing equipment took place between 1946-1953. The high cost of gold and other precious metals and alloys at the time is also cited as a major factor that influenced the development of Valplast® . Hungarian-American brothers Arpad and Tibor Nagy are credited with developing the design and fabrication techniques for Valplast at their laboratory, Master-Touch Dental Lab, in New York.

Valplast® is a unique type of superpolyamide, from the nylon family. The physical characteristics of Valplast® allow it to function as a completely tissue-borne, flexible partial denture. This contrasts with traditional metal RPD's that rely on rigid alloys to transfer masticatory stress to natural tooth or tooth and tissue surfaces . The requirements of retention, support and stability in a removable partial denture are addressed by leveraging natural properties of the flexible Valplast® base with simple designs.

Valplast® was first introduced to the dental industry in 1953 as an exclusive product of Master-Touch Dental Laboratory but was made available to other dental laboratories several decades later. As Valplast® continued to grow in popularity in the United States during the fifties and sixties, it also spread to several export markets including Germany, Italy, Greece, Hungary and Canada. Today, dental professionals in more than ninety countries are using Valplast® partials.

Valplast® is a type of flexible, nylon resin that is developed for use in flexible removable partial dentures. Valplast® Flexible Partials were invented in the early 1950's as an alternative to traditional metal and acrylic removable partial dentures (RPD's). By using a flexible nylon base, Valplast® eliminates the need for metal frameworks or acrylic resins for the construction of removable partial dentures.



History of Valplast Case Designs

Clasps are the retentive arms that are used to hold a partial denture in place and help promote stabilization of the denture. Valplast clasp design differs significantly from that of metal frame RPD clasp design. Instead of utilizing tooth borne clasps, Valplast partials rely mainly on flexible, dentoalveolar clasps that rest on the tissue surface. When designed and processed correctly, these clasps are capable of providing excellent comfort and aesthetics to the patient.

Most of the conceptual designs for Valplast clasps were based on early dentoalveolar clasp designs by Hungarian dentist Dr. Imre Kemény from his book "A foghiányok klinikuma és a lemez fogpótlás." The Kemény clasp designs failed in clinical usage because they were fabricated with conventional heat-cure acrylic. The clasps were rigid and failed to withstand the stresses involved in insertion and removal of these types of appliances. Also, because of the rigidity of the acrylic, the clasps were unforgiving in their interaction with mucous membranes. When Dr. Kemény was introduced to the Valplast® material, he noted favorably that the inadequacies of rigid materials previously at his disposal were fully overcome by the ideal flexibility of the Valplast® resin. His ideas were improved upon by Arpad Nagy and his colleagues as they continued to develop and refine the Valplast material and case designs in the late 1940's and early 50's.

Valplast clasps, in conjunction with other important elements of design (material thickness, palatal-lingual coverage, etc.) also address the requirement of stability by acting to inhibit anterior-posterior and lateral movements of the replacement teeth under mastication. Stress is supported by the alveolar ridge, with the flexibility of the Valplast base resin acting as a built-in stressbreaker, allowing for equal distribution of stress over the edentulous areas.



Mr. Arpad F. Nagy, co-inventor of the Valplast Flexible Partial Denture

Dr. Kemény Designs



The early dentoalveolar clasp designs by Dr. Kemény would have been ideal for removable partial dentures had the material (acrylic) been stronger, more flexible, and been able to resist breakage and deformation. These challenges were overcome with the arrival of Valplast, an unbreakable nylon resin for flexible partial dentures in the early 1950's.

Clasp Designs & Formation

There are generally four main types of clasp used for retention in a Valplast partial denture. They are the Wrap-Around, High Spur, Low Spur, and Split Clasp.

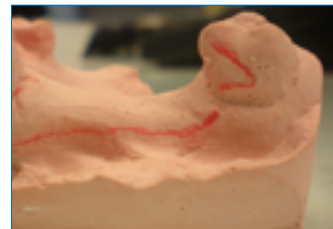
Wrap-Around Clasp

The Valplast wrap around clasp is a type of retainer that rests on the surfaces of the natural gum tissues in order to hold a Valplast flexible partial denture in place. It is the most common type of clasp used for Valplast partials. The wrap-around clasp originates from the buccal or labial flange of the denture base and traverses soft tissue to approach the abutment tooth from a gingival direction. For aesthetic purposes, this type of clasp often terminates $\leq 1\text{mm}$ onto the abutment tooth from a gingival direction, the tip of which falls into the embrasure between the abutment tooth and the next proximal tooth to it. The ideal shape and position of a wrap-around clasp is shown in Figure 1. It is essential to recognize incorrect clasp design and placement to understand better how a correctly designed clasp will provide predictable results and proper function. This type of clasp is very retentive as it makes use of both tooth and tissue undercuts. It is a good choice for retaining distal extensions and long spans of replacement teeth. In order to ensure patient comfort, it is important to note that these clasps do not actually compress the tissues for retention, but should always be resting in direct contact with tissue while in a relaxed position. If a gap is created by over-relief between the clasp and tissue, irritation could develop. Figure 2 illustrates a wrap-around clasp that is placed too high on the natural tooth surface, compromising aesthetics and failing to make use of tissue undercuts. Figure 3 demonstrates a wrap-around clasp that is overextended into the tissue undercut area, which may cause irritation to the patient, particularly upon insertion and removal of the denture as the clasp passes over high points of the tissue surface.



High Spur

In cases where the abutment tooth tilts to create a severe undercut making a wrap around clasp unfeasible, a high spur may be placed on the natural tooth. As this is not ideal for aesthetic considerations,



it is used mainly in posterior regions. The high spur is a common retainer for Kennedy Class III cases and modifications where natural posterior teeth bound the edentulous span. The high spur should be placed so that it enters along the height of contour and terminates in the infrabulge area of the abutment tooth.

Low Spur

Low spurs are placed on the natural abutment tooth next to the replacement and positioned close to the neckline in a roughly triangular form so as to appear as natural interproximal papillae. As they are more aesthetic than high spurs, they are mainly used in anterior areas. Because they are placed so low on the labial surface of the natural abutment teeth they are seldom used in cases where the abutment teeth are tilted or flared to create severe undercuts.



Split Clasp

The split clasp is used whenever the suprabulge portion of the abutment tooth is very wide and narrows substantially towards the infrabulge area, or when a flared or tilted condition of the abutment tooth requires that the retentive arm pass over a very severe high point before engaging undercuts. The split clasp resembles a roach clasp (from metal frame RPD design) in concept and basic design structure, with flexibility along both the vertical and horizontal axes of the junction.



Clasp Variations & Alternate Retention

Anchor Clasp

A seldom used but occasionally useful design is the labial or buccal anchor clasp. This clasp type is used mainly on maxillary full dentures in the labial region when large undercuts are present. These should extend a two-tooth length from the junction point where the clasp meets the adjoining buccal or labial flange.



Labial Strap

In cases where abutment teeth exhibit a high degree of mobility, they may be splinted by use of a thin, flexible labial (or buccal) strap. As demonstrated by the case in the photos below, the labial strap may be fabricated with what is essentially a series of continued split clasps so as to avoid placing excessive strain on the abutment teeth upon insertion and removal of the denture.



Implant Retained Overdenture with Bar Attachment

Being a flexible nylon resin, it is possible to fabricate retention clips for implant bars directly into the Valplast material without the need for additional components or metal housings.



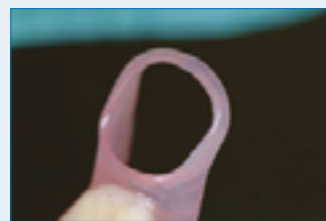
Split Flange Retention

In cases with large protuberant structures along the alveolar ridge, the buccal flange may be "split" along the height of contour to create a flexible, retentive arm out of the lower half of the split flange (along the peripheral border.)



Circumferential Clasp

The circumferential clasp was first suggested by Dr. Paul Kaplan, a U.S. Army Prosthodontist in his 2008 article "Flexible Removable Partial Dentures: Clasp & Design Concepts." This type of clasp completely encircles an abutment tooth for retention - ideal for free-standing distal abutments.



Combination Clasp

Another Kaplan design, this clasp is a combination of wrap-around and circumferential clasps that connect palatal/lingual and buccal components by crossing the occlusal table. This clasp may provide more retention of the denture and stability of free end saddles than a standard wrap-around clasp, but does require some tooth preparation in order to be placed correctly.



Friction Fit Denture

Complete maxillary dentures fabricated in Valplast may have limited success as the flexibility of the material might compromise the integrity of the post palatal seal. However, a friction fit overdenture may be fabricated for use over telescopic attachments which would address the requirement of retention without the need for retentive suction.



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