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The RPH Clasp Assembly: A Simple Alternative to Traditional Designs

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Abstract

One of the popular designs for the distal extension partial removable dental prosthesis is the RPI clasp assembly. A modification of the RPI clasp assembly is introduced. It incorporates a mesial rest (R), proximal plate (P), and a horizontal retentive arm (H—RPH). This clasp assembly provides benefits of the RPI clasp and can be used in clinical situations where the RPI clasp is contraindicated.

The design of distal extension-based (Kennedy class 1 and 2) removable partial dental prostheses has been the subject of numerous journal articles and book chapters over the years. The advocates of stress equalization, physiologic basing, broad stress distribution, and stress releasing have argued the advantages of various design components with only minimal support from the scientific process or evidence other than that provided through anecdote and empirical description. One of the more popular design philosophies incorporates the use of abutment stress breaking through the use of mesial occlusal rests (R), proximal plates (P), and buccal or labial I-bar retentive arms (I), the RPI design philosophy.[1,2] The RPI design concept is based upon abutment stress breaking through retentive arm disengagement during occlusal loading and proximal plate rotation below the proximal survey line either through plate design[1] or judicious intraoral adjustment described as physiologic relief.[2]

Certain clinical situations including buccally or labially flared abutment teeth, shallow vestibular depth, prominent frenal attachments, and soft tissue contour undercuts have been noted as contraindications for bar-type infrabulge retentive components. Additionally, some patients object to the feel of the bar-type retainer. The mesial rest (R), proximal plate (P), and Akers clasp (A), or RPA design concept, was introduced to deal with the shortcomings of the RPI concept.[3] With the RPA design, the traditional average circumferential retentive arm (Akers retentive arm) is modified from the traditional suprabulge configuration with a continuous retentive-arm-to-abutment-tooth contact to one in which the superior edge of the approach arm of the clasp is placed precisely over the survey line in anticipation that under occlusal loading, the retentive arm will disengage into the infrabulge space and avoid binding on the abutment tooth surface, causing a shift in the fulcrum point from the occlusal rest to the approach arm, thereby negating the stress release function intended. While the RPA retentive arm design circumvents some of the problems associated with the infrabulge bar type of retentive component, it is a difficult design concept to accurately create in the laboratory and may lend itself to potentially harmful torsional loading of the abutment tooth.

An additional clasp assembly design concept proposed for use in distal extension removable partial prosthesis design is the combination clasp assembly.[4] With the combination clasp concept, the circumferential cast retentive arm is replaced with an arm made of wrought wire, which is round in cross-section and more flexible than its cast counterpart. The combination clasp requires engagement of a deeper retentive undercut than its cast counterpart (0.02″ vs. 0.01″ for cast). While an effective alternative to the cast bar type infrabulge retentive arm, the wrought wire combination clasp may still cause unintended shifting of the rotational fulcrum in a distal extension prosthesis and may be susceptible to more frequent need for adjustment and may be a more expensive design due to the increased labor required to fabricate the combination-type retentive arm.

The horizontal retentive arm as originally described by Grasso has been used for many years at the University of Connecticut School of Dental Medicine as an alternative to the above-mentioned clasp assemblies for distal extension situations. The original concept described by Grasso included a distal occlusal rest, a vertical reciprocal arm, and a horizontal retentive arm.[5] The modification of this design to incorporate

Figure 1 RPH clasp assembly clinical occlusal view.

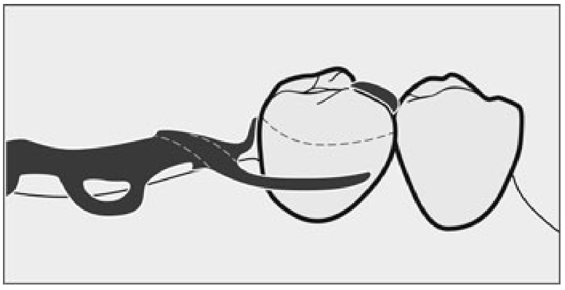

Figure 2 Schematic representation of relationship of the horizontal retentive arm to the abutment tooth. Facial view.

only the horizontal retentive arm into the RPI design concept is the design advocated here of mesial rest (R), proximal plate (P), and horizontal retentive arm (H—RPH). The horizontal arm may be cast half round in cross-section, cast round in cross-section, or may be fabricated from wrought wire (Figs 1–3). The practitioner may choose the retentive arm with the desired flexibility for a specific clinical situation. If the amount of undercut available is minimal, the cast half round or cast round would be preferable. An abutment tooth with a deep undercut in the desired area for retention and esthetics would be an indication for a more flexible clasp (wrought wire). Similarly, if the abutment tooth is narrow mesiodistally, a wrought wire clasp would give more flexibility in a short clasp arm to allow easier insertion and removal. Changing the gauge of the wire will also influence flexibility.

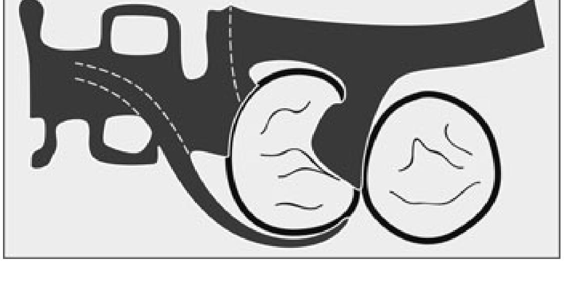

Figure 3 Schematic representation of relationship of the horizontal retentive arm to the abutment tooth. Occlusal view.

Figure 4 RPH clasp assembly on the master cast, occlusal view.

Because the horizontal retentive arm touches the abutment tooth only at its retentive tip, it is by definition an infrabulge type of retentive arm. The horizontal retentive arm originates from the retentive meshwork of the framework and travels horizontally, parallel to the plane of occlusion into the retentive undercut of the abutment tooth in a position at or mesial to the height of contour of the abutment tooth. In preparation of the master cast for duplication into the refractory cast, the abutment tooth is blocked out at the level of the retentive point so that when waxed and cast, the horizontal retentive arm touches the abutment tooth only at its retentive tip and is out of contact along the remainder of its length (Figs 4 and 5). Block-out at the level of the horizontal retentive arm is the same as the block-out used for generation of a bar-type retentive arm at the level of the horizontal path followed by the RPH clasp arm.

Proposed advantages of the RPH design concept include many of the advantages of the bar-type retentive arm allowing for the use of a cast retentive arm and retaining the potential stress-breaking concept of the RPI design. The RPH design concept may be used in situations that do not lend themselves to the use of a bar-type infrabulge retainer. The horizontal retentive arm may be used in situations where there are severe soft tissue undercuts, high-frenal attachments, and shallow vestibular depth. It may be used in situations where the survey line on the abutment tooth is more occlusally placed than is desirable, as the approach arm does not cross the free gingival margin

Figure 5 RPH clasp assembly on the master cast, distal view.

as a bar-type retentive arm would. It may also be a more esthetic retentive component than the bar-type retentive arm in situations with a high smile line with soft tissue exposure. The horizontal retentive arm also allows for easier adjustment as it travels from its source to its terminus in a straight line, allowing easier tightening or loosening.

The potential disadvantages of the horizontal retentive arm primarily relate to the functional length of the retentive arm itself. In situations of narrow mesiodistal abutment tooth width, the short length of the horizontal arm may be insufficient to allow flexibility to function well during insertion and removal. To avoid this problem, the retentive arm may be fabricated in a smaller cross-sectional size, which may be an esthetic advantage, or the point at which the retentive arm exits the denture base may be more distal, allowing for increased functional length of the arm. In such situations of short retentive arm length, the use of a wrought wire retentive arm could be considered as well. Because the retentive arm is not in contact with the abutment tooth for two-thirds of its length it is easy to keep the bend placed in the wire in one plane to gain additional flexibility. The wrought wire retentive arm is attached by soldering to the retentive mesh some distance from the point of flexure. Another disadvantage of the horizontal retentive arm is that the blocked-out space may act as a food trap, as is the case with all infrabulge retainers. The RPH design concept should be considered as an alternative to the bar-type retentive clasp arm in many clinical situations of removable partial prosthesis design.

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