

The modified swing-lock: A new approach

Walid Sadig, BDS, MS,^a and Faisal Fahmi, BDS, MSc^b

King Saud University, College of Dentistry, Riyadh, Saudi Arabia

The swing-lock removable partial denture (RPD) can address some specific partially edentulous situations better than conventional partial denture designs. The concept is recommended for maximizing stability and retention by access to more tooth surfaces and undercuts with the unique clasping mechanism offered by the incorporation of lock, hinge, and gate assemblies. Since its introduction, the swing-lock RPD has gained some degree of acceptance. However, it is infrequently used by clinicians because it is technique-sensitive, especially during hinge and lock fabrication, and the durability of the retentive element of the locking mechanism decreases with the progressive wear of the metal latch attachment. This article presents a new design for a swing-lock RPD by use of a vertical bar and plastic clip attachment as an alternative to the hinge and latch attachment. The suggested modification in the locking mechanism may overcome some of the problems associated with the conventional swing-lock RPD. (*J PROSTHET DENT* 1995;74:428-31.)

The swing-lock removable partial denture (SL-RPD) was introduced by Simmons¹ in the early 1960s. This type of prosthesis consists of a labial bar with projections and is fastened to the RPD framework by a hinge at one end and a latch at the other end. Reciprocation is achieved through a lingual plate that contacts all of the teeth by the projection of the labial bar.²

According to Antos et al.,³ the basic SL-RPD incorporates a lingual path of insertion, a hinge connection of the labial bar to the framework with a locking mechanism on the opposite end of the bar, and a labial opening arc of the retentive bar with struts (projections) and/or veneers that contact the infrabulge portion of the labial surfaces of the teeth.

The concept is recommended for maximizing stability and retention by gaining access to many more tooth surfaces and undercuts that are unapproachable with other partial denture clasp designs. The major indications for the use of an SL-RPD include (1) missing or weakened key abutment teeth, such as a bilateral distal extension RPD to replace all but a few incisors and one canine, (2) tooth mobility in patients who have undergone periodontal therapy or have major bone loss and require some type of stabilization, and (3) therapy for oncology patients who have undergone ablation surgery and have few remaining teeth, for example patients who have had a hemimaxillectomy or mandibular resection.^{4,5}

The conventional SL-RPD is not generally accepted as an alternate treatment modality by dental educators. Only 54% of the American dental schools teach swing-lock procedure, and only 14% of the dental students will complete an SL-RPD before graduating.⁶ One of the reasons that this type of restoration is used infrequently by clinicians is the sensitivity of the technique, particularly during the hinge and lock fabrication.⁷ In addition there is questionable durability of retention of the snap-lock system, which decreases as the metal latch attachment wears from repeated opening and closing.⁸

Making an SL-RPD with a vertical bar and plastic clip attachment is a new alternative to the hinge and latch attachment. The suggested modification in the locking mechanism may overcome problems associated with conventional SL-RPD.

PROCEDURE

1. Make an accurate diagnostic cast from an irreversible hydrocolloid impression. Survey and design the cast to determine the need for guiding planes and to locate occlusal rests.
2. Make the mouth preparations and an accurate border-molded impression. Accuracy is especially important in the labial vestibule for placement of the labial bar.
3. Pour a master cast in die stone, trim away any excess, and resurvey the cast. Transfer the design of the SL-RPD to the master cast. Place relief wax under the retentive mesh, lingual plate, and the labial bar. Do not block out the labial undercuts.
4. Duplicate the master cast in a refractory cast material.
5. Transfer the design from the master cast to the refractory cast.
6. Wax the lingual plate, retentive mesh, tissue stops, rests, and finish lines in the customary manner (Fig 1). (The lingual plate should extend occlusally past the height of contour of the lingual surfaces of the teeth to provide indirect retention.)

^aLecturer, Department of Removable Prosthetic Dental Sciences.

^bAssociate Professor, Department of Removable Prosthetic Dental Sciences.

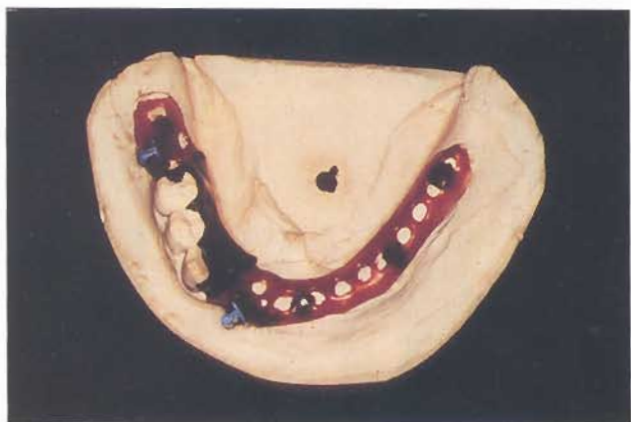


Fig. 1. Framework wax-up on refractory cast. Plastic attachment portion (occlusal view).

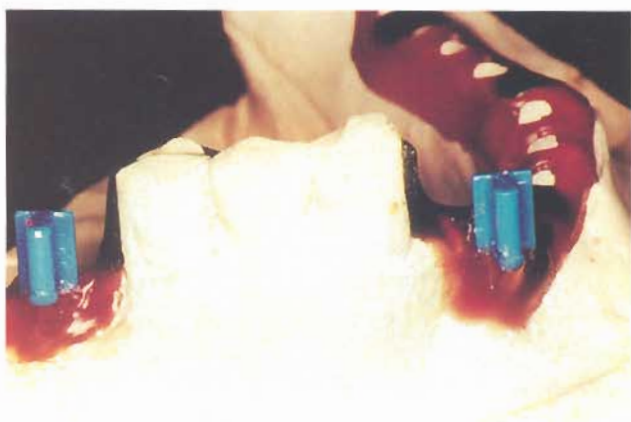


Fig. 2. Plastic attachment portions luted to retentive mesh facial to crest of ridge and parallel to each other in vertical and horizontal planes.

7. Use a bar and clip attachment (Hader vertical extension, A.P.M. Sternsgold, Attleboro, Mass.) in place of the hinge and latch attachment. With the aid of a surveyor, place the preformed plastic bar attachment with the attached mandrel over the crest of the ridge. This attachment is 6 mm in vertical height but can be reduced at the gingival surface to 3.5 mm for short interocclusal distances.
8. Lute the plastic bar to the waxed retentive mesh. Allow space between the abutment teeth on the cast and the plastic bar to set a denture tooth and for waxing the rider portion of the attachment. Place the plastic bar facial to the crest of the ridge and parallel to each other in the vertical plane (Fig. 2).
9. Sprue, invest, and cast the framework with any alloy desired.
10. Finish the metal framework and return it to the relieved master cast.
11. Place the plastic rider portion over the cast bar and prepare the cast for duplication by blocking out undercuts in the metal framework (Fig. 3).

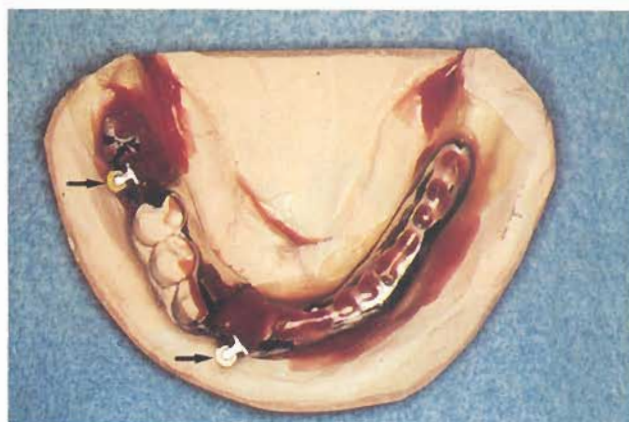


Fig. 3. Casting seated on master cast. Plastic rider placed over cast bar (arrows) and undercuts in metal framework blocked out with wax.



Fig. 4. Labial bar waxed on second refractory cast; 2 mm extension on labial bar (arrow) enables patient to unlock bar easily.



Fig. 5. Casting tried in patient's mouth. Plastic riders (arrows) seated in receptacles at each end of bar.

12. Duplicate the master cast with the cast framework seated firmly on it and pour the duplication mold in refractory material.
13. Wax the labial bar and the retentive projections on this

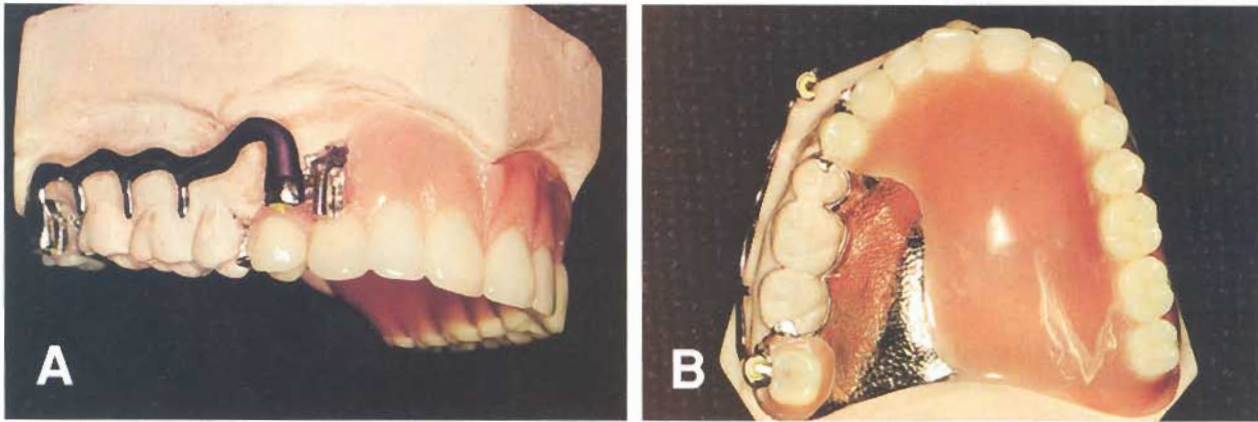


Fig. 6. Finished and polished maxillary modified SL-RPD on master cast. **A**, Buccal view; **B**, occlusal view.



Fig. 7. Modified SL-RPD in patient's mouth replaces all except three mandibular teeth.



Fig. 8. Modified SL-RPD retained by only four mandibular anterior incisors.

refractory cast and extend the wax labial bar distally to completely cover the refractory duplicates of the bar and rider components (Fig. 4).

14. Sprue, invest, cast, and finish the labial bar and polish.
15. Insert the plastic riders into the receptacles created at the ends of the labial bar. (The cast framework with labial bar may be tried in the patient's mouth at this time [Fig. 5].)
16. Set the denture teeth and complete the SL-RPD the same as any conventional removable denture, applying the principles of base extension and occlusal relation (Fig. 6)

DISCUSSION

Although the locking system of the modified SL-RPD described in this article differs totally from the hinge and latch attachment used in conventional SL-RPDs, the basic design principles of an SL-RPD such as stress distribution, rotational forces, labial bar, and retentive arms assembly were strictly followed and incorporated into the design.

Patients wearing these modified SL-RPDs are pleased with the results (Fig. 6). In a conventional SL-RPD, the remaining teeth are grasped firmly by the prosthesis (Figs. 7 and 8). A long distal extension base is likely to move toward the tissue under the force of occlusion. This movement can tip the teeth grasped by the prosthesis.^{9, 10} The use of a resilient extracoronary attachment such as the Hader vertical bar with the plastic rider as a hinge joint and locking mechanism results in the prosthesis grasping the teeth gently. This results in less rotational and horizontal loading on the abutment teeth whenever the prosthesis moves downward against the mobile mucosa.

Clinical evidence has shown that the locking mechanism in a conventional SL-RPD may show noticeable wear in a relatively short time, leading to loosening of the snap-lock mechanism. This situation may require frequent adjustment of the labial bar to tighten the snap-lock action.^{7, 8} Consequently, the passive contact of the vertical struts against the labial surfaces may be distorted. This situation requires further adjustment of the vertical projection arms

with pliers. On the contrary, adjustment of the labial bar and the vertical struts are not required with the modified SL-RPD. Whenever the retention of the bar and the clip deteriorate, retention can be adjusted simply by replacing the detachable plastic riders secured in the receptacles at the two ends of the labial bar with new ones. If the attachment parts are placed precisely parallel to each other with one path of insertion positioned to the vertical and horizontal planes, the retention of the plastic riders may last over a year.

Another favorable feature of the Hader bar vertical attachment is the ability to cast the plastic attachment as an integral part of the metal framework. With a conventional SL-RPD, the prefabricated plastic hinge and latch attachment need to be cast separately before the metal framework is cast. Casting the metal framework to the hinge joint has been a troublesome procedure for many dental technicians.

Generally, no functional problems were encountered with the modified SL-RPD. In some patients with limited interocclusal distances, the bulk of the attachment could not be accommodated easily in the available interarch space. In such instances, the vertical height of the attachment can be reduced to half size without representing a noticeable decrease in retention of the snap-lock mechanism. Occasionally, patients with poor manual dexterity may have difficulty opening the gate assembly. For these patients we suggest extending the right labial bar 2 to 3 mm past the attachment assembly for the right-handed person and similarly on the left side for the left-handed persons (Fig. 4). The extension will enable patients to place the thumbnail under the labial bar extension and pry open the snap lock.

SUMMARY

There are common problems that may occur for the clinicians and dental technicians during the process of fabri-

cation of a SL-RPD, the maintenance of the snap-lock retention mechanism, or both. An alternate technique of fabricating an SL-RPD with an extracoronal Hader vertical attachment as a hinge and lock mechanism was described.

The modified swing-lock prosthesis performed satisfactorily in the patients' mouths. The technique was characterized by simplicity, resiliency, durability, ease of adjustment and maintenance, and finally economics. The simplicity of the modified SL-RPD allows it to be used more frequently in situations for which more conventional types of treatment may appear hopeless.

REFERENCES

1. Simmons JJ. Swinglock stabilization and retention. A preliminary clinical report. *Tex Dent J* 1963;81:10-2.
2. Simmons JJ. Swinglock clinical manual. Dallas: Idea Development Co, 1968.
3. Antos EW Jr, Renner RP, Foerth D. The swing-lock partial denture: an alternative approach to conventional removable partial denture service. *J PROSTHET DENT* 1978;40:257-62.
4. Bolender CL, Becker CM. Swinglock removable partial dentures. Where and when. *J PROSTHET DENT* 1981;45:4-10.
5. Talbot TR. Review of the Swinglock removable partial denture. *Int J Prosthodont* 1991;4:80-8.
6. Renner RP, Foerth D, Antos E. Overdentures and Swinglock partial dentures as alternatives to traditional removable prosthodontics: a survey of American dental schools. *J Dent Educ* 1977;41:695-6.
7. Schwalm CA, LaSpina FV. Fabricating swinglock removable partial denture frameworks. *J PROSTHET DENT* 1981;45:2216-20.
8. Becker CM, Bolender CL. Designing swinglock partial dentures. *J PROSTHET DENT* 1981;46:126-32.
9. Schulte JK, Smith DE. Clinical evaluation of swinglock removable partial dentures. *J PROSTHET DENT* 1980;44:595-603.
10. Holmes JB. Influence of impression procedures and occlusal loading on partial denture movement. *J PROSTHET DENT* 1965;15:474.

Reprint requests to:

DR. WALID M. SADIG
COLLEGE OF DENTISTRY
KING SAUD UNIVERSITY
PO BOX 60169
RIYADH 11545
SAUDI ARABIA