Indirect Retainers

Partial denture movement can exist in three planes; horizontal, frontal, and sagittal. ***Tooth-supported partial dentures*** use teeth to control movement away from the tissues. ***Tooth-tissue—supported partial dentures*** have at least one end of the prosthesis free to move away from the tissue. This may occur because of the effects of gravity in the maxillary arch or adhesive foods in either arch. Thus, there is an axis or line about which the denture will rotate when the bases move away from the residual ridge and this is associated with tooth-tissue supported partial dentures. A ***fulcrum line*** is a theoretical line around which a removable dental prosthesis tends to rotate when subjected to forces towards or away from the residual ridge.

This movement away from the residual ridge around the fulcrum line can be prevented by the action of an indirect retainer, (Fig. 1). Thus, an ***indirect retainer*** is the component of a removable partial denture that assists the direct retainer(s) in preventing displacement of the distal extension denture base by functioning through lever action on the opposite side of the fulcrum line when the denture base moves away from the tissues in pure rotation around the fulcrum line. Therefore, the ***main function of the indirect retainer is*** to prevent movement of a distal extension base away from the tissues.

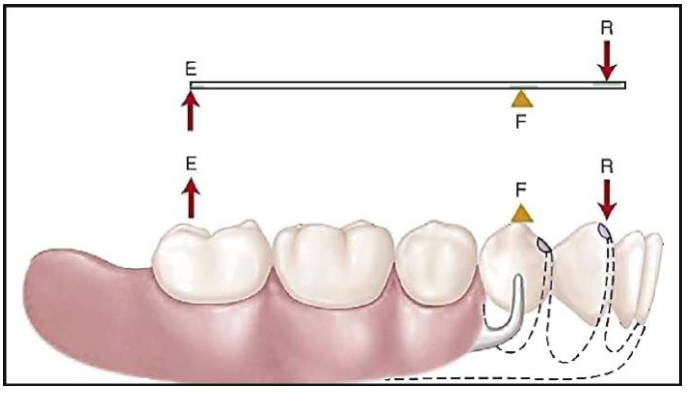

Figure 1: Action of the indirect retainer where E: Effort (e.g. sticky food), F: fulcrum line, & R: Resistance (indirect retention).

An indirect retainer consists of one or more rests and the supporting minor connectors and should be placed as far from the distal extension base as possible in a prepared rest seat on a tooth capable of supporting its function. The proximal plates, adjacent to the edentulous areas, also provide indirect retention. Although it is customary to identify the entire assembly as the indirect retainer, it should be remembered that the rest is actually the indirect retainer united to the major connector by a minor connector.

The most effective location of an indirect retainer is in the area of an incisor tooth, but this tooth may not be strong enough may have steep inclines that cannot support a rest. Thus, the nearest canine or the mesio-occlusal surface of the first premolar may be the best location for the indirect retention and on both sides of the arch closer to the fulcrum line are used to compensate for the compromise in distance.

In the absence of indirect retainers for distal end extension dentures subjected to posterior dislodging forces, two undesirable events may take place: (1) the denture base moves away from the supporting tissues, and (2) the anterior segment of the major connector impinges upon the underlying soft tissues (Fig. 2a). This results in transmission of destructive forces to the hard and soft tissues of the dental arch.

When an indirect retention is included in distal extension dentures, (1) forces acting to dislodge the distal extension bases are neutralized (Fig. 2b). Also, (2) the rotational axis shifts from the abutment teeth to the indirect retainers and as long as the clasp assemblies resist the vertical dislodging forces, the prosthesis remains in place. As dislodging forces become greater than the retentive capacities of the clasp assemblies, the prosthesis moves away from the underlying tissues.

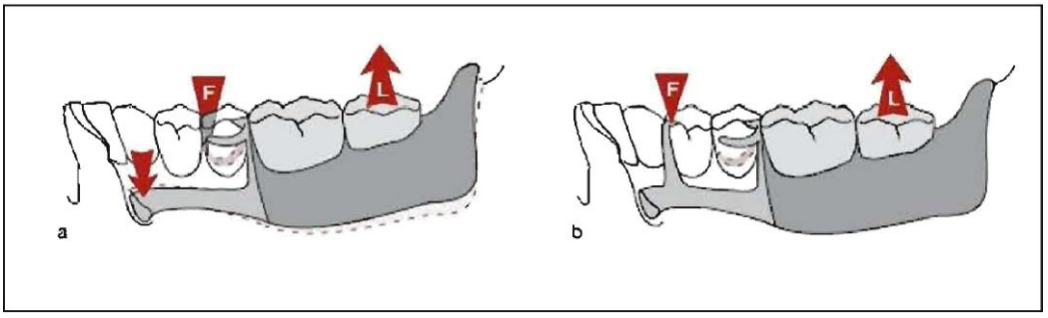

Figure 2: Movement of a distal extension denture in the absence (a) and presence (b) of an indirect retainer.

The following are the ***main factors influencing the effectiveness*** of an indirect retainer:

1. The principal occlusal rests on the primary abutment teeth must be held in their seats by the retentive arms of the direct retainers. If rests are held in their seats, rotation about an axis should occur, which subsequently would activate the indirect retainers. If total displacement of the rests occurs, no rotation about the fulcrum would occur, and the indirect retainers would not be activated.
2. Distance from the fulcrum line. The following three areas must be considered:
   a. Length of the distal extension base.
   b. Location of the fulcrum line.

c. How far beyond the fulcrum line the indirect retainer is placed.

3. Rigidity of the connectors supporting the indirect retainer. All connectors must be rigid if the indirect retainer is to function as intended.
4. Effectiveness of the supporting tooth surface. Tooth inclines and weak teeth should never be used to support indirect retainers.

In addition to the main function there are ***auxiliary functions*** which the indirect retainer may serve to achieve and these are as follows:

1. It tends to reduce antero-posterior tilting forces on the principal abutments. This is particularly important when an isolated tooth is being used as an abutment—a situation that should be avoided whenever possible. Ordinarily, proximal contact with the adjacent tooth prevents such tilting of an abutment as the base lifts away from the tissues.
2. Contact of its minor connector with axial tooth surfaces aids in stabilization against horizontal movement of the denture.
3. Anterior teeth supporting indirect retainers are stabilized against lingual movement.
4. It may act as an auxiliary rest to support a portion of the major connector, facilitating stress distribution. For example, a lingual bar may be supported against settling into the tissues by the indirect retainer acting as an auxiliary rest.
5. It may provide the first visual indications for the need to reline an extension base partial denture. Deficiencies in basal seat support are revealed by the dislodgment of indirect retainers from their rest seats when the denture base is depressed and rotation occurs around the fulcrum.

An indirect retainer is an auxiliary occlusal, cingulum, or incisal rest that contacts a properly designed rest seat when the removable partial denture is in place. In order to be effective, the indirect retainer must be rigid. If the indirect retainer is flexible, the prosthesis will not function as intended. In fact, potentially destructive forces may be amplified because of this lack of rigidity.

An occlusal rest is the preferred component for indirect retention. Because of its location and orientation, an occlusal rest permits forces to be directed within the long axis of the corresponding abutment.

Forms of Indirect Retainers:

The indirect retainer may take several forms and theses are:

1. Auxiliary Occlusal Rest

The most commonly used indirect retainer is an auxiliary occlusal rest located on an occlusal surface and as far away from the distal extension base as possible. As mentioned earlier, this is the best form of indirect retention.

In a Class I arch this location is usually on the mesial marginal ridge of the first premolar on each side of the arch. The ideal position for the indirect retainer perpendicular to the fulcrum line would be in the area of the central incisors, which are too weak and have steep lingual surfaces. Bilateral rests on the first premolars are quite effective, even though they are located closer to the axis of rotation (Fig. 3). This is advantageous because 1) not only are they effective without jeopardizing the weaker single-rooted teeth, but 2) interference with the tongue is far less when the minor connector can be placed in the embrasure between canine and premolar rather than anterior to the canine teeth.

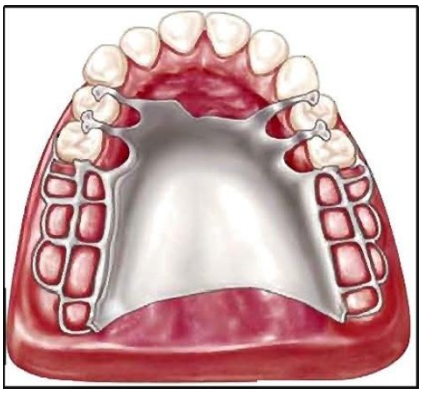

Figure 3: Auxiliary occlusal rests on the first premolars to prevent settling of the anterior portion of the major connector and to provide stabilization against horizontal rotation.

Indirect retainers for ***Class II partial dentures*** are usually placed on the marginal ridge of the first premolar tooth on the opposite side of the arch from the distal extension base (Fig. 4).

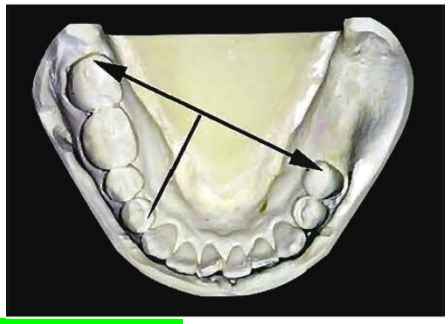

Figure 4: Class II design showing a favorable location for the indirect retainer on the mesio-occlusal of the first premolar. This location is at 90 degrees to the fulcrum line.

2. Lingual rest

A cingulum rest also can be used as an effective indirect retainer. A cingulum rest on the adjacent canine tooth may be used when the mesial marginal ridge of the first premolar is too close to the fulcrum line or when the teeth are overlapped. Modifications

of the linguial rest(mesial round rest). can be applied for anterior teeth when the converitional cingulum rest. is inapplicable.

3. Incisal rest.

An incisal rest also may provide indirect retainer on where other rests are coritraindicated. This is particularly true for maxillaty and maridibular incisors, as well as mandibular canines. bexcuse o f the unfavorable lingual anatomy of these teeth, incisal rests may be the only acceptable option. Unforturiately, incisal rests are esthetically objectioriable and exhibit long approach arms that may transfer harmful tipping forces to abutments. A better solution would be to use one o f the modifications for a lingual rest on these teeth.

4. Canine Extensions from Occlusal Rests

A finger extension from a premolar rest is placed on the prepared lingual slope of the adjacent canine tooth (Fig. 5) when the first premolar must serve as a primary abutment.

Figure 5: C_a the extensions from occlusal rits as irdirect retainers.

5. Cingulum Bars (Continuous Bars) and Linguoplates

In Class I & II partial derittures, a cingulum bar or linguoplate may act as an indirect retainer. Techriically, cingulum bars (continuous bars) and liriguoplates are riot indirect retainers because they rest on unprepared lingual inclines o f anterior teeth. The indirect retainers are actually the terminal rests at either end that occur in the form of auxiliary occlusal rests or canine rests.

Even when there is no need for indirect retention, continuous bar (cingulurn bar) or linguoplate raj or connector should never be used without terminal rests because of the resultant forces on inclined plane s o f the ariteri or teeth.

6. Modification Areas

The occlusal regt on a secondaty abutment in a Class II partial denture may serve as an indirect retainer. A secondary abutment is an abutment adjacent to a bounded ederitulous span other than the free end extension. If the mo di fi.cati on space were not present, as in

an unmodified Class II arch, auxiliary occlusal rests and stabilizing components would be essential to the design of the denture. However, the presence of a modification space conveniently provides an abutment tooth for support, stabilization, and retention.

If the occlusal rest on the secondary abutment lies far enough from the fulcrum line, it may serve as an indirect retainer. Its dual function then is tooth support for one end of the modification area and support for an indirect retainer.

If the secondary occlusal rest is too close to the fulcrum line to be effective than an auxiliary rest farther from the fulcrum line should be placed, both for indirect retention and for support for an otherwise unsupported major connector.

7. Rugae Support

The rugae area of the maxillary arch can be used as a means of indirect retention because the rugae area is firm and usually well situated to provide indirect retention for a Class I removable partial denture. Although this is true, rugae coverage is undesirable and should be avoided if possible.

The use of rugae support for indirect retention is usually part of a U shaped maxillary major connector (palatal horseshoe design). Posterior retention is inadequate due to absence of posterior palatal seal and the requirements for indirect retention are greater than avoiding rugae coverage.

In a maxillary arch, where only anterior teeth remain, full palatal coverage is usually necessary. In fact, with any Class I maxillary removable partial denture that extends distally from the first premolar teeth, except when a maxillary torous prevents its use, palatal coverage may be used to advantage.

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