Success with the cantilever fixed partial denture

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It is preferable to replace a missing tooth with a fixed rather than removable restoration.1,2 However, certain clinical conditions with abutments at only one end of the edentulous space preclude using a conventional fixed partial denture (FPD) and a cantilever FPD may be indicated.

The cantilever FPD is a fixed restoration that has one or more abutments at one end while the other end is unsupported.3 This unique arrangement accounts for the prime disadvantage: the creation of a Class I lever system (Fig. 1). When the cantilevered pontic is placed under occlusal function, forces are placed on the abutment(s). Many dentists have noted a high incidence of damage with these restorations; consequently, some are reluctant to prescribe cantilever FPDs for patients.4 Despite therapeutic intent, the cantilever principle can be abused and inadvertently contribute to the initiation and progression of periodontal disturbance (Fig. 2). However, if used judiciously and if certain criteria are met, the restoration can be a valuable service. This article discusses the factors necessary for a successful cantilever FPD.

FAVORABLE CLINICAL CONDITIONS DETERMINED THROUGH ORGANIZED DATA

The objective of diagnosis is to identify existing conditions, to investigate abnormalities, and to determine their cause. Many failures with the cantilever FPD originate from a hasty appraisal of the clinical conditions without substantial data. The importance of specific, organized data cannot be overemphasized. The workup should include (1) an interview with the patient after recording the medical and dental history, (2) extraoral and intraoral clinical examination, (3) evaluation of complete mouth radiographs, and (4) analysis of articulated diagnostic casts. Information is then used to determine whether the cantilever FPD is feasible.

The success of the cantilever FPD depends on the health of the supporting periodontium. Definitive treatment should be postponed until patients are instructed in, and able to maintain, plaque control. Abutment teeth must also have sufficient crown length and favorable root morphology with adequate periodontal tissue support.5 Endodontically treated teeth should have the appropriate coronal radicular stabilization.

A favorable occlusion opposing the cantilever FPD is the mucosa-borne prosthesis because a limited amount of force is exerted on the cantilevered pontic. Conversely, patients with excessive or premature wear patterns resulting from parafunctional habits are not ideal subjects for this treatment and it should be approached with extreme caution.

SOUND MECHANICAL FEATURES OF THE FIXED PARTIAL DENTURE

Forces applied to the cantilevered pontic are resisted through rotational and tilting movements by the abutment teeth rather than those along the long axes.4 To preserve the integrity of the supporting periodontium and prevent material failure, it is crucial to understand the nature of each component of the prosthesis.

Single cantilevered pontics with at least two abutments are recommended,7 although this may vary depending on the existing clinical conditions and the location of the pontic in the dental arch. The muscles of mastication cause the strongest forces to be applied in the posterior regions of the arch.8 When a cantilevered pontic is placed posteriorly, additional abutments may be required to withstand the forces (Fig. 3).

Complete crowns are the preferred retainers for the cantilevered FPD to achieve maximum retention and resistance.9 Secondary retentive grooves and box preparations can be used when necessary.
Fig. 1. Creation of class I lever system is primary disadvantage of cantilever fixed partial denture.

Fig. 2. Clinical failure due to fracture of metal component of fixed partial denture.

Fig. 3. Pontics extending into posterior regions of dental arch are subject to increased loads.

Fig. 4. Proper design of connectors provides adequate strength and rigidity yet allows for oral physiotherapy.

Fig. 5. Cantilevered pontics must satisfy patient's physiologic, functional, and esthetic requirements.

Fig. 6. Buccolingual width of pontic is reduced to control force on abutment teeth.
It has been shown that the connector is the weakest component of an FPD since it displays the highest concentration of stress. To help reduce and distribute stress, connectors should have a U-shaped rather than a sharp V-shaped outline form. Connectors must also have sufficient thickness for strength and rigidity to avoid deformation or ultimate fracture under stress, but inordinate thickness blocks access to oral hygiene (Fig. 4).

PROPER DESIGN OF THE CANTILEVERED PONTIC

Clinical studies indicate that mucosal irritation is consistently found in the vicinity of FPD pontics. This reaction may be more severe with the cantilevered pontic because it is supported at only one end, increasing the possibility of movement and subsequent mucosal trauma during function.

Optimal tissue response may depend more on the design of the pontic and on plaque control than on the material from which the pontic is fabricated, provided the pontic’s surface is glazed or polished. However, the tissue surface of the pontic should be designed to provide only select tissue contact, allowing minimal pressure between the pontic and the mucosa. Pontics must also be contoured to provide acceptable esthetics, adequate cheek and tongue support, and access for oral hygiene (Fig. 5).

An occlusion must be developed to reduce stress by directing the forces to abutment teeth so that the cantilevered pontic provides only a centric occlusal stop and not a disclusion function. It is also desirable to narrow the occlusal table of the pontic, which helps to reduce loads transferred to the abutment teeth. An acceptable guideline is to make the buccolingual width of the pontic no greater than the smallest abutment crown (Fig. 6).

MAINTENANCE OF THE SUPPORTING PERIODONTIUM

Treatment is not concluded with the cementation of the restoration but must be followed by occlusal adjustment and a stringent oral hygiene. The potentially harmful stresses induced by the cantilevered pontic in the presence of bacterial plaque can result in rapid destruction of the supporting tissues. Therefore, methods of plaque control must be instituted by the dentist and effectively performed by the patient to effect an ideal tissue response. The success of this restoration is impossible without adequate patient cooperation.

SUMMARY

Factors necessary for longevity of cantilevered FPDs include (1) favorable clinical conditions determined by organized data collection, (2) sound mechanical features of the FPD, (3) appropriate design of the cantilevered pontic, and (4) maintenance of the supporting periodontium.

REFERENCES


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