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Using the Pinledge as a Conservative Retainer: A Clinical Report

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Abstract

Prior to the invention of the metal ceramic crown, the pinledge retainer served prosthodontic dentistry for many years. The metal ceramic retainer has been the standard of choice for the majority of fixed partial dentures (FPDs) for nearly 40 years. Recent advances with acid-etched, resin-bonded metal retainers and most recently all-ceramic retainers may have led many to believe that the pinledge retainer is an outdated treatment modality. This clinical report provides examples of several types of pinledge retainers used to restore missing teeth or to splint teeth. These patient examples will also demonstrate that the pinledge retainer can provide excellent esthetics for today's appearance-conscious patients.

The pinledge has been cited in the literature for many years as being both an esthetic and conservative retainer for fixed partial dentures (FPDs). Prior to the invention of the metal ceramic crown and retainer in the 1950s,[1,2] the pinledge retainer was widely used as a retainer for FPDs. The main feature of the pinledge retainer is that it relies heavily upon substitution of pinholes for axial walls that are left unveneered. It is the most conservative of the partial veneer crowns in percentage of axial enamel left undisturbed.[3] Various authors have published modifications and applications of the pinledge preparation.[4-8] Several authors have investigated the longevity of the pinledge as a retainer for FPDs. Gustavsen and Silness[9] reported findings on 114 pin-retained FPDs 6 years after completion. They found a failure rate of 2.5%. Lundquist and Nilson[10] examined 51 pinledge retainers after 8 years and found a failure rate of 3.4%. Shillingburg et al[3] provide an excellent literature review. Techniques of pinledge retainer preparations have been described in several texts.[3,11-13]

The indications for a pinledge retainer preparation are that the coronal tooth structure is intact or nearly intact, normal coronal form is present, and the crown of the tooth is of average length or longer. The tooth must have average or greater labiolingual thickness in the incisal one-half of the crown, and the abutment teeth must be in normal alignment or very close to normal alignment.[11]

The contraindications for a pinledge retainer include when caries or a restoration extends past the normal outline of the preparation, or when either of these conditions would involve an area in which a retentive pinhole must be placed. The pinledge retainer is not indicated when the crown of the tooth exhibits an abnormal form or other developmental defects. If the crown of the tooth is so thin labiolingually that the preparation would allow the retainer to show through the labial enamel, or the labial enamel would be left unsupported by dentin, a pinledge retainer preparation is not recommended. Conditions that would cause excessive torsional forces to be applied to the retainers, such as abnormal alignment, production of a lever arm by the prosthesis, or excessive span length, are also contraindicated.[11]

A traditional pinledge retainer preparation on a maxillary central or lateral incisor involves the placement of three pinholes: two in the incisal one-quarter of the tooth and one in the cervical one-eighth of the tooth. These pinholes are made parallel to the incisal two-thirds of the clinical crown. Controversy exists regarding pinhole depth. Goodacre et al recommend the depth of the pinholes be 1.5 to 2.0 mm.[11] Conversely, Shillingburg et al recommend that the depth of the pinholes be a minimum of 3.0 mm.[3] Lorey et al recommend that the pinhole depth be 4.0 mm, and Hughes 3.0 to 5.0 mm.[14,15] Rosenstiel et al advocate a depth of at least 2 mm, and state a depth of 3 mm is permissible when placement and orientation allow.[13]

Goodacre et al also advocate the tapered pinhole technique.[11] Many pin retainer options are available and are as varied as the teeth to be prepared. One common modification outlined by Goodacre et al is the modified pin retainer for a maxillary canine where one cingulum pinhole is placed, and mesial and distal interproximal grooves are placed, because grooves are more retentive than pinholes.[11] Placement of grooves rather than a pinhole allows for greater rigidity, particularly when the groove is next to the connector area, which is desirable for use with a longer span FPD.[3,11] The purpose of this report is to illustrate several clinical examples of restorations with pinledge retainers.

Clinical reports

Anterior pinledge retainer applications

A 55-year-old female Caucasian patient originally presented with four crowded mandibular incisors and was diagnosed with severe periodontal disease on those incisors. Her remaining dentition had a very favorable periodontal prognosis as diagnosed by her periodontist. Orthodontic treatment was recommended on both the mandibular and maxillary arches. At that time, the patient declined maxillary orthodontic treatment but did allow mandibular orthodontic treatment to be completed. Prior to orthodontic treatment, the left central incisor was extracted, and orthodontic treatment was completed on the three remaining incisors to better align the five anterior teeth. When orthodontic treatment was completed, the three remaining incisors were extracted. The patient declined the option of implants. The left and right canines were intact with no restorations present. As per the ACP Prosthodontic Diagnostic Index (PDI) for the partially edentulous patient classification system, the patient was diagnosed as class I.[16] The patient stated that she wanted the minimal amount of tooth structure removed to provide her with an esthetic FPD. It was explained that due to the flattened gingival architecture, there would be cervical areas where there would be openings between the teeth and the gingiva. It was also explained that there might be a slight amount of metal showing on the mesial interproximal side of both canines, again due to the flattening of the gingival architecture.

The teeth were prepared with conventional pin-retained preparations involving three pins. All pinholes were prepared to a depth of 2.0 mm, and the tapered technique was used.[11] The width and thickness of the canines made them fairly ideal candidates for this type of preparation. The preparations were kept short of the incisal edges to minimize any metal showing in this area (Fig 1). An additional mesial interproximal groove was provided on both preparations for added resistance form. This was made parallel to the pinholes, which were parallel to the incisal two-thirds of the clinical crowns. A 0.5-mm chamfer was provided to allow more bulk for metal because of the long span of the FPD (Fig 2).

A standard fixed prosthodontic impression technique using heavy and light-bodied addition reaction silicones was used (Imprint II Garant, 3M ESPE, St. Paul, MN). A Lentulo spiral (Densply Caulk, Milford, DE) was used to spin the light-bodied material into each pinhole. A provisional FPD was fabricated from polyethylmethacrylate (SNAP, Parkell Biomaterials, Farmingdale, NY). Wilkinson plastic tapered pins were incorporated into the retainer waxups (Wilkinson Co., Inc., Post Falls, ID). A conventional high palladium metal ceramic alloy was used (Argedent 52SF, The Argen Corp., San Diego, CA). The framework was evaluated intraorally and finished. After satisfactory fit, three modified ridge lap incisor pontics were fabricated. Opaque porcelain was added to the interproximal side of the metal retainers to minimize the metal showing through in this area (Fig 3). The FPD was luted in place with an opaque dental adhesive (Panavia, Kuraray America, Inc.,

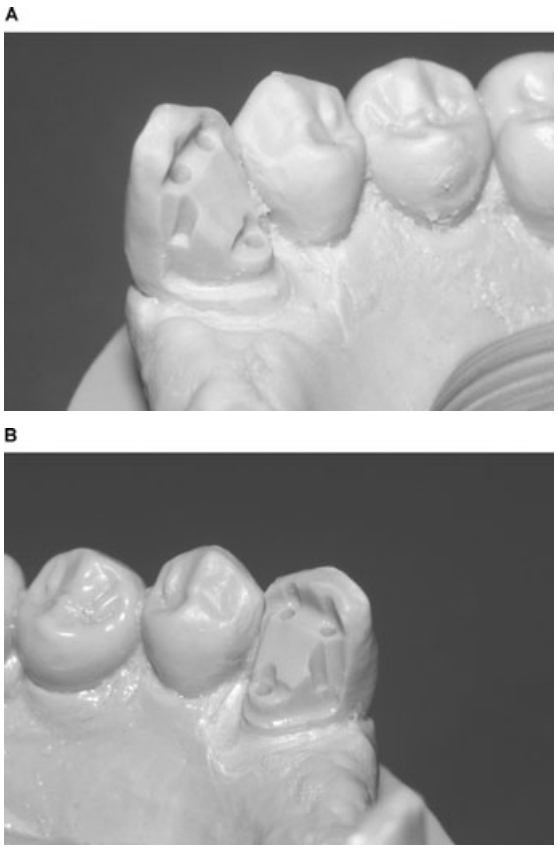

Figure 1 Right (A) and left (B) mandibular canine preparations.

Figure 2 Preparations and lingual view of path of insertion.

Figure 3 Definitive fixed partial denture.

Figure 5 Definitive fixed partial denture.

New York, NY). A Lentulo spiral was again used to deliver the luting agent into the pin holes. One thousandth of an inch clearance of occlusion was designed and adjusted over the incisal edges of the pontics (Shim Stock, The Artus Corp., Englewood, NJ).

A 17-year-old male Caucasian who had recently completed orthodontic treatment presented with a tooth size discrepancy in his maxillary left lateral incisor area. It was recommended to retreat with orthodontics, and the patient refused. There was not enough space between the central and canine teeth to provide the patient with even a narrow diameter implant due to the convergence of the roots. As per the ACP PDI for the partially edentulous patient classification system, the patient was diagnosed as class I.[16] Therefore, the next most conservative treatment involving a pinledge retainer was initiated. A pinledge retainer preparation was completed on the left maxillary canine using three tapered pin holes to depths of 2.0 mm. A mesial groove was placed for additional retention and resistance form, and a 0.3-mm chamfer finish line was completed (Fig 4). The preparation was kept cervical to the incisal one-third of the tooth for esthetic reasons. The pontic area was prepared as an ovate pontic at the time of the preparation. Impression, waxup, provisional, alloy, and luting procedures were identical to the previously described patient. The small cantilevered pontic on the left lateral incisor was kept out of both maximum intercuspation and excursive movements (Fig 5).

Splint applications

It is also possible to use the pinledge retainer preparation design for splinting periodontally involved teeth in either the maxilla or the mandible. It is more difficult to provide this on mandibular teeth due to the small size of the mandibular incisors; however, when the incisors have good facial to lingual thickness, adequate clinical crown length, and well-formed cingula, it is possible to prepare these teeth for this preparation design.

The patient was a 48-year-old female Caucasian referred by her periodontist for the splinting of severely periodontally involved mandibular anterior teeth. It was decided that due to the rotation and mobility of the mandibular incisors, a resin-retained FPD splint was not a viable option. A much less conservative option would have involved full coverage with metal ceramic retainers. As per the ACP PDI for the partially edentulous patient classification system, the patient was diagnosed as class I.[16] The mandibular anterior teeth were prepared for conventional pin retainer preparations (Fig 6). The thickness of these teeth allowed the placement of three tapered 2.0-mm

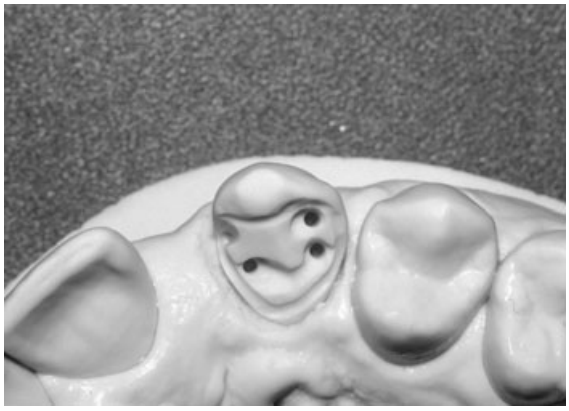

Figure 4 Left maxillary canine preparation.

Figure 6 Mandibular canine and incisor preparations.

Figure 7 Definitive splint-lingual view.

pinholes in each tooth with the preparation of a very slight chamfer finish line or a featheredge finish line where necessary on the cervical areas of the teeth. The preparations were finished at the cingula of the teeth to allow better oral hygiene access and better visibility of the marginal placement of the retainers. Impression and waxup procedures followed the previously described patient protocol. Intermediate Restorative Material (Dentsply Caulk, Dentsply, Milford, DE) was used to provisionally seal the pinholes. Two castings of a high noble metal alloy (Firmalay, Jelenko, Armonk, NY) were made with each consisting of three retainers. The castings were tried-in orally and luted together with pattern resin (GC Pattern Resin, GC America, Inc., Alsip, IL.). This assembly was then soldered together. The splint was designed to provide indirect retention for a removable partial denture (RPD) prosthesis. Cingulum rests were waxed on the retainers of both central incisors, the right lateral incisor, and right canine. The casting was luted in place, as described previously, with zinc phosphate cement (Fleck's Zinc Phosphate Cement, Mizzy, Inc., Cherry Hill, NJ), and the definitive RPD was fabricated (Fig 7). The facial view illustrates that this type of splint can be designed to show very minimal or no gold (Fig 8).

Figure 8 Definitive splint-facial view.

Discussion

These clinical reports describe the indications, contraindications, abutment teeth preparations, and clinical procedures involved in the fabrication of anterior pinledge-retained FPDs and splints. Patient examples reported have followed the indications recommended by Goodacre et al,[11] Shillingburg et al,[12,3] and Rosenstiel et al[13] for treatment with a pinledge retainer. If the patients are chosen carefully and follow the indications for treatment, the pinledge retainer can be a very esthetic, conservative, and successful preparation design. Goodacre et al's pinhole depth guidelines were followed.[11] The author believes that a depth of 1.5 to 2.0 mm allows very safe pin preparations on all teeth and in particular on young adults where the pulp chambers are larger. Ghashi (in Rosenstiel et al[13]) outlines the placement of the pinhole location with regard to pulpal anatomy for patients aged 10 to 60 years. All pinhole preparations were done freehanded, as no paralleling instrumentation was used. One of the keys to an esthetic outcome with this retainer is to leave the preparation 1 to 2 mm cervical to the incisal edge. This design prevents loss of incisal translucency and a possible decrease in value caused by the metal retainer. This is a modification of the preparation designs by Goodacre et al, Shillingburg et al, and Rosenstiel et al.[11-13] The impression, provisional, casting, and luting techniques followed accepted techniques as outlined in several texts.[11-13] An alternative to injecting silicone directly into the pinholes is to use plastic or nylon impression pins. These are placed into the pinholes and picked up in the impression material (V.I.P. Pin Kit, Coltene/Whaledent, Mahwah, NJ).[12]

The splinting of periodontally involved teeth can also use the pinledge retainer preparation if the same indications are followed.[11-13] These technical guidelines are easily modified for each patient as needed. Splinting of teeth using the pinledge design is somewhat limited in its application due to the design requirements. Splinting of greater than two teeth requires careful diagnosis to ensure all teeth involved can be prepared with the pinledge design. Pencil markings on each tooth can be a great aid to preparation planning as illustrated by Shillingburg et al[3] and Rosenstiel et al.[13] A pinledge splint provides excellent retention and stability of the teeth involved. Longevity of the splinted teeth is optimized with this design. This retainer may offer another advantage over a composite resin–fiber splint, because the retainers are a highly polished thin metal design.

The pinledge preparation is an exacting technique that requires great attention to detail and careful treatment planning. This technique is more difficult to perform than the more popular resin-retained FPD technique. The resin-retained FPD preparation design has evolved from a simple cingulum reduction to a preparation involving very distinct grooves and margins. The preparation now very closely mirrors the pinledge preparation with the exception of the absence of the pinholes.[12] Use of resin-retained FPDs, fiber-reinforced FPDs, and all-ceramic bonded FPDs has become very common. Fiber-reinforced and all-ceramic bonded fixed partial designs may be more conservative in retainer preparation, but do not incorporate the excellent retentive features of the pinledge pinholes. The retentive features of the pinledge offer greater longevity of the prosthesis than the primarily dentin-bonded,

fiber-reinforced, and all-ceramic bonded FPDs. Additionally, if treatment is carefully planned, the esthetics of the pinledge can be excellent. Unfortunately, the pinledge technique may not be taught as widely in graduate prosthodontic programs today as it was previously.

The clinical applications presented in this article illustrate that this retainer preparation design is a viable esthetic treatment option for today's patients.

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