Fig. 31.14 Periodontal failure resulting from defective fixed partial dentures. (A) Inadequate margins and contour. (B) Appearance before surgery. (C) Flap reflected. (D) Appearance after surgical recontouring. (E) Radiograph of new cast restorations. (F) Replacement restorations. (Courtesy Dr. C. L. Politis.)

Fig. 31.15 Gold crown with fluted contour at the furcation

Fig. 31.16 Example of a fixed implant restoration designed for optimal oral hygiene with convex ovate pontic surfaces that are easily cleaned with floss.

https://t.me/DentalBooksWorld

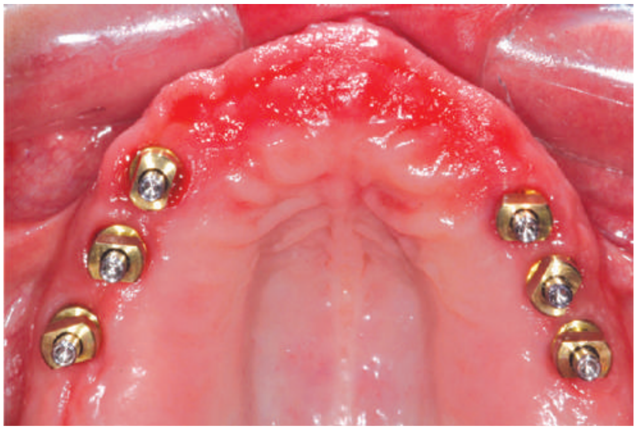


Fig. 31.17 Clinical example of soft tissues after removing a fixed implant-supported prosthesis that had a small labial flange. Although floss could pass under the flange, the inflamed gingival response was not acceptable.

detected with a patient who is known to grind their teeth. Patients can be either nocturnal or diurnal bruxers. If the occlusal device is prescribed to be worn only at night, it may not provide benefit to a patient who grinds their teeth only during the day. Diurnal parafunctional habits are difficult to treat because it is not practical for the patients to wear the occlusal device for the entire day. With daytime grinding and clenching of teeth, patients have to become aware of triggers that may lead to the parafunctional habit and work on biofeedback techniques to train them on how to relax and maintain a normal mandibular position. One form of training can be to set an hourly alert to remind patients to self-assess if they are engaging in destructive behaviors. Even though with such training, there may be times in a day where the patient must wear the occlusal device. Another scenario is where the occlusal device has mild occlusal wear facets and it fits the teeth but not well. Patients with frequent intrinsic and/or extrinsic acids in their mouth are susceptible to chemical erosion of the

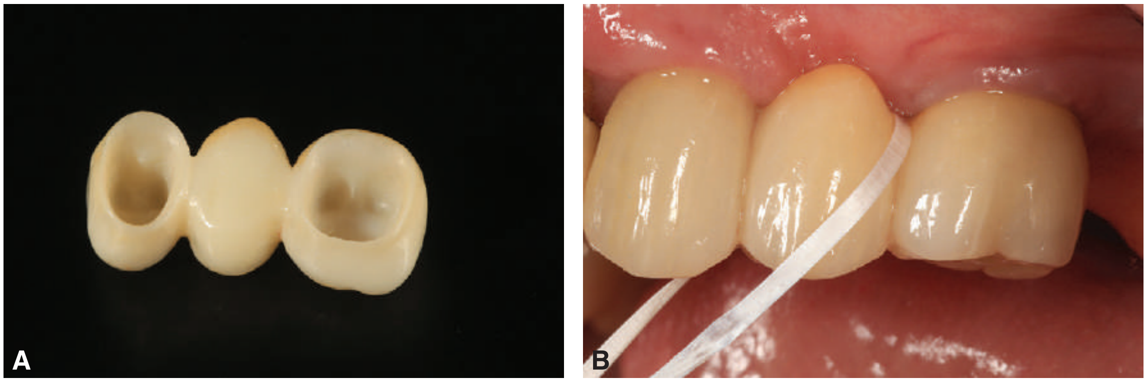


Fig. 31.18 (A) Implant-supported zirconia fixed partial denture with a modified ridge lap pontic. (B) The modified ridge lap pontic is an acceptable pontic design for optimal hygiene.

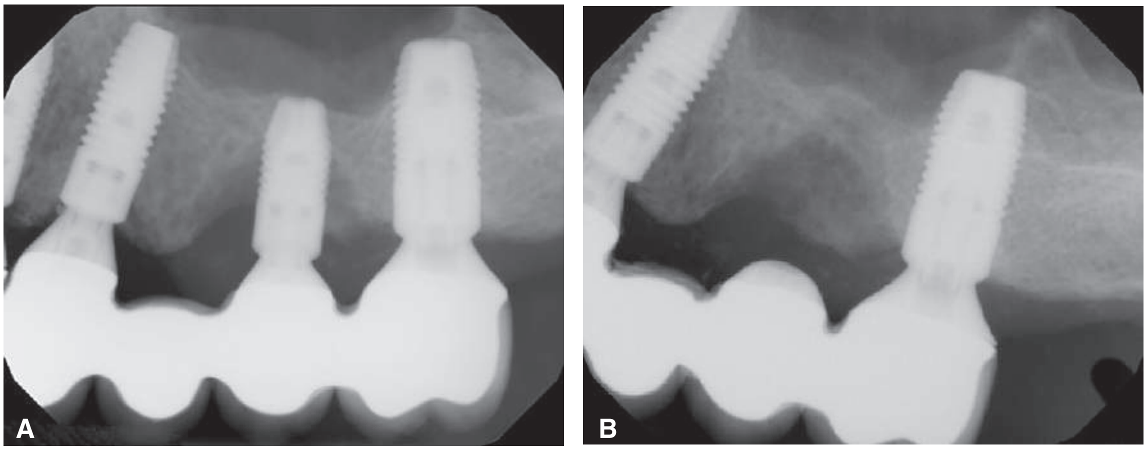


Fig. 31.19 (A) A fixed partial denture (FPD) supported by three dental implants. The failing premolar dental implant has deep pocketing, localized radiographic bone loss, and suppuration. (B) It was decided to tap the FPD off and remove the failing implant before it affected the proximal implants. Its titanium custom abutment was permanently cemented back into the FPD and the engaging implant part of the abutment was sectioned off and polished into the shape of an ovate pontic. Once an ideal ovate pontic was formed, the FPD was cemented back into service.

https://t.me/DentalBooksWorld

Fig. 31.20 If a cast restoration is not designed according to neuromuscular and temporomandibular controls, extensive wear can result after a relatively short time.

dentition. It is important to diagnose where the acid is coming from in order to stop the process. Extrinsic acid can typically be traced back to the patient's diet of highly acidic foods. Whereas gastroesophageal reflux disease (GERD) is a common cause of intrinsic acid erosion of the teeth. Many times, the location of the dental erosion will point to the acid's origin. Patients with GERD should be referred for medical consultation; however, the dentist often is the first to notice the disease.

Pulp and Periapical Health

At the recall appointment, the patient may describe one or more episodes of pain during the previous months. This could indicate the loss of vitality of an abutment tooth and should be investigated. Appropriate corrective measures can then be made.

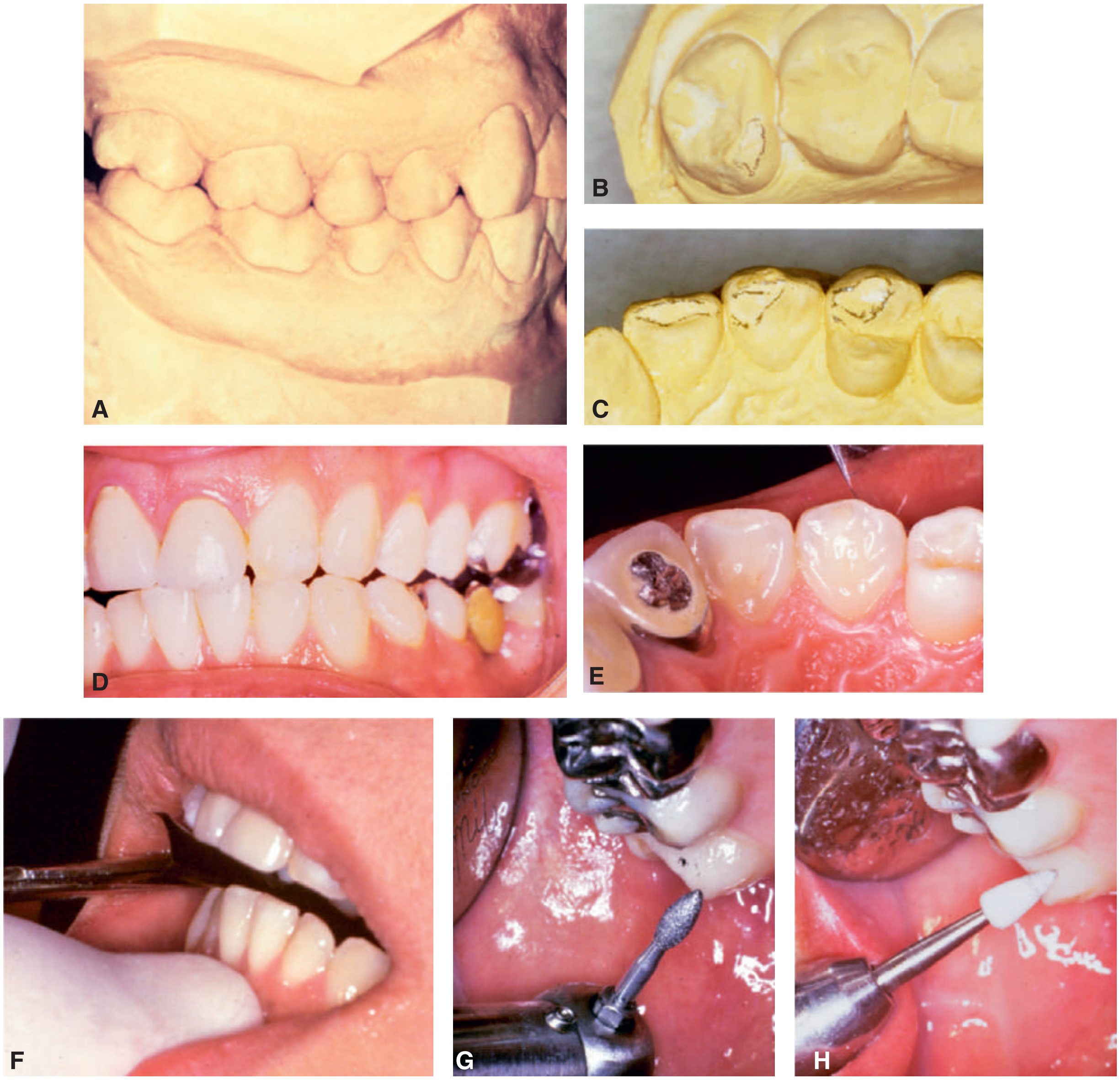


Fig. 31.21 Post-treatment occlusal analysis. (A) Diagnostic casts should be articulated periodically. (B) and (C) Nonworking wear facets on the maxillary molar correspond with wear on the premolar, canine, and lateral incisor. (D and E) Mandibular excursion corresponding to the observed wear patterns. (F and G) After marking, the newly detected interferences can be easily removed. (H) The adjusted surfaces are polished.

https://t.me/DentalBooksWorld

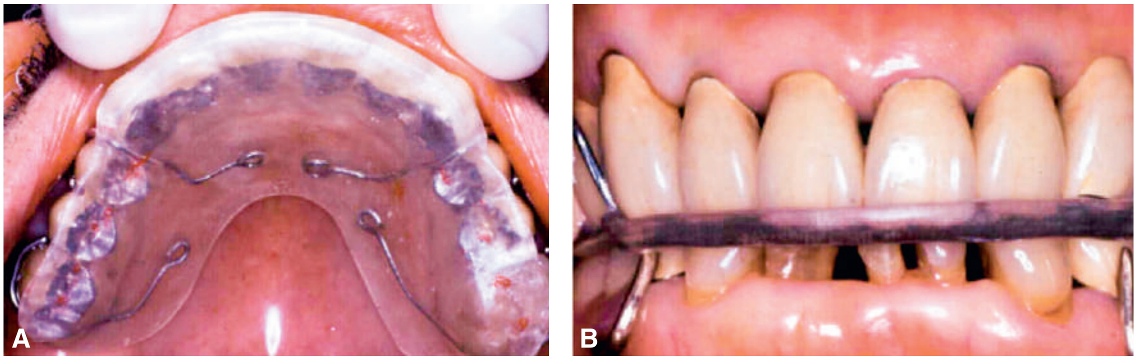


Fig. 31.22 (A and B) It may be essential to prescribe an occlusal device after extensive fixed prosthodontic treatment has been provided, especially if occlusal porcelain is used or the patient has a bruxism habit.

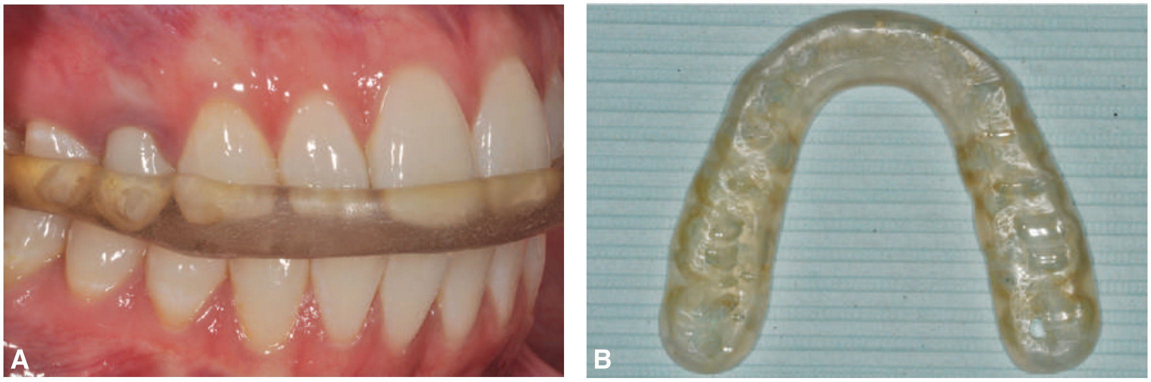


Fig. 31.23 (A) High-risk patient for parafunctional activities at a maintenance appointment and evaluation of the fit and wear of an occlusal guard. Note the wear on the maxillary canine and the ideal fit of the appliance to the maxillary teeth. The ideal fit confirms that the appliance was prescribed to be worn at the correct times. (B) Note the highly polished occlusal wear facets from active grinding and the perforation in the molar area. The active wear facets also confirm the appliance was prescribed to be worn at the correct times. Once a hole is worn through the acrylic resin, the clinician needs to decide either to remake or repair the appliance.

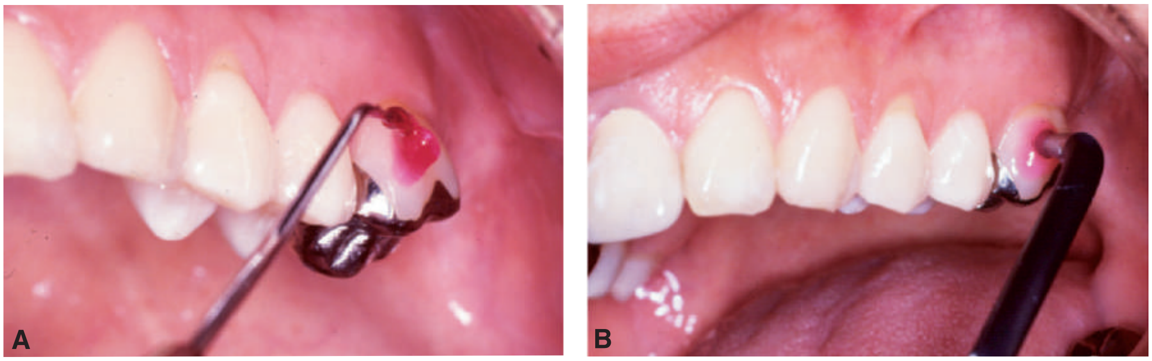


Fig. 31.24 (A and B) Partial-coverage restorations offer the advantage of convenient vitality assessment with an electric pulp tester.

One advantage of partial-coverage restorations is that pulp health can be monitored with an electric pulp tester (Fig. 31.24A and B), although the vitality of any tooth with a complete crown can still be assessed by thermal means. Correlating the histologic condition of a pulp directly with the patient's response to pulp testing is difficult.[38] Therefore, such results should be combined with other clinical data that result from careful patient history documentation and examination. Consultation with an endodontist is often advisable (Fig. 31.25A–C). Radiographs provide useful information about the presence of periapical pathosis. Teeth with fixed restorations should be reviewed radiographically every few years. The use of a standardized technique enables the dentist to make an objective comparison with previous films. Although the incidence of periapical disease in association with FPDs is high in some studies,[39,40] it is low in others.[33,41,42]

https://t.me/DentalBooksWorld

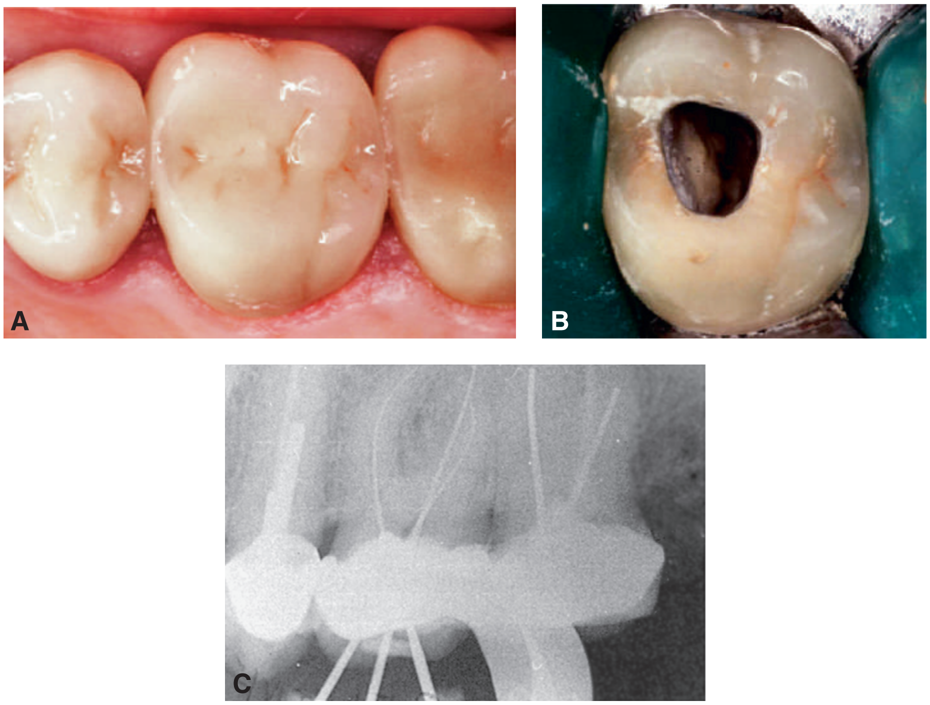


Fig. 31.25 Endodontic treatment after crown cementation. (A) Symptomatic maxillary molar with a metal-ceramic crown. (B) Access cavity prepared through the crown. (C) Endodontic therapy in progress. (Courtesy Dr. D. A. Miller.)

EMERGENCY APPOINTMENTS

On occasion, patients have an emergency between routine maintenance visits. With carefully planned and executed treatment, however, these should be rare (although problems can still develop even with the best treatment). Patients should be taught to notice small changes in their oral health and to report them promptly. For instance, the porcelain veneer of a metal-ceramic restoration may be shielded from further fracture when a small chip is promptly rounded off and the occlusion adjusted immediately after it is first noticed. Ceramic crowns are subject to fracture, which often necessitates their replacement (Fig. 31.26). Postponement of corrective treatment can be especially costly, necessitating a remake of a complex prosthesis that could have been saved with prompt attention.

Fig. 31.26 Clinical example of a fracture in a ceramic restoration. (Courtesy Dr. D. Ketteman.)

Pain

A patient presenting with pain should be asked about its location, character, severity, timing, and onset. Factors that precipitate, relieve, or change the pain should be investigated, and appropriate treatment measures should be initiated (see Chapter 3).

Although most oral pain is of pulpal origin, such an origin should never be assumed. A detailed investigation is always recommended. In difficult or questionable situations, the diagnosis should be confirmed by an appropriate specialist.

If the patient has several endodontically treated teeth that have been restored with posts and cores and with FPDs, the possibility of root fracture should be considered, especially for teeth that were internally weakened as a result of endodontic treatment in conjunction with oversized posts of suboptimal length. If a fracture has occurred, the tooth is almost invariably lost, which can significantly complicate follow-up treatment, especially if it involves an abutment tooth for an FPD (Fig. 31.27A–D). Fracture of a tooth that has not been endodontically treated can be confirmed by sequential loading of individual cusps (Fig. 31.28). Pain on release, the neural signal for which is transmitted by Aδ fibers, can be indicative of a radicular fracture. Sophisticated electronic testing to determine whether teeth have been fractured has also been reported.[43]

Loose Abutment Retainer

The looseness of a retainer (Fig. 31.29A–D) may not be easily perceived by the patient, especially if it is part of an FPD supported by several abutment teeth. The patient may have noticed a bad taste or smell rather than detecting movement.

https://t.me/DentalBooksWorld

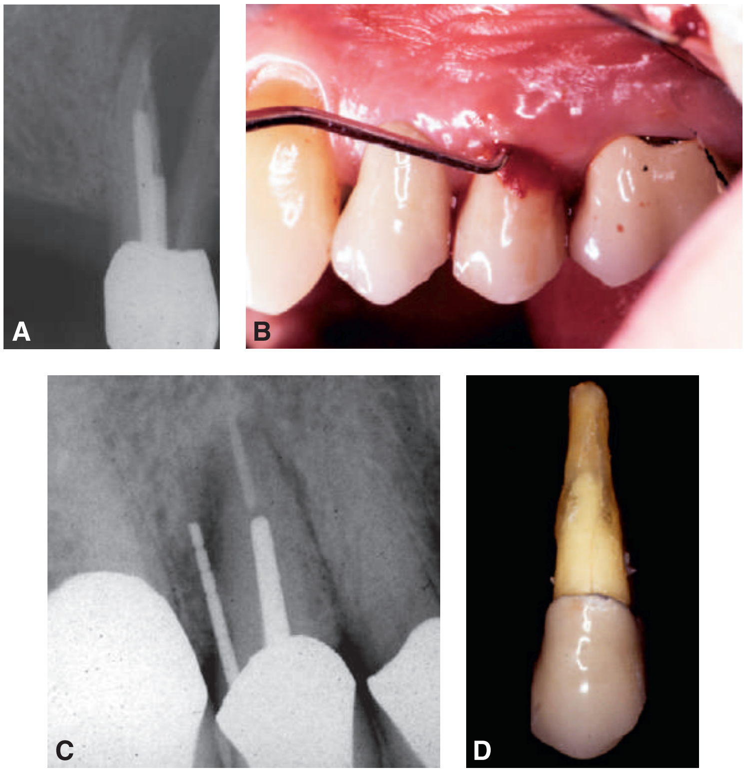


Fig. 31.27 (A) Longitudinal root fracture of an abutment tooth for a removable partial denture necessitated the removal of the abutment tooth. (B and C) Longitudinal fracture with resulting periodontal defect. (D) Fracture is clearly visible after removal. (Courtesy Dr. D. A. Miller.)

Fig. 31.28 A tooth sleuth can be used to selectively load individual cusps of teeth that are suspected of having a radicular fracture. Pain on release is indicative of a fracture.

Unless appropriate instrumentation is available, removing the prosthesis intact for re-cementation is often difficult or impossible. The devices shown in Figs. 31.30–31.33 have been successful, but are costly. The devices shown in Fig. 31.33 are less reliable and can be quite intimidating and uncomfortable for the patient. On occasion, a direct pull with hemostat forceps or special crown-removal forceps (Trial Crown Remover, Hu-Friedy Mfg. Co.) succeeds. (Metal-ceramic crowns should first be coated with autopolymerizing acrylic resin to prevent chipping or cracking.) Applying the tip of an ultrasonic scaler to the restoration is recommended because prolonged ultrasonic vibration can decrease crown retention.[44] A procedure for removing crowns and FPDs with a strongly adhesive resin[45] has been used successfully in certain situations (Fig. 31.34A and B).[46] When trying to remove a definitively cemented prosthesis, the dentist must use great caution. Unless force is applied in the path of withdrawal, an abutment tooth may fracture and be lost.

The looseness of a retainer usually indicates inadequate tooth preparation, poor cementation technique, or caries. In this situation, the tooth requires repreparation and a new prosthesis. Sectioning the prosthesis rather than attempting to remove it intact is often the best procedure (Fig. 31.35A–L).

Fractured Connector

An improperly fabricated connector may fracture under functional loading (Fig. 31.36A and B). Depending on the design and location of the FPD, the degree of pain may vary. Because the load is no longer shared between the abutment teeth, extra force is typically transmitted to the abutment tooth, and discomfort from overloading the periodontal ligament may draw attention away from the location of the actual problem. If the abutment teeth have good bone support and minimal mobility, fractures of connectors can be very difficult to detect clinically. Wedges can sometimes be positioned to separate the individual FPD components enough to confirm the correct diagnosis.

https://t.me/DentalBooksWorld

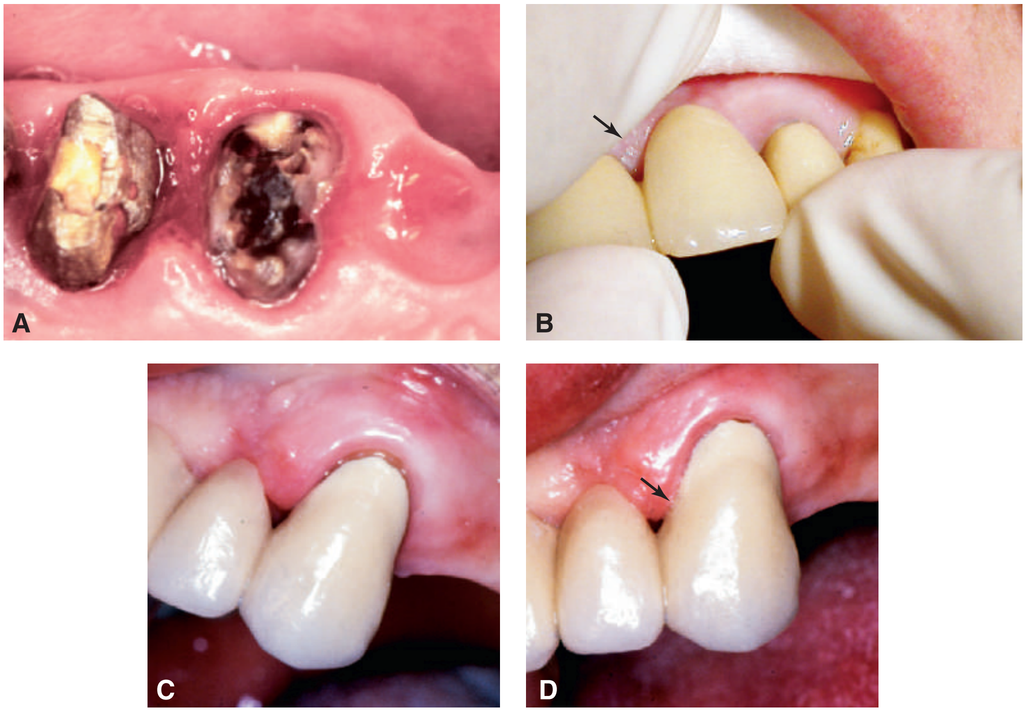


Fig. 31.29 (A) Severe tooth destruction may result when the looseness of a retainer goes undetected. (B) Looseness of one retainer is occasionally observed directly *(arrow)* when force is exerted in an occlusal direction. Water is then applied to the cervical area (C), and the diagnosis is confirmed if bubbles appear *(arrow)* when pressure is exerted (D).

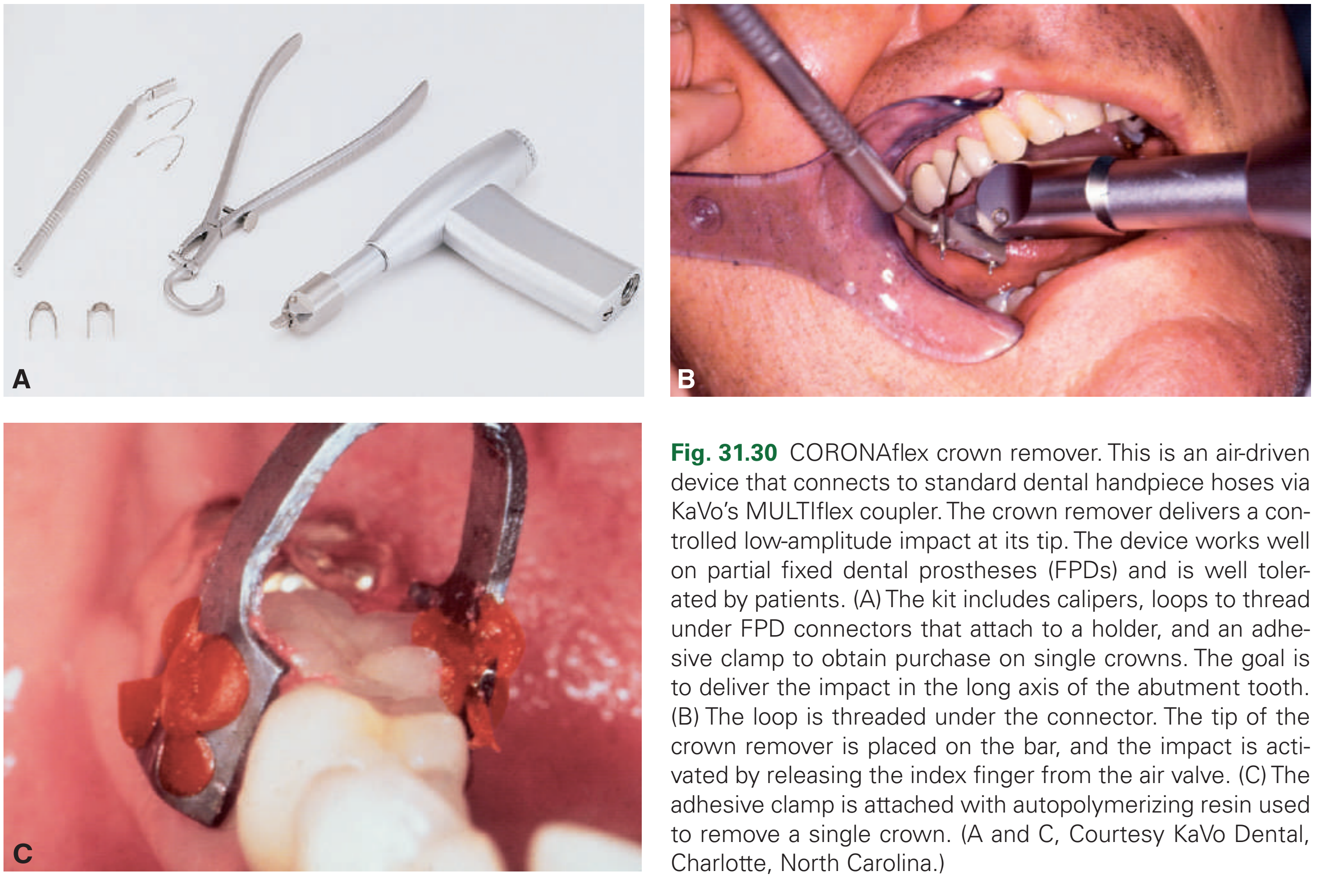


Fig. 31.30 CORONAflex crown remover. This is an air-driven device that connects to standard dental handpiece hoses via KaVo's MULTIflex coupler. The crown remover delivers a controlled low-amplitude impact at its tip. The device works well on partial fixed dental prostheses (FPDs) and is well tolerated by patients. (A) The kit includes calipers, loops to thread under FPD connectors that attach to a holder, and an adhesive clamp to obtain purchase on single crowns. The goal is to deliver the impact in the long axis of the abutment tooth. (B) The loop is threaded under the connector. The tip of the crown remover is placed on the bar, and the impact is activated by releasing the index finger from the air valve. (C) The adhesive clamp is attached with autopolymerizing resin used to remove a single crown. (A and C, Courtesy KaVo Dental, Charlotte, North Carolina.)

https://t.me/DentalBooksWorld

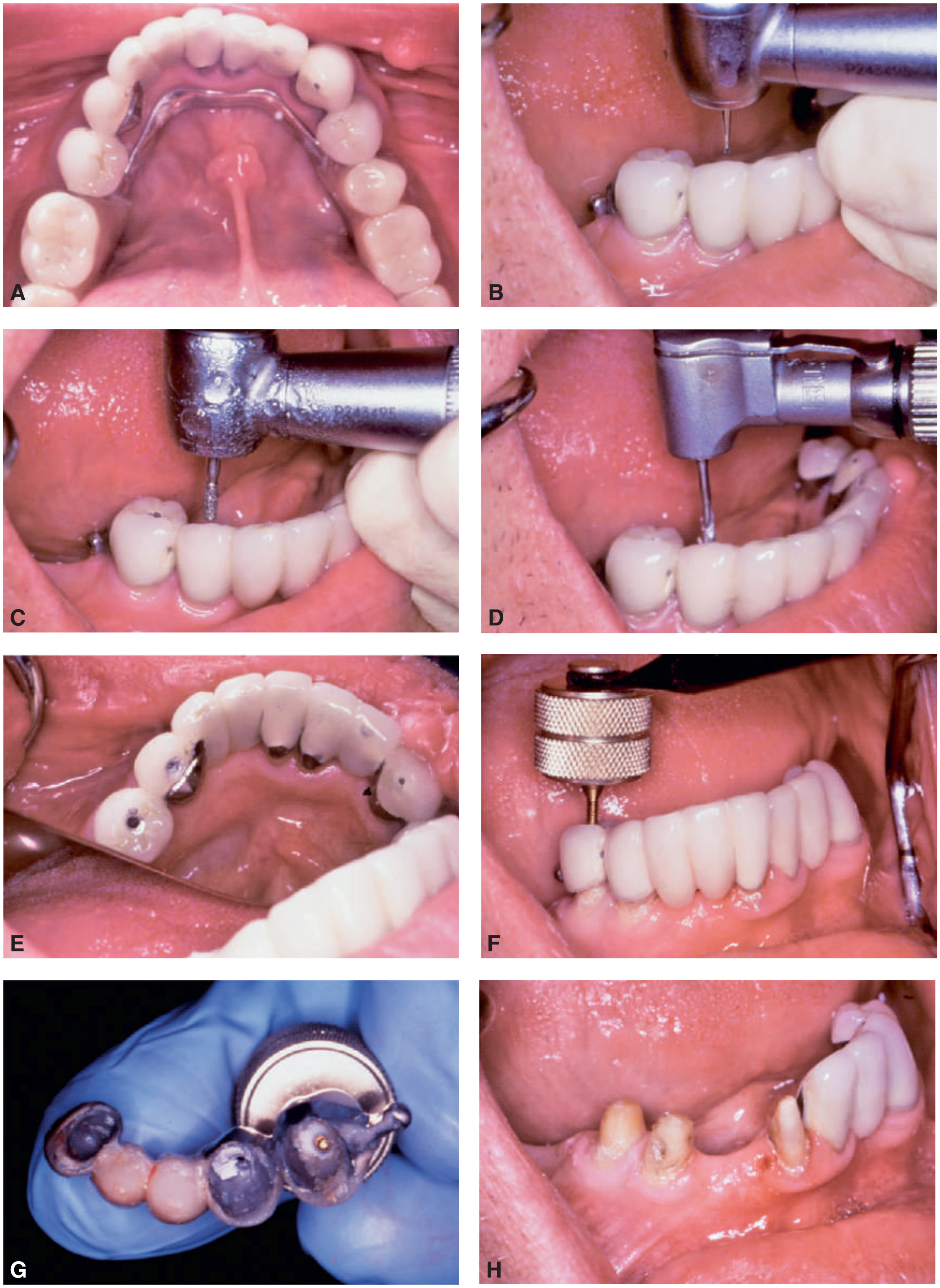


Fig. 31.31 The Metalift Crown and Bridge Removal System (Classic Practice Resources, Inc.). (A) Five-unit partial fixed dental prosthesis (FPD) supporting a partial removable dental prosthesis. The anterior abutment (right mandibular central incisor) is loose; the posterior abutments (both right mandibular premolars) are firmly cemented. (B) To obtain access to the metal on each abutment, a diamond is used to drill through the porcelain. (C) The metal is penetrated with a No. 1 round bur to create a pilot channel in each abutment. (D) The special drill is inserted into the pilot hole. (E) The holes should just penetrate the metal, as indicated by the visible cement. (F) The Metalift instrument is threaded into both crowns, breaking the cement seal. The partial FPD is removed (G), and if the abutments are satisfactory, as seen here (H), it can be recemented for further service. The manufacturer supplies threaded keys that can be used to seal the occlusal holes. To facilitate recovery, they can also be incorporated in crowns before cementation. (Courtesy Dr. R. D. Westerman.)

https://t.me/DentalBooksWorld

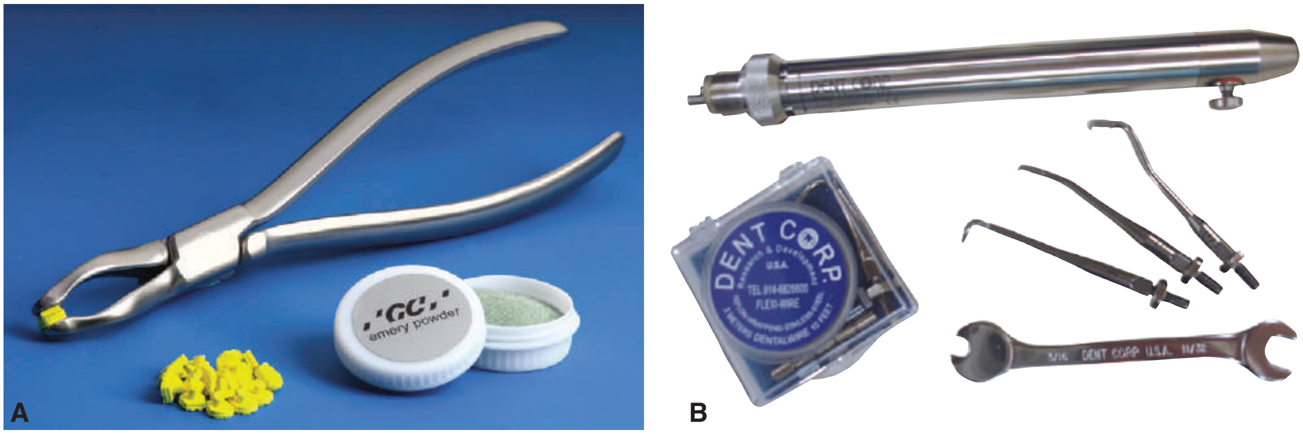


Fig. 31.32 Removal devices. (A) GC pliers. This device has a specially rasped finish with small sharp pins and is designed to grip a crown or partial fixed dental prosthesis and to deliver a removal force along the long axis. The grip can be enhanced with emery powder. (B) Easy Pneumatic Crown and Bridge Remover II. With this device, compressed air is used to deliver a controlled, adjustable force to remove the restoration. (A, Courtesy GC America, Inc., Alsip, Illinois. B, Courtesy Dent Corp Research and Development, White Plains, New York.)

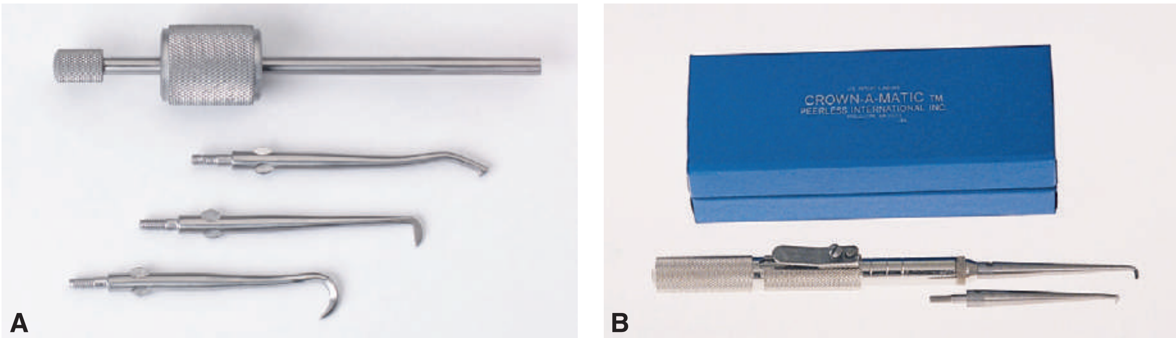


Fig. 31.33 Crown removers. (A) Back-action. (B) Spring-activated. (A, Courtesy Henry Schein Inc., Melville, New York. B, Courtesy Peerless International Inc., North Easton, Massachusetts.)

Fig. 31.34 Richwil Crown and Bridge Remover (Almore International, Inc., Portland, Oregon). This adhesive resin tablet is softened in warm water for 1 to 2 minutes, and the patient is instructed to close into it (A); the manufacturer recommends tying a length of floss to the tablet to prevent aspiration. The resin is cooled with water. A sharp opening action should remove the crown (B). Care is needed to avoid removing a restoration in the opposing jaw.

https://t.me/DentalBooksWorld

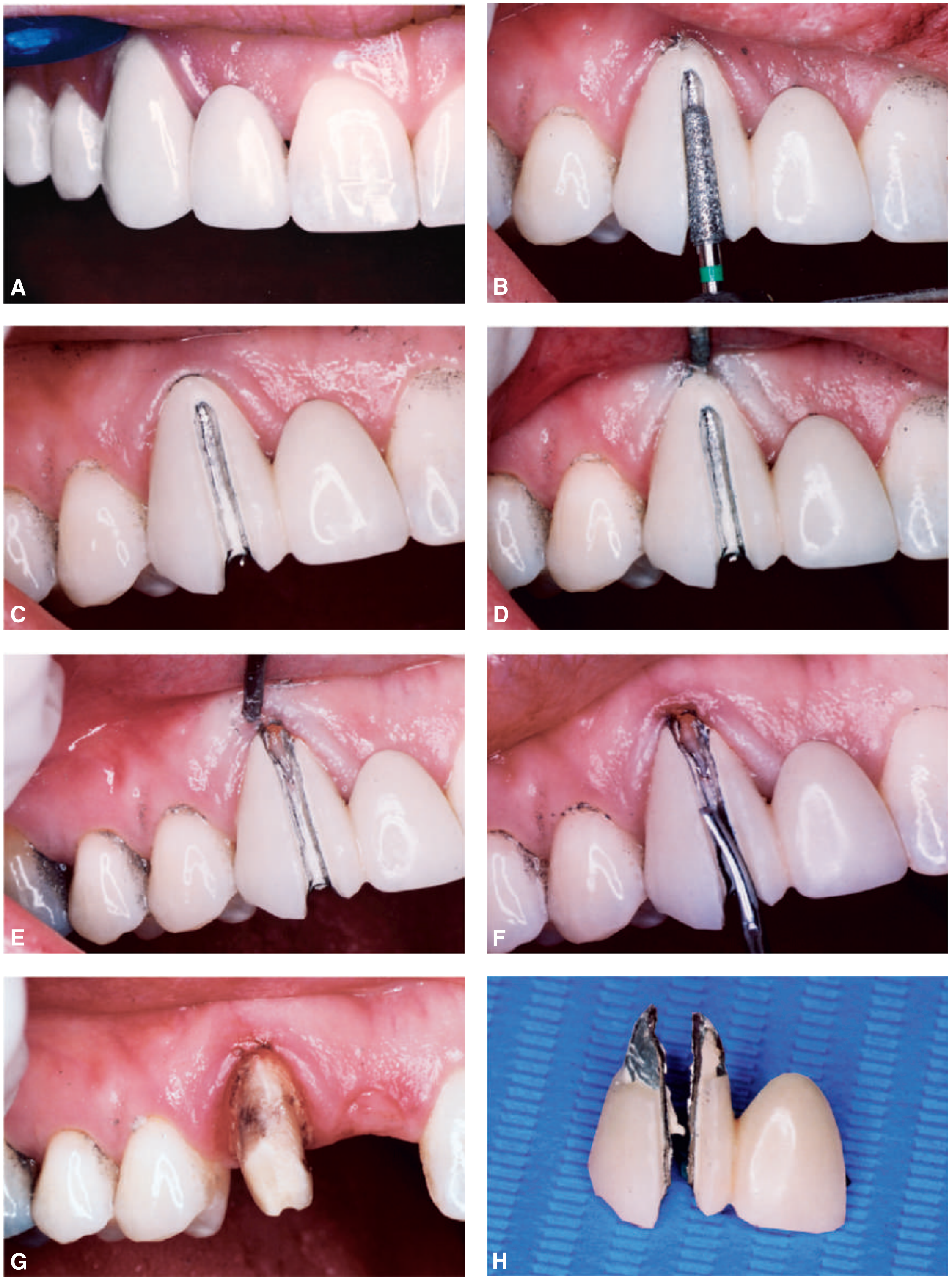


Fig. 31.35 Removal of an existing crown by sectioning. (A) This cantilevered partial fixed dental prosthesis had to be replaced for esthetic and periodontal reasons. (B) The restoration is carefully sectioned, with the initial cut through the ceramic just to the metal. It is easiest to do this on the facial and incisal surfaces. (C) The goal is to cut through the metal just to the cement and follow the cement toward the gingival margin. The gingiva is displaced with an instrument (D), and the crown is carefully sectioned to the gingival margin (E). (F) A suitable instrument (e.g., a cement spatula or sterilized screwdriver) is placed in the cut and gently rotated to force the halves of the crown apart. It may be necessary to section part of the lingual surface to facilitate this step. (G) The abutment. The additional incisal reduction was necessary; the notch in the incisal edge is of no concern. (H) Removed prosthesis.

https://t.me/DentalBooksWorld

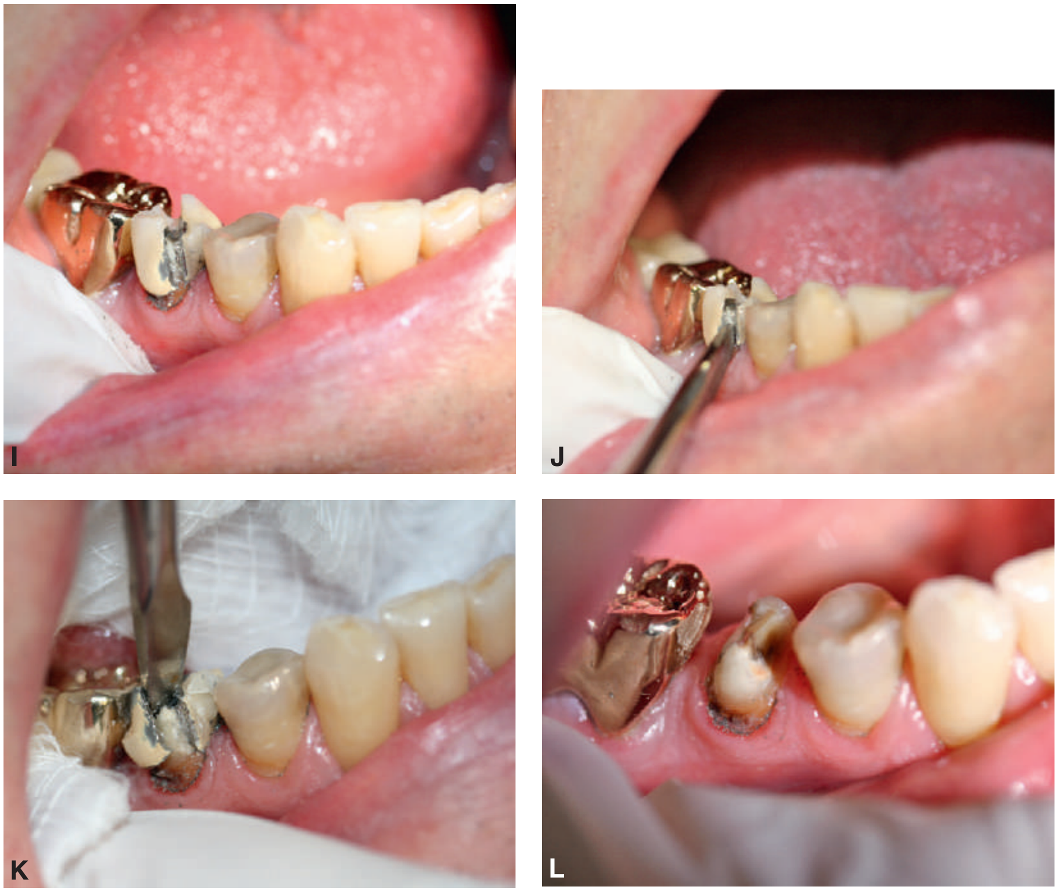


Fig. 31.35 Cont'd (I) A cut has been made through the mesiobuccal and occlusal surfaces of the defective metal-ceramic crown. An elevator is used to bend the crown open, initially from the buccal surface (J), and then the occlusal aspect (K). Note that gauze is used to capture any metal-ceramic shards that may chip off. (L) On removal of the crown, the residual tooth structure can be assessed for further modification. (A–H, Courtesy Dr. D. H. Ward.)

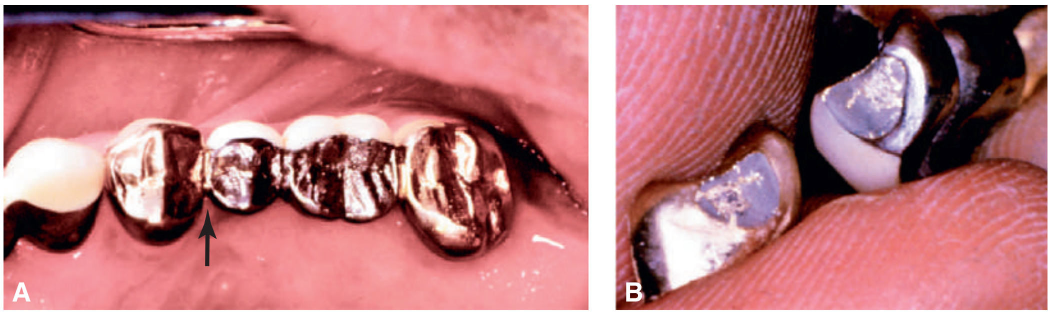


Fig. 31.36 (A) The soldered connector *(arrow)* of a four-unit partial fixed dental prosthesis fractured during function. (B) The soldering gap was too narrow; as a result, the connector was incomplete, which eventually caused the clinical failure. The long lever arm, which consisted of the two "cantilevered" pontics that resulted after fracture, caused the pulpal irritation to arise.

Debonded and Fractured Porcelain Veneer

One benefit with porcelain laminate veneers is that they can debond. A debonded veneer is more favorable to dentists and patients alike as compared to ceramic chipping or a horizontal fracture of a weakened tooth restored with a complete crown. Re-bonding a veneer is relatively simple, economical for the patient, and the appointment is easily added to a busy dental practice schedule (Fig. 31.37A–C).

Mechanical failure of a metal-ceramic restoration (Fig. 31.38) is not uncommon. It is usually related to incorrect framework design, improper laboratory procedures, excessive occlusal function, or trauma (e.g., an automobile or sports accident). Ceramic crowns are also susceptible to fracture after extended use (Fig. 31.39A–C).

If the porcelain has fractured on an otherwise satisfactory multiunit prosthesis, an attempt at repair rather than a remake

https://t.me/DentalBooksWorld

Fig. 31.37 (A) A mandibular incisor porcelain laminate veneer that debonded and warranted the patient to come in for an emergency dental appointment. (B) The type, quality, and quantity of residual tooth structure were reevaluated so that an appropriate adhesive protocol could be followed. (C) Post-cementation of mandibular porcelain laminate veneer that illustrates a favorable method of a dental repair.

Fig. 31.38 The incisal edge of the maxillary lateral incisor metal-ceramic pontic has fractured.

may be justified to save the patient additional discomfort, time, and expense. When the fractured porcelain is not missing and there is little or no functional loading on the fracture site, it can sometimes be bonded in place with a porcelain repair system (Fig. 31.40) with the use of silane coupling agents or 4-methacryloxyethyl-trimellitic anhydride (4-META) to promote bonding with acrylic or composite resin.[47–50] Unfortunately, the strength of joints made this way seems to diminish with changes in temperature[51] and with prolonged water storage.[52] Benefits from such repair are considered temporary, but it may be preferable to periodically perform a repair than to dismantle and remake a complex FPD. In other circumstances, the fractured area may be repaired with composite resin retained by means of mechanical undercuts in the framework.[53] The use of a silane coupling agent is also recommended for these repairs.

A metal-ceramic restoration made to fit over the fractured original can sometimes provide a more permanent repair. This technique is appropriate when the pontic rather than an abutment retainer has fractured. A little ingenuity is needed to produce a suitable design.[54,55] The most common difficulty encountered when such a repair is attempted is the weakening of the connectors during the preparation, with the associated risk of a subsequent prosthesis fracture (Fig. 31.41A–P).

COMPLICATIONS WITH IMPLANT-SUPPORTED RESTORATIONS

In fixed implant dentistry, the prosthetic screw is purposely designed as the weak link to minimize catastrophic failures and facilitate future maintenance issues. Between an osseous integrated dental implant and its related prosthesis, the prosthesis is at a higher risk of clinical complications.[56,57] Although the prosthetic screw is designed to fail first, it does not always happen so, fortunately. Through contemporary prosthodontics, a clinician

https://t.me/DentalBooksWorld

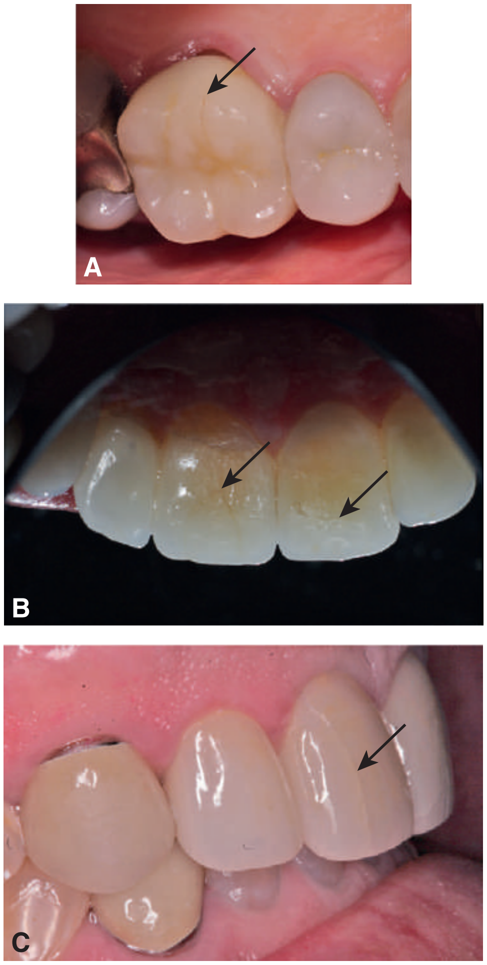


Fig. 31.39 (A) In this monolithic zirconia molar crown, a crack (*arrow*) extended from the central fossa to the mesiolingual surface. (B) The lingual surfaces of veneered zirconia crowns on both central incisors exhibit cracking (*arrows*). These crowns had been in service for approximately 7 years before failure occurred. (C) Fracture (*arrow*) in pressed lithium-disilicate crown. (A–C, Courtesy Dr. D. Ketteman.)

Fig. 31.40 On occasion, repairing a fractured metal-ceramic veneer is more advantageous than replacing the entire fixed dental prosthesis. (A) Fractured central incisor pontic of an extensive prosthesis. (B) The porcelain surface has been etched; a resin repair system has been used.

is faced with maintenance issues when clinical complications arise. Fortunately, clinicians have contemporary solutions through computer-aided design and computer-aided manufacturing (CAD-CAM). The value of CAD-CAM in prosthetic maintenance is illustrated with a patient treatment.

The patient had been in the maintenance phase for 14 years after a comprehensive reconstruction. She presented to the office an emergency visit because her crown fell off. Upon examination, it was concluded that the high-cast noble custom implant abutment had fractured horizontally subsequent to s screw loosening. Peri-implant tissues were inflamed from the loose abutment. Furthermore, the existing metal-ceramic crown could not be recemented because the residual axial walls of the custom implant abutment were of insufficient height for retention and resistance (Fig. 31.42A–B). Stronger resin cements were contraindicated to improve the retention of the crown because of the difficulty of removing residual cement from the deep lingual margins and the loss of retrievability. To further complicate the treatment, the failed implant crown was splinted to three splinted posterior crowns through a rigid precision attachment. Potentially, a failure of one splinted crown could affect the associated crowns, resulting in a catastrophic failure. However, CAD-CAM technology offered a solution to repair the failure by making a new custom abutment and preventing a potential catastrophic failure (see Fig. 31.42C–E).

Although CAD-CAM technology has greatly improved the level of care for all dental patients, a dentist must understand its limitations. Updates and new software versions may result in patient records becoming obsolete. Long-term management of patient CAD-CAM files may pose a future challenge.

RETREATMENT

FPDs do not last forever; however, with good plaque removal, patient motivation, and average or above-average resistance to disease, a well-designed and well-fabricated restoration can provide many years of service. With poor care and neglect, even the "perfect" prosthesis or restoration can fail rapidly (Fig. 31.43). Because of exceptional host resistance, long-term success is sometimes possible with obviously defective restorations (Fig. 31.44A and B).

https://t.me/DentalBooksWorld

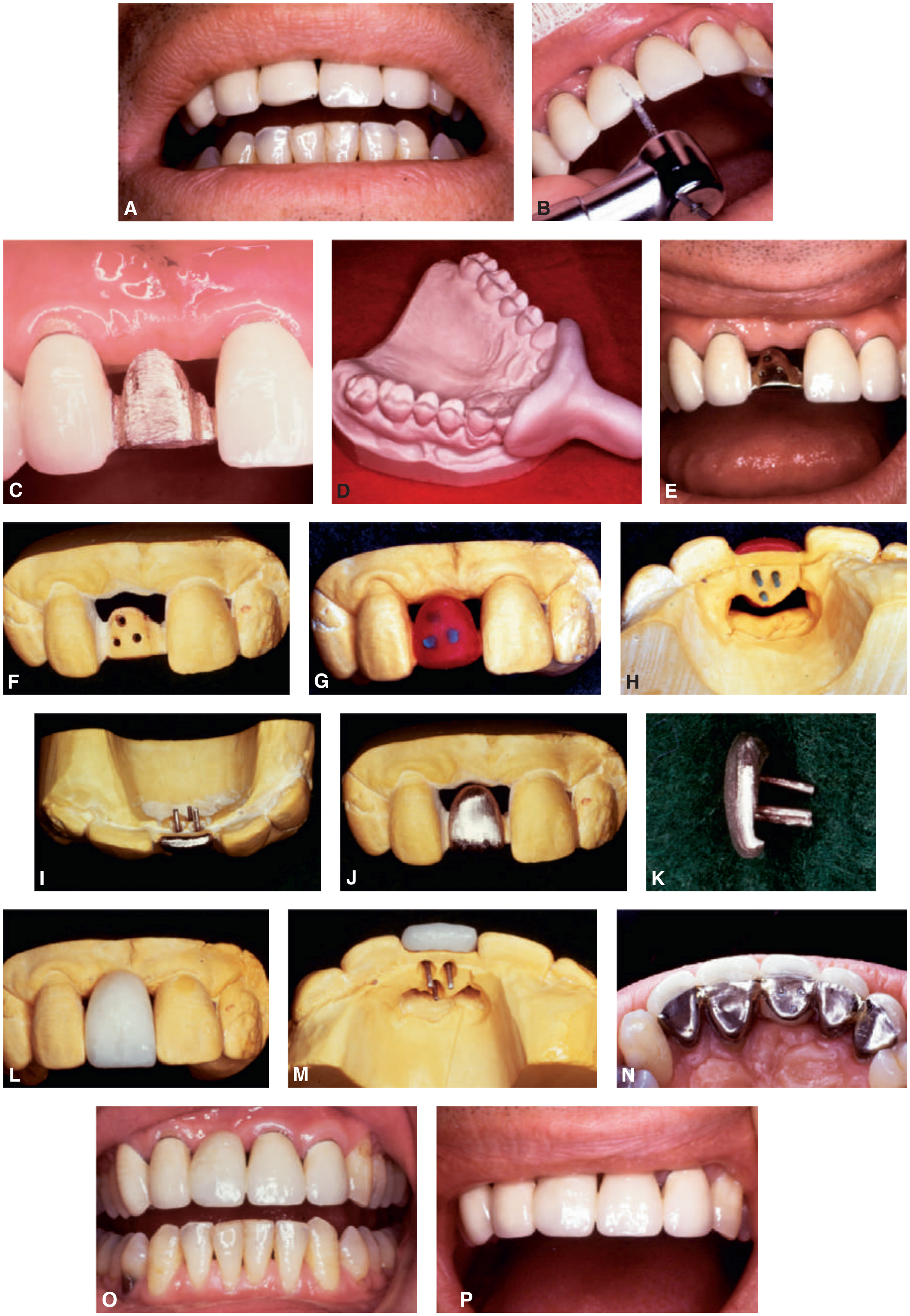


Fig. 31.41 Repair of a fractured metal-ceramic pontic. (A) Pretreatment appearance. (B) The ceramic veneer is removed with diamond rotary instruments. (C) Appearance after porcelain removal. (D) Special impression tray. (E) Pinholes are placed in the substructure. (F) Cast of the substructure. (G and H) Waxed overlay. Note the plastic pins used (H). (I) Cast overlay. (J) Facial view. (K) Proximal view. (L) Facial view after the porcelain application. (M) Lingual view after firing (cast relieved). (N) Appearance after cementation. (O and P) The finished repair. (Courtesy Dr. A. G. Gegauff.)

https://t.me/DentalBooksWorld

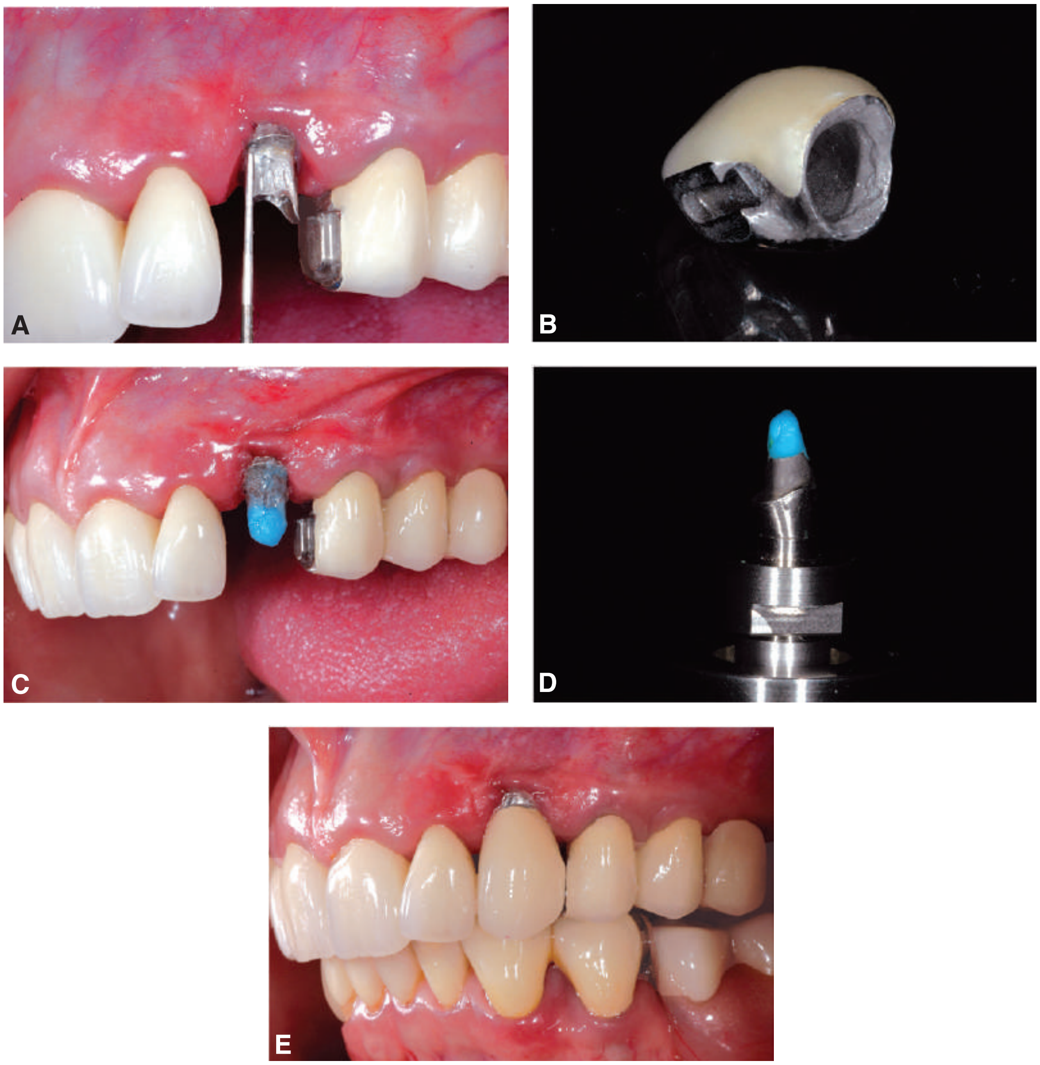


Fig. 31.42 (A) Complex reconstruction is challenged with a potentially catastrophic failure of a cast custom abutment. The residual axial walls of the custom abutment were less than 3 mm in height. (B) The failed implant crown was splinted to three splinted crowns through a precision attachment and posed a catastrophic failure. (C) Polyvinyl siloxane impression material was injected into the failed crown and then the crown was seated on the fractured cast abutment while using the rigid connector and the patient's occlusion to obtain the ideal crown location for a passive fit. (D) Once the impression material had polymerized, the crown and abutment with the impression material were removed from the mouth. The fractured custom abutment and impression of the intaglio surface of the crown were scanned as one piece and a new titanium custom abutment was copied milled. (E) The newly cloned custom titanium abutment was inserted with a new prosthetic screw and the existing crown with the precision attachment was cemented back into service with an interim luting agent.

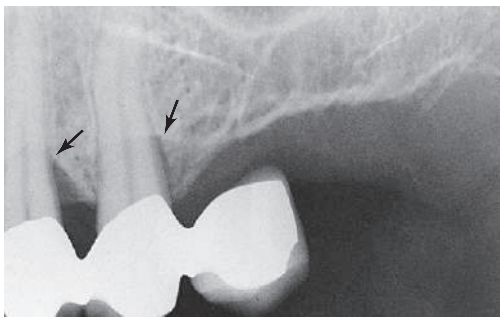


Fig. 31.43 Osseous defects *(arrows)* occurred within 2 years of the placement of this partial fixed dental prosthesis. (Courtesy Dr. J. Keene.)

Nevertheless, at some stage, the decision about re-treatment must be made. Much depends on whether the re-treatment is part of an ongoing program of comprehensive care or whether the existing prosthesis has been subjected to years of neglect.

Planned Re-Treatment

At the original treatment planning stage, the need for future re-treatment should be considered. This consideration may need to be general rather than specific because of difficulties in accurately predicting the pattern of future dental disease. On occasion, however, a prosthesis is designed to accommodate the eventual failure of a doubtful abutment (Fig. 31.45A–F). With a little foresight, survey contours can already be incorporated

https://t.me/DentalBooksWorld

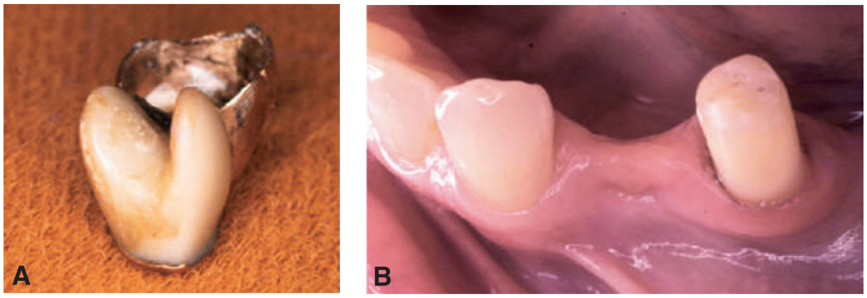


Fig. 31.44 (A) A "saddle" pontic should not be fabricated because it makes plaque control impossible. This particular partial fixed dental prosthesis, however, served for 35 years. (B) Despite poor pontic design, there are no significant signs of ulceration. This example illustrates the variability of tissue response as a result of differences in host resistance.

Fig. 31.45 Anticipation of future needs. (A) Appearance 4 years after the restoration of an arch with periodontally compromised teeth. Three intracoronal rests *(arrows)* were fabricated to support a partial removable dental prosthesis (RDP). (B) An additional rest *(arrow)* was included as a nonrigid connector for splinting the prostheses in the maxillary left quadrant. This rest is parallel to the others, so it is available (if needed) for future support of a modified or new RDP. (C) The lingual wall of the premolar incorporates the appropriate survey contour *(arrow)* to accommodate such a prosthesis. (D) The RDP in place. Note the third intracoronal rest *(arrow)*. (E and F) External and internal views of the RDP. This was cast in type IV gold, which allows the relatively easy addition of a new minor connector with conventional soldering techniques.

https://t.me/DentalBooksWorld

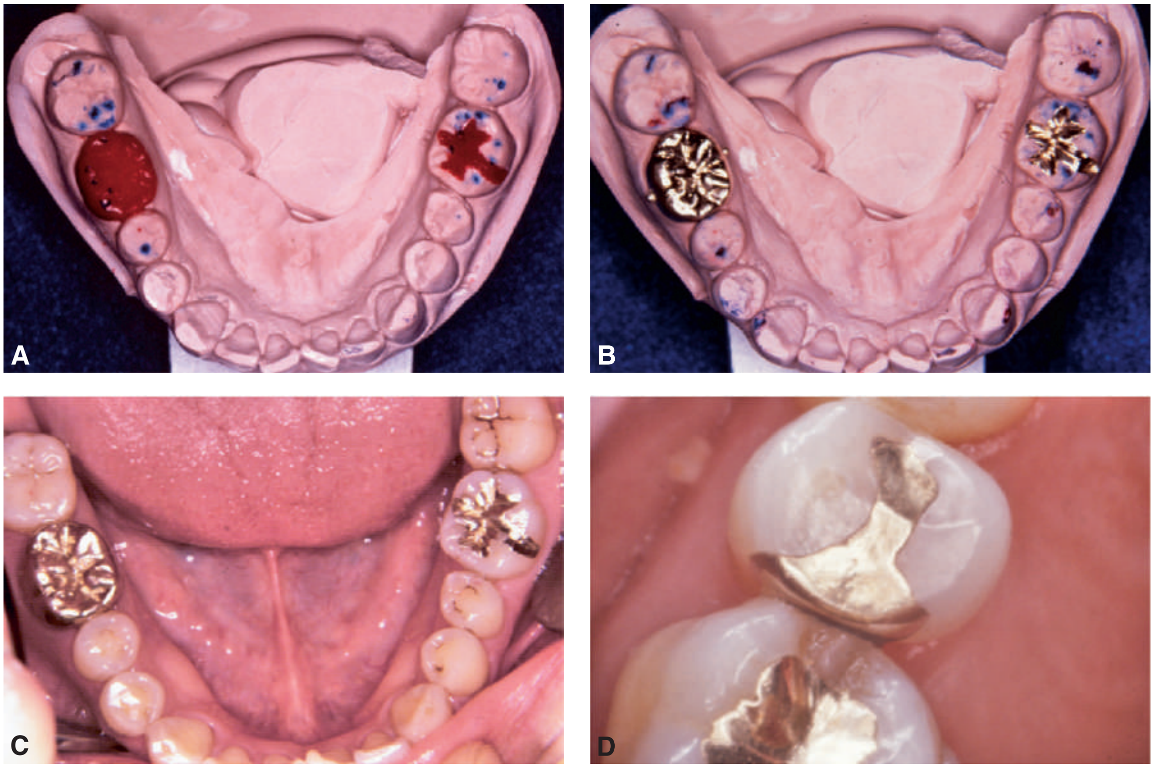


Fig. 31.46 Simple cast restorations (treatment I): a complete cast crown and an inlay used to restore the first molars. (A) Wax patterns. (B) Castings seated and adjusted for clinical evaluation. (C) Cemented restorations. (D) This two-surface intracoronal cast restoration served for 66 years.

in the retainers of an FPD to accommodate a future partial removable dental prosthesis in the event of loss of a terminal abutment. Similarly, accommodations can be made for future occlusal rests by intentionally increasing occlusal reduction during tooth preparation and using metal occlusal surfaces. Furthermore, proximal boxes can be incorporated to achieve extra metal thickness if it is anticipated that a nonrigid (dovetail) rest could simplify future re-treatment (see Fig. 31.45A–F).

When tooth preparations are conservative, when preparation margins are supragingival, and when complicated FPD designs are avoided, subsequent re-treatment and replacement of failed work can be performed in a predictable manner, provided that plaque control and follow-up care are maintained.

The key to successful fixed prosthodontic treatment planning (see Chapter 3) lies in anticipating potential areas of a future failure. Ideally, the design of a prosthesis should incorporate an escape mechanism to allow simple and convenient alteration to accommodate future treatment needs.

Neglect

An extensive FPD that has been neglected is much more difficult to treat. Considerable expertise is needed to perform the lengthy and demanding procedures successfully. Specialized treatment is almost always necessary and usually includes controlling the mobility of the abutment teeth, improving support for removable appliances in the edentulous area, and creating a more favorable load distribution.

TREATMENT PRESENTATIONS

Several treatment results are presented, including follow-up documentation as appropriate, in some cases over many years. The treatments demonstrate successful approaches that are consistent with the principles discussed throughout this text.

- Treatment I (Fig. 31.46A–D): simple cast restorations
- Treatment II (Fig. 31.47A–G): single cast restorations
- Treatment III (Fig. 31.48): simple partial FPDs
- Treatment IV (Fig. 31.49): full-mouth rehabilitation with FPDs and removable prostheses
- Treatment V (Fig. 31.50): extensive fixed prosthodontic treatment
- Treatment VI (Fig. 31.51): extensive fixed and removable prosthodontic treatment
- Treatment VII (Fig. 31.52): anticipation of future needs
- Treatment VIII (Fig. 31.53): long-term evaluation of comprehensive rehabilitation with FPDs and removable dental prostheses
- Treatment IX (Fig. 31.54): long-term evaluation of comprehensive rehabilitation with FPDs
- Treatment X (Fig. 31.55): long-term evaluation of comprehensive rehabilitation of a periodontally compromised dentition
- Treatment XI (Fig. 31.56): long-term evaluation of FPDs

https://t.me/DentalBooksWorld

Fig. 31.47 Single cast restorations (treatment II) reestablish canine guidance and functional occlusion. (A) Extensive anterior wear was caused by prolonged parafunctional activity that resulted from malocclusion. (B) Anterior pinledges are waxed concurrently with the molar castings. (C) Anterior guidance and posterior occlusion are reestablished. Castings seated and adjusted (D) and at clinical evaluation (E). (F) A normal canine-to-canine relationship has been reestablished. (G) Working-side excursion.

https://t.me/DentalBooksWorld

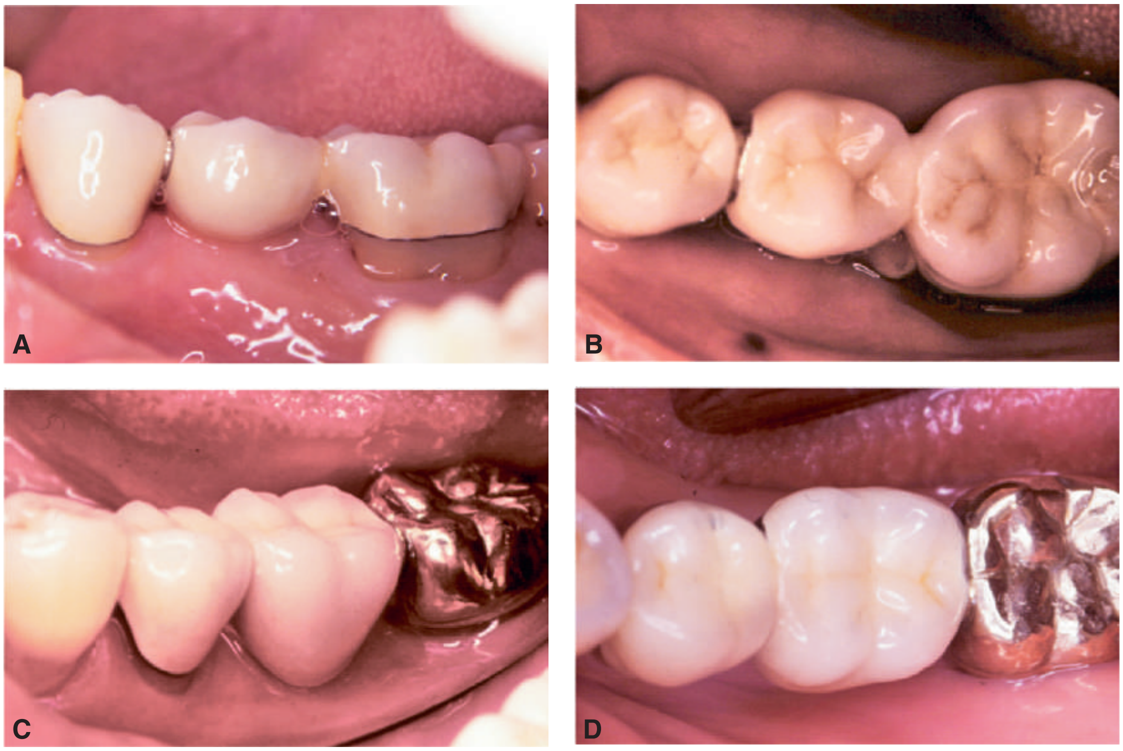


Fig. 31.48 Simple partial fixed dental prostheses (FPDs; treatment III). Long-term follow-up: These small FPDs remain serviceable after 7 and 13 years. (A and B) Appearance at 7-year follow-up. (C and D) Appearance at 13-year follow-up.

https://t.me/DentalBooksWorld

Fig. 31.49 Complete-mouth rehabilitation with fixed, implant-supported, and removable partial prosthodontics (treatment IV). Before treatment (A–E): Note the reverse smile line and discrepancy in the maxillary central incisor gingival tissue levels. The maxillary first molars had furcation involvement and poor prognosis as a result of periodontal bone loss. (A and B) Occlusal views. (C) Frontal view. (D and E) Right and left views in maximum intercuspation. During treatment: (F) Diagnostic waxing. (G) Dental implants were placed to restore the mandibular arch and to provide retention and support for a maxillary partial removable dental prosthesis (RDP). (H) The gingival tissue levels were corrected with periodontal surgery. (I and J) Anterior teeth were prepared for fixed restorations.

https://t.me/DentalBooksWorld

Fig. 31.49 Cont'd After treatment: Occlusal views of the maxillary arch without (K) and with (L) partial RDP. (M) Occlusal view of the restored mandibular arch. Views in maximum intercuspation: right (N) and left (O) mirror views and frontal view (P). (Courtesy Dr. B. A. Purcell.)

https://t.me/DentalBooksWorld

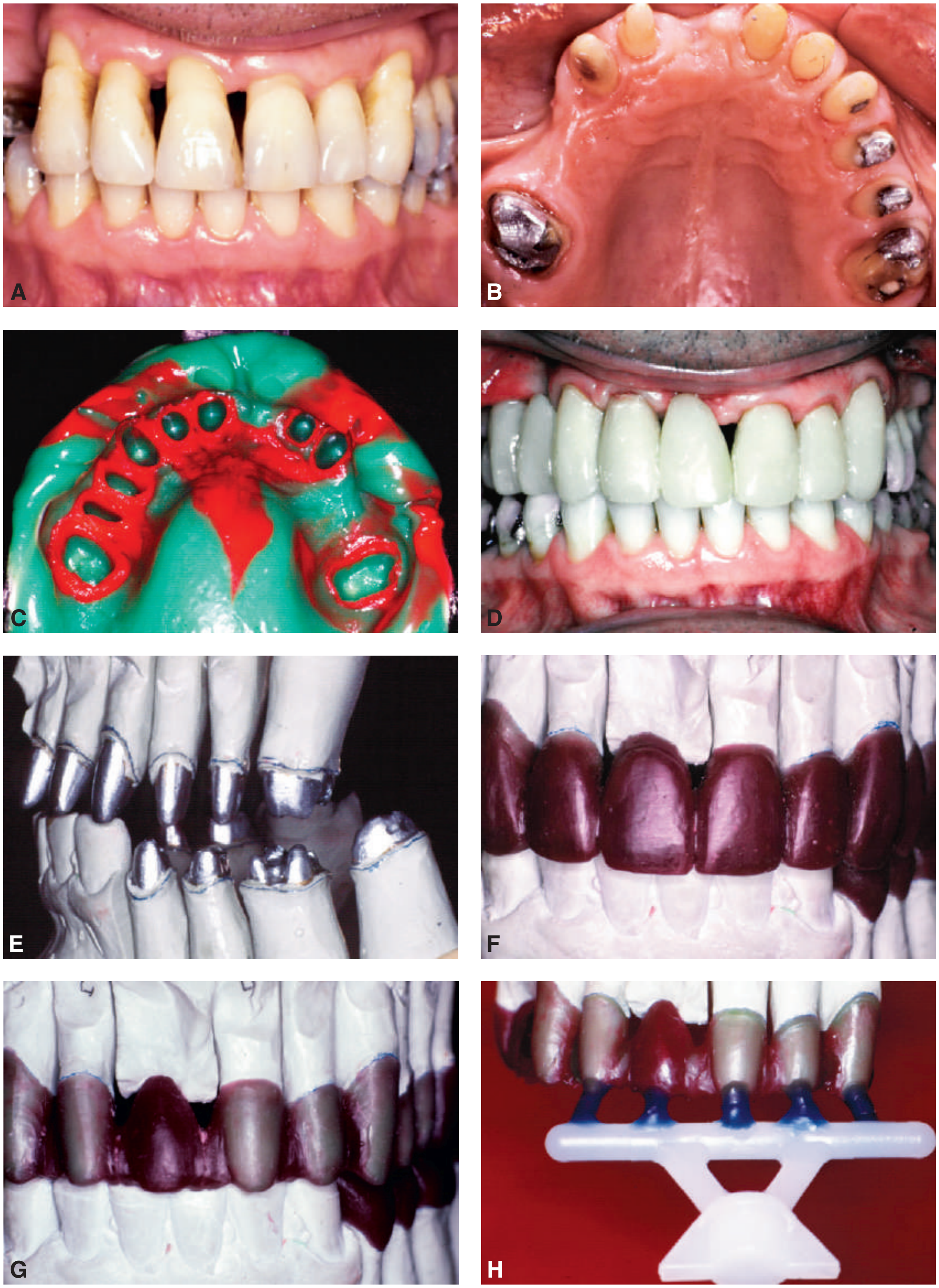


Fig. 31.50 Extensive fixed prosthodontic treatment (treatment V): teeth with advanced periodontal disease restored with fixed dental prostheses. (A) Initial presentation. The patient required the extraction of the right maxillary incisor and surgical correction of the periodontal defects. (B) Maxillary teeth prepared for metal-ceramic restorations. (C) Reversible hydrocolloid impression. (D) Interim restorations. (E) Definitive casts. (F) Anatomic contour wax patterns. (G) Patterns cut back for porcelain application. (H) Patterns with sprues inserted.

https://t.me/DentalBooksWorld

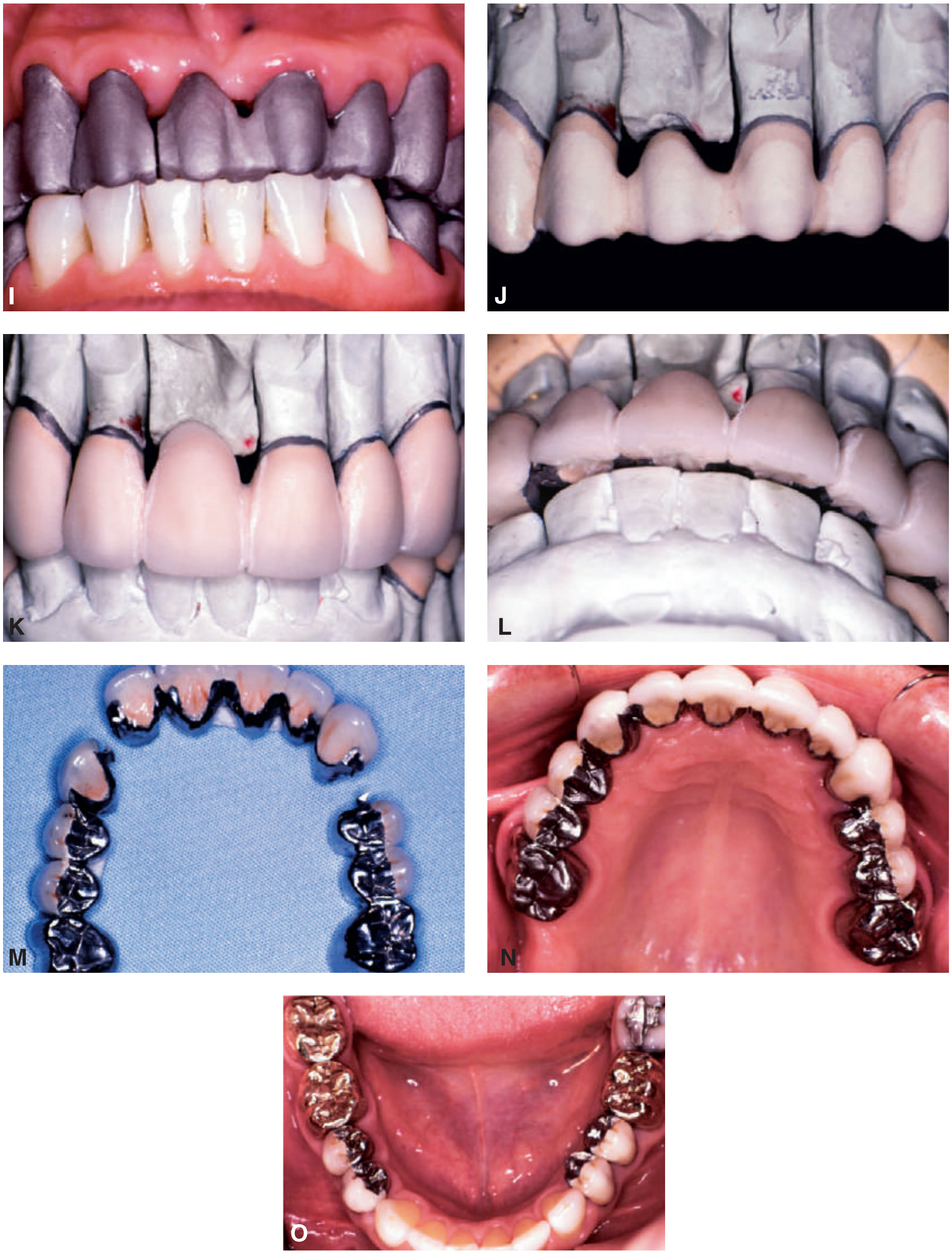


Fig. 31.50 Cont'd (I) Appearance of the metal framework at evaluation. (J) Opaque porcelain was applied. (K) Appearance of porcelain at bisque stage. (L) Centric contacts are on metal. (M) Finished restorations before cementation. The extensive prosthesis is segmented with intracoronal rests. (N and O) Cemented prostheses. (Courtesy Dr. M. T. Padilla.)

https://t.me/DentalBooksWorld

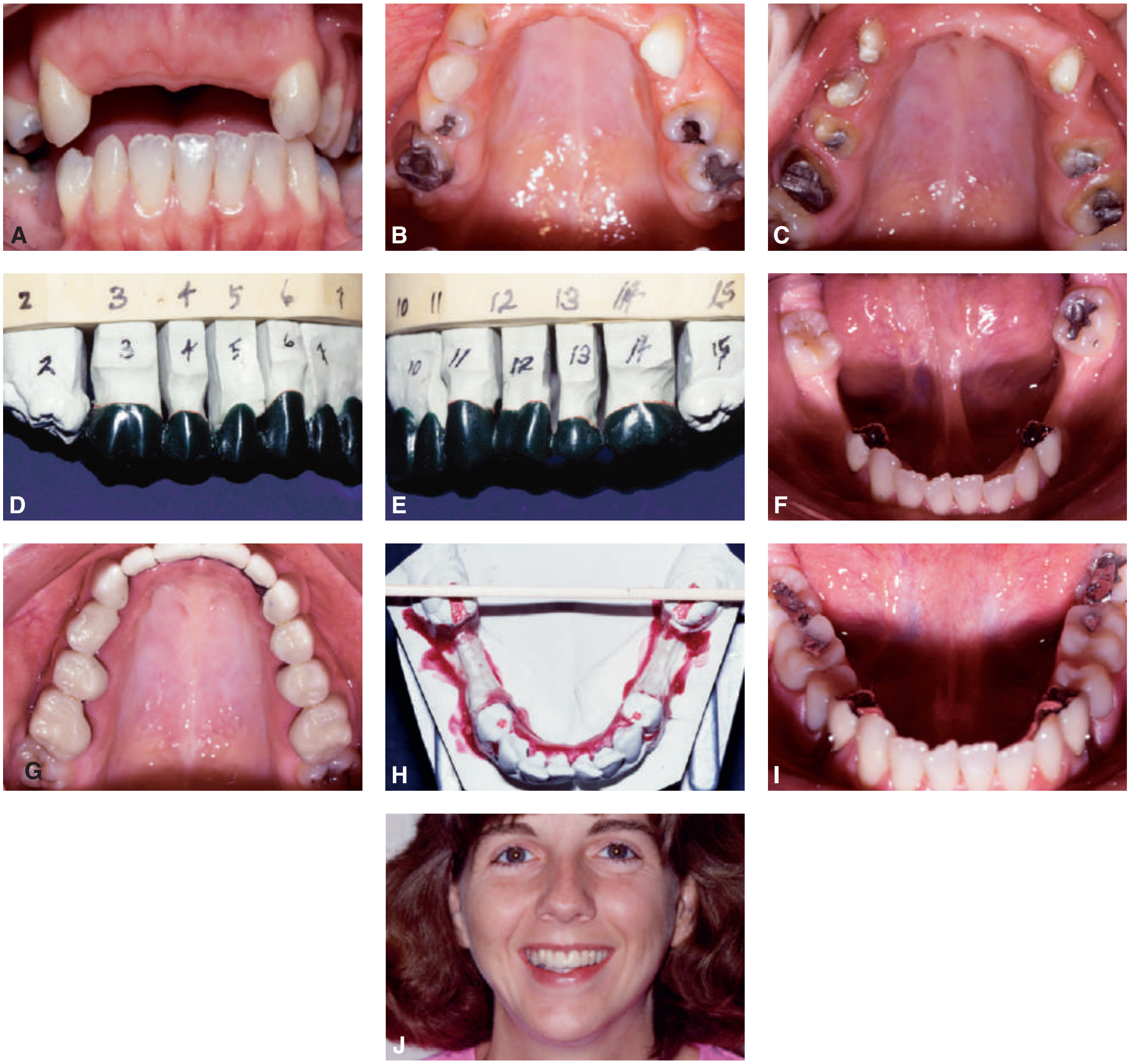


Fig. 31.51 Extensive fixed and removable prosthodontic treatment (treatment VI). The patient presented with missing maxillary anterior teeth (A) and missing mandibular posterior teeth (B). There was a significant slide from centric relation to maximum intercuspation. The patient was treated with a combination of fixed and removable prostheses. (C) Maxillary teeth were prepared, and foundation restorations were placed. (D and E) Maxillary teeth waxed to anatomic contour. (F and G) Completed fixed restorations. (H) Definitive cast for mandibular partial removable partial denture (RPD) framework before duplication. A rotational path of placement was used to engage mesial undercuts in second molars. (I) Completed mandibular RPD Amalgam stops were placed in the first molars to prevent premature wear of the denture teeth. (J) Appearance at the completion of treatment.

https://t.me/DentalBooksWorld

Fig. 31.51 **Cont'd** (K–O) Appearance 13 years after treatment. (Courtesy Dr. J. A. Holloway.)

https://t.me/DentalBooksWorld

Fig. 31.52 Anticipation of future needs (treatment VII). Appearance of maxillary teeth (A) and mandibular teeth (B) before treatment. Appearance at bisque bake: buccal views (C and D) and labial view (E). (F) Occlusal view before clinical evaluation. (G) Occlusal view at clinical evaluation. Note the location of the occlusal rests to anticipate various future partial removable dental prosthesis designs. An intracoronal rest (dovetail) was incorporated in the left lateral incisor. It is filled with composite resin, which is easily removed if the need arises. (H) Appearance at completion of treatment.

https://t.me/DentalBooksWorld

Fig. 31.53 Long-term evaluation of comprehensive rehabilitation with fixed and removable dental prostheses (treatment VIII). The patient presented with multiple failing restorations and severely compromised function. (A–E) Preoperative photographs. (F–J) Posttreatment photographs. Where possible, I-bars were used to minimize clasp visibility. Also, note the extensive use of metal occlusal surfaces. When prostheses are designed for dentitions with compromised crown-to-root ratios, the occlusion and anterior guidance components must be adjusted precisely. (K–Q) Seventeen-year follow-up photographs. Note that the maxillary canine was lost and the existing retainer was modified into a pontic through the addition of composite resin. Additional endodontic treatment was needed as time passed.

https://t.me/DentalBooksWorld

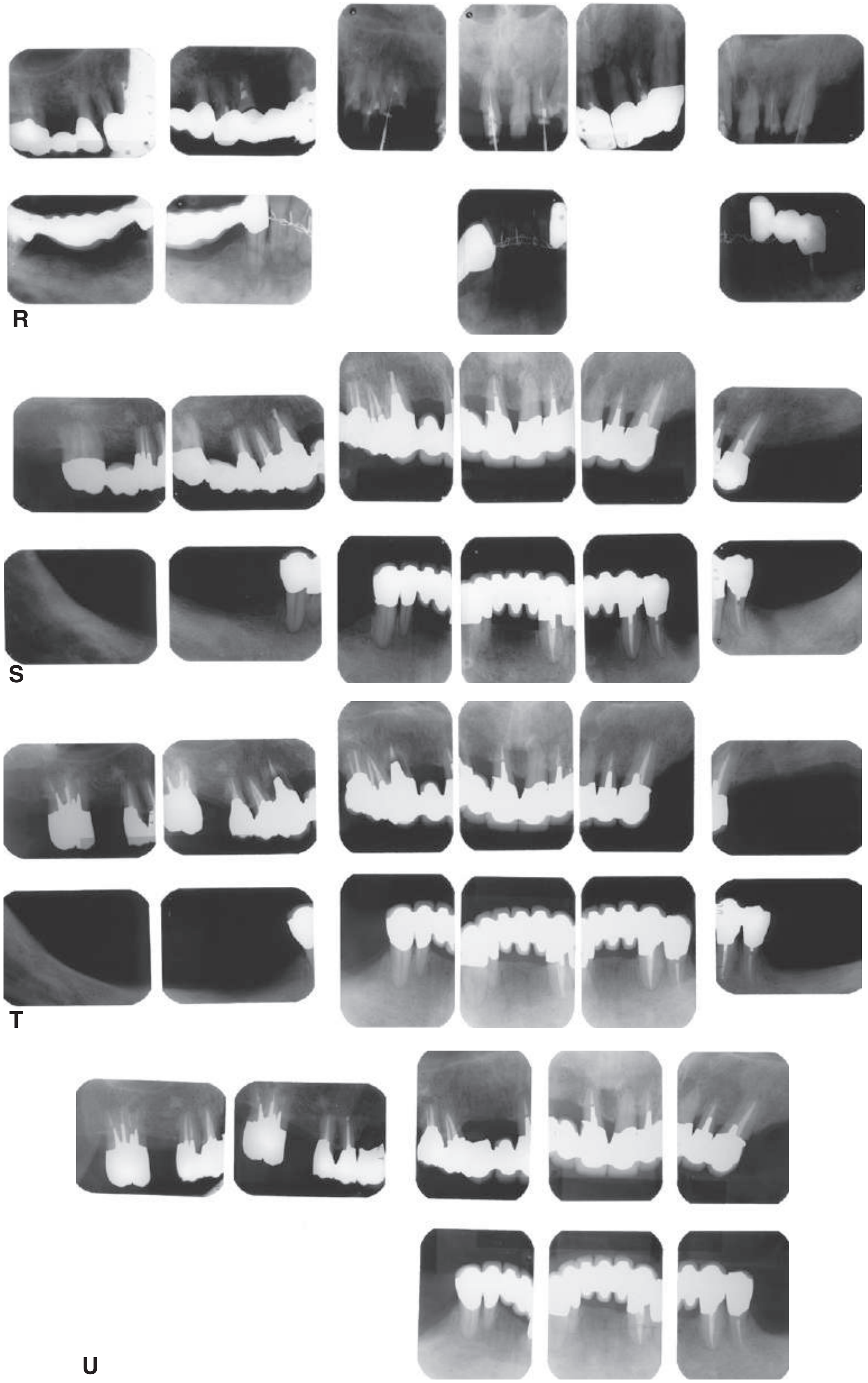
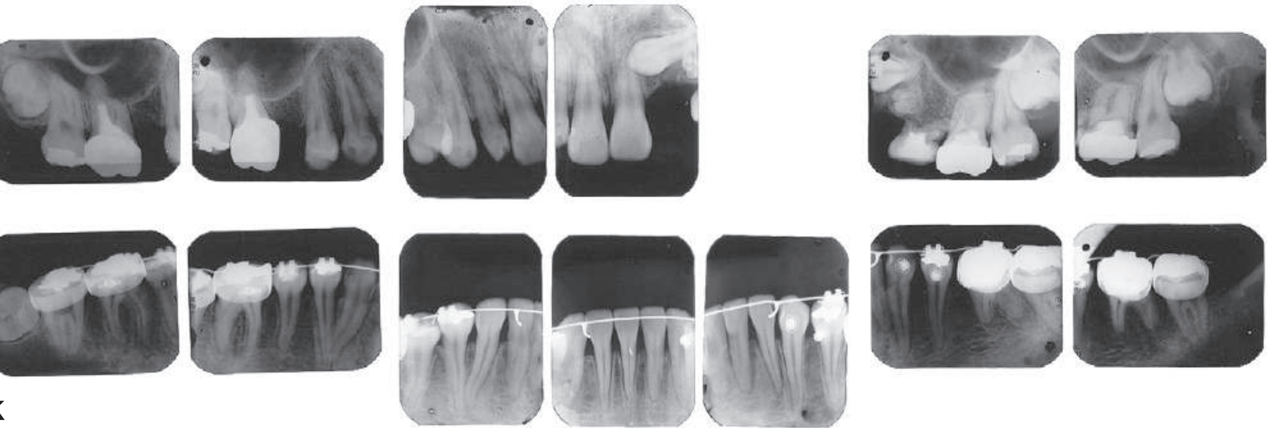


Fig. 31.53 Cont'd (R) Preoperative radiographs. (S) Postoperative radiographs. (T) Eight-year postoperative radiographs. (U) Seventeen-year postoperative radiographs. A fixed partial denture (FPD) was fabricated, replacing the missing tooth #3 with teeth #5, #4, and #2 as abutments. The teeth were prepared with minimal taper, and the castings exhibited good retention. After 10 years, the FPD failed when tooth #2 became dislodged, possibly as a result of the additional loading by the removable partial denture (RPD). Tooth #2 and the pontic were removed, endodontic treatment was performed, a new crown was fabricated, and the #3 pontic was incorporated in a new RPD. Tooth #6 was lost as a result of internal resorption and caries. Initially, the tooth was discolored, but the lesion was inactive, and the attempt to save it failed after 8 years. Its guarded prognosis was discussed as a significant risk factor before treatment initiation. This suggests that teeth with a guarded prognosis can be maintained if attention is paid to the principles of casting adaptation and occlusion.

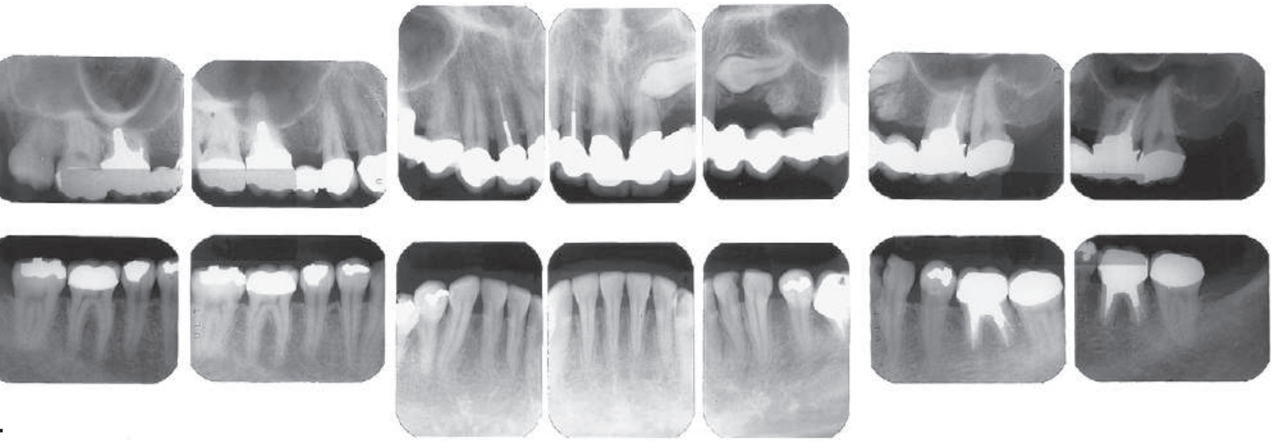
https://t.me/DentalBooksWorld

Fig. 31.54 Long-term follow-up after comprehensive treatment with fixed partial dentures (FPDs) of the patient in Fig. 31.42 (treatment IX). (A–E) Preoperative photographs. (F–J) Postoperative photographs.

https://t.me/DentalBooksWorld



K



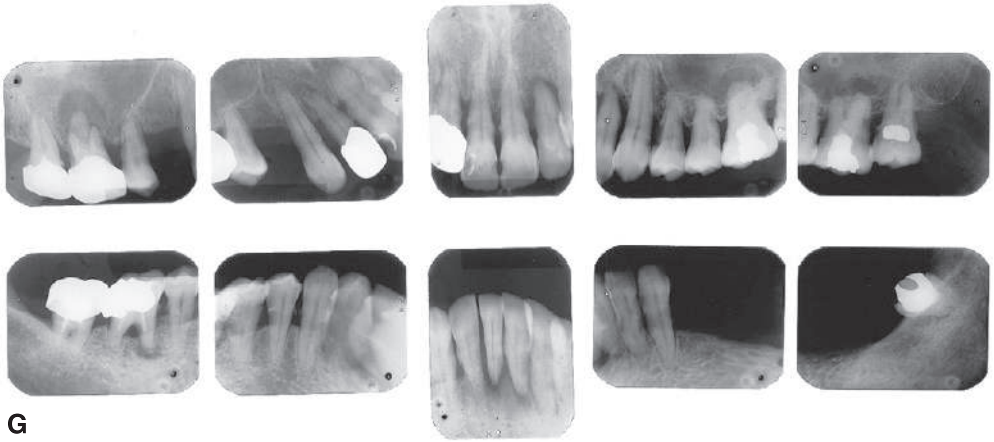
L

Fig. 31.54 Cont'd (K) Preoperative radiographs. (L) Fourteen-year postoperative radiographs. If the FPDs have been designed carefully and the patient is cooperative and maintains excellent plaque control, FPDs can withstand the test of time. Today, these prostheses continue to provide excellent esthetics and function after more than 16 years of service. Note that no intervention was performed for the impacted canine. Initially, the patient presented with only posterior guidance on the left and right first molars. A gingival graft was performed on the left side before the fixed prosthodontic treatment. Fourteen years later, all teeth were stable without any clinically significant mobility, and the anterior guidance components exhibited no visible faceting. No significant change occurred in bone levels, whereas apparent radiographic bone densities appeared slightly increased. Meticulous attention to the precise adjustment of the occlusion, especially the anterior guidance component, contributed to the long-term success of this treatment. The 14-year postoperative radiographs showed no signs of occlusal trauma. Also, note that three endodontically treated molars had very large access cavities. Such teeth had a guarded prognosis and were prone to fracture, but no fractures had occurred. Again, this suggests the importance of precise and optimal load distribution at the time of initial treatment and during periodic follow-up appointments. Recall visits were scheduled every 6 months.

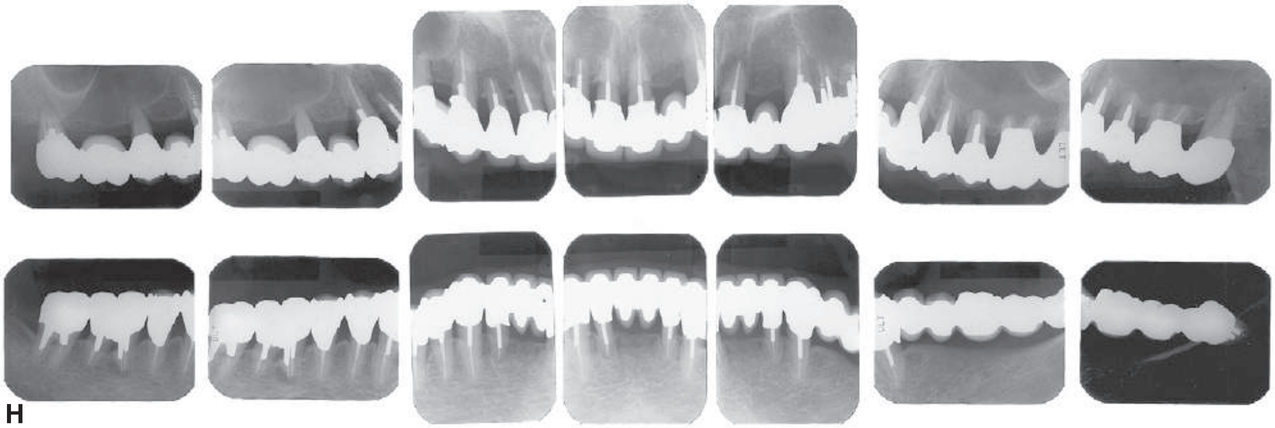
https://t.me/DentalBooksWorld

Fig. 31.55 Comprehensive rehabilitation of severely periodontally compromised dentition (treatment X). (A–C) Preoperative photographs. (D–F) Fourteen-year postoperative photographs. In the initial discussion of an extensive treatment plan with a patient with a severely compromised dentition, the many risks and possibilities of failure must be fully understood by all parties. This extremely complex rehabilitation continues to serve well today. A meticulous design and frequent recall appointments, combined with outstanding home care, enabled this patient to enjoy improved function 14 years later. Throughout the follow-up, the patient was seen at 1-month and periodic 3-month recall appointments, depending on pocket charting and patient motivation. At the 14-year evaluation, tooth #4 had no attached gingiva and little bone support, but no pocket formation. Initially, it was expected that this tooth would be the first to be lost. In conjunction with loss of tooth #1, this would have necessitated a partial removable dental prosthesis or implant-supported fixed dental prosthesis. Occlusal rests, undercuts, and guide planes had been incorporated in the initial prosthesis to anticipate such failure. After more than 14 years, the prostheses continued to serve satisfactorily. The anterior guidance component was starting to show some wear. Throughout the recall period, wherever posterior tooth contact was observed in excursive movements, they were eliminated as part of the ongoing occlusal adjustment. Meticulous management of load distribution contributed to the long-term success of this very complex rehabilitation.

https://t.me/DentalBooksWorld



G



H

Fig. 31.55 Cont'd (G) Preoperative radiographs. (H) Fourteen-year postoperative radiographs. This patient was referred initially for complete maxillary and mandibular denture fabrication. Before prosthodontic treatment, the periodontal condition was treated. Treatment included a modified Widman flap, performed throughout both arches. A root resection was performed for tooth #14, and tooth #30 was hemisected, which resulted in two premolar-like restorations. Use of the severely tilted tooth #17 as a single abutment to support a very long span posed a substantial risk to the long-term success of this treatment, and the tooth's future loss was anticipated in the design of the prostheses. Another risk was posed by the root structure of tooth #1, with a small, fused root. This tooth was lost after 14 years as a result of a periodontal defect that progressed along a vertical groove in the fused root.

https://t.me/DentalBooksWorld

Fig. 31.56 Long-term evaluation of fixed partial dentures (FPDs; treatment XI). (A)–(E) Preoperative photographs. (F)–(J) Eighteen-year posttreatment photographs. Three simple FPDs, combining conventional and metal-ceramic prostheses with post-soldered connectors, continue to serve 18 years after initial placement. Complications over the years included the reshaping of some restorations to correct occlusal discrepancies and the endodontic treatment of tooth #19 through the prosthesis (the access cavity was restored with amalgam). The patient presented with congenitally missing teeth #4 and #12. The maxillary canine was left in the premolar position for use as an abutment with posterior disocclusion resulting from guidance on the canine-shaped pontic. This is not ideal from the perspective of force distribution; however, the canine root successfully withstood the loading over time. Risk factors initially discussed with the patient included uncertainty regarding the effect of the crown-to-root ratios on the long-term prognosis. At the time of prosthetic treatment, more than 25 years before these pictures were taken, osseous integration was not the reliable treatment modality that it is today. The patient declined a removable prosthesis as an alternative to FPDs. A pinledge retainer was used on the small lateral incisor. Over time, not only was this esthetically effective, but it contributed to the long-term maintenance of its periodontal health. Similarly, a pinledge was used on the left mandibular canine, a far more conservative option than a metal-ceramic restoration. If instead metal-ceramic retainers had been used, additional treatment needs and possibly the loss of the lateral incisor may have eventually resulted. Teeth #18, #19, and #3 were treated endodontically; cast posts and cores were used. Also, note that tooth #8 has served well over time. The conservative access cavity was restored, and the favorable position in the arch results in favorable loading. Recall appointments for the patient were scheduled at 6-month intervals throughout the evaluation period.

https://t.me/DentalBooksWorld

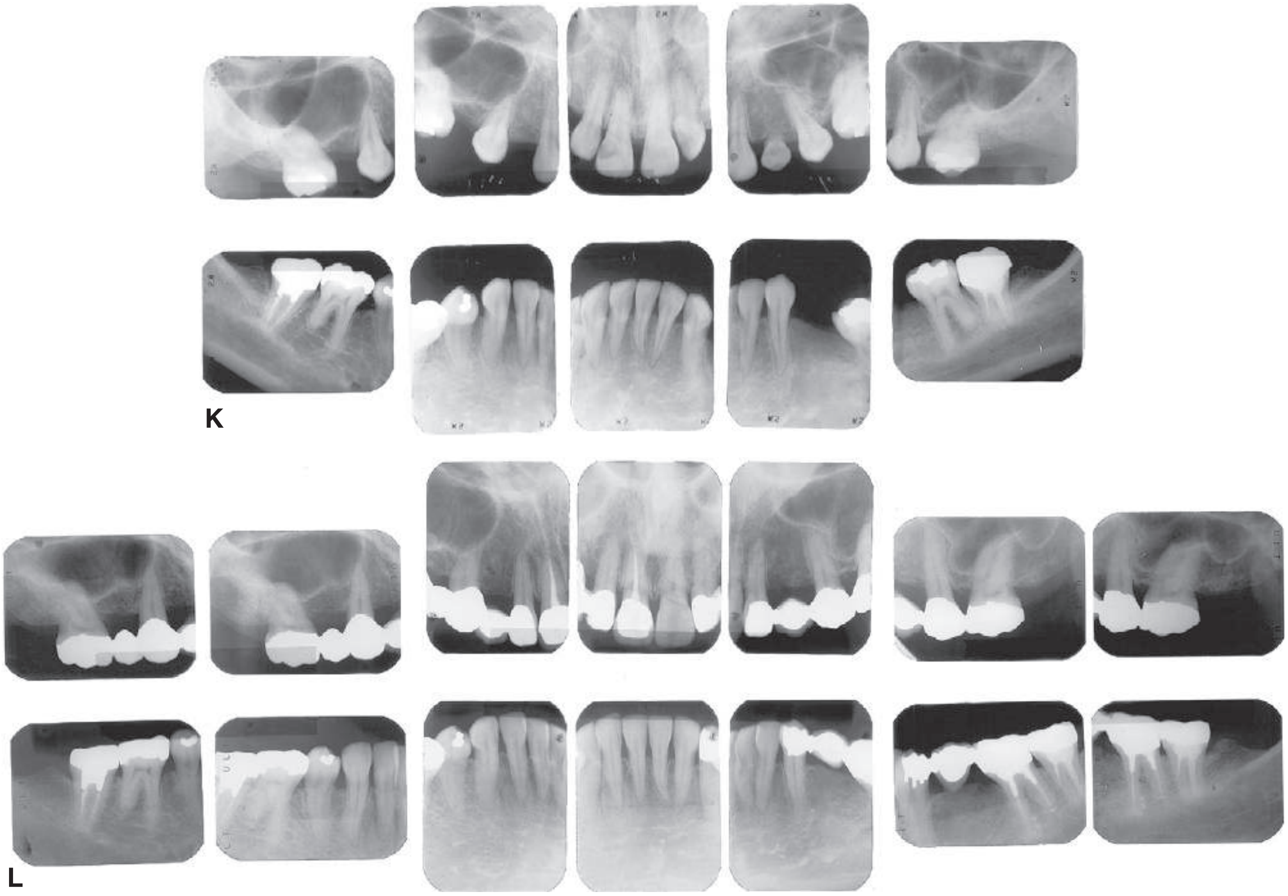


Fig. 31.56 Cont'd (K) Preoperative radiographs. (L) Eighteen-year postoperative radiographs.

SUMMARY

Well-organized and efficient postoperative care is the chief mechanism for ensuring optimal longevity and success in fixed prosthodontics. A restoration that is inserted and then forgotten or ignored is likely to fail, regardless of how skillfully it was designed, created, and placed. Restored teeth require more assiduous plaque removal and maintenance than do healthy unrestored teeth, and, similarly, an FPD requires additional care and attention.

Common complications after completion of the active phase of treatment include caries, periodontal failure, endodontic failure, loose retainers, porcelain debonding or fracture, and root fracture. If possible, the dentist should anticipate the long-term prognosis and treatment needs of the patient and attempt to design the treatment plan accordingly. On occasion, FPDs can be designed so that future re-treatment can be anticipated and simplified. However, it is impossible, even for the most experienced and talented clinicians, to anticipate every contingency and complication. The patient must understand the limitations of fixed prosthodontics before treatment begins.

STUDY QUESTIONS

1. What should be included in a typical posttreatment assessment once the previously rendered treatment has been completed? When and how often should the patient be reexamined? Provide examples of variables that influence this frequency.
2. What are typical complications for short-term post cementation? How can they be avoided? Once they have been identified, how can they be resolved?
3. How can advanced root caries be satisfactorily resolved?
4. How is the looseness of a retainer confirmed? Once this has been confirmed, how is the FPD removed?
5. Give three examples of treatment planning in which future failure is taken into consideration.

REFERENCES

1. Tolboe H, et al. Influence of oral hygiene on the mucosal conditions beneath bridge pontics. *Scand J Dent Res*. 1987;95:475.
2. Tolboe H, et al. Influence of pontic material on alveolar mucosal conditions. *Scand J Dent Res*. 1988;96:442.
3. Staun Larsen L, et al. Fluoride in saliva and dental biofilm after 1500 and 5000 ppm fluoride exposure. *Clin Oral Investig*. 2018;22:1123.
4. Ericson G, et al. Cross-sectional study of patients fitted with fixed partial dentures with special reference to the caries situation. *Scand J Dent Res*. 1990;98:8.
5. Akerboom HB, et al. Radiopacity of posterior composite resins, composite resin luting cements, and glass ionomer lining cements. *J Prosthet Dent*. 1993;70:351.

https://t.me/DentalBooksWorld