

# Individualized Prosthodontic Rehabilitation of Kennedy Class I, II Modification 2, and IV Partially Edentulous Arches Using Precision Attachment and Conventional Cast Partial Dentures: A Case Series

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## ABSTRACT

**Background:** Rehabilitation of partially edentulous patients remains a significant challenge because each clinical situation presents unique biomechanical, functional, and esthetic demands. Although implant-supported prostheses are widely used, cast removable partial dentures (CPDs) continue to provide a predictable, conservative, and cost-effective treatment option for patients in whom implant therapy is contraindicated, declined, or impractical. Appropriate prosthesis selection based on Kennedy classification, biomechanical principles, periodontal status, and esthetic requirements is essential for successful rehabilitation.

**Case Presentation:** This case series describes the prosthodontic rehabilitation of three female patients presenting with different Kennedy classifications. A Kennedy Class II Modification 2 mandibular arch was rehabilitated using a precision attachment-retained cast partial denture to satisfy high esthetic demands and improve retention. A Kennedy Class IV maxillary arch and a Kennedy Class I mandibular arch were rehabilitated using conventional cast removable partial dentures designed according to established biomechanical principles.

**Clinical Management:** All patients underwent comprehensive clinical examination, diagnostic cast analysis, surveying, mouth preparation, definitive impression procedures, framework fabrication, framework try-in, jaw relation recording where indicated, wax trial, prosthesis insertion, and scheduled post-insertion follow-up. Prosthesis design was individualized according to each patient's clinical presentation and functional requirements.

**Results:** All patients demonstrated satisfactory retention, stability, support, tissue adaptation, and occlusal harmony. Significant improvements were observed in mastication, phonetics, facial esthetics, and overall patient satisfaction. The precision attachment-retained prosthesis successfully eliminated visible clasp display while providing excellent retention, whereas the conventional cast partial dentures restored function and esthetics with favorable clinical outcomes.

**Conclusion:** Successful rehabilitation of partially edentulous patients requires individualized treatment planning rather than a standardized prosthodontic approach. Careful selection between precision attachment-retained and conventional cast removable partial dentures enables predictable restoration of function and esthetics while preserving the remaining dentition.

**Keywords:** Cast removable partial denture; precision attachment; Kennedy classification; partial edentulism; prosthodontic rehabilitation; distal extension; esthetic rehabilitation.

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## INTRODUCTION

Partial edentulism continues to be a significant restorative challenge despite remarkable advances in contemporary prosthodontics. Loss of natural teeth adversely affects masticatory efficiency, phonetics, facial esthetics, occlusal stability, periodontal health, and overall oral health-related quality of life. If left untreated, it may result in drifting and supra-eruption of adjacent teeth, occlusal disharmony, progressive alveolar ridge resorption, and functional impairment.

Therefore, timely prosthodontic rehabilitation is essential to restore oral function while preserving the remaining dentition and supporting oral structures.<sup>1-4</sup>

Several treatment modalities are available for the rehabilitation of partially edentulous patients, including fixed dental prostheses, implant-supported restorations, implant-assisted removable prostheses, and removable partial dentures. Although implant dentistry has revolutionized the management of partial edentulism, implant therapy is not universally applicable because of anatomical limitations, systemic conditions, financial considerations, patient preference, or the desire to preserve existing oral tissues. Consequently, cast removable partial dentures (CPDs) continue to represent a conservative, biologically acceptable, and cost-effective treatment option capable of providing predictable long-term functional rehabilitation.<sup>1-4</sup>

Cast removable partial dentures offer several advantages over acrylic removable partial dentures because their rigid cobalt-chromium framework provides superior support, retention, stability, durability, and more favorable distribution of occlusal forces. Successful treatment, however, depends on meticulous diagnosis, comprehensive treatment planning, appropriate mouth preparation, sound biomechanical design, accurate clinical and laboratory procedures, and regular post-insertion maintenance. Kennedy's classification remains the most widely accepted system for categorizing partially edentulous arches and serves as the basis for removable partial denture design by guiding decisions regarding support, retention, reciprocation, and stress distribution.<sup>2-4</sup>

Among distal extension cases, precision attachment-retained removable partial dentures provide an esthetic alternative to conventional clasp-retained prostheses by eliminating visible clasp display while improving retention and providing a controlled path of insertion. Their successful application, however, requires careful patient selection, healthy periodontal support, adequate restorative space, precise laboratory procedures, and long-term maintenance. In contrast, conventional clasp-retained cast partial dentures remain the treatment of choice in many clinical situations because of their simplicity, predictable clinical performance, ease of maintenance, and cost-effectiveness.<sup>5-7</sup>

Recent advances in digital dentistry, including digital impressions, virtual surveying, computer-aided design/computer-aided manufacturing (CAD/CAM), selective laser melting, and additive manufacturing, have enhanced the precision and reproducibility of cast removable partial denture fabrication. Nevertheless, irrespective of the fabrication technique employed, successful rehabilitation continues to depend primarily on sound biological and biomechanical principles combined with individualized treatment planning.<sup>13-17</sup>

Although numerous reports have described successful rehabilitation of individual Kennedy classifications, comparatively few case series demonstrate the application of different prosthetic designs across multiple clinical situations within a single report. Presenting diverse Kennedy classifications allows comparison of treatment philosophies and highlights the importance of tailoring prosthesis design according to biomechanical requirements, esthetic demands, periodontal status, and patient-specific factors rather than adopting a uniform treatment approach. The present case series describes the prosthodontic rehabilitation of three patients presenting with Kennedy Class I, Kennedy Class II Modification 2, and Kennedy Class IV partially edentulous arches using conventional and precision attachment-retained cast removable partial dentures. The report emphasizes the clinical decision-making process involved in prosthesis selection and demonstrates that successful rehabilitation depends on individualized treatment planning and adherence to established prosthodontic principles to achieve predictable functional and esthetic outcomes.

## CASE SERIES

### Clinical Protocol

All patients were treated in the Department of Prosthodontics and Crown & Bridge, Himachal Dental College, Sundernagar, following a standardized diagnostic and clinical protocol. Comprehensive medical and dental histories were obtained, followed by extraoral and intraoral examinations. Diagnostic impressions were made using an irreversible hydrocolloid impression material, and diagnostic casts were poured using Type III dental stone.

The diagnostic casts were surveyed to determine the path of insertion, identify suitable abutment teeth, evaluate available undercuts, and design the prosthesis according to established biomechanical principles. Appropriate mouth preparations, including guide planes, occlusal rest seats, and enamel modifications, were completed before making definitive impressions using an elastomeric impression material. Frameworks were designed on refractory casts and fabricated using cobalt-chromium alloy by the conventional lost-wax casting technique. Metal framework try-in was performed to assess fit, support, retention, stability, and tissue adaptation. Following satisfactory evaluation of jaw relations, esthetics, phonetics, and occlusion during the wax trial stage, the prostheses were processed with heat-polymerized acrylic resin, finished, polished, and inserted. All patients received standardized post-insertion instructions and were recalled after 24 hours, one week, one month, and three months for clinical evaluation.

### CASE 1

#### **Precision Attachment-Retained Rehabilitation of a Kennedy Class II Modification 2 Mandibular Arch**

A 50-year-old female presented to the Department of Prosthodontics and Crown & Bridge with the chief complaint of difficulty in mastication due to multiple missing mandibular teeth. The patient also expressed dissatisfaction with her facial appearance because of reduced lip support and requested an esthetic prosthesis without visible metal clasps. The medical history was non-contributory, whereas the dental history revealed multiple extractions secondary to dental caries and periodontal disease.

Extraoral examination demonstrated mild facial asymmetry with reduced lower facial fullness and diminished lip support, contributing to a compromised facial appearance (**Figure 1**). Following definitive prosthodontic rehabilitation, a marked improvement in facial esthetics and lower lip support was observed (**Figure 2**).

Clinical examination of the mandibular arch before treatment revealed a Kennedy Class II Modification 2 partially edentulous arch with moderate residual ridge resorption and satisfactory periodontal support of the remaining dentition (**Figure 3**). Appropriate mouth preparation, including preparation of the abutment teeth, was completed prior to fabrication of the definitive prosthesis (**Figure 4**).

Considering the patient's high esthetic expectations, favorable periodontal support, adequate restorative space, and desire to eliminate visible clasp display, rehabilitation using a precision attachment-retained cast removable partial denture was planned. Implant-supported rehabilitation and a conventional clasp-retained cast partial denture were discussed but were not selected because of patient-related considerations and esthetic concerns.

**Figure 5** illustrates the wax pattern of the precision attachment-retained cast partial denture framework fabricated on the master cast. The cast metal framework was evaluated intraorally for passive seating, adaptation, stability, and retention before proceeding to the subsequent clinical stages (**Figure 6**). A pre-fabrication trial was performed to verify the precision attachment assembly and assess prosthesis fit before definitive processing (**Figure 7**).

Following insertion, the definitive prosthesis demonstrated satisfactory adaptation, excellent retention, stability, and harmonious occlusion (**Figure 8**). The completed precision attachment-retained cast partial denture is shown from the tissue-bearing surface (**Figure 9**) and framework (intaglio) surface (**Figure 10**). Post-insertion right and left lateral intraoral occlusal views demonstrated favorable intercuspation, stable occlusion, and satisfactory prosthesis integration (**Figures 11 and 12**).

At follow-up appointments, the patient reported significant improvement in mastication, speech, facial esthetics, lower lip support, and overall confidence. Clinical examination revealed healthy supporting tissues with no evidence of attachment-related complications, framework instability, or soft tissue irritation.

### CASE 2

#### **Conventional Cast Partial Denture Rehabilitation of a Kennedy Class IV Maxillary Arch**

A 34-year-old female presented with the chief complaint of missing maxillary anterior teeth resulting in compromised esthetics, reduced incisive efficiency, and diminished confidence during speech and smiling. The medical history was non-contributory.

Pre-treatment extraoral examination demonstrated compromised smile esthetics due to the absence of the anterior teeth (**Figure 13**). Following insertion of the definitive prosthesis, facial appearance and smile esthetics improved considerably (**Figure 14**).

Clinical examination revealed a Kennedy Class IV maxillary partially edentulous arch with a well-healed anterior residual ridge and favorable periodontal support of the remaining dentition (**Figure 15**). The opposing mandibular arch was also evaluated as part of comprehensive treatment planning (**Figure 16**).

Treatment options including implant-supported rehabilitation, tooth-supported fixed partial denture, and conventional cast removable partial denture were discussed. Considering preservation of sound abutment teeth, patient preference, and financial considerations, rehabilitation using a conventional cast removable partial denture was selected.

Maxillomandibular jaw relation was recorded before fabrication of the prosthesis (**Figure 17**). The definitive framework was designed according to established biomechanical principles for a Kennedy Class IV cast removable partial denture (**Figure 18**).

Following insertion, the definitive prosthesis demonstrated satisfactory adaptation, retention, stability, and restoration of anterior esthetics. The occlusal view of the seated prosthesis is shown in **Figure 19**, while the post-insertion frontal intraoral view demonstrates restoration of anterior esthetics and harmonious occlusion (**Figure 20**).

The patient reported improved phonetics, incising efficiency, smile esthetics, and overall satisfaction. No evidence of framework distortion, clasp deformation, or soft tissue irritation was observed during follow-up.

### CASE 3

#### Conventional Cast Partial Denture Rehabilitation of a Kennedy Class I Mandibular Arch

A 49-year-old female presented with bilateral posterior mandibular edentulism associated with reduced masticatory efficiency. The dental history revealed multiple extractions secondary to dental caries and periodontal disease. Pre-treatment extraoral examination is shown in **Figure 21**, while the post-treatment extraoral photograph demonstrates improvement in facial appearance following prosthodontic rehabilitation (**Figure 22**).

The framework design for the mandibular cast removable partial denture was completed on the master cast according to established biomechanical principles (**Figure 23**). Pre-treatment intraoral examination of the maxillary arch is shown in **Figure 24**, whereas the mandibular arch following rest seat preparation is illustrated in **Figure 25**.

Because bilateral distal extension prostheses are susceptible to rotational movement, particular emphasis was placed on broad stress distribution, indirect retention, and rigid framework design. Following insertion, the seated mandibular cast partial denture demonstrated excellent adaptation and stability (**Figure 26**).

Post-insertion right lateral (**Figure 27**), frontal (**Figure 28**), and left lateral (**Figure 29**) intraoral occlusal views demonstrated satisfactory intercuspation, prosthesis stability, and restoration of posterior support.

At follow-up, the patient reported marked improvement in masticatory efficiency and oral comfort. Clinical examination demonstrated healthy supporting tissues with no evidence of biological or mechanical complications.

#### Comparative Analysis of the Three Cases

**Table 1. Comparative Clinical Characteristics of the Three Cases**

| Variable                  | Case 1                                             | Case 2                            | Case 3                            |
|---------------------------|----------------------------------------------------|-----------------------------------|-----------------------------------|
| Age (years)               | 50                                                 | 34                                | 49                                |
| Gender                    | Female                                             | Female                            | Female                            |
| Kennedy Classification    | Class II Modification 2                            | Class IV                          | Class I                           |
| Arch                      | Mandibular                                         | Maxillary                         | Mandibular                        |
| Primary Complaint         | Difficulty in mastication and poor esthetics       | Missing anterior teeth            | Difficulty in mastication         |
| Type of Prosthesis        | Precision attachment-retained cast partial denture | Conventional cast partial denture | Conventional cast partial denture |
| Support                   | Tooth–tissue supported                             | Tooth supported                   | Tooth–tissue supported            |
| Major Treatment Objective | Esthetics and retention                            | Esthetics and anterior function   | Posterior support and mastication |
| Outcome                   | Excellent                                          | Excellent                         | Excellent                         |

### DISCUSSION

The rehabilitation of partially edentulous patients requires an individualized treatment approach that integrates biomechanical principles, esthetic requirements, periodontal status, patient expectations, and long-term maintenance considerations. Although implant-supported prostheses have become an established treatment modality, cast removable partial dentures (CPDs) continue to play an indispensable role in contemporary prosthodontics because they provide a conservative, biologically acceptable, and economically feasible treatment option for patients in whom implant therapy is contraindicated, declined, or impractical.<sup>1-4</sup>

The present case series illustrates that successful prosthodontic rehabilitation depends on selecting the most appropriate prosthesis for a given clinical situation rather than adopting a uniform treatment philosophy. The three cases represented distinct Kennedy classifications, each presenting unique biomechanical and esthetic challenges that required different design strategies. By demonstrating the clinical application of both precision attachment-retained and conventional clasp-retained cast partial dentures, this series highlights the importance of individualized treatment planning based on sound prosthodontic principles.

Kennedy Class I and Class II arches are tooth–tissue-supported situations in which functional loads are shared between the periodontal ligament and the compressible mucosa of the residual ridge. Because these supporting tissues differ considerably in resilience, distal extension prostheses are susceptible to rotation during function, potentially increasing

stresses on terminal abutment teeth. Stewart and McCracken emphasized that broad denture base coverage, strategically positioned rests, guide planes, indirect retainers, and appropriate clasp assemblies are essential for minimizing rotational movement and preserving abutment health.<sup>2</sup> In the present series, these principles were incorporated into the framework design of both distal extension cases, resulting in satisfactory retention, stability, and healthy supporting tissues during the follow-up period.

Case 1 presented additional esthetic challenges because the patient requested rehabilitation without visible clasp display. In such situations, precision attachment-retained removable partial dentures provide an effective alternative to conventional clasp-retained designs by improving esthetics while maintaining retention and a controlled path of insertion. Burns and Ward emphasized that attachment selection should be based on periodontal support, available restorative space, biomechanical requirements, and patient expectations rather than esthetics alone.<sup>5,6</sup> In the present patient, favorable periodontal support, adequate restorative space, and high esthetic demands justified the use of a precision attachment-retained prosthesis. Elimination of visible clasp display improved patient acceptance while maintaining excellent functional performance throughout the observation period.

In contrast, Cases 2 and 3 demonstrate that conventional clasp-retained cast removable partial dentures remain highly effective when appropriately indicated. In the Kennedy Class IV maxillary arch, the principal treatment objectives were restoration of anterior esthetics, phonetics, and incising efficiency. Because the remaining posterior teeth provided adequate support and retention, a conventional cast partial denture offered a conservative solution without the need for extensive tooth preparation or additional restorative procedures. Similarly, the Kennedy Class I mandibular arch required careful biomechanical design to control rotational movement associated with bilateral distal extension bases. Appropriate framework design incorporating broad tissue support, rigid major connectors, indirect retention, and favorable stress distribution resulted in satisfactory functional and clinical outcomes.

These cases reinforce an important clinical principle: the success of removable partial dentures is determined more by appropriate case selection and biomechanical design than by the retention system itself. Precision attachments should not be regarded as routine substitutes for conventional clasp assemblies but as valuable adjuncts in carefully selected patients with appropriate periodontal support, sufficient restorative space, and high esthetic demands. Conversely, conventional clasp-retained prostheses continue to provide predictable long-term outcomes in the majority of partially edentulous situations while remaining simpler to fabricate, maintain, and repair.<sup>2,5-7</sup>

Recent advances in digital prosthodontics have expanded the possibilities for removable partial denture fabrication. Digital impressions, virtual surveying, CAD/CAM technologies, selective laser melting (SLM), direct metal laser sintering (DMLS), and additive manufacturing have improved framework accuracy, reproducibility, and laboratory efficiency. Systematic reviews have demonstrated encouraging clinical outcomes for digitally manufactured removable partial dentures, although long-term evidence remains limited.<sup>13-17</sup> Nevertheless, regardless of whether frameworks are fabricated conventionally or digitally, successful treatment continues to depend on accurate diagnosis, sound biomechanical design, meticulous clinical execution, and regular maintenance.

Implant-assisted removable partial dentures (IARPDs) have also emerged as an effective option for selected distal extension cases by converting tooth-tissue-supported prostheses into tooth-implant-supported prostheses, thereby reducing denture base displacement and improving support and stability.<sup>10,11</sup> However, implant therapy may not always be feasible because of anatomical limitations, systemic considerations, financial constraints, or patient preference. The present series reflects routine clinical practice, where conventional and precision attachment-retained cast removable partial dentures continue to provide predictable rehabilitation when carefully planned and executed.

An important strength of the present report is the inclusion of three distinct Kennedy classifications managed using different prosthodontic strategies within a single case series. Rather than demonstrating a single prosthesis design, the report illustrates how treatment planning must be adapted according to biomechanical requirements, esthetic expectations, and patient-specific factors. This comparative presentation enhances the educational value of the report and reflects the diversity of clinical situations encountered in routine prosthodontic practice.

The present study has certain limitations. Only three patients were included, and the follow-up period was limited to the early post-insertion phase. Consequently, long-term prosthesis survival, maintenance requirements, attachment wear, and biological complications could not be evaluated. Furthermore, standardized patient-reported outcome measures, such as Oral Health Impact Profile (OHIP-14), visual analogue scales, or objective assessments of masticatory performance, were not included. Future prospective studies with larger sample sizes, longer follow-up periods, and validated patient-reported outcome measures are required to strengthen the evidence supporting different cast removable partial denture designs.

Within these limitations, the present case series demonstrates that individualized prosthodontic treatment planning, careful prosthesis selection, and adherence to established biomechanical principles enable both precision attachment-

retained and conventional cast removable partial dentures to achieve predictable functional and esthetic rehabilitation across diverse patterns of partial edentulism.

### Clinical Significance

This case series highlights the importance of individualized prosthodontic treatment planning in the rehabilitation of partially edentulous patients. Selection between conventional clasp-retained and precision attachment-retained cast removable partial dentures should be based on Kennedy classification, biomechanical requirements, periodontal status, esthetic expectations, and patient-specific factors rather than a standardized treatment approach. The three cases demonstrate that adherence to sound prosthodontic principles enables both treatment modalities to provide predictable restoration of function, esthetics, phonetics, and patient satisfaction. Despite the increasing use of implant-supported prostheses, cast removable partial dentures continue to remain a valuable and clinically relevant treatment option in contemporary prosthodontic practice.

### CONCLUSION

Within the limitations of this case series, individualized prosthodontic treatment planning based on sound biological and biomechanical principles resulted in successful rehabilitation of Kennedy Class I, Kennedy Class II Modification 2, and Kennedy Class IV partially edentulous arches. Precision attachment-retained cast removable partial dentures provided superior esthetic outcomes in carefully selected distal extension situations, whereas conventional clasp-retained cast removable partial dentures demonstrated predictable restoration of function and esthetics in appropriately indicated cases.

The findings emphasize that successful rehabilitation depends primarily on accurate diagnosis, appropriate case selection, meticulous clinical and laboratory procedures, and regular maintenance rather than on the choice of retention system alone. Although implant-supported treatment has expanded the therapeutic options available for partial edentulism, cast removable partial dentures continue to serve as a conservative, biologically acceptable, and cost-effective treatment modality capable of achieving favorable clinical outcomes.

Future prospective clinical studies with larger patient cohorts, longer follow-up periods, and standardized patient-reported outcome measures are warranted to further evaluate the long-term performance of conventional and precision attachment-retained cast removable partial dentures.

### Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. In these forms, the patients have provided consent for their clinical information and clinical photographs to be reported in the journal. The patients understand that their names and initials will not be published, and every effort will be made to conceal their identity. However, complete anonymity cannot be guaranteed.

### Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

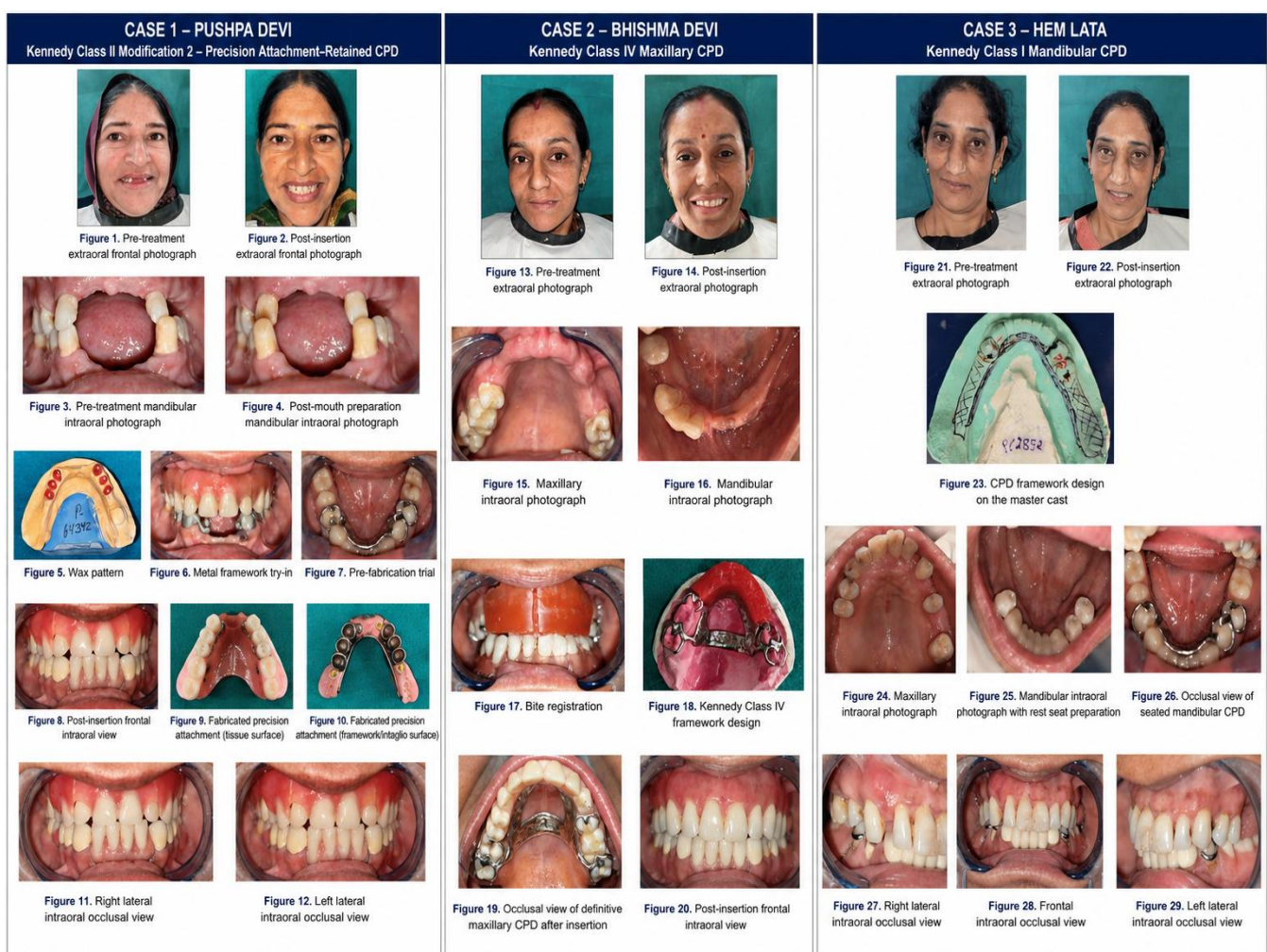
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CPD: Cast partial denture