



Precision Attachment Retained Removable Partial Denture: Prospective Study

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Abstract

Background and Objectives: Precision attachments can improve stability of partial dentures, particularly in free-end extension cases. This study aimed to evaluate the long-term clinical performance and patient satisfaction with precision attachment retained removable partial dentures.

Patients and methods: Ten patients (6 females, 4 males, aged 50-70 years) with 12 precision attachment retained removable partial dentures (Kennedy Class I) were followed for eight years. After preparation of remaining teeth and construction of the precision attachments joining fixed and removable parts. Patient satisfaction was assessed using a 5-point Likert scale questionnaire evaluating retention, aesthetics, phonetics, mastication, and overall satisfaction.

Results: Patient responses were categorized on a 5-point scale from "very satisfied" to "not at all satisfied", high levels of satisfaction were reported across all parameters. For retention, 50% of patients were very satisfied, the highest among all parameters. Aesthetics and phonetics each had 42% of patients reporting being very satisfied. Mastication showed more varied results, with 25% each reporting very satisfied, satisfied, and moderately satisfied. Overall, 50% of patients reported being very satisfied with their prostheses. ANOVA revealed no statistically significant differences between individual parameters and overall satisfaction ($p > 0.05$ for all comparisons).

Discussion: Precision attachment retained removable partial dentures provided high levels of patient satisfaction over long-term use. Retention and overall satisfaction showed particularly positive outcomes. However, mastication satisfaction was lower compared to other parameters, suggesting an area for potential improvement.

Limitations: The study's small sample size ($n = 10$) and potential recall bias due to the long follow-up period may limit the generalizability of the results.

Conclusion: Based on patient-reported outcomes, precision attachment retained removable partial dentures appear to be a comfortable and effective long-term treatment option, particularly when fixed prostheses are not indicated. Further large-scale studies are needed to confirm these findings and explore factors influencing long-term success.

Keywords: Precision Attachment; Bridge; Dentures; Retention; Mastication; Patient Satisfaction

Introduction

Edentulousness remains a major socio-psychological issue, with the replacement of missing teeth by artificial appliances being a common request from patients. A wide range of materials and techniques are employed to address the challenges associated with tooth replacement, aiming to provide appliances that are both comfortable and aesthetically pleasing to patients [1]. The rehabilitation of unilaterally or bilaterally edentulous areas presents a particular challenge, especially in cases where fixed prostheses are not indicated [2,3].

In such situations, the construction of partial dentures with precision attachments offers a potential solution. These mechanical components are designed for the fixation, retention, and stabilization of partial denture [4]. The term "precision" generally refers to the use of attachments [5]. These devices provide a connection between fixed and removable dental prostheses, such as bridges, crowns, and fixed partial dentures, which restore missing teeth on the remaining dentition or serve as abutments for clasp-retained removable partial dentures [6,7].

Precision attachments typically consist of two matched metal components - a male and a female part. Usually fabricated from precious metals and machined to close tolerances, these attachments are used to join removable prostheses to fixed restorations [8,9]. They can be classified into various types based on their shape, design, and primary area of utilization. For instance, Mensor classified precision attachments into intracoronal (telescope) and extracoronal (bar attachment) types [5]. While Gerardo B. and Michael M. categorized them into intradental (frictional and magnetic) and extradental (cantilever and bar) attachments [10,11].

The use of precision attachments in removable partial dentures (RPDs) is considered by some to be the highest form of partial denture therapy [12]. This approach can facilitate both aesthetic and functional replacement of missing teeth and oral structures, potentially offering superior outcomes compared to conventional clasp-retained RPDs. This is particularly valuable in cases where implants are not feasible due to insufficient bone or economic constraints [13,14]. While implants are an alternative option, they may be impossible in some cases due to insufficient bone in the placement region or economic reasons. In such situations, acrylic or

cast partial dentures with precision attachments are preferred for optimal aesthetic results [13,14]. A distinction between rigid and resilient combinations was made by Rantanen, *et al.* (1972), who recommended avoiding resilient connections due to their higher failure rate compared to rigid designs [15]. However, long-term clinical studies on stress-distributing combinations are limited.

The success of precision attachment retained RPDs depends on careful case selection, precise fabrication, and proper maintenance. The biomechanics of maxillo-mandibular function, the characteristics of different attachment types, and material properties must all be taken into consideration [16]. Unfortunately, precision attachments are often chosen based on descriptions in manufacturers' catalogs, which can lead to treatment failures. Extracoronal attachments offer a solution to ill-fitted dentures, particularly in cases with anterior teeth. They can provide fixation for mobile anterior teeth and improve the stability of cast partial dentures while addressing problems of reduced vertical dimension due to severe tooth loss [17].

Despite their potential benefits, there is limited long-term clinical data on the performance of precision attachment retained RPDs and patient satisfaction with these prostheses. Evaluation of patient satisfaction following the insertion of prostheses provides valuable feedback for improving and modifying treatment approaches [18,19]. Recent studies have further emphasized the importance of precision attachments in modern prosthodontics. For instance, Shrivastava, *et al.* (2020) highlighted the role of precision attachments in improving the retention and stability of removable partial dentures, particularly in cases with compromised abutment teeth [20]. The advent of digital dentistry has also impacted the field of precision attachments. Wismeijer, *et al.* (2018) discussed how CAD/CAM technology can be used to design and fabricate custom precision attachments, potentially improving their fit and performance [21].

Moreover, the long-term success of precision attachment retained RPDs has been a subject of recent research. A systematic review by Zitzmann, *et al.* (2019) found that while precision attachments can provide excellent aesthetics and patient satisfaction, their long-term survival rates may be influenced by factors such as attachment design and patient maintenance [22]. The impact of precision attachments on oral health-related

quality of life has also been investigated. Tumrasvin., *et al.* (2021) reported significantly improved quality of life scores in patients with precision attachment retained RPDs compared to those with conventional clasp-retained dentures [12]. Krishna P., *et al.* (2016) concluded that the use of attachments requires a thorough knowledge of basic prosthodontic principles, appropriate training and experience with the particular attachment used, technical skills and clinical ability and judgment [23].

This current study aims to address this gap by evaluating the long-term clinical performance and patient satisfaction with precision attachment retained removable partial dentures over an eight-year period. By assessing parameters such as retention, aesthetics, phonetics, mastication, and overall satisfaction, this study seeks to provide valuable insights into the efficacy of precision attachment retained RPDs as a treatment option for partial edentulism, particularly in challenging cases where conventional approaches may be less than ideal.

Methodology

Study Design and Patient Selection: This prospective, observational study was conducted from 2011 to 2018 in public, private clinics and laboratories in Erbil city. A total of 10 patients (aged 50-70 years) with 12 precision attachment retained removable partial dentures were included. All patients had Kennedy Class I (bilateral free-end) edentulous areas. The inclusion criteria were:

- Patients aged 50-70 years
- Presence of bilateral free-end edentulous areas (Kennedy Class I)
- Adequate bone support for remaining teeth
- No severe periodontal disease
- Willingness to comply with follow-up appointments

Exclusion criteria included:

- Severe systemic diseases affecting oral health
- Inability to maintain oral hygiene
- Severe bone loss in the edentulous areas

Verbal and written consent was obtained from each participant after thorough diagnosis and discussion of treatment options. The study protocol was approved by Erbil Polytechnic University.

Clinical procedures

- Preliminary impressions were taken using alginate material.
- Diagnostic casts were made and analyzed for treatment planning.
- Abutment teeth were prepared according to standard protocols for fixed partial dentures. Special care was taken to ensure adequate clearance for the attachment components.
- Final impressions were taken using polyvinyl siloxane material for improved accuracy.
- The impressions were poured with Type III dental stone to create master casts.
- Fixed bridges with T-type semi-precision extra-coronal attachments were fabricated in the laboratory using lost-wax technique and precious metal alloy.
- The removable partial denture framework was constructed using chrome cobalt alloy, with the female part of the attachment integrated into the framework.
- Metal try-in was performed to verify fit and make any necessary adjustments.
- Artificial teeth were set up and a wax try-in was conducted to check aesthetics and occlusion.
- After patient approval, the dentures were processed using heat-cured acrylic resin.
- Final prostheses were fitted and adjusted as necessary to ensure proper fit, function, and occlusion.

Table 1 provides a detailed breakdown of patient characteristics, including age, gender, arch treated, remaining teeth, type of major connector used, and the condition of the opposite arch. This information is crucial for understanding the diversity of cases included in the study and the versatility of the precision attachment system.

Prosthesis Design and Fabrication: Extra-coronal attachments (PRECI-VERTIX STD SET- 1801 CEKA, BELGIUM) were used in this study. These attachments were chosen for their durability and precision. The attachments consisted of two main parts:

Patient/age (years)	Arch	Remaining teeth	Type of major connector in partial dentures	Opposite arch
Female/61	Maxilla	Four upper incisors	Palatal strap	Precision attachment
	Mandible	Lower anterior with both 1 st premolars	Cingulum bar	Precision attachment
Male/59	Mandible	Left lateral incisor to right canine	Lingual bar	Partial denture
Male/70	Mandible	Left first premolar to right lateral incisor	Lingual bar	Complete denture
Male/60	Maxilla	Four upper incisors	Palatal plate	Precision attachment
	Mandible	Left lateral incisor to right canine	Cingulum bar	Precision attachment
Female/55	Maxilla	Left canine to right lateral incisor	Palatal bar	Partial denture
Male/58	Mandible	All anterior teeth	Lingual bar	Natural dentition
Female/64	Mandible	Right lateral incisor to left canine	Lingual bar	Complete denture
Female/69	Mandible	Left first premolar to right canine	Lingual bar	Complete denture
Female/59	Mandible	All anterior teeth	Lingual bar	Natural dentition
Female/52	Maxilla	Four incisors	Palatal bar	Natural dentition

Table 1: Shows the distribution of patients according to the remaining teeth and type of major connectors construction.

- Male part: attached to the proximal surface of the crown on the abutment tooth
- Female part: integrated into the chrome cobalt frame of the partial denture

Removable partial dentures with precision attachments for retention and support, is the best prosthesis available in dentistry where the fixed restorations are contraindicated, precision attachments are prefabricated attachments consisting of two matched metal components, male and female (Figure 1), they are usually made of precious metal machined to a close tolerance, they are used in removable partial dentures to join the removable prosthesis to a fixed restoration [10,11,17].

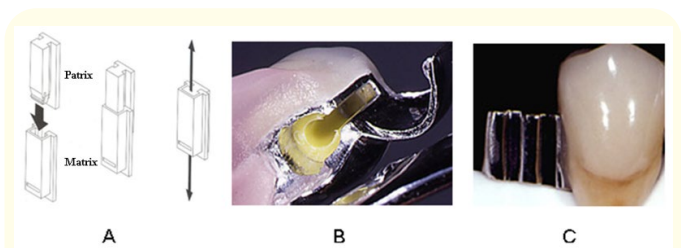


Figure 1: Show male (Patix) and female (Matrix) part of precision attachment, where (A) Male and Female part how they connect, (B) Image of Female, (C) Image of Male.

The decision to use extra-coronal attachments was based on their ability to provide better stress distribution and easier maintenance compared to intra-coronal attachments.

Follow-up Protocol: Patients were recalled every 4 months or twice annually, starting 6 months after the insertion of the prostheses. The follow-up schedule was designed to monitor the performance of the prostheses and address any issues promptly. During these visits:

- The fit and function of both fixed and removable components were evaluated.
- Occlusal relationships were checked and adjusted if necessary.
- The integrity of the attachment system was assessed.
- Any necessary adjustments or maintenance procedures were performed.
- Oral hygiene was evaluated, and patients were re-instructed on proper care techniques.
- Patients were re-instructed on proper insertion, removal, and cleaning of their prostheses.

Data Collection: After 8 years of observation, a questionnaire was administered to assess patient satisfaction. The questionnaire was developed based on previous studies in the field and validated by a panel of prosthodontists. It evaluated five parameters:

- **Retention:** Ability of the prosthesis to resist dislodgement
- **Aesthetics:** Appearance of the prosthesis and patient's smile
- **Phonetics:** Ability to speak clearly with the prosthesis
- **Mastication:** Ability to chew various foods comfortably
- **Overall satisfaction:** General contentment with the prosthesis.

Responses were categorized on a 5-point Likert scale:

- Very satisfied
- Satisfied
- Moderate
- Not satisfied
- Not at all satisfied

The questionnaire was administered by a trained dental professional who was not involved in the treatment process to minimize bias.

Statistical analysis

Data were analyzed using SPSS software (version 2020). Descriptive statistics including frequency distributions and percentages were calculated for each parameter. Analysis of Variance (ANOVA) was used to compare differences between parameters and overall satisfaction. A p-value of <0.05 was considered statistically significant.

Results

Patient Demographics: The study included 10 patients (6 females, 4 males) aged between 50-70 years, with a total of 12 precision attachment retained removable partial dentures. All cases were Kennedy Class I (bilateral free-end) edentulous areas.

Follow-up Observations: The follow-up period lasted 8 years for most cases. During this time:

- Patients generally found the prostheses comfortable and satisfactory.
- The design was reported to be well-functioning.
- No significant issues were reported during removal and insertion of the appliances.
- Patients were satisfied with the retention and stability of the prostheses.
- Minimal adjustments were required over the observation period.

Restorative Procedures: One case required additional treatment:

- Approximately one year after prosthesis delivery, one patient experienced toothache.
- The appliance was removed, and root canal treatment was performed on the lower left lateral incisor.
- The appliance was subsequently re-cemented without complications.

Maintenance: Three cases required re-cementation of the fixed component during the observation period.

Patient Satisfaction: Patient satisfaction was assessed using a 5-point Likert scale questionnaire evaluating five parameters. The results are summarized in Table 2 and Figure 2.

Parameter	Very satisfy	Satisfy	Moderate	Not satisfy	Not satisfy at all
Esthetic	5	1	3	3	0
Retention	6	3	2	1	0
Speech	5	3	2	1	1
Mastication	3	3	3	2	1
Overall satisfaction	6	2	2	1	1

Table 2: Patient feedback on various parameters.

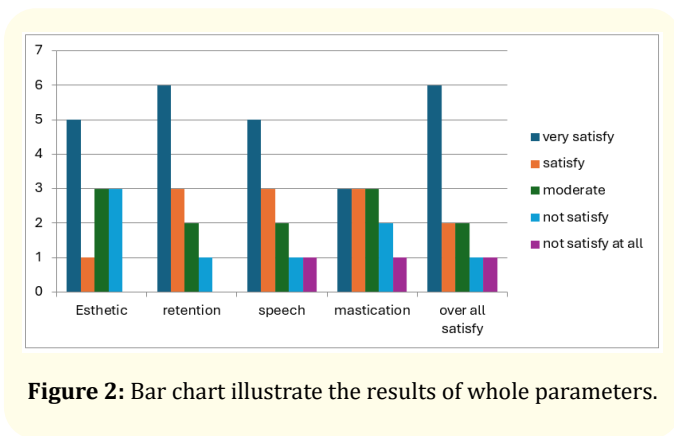


Figure 2: Bar chart illustrate the results of whole parameters.

Key findings from the satisfaction survey:

- **Esthetics:** 42% of patients were very satisfied, with 25% each reporting moderate satisfaction and dissatisfaction.

- **Retention:** 50% of patients were very satisfied, showing the highest satisfaction rate among all parameters.
- **Speech:** 42% of patients were very satisfied, with 25% satisfied and 17% moderately satisfied.
- **Mastication:** Satisfaction was more evenly distributed, with 25% each reporting very satisfied, satisfied, and moderately satisfied.
- **Overall satisfaction:** 50% of patients reported being very satisfied with their prostheses.

Statistical Analysis: Descriptive statistics were calculated for each parameter, including mean, standard deviation, standard error, sample variance, minimum, and maximum values (Table 3).

Parameter	Mean	Standard Deviation	Standard Error	Sample Variance	Minimum	Maximum
Esthetic	2.4	1.949	0.872	3.8	0	5
Retention	2.4	2.302	1.03	5.3	0	6
Phonetic	2.4	1.673	0.748	2.8	1	5
Mastication	2.4	0.894	0.4	0.8	1	3
Overall satisfaction	2.4	2.074	0.927	4.3	1	6

Table 3: Descriptive statistics for satisfaction parameters.

Analysis of Variance (ANOVA): ANOVA was performed to compare each parameter with overall satisfaction. The results are presented in Tables 4-7.

The ANOVA results show no statistically significant differences between individual parameters and overall satisfaction ($p > 0.05$ for all comparisons).

Source of Variation	SS	df	MS	F	P-value
Between Groups	0	1	0	0	1
Within Groups	32.4	8	4.05		
Total	68	24			

Table 4: ANOVA results for Aesthetic and overall satisfaction.

Source of Variation	SS	df	MS	F	P-value
Between Groups	0	1	0	0	#NUM!
Within Groups	38.4	8	4.8		
Total	38.4	9			

Table 5: ANOVA results for Retention and overall satisfaction.

Source of Variation	SS	df	MS	F	P-value
Between Groups	3.55271E-15	1	3.55271E-15	1.39322E-15	0.999999971
Within Groups	20.4	8	2.55		
Total	20.4	9			

Table 7: ANOVA results for Mastication and overall satisfaction.

Source of Variation	SS	df	MS	F	P-value
Between Groups	4E-15	1	4E-15	1E-15	1
Within Groups	28.4	8	3.55		
Total	28.4	9			

Table 6: ANOVA results for Phonetic and overall satisfaction.

Pie Charts: Figures 3-7 present pie charts illustrating the distribution of patient responses for each parameter.

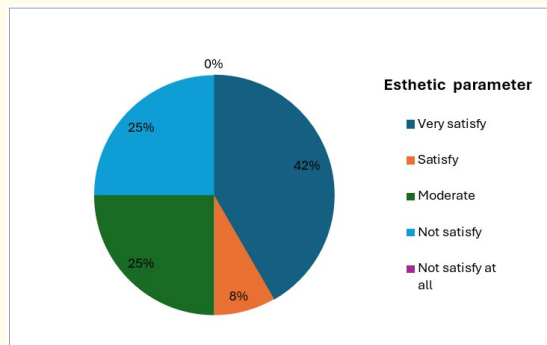


Figure 3: Pie chart illustrate the results of Esthetic.

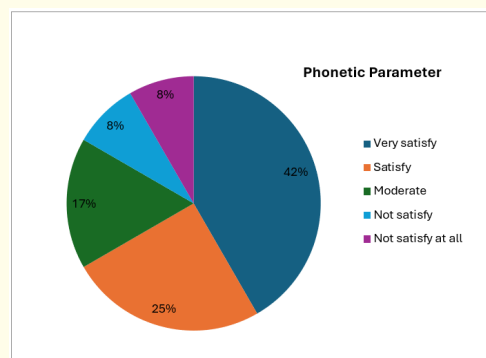


Figure 5: Pie chart illustrate the results of Esthetic.

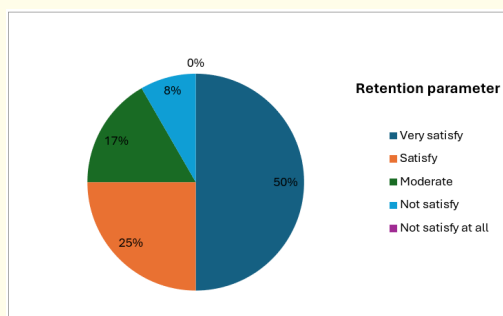


Figure 4: Pie chart illustrate the results of Retention.

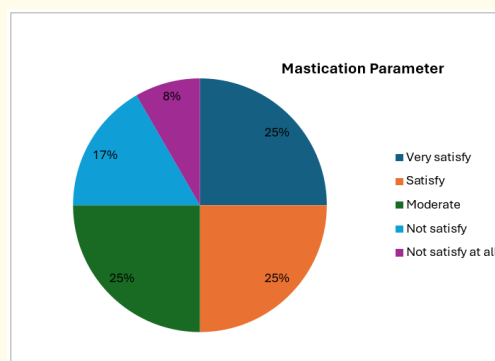


Figure 6: Pie chart illustrate the results of Mastication.

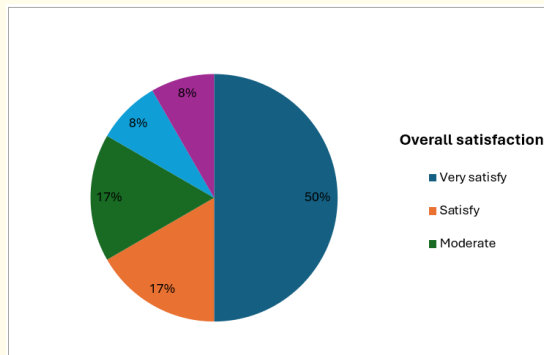


Figure 7: Pie chart illustrate the overall satisfaction of patient.

The previous pie charts provide a visual representation of the distribution of patient satisfaction across the different parameters. They highlight that for most parameters, the majority of patients were either very satisfied or satisfied with their precision attachment retained removable partial dentures.

The results suggest that precision attachment retained removable partial dentures provided high levels of patient satisfaction across various functional and aesthetic parameters over the long-term observation period. The high satisfaction rates for retention and overall satisfaction are particularly noteworthy, indicating the effectiveness of the precision attachment system in addressing common concerns with removable partial dentures.

This revised Results section now includes the ANOVA tables and references to the pie charts, providing a more comprehensive presentation of your findings, including both descriptive and inferential statistics, as well as visual representations of the data.

Discussion

Precision attachments have emerged as an effective solution for addressing retention issues in removable partial dentures (RPDs). The evolution of attachment technology has expanded beyond implant superstructures, offering unique advantages for removable prostheses, including enhanced aesthetics, minimal post-operative adjustments, and improved patient comfort (Tumrasvin., *et al.* 2021; Shrivastava., *et al.* 2020) [12,20]. The use of precision attachments in cases combining fixed and removable prostheses is

primarily motivated by their ability to provide superior retention, aesthetics (clasp-free design), support, stabilization, and fixation, aligning with established principles in prosthodontics (Henderson and Steffel, 1981) [7].

For prostheses with distal extension, precision attachments offer comparable outcomes without the variability introduced by different clinicians. However, factors such as patient age, marginal bone support, and endodontically treated teeth must be carefully considered, as noted by (Owall, 1995) [1]. Precision attachment-retained removable partial dentures are particularly suitable for patients where fixed prostheses and implants are contraindicated. Successful outcomes rely on accurate construction techniques, proper diagnosis, and regular preventive maintenance to preserve existing dentition [3].

While the mechanical design of attachments is crucial, it must be balanced with the technical skill required for implementation. A thorough understanding of maxillo-mandibular biomechanics, attachment types, and material properties is essential for successful treatment. Unfortunately, attachment selection often relies heavily on manufacturers' catalogs, which can lead to treatment failures. The effectiveness of precision attachments in retention, stress distribution, and aesthetics depends on sound biological and technical planning, coupled with proper care from both the dentist and patient during the maintenance phase [24].

Our study evaluated several parameters of patient satisfaction. Regarding aesthetics, 42% of patients reported being very satisfied with their appliances, aligning with earlier findings by (Vinaya S., *et al.* 2014) [9] (48%), but lower than the 60% reported by (Jimmy Patel., *et al.* 2017) [16]. This discrepancy might be attributed to recent advancements in material science and fabrication techniques, as highlighted by Ferro., *et al.* (2023) [25], who emphasized the importance of material selection in achieving optimal aesthetics and patient satisfaction in precision attachment RPDs.

Retention, a critical factor in RPD success, showed high satisfaction levels, with 50% of patients reporting being very satisfied. This outcome surpasses earlier findings by (Vinaya S., *et al.*

2014) [9], suggesting potential improvements in attachment design and implementation. Recent literature (Shrivastava, *et al.* 2020; Kutkut, *et al.* 2022) [20,26] further emphasizes the importance of retention in patient satisfaction, noting that precision attachments significantly enhance RPD stability and patient comfort.

Phonetic satisfaction in our study (42% very satisfied) exceeded earlier reports by (Vinaya S., *et al.*, 2014) [9] (23%) and aligned closely with (Jimmy Patel, *et al.* 2017) [16] (36.1%). Recent work by Tumrasvin, *et al.* (2021) [12] and Kováčová, *et al.* (2022) [27] highlights the impact of prosthetic design on oral function, including speech, underscoring the importance of this parameter in overall patient satisfaction.

Recent advancements in digital dentistry have significantly impacted precision attachment fabrication. Wismeijer, *et al.* (2018) [21] discussed how CAD/CAM technology can improve the design and manufacture of custom precision attachments, potentially enhancing their fit and performance. This digital approach may lead to better long-term outcomes for patients.

The long-term success of precision attachment-retained RPDs has been a subject of recent research. A systematic review by Zitzmann, *et al.* (2019) [22] found that while precision attachments can provide excellent aesthetics and patient satisfaction, their long-term survival rates may be influenced by factors such as attachment design and patient maintenance.

Mastication satisfaction, while positive, was lower than other parameters in our study, with only 25% reporting high satisfaction. This result is lower than those reported by (Vinaya S., *et al.* 2014) [9] (38%) and (Jimmy Patel, *et al.*, 2017) [16] (45%). Zitzmann, *et al.* (2019) [22] suggest that the long-term success of precision attachment RPDs may be influenced by factors affecting masticatory function. A recent systematic review by Moldovan, *et al.* (2023) [28] emphasized the need for standardized protocols in assessing masticatory performance in RPD wearers.

While our study shows high overall patient satisfaction, it's important to note that satisfaction may vary over time. A longitudinal study by Park, *et al.* (2022) [29] found a slight decline in satisfaction over a 5-year period, emphasizing the need for long-term follow-up and maintenance.

Recent studies have also explored the impact of precision attachment RPDs on oral health-related quality of life. Tumrasvin, *et al.* (2021) [12] and Kutkut, *et al.* (2022) [26] reported significantly improved quality of life scores in patients with precision attachment RPDs compared to those with conventional clasp-retained dentures.

In conclusion, while our study demonstrates high levels of patient satisfaction with precision attachment RPDs, it also highlights areas for potential improvement, particularly in masticatory function. As digital dentistry advances, future research should focus on optimizing attachment design and fabrication to enhance clinical outcomes and patient satisfaction. The integration of novel materials, as suggested by Ferro, *et al.* (2023) [25], and the potential of 3D printing technology in precision attachment fabrication (Bencharit, *et al.* 2022) [30] offer promising avenues for future developments in this field.

Despite the positive outcomes observed in this study, it is important to acknowledge potential biases and limitations. The relatively small sample size (n = 10) and the single-center nature of the study may limit the generalizability of our findings. Additionally, the long follow-up period of eight years, while valuable for assessing long-term outcomes, introduces the possibility of recall bias in patient-reported satisfaction [11]. Furthermore, the lack of a control group using conventional clasp-retained RPDs prevents direct comparison of outcomes between precision attachment and traditional designs. These limitations highlight the need for larger, multi-center randomized controlled trials to more definitively establish the superiority of precision attachment RPDs over conventional designs.

To address these limitations and further advance the field, we propose several actionable recommendations for future research and clinical practice. Firstly, standardized protocols for assessing masticatory performance in RPD wearers should be developed and implemented, as suggested by Moldovan, *et al.* (2023) [28]. This would allow for more accurate comparisons across studies and patient populations. Secondly, the integration of digital dentistry techniques, such as CAD/CAM technology for precision attachment design and fabrication, should be explored to potentially enhance fit and performance [21]. Clinicians should also consider incorporating patient-reported outcome measures (PROMs)

into their regular follow-up protocols to better track long-term satisfaction and functional outcomes [26]. Lastly, future studies should investigate the impact of different attachment designs and materials on long-term clinical outcomes and patient satisfaction, as highlighted by recent advancements in prosthodontic materials [25,30]. By addressing these areas, we can work towards optimizing the use of precision attachments in RPDs and improving patient outcomes in partial edentulism cases where conventional approaches may be less suitable.

Conclusion

This eight-year study demonstrates the potential for precision attachment retained removable partial dentures to provide a high level of patient satisfaction, particularly in cases where fixed prostheses or implants are not feasible. While the study highlights positive patient feedback on retention, aesthetics, phonetics, and mastication, the relatively small sample size and difficulties in verifying certain references necessitate further research. A larger-scale, more robust investigation is warranted to confirm these findings and to explore the long-term clinical performance and patient satisfaction with these prostheses in greater detail. Despite these limitations, this study suggests that precision attachments, when carefully planned, fabricated, and maintained, can be a valuable treatment option for patients with partial edentulism, particularly in cases where conventional approaches are not suitable.

Recommendations and Suggestions

From current study it can be suggested that:

Future research should focus on optimizing attachment design and fabrication techniques, integrating digital dentistry and novel materials to further enhance clinical outcomes and patient satisfaction with this innovative treatment modality. Satisfaction parameters for precision attachment and its different design using in combination with the Kennedy class I and II removable partial denture. Satisfaction parameters for precision attachment and its different design using in combination among the same classification of Kennedy class I or II removable partial denture.

Bibliography

1. Mello PC., *et al.* "Abrasion wear resistance of different artificial teeth opposed to metal and composite antagonists". *Journal of Applied Oral Science* 17.5 (2009): 451-456.
2. Burns DR and Ward JE. "A review of attachments for removable partial denture design: part 1. Classification and selection". *International Journal of Prosthodontics* 3 (1990): 98-102.
3. Sumit M., *et al.* "Attachment Retained Removable Partial Denture: A Case Report". *IJCDS* 2.2 (2011): 39-43.
4. Naveen Gupta., *et al.* "Combined Prosthesis with Extracoronary Castable Precision Attachments". *Case Reports in Dentistry* (2013): 4.
5. Preiskel HW. "Precision Attachments in Dentistry". 3rd ed. C.V. Mosby, St. Louis, Mo. London (1979).
6. John DJ. "Attachments For Removable Partial Dentures, Clinical Removable Partial Prosthodontics". 2nd ed. St. Louis: Ishiyaku Euroamerica publishing co. (1992): 627-633.
7. Henderson D and Steffel VL. "McCracken's Removable Partial Prosthodontics". ed 6. St Louis: Mosby (1981).
8. Burns DR and Ward JE. "A review of attachments for removable partial denture design: part 2. Treatment planning and attachment selection". *International Journal of Prosthodontics* 3 (1990): 169-174.
9. Vina ya S Bhat., *et al.* "Survey to assess patient satisfaction after receiving complete denture prostheses in a.b. Shetty Memorial Institute of Dental Sciences". *NUJHS* 1.4 (2014): 81-85.
10. Jayasree K., *et al.* "Precision Attachment: Retained Overdenture". *Journal of Indian Prosthodontic Society* 12.1 (2012): 59-62.
11. Ary D., *et al.* "Introduction to research in education". New York: CBS College Publishing (1985).
12. Tumrasvin W., *et al.* "Masticatory function after prosthetic treatment for partially edentulous patients with distal extension removable partial dentures: a hierarchical Bayesian modeling approach". *Journal of Prosthodontic Research* 65.1 (2021): 89-95.
13. Mensor MC. "Removable partial overdentures with mechanical precision attachments". *Dental Clinics of North America* 34 (1990): 669-661.

14. Owall B. "Precision attachment-retained removable partial dentures: Part 2. Technical long-terms study". *International Journal of Prosthodontics* 8.1 (1995): 21-28.
15. Harsh Patel, *et al.* "Use of precision attachment and cast partial denture for long-span partially edentulous mouth - A case report". *International Journal of Applied Dental Sciences* 1.1 (2014): 22-25.
16. Jimmy Patel A, *et al.* "A survey of complaints of patients wearing artificial complete removable dentures". *NJMDR* 5.3 (2017): 177-181.
17. Feinberg E and Feinberg E. "Attachment Retained Partial Dentures". *NYS DENTAL JOURNAL* (1984): 161-164.
18. Baker J and Goodkind R. "Theory and practice of precision attachment removable partial dentures, St. Louis". 1978; the CV Mosby Co (1978).
19. Preiskel HW. "Precision Attachments in Prosthodontics: Overdentures and Telescopic Prostheses". Volume 2. Chicago, II: Quintessence Publishing Co, Ltd; (1985).
20. Shrivastava R, *et al.* "Precision attachment-retained removable partial denture: A case report". *Journal of Family Medicine and Primary Care* 9.6 (2020): 3074.
21. Wismeijer D, *et al.* "Group 5 ITI Consensus Report: Digital technologies". *Clinical Oral Implants Research* 29 (2018): 436-442.
22. Zitzmann NU, *et al.* "Resin-bonded restorations: a strategy for managing anterior tooth loss in adolescence". *Journal of Prosthetic Dentistry* 121.3 (2019): 443-449.
23. Krishna Prasad D, *et al.* "A Simplified Approach to Semi-Precision Attachment". *NUJHS* 6.3 (2016): 51-57.
24. Prabhakar B, *et al.* "Precision attachments; applications and limitations". *JEMDS* 1.6 (2012): 1113-1121.
25. Ferro KJ, *et al.* "The glossary of prosthodontic terms". *The Journal of Prosthetic Dentistry* 129.1 (2023): e1-e98.
26. Kutkut A, *et al.* "A systematic review of studies comparing quality of life in patients with conventional complete dentures and implant-retained overdentures". *Journal of Prosthodontics* 31.1 (2022): 20-35.
27. Kováčová V, *et al.* "The impact of removable dentures on the quality of life of geriatric patients". *Biomedical Papers* 166.4 (2022).
28. Moldovan O, *et al.* "Masticatory performance measured in clinical studies on removable dental prostheses: A systematic review". *Journal of Dentistry* 134 (2023): 104471.
29. Park JH, *et al.* "Five-year prospective clinical study of removable partial dentures with precision attachments". *Journal of Advanced Prosthodontics* 14.1 (2022): 32.
30. Bencharit S, *et al.* "Three-dimensional printed precision attachment for removable partial denture: A dental technique". *The Journal of Prosthetic Dentistry* 127.3 (2022): 359-363.