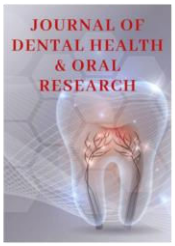

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Research Article

Removable Partial Denture Outcomes in an Academic Dental Setting

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Abstract

Background: Removable Partial Dentures (RPDs) offer a cost-effective solution for replacing missing teeth, as they tend to be less expensive than other options. This study aims to determine the actual failure rate of RPDs through thorough manual chart reviews of RPD cases. Outcomes of Removable Partial Dentures (RPDs) can be dependent on various factors also, including the patient's age, socioeconomic status and the chronic conditions of oral and overall health.

Methods: We extracted data from the EHR on 200 RPD cases delivered at the University of Michigan Dental School clinic from January 2019 to December 2019 and from January 2021 to December 2021. We first generated reports from electronic health records to identify failure rates. Then, we performed a manual review of the charts to verify the data. The 200 cases were under procedure code D5213 (maxillary metal framework RPD) and D5214 (mandibular metal framework RPD). The primary focus of our evaluation was to identify instances of retreatment or failure within 2 years, more than 5 adjustments within two years (which we also defined as a failure) or patient-reported dissatisfaction with the prosthesis.

Results: Electronic Health Record reports at the University of Michigan School of Dentistry indicate a 0.32% failure rate for Removable Partial Dentures (RPD) in 2019 and 0.60% in 2021. However, manual chart reviews revealed a different picture: In 2019, 9.0% of RPD patients were retreated; in 2021, 12.0% required retreatment. Failure rates for RPDs with codes D5213 (maxillary RPD) and D5214 (mandibular RPD) were 11.36% and 7.14% in 2019, respectively and increased to 17.07% and 8.47% in 2021.

Conclusion: Our study revealed higher Removable Partial Dentures (RPD)failure rates than the electronic health record reports. Our findings have important implications for curriculum and faculty training and highlight the need for precise documentation to align EHR reports with hand-search findings.

Keywords: Removable Partial Denture (RPD) Failure; Dental School Setting < Reasons of RPD Failure < RPD Failure Rate; Academia < Dental Documentation; University Settings < Importance of Documentation

Introduction

A common and affordable treatment option to replace missing teeth is the Removable Partial Denture (RPD) [1-3]. Since there is an increase in the number of people with partially edentulous spaces, there is an increased demand for Removable Partial Dentures (RPD) among those adults [4]. As the global population experiences higher life expectancy, an increased need for Removable Partial Dentures (RPD) may also be anticipated. Combining aging with better global oral health may also mean a movement away from complete edentulism to partial edentulism which may increase the demand for Removable Partial Dentures (RPD) [4]. Evidence shows a correlation between low income and tooth loss [5]. Therefore, removable partial dentures (RPD) are an effective and cost-efficient solution for replacing missing teeth. The advantages of Removable Partial Dentures

(RPD) over fixed prostheses are lower cost, greater reversibility and 7easier home care [5].

Flexible RPDs are a relatively new advancement and these can engage in soft and hard tissue undercuts, in addition to improved esthetics with the use of invisible clear clasps on the abutment teeth. The flexibility of the Removable Partial Dentures (RPD) leads to an even distribution of masticatory forces as opposed to specific support sites. Additionally, this type of Removable Partial Denture (RPD) can engage ridge undercuts and tooth abutments for support and retention [6].

Removable Partial Dentures (RPD) provide many benefits, however, they have also been associated with higher rates of gingivitis, periodontitis and 7increased mobility of abutment teeth [7], [8]. Since periodontal disease is one of the major factors leading to tooth loss, it is a conundrum [3]. According to the study by M. Saito et al., many researchers reported that Removable Partial Dentures (RPD)can be maintained with a precision attachment called rigid designs and this attachment enhances oral function. However, due to expense, precision attachments are less common compared to Removable Partial Dentures (RPD) with clasps [2].

It is worth noting that only a few earlier studies have examined periods longer than ten years in relation to Removable Partial Dentures (RPD) success rate [9]. Technical complications associated with failure of Removable Partial Dentures (RPD) include issues with the framework (fracture or repair of denture base), de-cementation of anchor crown and 7problems with denture teeth [10,11]. As per Dawid, et al., while essential design elements remain constant, specific attachments and design specifications vary with the prosthetic type; hence, direct comparison is not always possible [10]. Further studies are also needed to examine the effect of patient care on the maintenance and survival of RPDs [9].

There is a paucity of knowledge about the failure rate of traditional, tooth-supported, metal and/or acrylic-based Removable Partial Dentures (RPD) in a dental school setting. In the current study, we focused on the failure rate of traditional Removable Partial Dentures (RPD)in a dental school setting which is a challenging and complex environment where care is delivered by learners under the supervision of fully licensed dental faculty. The current study is a quality assurance project that aims to understand the differences between electronic health record failure reports and manual chart reviews for determining failures. An initiative to complete manual chart reviews was adopted because it was believed that many re-treatments were completed under miscellaneous treatment codes (such as D9999 and D5999) to prevent the administrative burden - but this meant that an electronic health record report would not capture miscoded events and a manual chart review was necessary.

Methodology

The study consisted of two phases: an electronic report for Removable Partial Dentures (RPD)and a manual chart review. We first extracted information from the Electronic Health Record (EHR) about removable partial dentures delivered between January 2019 to December 2019 and January 2021 to December 2021. All of these removable partial denture prostheses were completed at the University of Michigan in the predoctoral dental clinics by dental students under the supervision of licensed faculty clinicians.

With one trained dentist reviewer (the school's Quality Analyst), a manual chart review of 200 charts where Removable Partial Dentures (RPD) were delivered between January 2019 to December 2019 and January 2021 to December 2021 were analyzed. Procedure codes D5213 and D5214 were utilized and D5213 represents a Maxillary partial denture with cast metal framework with resin denture bases, while D5214 represents a Mandibular partial denture with cast metal framework with resin denture bases. The chart review process involved reviewing the notes to determine if patients had expressed satisfaction/dissatisfaction with their prosthesis; if they had been re-treated within one year; and if they had been appropriately documented. When further guidance was needed to make a decision, the reviewer met with a second trained reviewer. They discussed the case to determine how to classify it.

The primary focus of this evaluation was to identify instances of retreatment/failure. In this quality assurance study, "retreatment"/ "failure" was defined as making more than 5 adjustments within two years or patient-reported satisfaction/dissatisfaction with the prosthesis if re-treated within one year. This research study was deemed as "not regulated" by the University of Michigan's Medical School's Committee on Human Studies (HUM00253928).

Results

We selected 200 consecutive Removable Partial Dentures (RPD) cases delivered during the period January 2019 to December 2019 and January 2021 to December 2021. We omitted the year 2020 because so few Removable Partial Dentures (RPD)were delivered due to closures associated with the global COVID-19 pandemic. In 2019, there were 44 cases of maxillary metal framework Removable Partial Dentures (RPD) and 5 failed cases. There were 56 cases of mandibular metal framework RPD and 4 failed cases. In 2021, there were 41 cases of maxillary Removable Partial Dentures (RPD) and 7 failed cases. There were 59 cases of mandibular Removable Partial Dentures (RPD) and 5 failed cases. Among 100 patients in 2019, 9 were retreated/ failed. For the year 2021, 12 cases were re-treated/ failed out of 100 (Fig. 1). Fig. 2 shows the Removable Partial Dentures (RPD) Failure rates by treatment procedure codes D5213 (maxillary metal framework RPD) and D5214 (mandibular metal framework RPD) for 2019 and 2021. In 2019, out of the total, there was ana 11.36% failure rate of maxillary Removable Partial Dentures (RPD) cases D5213 and 7.14% of Mandibular cases with code D5214. In 2021, there was a higher failure rate, which was a 17.07% failure rate for maxillary Removable Partial Dentures (RPD) cases D5213 and 8.47% for Mandibular cases with code D5214. The overall failure rate was 11.01%. Using electronic health record reporting (which depends on accurately coded treatments), the Removable Partial Dentures (RPD) failure rates were 0.32% (5/1/2020 - 4/30/2021) and 0.60% (5/1/2021-4/3/2022).

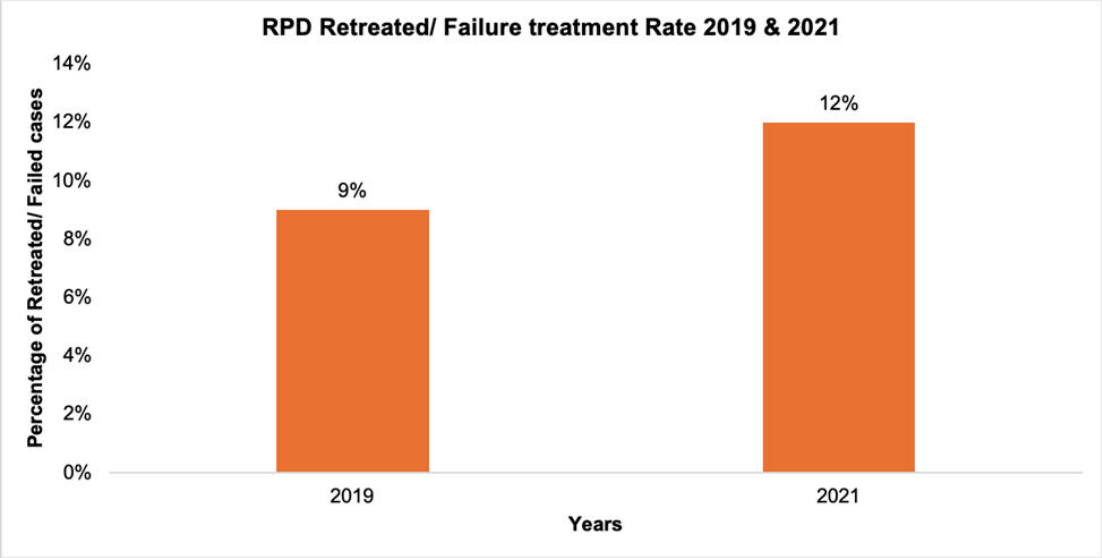

Figure 1: Removable Partial Dentures (RPD) Yearly Retreated/ Failure Treatment Rate 2019 and 2021.

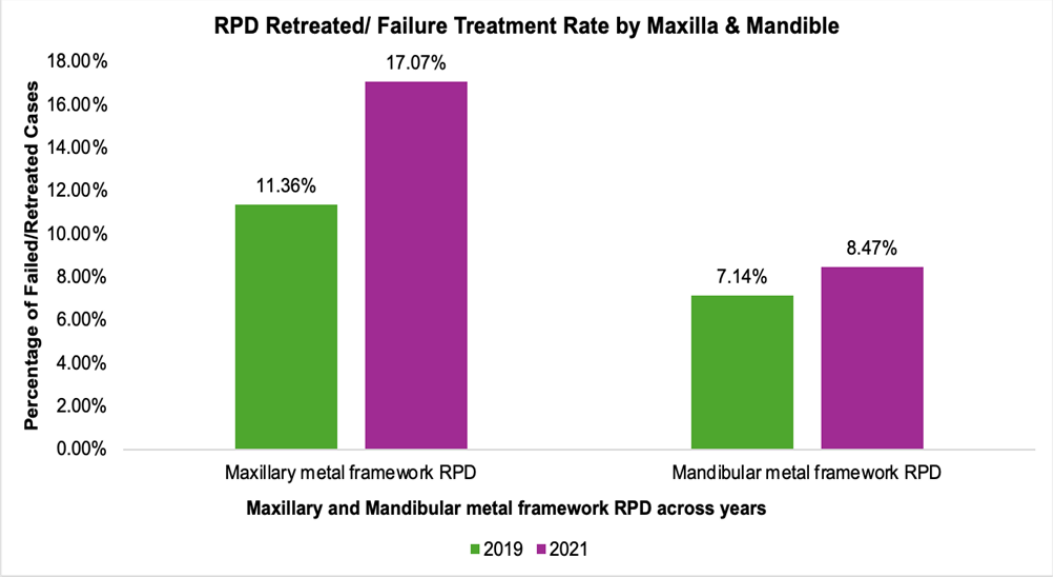

Figure 2: Removable Partial Dentures (RPD) Retreated/ Failure Treatment Rate by Maxilla and Mandible.

Discussion

Our study found higher failure rates through chart review when compared to electronic health record reports - 11.0% versus 0.46%. Additionally, our study periods conveniently stretch from before the COVID-19 pandemic to after, it was possible to compare the pre-COVID and post-COVID periods. During the pre-COVID period, we found that the failure rate was 9.0% whereas post-COVID we found that the failure rate increased to 12.0%. According to the study by Farrokhi, et al., COVID-19 impacted the quality of dental education negatively and this could be one explanation for the rising failure rate we observed. One of the primary issues with dental education which relies heavily on hands-on training is that virtual education cannot completely replace in-person training and students felt that virtual education detrimentally affected practical training [12].

Another important finding in our study was that maxillary Removable Partial Dentures (RPD)failure rates were higher in both 2019 (11.36%) and 2021 (17.07%) compared to mandibular Removable Partial Dentures (RPD)failure rates - in 2019 (7.14%) and 2021 (8.47%). However, contrary to our study, previous research suggests that there have been more alterations and replacements in mandibular Removable Partial Dentures (RPDs) than in maxillary Removable Partial Dentures (RPDs) and more failures occur after 8 years for mandibular Removable Partial Dentures (RPDs) [13]. Patient Demographics, such as age and socioeconomic status, can also significantly influence the outcomes of Removable Partial Dentures (RPD). Older Patients often have more complex dental needs due to wear and years of existing teeth, increased periodontal disease and 7higher bone loss in edentulous areas tend to be faster in younger patients and slow down as they get older. It has been suggested that pressure from a large denture base might lead to more bone loss [14]. Another study suggests that higher satisfaction with maxillary dentures in patients could be due to the greater stability provided by the hard palate, which offers a larger surface area for support [15]. A key difference between all those studies and ours is that ours was conducted in a learning environment and this may be a factor leading to the reversal of higher failure rates in the maxilla.

Our results also highlight how crucial it is for dental clinics to have accurate reporting and documentation procedures. Before our pilot study, the organization depended on electronic reports showing excellent success rates, indicating no need for intervention. The findings of our study may have many implications including the need for improved documentation, improved adherence to clinical protocols and 7curriculum improvements.

We observed that miscoding always used fee-free codes such as D5999 for RPDs - it seemed that this was a workaround that arose from the need to complete a fee adjustment form when the appropriate code was used. Unfortunately, this led to miscoding and rendered the electronic report useless. Another possible solution is to eliminate all free codes which may drive more accurate coding practices. Previous research suggests that the higher-than-expected failure rates of partial dentures also indicate the need for careful monitoring and continuous quality improvement in dental education and practice [16]. When the charts were reviewed manually, some areas needing improvement were identified that the EHR reports missed. These include making sure treatment notes are thorough (potentially using templates for specific procedures), recording patient satisfaction and 7using the correct code on Dental Nomenclature and Procedures (CDT) [17].

The design of the Removable Partial Dentures (RPDs) plays a crucial role in its success and appropriately designed Removable Partial Dentures (RPDs) have been shown to increase oral hygiene levels and lower the incidence of local pathologic alterations [18]. The success of Removable Partial Dentures (RPDs) relies on sufficient fabrication and adjustments during denture delivery. It also helps to understand the function and esthetics to ensure patients are satisfied [19]. Removable Partial Dentures (RPDs) are complex devices because their acceptance is influenced by biological, mechanical, aesthetic and 7psychological factors, all of which contribute to the success of treatment [5].

Carefully designed Removable Partial Dentures (RPDs) with proper extensions can greatly improve patients' masticatory ability and comfort [13]. Factors such as the durability and lifespan of the RPD, key design features and materials and 7the functionality of the prosthesis play a role in its effectiveness. The impact on patients' mental and social well-being, including their satisfaction and quality of life, is also important. Additionally, considering the cost-effectiveness of Removable Partial Dentures (RPDs) treatment in both the short and long term can help lower failure rates [20].

While retrospective studies provide valuable insights, they have limitations due to their reliance on the quality of available clinical records. Despite the advice for patients to attend follow-up appointments at least once every six months after denture

replacement, evidence has shown that many patients adhered to this recommendation [21]. Educating patients about oral health issues related to Removable Partial Dentures (RPDs) is crucial due to a general lack of awareness [9].

Conclusion

Our study provides insights into the true failure rates of removable partial dentures within an academic dental clinic setting. The higher failure rates of partial dental prostheses compared to the reports extracted from the EHR have implications for curriculum and faculty training and highlight the need for precise documentation to align EHR reports with hand-search findings. In the future, dental schools must prioritize accurate record-keeping for legal compliance and better patient care to reduce failure rates, while emphasizing comprehensive dental care education for long-term treatment success.

Conflict of Interest

All authors declare that they have no conflicts of interest.

Author Contributions

All authors contributed equally for this paper.

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References

1. Moldovan O, Rudolph H, Luthardt RG. Biological complications of removable dental prostheses in the moderately reduced dentition: a systematic literature review. Clin Oral Investig. 2018;22(7):2439-61.
2. Saito M, Notani K, Miura Y, Kawasaki T. Complications and failures in removable partial dentures: a clinical evaluation. J Oral Rehabil. 2002;29(7):627-33.
3. Koyama S, Fuji T, Ohi T, Kadowaki K, Yoda N, Sasaki K. Practice-based longitudinal study of multifactorial risk assessment for periodontal condition and survival of remaining teeth in patients with removable partial dentures. Int J Prosthodont. 2018;31(5):502-8.
4. Shaha M, Varghese R, Atassi M. Understanding the impact of removable partial dentures on patients' lives and their attitudes to oral care. Br Dent J. 2021.
5. De Kok IJ, Cooper LF, Guckes AD. Factors influencing removable partial denture patient-reported outcomes of quality of life and satisfaction: a systematic review. J Prosthodont. 2017;26(1):5-18.
6. Sadek SA, Elawady D. Impact of removable partial denture type on patient satisfaction and abutment survival rate-RCT. Open Access Maced J Med Sci. 2019;7(15):2513-9.
7. Nisser J, Kisch J, Chrcanovic BR. Risk factor assessment for survival of removable partial dentures and their abutment teeth: a retrospective analysis. Int J Prosthodont. 2022;35(5):598-608.
8. Addy M, Bates JF. Plaque accumulation following the wearing of different types of removable partial dentures. J Oral Rehabil. 1979;6(2):111-7.
9. Yoshino K, Ito K, Kuroda M, Sugihara N. Survival rate of removable partial dentures with complete arch reconstruction using double crowns: a retrospective study. Clin Oral Investig. 2020;24(4):1543-9.
10. Dawid MT, Moldovan O, Rudolph H, Kuhn K, Luthardt RG. Technical complications of removable partial dentures in the moderately reduced dentition: a systematic review. Dent J (Basel). 2023;11(2):55.
11. Wagner B, Kern M. Clinical evaluation of removable partial dentures 10 years after insertion: success rates, hygienic problems and technical failures. Clin Oral Investig. 2000;4(2):74-80.
12. Farrokhi F, Mohebbi SZ, Farrokhi F, Khami MR. Impact of COVID-19 on dental education- a scoping review. BMC Med Educ. 2021;21(1):587.
13. Moreno A, Haddad MF, Goiato MC. Epidemiological data and survival rate of removable partial dentures. J Clin Diagn Res. 2016;10(5):ZC84-7.
14. Koyama S, Sasaki K, Yokoyama M, Sasaki T, Hanawa S. Evaluation of factors affecting the continuing use and patient satisfaction with removable partial dentures over 5 years. J Prosthodontic Res. 2010;54(2):97-101.
15. Krausch-Hofmann S, Cuypers L, Ivanova A, Duyck J. Predictors of patient satisfaction with removable denture renewal: a

pilot study. J Prosthodontics. 2016;27(6):509-16.
16. Patel P, Kapadia U, Vyas J, Mhay S, Nalliah RP. Determining the failure rate of direct restorations-chart review versus electronic health record reports. Dent J (Basel). 2024;12(8):250.
17. Kadhium VS, Sharma P, Xie D, Nalliah RP. A deep dive into complete denture outcomes at an academic teaching center. J Dent Educ. 2023;87:905-7.
18. Jorge JH, Quishida CC, Vergani CE, Machado AL, Pavarina AC, Giampaolo ET. Clinical evaluation of failures in removable partial dentures. J Oral Sci. 2012;54(4):337-42.
19. D'Souza NL, Hajhamid B, Somogyi-Ganss E. Postinsertion adjustment appointments and their association with cast removable partial denture survival. J Prosthet Dent. 2023;130(2):238.e1-7..
20. Campbell SD, Cooper L, Craddock H. Removable partial dentures: The clinical need for innovation. J Prosthet Dent. 2017;118(3):273-80.
21. Dula LJ, Ahmedi EF, Lila-Krasniqi ZD, Shala KSH. Clinical evaluation of removable partial dentures on the periodontal health of abutment teeth: a retrospective study. Open Dent J. 2015;9:132-9.