Moldova Region Population Study of Social Cases Affected by Partial Edentation

FLORINEL COSMIN BIDA¹, DORIANA AGOP-FORNA², COSMIN IONUȚ CREȚU¹, WALID ELDBI AL HAGE¹, NORINA CONSUELA FORNA¹

¹Department of Implantology, Removable Prostheses, Dental Prostheses Technology, Faculty of Dental Medicine, “Grigore T. Popa” University of Medicine and Pharmacy, Iasi, Romania
²Department of Dento-alveolar Surgery, Faculty of Dental Medicine, “Grigore T. Popa” University of Medicine and Pharmacy, Iasi, Romania

ABSTRACT: As the number of partially edentulous patients grows, so will the demand for removable partial dentures (RPDs) in clinical practice because it is a safe, conservative, and cost-effective alternative that provides good plaque control but necessitates periodic maintenance visits. The goal of this research was to look at the incidence of partial edentulism, RPD type, design, and components, as well as their frequency of use, among patients at the Dental Faculty's Department of Partial Dentures in Iasi.

KEYWORDS: Removable partial dentures, clasps design, biomechanical concept, partial edentulism.

Introduction

RPD treatment is a less invasive alternative to fixed partial dentures with dental or implant support, allowing for fewer surgeries [1] to restore esthetics and function [2].

As the number of partially edentulous patients grows, so will the demand for removable partial dentures (RPDs) in clinical practice because it is a safe, conservative, and cost-effective alternative that provides good plaque control but necessitates periodic maintenance visits [3,4].

Although dental bridges and implants are now therapy alternatives for certain edentations, removable partial dentures with metal frameworks can have several advantages and are commonly utilized in clinical practice.

Because these prostheses need support from the teeth, mucosa, and underlying residual alveolar ridges, the design and maintenance of bilateral and unilateral distal extension partial dentures (Kennedy Class I and II) provide many challenges for clinicians [5,6].

Dentures must protect the remaining structures while also working in tandem with the masticatory system.

If the manufactured RPD does not correspond to the biological and mechanical criteria, significant harm to the remaining hard and soft tissues may emerge [7,8].

Clasps are used for both direct and indirect retention of an RPD.

The retentive clasp arm's tip must be sufficiently undercut below the contour height to accomplish retention, while the reciprocal clasp arm braces the abutment tooth during prosthesis installation and removal [9,10].

Precision attachments or traditional clasps have been frequently applied to avoid denture instability [11,12,13].

The indirect retainers are another crucial component of an RPDP; when the bases move away from the residual ridge, they prevent the retentive clasp arms from establishing a fulcrum around which the denture rotates [14].

To achieve the highest retention and stability features of a prosthesis, rigorous intraoral inspection, diagnosis, adequate planning, and execution are required [15].

Unfortunately, the RPDP has been demoted to a secondary alternative in preference of more costly but more functional and attractive treatments such as dental bridges on natural teeth or implants [16], which explains why there has been less research data on this topic in the last 20 years.

The goal of this research is to find out what variables impact partly edentulous patients' treatment decisions, as well as the impact of these factors on the treatment solution and final design of removable dentures in a group of patients who needed prosthetic treatment.

Material and Method

The current study was carried out by examining and quantifying clinical papers of patients who got professional prosthetic treatment at Department of Partial Dentures of Dental Faculty in Iasi.

The treatments with removable partial dentures with metal framework, the ratio of
existing clinical-biological parameters and their influence on treatment selection and the design of various forms of prosthetic structures were all reviewed.

These characteristics were studied in a cohort of 873 individuals who sought prosthetic treatment between January 2004 and January 2019.

Following a review of the current database (patient registration sheets, paraclinical examinations-orthopantomography, computer-tomographs, study casts, individual presentations of each case, and data recorded in laboratory archives), a total of 546 patients were included in the final research.

All participants were informed about the study's use of clinical and paraclinical data.

The ethical committee of the University of Medicine and Pharmacy, “Grigore T. Popa”, Iași, authorized the current study (No. 9430/12.06.2020).

The inclusion criteria were represented by:

✓ patients older than 19 years;
✓ patient record data sheets containing all information on treatment, the protocol used;
✓ patients with no current employment at that date from a socially disadvantaged category;
✓ paraclinical examinations (at least one radiological investigation-orthopantomography or computed tomography and the initial cast study);
✓ specific laboratory data sheets containing all features of removable dentures as well as the design and distribution of elements for support and stability.

The exclusion criteria were represented by:

✓ patient record data sheets that did not include all information on prosthetic treatment, the protocol used and alternative treatment options;
✓ lack of paraclinical investigations;
✓ incomplete specific laboratory data sheets;
✓ patients who did not continue treatment after transitional dentures;
✓ patients with incomplete treatment.

The following parameters were included for the analysis of prosthetic treatments with partial removable dentures with metal framework: age (19-30 years, 31-40 years, 41-50 years, 51-60 years, 61-70 years old, 71-80 years old, and over 81 years old), gender, Kennedy Class for edentulous space, denture location-upper or lower denture, clasps and major connector design, and special attachment elements design.

The data collected were quantified and statistical analysis and validation tests were performed using the method of descriptive statistics, performed using Microsoft Access software for specific analysis according to the parameters followed by the database and Microsoft Excel for statistical analysis.

In the statistical study we used elements of descriptive statistics and Pearson correlations.

The software used was SPSS 20, trial.

The software company is IBM-USA.

During this study, we tried to determine the highest frequency for which type of clasp and which type of connector is found, both for the maxilla and for the mandible, in men and women.

We also tried to determine if there is a significant correlation between the type of clasp or main connector or precision attachment and type of edentation, both for men and women, in maxilla or in mandible.

Results

In terms of demographic characteristics, the patients participating in this study are divided by gender as follows: 304 men (55.7%) and 242 women (44.3%) and by age as showed in Figure 1 below:

![Figure 1. Distribution by age and gender of study group.](image-url)
The frequency distributions for the 4 Kennedy classes and locations are as follows (Tables 1-2):

**Table 1. Edentation type for men/women.**

| Class  | Men Frequency | Women Frequency | Percent Men | Percent Women |
|--------|---------------|-----------------|-------------|---------------|
| Cls I  | 193           | 164             | 28.4        | 24.1          |
| Cls II | 41            | 30              | 6.0         | 4.4           |
| Cls III| 53            | 39              | 7.8         | 5.7           |
| Cls IV | 17            | 9               | 2.5         | 1.3           |
| Total  | 304           | 242             | 44.7        | 35.6          |

**Table 2. Denture location for men/women.**

| Location      | Men Frequency | Women Frequency | Percent Men | Percent Women |
|---------------|---------------|-----------------|-------------|---------------|
| Maxilla       | 132           | 111             | 19.4        | 16.3          |
| Mandible      | 79            | 52              | 11.6        | 7.6           |
| Total         | 211           | 163             | 31.6        | 23.9          |

**Table 3. Major connectors design for men/women.**

| Connector         | Men Frequency | Women Frequency | Percent Men | Percent Women |
|-------------------|---------------|-----------------|-------------|---------------|
| Palatal plate     | 31            | 11              | 4.6         | 1.6           |
| Palatal strap     | 79            | 51              | 11.6        | 7.5           |
| U shaped          | 39            | 43              | 5.7         | 6.3           |
| Horse shoe        | 65            | 58              | 9.6         | 8.5           |
| Lingual bar       | 144           | 110             | 21.2        | 16.2          |
| Lingual plate     | 29            | 22              | 4.3         | 3.2           |
| Total             | 387           | 295             | 56.9        | 43.4          |

**Table 4. Clasps design for men/women.**

| Clasp            | Men Frequency | Women Frequency | Percent Men | Percent Women |
|------------------|---------------|-----------------|-------------|---------------|
| Acker            | 69            | 40              | 10.1        | 5.9           |
| Double Akers     | 39            | 21              | 5.7         | 3.1           |
| Simple circle    | 48            | 8               | 7.1         | 1.2           |
| Ring clasp       | 75            | 79              | 11.0        | 11.6          |
| Total            | 231           | 148             | 34.0        | 21.8          |

The positive value of the correlation coefficient shows that as the values of one variable increase, so do the values of the other. The value of the coefficient \( r \) is an indicator of the effect size.

To find out if there are correlations between edentations and the design of the main connectors (Table 3), we found for men, there is a significant positive relationship between edentation and connector design. \( r=+0.537 \)-correlation coefficient, \( N=211, p=0.0001 \).

The positive value of the correlation coefficient shows that as the values of one variable increase, so do the values of the other. The value of the coefficient \( r \) is an indicator of the effect size.

The closer it is to 1 (regardless of the sign), the stronger the association between the two variables.

The correlation between edentations and the design of the main connectors very clearly suggests the existence of a linear type association between the two variables.

The shape of the scattering of the results is relatively straight, indicating a linear relationship and not a curvilinear one.

There is no statistically significant association. \( p=107>0.05 \)

There is also a significant positive relationship between edentations and connector design in women. \( (r=+0.711, N=153, p=0.0001) \).

The positive value of the correlation coefficient shows that as the values of one variable increase, so do the values of the other. The value of the coefficient \( r \) is an indicator of the effect size.

The closer it is to 1 (regardless of the sign), the stronger the association between the two variables.

We have a significant positive relationship between edentations and connectors. \( r=+0.314 \)-correlation coefficient, \( N=131 p=0.0001 \).

The coefficient \( r \) indicates a very weak association between the two variables.

We have a significant positive relationship between edentations and clasps \( r=+0.59 \)-correlation coefficient, \( N=231 p=0.0001 \) (Table 4).

The coefficient \( r \) indicates an average association between the two variables.

We have a significant positive relationship between edentations and clasps \( r=+0.866 \)-correlation coefficient, \( N=148 p=0.0001 \).

The coefficient \( r \) indicates a strong association between the two variables.

We have a significant positive relationship between edentation and precision attachments \( r=+0.395 \)-correlation coefficient, \( N=148 p<0.0001 \) (Table 5).

The coefficient \( r \) indicates a very weak association between the two variables.

We have a significant positive relationship between edentations and precision attachments \( r=+0.859 \)-correlation coefficient, \( N=99 p=0.0001 \).

The coefficient \( r \) indicates a strong association between the two variables.
Discussions

A RPD that replaces lost structures while minimizing damage to surviving hard and soft tissues is regarded as an efficient and viable technique of treatment.

A framework design is essential to create a denture that is strong and durable enough to not compromise a restored occlusion [16].

As a consequence, RPD efficacy depends on the RPD design and accompanying data, as well as strong communication with laboratory personnel, therefore all clinical and lab sheets demonstrated their value in data collecting and interpretation.

RPD use has grown in patients aged 61-70 years.

Males made up 55.7 percent of those treated in this research, which was substantially greater than females.

This frequency is equivalent to Owall et al. [17], but varies from Toremalm and Owall [18] and Fej'erdy et al. [16].

According to the present research, metallic RPDs were indicated in a higher percentage of Kennedy class I and II than acrylic RPDs.

This may be due to the fact that therapy was provided in a school context, following academic therapeutic guidelines.

Acrylic resin RPDs are substantially more common than cast metal framework RPDs in certain other nations, contrary to the findings of the present research [19,20].

Other data suggested a higher prevalence of RPDs in the maxillary arch than in the mandibular arch, 43.4% for men and 45.9% for women which could be connected to a better stability of upper metallic RPDs rather than acrylic and probably a better patient adaptation.

More than half of the patients (47.6%) had Kennedy class I RPD, which was a substantial number, followed by classes III, II, and IV.

Curtis et al. (1992) observed that 40 percent of 327 work permission forms were for Kennedy class I [21], which is consistent with our findings.

For both men and women, the percentages of Kennedy class II and III RPDs were 13.5 percent and 12.4 percent for class II, respectively, and 17.4 percent and 16.1 percent for class III.

Demand for RPDs has been shown to vary in previous studies.

As the most prevalent edentulous arches for which patients requested tooth replacement, Fouda et al. reported Kennedy class III [22], Osborne and Lammine reported Kennedy class I [23], and Bassey reported Kennedy class IV [24].

The palatal strap (Table 5) was the most prevalent maxillary major connection, followed by the U shaped connector, according to the findings of this research.

Despite the fact that a complete palatal plate was recommended for Kennedy class I and large maxillary edentulous regions [6], our findings revealed that the palatal strap was the most often employed main connector, perhaps because to the patients' preference for minimum palatal covering.

In contrast to the findings of Owall and Taylor [18], who found that the U-shaped major connector was used more (55.2 percent) than other maxillary major connectors, the U-shaped major connector was used less frequently, in agreement with previous findings [6], possibly due to its mechanical deficiency and tendency to flex during handling or mastication, possibly due to its mechanical deficiency and tendency to flex during handling or mastication.

The usage of the lingual plate is recommended based on the findings of this investigation (21.2 % and 16.2 %) and was significantly higher than that of the lingual bar.

It's more probable that this was because to the long span class I strength requirements, which demanded stability and indirect retention.

In the present study, Aker clasps were found in 10.1% in men, Curtis et al. found that they were widely utilized (62.7 percent), even with distal extension partial dentures [21], contradicting the results of Curtis et al.

Conclusions

The current study's findings are useful in assessing the quality of RPDs provided to patients.

It also contains useful material for educational and training reasons.

The study's limitations include the relatively small sample size and the collecting of data from a single school.

Conflict of interests

None to declare. There has been no significant financial support not mentioned within the manuscript for this work that could have influenced its outcome.
References
1. Kim JJ. Revisiting the removable partial denture. Dent Clin North Am, 2019, 63(2):263-278.
2. Marie A, Keeling A, Hyde TP, Nattress BR, Papit S, Murphy RJ, Shary TJ, Dillon S, Osnes C, Wood DJ. Deformation and retentive force following in vitro cyclic fatigue of cobalt-chrome and aryl ketone polymer (AKP) clasps. Dent Mater, 2019, 35(6):e113-e121.
3. Forna N, De Baat C, Bratu D, Mercut V, Petre A, Plopsor S, Traistaru T. Dinamica evolutiei si complicatiilor produse de edentatie. In: Protetica Dentară Vol. I, Editura Enciclopedica, 2011, București, 424-429.
4. Westmann B, Budtz-Jørgensen E, Jepson N, Mushimoto E, Palmqvist S, Sofou A, Owall B. Indications for removable partial dentures: a literature review, Int J Prosthodont, 2005, 18(2):139-145.
5. Zarrati S, Bahrami M, Heidari F, Kashani J. Three dimensional finite element analysis of distal abutment stresses of removable partial dentures with different retainer designs. J Dent (Tehran), 2015, 12(6):389-397.
6. Forna N, De Baat C, Lascu L, Pauna M. Tabloul clinic al edentatiei partiile intins. In: Protetica Dentară Vol. II, Editura Enciclopedica, 2011, București, 18-25.
7. Kumar N, Köhl DK, Jain V, Nanda A. Stress distribution and patient satisfaction in flexible and cast metal removable partial dentures: Finite element analysis and randomized pilot study. J Oral Biol Craniofac Res, 2021, 11(4):478-485.
8. Tribst JPM, Dal Piva AMO, Borges ALS, Araújo RM, da Silva JMF, Bottino MA, Kleverlaan CJ, de Jager N. Effect of different materials and undercut on the removal force and stress distribution in circumferential clasps during direct retainer action in removable partial dentures. Dent Mater, 2020, 36(2):179-186.
9. Rodrigues RC, Faria AC, Macedo AP, de Mattos Mda G, Ribeiro RF. Retention and stress distribution in distal extension removable partial dentures with and without implant association. J Prosthodont Res, 2013, 57(1):24-29.
10. Bosinceanu DG, Sandu IG, Baciu ER, Bosinceanu DN, Surlari Z, Martu I, Balcos C, Bolat M. Flexible acrylic vs. chromium cobalt removable partial dentures-a viable therapeutic solution. Mater Plastice, 2019, 56(1):120-123.
11. Uludag B, Celik G. Technical tips for improved retention and stabilization of a unilateral removable partial denture. J Oral Implantol, 2007, 33(6):344-346.
12. Richert R, Alshehri AA, Alageel O, Caron E, Song J, Ducrot M, Tamimi F. Analytical model of I-bar clasps for removable partial dentures. Dent Mater, 2021, 37(6):1066-1072.
13. Bosinceanu DG, Bosinceanu DN, Luchian I, Baciu R, Tatarciu M, Martu I. Complete dentures-clinical behavior and patients complaints. Romanian Journal of Oral Rehab, 2017, 9(2):5-8.
14. Campos Sugio CY, Mosquim V, Jacomine JC, Zabeu GS, de Espíndola GG, Bonjardim LR, Bonfante EA, Wang L. Impact of rehabilitation with removable complete or partial dentures on masticatory efficiency and quality of life: A cross-sectional mapping study. J Prostheth Dent, 2021, S0022-3913(21)00334-6.
15. Lemos CAA, Nunes RG, Santiago-Júnior JF, Marcela de Luna Gomes J, Oliveira Limirio JP, Rosa CDDR, Verri FR, Pellizzer EP. Are implant-supported removable partial dentures a suitable treatment for partially edentulous patients? A systematic review and meta-analysis. J Prostheth Dent, 2021, 101(2):256-267.
16. Fejérdy P, Borbély J, Schmidt J, Jánh M, Hermann P. Removable partial denture design and its effect on remaining teeth, based on Hungarian national survey. Fogyorv Sz, 2008, 101(1):3-11.
17. Owall BE, Bieniek KW, Speikermann H. Removable partial denture production in western Germany. Quintessence Int, 1995, 26(9):621-627.
18. Owall BE, Taylor RL. A survey of dentitions and removable partial dentures constructed for patients in North America. J Prostheth Dent, 1989, 61(4):465-470.
19. Radhi A, Lynch CD, Hannigan A. Quality of written communication and master impressions for fabrication of removable partial prostheses in the Kingdom of Bahrain. J Oral Rehabil, 2007, 34(2):153-157.
20. Schwarz WD, Barsby MJ. A survey of the practice of partial denture prosthetics in the United Kingdom. J Dent, 1980, 8(2):95-101.
21. Curtis DA, Curtis TA, Wagnild GW, Finzen FC. Incidence of various classes of removable partial dentures. J Prostheth Dent, 1992, 67(5):664-667.
22. Fouda SM, Al-Harbi FA, Khan SO, Vrbanec JI, Raustia A. Missing teeth and prosthetic treatment in patients treated at College of Dentistry, University of Dammam. Inter J Dentistry, 2017, 2017:7593540.
23. Gad MM, Abualsaud R, Al-Thobity AM, Al-Abidi KS, Khan SQ, Abdel-Halim MS, Al-Harbi FA, El Zayat M, Fouda SM. Prevalence of partial edentulism and RPD design in patients treated at College of Dentistry, Imam Abdulrahman Bin Faisal University, Saudi Arabia. Saudi Dent J, 2020, 32(2):74-79.
24. Bassey IE. The prosthetic requirements of partially edentulous patients as seen in Lagos University Teaching Hospital. Nig Q J Hosp Med, 1985, 3:49-51.