Ref: Ro J Stomatol. 2022;68(1)
DOI: 10.37897/RJS.2022.1.3

Retrospective study about the success of fixed prosthetic restorations made of different types of dental materials

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ABSTRACT

Objectives. Analysis of a group with oral rehabilitation patients with different types of fixed protected restorations, to correlate the therapeutic success rate with the type of aggregation of restorations and with the materials used to fabricate them.

Material and methods. The study material was represented by the medical records of one group of the patients with various types of partial edentation. The interest data were collected and were processed with Microsoft Excel statistics from the Office 365 package.

Results. The group included: 162 patients (59.56%) with 182 fixed prosthetic restorations with teeth aggregation (of which 106 metal-ceramic restorations, 33 metal-composite restorations, 22 restorations from zirconium with ceramic and 21 all-ceramic restorations) and 110 patients (40.44%) with 140 fixed prosthetic restorations with implant aggregation (72 metal-ceramic restorations, 5 metal-composite restorations, 36 zirconium-ceramic restorations and 27 all-ceramic restorations). Complications detected 3 years after the completion of prosthetic treatment were classified into biological and technical complications.

Discussions. In the analyzed group, the metal-ceramic prosthetic restorations were numerically superior to those of integral ceramics or zirconium oxide and ceramics, but we also noticed the presence of metal-composite restorations, preferred by certain categories of patients for economic reasons. In our study we identified 21 technical complications and 19 biological complications.

Conclusions. In the group analyzed retrospectively, the therapeutic success rate at 3 years was 87.58%. Metal-ceramic restorations were the main way of rehabilitation applied to edentulous patients. Metal-composite restorations had the highest percentage failure rate, and all-ceramic restorations had the lowest percentage failure rate. The failure rate for prosthetic restorations with teeth aggregation was 14.83%, and the failure rate for restorations with implant aggregation was 9.29%. In order to validate the results obtained, it is necessary to extend the study to larger groups of patients, dispensed for longer periods of time.

Keywords: fixed prosthetic restorations, success rate, technical complications and biological complications

INTRODUCTION

In recent years, the range of materials used to make fixed prosthetic restorations has increased significantly, whether the restoration is made with dental or implant support (1).

Although ceramics deposited on metal alloys are still the gold standard in the manufacture of fixed prosthetic restorations, new CAD-CAM technologies allow the use of procedures for obtaining prosthetic parts faster, with improved accuracy (2,3) and a su-

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Article History:
Received: 28 February 2022
Accepted: 14 March 2022

perior aesthetic appearance, so that fixed ceramic or plated zirconium oxide fixed prostheses are increasingly used.

The selection of the best dental materials that can be used for the fixed prosthesis of a partial edentulous remains a challenge for clinicians, with each type of material having advantages and disadvantages in use.

Metal-ceramic restorations have stood the test of time and remain the most investigated prosthetic restoration materials (4-21), while the long-term behavior of more recently used materials, such as all-ceramic (22-26), monolithic zirconia (27-31) or ceramic-coated zirconia (32,33) further raises questions.

This retrospective study was performed in order to analyze a group of orally rehabilitated patients with different types of fixed prosthetic restorations, highlighting the therapeutic success rate depending on the type of aggregation of restorations and the materials used to make prosthetic parts.

MATERIAL AND METHOD

The study material was represented by the consultation and treatment sheets of 431 patients with various types of partial edentation who addressed between January 2018 and December 2021 to a number of 4 dental offices in urban areas for various reasons related to the oral health conditions.

The study was retrospective and was conducted in accordance with the Helsinki Declaration, respecting human rights and without harming patients or the environment. Inclusion and exclusion criteria were applied to the group of patient.

The criteria for inclusion in the study were represented by:

- The presence on the arch of an edentulous gap with fixed rehabilitation for at least 3 years;
- Acceptance of inclusion in the study, with the protection of the patient's identity.

From the initial study group were excluded those patients who did not agree to be included in the study, who had extensible edentulous with partial prosthetic rehabilitation, non-rehabilitated or rehabilitated partial edentations more recently than 3 years ago, so that the final group was 272 patients.

From the observation and treatment sheets were colected data about:

- Age of patients;
- Sex of patients;
- The environment from which the patients come;
- The educational level of patients;
- Locating edentulous gaps;
- Etiology of edentulousness;
- The type of fixed prosthetic restoration that the patients presented at the time of the consultation (fixed prosthetic restoration with dental aggregation, fixed prosthetic restoration with implant aggregation);
- The materials from which the fixed prosthetic restorations were made (MCR = metal-ceramic restorations, MCOR = metal-composite restorations, ACR = all-ceramic restorations, ZCR = zirconia and ceramic restorations);
- Possible complications of prosthetic treatment.

The retrieved data was statistically processed with Microsoft Excel in the Office 365 package.

OBTAINED RESULTS

The final group consisted of 160 female patients (58.82%) and 112 male patients (41.18%). The distribution of the group by age groups included:

- 48 patients (17.65%) under 30 years of age;
- 66 patients (24.26%) aged between 31 and 40 years;
- 42 patients (15.44%) between 41 and 50 years old;
- 62 patients (22.8%) between 51 and 60 years of age;
- 42 patients (15.44%) between 61 and 70 years of age;
- 12 patients (4.41%) over 70 years of age.

154 patients in the group (56.62%) came from urban areas and 118 patients (43.38%) from rural areas. Regarding the level of education, we found that 148 patients (54.41%) had higher education, 70 patients (25.74%) had graduated high school and 54 patients (19.85%) were secondary school graduates.

126 patients (46.32%) had prosthetic gaps at the upper jaw level, 96 patients (35.3%) had prosthetic gaps at the mandibular level, and 50 patients (18.38%) had edentulous gaps on both arches.

The distribution according to the etiology of edentulousness was: 122 cases (44.85%) in which the cause of tooth loss was complicated dental caries, 114 cases (41.92%) of edentulousness had periodontal disease, 28 cases (10.29%) of iatrogenicity and 8 cases (2.94%) of edentation caused by trauma.

Depending on the type of prosthetic restoration older than 3 years and the types of materials from which they were made, the batch included:

- 162 patients (59.56%) with 182 fixed prosthetic restorations with dental aggregation (of which 106 metal-ceramic restorations, 33 metal-composite restorations, 22 ceramic-coated zirconium oxide restorations and 21 integral ceramic restorations);
- 110 patients (40.44%) with 140 fixed prosthetic restorations with implant aggregation (72 metal-ceramic restorations, 5 metal-composite restorations, 36 restorations made of zirconium oxide covered with ceramics and 27 estorations made of integral ceramics).

We classified the complications detected 3 years after the completion of the prosthetic treatment in:

A. Biological complications - gingival staining, gingival retractions, peridental or peri-implant gingival proliferation and bleeding, alveolar resorption greater than 2 mm in relation to bone remodeling considered normal depending on the period elapsed since the insertion of implants

B. Technical complications - fracture of the physiognomic plywood, fracture or perforation of the metal skeleton, decimentation of the prosthetic restorations aggregated by cementation, fracture of the implant abutments, fracture of the fixing screws, unscrewing of the prosthetic restoration.

In the case of fixed prosthetic restorations with dental aggregation, the following biological complications have been identified:

- 3 cases of gingival staining and 2 cases of gingival retraction in patients with metal-ceramic restorations;
- 2 cases of gingival retractions and 2 cases of gingival proliferation in patients with metal-composite restorations;
- 1 case of gingival retraction in patients with restorations of integral ceramics, respectively of zirconium oxide and ceramics.

From a technical point of view, in the case of patients with fixed dental prosthetic restorations, the following complications were recorded in the consultation and treatment sheets:

- 2 decimations each in patients with metal-ceramic and metal-composite restorations;
- Fracture of the physiognomic plywood at 3 metal-ceramic restorations, at 2 metal-composite restorations and at 4 restorations made of zirconium oxide covered with ceramic;
- Fracture of the metal component at a metal-ceramic restoration and at 2 metal-composite restorations.

In patients with fixed prosthetic restorations with implant aggregation, the following biological complications have been reported:

- Gingival retractions in 2 patients with metal-ceramic restorations and in 1 patient with metal-composite restoration;
- Alveolar resorptions greater than 2 mm in relation to bone remodeling considered appropriate for the respective clinical cases in 1 patient with integral ceramic restoration, in 2 patients with zirconium oxide restorations covered with ceramic and in 2 patients with metal-ceramic restorations.

The technical complications detected at least 3 years after the prosthetic loading of dental implants consisted of:

- Fixing screw fracture in case of 3 metal-ceramic restorations;
- Unscrewing the prosthetic restoration in a case of all-ceramic restoration;
- Physiognomic plywood fracture in case of zirconium oxide and ceramic restoration.

Figures 1-4 show a comparison of the biological and technical complications detected, depending on the type of aggregation of the restorations and depending on the dental materials from which the examined prosthetic parts were made.

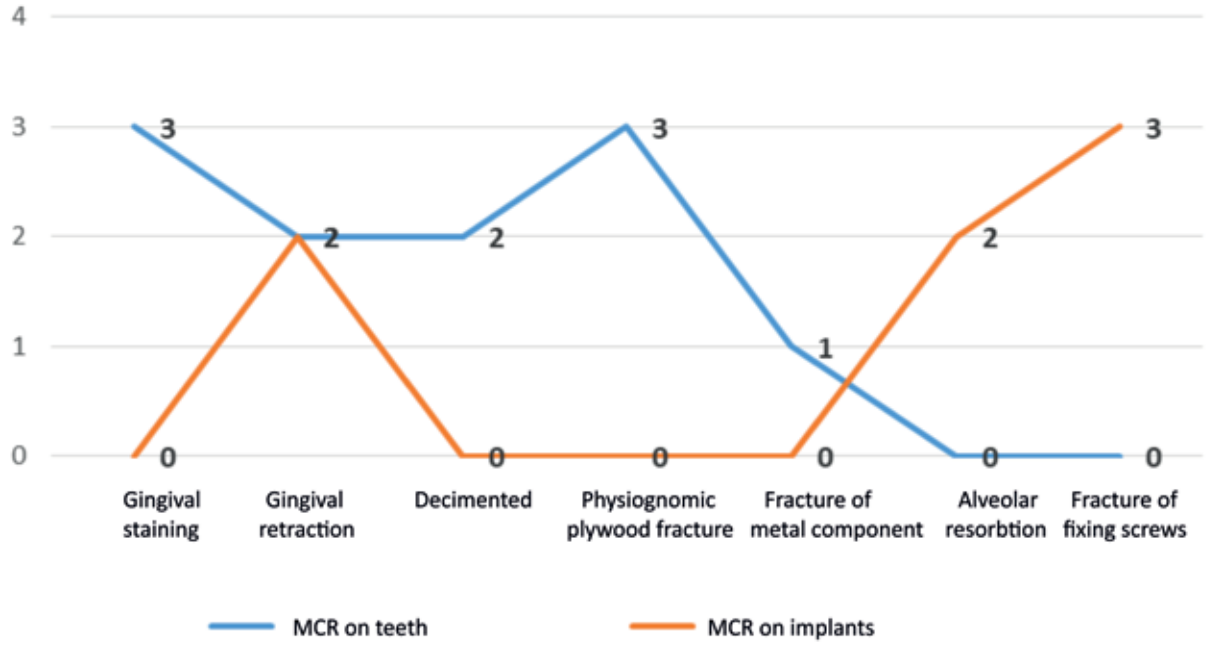

FIGURE 1. Comparative incidence of biological and technical complications detected in metal-ceramic restorations (MCR) with dental or implant aggregation

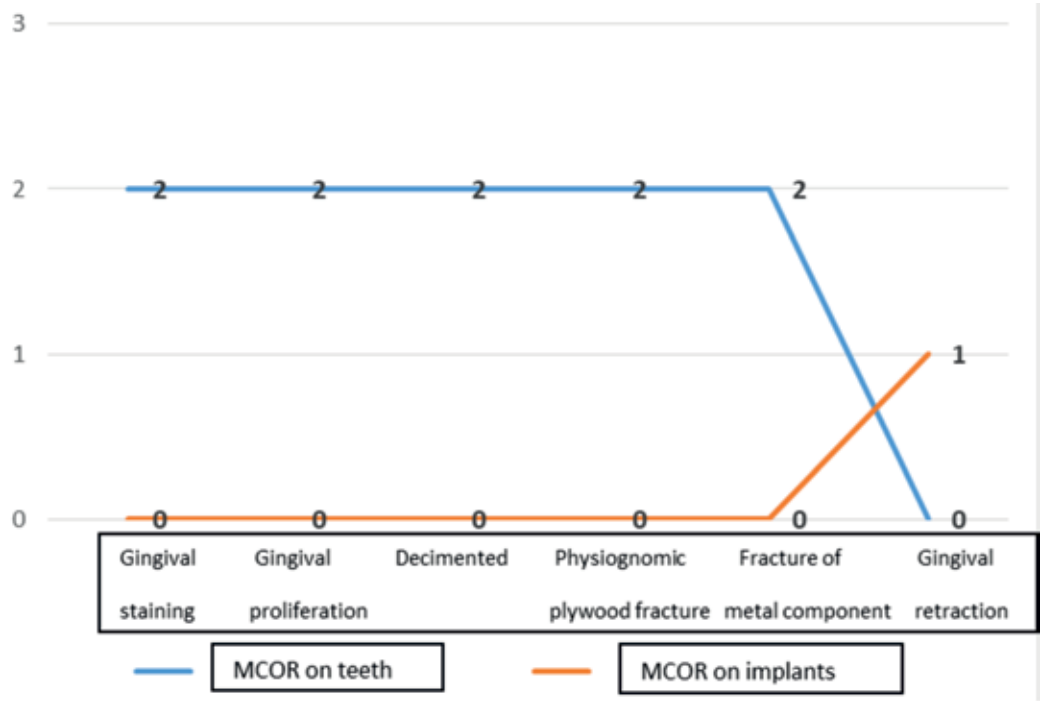

FIGURE 2. Comparative incidence of biological and technical complications detected in metal-composite restorations (MCOR), with dental or implant aggregation

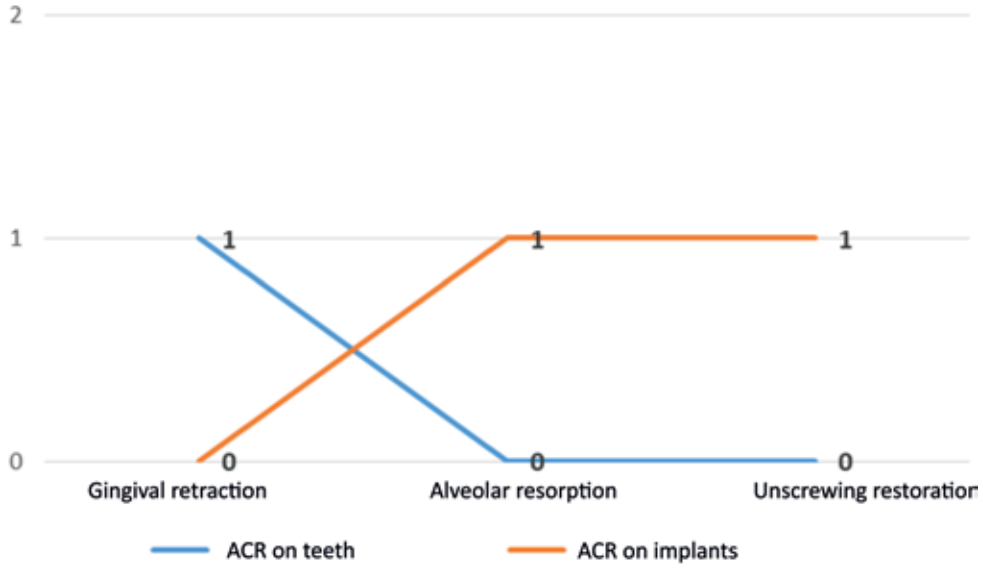

FIGURE 3. Comparative incidence of biological and technical complications detected in all-ceramic restorations (ACR), with dental or implant aggregation

DISCUSSIONS

The study group mainly included female patients, especially in the age group 31-40 years. We notice in the analyzed group a lower distribution in the older age groups (15.44% of patients in the age group 61-70 years and only 4.41% patients over 70 years).

Internationally, it has been found that people live longer and retain more natural teeth until old age (34,35).

More than half of the patients included in this study were from urban area and had higher education. Given that economic difficulties can adversely affect oral health and, in turn, oral conditions can interfere with general health, the literature considers that a patient's socioeconomic status has a short-term influence on oral pathology which in turn causes long-term general damage to the body (36 - 38). It is also important to remember that there is a strong psychological component associated with patients' fear of dental treatments (39,40).

In the study group, maxillary edentulous gaps predominated, but a significant percentage of patients (18.38%) had gaps on both arches.

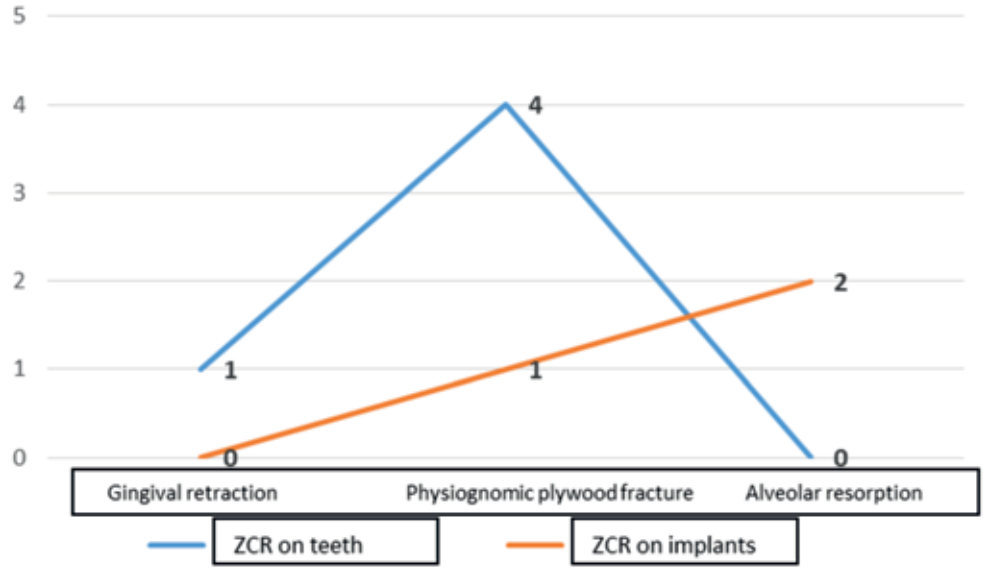

FIGURE 4. Comparative incidence of biological and technical complications detected in zirconia and ceramic restauration (ZCR) restorations with dental or implant aggregation

Dental caries and periodontopathy predominated in the etiology of edentulousness. According to the Global Burden of Disease Study (2016), severe periodontal disease is the 11th most widespread disease (41), with the prevalence of the disease ranging from 20-50% worldwide (42). Tooth decay is a global public health problem and, if left untreated, can lead to complications including pain, abscess and tooth loss (43). According to studies (44), there are at least 2.3 billion people worldwide affected by decaying permanent dentition and more than 530 million children with decaying primary dentition. A systematic review (45) indicated that socio-economic factors, such as education level, occupation and income, are strongly associated with the incidence of dental caries in adults.

Metal-ceramic prosthetic restorations were numerically superior to those of integral ceramics or zirconium oxide and ceramics, but we also noticed the presence of metal-composite restorations, preferred by certain categories of patients for economic reasons.

In our study we identified a 3-year success rate of over 87% of prosthetic restorations examined, similar to other studies (46-48). We detected 21 technical complications and 19 biological complications. Classifying the failures according to the materials from which the restorations were made, the metal-composite restorations were in the first place, followed by the zirconium oxide and ceramic restorations, the metal-ceramic restorations and the all-ceramic restorations.

CONCLUSIONS

In the retrospectively analyzed group, the therapeutic success rate at 3 years was 87.58%.

Metal-ceramic restorations were the main way of rehabilitation applied to edentulous breaches. Metal-composite restorations had the highest percentage failure rate, and all-ceramic restorations had the lowest percentage failure rate.

The failure rate for prosthetic restorations with dental aggregation was 14.83%, and the failure rate for restorations with implant aggregation was 9.29%.

Based on this study, limited by the relatively small number of patients and the dispensary period of only 3 years, we can appreciate that the integral ceramic restorations had a better behavior.

Acknowledgements

This work is supported by the project *ANTREPRENORDOC*, in the framework of Human Resources Development Operational Programme 2014-2020, financed from the European Social Fund under the contract number 36355/23.05.2019 HRD OP /380/6/13 – SMIS Code: 123847.

The authors did not declare any conflict of interest in this study. All authors have read, approved, and made equal contributions to the publication of this material.

Conflict of interest: none declared
Financial support: none declared