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Comparative Analysis of Long-Term Outcomes of Removable Plate Dentures and Implant-Supported Overdentures in Complete Edentulism

▷ **Abstract.** Treatment strategies for patients with complete edentulism must be guided by a highly individualized approach, as the condition of the edentulous oral cavity serves as a prognostic factor influencing both the complexity of prosthetic design and the expected treatment outcomes. Key considerations in managing such patients include the duration of edentulism and the patient's adherence to regular dental visits, which are essential for the timely detection of potential complications following prosthetic rehabilitation.

The aim of the study: was to conduct dynamic monitoring of quality indicators of removable prosthetic constructions in complete edentulism, including those supported by intraosseous implants.

Materials and Methods: The study cohort comprised patients using conventional complete removable dentures and patients rehabilitated with overdentures retained by a bar supported on four implants. During the follow-up period, participants underwent professional oral hygiene procedures one to two times annually. Occlusal adjustment and denture retention control were performed as needed. The condition of the prostheses and supporting tissues was evaluated using 38 parameters. The principal indicators included frequency of use (continuous vs. intermittent for esthetics or mastication), insufficient retention, mismatch between the denture base and the supporting tissues, denture fracture, peri-implant gingival inflammation, and the necessity for denture remaking or replacement.

Results: Insufficient retention of conventional complete dentures was first observed after one year of functional loading (5.7% of cases) and reached 100% after seven years. Similarly, progressive atrophy of the denture-bearing tissues was noted in 1.9% of cases after one year and in all cases after seven years.

Conclusions: Over a seven-year observation period, the majority of conventional complete dentures required replacement due to insufficient retention, tissue atrophy, fractures, and wear of artificial teeth. Despite the inherent disadvantages of removable prostheses and the occurrence of peri-implant soft tissue inflammation, the overall quality indicator—defined as the need for replacement or modification of the prosthetic design—was significantly lower in implant-supported overdentures. These findings highlight the clinical advantages of overdentures compared with conventional complete removable dentures.

Keywords: *overdenture, dental implant, edentulism, prosthetic quality.*

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Introduction

In patients with complete edentulism, implant placement in the anterior region of the jaws is considered significantly safer than in the posterior regions. This approach enhances the retention of complete removable dentures, which, in such cases, function as overdentures [1–8]. Despite the widespread clinical application of implant-supported overdentures, the

literature provides limited evidence regarding their long-term effectiveness compared with conventional complete removable dentures.

Given the prognostic importance of the edentulous oral condition and the need for individualized treatment strategies, further investigation is warranted. Therefore, **the aim of the present study** was to perform dynamic monitoring of quality indicators associated with removable prosthetic con-

structions in complete edentulism, including those supported by intraosseous implants.

Materials and Methods

The outcomes of orthopedic treatment for complete edentulism using conventional complete removable dentures and implant-supported overdentures (with a bar fixed to four implants) were followed over seven years. The study included patients wearing complete removable dentures and patients using removable overdentures with bar retention supported by four implants.

Among patients with complete removable dentures, 42.2% were men and 57.8% were women (among patients with implant-supported dentures, 61.9% were men and 38.1% were women). Among patients with complete removable dentures, those aged 40–49 years accounted for 10.8%, those aged 50–59 years for 33.7%, and those aged 60 years and older for 55.4%. In the implant-supported denture group, patients aged 30–39 years constituted 4.9%, 40–49 years—19.0%, 50–59 years—57.1%, and 60 years and older—19.0%.

The localization of complete removable dentures was as follows: maxilla—38.6%, mandible—33.7%, and both jaws—27.7%. In the implant-supported denture group, the respective distribution was 33.3%, 66.7%, and 0.0%. Baseline moderate-to-severe atrophy of the denture-bearing tissues was observed in 60.2% of patients with complete removable dentures and in 33.3% of patients with implant-supported overdentures.

During the follow-up period, patients underwent professional oral hygiene procedures one to two times per year; occlusal adjustment and denture retention control were performed as indicated. The condition of removable dentures and the underlying tissues was assessed using 38 parameters. The main parameters included frequency of use (continuous use, intermittent use for esthetics or mastication), insufficient retention, mismatch between the denture base and the denture-bearing area, denture fracture, peri-implant gingival inflammation, and the need for denture remaking or replacement.

Results

With increasing follow-up duration, the advantages of implant-supported overdentures became more evident than those of conventional complete removable dentures. The mean adaptation period for complete removable dentures was 26.3 ± 1.8 days.

Insufficient retention of complete removable dentures began to manifest after one year of functional loading (5.7% of dentures) and reached 100% of the remaining dentures after seven years.

Similarly, the degree of atrophy of the denture-bearing tissues increased with time: after one year of loading, it was observed in 1.9% of dentures, and after seven years, in 100% of dentures.

Trauma to the oral mucosa was detected in 4.7% of dentures after one year of loading and increased to 20.0% after seven years. Dryness and burning sensations of the mucosa under the denture were noted after one year in 3.8% and 1.8% of cases, respectively, and increased to 20.0% after seven years. Hyperemia of the denture-bearing area was observed in 4.7% of cases after 1 year and increased to 40.0% after 7 years. Hypertrophy of the denture-bearing tissues was detected after three years of use in 1.0% of cases and increased to 20.0% after seven years.

Denture fractures were frequently observed as cracks, chipping, base fractures, and fractures of artificial teeth, often occurring in combination. After one year of loading, one denture fracture occurred; over the seven-year observation period, fractures were recorded in two dentures. The most common defects were cracks and chipping of artificial teeth, as well as fractures of the denture base.

Relining of complete removable dentures due to atrophy of the denture-bearing tissues was required starting from the first year of loading and accounted for 14.3% of cases. After one year of loading, repair was performed on one denture; after seven years, in 20.0% of cases (one denture). Wear of artificial teeth increased rapidly, from 2.8% after two years of observation to 100% after seven years.

A decrease in the lower facial height and signs of temporomandibular joint (TMJ) pathology were detected after two years of use in one denture (0.9%) and after seven years in four (80%) and two (40%) dentures, respectively.

Poor hygiene of complete removable dentures was frequently observed: 24.5% of dentures had poor hygiene after one year of loading, and 60% after seven years. Consequently, as well as due to gastrointestinal pathology, halitosis was detected in 11.3% of cases after one year and in 40% after seven years.

Continuous use of complete removable dentures was characteristic of 69.1% of dentures on average per year (ranging from 91.5% at one-year follow-up to 20% after seven years). On average, 9.7% of complete removable dentures were not used annually (from 1.9% in the first year to 20% in the seventh year). The remaining dentures were used predominantly for esthetic purposes (12.8%) or mastication (12.6%).

As a result of seven years of use of complete removable dentures, 95.3% of them required

replacement due to various deficiencies. Adequate functional quality was preserved in only 4.7% of the dentures. The need for replacement became evident as early as the three-year follow-up period.

In implant-supported overdentures, compared with conventional complete removable dentures, the adaptation period was significantly shorter (mean adaptation time: 18.8 ± 1.2 days). Insufficient retention after two years of functional loading was detected in 2 dentures (4.8%) and increased to 83.3% (10 dentures) after seven years, which was still lower than that observed in complete removable dentures.

Atrophy of the denture-bearing tissues in the presence of implants was less pronounced than in complete removable dentures: after two years of loading, it was observed in 9.6% (4 dentures), and after seven years, in 91.7% (11 dentures). Trauma to the oral mucosa was detected three times less frequently than in complete removable dentures. Xerostomia was also less common: after two years of loading, it was noted in 4.8% (2 dentures), and after seven years in 16.7% (2 dentures). Burning sensation in the oral cavity was not recorded. Hyperemia or hypertrophy of the denture-bearing tissues was rare.

Implant-supported removable dentures were less prone to fracture, with fracture rates ranging from 2.4% after 3 years to 8.3% after 7 years. Relining of implant-supported dentures due to atrophy of the denture-bearing tissues was required starting from the second year of loading (1 denture, 2.4%) and reached 6.3% (1 denture) after seven years, which was less frequent than in complete removable dentures. Denture repairs were performed after four years of loading in 1 denture (2.4%) and after seven years in 1 denture (8.3%), which was significantly lower than for complete removable dentures.

A high incidence of wear of artificial teeth was studied; however, it was less pronounced than in complete removable dentures, increasing from 9.6% (4 dentures) after two years of observation to 100% (12 dentures) after seven years. A reduction in the lower facial height was detected after two years of use in 1 denture (2.4%) and increased to 33.3% (4 dentures) after seven years, which was almost 1.5 times less frequent than in complete removable dentures. Manifestations of temporomandibular joint (TMJ) pathology were rare.

An exacerbation of peri-implantitis was recorded once in the seventh year of implant loading (8.3%). Chronic peri-implantitis in the form of peri-implant

pockets began to appear in the third year of loading (1 denture, 2.4%) and increased to 16.7% (2 dentures) after seven years. Implant mobility under two dentures was observed at the end of the follow-up period (8.3%). Gingival recession around implants was noted after three years of loading in 1 denture (2.4%) and after seven years in 2 dentures (12.6%). Chronic peri-implant gingival inflammation (mucositis) increased from 2.4% (1 denture) at the two-year follow-up to 16.7% (2 dentures) at the seven-year follow-up.

Poor hygiene was noticed in 7 dentures (16.9%) after one year of loading and in 7 dentures (58.3%) after seven years of observation; these values were comparable to those recorded for complete removable dentures. Halitosis was detected in 4 dentures (9.5%) after one year and in 4 dentures (33.3%) after seven years. No implant fractures were recorded.

One supporting implant was removed after six years of loading (1 denture, 5.0%), and 2 dentures (16.7%) required implant removal after seven years. In total, 12 implants were removed, representing 8.1% of all placed implants.

The average annual rate of continuous use of implant-supported dentures was 97.5% (ranging from 100% at the one-year follow-up to 87.5% after 7 years), which was higher than that of complete removable dentures. Only two dentures were used, predominantly for esthetic purposes, over the last two years.

Overall, after 7 years of use, 27 implant-supported dentures (64.3%) required replacement due to various deficiencies, and 3 dentures (7.2%) required a change in prosthetic design due to implant removal. Adequate functional quality was maintained in 28.5% of implant-supported dentures.

Conclusions

1. Thus, over a seven-year observation period, the vast majority of complete removable dentures require replacement due to insufficient retention, atrophy of the denture-bearing tissues, fractures, and wear of artificial teeth.

2. Despite the disadvantages inherent to all removable dentures, as well as the occurrence of inflammatory complications in the peri-implant soft tissues, the integral indicator of prosthetic treatment quality—namely, the need for replacement or change of prosthetic design—is clearly lower in implant-supported overdentures. This demonstrates their advantage over conventional complete removable dentures.

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Порівняльний аналіз довгострокових результатів використання знімних пластинкових протезів та зовнішніх протезів при повній адентії

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Анотація. Варіанти та можливості лікування пацієнтів з повною втратою зубів, безсумнівно, повинні базуватися на принципах максимально індивідуалізованого підходу, оскільки стан адентії порожнини рота є прогностичним фактором, що визначає складність конструкції протеза та можливий результат протезного лікування. Найважливішими факторами, котрі слід враховувати при лікуванні пацієнтів з цим діагнозом, є тривалість беззубості, а також усвідомлення пацієнтом необхідності регулярних відвідувань стоматолога з метою своєчасного виявлення ризику ускладнень після протезного лікування.

Мета дослідження: проведення динамічного моніторингу показників якості знімних протезних конструкцій при повній адентії, включаючи ті, що спираються на внутрішньокісткові імпланти.

Матеріали та методи. У дослідженні взяли участь пацієнти, які носили повні знімні протези, та пацієнти, які використовували знімні (повні) протези з балочною ретенцією, що підтримувалася чотирма імплантатами. Протягом періоду спостереження пацієнти проходили професійні процедури гігієни порожнини рота 1–2 рази на рік; корекція оклюзії та контроль ретенції протезів проводилися за показаннями. Стан знімних протезів та навколишніх тканин оцінювався за 38 параметрами. Основними параметрами були: частота використання (постійне використання, періодичне використання для естетики або жування); недостатня ретенція; невідповідність між базисом протеза та ділянкою, на яку лягає протез; перелом протеза; періімплантні запалення ясен; необхідність перероблення або заміна протеза.

Результати. Недостатня ретенція повних знімних протезів почала проявлятися після 1-го року функціонального навантаження (5,7 % протезів) і досягла 100 % решти протезів через сім років. Аналогічно, ступінь атрофії тканин, що несуть протез, збільшувався з часом: після першого року навантаження він спостерігався у 1,9 % протезів, а після семи років — у 100 % протезів.

Висновки. Протягом семирічного періоду спостереження переважна більшість повних знімних протезів потребують заміни через недостатню ретенцію, атрофію тканин, що несуть протез, переломи та знос штучних зубів. Незважаючи на недоліки, властиві всім знімним протезам, а також виникнення запальних ускладнень у м'яких тканинах навколо імплантів, інтегральний показник якості протезного лікування, а саме необхідність заміни або зміни конструкції протеза, є явно нижчим у протезах на імплантатах. Це демонструє їхню перевагу над звичайними повними знімними протезами.

Ключові слова: зовнішній протез, імплантат, адентія, якість.

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