

Olcay Şakar
Editor

Removable Partial Dentures

A Practitioners' Manual

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Foreword

Removable partial dentures (RPDs) have for long been a very common treatment option for subjects with partial edentulism, i.e., loss of some but not all teeth. Even if the prevalence varies considerably between countries, RPD treatment is in a global context still the most common prosthodontic option for partially edentulous patients. With the successful development of dental implants, many clinicians have come to believe that implant treatment can solve all problems related to tooth loss and substitute both RPDs and complete dentures. This is of course not true, not only because of often-unfavorable oral conditions but also of a number of nondental factors such as fear of surgery and suspicion of implant treatment. The most important obstacle is however economical. A majority of partially edentulous people belong to the poorest section of the population and can never be candidates for any implant treatment. For those, RPDs may be a realistic option. For others with positive experience of an RPD, it will remain an acceptable treatment.

During the last few decades, many dentists have considered RPDs an inferior treatment in the restoration of tooth loss when compared with fixed dental prostheses on natural teeth or on dental implants. It is true that the use of RPDs may involve a risk of potential harm to the oral tissues, probably greater than when using fixed restorations. However, this can be counteracted with proper planning and conduct of the treatment including individual instruction in oral hygiene, pre-prosthetic periodontal treatment, and maintenance of dental and periodontal health after the delivery of the RPD. A satisfactory prognosis for most RPD treatments can be obtained provided correct indications have been used, the dentist and the dental technician collaborate closely in the construction of the prosthesis, and the patient succeeds in maintaining good oral hygiene in the long run. These conditions and the fact that an RPD treatment is more rapidly performed and is less costly than other alternatives indicate that RPDs will remain a viable option in the rehabilitation of partially edentulous patients in the predictable future.

This impressive new textbook combines a straightforward description of well-established principles and methods for the treatment of partially edentulous patients with new and modern knowledge based on available scientific evidence. It contains basic information on the epidemiology of partial edentulism and its effect on the stomatognathic system as well as a detailed account and directions for the clinical and laboratory work in the fabrication of RPDs. There are interesting chapters on advanced RPD techniques using various attachments, double crown systems, and dental implants as well as a

discussion on the role of partial edentulism and temporomandibular disorders.

The text is easy to read and supplemented with informative illustrations. The book will therefore be valuable both in undergraduate and postgraduate education. It deserves also to have a place in the office of any dentist treating adult and elderly patients.

Mölndal, Sweden

Gunnar E. Carlsson
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Dr Dent hc, FDSRCS

Preface and Acknowledgments

Istanbul University Faculty of Dentistry, which is located in the most crowded and socioeconomically cosmopolitan city of Turkey, has a remarkable capacity regarding both the number of patients and students. Every year an average of 1800 complete and 1200 removable partial dentures are delivered in the department of prosthodontics.

As an academician, concentrated on removable dentures, my opinion is that with incomplete knowledge of removable dentures any prosthodontic treatment including intraoral appliances would fail to succeed.

Removable partial dentures appeal as complex structures mostly due to the components of the framework to both dental students and dentists. This is the main reason why a great part of the design process is left to dental technicians to be carried out. However, these dentures are simple and cost-effective solutions providing long-term service to a vast majority of patients when they are properly designed.

This book is designed as a guide to simplify basic knowledge and clinical procedures that are often regarded as complicated. It is therefore enriched with visual items like photographs, videos and descriptive illustrations of selected cases, and clinical and desktop procedures as much as possible.

Even though this book is mainly meant for dentists, I hope it will also be an up-to-date handbook for both dental students and technicians.

Prosthodontic treatment may be considered to require the highest levels of artistic care combined with a wide curriculum of knowledge among all disciplines of dentistry. Therefore, I am thankful to my colleagues who contributed to the mutual effort of bringing this book to life with their valuable expertise and knowledge. I am also grateful to my senior tutors, especially to my mentor, Professor Mehmet S. Beyli, who showed me the way through my academic life, and to Professor Gunnar E. Carlsson, who led and inspired me with his knowledge and experience and honored me by writing the foreword.

I am also grateful to Springer for offering me the opportunity to publish this book and for their constant support.

I also thank our Ph.D. students Zeynep Mumcu, Ercan Yılmaz, Fatih Ayçiçek, Anıl Gürel, Pınar Şeşen, and Mehmet Berk Kaffaf who worked hard in every step of the book; Başak Çetinkaya on behalf of Profcat Interactive Media for preparing the illustrations; graphic designer Hakin Des for managing visual items; and our dental technicians Erbil Sümbüllü and Cihan Bozpınar for their valuable input.

I am much indebted to my family, especially to my daughter Doğa, my husband Semir, to my friends and to the families of all authors for their kind understanding and support.

“Knowledge grows when shared,” so I am pretty sure that this book will mature with the precious feedback from our readers and new information will spring out for future generations. Therefore, I would like to thank all readers who share our knowledge in advance.

Istanbul, Turkey

Olçay Şakar

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Part I

Introduction to Removable Partial Dentures

Current Status on Partial Edentulism and Removable Partial Dentures

1

Olcaý Şakar

Oral health, without a doubt, plays a vital part in both general health and quality of life. In 2010, it was reported that nearly 3.9 billion people have varying levels of oral disease. Among the reviewed 291 diseases and injuries, the leading problem was found to be the caries of permanent dentition. Severe periodontitis ranked 6th, caries of primary dentition came up 10th, and severe tooth loss, referring to less than 9 remaining permanent teeth, 36th. The term “disability-adjusted life years” refers to the sum of lost potential years due to early death and productive years accompanied with disabilities. Severe tooth loss comes out as the main cause of disability-adjusted life years for people over the age of 60. Therefore, tooth loss will continue to be, as it always has been, a major factor affecting individuals’ oral and systemic conditions along with their quality of life. According to the World Health Organization’s (WHO) 2012 report, 60–90 % of school children and almost 100 % of the adult population have caries. The ratio of severe periodontitis in middle-aged people between 35 and 44 is 15–20 %. Almost three out of every ten people all over the world between the ages of 65 and 74 are totally edentulous. Furthermore, almost 60 % of tooth

loss was found to be due to dental caries that are left untreated, followed by periodontal involvement that led to extraction by 30 %.

As the average life span of the global population is increasing rapidly, the oral health of elderly people is becoming more important.

This elderly population, particularly of more developed countries, is expected to have an annual increase of 1.0 % until 2050 and 0.11 % between 2050 and 2100, which indicates an increase of 45 % by the middle of the century. The number of elderly people, which is currently 287 million people, will increase to 417 million from 2013 to 2050, and by 2100, the elderly population over the age of 60 will be 440 million. The underdeveloped parts of the world show even more vivid dynamic. The 3.7 % yearly rise from 2010 to 2015, which is the highest rate of all times, is expected to be followed by a 2.9 % rise until 2050 and 0.9 % in the next 50 years. 554 million in 2013 will rise to 1.6 billion by 2050 and to 2.5 billion by the end of the century.

The average life span worldwide, which was 69 years between 2005 and 2010, is expected to rise to 76 years from 2045 to 2050 and to 82 years by the end of the century. The scenario is much faster in developed countries. The expected increase for corresponding time intervals is 77–83 years until the middle of the century and to 89 years by 2095–2100.

The rate of total and partial edentulous people in a population and relevant types of prosthetic

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restorations vary from one country to another. However, these parameters change even in a constant population over time. Socioeconomic status, smoking habits, attitude to dental care, and dental anxiety may be mentioned among many possible causes of these variations in both domestic and international populations.

Total edentulism is in global decline, and WHO declared a number of at least 20 teeth to be functional dentition, but it is a pity that even in Europe, where the rate of edentulism is known to be the least, this goal of functional dentition has not yet been achieved for many dentate subjects over the age of 60 (Table 1.1).

The evident increasing elderly population versus decreasing total edentulism tendency indicates that we will be dealing with an escalating number of partial edentulism in the following years. It is not hard to guess that this population will seek less complicated and more affordable treatment options when compared to young people who have higher incomes and motivation to cope with the exhausting, time-consuming, and expensive treatment alternatives.

It should not be ignored that even if a removable partial denture (RPD) is accepted as an economic treatment option for some parts of the world, the simplest basic applications of dentistry are still unaffordable for other less wealthy regions, because poverty is still the major issue which should urgently be addressed. The world is said to be enjoying its most wealthy period since the middle of the twentieth century; however, almost 2.5 billion people live with an income of

less than 2 USD per day, which is declared as the poverty line by the World Bank. Furthermore, 1.2 billion people live under 1 USD and that is the hunger line.

Another issue regarding the attainability of health-care services is the ratio of elderly people who need, by various means, the care of the younger generation; this is called “the old age dependency ratio.” The increase in this ratio indicates fewer working people taking care of more elderly dependent persons, which in turn complicates the availability of health-care services socioeconomically (Table 1.2).

The type of treatment for partially edentulous patients varies according to local factors like the condition of remaining hard and soft tissues, systemic condition of the patient, socioeconomic status, and patient preferences.

Implant-assisted prostheses for totally and partially edentulous patients have been a choice of treatment for a while. The growing popularity of dental implants also attracted the attention of scientific research, which led them to become a major subject of scientific meetings and events. Being fed by the media with the current innovations in dentistry and dental implants led people to demand these treatment alternatives from their dentists. However, despite this focus on implant dentistry, it is estimated that the number of totally or partially edentulous patients who could receive a treatment involving dental implants covers merely 1.7 % of the relevant population globally. The common cause for this limited availability is the high expense of implants. The idea of com-

Table 1.1 In various countries, the percentages of total edentulism and the people with functional dentition in subjects 60 years old and over

Author (First name)	Publication Date	Country	Sample (n)	Age (years)	Prevalence of total edentulism (%)	People with functional dentition (%)
Peltola	2004	Finland	260	≥ 60	42	18 ** #
Petersen	2004	Denmark	1612	65–74	27	40 *
Tramini	2007	France	321	≥ 65	26.9	33.6 *
Madlena	2008	Hungary	612	65–74	19.8	22.6 **
Ribeiro	2011	Brazil	5349	65–74	54.7	10 *
Doğan	2012	Turkey	1545	65–74	48	12.4 **
Urzua	2012	Chile	465	65–74	11.4	23.87 **

*Min 20 teeth, ** Min 21 teeth, #: This data was obtained only from the dentate subjects (n: 151).

Table 1.2 The old age dependency ratio is the ratio of the population aged 65 years or over to the population aged 15–64

Year	World	Sub-Saharan Africa	Africa	Asia	Europe	Latin America and the Caribbean	Northern America	Oceania
2000	11.0	5.6	6.1	9.1	21.8	9.1	18.6	15.3
2005	11.3	5.7	6.1	9.6	23.3	9.7	18.4	15.7
2010	11.7	5.8	6.2	10.1	23.9	10.4	19.6	16.4
2015	12.5	5.8	6.3	11.0	25.9	11.5	22.4	18.4
2020	14.2	5.8	6.5	12.9	29.0	13.3	25.9	20.4
2030	17.8	6.0	7.0	17.1	35.9	18.1	33.5	24.5
2050	24.7	8.0	9.5	27.0	46.6	30.5	36.2	29.0

They are presented as number of dependents per 100 people of working age (15–64)

binning all mandibular complete dentures with two implants has gained wide acceptance, but even this may be limited to the wealthiest countries, which leaves most edentulous patients out of range. As the global dynamics of economics are not likely to change soon, treatment options involving implants will continue to be restricted to a wealthy minority for a long time. On the other hand, a clinical study revealed that even when cost is ignored as a drawback, more than one-third of patients refused to have implants even free of charge to improve the comfort of their mandibular dentures. The main reason for refusal was the patients' concerns regarding surgery. These concerns included the thought of implants as unnecessary, drawbacks related to complications, negative feedbacks from unsatisfied people, and not having enough time for the length of overall treatment.

Recently the term “appropriatech,” which is derived from the words “appropriate” and “technology,” has been coined to describe a philosophy of treatment approach combining cheap yet effective materials and techniques to make the most cost-effective dentures without ignoring any basic principles of care. And it has been emphasized that innovations in materials and techniques add many advantages to dental practice but may sometimes cause dentists to forget their humanistic priorities.

As a conclusion, the RPD treatment comes out as a less complicated and cost-effective alternative to achieve functional and esthetic goals of prosthetic rehabilitation. Therefore, people who

do not want their teeth to be prepared, systemic conditions that jeopardize surgery, and extensive treatment periods may indicate an RPD treatment. In addition, whenever teeth bound large edentulous spaces are present and flange support is inevitable due to extensively reduced alveolar ridge, an RPD is certainly the choice of treatment. Another indication is the maxillofacial defect patient, in whom an RPD can offer the fastest and satisfactory solution. When proper artificial teeth positions are hard to establish or implant positions turn the supra-structure design into a biomechanical challenge, an RPD can be the solution. Similarly, patients who need the reestablishment of occlusal vertical dimension and maximal intercuspal position are also candidates for both provisional and permanent overlay RPDs.

Despite the lack of adequate information about the percentage of patients using RPDs all over the world, limited recent studies from different countries, such as Kazakhstan 54.6 %, European countries 10–19 %, and Taiwan 15.4 %, have revealed that the RPD is still a common treatment alternative and emphasized its indispensable status.

RPDs have been proven to have satisfactory service time free from damaging influences over the remaining tissues if they are properly constructed and maintained. Recently, 90–96.4 % of properly designed RPDs have been found to be still in function after 5 years, 89.8 % after 10 years, and 50.4 % after 25 years.

Despite all these evidence-based advantages of RPDs, probably because of industrial pressure and