Treatment Options Before and After Edentulism

Implant Overdenture

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Preface

This book is the second in a series of three books:

1. Tooth-supported overdentures
2. Implant-retained overdenture applications in edentulous patients
3. Implant-retained fixed restoration applications in edentulous patients

This book consists of seven chapters and more than 700 colorful pictures of our own clinical cases.

This book will continue to serve as a guidebook not only for dentistry students but also for dentists. It will help the clinicians to offer the most proper treatment options to the patients and give practical information about the solutions to the problems occurring before and after the use of implant-retained and implant-supported overdentures.

In this book, we have tried to give theoretical information that can be adopted in a clinical setting rather than giving theoretical information that cannot be applied practically.

I would like to thank RHEIN83, CEKA PRECI-LINE, and Preat Corporation companies for allowing me to share clinical and laboratory cases.

I would like to thank Optimal Dental Laboratory for their continuous support in the laboratory stages of our clinical cases and to all who contributed during the writing and publishing of this book.

Istanbul, Turkey — Yasemin Kulak Özkan

Contents

Abbreviations

BAFO	Bone area fraction occupancy
BBO	Bilateral balanced occlusion
BIC	Bone implant contact
BMD	Bone mineral density
CAD/CAM	Computer-aided design/computer-aided manufacture
CBCT	Cone-beam computed tomography
CD	Complete denture
CLC	Conventional loading concept
CPO	Canine-protected occlusion
CT	Computed tomography
CTX	Carboxy terminal telopeptide
DAH	Denture attachment housing
ELC	Early loading concept
HA	Hydroxyapatite
HP	Hybrid prosthesis
ILC	Immediate loading concept
IOD	Implant overdenture
IROD	Implant-retained overdenture
ISFP	Implant-supported fixed prosthesis
ISOD	Implant-supported overdenture
ISQ	Implant stability quotient
ISRP	Implant-supported removable prosthesis
LCD	Lower complete denture
LODI	Locator overdenture implant
LZ	Lekholm and Zarb
MI	Maximum intercuspation
MLO	Medially positioned lingual occlusion
OPTG	Orthopantomogram
PM	Prosthetic movement
SLA	Sandblasted, large grit, acid-etched
TA	Telescopic attachment
TiCN	Titanium carbon nitride

TiN	Titanium nitride
TPS	Titanium plasma spray
TSOD	Tissue-supported overdenture
UCD	Upper complete denture
UIOD	Upper implant overdenture
VAS	Visual analog scale

General Overview of Implant Treatment

1

Buket Akalın Evren and Yasemin Kulak Özkan

In 1991, the necessity of one or two complete dentures in the elderly population was 33.6 million in the United States, while it is expected that the number will be 37.9 million in 2020. In our country, it is reported that the number reached 7.5 million from 3.9 million in 2010. According to the National Institute of Health, most of these patients visit their dentist every 14 years, a schedule not conducive to proper maintenance for ensuring properly fitting and functional prostheses. All over the world, 60 million edentulous patients were treated by conventional complete dentures, while 8 million patients were treated with implants. Nowadays, the number of patients treated with implants is rapidly increasing.

1.1 Problems in Complete Dentures

After the extraction, all the changes on the residual ridge can be divided into two phases. In the first phase, the general skeletal loss is significant for the residual ridge. In the final phase of resorption, trabecular bone mineral density and the alveolar ridge's height do not change, both in healthy individuals and those with osteoporosis. Tooth loss causes resorption of the upper part of the mandible (alveolar ridge) and is the main factor influencing the residual mandible's clinical height. Klemetti stated that initially, resorption starts on the alveolar part of the mandible, and the rest of the mandible remains unchanged. Factors such as resorption, postmenopause, or osteoporosis do not change the lower part of the mandible. The main reason for this may be the function of the masticatory muscles.

The period of edentulism is also related to alveolar ridge resorption, especially in the mandible. Alveolar bone loss in the edentulous jaw is a permanent process during

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the period of denture wearing. The long-term usage of faulty prosthesis or prosthesis with a lack of occlusal harmony is among the main factors that enhance alveolar bone resorption. Alveolar ridge resorption was higher only in those patients with an extended period of wearing nonadapted dentures. Resorption in the frontal part of the mandibular alveolar ridge is highest in the first year of denture wearing, and after that, it is lower for 7 years, and after that period, alveolar ridge resorption starts to decrease. Crum and Rooney reported a bone reduction in the mandibular frontal part of 0.6 mm in immediate complete denture wearers and 5.2 mm in immediate complete denture wearers during 5 years of denture wearing. They stated that the mandible (the smaller jaw's smaller surface) could not resist the strong chewing forces under the denture base. Also, the maxilla is less reduced because palatum durum resists the chewing forces and the more excellent surface of the denture base, the better guidance of the chewing forces (smaller amount of force on the unit of the ridge). In the upper and lower complete dentures, the mandible's average unit pressure is twice as high as the maxillary pressure because of the smaller contact surface with the supporting tissues. The occlusal forces are higher in the posterior area than the anterior area. As a result, decreased bone quality and increased forces should be considered in the treatment planning. Most of the researchers reported that excessive mandibular atrophy is related to metabolic bone diseases in edentulous patients. Besides, alveolar bone resorption is also related to nutrition, hormonal imbalance, systemic factors, occlusal trauma, dysfunction atrophy, and tooth extraction. Resorption factors differ through original anatomy, damage of peripheral tissues following a tooth extraction, metabolic bone diseases like osteoporosis, age and gender, amount of time after tooth extraction, change of mechanic stimuli during chewing and swallowing, phonation, parafunctional habits like bruxism, and mucosal pressure of removable prosthesis. Also, a decrease in stabilization and retention of the prosthesis by the tongue in the mandible reduces chewing efficiency and function. Problems like inadequate stability and retention, pain during chewing, and denture instability negatively affect patient satisfaction.

Conventional complete dentures show satisfactory results if there is no excessive resorption in the remaining alveolar bone and clinical procedures are followed adequately. Situations in which conventional complete dentures cannot be used comfortably are listed below:

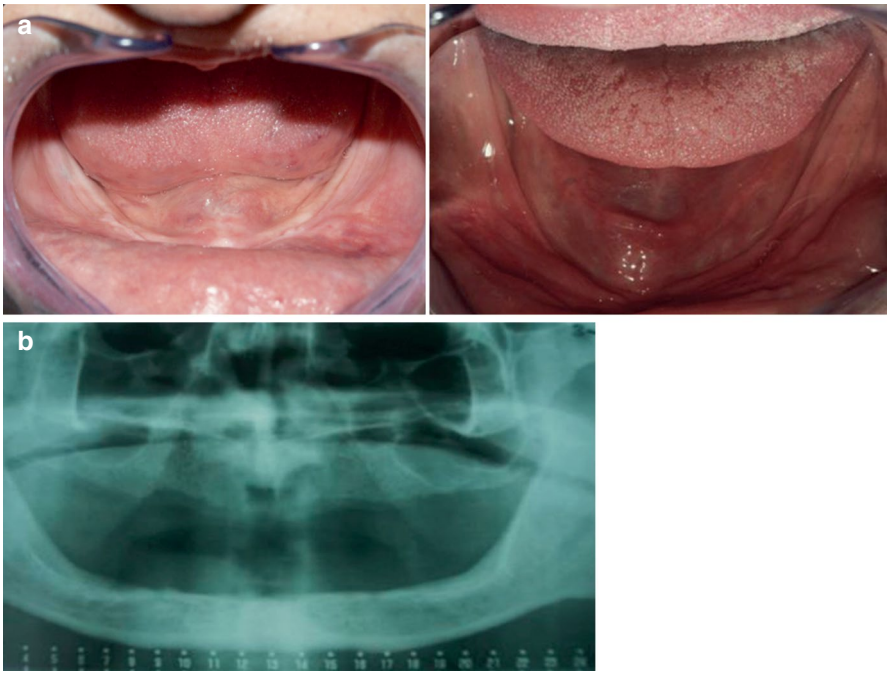
1. Cases with hypermobile crest suffer from retention and stability loss of dentures due to the extreme alveolar bone resorption or loss of neuromuscular control after long years of successful complete denture usage.
2. The necessity of reconstruction of resorbed soft and hard tissues.
3. Pain and difficulty of usage, caused by lack of stabilization.
4. İntolerance caused by the extreme gag reflex due to conventional complete dentures.
5. Lack of stabilization and support caused by the distribution of remaining natural teeth.
6. Cases with complete denture against natural dentition. (Especially in cases with maxillary anterior natural dentition occluding against mandibular complete denture, excessive alveolar bone resorption is seen in the mandibular anterior alveolar bone.)

1.2 Methods for Increasing the Stability of Complete Dentures

Some precautions may be taken in the extremely resorbed alveolar bone to maintain prosthetic stability and patient satisfaction (Picture 1.1a, b). Patient satisfaction can be increased by applying soft lining material on the denture's tissue surface (Picture 1.2). Applying soft lining material to reduce the mucosal pain in extremely resorbed alveolar bone in situations where mental foramina move toward the top of the crest by resorption, the pressure of occlusal forces and also the friction between tissue and prosthesis decrease.

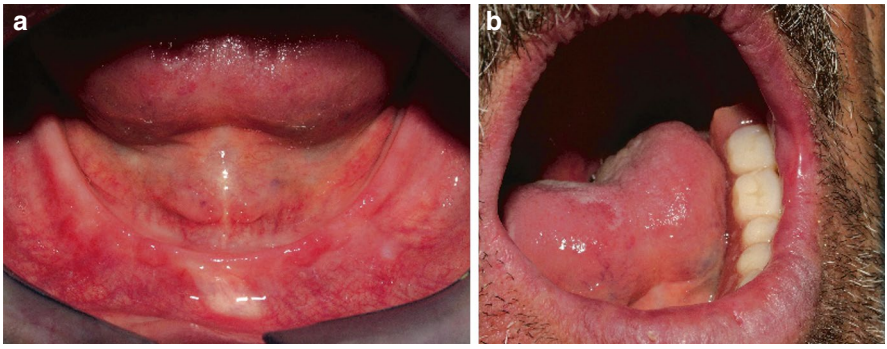
The neutral zone area is used to increase denture stability; proper utilization of the neutral areas is aimed, so the tooth arrangement should be done in the area where the tongue and the cheek muscles neutralize each other. This technique is called "the neutral zone technique" (Pictures 1.3, 1.4, and 1.5).

If there is not enough bone height available, patient satisfaction may be increased with the vestibuloplasty process. The common opinion in the literature about the vestibuloplasty process mentioned that mandibular bone height might cause problems in cases with less than 15 mm bone height. In this case, there are three different treatment alternatives. These are reconstructing the prosthesis, rearranging the prosthesis after pre-prosthetic surgery to expand basal seal areas or utilizing intraosseous implants (Picture 1.6a, b).



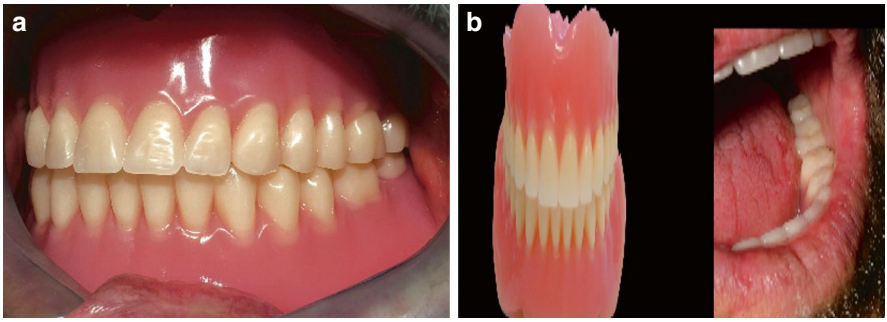
Picture 1.1 (**a**, **b**) Severe resorption seen in the mandible, clinical, and panoramic x-ray view

Picture 1.2 Applying soft lining material on the denture's tissue surface



Picture 1.3 The neutral zone technique steps increased stability for resorbed jaws. (**a**) resorbed mandible and (**b**) unstable mandibular denture

Picture 1.4 (**a**) Firstly denture base resin was fabricated to obtain an anatomic impression. Tissue conditioner material (Viscogel, DENTSPLY) was mixed and adapted to the mandibular denture base. Then it was placed in the mouth and the patient was asked to pursue his/her lips, count from 60–70, smile, pronounce the vowels, swallow, slightly protrude the tongue, and lick the lips until the material has set. (**b**) This record is then placed on the model again and key grooves are carved on the plaster model with a drill. Wax rolls are prepared and firmly fixed on the retromolar extension of the record. The lower model is isolated, and it is covered entirely with hard stone by only leaving the ends of the waxes out of the stone. (**c**) After the stone is hardened, it is removed from the lower model, and the tissue conditioner record is detached from the lower base plate. The base plate is placed in the lower model again. Wax rolls are removed, the inside of the plaster is entirely isolated, and the lower plaster is carefully settled and fixed on the model. A sufficient amount of red wax is melted. Then the melted wax is poured into the space remaining from wax rolls. (**d**, **e**) After the wax is completely cooled, the plaster key's upper part is removed, and the model is obtained with wax rims on the base plate. After the models are fixed on the articulator, the wax rim is covered with silicone impression on the labial, buccal, and lingual sides only to leave the occlusal surface open, and thus, a silicone index is prepared. The teeth are aligned according to the silicone index, so the neutral zone record is made



Picture 1.5 (**a**) Finished denture with neutral zone technique and (**b**) stable mandibular complete denture

Picture 1.6 (**a**, **b**) If there is not enough bone height available, vestibuloplasty surgery should be used for increasing patient satisfaction

1.3 Implant Treatment Types for Complete Denture Patients

In patients with unsatisfied complete dentures, treatment with dental implants can be rewarding, providing the highest patient satisfaction levels. Restoration of esthetics, function, and self-confidence while enhancing bone preservation's biological benefits are a few reasons to pursue patients for dental implant therapy. Long-term studies reported that the amount of bone loss resulting from physiological changes

is 0.4 mm per year in the edentulous anterior mandibular region. This loss will be only 0.5 mm in 5 years (0.1 mm. per year) in cases treated by implant supported removable dentures. Besides, the functional capacity of complete denture cases is increased dramatically by the usage of implants (Table 1.1).

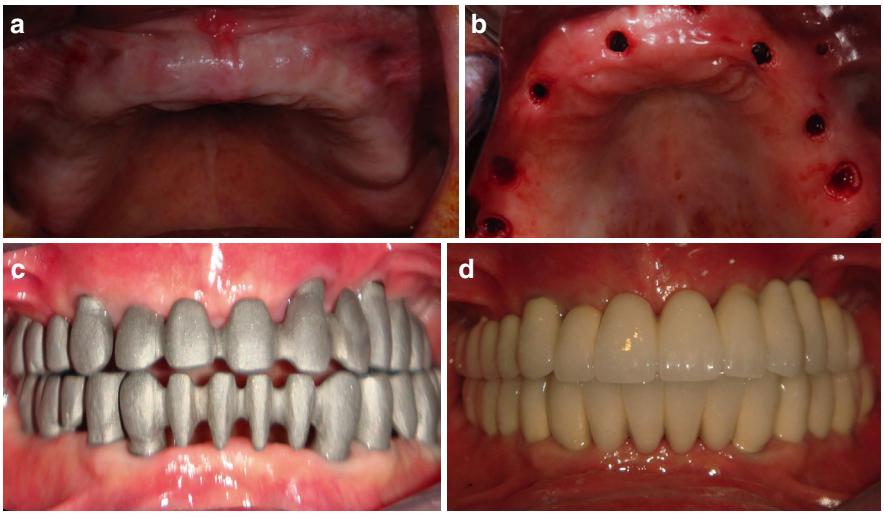
There are three main choices for restoring the mandibular arch with implants: a fixed restoration (ISFP) which may be a metal-ceramic implant-supported restoration, a hybrid type restoration (HP) and "All on Four concepts" restoration (Pictures 1.7, 1.8, and 1.9), or a minimalist approach with two implants to retain a removable prosthesis (IOD) or four implants to support removable prosthesis (Picture 1.10).

The overdenture-type (IOD) restoration is the least expensive initially. The IOD is more economical and very satisfactory for those patients who lack the muscular coordination to wear complete dentures but have no complaint of pain due to the loading of the mucosa.

The factors to be considered in the treatment planning of fixed or removable implant-retained prosthesis in edentulous patients are the esthetic and functional expectations of the patient, economic conditions, anatomy, and morphology of the alveolar crest, interarch relationship, and distribution, location, and the number of the implants. The clinicians should know the differences between ISFP and IOD (Table 1.2).

Table 1.1 Functional capacity of natural teeth and restorations

Functional capacity	%
Natural teeth	100
İmplant retained fixed restorations	70
İmplant retained overdentures	30
Mandibular complete denture	10
No teeth and no denture	0



Picture 1.7 (**a**) Clinical appearance of the upper jaw edentulous patient, (**b**) 7 implants placed in the upper jaw (**c**) Trying the metal framework prepared as a single unit in the mouth (**d**) Metal Porcelain superstructure in situ