

CONTEMPORARY FIXED PROSTHODONTICS

Rosenstiel | Land | Fujimoto
FIFTH EDITION

ELSEVIER



EVOLVE STUDY RESOURCES FREE WITH TEXTBOOK PURCHASE
EVOLVE.ELSEVIER.COM

YOU'VE JUST PURCHASED MORE THAN A TEXTBOOK!

Evolve Student Resources for *Rosenstiel/Land/Fujimoto: Contemporary Fixed Prosthodontics, Fifth Edition*, include the following:

- Practice examination questions for each chapter
- The Glossary of Prosthodontic Terms



Activate the complete learning experience that comes with each textbook purchase by registering at

<http://evolve.elsevier.com/Rosenstiel/prosthodontics/>

REGISTER TODAY!

You can now purchase Elsevier products on Evolve!
Go to evolve.elsevier.com/html/shop-promo.html to search and browse for products.

CONTEMPORARY FIXED PROSTHODONTICS

This page intentionally left blank

CONTEMPORARY FIXED PROSTHODONTICS

FIFTH EDITION

Stephen F. Rosenstiel, BDS, MSD

Professor Emeritus, Restorative and Prosthetic Dentistry
College of Dentistry
The Ohio State University
Columbus, Ohio

Martin F. Land, DDS, MSD

Professor of Fixed Prosthodontics
School of Dental Medicine
Southern Illinois University, Edwardsville
Alton, Illinois

Junhei Fujimoto, DDS, MSD, DDSc

Part-Time Lecturer, Tokyo Medical and Dental University
Director, J.F. Occlusion and Prosthodontic Postgraduate Course;
Private Practice
Tokyo, Japan

ELSEVIER

ELSEVIER

3251 Riverport Lane
St. Louis, Missouri 63043

CONTEMPORARY FIXED PROSTHODONTICS,
FIFTH EDITION

ISBN: 978-0-323-08011-8

Copyright © 2016 by Elsevier Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the Publisher. Details on how to seek permission, further information about the Publisher's permissions policies and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at our website: www.elsevier.com/permissions.

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

Notices

Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods, they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

With respect to any drug or pharmaceutical products identified, readers are advised to check the most current information provided (i) on procedures featured or (ii) by the manufacturer of each product to be administered, to verify the recommended dose or formula, the method and duration of administration, and contraindications. It is the responsibility of practitioners, relying on their own experience and knowledge of their patients, to make diagnoses, to determine dosages and the best treatment for each individual patient, and to take all appropriate safety precautions.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of product liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

Previous editions copyrighted 2006, 2001, 1995, and 1988.

Library of Congress Cataloging-in-Publication Data

Rosenstiel, Stephen F., author.

Contemporary fixed prosthodontics / Stephen F. Rosenstiel, Martin F. Land, Junhei Fujimoto.—
Fifth edition.

p. ; cm.

Includes bibliographical references and index.

ISBN 978-0-323-08011-8 (hardcover : alk. paper)

I. Land, Martin F., author. II. Fujimoto, Junhei, author. III. Title.

[DNLM: 1. Denture, Partial, Fixed. 2. Prosthodontics—methods. WU 515]

RK666

617.6'92—dc23

2015024195

Executive Content Strategist: Kathy Falk
Senior Content Development Specialist: Courtney Sprehe
Publishing Services Manager: Catherine Jackson
Senior Project Manager: Rachel E. McMullen
Design Direction: Xiaopei Chen

Printed in China

Last digit is the print number: 9 8 7 6 5 4 3 2 1



CONTRIBUTORS

Robert F. Baima, DDS

Clinical Associate Professor, Department of Periodontology and Restorative Dentistry, School of Dentistry, University of Detroit Mercy, Detroit, Michigan; Diplomate, American Board of Periodontology, Diplomate, American Board of Prosthodontics

Rick K. Biethman, DMD

Assistant Professor, Department of Restorative Dentistry, School of Dental Medicine, Southern Illinois University, Alton, Illinois

William A. Brantley, PhD

Professor and Director of the Graduate Program in Dental Materials Science, Division of Restorative and Prosthetic Dentistry, College of Dentistry, The Ohio State University, Columbus, Ohio

Isabelle L. Denry, DDS, MS, PhD

Professor, Department of Prosthodontics and Dows Institute for Dental Research, College of Dentistry, The University of Iowa, City, Iowa

R. Duane Douglas, DMD, MS

Associate Professor and Chair, Department of Restorative Dentistry, School of Dental Medicine, Southern Illinois University, Alton, Illinois

A. Jon Goldberg, PhD

Professor, Department of Reconstructive Sciences, Director, Center for Biomaterials, School of Dental Medicine, University of Connecticut, Farmington, Connecticut

Julie A. Holloway, DDS, MS

Professor and Head, Department of Prosthodontics, College of Dentistry, The University of Iowa, Iowa City, Iowa

Christa D. Hopp, DMD, BS

Associate Professor, Section Head, Operative Dentistry, School of Dental Medicine, Southern Illinois University, Alton, Illinois

William M. Johnston, PhD

Professor Emeritus, Division of General Practice and Materials Science, College of Dentistry, The Ohio State University, Columbus, Ohio

Peter E. Larsen, DDS

The Larry J. Peterson Endowed Professor, and Chair of Oral and Maxillofacial Surgery, College of Dentistry, The Ohio State University, Columbus, Ohio

Edwin A. McGlumphy, DDS, MS

Professor, Department of Restorative and Prosthetic Dentistry, College of Dentistry, The Ohio State University, Columbus, Ohio

Jonathan C. Meiers, DMD, MS

Chief, Dental Service, VA Connecticut Healthcare System, 950 Campbell Ave. West Haven, Connecticut

Donald A. Miller, DDS, MS

Private Practice, Chicago and Naperville, Illinois, Clinical Associate Professor, University of Illinois at Chicago College of Dentistry; Diplomate, American Board of Endodontics

Van P. Thompson, DDS, PhD

Professor, Division of Tissue Engineering and Biophonics, King's College London Dental Institute, London, United Kingdom

Alvin G. Wee, DDS, MS, MPH

Associate Professor, Division of Oral Facial Prosthetics/Dental Oncology, Department of Otolaryngology—Head and Neck Surgery; Member, Cancer Prevention and Control Program, University of Nebraska Medical Center Eppley Cancer Center, Courtesy Associate Professor, College of Dentistry, University of Nebraska Medical Center, Omaha, Nebraska

Burak Yilmaz, DDS, PhD

Associate Professor, Division of Restorative Science and Prosthodontics, College of Dentistry, The Ohio State University, Columbus, Ohio

PREFACE

In the late summer of 1975, three young dentists from England, Holland, and Japan met for the very first time at the School of Dentistry in Indianapolis. They shared a common interest in “crown and bridge” prosthodontics. Little did they know that 40 years later they would take immense satisfaction in having completed the fifth edition of *Contemporary Fixed Prosthodontics*.

As the three of us embarked on mastering the art and science of fixed prosthodontics, we encountered the complete range of human emotions, ranging from insecurity to self-confidence, from frustration to fulfillment, and from anxiety to satisfaction and occasional pride. It is with much pride that we introduce this comprehensively updated and revised edition of one of the most widely used and translated texts in our field.

The task once again was overwhelming. Technology had developed far beyond our comfort zones of clinical sciences and dental materials. The technological advances in imaging and CAD/CAM tempted us to add a chapter (in an appropriate place in the text) summarizing new technological developments. Instead, we opted to integrate new technologies throughout the text, as we consistently tried to do in earlier editions. Early in the review process, we realized that describing some of the new systems would be impossible in a step-by-step format. Advances and improvements occur at such a pace that a chapter that was comprehensively rewritten would soon be out of date. As a result, we embarked on a process of breaking down the newer technologies into their underlying principles and then integrating this information—often gleaned from sources outside the conventional dental literature—into the text.

The fifth edition now includes cone-beam technology for diagnostic purposes and implant placement. Impression making was expanded with a section on optical imaging, and solid casts are contrasted with their virtual counterparts. Wax pattern fabrication is still presented in the classical manner but is augmented with specific information on computer-aided design followed by either printing or milling. Similarly, the section on the fabrication of metal ceramic substructures and all-ceramic restorations was revised to include the new CAD/CAM techniques.

Since the publication of the fourth edition, the dental laboratory industry has undergone revolutionary change.

Smaller laboratories must compete with large corporations that can more easily invest in expensive new technologies. When we visited laboratories and manufacturers, we realized that the transition to CAD/CAM was not a seamless process.

A number of years ago, a highly skilled and seasoned ceramist at a major dental laboratory was put in charge of the digital production of all-ceramic restorations. He shared with us that the learning curve had been particularly steep in the beginning when he tried to teach the very best and brightest computer personnel he could find the necessary dental knowledge. A number of years into this process, he started to teach his most experienced certified dental technicians how to operate some of the newly developed CAD/CAM tools, and, as he told us, “In six months, we were up and running, and we have never looked back.”

The foregoing experience reinforces the importance of establishing a solid foundation in the fundamental skill sets for fixed prosthodontics before successfully applying them to some of the new technologies. Any student of fixed prosthodontics must have a thorough knowledge of dental anatomy, tooth form and function before embarking on even the classical approaches to the fabrication of individual crowns or simple fixed dental prostheses. A thorough understanding of form and function is, in turn, prerequisite to achieving mastery of today’s cutting-edge technologies. A sincere effort was made to include new illustrations of commonly incorporated techniques in undergraduate curricula throughout the United States and Canada. Popular techniques have been added to the previously recommended approaches, illustrations of instrumentation have been replaced to incorporate contemporary equipment, and other new materials have been incorporated throughout.

With this text, we hope to serve predoctoral students, postdoctoral fellows, practitioners, and researchers. The text is well indexed, and every effort has been made to ensure the rapid retrievability of evidence-based information for the busy practitioner or dental manufacturer.

Stephen F. Rosenstiel

Martin F. Land

Junhei Fujimoto

ACKNOWLEDGMENTS

In recognition of so many colleagues and friends ...

Where to begin? After three decades, we are unlikely to achieve absolute accuracy in crediting all of those whose selfless contributions to the development of this text have helped it evolve. Whenever we asked, we met with a willingness to share concepts, new technology, illustrations, photographs, materials, and whatever else we requested. Permissions were routinely granted and, invariably, most kindly approved. We again have made every effort to accurately and precisely give credit to all of those to whom credit is due. Any errors and omissions are absolutely unintentional and the sole responsibility of the authors—we apologize if such should have occurred.

A special thank you to the following:

James Cockerill, RBP, who once again provided selected photographic support consistent with his previous contributions.

Our contributors: Robert F. Baima, Rick K. Biethman, William A. Brantley, Isabelle L. Denry, R. Duane Douglas, Martin A. Freilich, A. Jon Goldberg, Julie A. Holloway, Christa D. Hopp, William M. Johnston, Peter E. Larsen, Leon W. Laub, Edwin A. McGlumphy, Jonathan C. Meiers, Donald A. Miller, M. H. Reisbick, James L. Sandrik, Van P. Thompson, Alvin G. Wee, and Burak Yilmaz.

Faculty and staff at Southern Illinois University, School of Dental Medicine: Dr. Jeffrey Banker, Dr. Rick Biethman, Dr. Robert Blackwell, Dr. Duane Douglas, Dr. Randy Duncan, Dr. Christa Hopp, Ms. Nancy Inlow, Dr. Daniel Ketteman, Dr. Dennis Knobloch, Ms. Robin Manning, Dr. Jack Marincel, Ms. Tobbi McEuen, Dr. Charles Poeschl, Dr. Steven Raney, Dr. Vincent Rapini, Dr. William Seaton, Dr. Joseph Sokolowski, Dr. Charles Thornton, Ms. Michele Wadlow, and Dr. Daniel Woodlock.

Faculty and staff at The Ohio State University: Dr. Shereen Azer, Dr. Nancy Clelland, Dr. Allen Firestone, Dr. Lisa Knobloch, Dr. John Nusstein, Dr. Robert Seghi, Dr. Burak Yilmaz, and Ms. Amy Barker for their many valuable insights and their continuous support along the way.

Photographer Brodie Strum (Chicago, Illinois) who provided assistance with the post photographs in [Chapter 12](#).

All of the medical illustrators who have been instrumental in expanding and refining the art program through the many editions: Krystyna Srodulski (San

Francisco, California); Donald O'Connor (St. Peters, Missouri); Sandra Cello-Lang (Chicago, Illinois); Sue E. Cottrill (Chicago, Illinois); Kerrie Marzo (Chicago Heights, Illinois).

The outstanding team at Elsevier who continued to believe in our ability to complete this task, and whose relentless pursuit of quality has helped make this our finest edition yet: Kathy Falk, Executive Content Strategist; Courtney Sprehe, Senior Content Development Specialist; and Rachel McMullen, Senior Project Manager for their help, patience, and understanding throughout.

A special thank you to the many individuals in the dental manufacturing and marketing industries who provided us with information and illustrations of their products.

In each of the previous editions, we have written a special thank you to our spouses, Enid, Karen, and Yoshiko. Sadly Karen Tolbert Land died on January 4, 2014, and was not able to see this fifth edition through to completion. Her home in Alton, Illinois, always served as our base when we met with Elsevier in St. Louis. Working on this edition was not the same without her hospitality.

“Looking back over my career, I can tell you a lot of things about fixed prosthodontics. Most importantly, I can tell you very sincerely: I have never been bored” said the experienced teacher.

The fifth edition of *Contemporary Fixed Prosthodontics* is close to what we originally envisioned as we embarked on this original journey. We hope that it will help advance the art and science of what is beyond question the most challenging clinical dental specialty. We know that we do not have all the answers, but we hope that students and practitioners, researchers and manufacturers, and all who demonstrate the interest and commitment necessary to achieve mastery in a discipline we have come to love and respect, may find many, if not most, of the answers they seek.

Stephen F. Rosenstiel

Martin F. Land

Junhei Fujimoto

CONTENTS

PART I

PLANNING AND PREPARATION

- 1 HISTORY TAKING AND CLINICAL EXAMINATION, 3
- 2 DIAGNOSTIC CASTS AND RELATED PROCEDURES, 35
- 3 TREATMENT PLANNING, 70
- 4 PRINCIPLES OF OCCLUSION, 92
- 5 PERIODONTAL CONSIDERATIONS, 117
- 6 MOUTH PREPARATION, 138

PART II

CLINICAL PROCEDURES: SECTION 1

- 7 PRINCIPLES OF TOOTH PREPARATION, 169
- 8 THE COMPLETE CAST CROWN PREPARATION, 209
- 9 THE METAL-CERAMIC CROWN PREPARATION, 222
- 10 THE PARTIAL VENEER CROWN, INLAY,
AND ONLAY PREPARATIONS, 236
- 11 TOOTH PREPARATION FOR ALL-CERAMIC
RESTORATIONS, 264
- 12 RESTORATION OF THE ENDODONTICALLY
TREATED TOOTH, 278
- 13 IMPLANT-SUPPORTED FIXED PROSTHESES, 318
- 14 TISSUE MANAGEMENT AND IMPRESSION
MAKING, 367
- 15 INTERIM FIXED RESTORATIONS, 401

PART III

LABORATORY PROCEDURES

- 16 COMMUNICATING WITH THE DENTAL
LABORATORY, 443

- 17 DEFINITIVE CASTS AND DIES, 457
- 18 WAX PATTERNS, 489
- 19 FRAMEWORK DESIGN AND METAL SELECTION FOR
METAL-CERAMIC RESTORATIONS, 521
- 20 PONTIC DESIGN, 546
- 21 RETAINERS FOR PARTIAL REMOVABLE DENTAL
PROSTHESES, 576
- 22 INVESTING AND CASTING, 601
- 23 DESCRIPTION OF COLOR, COLOR-REPLICATION
PROCESS, AND ESTHETICS, 624
- 24 METAL-CERAMIC RESTORATIONS, 647
- 25 ALL-CERAMIC RESTORATIONS, 674
- 26 RESIN-BONDED FIXED DENTAL PROSTHESES, 694
- 27 CONNECTORS FOR PARTIAL FIXED DENTAL
PROSTHESES, 713
- 28 FINISHING THE CAST RESTORATION, 736

PART IV

CLINICAL PROCEDURES: SECTION 2

- 29 EVALUATION, CHARACTERIZATION, AND
GLAZING, 751
- 30 LUTING AGENTS AND CEMENTATION
PROCEDURES, 774
- 31 POSTOPERATIVE CARE, 792

- APPENDIX: DENTAL MATERIALS AND
EQUIPMENT INDEX, 829



PART I

PLANNING AND
PREPARATION

This page intentionally left blank

HISTORY TAKING AND CLINICAL EXAMINATION

Fixed prosthodontic treatment involves the replacement and restoration of teeth by artificial substitutes that are not readily removable from the mouth. Its focus is to restore function, esthetics, and comfort. Fixed prosthodontics can offer exceptional satisfaction for both patient and dentist. It can transform an unhealthy, unattractive dentition with poor function into a comfortable, healthy occlusion capable of years of further service while greatly enhancing esthetics (Fig. 1-1, *A* and *B*). Treatment can range from fairly straightforward measures—such as restoration of a single tooth with a cast crown (see Fig. 1-1, *C*), replacement of one or more missing teeth with a fixed dental prosthesis (see Fig. 1-1, *D*), or an implant-supported restoration (see Fig. 1-1, *E*)—to highly complex restorations involving all the teeth in an entire arch or the entire dentition (see Fig. 1-1, *F*).

To achieve predictable success in this technically and intellectually challenging field, meticulous attention to every detail is crucial: the initial patient interview and diagnosis, the active treatment phases, and a planned schedule of follow-up care. Otherwise, the result is likely to be unsatisfactory and frustrating for both dentist and patient, resulting in disappointment and loss of confidence in each other.

Problems encountered during or after treatment can often be traced to errors and omissions during history taking and initial examination. The inexperienced clinician may plunge into the treatment phase before collecting sufficient diagnostic information that helps predict likely pitfalls.

Making the correct diagnosis is prerequisite for formulating an appropriate treatment plan. All pertinent information must be obtained. A complete history includes a comprehensive assessment of the patient's general and dental health, individual needs, preferences, and personal circumstances. This chapter is a review of the fundamentals of history taking and clinical examination, with special emphasis on obtaining the necessary information to make appropriate decisions about fixed prosthodontic treatment.

HISTORY

A patient's history should include all pertinent information concerning the reasons for seeking treatment, along with any personal information, including relevant previous medical and dental experiences. The chief complaint should be recorded, preferably in the patient's own words. A screening questionnaire (Fig. 1-2) is useful for history taking; it should be reviewed in the patient's presence to correct any mistakes and to clarify inconclusive entries.

If the patient is mentally impaired or a minor, the guardian or responsible parent must be present.

Chief Complaint

The accuracy and significance of the patient's primary reason or reasons for seeking treatment should be analyzed first. These may be just the obvious features, and careful examination often reveals problems and disease of which the patient is unaware; nevertheless, the patient perceives the chief complaint as the major or only important problem. Therefore, when a comprehensive treatment plan is proposed, special attention must be given to how the chief complaint can be resolved. The inexperienced clinician who tries to prescribe an "ideal" treatment plan can easily lose sight of the patient's wishes. The patient may then become frustrated because the dentist does not appear to understand or does not want to understand the patient's point of view.

Chief complaints usually belong to one of the following four categories:

- Comfort (pain, sensitivity, swelling)
- Function (difficulty in mastication or speech)
- Social (bad taste or odor)
- Appearance (fractured or unattractive teeth or restorations, discoloration)

Comfort

If pain is present, its location, character, severity, and frequency should be noted, as well as the first time it occurred, what factors precipitate it (e.g., pressure, hot, cold, or sweet things), any changes in its character, and whether it is localized or more diffuse in nature. It is often helpful for the patient to point at the area while the dentist pays close attention.

If swelling is present, the location, size, consistency, and color are noted, as well as how long it has been felt and whether it is increasing or decreasing.

Function

Difficulties in chewing may result from a local problem such as a fractured cusp or missing teeth; they may also indicate a more generalized malocclusion or neuromuscular dysfunction.

Social Aspects

A bad taste or smell often indicates compromised oral hygiene and periodontal disease. Social pressures prompt many affected patients to seek care.



FIGURE 1-1 ■ **A**, Severely damaged maxillary dentition. **B**, Restoration with metal-ceramic fixed prostheses. **C**, Complete cast crown that restores mandibular molar. **D**, Three-unit fixed dental prosthesis that replaces missing mandibular premolar. **E**, Congenitally missing maxillary lateral incisors replaced with implant supported crowns. **F**, Extensive fixed prosthodontics involving restoration of multiple teeth. (**C**, Courtesy Dr. X. Lepe. **D**, Courtesy Dr. J. Nelson. **E**, Courtesy Dr. A. Hsieh.)

Appearance

Compromised appearance is a strong motivating factor for patients to seek advice as to whether improvement is possible (Fig. 1-3). Such patients may have missing or crowded teeth, or a tooth or restoration may be fractured. The teeth may be unattractively shaped, malpositioned, or discolored, or there may be a developmental defect. A single discolored tooth may indicate pulpal disease.

Personal Details

The patient's name, address, phone number, gender, occupation, work schedule, marital status, and budgetary

flexibility are noted. Much can be learned in a 5-minute, casual conversation during the initial visit. In addition to establishing rapport and developing a basis on which the patient can trust the dentist, small and seemingly unimportant personal details often have considerable influence in establishing a correct diagnosis, prognosis, and treatment plan.

Medical History

An accurate and current general medical history should include any medications the patient is taking and all relevant medical conditions. If necessary, the patient's

physician or physicians can be contacted for clarification. The following classification may be helpful:

1. Conditions affecting the treatment methods (e.g., any disorders that necessitate the use of antibiotic premedication, any use of steroids or anticoagulants, and any previous allergic responses to medication or dental materials). Once such conditions are identified, treatment usually can be modified as part of the comprehensive treatment plan, although some conditions may severely limit available options.
2. Conditions affecting the treatment plan (e.g., previous radiation therapy, hemorrhagic disorders, extremes of age, and terminal illness). These can be expected to affect the patient's response to dental treatment and may influence the prognosis. For instance, patients who have previously received radiation treatment in the area of a planned extraction require special measures (hyperbaric oxygen) to prevent serious complications.



FIGURE 1-3 ■ Poor appearance is a common reason for seeking restorative dental treatment.

3. Systemic conditions with oral manifestations. For example, periodontitis may be exacerbated by diabetes, menopause, pregnancy, or the use of anticonvulsant drugs (Fig. 1-4); in cases of gastroesophageal reflux disease, bulimia, or anorexia nervosa, teeth may be eroded by regurgitated stomach acid^{1,2} (Fig. 1-5); certain drugs may generate side effects that mimic temporomandibular disorders³ or reduce salivary flow.^{4,5}
4. Possible risks to the dentist and auxiliary personnel (e.g., patients who are suspected or confirmed carriers of hepatitis B, acquired immunodeficiency syndrome, or syphilis).

Dental offices practice “universal precautions” to ensure appropriate infection control. This means that full infection control is practiced for every patient; no additional measures are needed when dentists treat known disease carriers.⁶

Dental History

Clinicians should complete a thorough examination before establishing a diagnosis. With adequate experience, a clinician can often assess preliminary treatment needs during the initial appointment, but review and



FIGURE 1-4 ■ Severe gingival hyperplasia associated with anti-convulsant drug use. (Courtesy Dr. P.B. Robinson.)



FIGURE 1-5 ■ A, Extensive damage caused by self-induced acid regurgitation. Note that the lingual surfaces are bare of enamel except for a narrow band at the gingival margin. B, Teeth prepared for partial-coverage restorations. C and D, The completed restoration.

analysis of additional diagnostic information are frequently necessary (see [Chapter 2](#)). Also, assessing the quality of a previously rendered treatment fairly can be difficult because the circumstances under which the treatment was rendered are seldom known. When such an assessment is requested for legal proceedings, the patient should be referred to a specialist familiar with the “usual and customary” standard of care.

Periodontal History

The patient’s oral hygiene is assessed, and current plaque-control measures are discussed, as are previously received oral hygiene instructions. The frequency of any previous debridement should be recorded, and the dates and nature of any previous periodontal surgery should be noted.

Restorative History

The patient’s restorative history may include only simple composite resin or dental amalgam fillings, or it may involve crowns and extensive fixed dental prostheses. The age of existing restorations can help establish the prognosis and probable longevity of any future fixed prostheses.

Endodontic History

Patients often forget which teeth have been endodontically treated. These can be readily identified with radiographs. The findings should be reviewed periodically so that periapical health can be monitored and any recurring lesions promptly detected ([Fig. 1-6](#)).

Orthodontic History

Occlusal analysis should be an integral part of the assessment of dentition after orthodontic treatment. If restorative treatment needs are anticipated, the restorative dentist should perform the occlusal evaluation. Occlusal adjustment (reshaping of the occlusal surfaces of the teeth) may be needed to promote long-term positional

stability of the teeth and to reduce or eliminate parafunctional activity (see [Chapter 6](#)). On occasion, root resorption (detected on radiographs) ([Fig. 1-7](#)) may be attributable to previous orthodontic treatment. Because this may affect the crown-to-root ratio, future prosthodontic treatment and its prognosis may also be affected. Restorative treatment can often be simplified by minor tooth movement. In orthodontic treatment, considerable time can be saved if minor tooth movement (for restorative reasons) is incorporated from the start. Thus good communication between the restorative dentist and the orthodontist may prove very helpful.

Removable Prosthodontic History

The patient’s experiences with removable prostheses must be carefully evaluated. For example, a partial removable dental prosthesis may not have been worn for a variety of reasons, and the patient may not even mention its existence. Careful questioning and examination usually elicits discussion concerning any such devices. Listening to the patient’s comments about previously unsuccessful removable prostheses can be very helpful in assessing whether future treatment will be more successful.

Oral Surgical History

The clinician must obtain information about missing teeth and any complications that may have occurred during tooth removal. Special evaluation and data collection procedures are necessary for patients who require prosthodontic care after orthognathic surgery. Before any treatment is undertaken, the prosthodontic component of the proposed treatment must be fully coordinated with the surgical component.

Radiographic History

Previously made radiographs may prove helpful in judging the progress of dental disease. They should be obtained if possible. Dental practices usually forward radiographs or acceptable duplicates promptly on request.



FIGURE 1-6 ■ Defective endodontic treatment has led to recurrence of a periapical lesion. Re-treatment is required.



FIGURE 1-7 ■ Apical root resorption after orthodontic treatment.

In most instances, however, a current diagnostic radiographic series is essential and should be obtained as part of the examination.

Myofascial Pain and Temporomandibular Joint Dysfunction History

Myofascial pain, clicking in the temporomandibular joints (TMJs), or neuromuscular symptoms, such as abnormal muscle tone or tenderness to palpation, should be treated and resolved before fixed prosthodontic treatment begins. A screening questionnaire efficiently identifies patients with these symptoms who may be at higher risk for complications. Such patients should be questioned regarding any previous treatment for joint dysfunction (e.g., occlusal devices, medications, biofeedback, or physical therapy exercises).

EXAMINATION

In an examination, the clinician uses sight, touch, and hearing to detect abnormal conditions. To avoid mistakes, it is critical to record what is actually observed rather than to make diagnostic comments about the condition. For example, “swelling,” “redness,” and “bleeding on probing of gingival tissue” should be

recorded, rather than “gingival inflammation” (which implies a diagnosis).

Thorough examination and data collection are needed for prospective patients who desire fixed prosthodontic treatment, and more detailed protocols for this effort can be obtained from various textbooks of oral diagnosis.^{7,8}

General Examination

The patient’s general appearance, gait, and weight are assessed. Skin color is noted, and vital signs, such as respiration, pulse, temperature, and blood pressure, are measured and recorded. Middle-aged and older patients can be at higher risk for cardiovascular disease. Relatively inexpensive cardiac monitoring units are available for in-office use (Fig. 1-8). Patients whose vital sign measurements are outside normal ranges should be referred for a comprehensive medical evaluation before definitive prosthodontic treatment is initiated.

Extraoral Examination

Special attention is given to facial asymmetry because small deviations from normal may hint at serious underlying conditions. Cervical lymph nodes are palpated, as are the TMJs and the muscles of mastication.

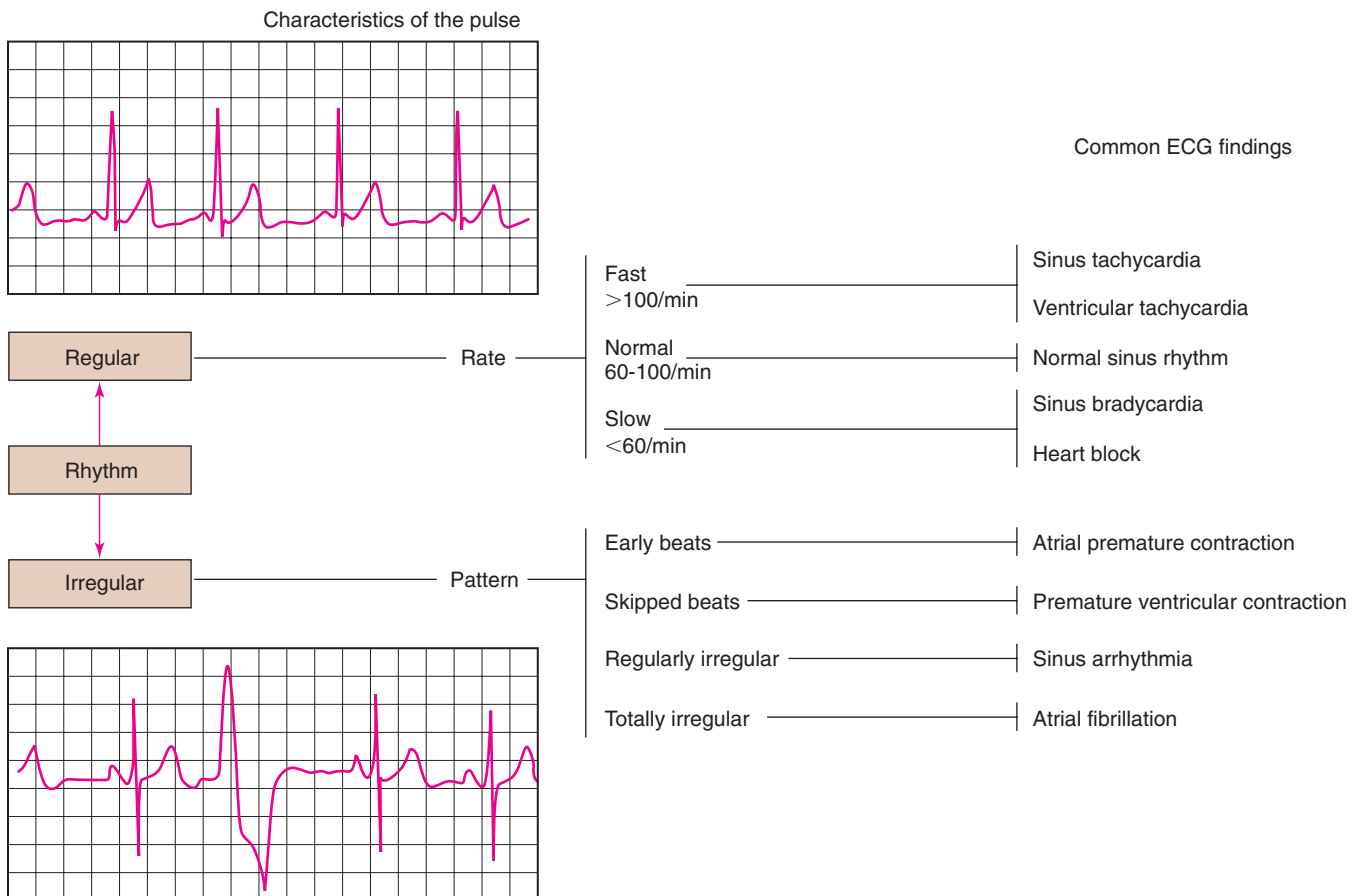


FIGURE 1-8 ■ Cardiac monitoring printout and representative ECG findings. (Courtesy Dr. T. Quilitz.)



FIGURE 1-9 ■ Auricular palpation of the posterior aspects of the temporomandibular joints.

Temporomandibular Joints

The clinician locates the TMJs by palpating bilaterally just anterior to the auricular tragi while the patient opens and closes the mouth. This enables a comparison between the relative timing of left and right condylar movements during the opening stroke. Asynchronous movement may indicate a disk displacement that prevents one of the condyles from making a normal translatory movement (see Chapter 4). Auricular palpation (Fig. 1-9) with light anterior pressure helps identify potential disorders in the posterior attachment of the disk. Tenderness or pain on movement is noted and can be indicative of inflammatory changes in the retrodiscal tissues, which are highly vascular and innervated. Clicking in the TMJ is often noticeable through auricular palpation but may be difficult to detect in palpation directly over the lateral pole of the condylar process because the overlying tissues can muffle the click. By placing the fingertips on the angles of the patient's mandible, the clinician can identify even a minimal click because very little soft tissue lies between the fingertips and the mandibular bone.

A maximum mandibular opening resulting in less than 35 mm of interincisal movement is considered restricted, because the average opening is greater than 50 mm.^{9,10} Such restricted movement on opening can be indicative of intracapsular changes in the joints. Similarly, any midline deviation on opening or closing is recorded. The maximum lateral movements of the patient can be measured (normal is approximately 12 mm) (Fig. 1-10).

Muscles of Mastication

Next, the masseter and temporal muscles, as well as other relevant postural muscles, are palpated for signs of tenderness (Fig. 1-11). Palpation is best accomplished bilaterally and simultaneously. This allows the patient to compare and report any differences between the left and right sides. Light pressure should be used (the amount of pressure that can be tolerated without discomfort on one's closed eyelid is a good comparative measure), and if any difference is reported between the left and right sides, the patient is asked to classify the discomfort as mild, moderate, or severe. If there is evidence of significant asynchronous movement or TMJ dysfunction, the



FIGURE 1-10 ■ Maximum opening of more than 50 mm (A) and lateral movement of approximately 12 mm (B) are normal.

clinician should follow a systematic sequence for comprehensive muscle palpation as described by Solberg (1976)⁹ and Krogh-Poulsen and Olsson (1966).¹¹ Each palpation site is scored numerically on the basis of the patient's response. If neuromuscular or TMJ treatment is initiated, the examiner can then repalpate the same sites periodically to assess the response to treatment (Fig. 1-12).

Lips

The patient is observed for tooth visibility during normal and exaggerated smiling. This can be critical in the planning of fixed prosthodontic treatment,¹² especially when the need to fabricate crowns or fixed dental prostheses is anticipated in the esthetic zone. Some patients show only their maxillary teeth during smiling. More than 25% do not show the gingival third of the maxillary central incisors during an exaggerated smile¹³ (Fig. 1-13). The extent of the smile depends on the length and mobility of the upper lip and the length of the alveolar process. When the patient laughs, the jaws open slightly and a dark space is often visible between the maxillary and mandibular teeth (Fig. 1-14). This has been called the *negative space*.¹⁴ Missing teeth, diastemas, and fractured or poorly restored teeth disrupt the harmony of the negative space and often must be corrected.¹⁵ (See Chapter 23.)

Intraoral Examination

The intraoral examination can reveal considerable information concerning the condition of the soft tissues, teeth, and supporting structures. The tongue, floor of the mouth, vestibule, cheeks, and hard and soft palates are examined, and any abnormalities are noted. This information can be evaluated properly during treatment planning only if objective indices, rather than vague assessments, are used.

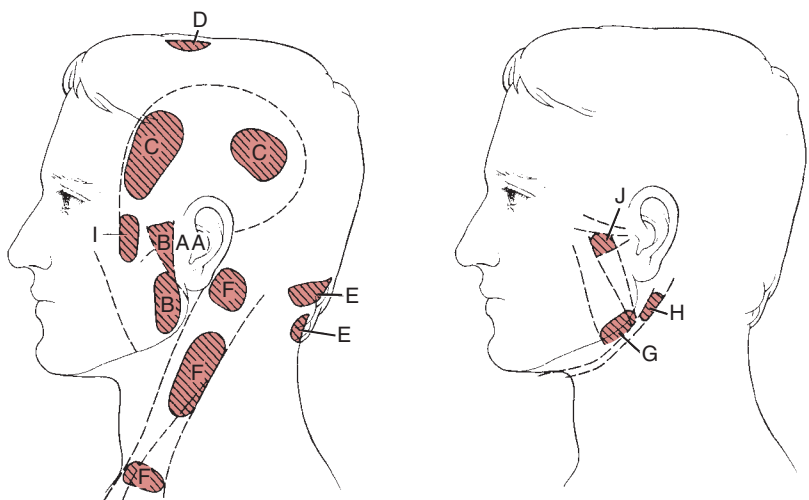
Periodontal Examination*

In a periodontal examination,¹⁶ the clinician evaluates the status of bacterial accumulation, the response of the host

*This section is written by Robert F. Baima.



FIGURE 1-11 ■ Muscle palpation of the masseter (A), the temporal muscle (B), the trapezius muscle (C), the sternocleidomastoid muscle (D), and the floor of the mouth (E).



Palpation is best done bilaterally; simultaneously, the patient is asked to identify any differences between left and right.

FIGURE 1-12 ■ Palpation sites for assessing muscle tenderness. A, Temporomandibular joint capsule: lateral and dorsal. B, Masseter: deep and superficial. C, Temporal muscle: anterior and posterior. D, Vertex. E, Neck: nape and base. F, Sternocleidomastoid muscle: insertion, body, and origin. G, Medial pterygoid muscle. H, Posterior digastric muscle. I, Temporal tendon. J, Lateral pterygoid muscle. (From Krogh-Poulsen WG, Olsson A: Occlusal disharmonies and dysfunction of the stomatognathic system. Dent Clin North Am 10:627, 1966.)



FIGURE 1-13 ■ Smile analysis is an important part of the examination, particularly when anterior crowns or fixed dental prostheses are being considered. **A**, Some individuals show considerable gingival tissue during an exaggerated smile. **B**, Others may not show the gingival margins of even the central incisors. **C**, This individual shows little tooth when smiling.



FIGURE 1-14 ■ The “negative space” between the maxillary and mandibular teeth is assessed during the examination.

tissues, and the degree of reversible and irreversible damage. Long-term periodontal health is prerequisite for successful fixed prosthodontics (see [Chapter 5](#)). Existing periodontal disease must be corrected before any definitive prosthodontic treatment is undertaken.

Gingiva

The gingiva is dried for the examination so that moisture does not obscure subtle changes or detail. Color, texture, size, contour, consistency, and position are noted. The gingiva is carefully palpated to express any exudate present in the sulcular area.

Healthy gingiva ([Fig. 1-15, A](#)) is pink, stippled, and firmly bound to the underlying connective tissue. The free gingival margin is knife-edged, and sharply pointed papillae fill the interproximal spaces. Any deviation from these findings is noted. With the development of chronic

marginal gingivitis (see [Fig. 1-15, B](#)), the gingiva becomes enlarged and bulbous, stippling is lost, the margins and papillae are blunted, and bleeding and exudate are observed.

To assess the width of the band of attached keratinized gingiva around each tooth, the clinician measures the width of the surface band of keratinized tissue in an apico-coronal dimension with a periodontal probe and subtracts the measurement of the sulcus depth. Alternatively, the marginal gingiva can be gently depressed with the side of a periodontal probe or explorer. At the mucogingival junction (MGJ), the effect of the instrument is seen to end abruptly, indicating the transition from tightly bound gingiva to more flexible mucosa. A third technique is to inject anesthetic solution into the nonkeratinized mucosa close to the MGJ to make the mucosa balloon slightly.

Periodontium

The periodontal probe ([Fig. 1-16, A](#)) provides a measurement (in millimeters) of the depth of periodontal pockets and healthy gingival sulci. The probe is inserted essentially parallel to the tooth and is “walked” circumferentially through the sulcus in firm but gentle steps; the examiner determines the measurement when the probe is in contact with the apical portion of the sulcus (see [Fig. 1-16, B](#)). Thus any sudden change in the attachment level can be detected. The probe may also be angled slightly (5 to 10 degrees) interproximally to reveal the topography of an existing lesion. Probing depths (usually six per tooth) are recorded on a periodontal chart ([Fig. 1-17](#)), which also contains other data such as tooth mobility or malposition, open proximal contact areas,



FIGURE 1-15 ■ **A**, Healthy gingiva is pink, knife-edged, and firmly attached. **B**, In gingivitis, plaque and calculus cause marginal inflammation, with changes in color, contour, and consistency of the free gingival margin. In this case, inflammation extends into the keratinized attached gingiva.

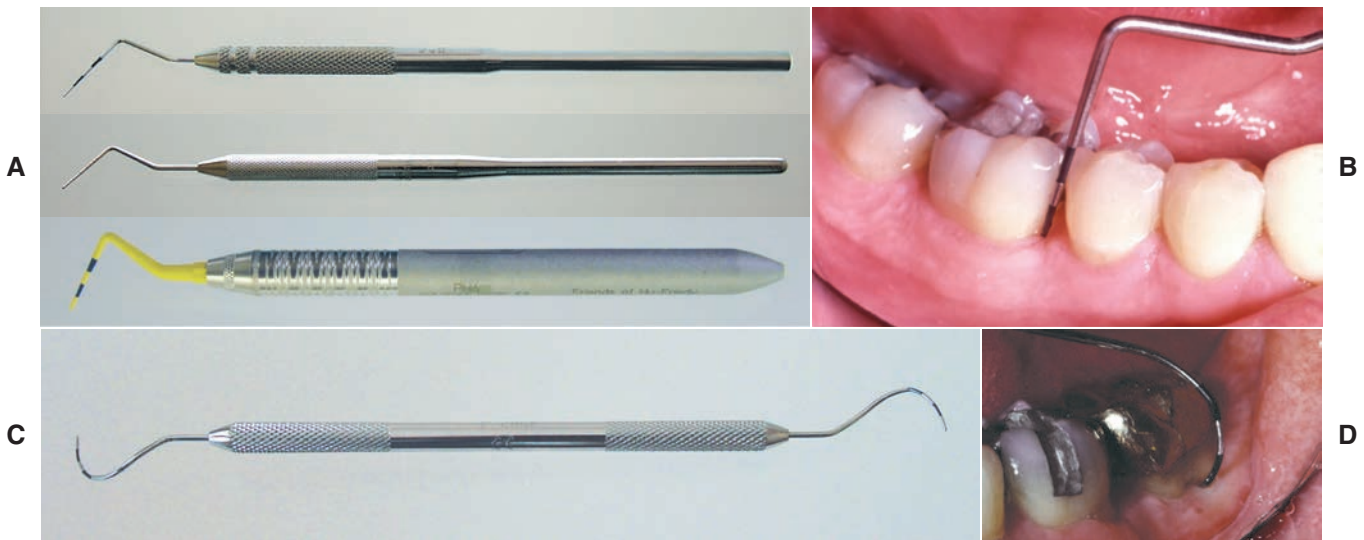


FIGURE 1-16 ■ **A**, Three types of sulcus/pocket-measuring probes. **B**, Correct position of a periodontal probe in the interproximal sulcular area, parallel to the root surface and in a vertical direction as far interproximally as possible. **C** and **D**, Graduated furcation probe. (A and C, From Boyd LB: Dental instruments, 5th ed. St. Louis, Saunders, 2015.)

inconsistent marginal ridge heights, missing or impacted teeth, areas of inadequate attached keratinized gingiva, gingival recession, furcation involvements, and malpositioned frenum attachments).

Clinical Attachment Level

Documenting the level of epithelial attachment helps the clinician quantify periodontal destruction and is essential for rendering a diagnosis of periodontitis (loss of connective tissue attachment).^{17,18} This measurement also provides objective information regarding the prognosis of individual teeth. The clinical attachment level is determined by measuring the distance between the apical extent of the probing depth and a fixed reference point on the tooth, most commonly either the apical extent of a restoration or the cemento-enamel junction (CEJ). This is recorded on modified periodontal charts (Fig. 1-18). When the free margin of the gingiva is located on the clinical crown and the level of the epithelial attachment is at the CEJ, there is no attachment loss, and recession is noted as a negative number. When the attachment level is on root structure and the free gingival margin is at the CEJ, attachment loss equals the probing depth, and the

recession is scored 0. When increased periodontal destruction and recession are present, attachment loss equals the probing depth plus the measurement of recession¹⁹ (see Fig. 1-18, B and C). Clinical attachment level is a measure of periodontal destruction at a site, rather than of current disease activity; it may be considered the diagnostic “gold standard” for periodontitis²⁰ and should be documented in the initial periodontal examination.²¹ It is an important consideration in the development of the overall diagnosis, treatment plan, and the prognosis of the dentition.

• • •

Dental Charting

An accurate charting of the state of the dentition reveals important information about the condition of the teeth and facilitates treatment planning. Adequate charting (Fig. 1-19) shows the presence or absence of teeth, dental caries, restorations, wear faceting and abrasions, fractures, malformations, and erosions. Tooth loss often affects the position of adjacent teeth (see Treatment of Tooth Loss section, Chapter 3). The presence of caries

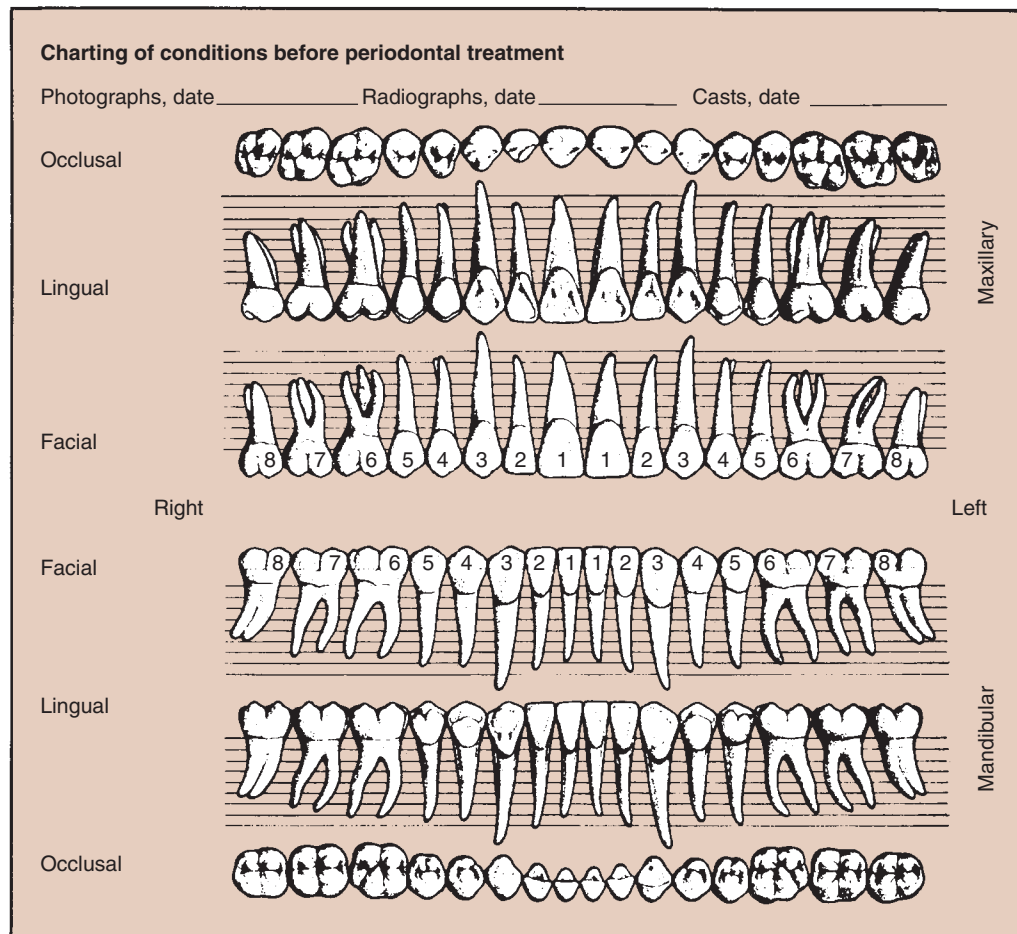


FIGURE 1-17 ■ Chart for recording pocket depths. The parallel lines are approximately 2 mm apart. The notations involved in using the chart are as follows: 1, Block out any missing teeth. 2, Draw a red **x** through the crown of any tooth that is to be extracted. 3, Record the gingival level with a continuous **blue** line. 4, Record pocket depths with a **red** line interrupted at the proximal surfaces of each tooth. 5, Shade the pocket form on each tooth with a **red** pencil (between the **red** and **blue** lines). 6, Indicate bifurcation or trifurcation involvements with a small red **x** at the involved area. 7, Record open contacts with vertical parallel lines (||) through the area. 8, Record improper contacts with a wavy red line through the area. 9, Record gingival overhang(s) with a red spur (**^**) through the area. 10, Outline cavities and faulty restorations of periodontal significance in **red**. 11, Indicate rotated teeth by outlining in **blue** to show their actual position. (Modified from Goldman HM, Cohen DW: Periodontal Therapy, 5th ed. St. Louis, Mosby, 1973.)

on one interproximal surface should prompt the examiner to carefully inspect the adjacent proximal surface, even if caries is not apparent radiographically. The degree and extent of caries development over time can have a considerable effect on the eventual outcome of fixed prosthodontic treatment. The condition and type of the existing restorations are noted (e.g., amalgam, cast gold, composite resin, all-ceramic). Open contacts and areas where food impaction occurs must also be identified. The presence of wear facets is indicative of sliding contact sustained over time and thus may indicate parafunctional activity (see Chapter 4). Wear facets are often easier to see on diagnostic casts, however (see Chapter 2); during the clinical examination, the location of any observed facet is recorded. Fracture lines in teeth may necessitate fixed prosthodontic intervention, although minor hairline cracks in walls that are not subject to excessive loading can often go untreated and simply be observed at recall appointments (see Chapter 32). The location of fractures and any other abnormalities should be recorded.

Occlusal Examination

The clinician starts the occlusal examination by asking the patient to make a few simple opening and closing movements, which the clinician carefully observes. The objective is to determine to what extent the patient's occlusion differs from the ideal (see Chapter 4) and how well the patient has adapted to any difference that may exist. Special attention is given to initial contact, tooth alignment, eccentric occlusal contacts, and jaw maneuverability.

Initial Tooth Contact. The relationship of teeth in both centric relation (see Chapter 4) and the maximum intercuspation should be evaluated. If all teeth come together simultaneously at the end of terminal hinge closure, the centric relation (CR) position of the patient is said to coincide with the maximum intercuspation (MI) (see also Chapters 2 and 4). The patient is guided into a terminal hinge closure to detect where initial tooth contact occurs (see also the sections on bimanual manipulation and terminal hinge closure in Chapters 2 and 4).

Date: _____
 Patient name: _____
 Student name: _____

Periodontal Chart: Initial Re-evaluation SPT POE
 Pages of chart: 1-4 1 & 5 6 and/or 1-4 1-4

Medical Alert: _____

PD Recession AL	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>											<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>											<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>										
PD Recession AL	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>											<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>											<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>										
PD Recession AL	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>											<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>											<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>										

Instructor:
(Name & number)

Keys:

Furcation: V (I), ▽ (II), ▼ (III)

Missing tooth: (x)

Unerupted/Impacted tooth:

Mobility: I, II, III (written in space between occlusal and buccal surface)

Crown:

Open contact: ||

Root canal:

Overhang:

Rotation:

Drifting:

A

FIGURE 1-18 ■ A, Modified periodontal chart.



FIGURE 1-18, cont'd ■ **B**, Maxillary right sextant of modified periodontal chart with areas to record probing depths (PD), recession, and attachment loss (AL). **C**, Maxillary left sextant of modified periodontal chart exhibiting clinical documentation. (Courtesy University of Detroit Mercy School of Dentistry, Department of Periodontology and Dental Hygiene, Detroit.)

The clinician should ask the patient to “close feather-light” until any of the teeth touch and to have the patient help identify where that initial contact occurs by asking him or her to point at the location. If initial contact occurs between two posterior teeth (usually molars), the subsequent movement from the initial contact to the MI position is carefully observed and its direction noted. This is referred to as a *slide from CR to MI*. The presence, direction, and estimated length of the slide are recorded, and the teeth on which initial contact occurs are identified. Any such discrepancy between CR and MI should be evaluated in the context of other signs and symptoms that may be present: for example, abnormal muscle tone previously observed during the extraoral examination, mobility (noted during the periodontal evaluation) on the teeth where initial contact occurs, and any wear facets on the teeth contacting during the slide.

General Alignment. Any crowding, rotation, supra-eruption, spacing, malocclusion, and vertical and horizontal overlap (Fig. 1-20) are recorded. In many cases, teeth adjacent to edentulous spaces have shifted slightly. Even minor tooth movement can significantly affect fixed prosthodontic treatment. Tipped teeth affect tooth preparation design or may necessitate minor tooth movement before restorative treatment. Supra-erupted teeth are easily overlooked clinically but frequently complicate fixed dental prosthesis design and fabrication.

The relative relationship of adjacent teeth to planned fixed prostheses is important. A tooth may have drifted into the space previously occupied by the tooth in need of treatment because a large filling was lost for some time. Such changes in alignment can seriously complicate or preclude fabrication of a cast restoration for the damaged tooth and may even necessitate its extraction (see Fig. 1-20, B).

Lateral and Protrusive Contacts

The degree of vertical and horizontal overlap of the teeth is noted. When asked, most patients are capable of making an unguided protrusive movement. During this movement, the degree of posterior disclusion that results from the overlaps of the anterior teeth is observed. Excursive contacts on posterior teeth may be undesirable (see Chapter 4).

The patient is then guided into lateral excursive movements, and the presence or absence of contacts on the nonworking side and then the working side is noted. Such tooth contact in eccentric movements can be verified with a thin Mylar strip (shim stock). Any posterior cusps that hold the shim stock are evident (Fig. 1-21). Teeth subjected to excessive loading may develop varying degrees of mobility. Tooth movement (fremitus) should be confirmed by palpation (Fig. 1-22). If excessive occlusal contact is suspected, a finger placed against the buccal or labial surface while the patient lightly taps the teeth together helps locate fremitus in MI.

Jaw Maneuverability

The ease with which the patient moves the jaw and the way the mandible can be guided through hinge closure and excursive movements should be evaluated because this information is useful for assessing neuromuscular and masticatory function. If the patient has developed a pattern of protective reflexes, manipulating the jaw in a reproducible hinge movement can be difficult or impossible. Any restriction in maneuverability is recorded. A patient may move relatively freely in one lateral excursion but have difficulty moving to the contralateral side. Such limitation in maneuverability should be considered in the context of comprehensive

EXISTING RESTORATIONS, MISSING TEETH (for charting, use #2 pencil; make all other entries in ink)		NOTES: (on Defects, Diseases, and Abnormalities)							
DATE 1: 11/12/82	DATE 2:	DATE 3:							
			TOOTH NO. DESCRIPTION (print) 1 ¹⁸ 2 ¹⁷ Defective restoration 3 ¹⁶ OL defective 4 ¹⁵ D caries 5 ¹⁴ Defective 6 ¹³ D caries, M defective 7 ¹² L & M caries 8 ¹¹ D defective 9 ²¹ 10 ²² L pit caries, D defective 11 ²³ M caries 12 ²⁴ D overhang 13 ²⁵ Defective; recurrent caries 14 ²⁶ M overhang 15 ²⁷ Caries, broken tooth 16 ²⁸ 17 ³⁸ 18 ³⁷ 19 ³⁶ 20 ³⁵ 21 ³⁴ M caries 22 ³³ D caries (lost amalgam) 23 ³² M defective 24 ³¹ D defective 25 ⁴¹ 26 ⁴² 27 ⁴³ D defective 28 ⁴⁴ M caries 29 ⁴⁵ D overhang, M defective 30 ⁴⁶ Caries, broken tooth 31 ⁴⁷ F & L caries 32 ⁴⁸						
CR—CO 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 RL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 LL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17									
ANGLE'S CLASS / STATEMENT OF OCCLUSION Anterior crowding, limited LL movement									
STATEMENT OF PERIODONTAL HEALTH Gingivitis, bleeding upon probing, minimal pocket depth			BLEEDING INDEX PLAQUE INDEX						
RADIOGRAPHIC EXPOSURE RECORD:			DENTURE RECORD: Dentures: Upper: how old _____ years Lower: how old _____ years Partials: Upper: how old _____ years Lower: how old _____ years						
DATE (m/d/yy)	NO. OF FILMS	TYPE FILM	OPERATOR	AUTHORIZED BY	DATE (m/d/yy)	NO. OF FILMS	TYPE FILM	OPERATOR	AUTHORIZED BY
11/12/82	16	11							
STUDENT SIGNATURE					NO.				
INSTRUCTOR SIGNATURE					NO.				

FIGURE 1-19 ■ An appropriate charting system (A) designates the location, type, and extent of existing restorations and the presence of any disease condition, all of which become part of the patient's permanent record. Radiographic findings obtained from a full-mouth series

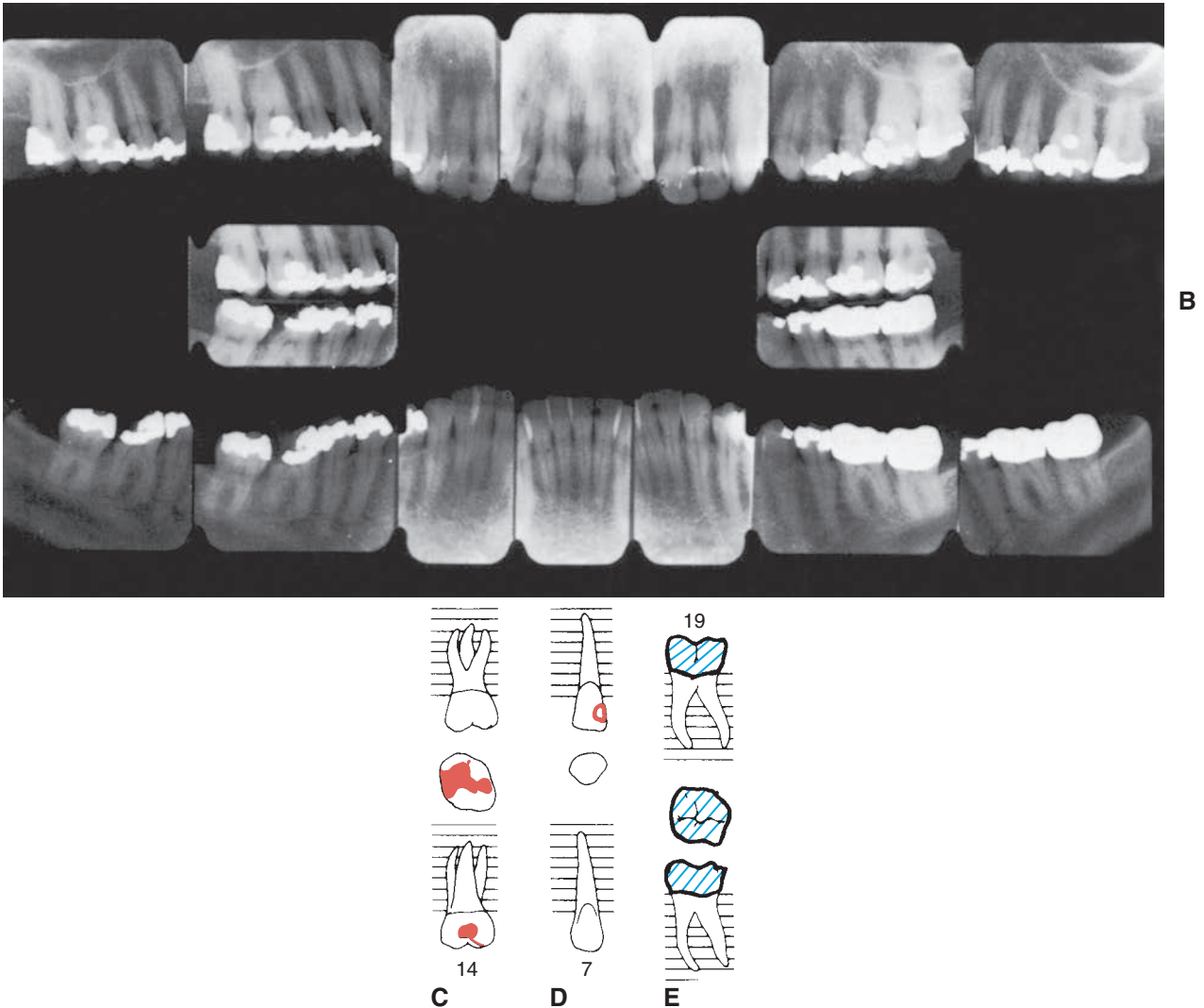


FIGURE 1-19, cont'd ■ (B) are compared with the clinical findings and noted in the record. Charting is performed to provide a quick reference to conditions in the mouth. The following may be useful: (1) Amalgam restorations (C) are depicted by an outline drawing blocked in solidly to show the size, shape, and location of the restoration. (2) Tooth-colored restorations (D) are depicted by an outline drawing of the size, shape, and location of the restoration. (3) Gold restorations (E) are depicted by an outline drawing inscribed with diagonal lines to show the size, shape, and location of the restoration. (4) Missing teeth are denoted by a large X on the facial, lingual, and occlusal diagrams of each tooth that is not visible clinically or on radiographs. (5) Caries is recorded by circling the tooth number at the apex of the involved tooth and noting the presence and location of the cavity in the description column corresponding to the tooth number on the right. (6) Defective restorations are recorded by circling the tooth number and noting the defect in the description column. (Modified from Roberson T, et al: *The Art and Science of Operative Dentistry*, 4th ed. St. Louis, Mosby, 2002.)

occlusal and neuromuscular analysis (see Chapters 4 and 6).

Radiographic Examination

Digital radiographs provide essential information to supplement the clinical examination. Detailed knowledge of

the extent of bone support and the root structure of each standing tooth is critical for establishing a comprehensive fixed prosthodontic treatment plan. According to radiation exposure guidelines, the number of radiographs should be limited to only those that will result in potential changes in treatment decisions; however, a full periapical series (Fig. 1-23) is normally required for new patients so that a comprehensive fixed prosthodontic treatment plan can be developed.

Panoramic films (Fig. 1-24) provide useful information about the presence or absence of teeth. They are especially helpful in assessing third molars and impactions, evaluating the bone before implant placement (see Chapter 13), and screening edentulous arches for buried root tips. However, they do not provide a detailed view sufficient for assessing bone support, root structure, caries, or periapical disease.

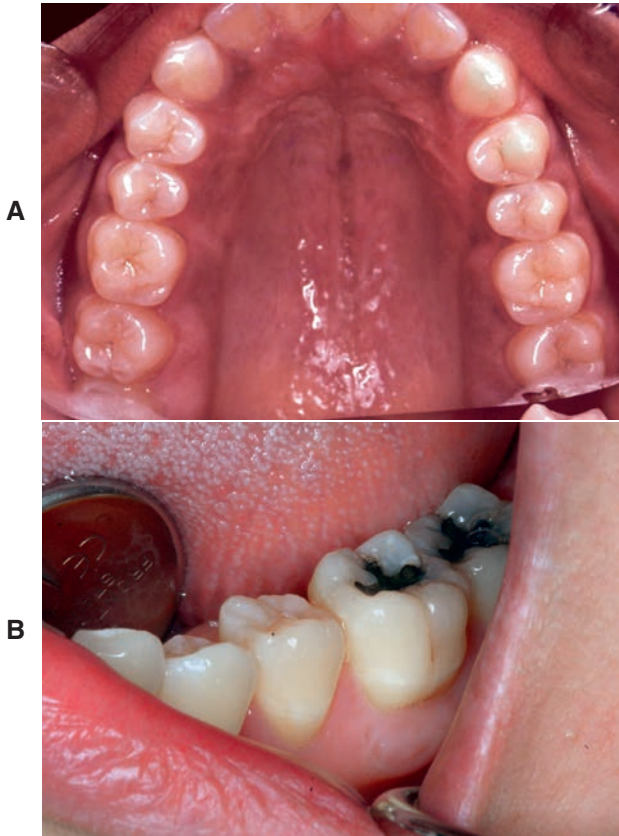


FIGURE 1-20 ■ Alignment of the dentition can be assessed intraorally, although diagnostic casts allow a more detailed assessment. **A**, This set of teeth is free of caries and in good alignment. **B**, Poor vertical alignment: the mandibular molar is supra-erupted, which has resulted in marginal ridge height discrepancy.



FIGURE 1-21 ■ Thin Mylar shim stock (**A**) can be used to test eccentric tooth contact (**B**).



FIGURE 1-22 ■ **A**, Fremitus (movement on palpation) indicates tooth contact during lateral excursions. **B**, Mobility is tested by exerting horizontal force on the tooth between the handles of two instruments.

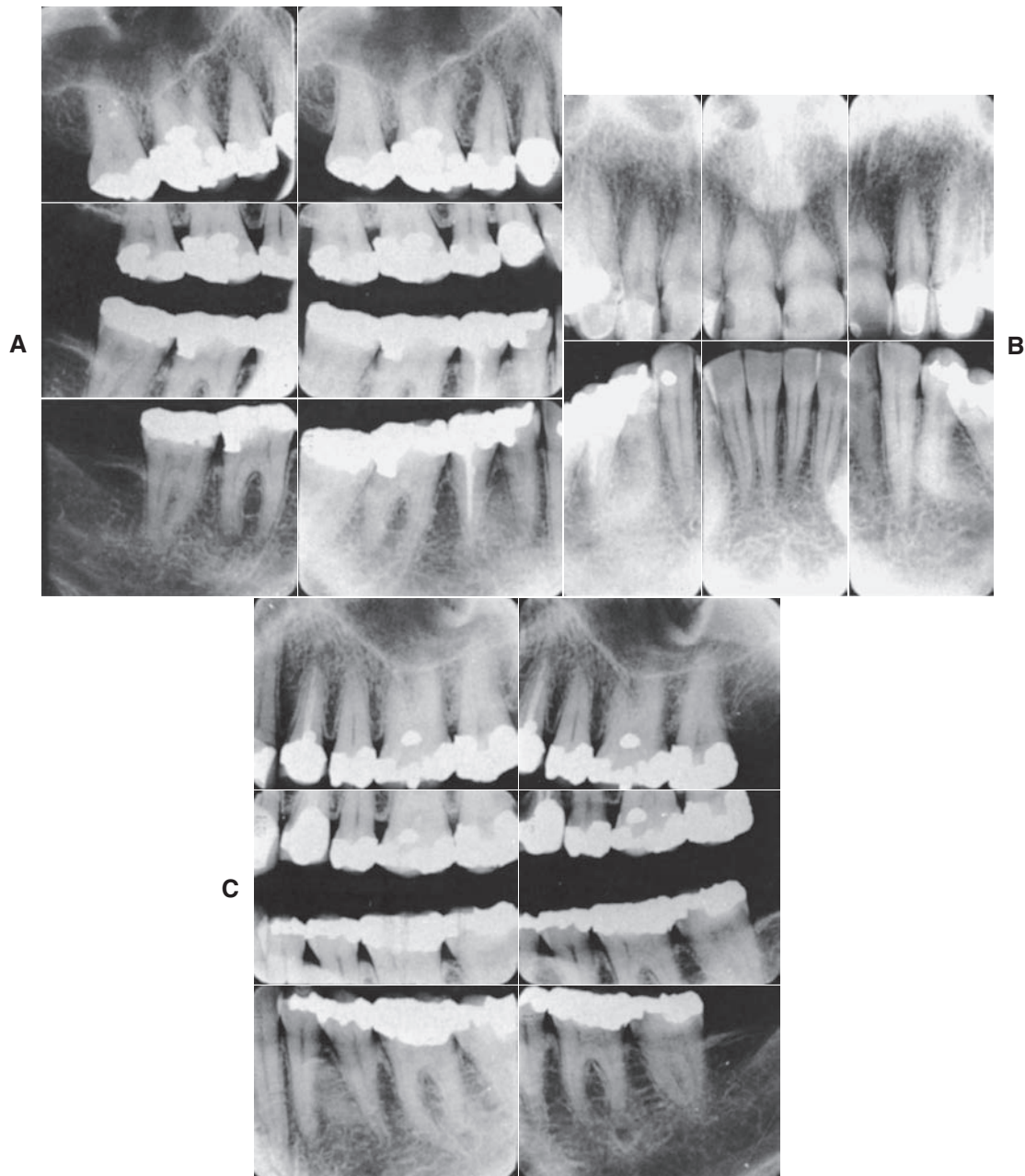


FIGURE 1-23 ■ A to C, A full-mouth radiographic survey should enable the dentist to make a detailed assessment of the structure of each tooth and its bone support.



FIGURE 1-24 ■ A panoramic film cannot be substituted for a full-mouth series because the image is distorted. Nevertheless, it is very useful for assessing unerupted teeth, screening edentulous areas for buried root tips, and evaluating the bone before implant placement.

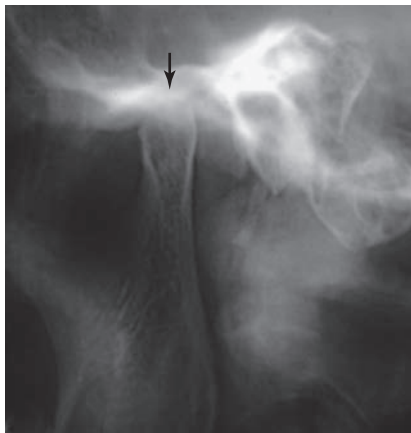


FIGURE 1-25 ■ A transcranial radiograph shows the lateral pole of the mandibular condyle (arrow).

Special radiographs may be needed for the assessment of TMJ disorders and a wide variety of pathologic conditions ranging from bone and mineral disorders to metabolic disorders, genetic abnormalities, and soft tissue calcifications, such as carotid artery calcification.²¹ For assessment of the TMJs, a transcranial exposure (Fig. 1-25), with the help of a positioning device, reveals the lateral third of the mandibular condyle and can be used to detect some structural and positional changes. However, interpretation may be difficult,²² and more information may be obtained from other images²³ (Fig. 1-26). Cone-beam imaging is considered prerequisite to most dental implant placements. In this form of imaging, osseous contours and bone volume are visualized, which improves decision making about the size of implant fixtures that realistically can be accommodated (Fig. 1-27).

Vitality Testing

Before any restorative treatment is begun, pulpal health must be confirmed, usually by assessing the response to thermal stimulation. In vitality tests, however, only the afferent nerve supply is assessed. Misdiagnosis can occur if the nerve supply is damaged but the blood supply is intact. Careful inspection of radiographs is therefore essential in the examination of such teeth.

DIAGNOSIS AND PROGNOSIS

Not all patients seeking fixed prosthodontic treatment have diagnostic problems. Nevertheless, diagnostic errors are possible, especially when a patient complains of pain or of symptoms of occlusal dysfunction. Treatment may be needed to eliminate obvious potential sources of the complaint, such as dental caries or a fractured tooth. A logical and systematic approach to diagnosis helps avoid mistakes.

Differential Diagnosis

When the history and examination are complete, a differential diagnosis is made. The most likely causes of the

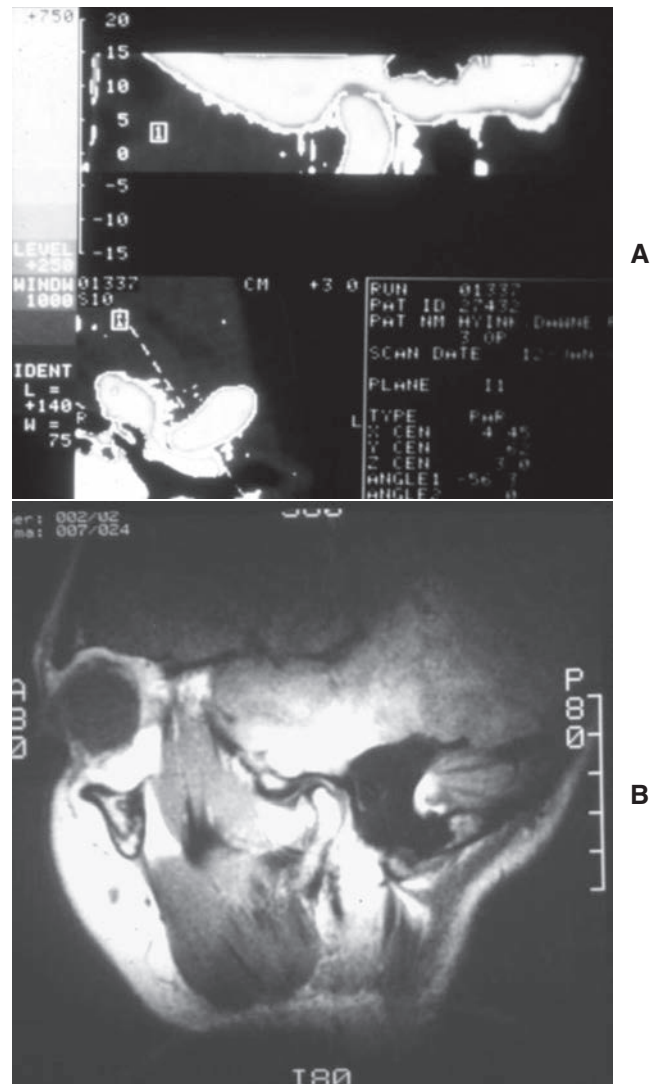


FIGURE 1-26 ■ More sophisticated techniques enable the generation of computer-assisted images of clinician-determined cross-sections. **A**, A computed tomographic (CT) scan. **B**, A magnetic resonance image showing the soft tissue in greater detail. (Courtesy Dr. J. Petrie.)

observed conditions are identified and recorded in order of probability. A definitive diagnosis can usually be developed after such supporting evidence has been assembled.

A typical diagnosis condenses the information obtained during the clinical history taking and examination. For instance, a diagnosis could read as follows: “28-year-old male, no significant medical history; vital signs normal. Chief complaint: Mesiolingual cusp fracture on tooth #30. Teeth #1, #16, #17, #19, and #32 missing. Patient reports significant postoperative discomfort after previous molar extraction. High smile line. Caries: #6, mesial; #12, distal; #20, mesio-occlusal; and #30, mesio-occlusal-distal. Tooth #8 has received previous endodontic treatment. Generalized gingivitis in four posterior quadrants, with recession noted on teeth #23, #24, and #25; 5-mm pockets on teeth #18, #30, and #31. Radiographic evidence of periapical pathology in tooth #30. Tooth #30 tests nonvital.”

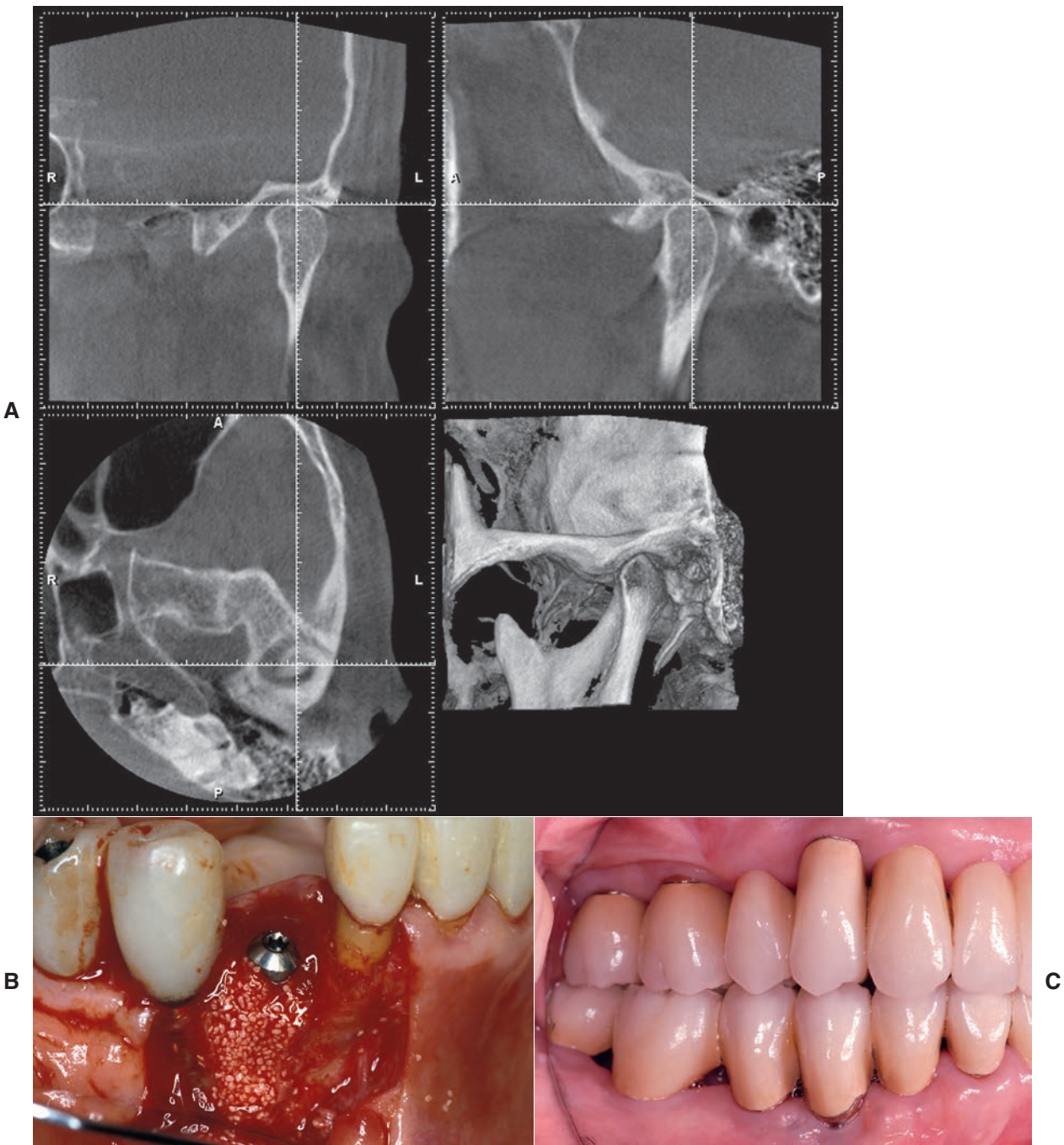


FIGURE 1-27 ■ **A**, Cone-beam technology is useful for definitive evaluation of pathologic conditions of the temporomandibular joint because it enables viewing of any desired cross section. **B**, Ridge augmentation surgery. **C**, Completed restoration.

This hypothetical scenario summarizes the patient's problems, allowing subsequent prioritization as a treatment plan is developed (see [Chapter 3](#)). In this case, the patient's chief complaint probably has existed longer than the symptoms that caused the patient to seek care.

Prognosis

The prognosis is an estimation of the likely course of a disease. It can be difficult to make, but its importance to patient management and successful treatment planning must nevertheless be recognized. The prognosis of dental

disorders is influenced by general factors (age of the patient, lowered resistance of the oral environment) and local factors (forces applied to a given tooth, access for oral hygiene measures). For example, a young person with periodontal disease has a more guarded prognosis than does an older person with the same disease experience. In the younger person, the disease has followed a more virulent course because of the generally less developed systemic resistance; these facts should be reflected in treatment planning.

Fixed prostheses function in a hostile setting: In the moist oral environment, the teeth are subject to constant changes

in temperature and acidity and to considerable load fluctuation. A comprehensive clinical examination helps establish the likely prognosis. All facts and observations are first considered individually and then correlated appropriately.

General Factors

The overall caries rate of the patient's dentition indicates future risk to the patient if the condition is left untreated. Important variables include the patient's understanding and comprehension of plaque-control measures, as well as the physical ability to perform those tasks. Analysis of systemic problems in the context of the patient's age and overall health provides important information. For example, the incidence of periodontal disease is higher in diabetic patients than in the general population, and special precautionary measures may be indicated in those patients before treatment begins. Such conditions also affect the overall prognosis.

Some patients are capable of exerting an extremely high occlusal force (see Fig. 7-39), whereas others are not. If muscle tone of hypertrophied elevator muscles is identified as abnormal during the extraoral examination and multiple intraoral wear facets are observed, loading of the teeth is considerably higher than in the dentition of a frail 90-year-old patient who fatigues easily when asked to close. Other important factors in determining overall prognosis are the history and success of previous dental treatments. If a patient's previous dental care has been successful over a period of many years, a better prognosis can be anticipated than when apparently properly fabricated prostheses fail or become dislodged within a few years of initial placement.

Local Factors

The observed vertical overlap of the anterior teeth has a direct effect on the load distribution in the dentition and thus can have an effect on the prognosis. Minimal vertical overlap is generally less favorable because higher load on posterior teeth results (see Chapter 4). In the presence of favorable loading, minor tooth mobility is less of a concern than in the presence of unfavorably directed or high load. Impactions adjacent to a molar that will be crowned may pose a serious threat in a younger patient, in whom additional growth can be anticipated, but may be of lesser concern in an older patient.

Individual tooth mobility, root angulation, root structure, crown-to-root ratios, and many other variables all have an effect on the overall prognosis for fixed prosthodontic devices. They are addressed later in this book (see also Chapter 3).

Prosthodontic Diagnostic Index (PDI) for Partially Edentulous and Completely Dentate Patients

The American College of Prosthodontists (ACP) has developed diagnostic indices for partial edentulism²⁴ and for completely dentate patients²⁵ on the basis of diagnostic findings that are summarized here with the permission

and support of the ACP. These guidelines are intended to help practitioners determine appropriate treatments for their patients. For each index, four categories, class I to class IV, are defined; class I represents an uncomplicated clinical situation and class IV represents a complex clinical situation. The indices are designed for use by dental professionals involved in the diagnosis and treatment of partially edentulous and completely dentate patients. Potential benefits of the system include (1) improved intraoperator consistency, (2) improved professional communication, (3) insurance reimbursement commensurate with complexity of care, (4) improved screening tool for dental school admission clinics, (5) standardized criteria for outcomes assessment and research, (6) enhanced diagnostic consistency, and (7) simplified decision to refer a patient.

Each class is differentiated by specific diagnostic criteria (ideal or minimal, moderately compromised, substantially compromised, or severely compromised) of the following (for partially edentulous patients):

1. Location and extent of the edentulous area or areas
2. Condition of the abutment teeth
3. Occlusal scheme
4. Residual ridge

For completely dentate patients, only tooth condition and occlusal scheme are evaluated.

Location and Extent of the Edentulous Areas

In the *ideal or minimally compromised edentulous area*, the edentulous span is confined to a single arch, and one of the following conditions is present:

- Any anterior maxillary span that does not exceed two missing incisors
- Any anterior mandibular span that does not exceed four missing incisors
- Any posterior maxillary or mandibular span that does not exceed two premolars or one premolar and one molar

In the *moderately compromised edentulous area*, the edentulous span is in both arches, and one of the following conditions exists:

- The span includes any anterior maxillary span that does not exceed two missing incisors.
- The span includes any anterior mandibular span that does not exceed four missing incisors.
- The span includes any posterior maxillary or mandibular span that does not exceed two premolars or one premolar and one molar.
- The maxillary or mandibular canine tooth is missing.

The *substantially compromised edentulous area* includes the following conditions:

- Any posterior maxillary or mandibular span that is greater than three missing teeth or two molars
- Any edentulous span, including anterior and posterior areas of three or more missing teeth

The *severely compromised edentulous area* includes the following condition:

- Any edentulous area or combination of edentulous areas whose care requires a high level of patient compliance

Condition of the Abutment Teeth (Tooth Condition for Completely Dentate Patients)

In cases of ideal or minimally compromised abutment teeth,

- No preprosthetic therapy is indicated.

In cases of moderately compromised abutment teeth,

- Tooth structure is insufficient to retain or support intracoronal restorations, in one or two sextants.
- Localized adjunctive therapy (i.e., periodontal, endodontic, or orthodontic procedures, in one or two sextants) is required for abutments.

In cases of substantially compromised abutment teeth,

- Tooth structure is insufficient to retain or support intracoronal or extracoronal restorations, in four or more sextants.
- Extensive adjunctive therapy (i.e., periodontal, endodontic or orthodontic procedures, in four or more sextants) is required for abutments.

In cases of severely compromised abutment teeth,

- Abutments have a guarded prognosis.

Occlusal Scheme

Ideal or minimally compromised occlusal schemes are characterized by the following conditions:

- No preprosthetic therapy required
- Class I molar and jaw relationships

Moderately compromised occlusal schemes are characterized by the following conditions:

- Necessity for localized adjunctive therapy (e.g., enameloplasty on premature occlusal contacts)
- Class I molar and jaw relationships

Substantially compromised occlusal schemes are characterized by the following conditions:

- Necessity for reestablishment of entire occlusal scheme, but without any change in the occlusal vertical dimension
- Class II molar and jaw relationships

Severely compromised occlusal schemes are characterized by the following conditions:

- Necessity for reestablishment of entire occlusal scheme, with changes in the occlusal vertical dimension
- Class II, division 2, and class III molar and jaw relationships

Residual Ridge

The Classification System for Complete Edentulism²⁶ is used to categorize any edentulous span present in a partially edentulous patient.

Classification System

The four criteria and their subclassifications are organized into an overall classification system for partial edentulism; the two criteria provide the system for completely edentulous patients.

Class I

This class (Figs. 1-28 and 1-29) is characterized by ideal or minimal compromise in the location and extent of an edentulous area (which is confined to a single arch), abutment conditions, occlusal characteristics, and residual ridge conditions. All four of the diagnostic criteria are favorable.

1. The location and extent of the edentulous area are ideal or minimally compromised:
 - The edentulous area is confined to a single arch.
 - The edentulous area does not compromise the physiologic support of the abutments.
 - The edentulous area may include any anterior maxillary span that does not exceed two incisors, any anterior mandibular span that does not exceed four missing incisors, or any posterior span that does not exceed two premolars or one premolar and one molar.
2. The abutment condition is ideal or minimally compromised, with no need for preprosthetic therapy.
3. The occlusion is ideal or minimally compromised, with no need for preprosthetic therapy; maxillo-mandibular relationship consists of class I molar and jaw relationships.
4. Residual ridge structure conforms to the class I complete edentulism description.

Class II

This class (Figs. 1-30 and 1-31) is characterized by moderately compromised location and extent of edentulous areas in both arches, abutment conditions that necessitate localized adjunctive therapy, occlusal characteristics that necessitate localized adjunctive therapy, and residual ridge conditions.

1. The location and extent of the edentulous area are moderately compromised:
 - Edentulous areas may exist in one or both arches.
 - The edentulous areas do not compromise the physiologic support of the abutments.
 - Edentulous areas may include any anterior maxillary span that does not exceed two incisors, any anterior mandibular span that does not exceed four incisors, any posterior span (maxillary or mandibular) that does not exceed two premolars, or one premolar and one molar or any missing canine (maxillary or mandibular).
2. Condition of the abutments is moderately compromised:
 - Abutments in one or two sextants have insufficient tooth structure to retain or support intracoronal or extracoronal restorations.
 - Abutments in one or two sextants necessitate localized adjunctive therapy.
3. Occlusion is moderately compromised:
 - Occlusal correction necessitates localized adjunctive therapy.
 - Maxillomandibular relationship is characterized as class I molar and jaw relationships.
4. Residual ridge structure conforms to the class II description of complete edentulism.

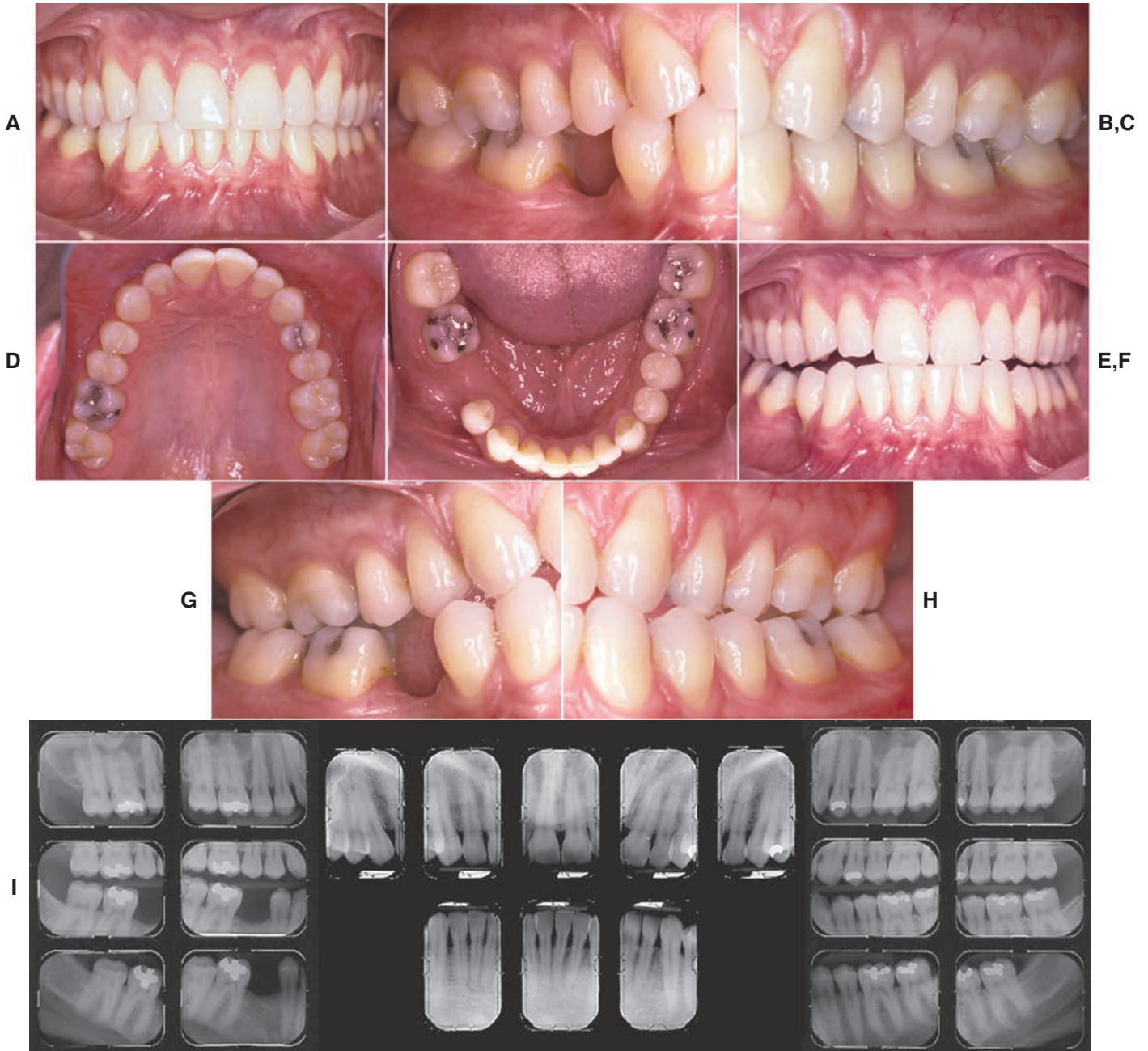


FIGURE 1-28 ■ Class I. This patient is categorized as class I because of an ideal or minimally compromised edentulous area, abutment condition, and occlusion. There is a single edentulous area in one sextant. The residual ridge is considered type A. **A**, Frontal view, maximum intercuspation. **B**, Right lateral view, maximum intercuspation. **C**, Left lateral view, maximum intercuspation. **D**, Occlusal view, maxillary arch. **E**, Occlusal view, mandibular arch. **F**, Frontal view, protrusive relationship. **G**, Right lateral view, right working movement. **H**, Left lateral view, left working movement. **I**, Full-mouth radiographic series. (From McGarry TJ, et al: Classification system for partial edentulism. *J Prosthodont* 11:181, 2002.)



FIGURE 1-29 ■ Class I. This patient is categorized as class I because an ideal or minimally compromising tooth condition and occlusal scheme are exhibited. A single large amalgam core restoration requires a complete coverage restoration in one sextant. **A**, Frontal view, maximum intercuspation. **B**, Right lateral view, maximum intercuspation. **C**, Left lateral view, maximum intercuspation. **D**, Occlusal view, maxillary arch. **E**, Occlusal view, mandibular arch. **F**, Panoramic radiograph. (From McGarry TJ, et al: Classification system for the completely dentate patient. *J Prosthodont* 13:73, 2004.)

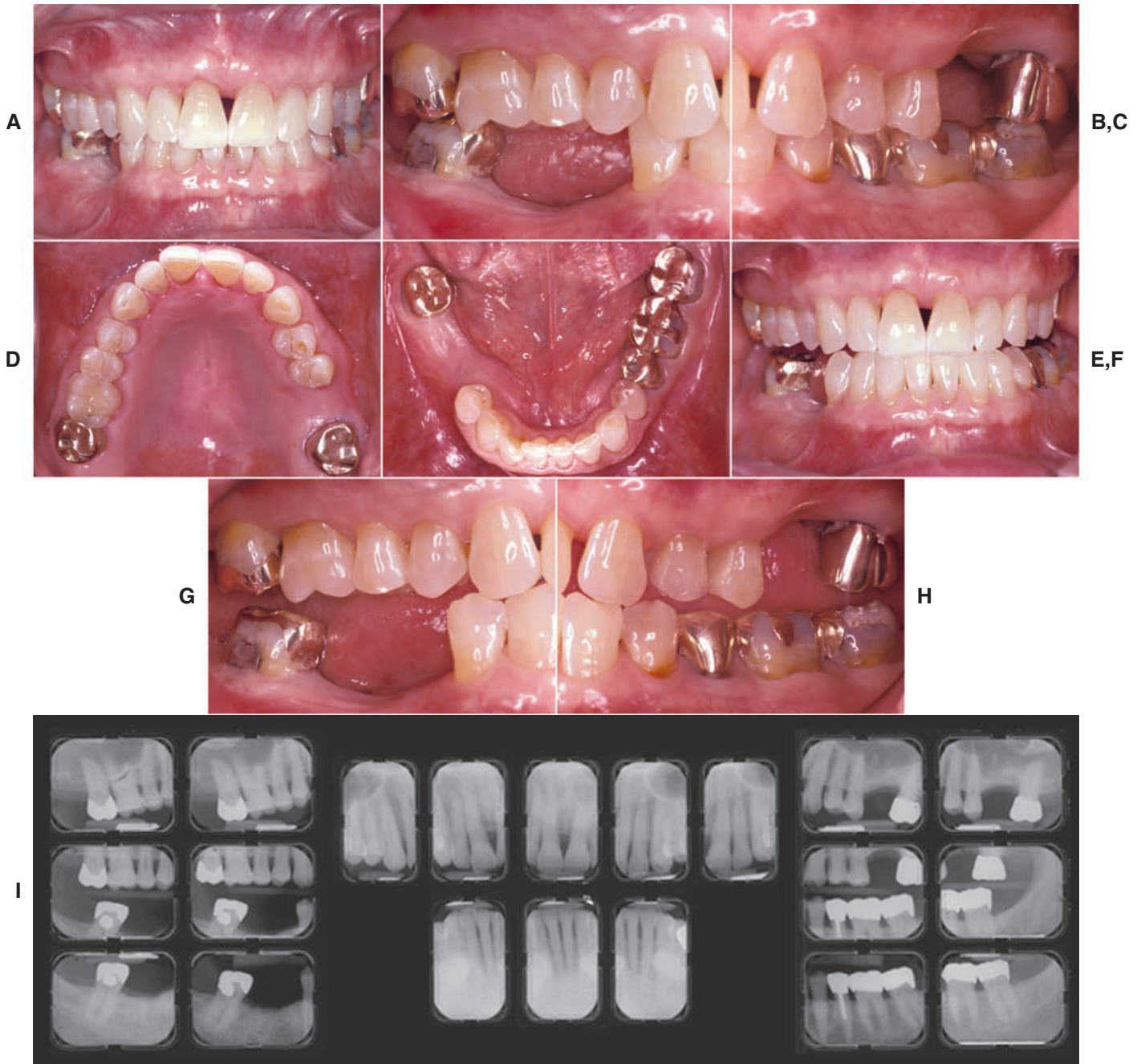


FIGURE 1-30 ■ Class II. This patient is categorized as class II because edentulous areas are present in two sextants in different arches. **A**, Frontal view, maximum intercuspation. **B**, Right lateral view, maximum intercuspation. **C**, Left lateral view, maximum intercuspation. **D**, Occlusal view, maxillary arch. **E**, Occlusal view, mandibular arch. **F**, Frontal view, protrusive relationship. **G**, Right lateral view, right working movement. **H**, Left lateral view, left working movement. **I**, Full-mouth radiographic series. (From McGarry TJ, et al: Classification system for partial edentulism. *J Prosthodont* 11:181, 2002.)



FIGURE 1-31 ■ Class II. This patient is categorized as class II because one sextant exhibits three defective restorations with an esthetic component. Additional variables of gingival architecture and individual tooth proportions increase the complexity of diagnosis. **A**, Frontal view, maximum intercuspation. **B**, Right lateral view, maximum intercuspation. **C**, Left lateral view, maximum intercuspation. **D**, Occlusal view, maxillary arch. **E**, Occlusal view, mandibular arch. **F**, Panoramic radiograph. (From McGarry TJ, et al: Classification system for the completely dentate patient. *J Prosthodont* 13:73, 2004.)

Class III

This class (Figs. 1-32 and 1-33) is characterized by substantially compromised location and extent of edentulous areas in both arches, abutment condition that necessitates substantial localized adjunctive therapy, occlusal characteristics that necessitate reestablishment of the entire occlusion without a change in the occlusal vertical dimension, and residual ridge conditions.

1. The location and extent of the edentulous areas are substantially compromised:
 - Edentulous areas may be present in one or both arches.
 - Edentulous areas compromise the physiologic support of the abutments.
 - Edentulous areas may include any posterior maxillary or mandibular edentulous area greater

2. The condition of the abutments is moderately compromised:
 - Abutments in three sextants have insufficient tooth structure to retain or support intracoronal or extracoronal restorations.
 - Abutments in three sextants necessitate more substantial localized adjunctive therapy (i.e., periodontal, endodontic, or orthodontic procedures).
 - Abutments have a fair prognosis.
3. Occlusion is substantially compromised:
 - The entire occlusal scheme must be reestablished without an accompanying change in the occlusal vertical dimension.
 - Maxillomandibular relationship is characterized as class II molar and jaw relationships.

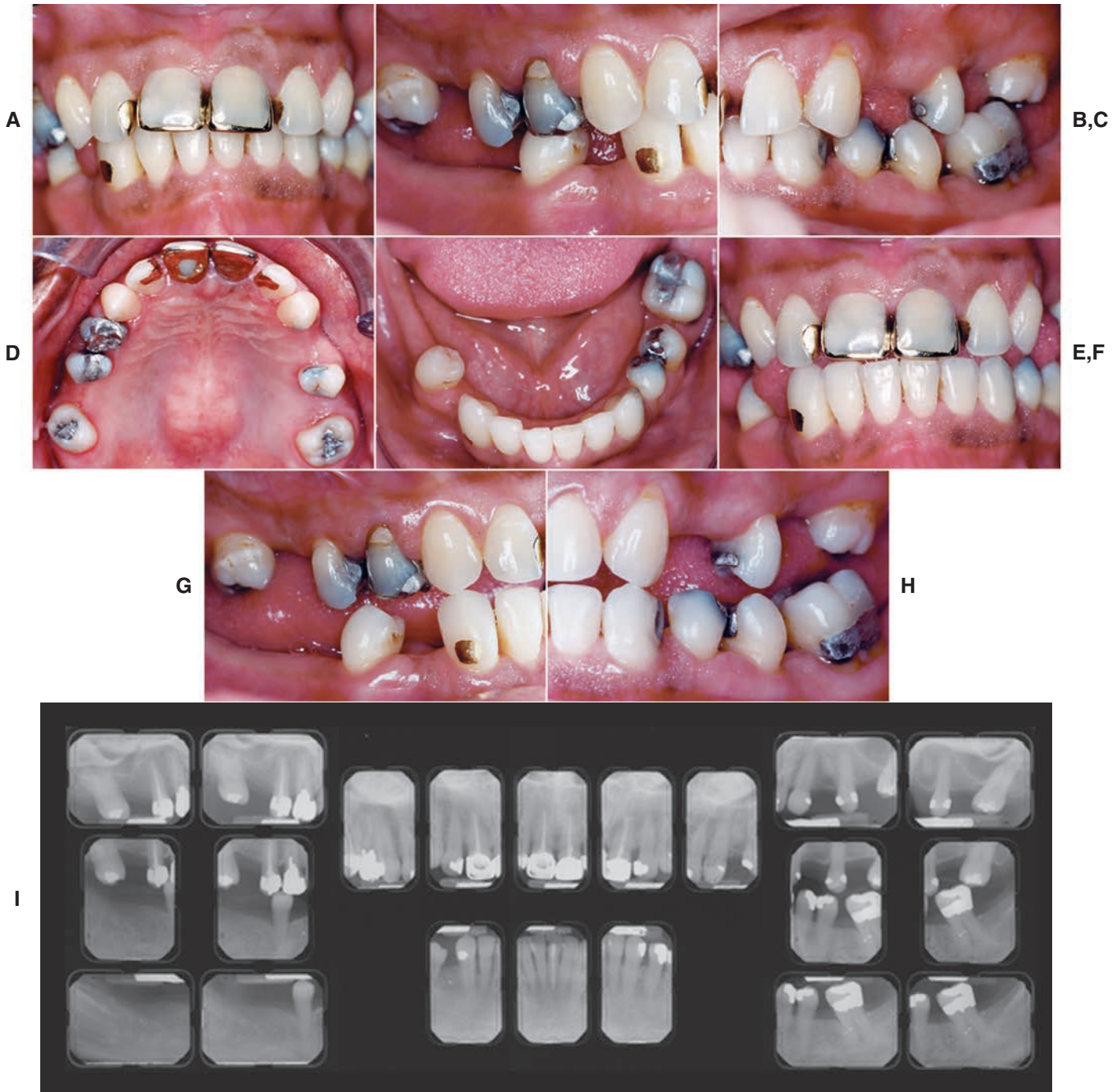


FIGURE 1-32 ■ Class III. This patient is categorized as class III because the edentulous areas are located in both arches and there are multiple such locations within each arch. The abutment condition is substantially compromised as a result of the need for extra-coronal restorations. There are teeth that are extruded and malpositioned. The occlusion is substantially compromised because reestablishment of the occlusal scheme is required without a change in the occlusal vertical dimension. **A**, Frontal view, maximum intercuspation. **B**, Right lateral view, maximum intercuspation. **C**, Left lateral view, maximum intercuspation. **D**, Occlusal view, maxillary arch. **E**, Occlusal view, mandibular arch. **F**, Frontal view, protrusive relationship. **G**, Right lateral view, right working movement. **H**, Left lateral view, left working movement. **I**, Full-mouth radiographic series. (From McGarry TJ, et al: Classification system for partial edentulism. *J Prosthodont* 11:181, 2002.)



FIGURE 1-33 ■ Class III. This patient is categorized as class III because large defective amalgam and composite restorations are present in four sextants. The remaining tooth structure is substantially compromised in most posterior teeth. The occlusion is substantially compromised, which necessitates reestablishment of the occlusal scheme without a change in the occlusal vertical dimension. **A**, Frontal view, maximum intercuspitation. **B**, Right lateral view, maximum intercuspitation. **C**, Left lateral view, maximum intercuspitation. **D**, Occlusal view, maxillary arch. **E**, Occlusal view, mandibular arch. **F**, Panoramic radiograph. (From McGarry TJ, et al: Classification system for the completely dentate patient. *J Prosthodont* 13:73, 2004.)

4. Residual ridge structure conforms to the class III complete edentulism description.

Class IV

This class (Figs. 1-34 and 1-35) is characterized by severely compromised location and extent of edentulous areas with guarded prognosis, abutment conditions that necessitate extensive therapy, occlusion characteristics that necessitate reestablishment of the occlusion with a change in the occlusal vertical dimension, and residual ridge conditions.

1. The location and extent of the edentulous areas result in severe occlusal compromise:
 - Edentulous areas may be extensive and may be present in both arches.

- Edentulous areas compromise the physiologic support of the abutment teeth, and so the prognosis is guarded.
 - Edentulous areas include acquired or congenital maxillofacial defects.
 - At least one edentulous area has a guarded prognosis.
2. Abutments are severely compromised:
 - Abutments in four or more sextants have insufficient tooth structure to retain or support intra-coronal or extracoronal restorations.
 - Abutment conditions in four or more sextants necessitate extensive localized adjunctive therapy.
 - Abutments have a guarded prognosis.

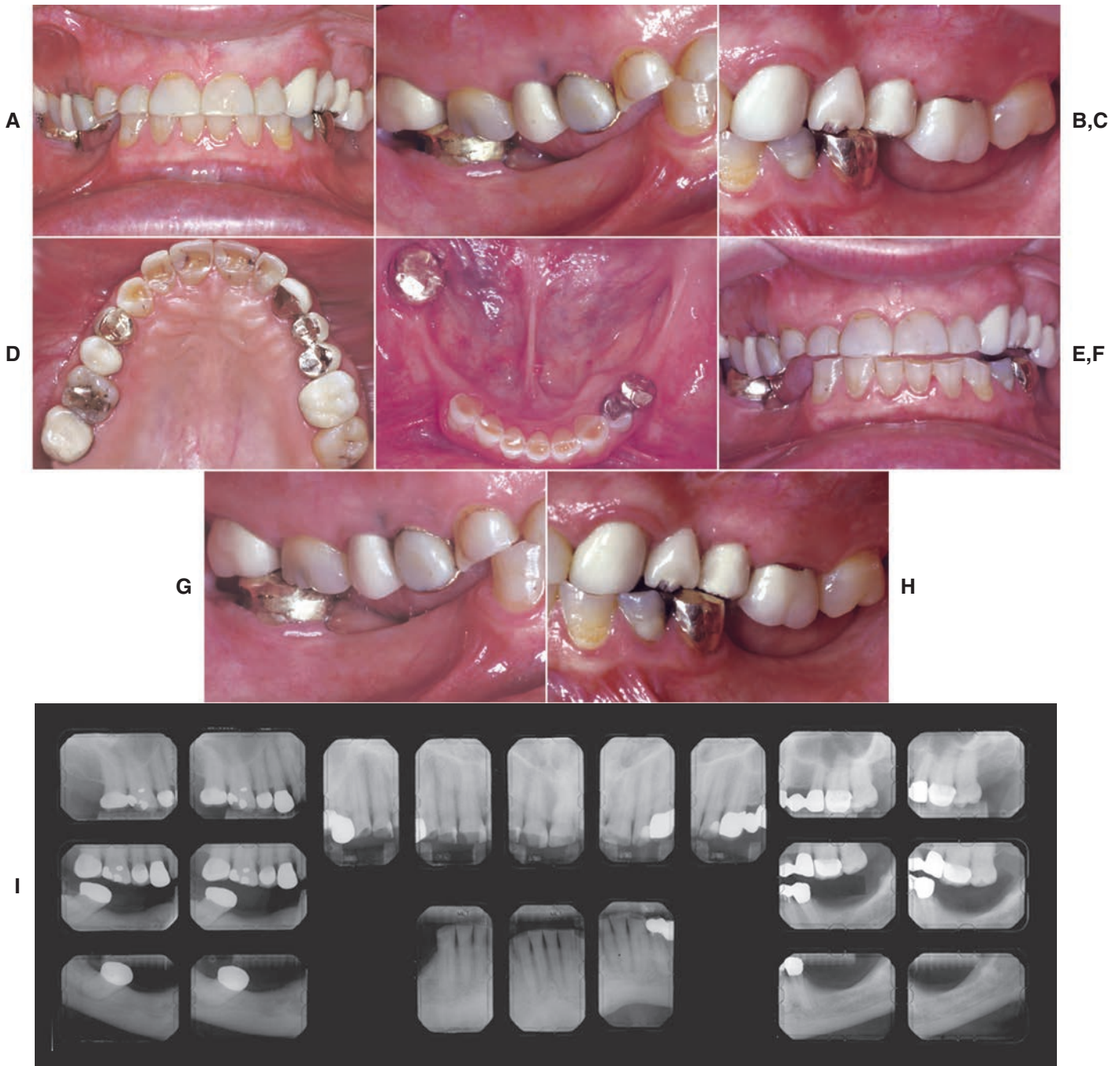


FIGURE 1-34 ■ Class IV. This patient is categorized as class IV because edentulous areas are found in both arches, and the physiologic abutment support is compromised. Abutment condition is severely compromised as a result of advanced attrition and failing restorations, which necessitates extracoronar restorations and adjunctive therapy. The occlusion is severely compromised, which necessitates reestablishment of occlusal vertical dimension and proper occlusal scheme. **A**, Frontal view, maximum intercuspation. **B**, Right lateral view, maximum intercuspation. **C**, Left lateral view, maximum intercuspation. **D**, Occlusal view, maxillary arch. **E**, Occlusal view, mandibular arch. **F**, Frontal view, protrusive relationship. **G**, Right lateral view, right working movement. **H**, Left lateral view, left working movement. **I**, Full-mouth radiographic series. (From McGarry TJ, et al: Classification system for partial edentulism. *J Prosthodont* 11:181, 2002.)



FIGURE 1-35 ■ Class IV. This patient is categorized as class IV because advanced attrition of the occlusal surfaces is present in more than three sextants. The occlusion is severely compromised, which necessitates reestablishment of occlusal vertical dimension and a proper occlusal scheme. **A**, Frontal view, maximum intercuspitation. **B**, Right lateral view, maximum intercuspitation. **C**, Left lateral view, maximum intercuspitation. **D**, Occlusal view, maxillary arch. **E**, Occlusal view, mandibular arch. **F**, Panoramic radiograph. (From McGarry TJ, et al: Classification system for the completely dentate patient. *J Prosthodont* 13:73, 2004.)

3. Occlusion is severely compromised:
 - Reestablishment of the entire occlusal scheme, including changes in the occlusal vertical dimension, is necessary.
 - Maxillomandibular relationship is characterized as class II, division 2, or class III molar and jaw relationships.
4. Residual ridge structure conforms to the class IV complete edentulism description.

Other characteristics include severe manifestations of local or systemic disease, including sequelae from oncologic treatment, maxillomandibular dyskinesia or ataxia, and refractoriness (a patient's presenting with chronic complaints after appropriate therapy).

Guidelines for the Use of PDI Classification System for Partial Edentulism and Complete Dentition

The analysis of diagnostic factors is facilitated with the use of a worksheet (Fig. 1-36 and Table 1-1). Each criterion is evaluated, and a checkmark is placed in the appropriate box. In instances in which a patient's diagnostic criteria overlap two or more classes, the more complex class is the selected diagnosis.

The following additional guidelines should be followed to ensure consistent application of the classification system:

1. Consideration of future treatment procedures must not influence the choice of diagnostic level.

Description	Class I	Class II	Class III	Class IV
Location and Extent of Edentulous Areas				
Ideal or minimally compromised: single arch				
Moderately compromised: both arches				
Substantially compromised: more than three teeth				
Severely compromised: guarded prognosis				
Congenital or acquired maxillofacial defect				
Abutment Condition				
Ideal or minimally compromised				
Moderately compromised: one to two sextants				
Substantially compromised: three sextants				
Severely compromised: four or more sextants				
Occlusion				
Ideal or minimally compromised				
Moderately compromised: local adjunctive treatment				
Substantially compromised: occlusal scheme				
Severely compromised: change in occlusal vertical dimension				
Residual Ridge				
Class I edentulous				
Class II edentulous				
Class III edentulous				
Class IV edentulous				
Conditions Creating a Guarded Prognosis				
Severe oral manifestations of systemic disease				
Maxillomandibular dyskinesia and/or ataxia				
Refractory condition				

FIGURE 1-36 ■ Worksheet used to determine prosthodontic diagnostic index classification. Note: Individual diagnostic criteria are evaluated, and the appropriate box is checked. The most advanced finding determines the final classification. Guidelines for use of the worksheet: 1. Possession of any single criterion of a more complex class places the patient into the more complex class. 2. Consideration of future treatment procedures must not influence the diagnostic level. 3. Initial preprosthetic treatment and/or adjunctive therapy can change the initial classification level. 4. If there is an esthetic concern/challenge, the classification is increased in complexity by one level in class I and II patients. 5. In the presence of symptoms of temporomandibular disorder, the classification is increased in complexity by one or more levels in class I and II patients. 6. In the situation in which the patient presents with an edentulous mandible opposing a partially edentulous or dentate maxilla, the patient is categorized as class IV.

TABLE 1-1 Worksheet Used to Determine Prosthodontic Diagnostic Index Classification of Completely Dentate Patients

Description	Class I	Class II	Class III	Class IV
Teeth Condition				
Ideal or minimally compromised: three or fewer teeth in one sextant	X			
Moderately compromised: one or more teeth in one to two sextants		X		
Substantially compromised: one or more teeth in three to five sextants			X	
Severely compromised: four or more teeth, all sextants				X
Occlusal Scheme				
Ideal or minimally compromised	X			
Moderately compromised: anterior guidance intact		X		
Substantially compromised: extensive rest/same OVD			X	
Severely compromised: extensive rest/new OVD				X
Conditions Creating a Guarded Prognosis				
Severe oral manifestations of systemic disease				X
Maxillomandibular dyskinesia or ataxia				X
Refractory condition				X

Note: Individual diagnostic criteria are evaluated, and the appropriate box is checked. The most advanced finding determines the final classification.

Guidelines for use of this worksheet:

1. Consideration of future treatment procedures must not influence the diagnostic level.
2. Initial preprosthetic treatment or adjunctive therapy can change the initial classification level.
3. If there is an esthetic concern/challenge, the classification is increased in complexity by one or more levels.
4. In the presence of temporomandibular joint symptoms, the classification is increased in complexity by one or more levels.
5. It is assumed that the patient will receive therapy designed to achieve and maintain optimal periodontal health.
6. Situations that fail to conform to the definition of completely dentate should be classified according to the classification system for partial edentulism.

OVD, Occlusal vertical dimension.

2. Initial preprosthetic treatment or adjunctive therapy can change the initial classification level. Classification may need to be reassessed after existing prostheses are removed.
3. Esthetic concerns or challenges raise the classification by one level in cases of class I and class II dentition.
4. The presence of symptoms of temporomandibular disorder raises the classification by one or more levels in patients with class I and class II dentition.
5. In a patient presenting with an edentulous maxilla opposing a partially edentulous mandible, each arch is diagnosed according to the appropriate classification system; that is, the maxilla is classified according to the complete edentulism classification system, and the mandible is classified according to the partial edentulism classification system. The sole exception to this rule is the case of an edentulous mandible opposed by a partially edentulous or dentate maxilla. This clinical situation entails significant complexity and potential long-term morbidity and, as such, should be categorized as class IV in either system.
6. Periodontal health is intimately related to the diagnosis and prognosis for partially edentulous patients. For the purpose of this system, it is assumed that patients receive therapy to achieve and maintain periodontal health so that appropriate prosthodontic care can be accomplished.

The classification system for partial edentulism is based on the most objective criteria available to facilitate uniform use of the system. Such standardization may help improve communications among dental professionals and third parties. This classification system serves to identify patients most likely to require treatment by a specialist or by a practitioner with additional training and experience in advanced techniques. This system should also be valuable to research protocols as different treatment procedures are evaluated. With the increasing complexity of treatment, this partial edentulism classification system, coupled with the complete edentulism classification system, helps dental school faculty assess entering patients for the most appropriate patient assignment for better care. On the basis of use and observations by practitioners, educators, and researchers, this system is modified as needed.

SUMMARY

A comprehensive history and a thorough clinical examination provide sufficient data for the practitioner to formulate a successful treatment plan. If they are too hastily accomplished, details may be missed, which can cause significant problems during treatment, when it may be difficult or impossible to make corrections. Also, the overall outcome and prognosis may be adversely affected. In particular, it is crucial to develop

a thorough understanding of each patient's special concerns relating to previous care and his or her expectations about future treatment. Many problems encountered during fixed prosthodontic treatment are directly traceable to factors overlooked during the initial examination and data collection. A diagnosis is a summation of the observed problems and their underlying causes. The patient's overall prognosis is influenced by general and local factors.

REFERENCES

1. Moazzez R, et al: Dental erosion, gastro-oesophageal reflux disease and saliva: how are they related? *J Dent* 32:489, 2004.
2. Milosevic A: Eating disorders and the dentist. *Br Dent J* 186:109, 1999.
3. Cope MR: Metoclopramide-induced masticatory muscle spasm. *Br Dent J* 154:335, 1983.
4. Pajukoski H, et al: Salivary flow and composition in elderly patients referred to an acute care geriatric ward. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 84:265, 1997.
5. Hunter KD, Wilson WS: The effects of antidepressant drugs on salivary flow and content of sodium and potassium ions in human parotid saliva. *Arch Oral Biol* 40:983, 1995.
6. Infection control recommendations for the dental office and laboratory. *J Am Dent Assoc (Suppl)*:1, 1992.
7. Epstein O, et al: *Pocket Guide to Clinical Examination*, 4th ed. St. Louis, Elsevier, 2009.
8. Little JW, et al: *Little and Falace's Dental Management of the Medically Compromised Patient*, 8th ed. St. Louis, Elsevier, 2012.
9. Solberg WK: Occlusion-related pathosis and its clinical evaluation. In Clark JW, ed: *Clinical Dentistry*, vol 2, chap 35. Hagerstown, Md, Harper & Row, 1976.
10. Pullinger AG, et al: Differences between sexes in maximum jaw opening when corrected to body size. *J Oral Rehabil* 14:291, 1987.
11. Krogh-Poulsen WG, Olsson A: Occlusal disharmonies and dysfunction of the stomatognathic system. *Dent Clin North Am* 10:627, 1966.
12. Moskowitz ME, Nayyar A: Determinants of dental esthetics: a rational for smile analysis and treatment. *Compend Contin Educ Dent* 16:1164, 1995.
13. Crispin BJ, Watson JF: Margin placement of esthetic veneer crowns. I. Anterior tooth visibility. *J Prosthet Dent* 45:278, 1981.
14. Lombardi RE: The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent* 29:358, 1973.
15. Rosenstiel SF, Rashid RG: Public preferences for anterior tooth variations: a web-based study. *J Esthet Restor Dent* 14:97, 2002.
16. Parameter on comprehensive periodontal examination. American Academy of Periodontology. *J Periodontol* 71:847, 2000.
17. Guidelines for periodontal therapy. American Academy of Periodontology. *J Periodontol* 69:405, 1998.
18. Carranza FA Jr, Newman MG: *Clinical Periodontology*, 8th ed. Philadelphia, WB Saunders, 1996.
19. Goodson JM: Selection of suitable indicators of periodontitis. In Bader JD, ed: *Risk Assessment in Dentistry*. Chapel Hill, N.C., University of North Carolina Dental Ecology, 1989.
20. American Academy of Periodontology: *Parameters of Care*. Chicago, American Academy of Periodontology, 1989.
21. Carter L: Clinical indications as a basis for ordering extraoral imaging studies. *Compend Contin Educ Dent* 25:351, 2004.
22. Van Sickels JE, et al: Transcranial radiographs in the evaluation of craniomandibular (TMJ) disorders. *J Prosthet Dent* 49:244, 1983.
23. Brooks SL, et al: Imaging of the temporomandibular joint: a position paper of the American Academy of Oral and Maxillofacial Radiology. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 83:609, 1997.
24. McGarry TJ, et al: Classification system for partial edentulism. *J Prosthet Dent* 11:181, 2002.
25. McGarry TJ, et al: Classification system for the completely dentate patient. *J Prosthet Dent* 13:73, 2004.
26. McGarry TJ, et al: Classification system for complete edentulism. *The American College of Prosthodontics. J Prosthet Dent* 8:27, 1999.

STUDY QUESTIONS

1. Discuss the importance of the chief complaint and its management during examination and presentation of the treatment plan.
2. What is the classification of conditions observed as part of the medical history?
3. Describe the various areas included in the documentation of a comprehensive dental history.
4. What systemic conditions may cause oral manifestations that can affect a plan for fixed prosthodontic treatment?
5. What is included in a comprehensively conducted extraoral examination? Specify all structures included in palpation.
6. Discuss three critical observations that are part of a comprehensive periodontal examination. Why are they important in the evaluation for fixed prosthodontic treatment?
7. What would be recorded as part of an intraoral charting?
8. Discuss the various types of radiographs available for diagnostic purposes. What are the advantages and limitations of each technique?
9. Give examples of general and local factors that may influence the patient's prognosis.