The Complete Denture: A Clinical Pathway

Second Edition

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Contents

Dedication
Preface
Contributors
1. Seeking the Problem
2. Impressions for Study Casts
3. Making Master Casts
4. Selecting Maxillary Anterior Teeth
5. Recording the Relationship of the Jaws and Arranging the Maxillary Anterior Teeth
6. Arranging the Mandibular Anterior Teeth and All of the Posterior Teeth
7. Clinical Evaluation of the Teeth in Wax
8. Processing Acrylic Resin
9. Adjustment and Insertion of the Dentures
10. Relining and Repairing a Complete Denture
11. Immediate Dentures
12. Implant Overdentures
   Appendix 1: The Complete Denture: A Step-by-Step Summary
   Appendix 2: What Should You Expect from a New Denture?
Dedication

To Mary for constant support and encouragement
To my father Patrick J. MacEntee who introduced me to the art of complete dentures
To Stephen Bartlett and John J. Sharry for the direction to master the art
To my colleagues and students who continue to stimulate me
Preface

I began the preface to the first edition of this text by posing several questions: “Why write a book about a dying art, about a skill with little science, or about a service that is no longer in the main purview of the dental profession? Is not edentulism on the decline because the youth today will keep their teeth for life? Have not oral implants transformed the edentulous mouth into a foundation for fixed prostheses?”

I continue to hear these questions, even accompanied by the ring of ageism: “Isn’t tooth loss an old person’s affliction?” Everyone in dental academia knows that the curriculum has moved away from prosthodontics to embrace, it is said, knowledge that is much more relevant to the dentist in the new millennium.¹ The seminal question remains on the agenda of most dental faculties: “Why bother with the complete denture?” But, as I explained in the first edition, the art and science of complete dentures provides the foundation for so much of a dental clinician’s day: listening to patients; probing for diagnostic clues; distinguishing healthy from diseased tissues and functional from dysfunctional structures; assessing the arrangement of teeth for patients who are concerned about dentofacial disfigurements and for occlusal contacts that are physiologically unstable; making impressions; using dental articulators; manipulating an array of biomaterials; and communicating their observations and recommendations to others.

There has been remarkably little attention given in either dental education or the related sciences to the management of chronic disorders, yet we know that successful aging is influenced strongly by the long-term skills people develop to adapt and cope with chronic adversities.²,³ As clinicians, we are skilled in the techniques to remove, change, and replace structures in and around the mouth. We can deliver the most exquisite prostheses, far beyond the expectations or demands of most patients. Yet, we are much less skilled at maintaining a comfortable quality of life with minimal effort and expense to patients and ourselves.⁴

Almost everywhere, there has been an excellent trend away from complete tooth loss, and more people than ever before are retaining some natural teeth for life. However, the epidemiologic data available on the prevalence and incidence of tooth loss is sadly wanting.⁵ Steele et al⁶ reported from a 2009 survey of oral health in the United Kingdom that “[a]lthough the percentage of people who are edentate is small, it still accounts for approximately 2.7 million adults across England, Wales, and Northern Ireland.” The 2007 to 2009 Canadian Health Measures Survey found that 6.4% of adults aged 19 to 79 had no natural teeth, which amounts to about 1.5 million adults in Canada, excluding indigenous peoples, who need complete dentures.⁷ The equivalent number of edentulous adults in Australia is about 1.2 million.⁸ Therefore, no matter how or where we look, we cannot say with any confidence that patients in the near future will not need or want full dental prostheses.

Oral implants have moved the demand away from complete dentures as described in most of this book, although we have included a chapter on implant-retained dentures. Yet, replacement of missing teeth with an implant-retained denture is not far removed from the main topics of this book. The diagnostic skills are very similar for the clinician who is helping a patient decide whether or not to replace an old prosthesis. The materials available for making either mucosal or implant dentures are much the same—as are the impressions, jaw relationships, clinical trials, delivery, and post-delivery care. In short, it would be impossible to make an implant-retained denture without the skills associated with complete dentures. And so, the question remains: “Where do we learn effectively about the consequences and replacement of missing teeth if not when making complete dentures?” A dental curriculum without complete dentures will be a curriculum challenged for clinical relevance to so much of prosthodontics and dentistry. Ultimately, a clinician without the knowledge, skills, and art associated so directly and obviously with complete dentures will be seriously restricted as a general provider of oral health care.

We see already a decline in prosthodontic services as clinicians focus their practice on less demanding services. Denture wearers do not place a heavy demand on dentists, not necessarily because they are at ease with their dentures, but because they have learned to adapt and cope with this disability. They are reluctant to seek further prosthodontic treatment because they have been dissatisfied with the treatment they received previously.⁹,¹⁰

This text is one among many on the topic of complete dentures. It differs only in that it describes and illustrates a technique that my colleagues and I have found to be relatively straightforward and based on methods without unnecessary frills. It offers a minimally acceptable protocol or clinical path based on the principles of “appropriat-ech”.¹¹,¹² Of course, this path is influenced largely by our own clinical experiences, but, when available, we reference the sources of more objective evidence to provide the biologic, psychologic, technical, and artistic foundations upon which people who are disabled by tooth loss might find relief. We have avoided detailed descriptions of alternative techniques, not because we feel that they are any less effective, but because, in our experience as clinicians and teachers, our students have attained greater success by focusing carefully on one path without the confusion of many crossroads.
References


Acknowledgments

This text evolved initially from the influence of my teachers, Stephen Bartlett, John J. Sharry, and Aiden Stephens, who gave me the solid foundation of their experiences while encouraging me to question everything. It was refined over many years by the advice and experiences shared freely by my colleagues at the University of British Columbia and by the questions raised and sometimes answered by my colleagues in prosthodontics, dental geriatrics, and public health around the globe. I am very fortunate also to have benefited from the friendship of two giants in our discipline—Gunner Carlsson and George Zarb. Gunner has been the most coherent voice of reason in prosthodontics, and in retirement he continues to ask the right questions, which I hope will be evident to readers of this book. George Zarb, in a similar way, has changed the way we all practice dentistry, yet he remains solidly connected to the foundations of our profession. His friendship, erudition, and constant support have been my mainstay in prosthodontics for almost half a century. And, most recently, I have been inspired by Peter Owen in South Africa who, through his concept of “appropriatech,” has shown me that economic stress and quality of care are indeed compatible in prosthodontics and the rest of dentistry if we can look past the technical glitz to find the services most appropriate for the communities we serve.

I acknowledge the manufacturers of the materials mentioned throughout the book. I would like to add, nonetheless, that the products identified in the text reflect my own practical experience, and in no way do I or my colleagues wish to imply that they are superior to materials available for the same purpose from other manufacturers.
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Seeking the Problem

The Interview

“Interviewing is rather like marriage: everybody knows what it is, an awful lot of people do it, and yet behind each front door there is a world of secrets.”

Ann Oakley

People seeking the services of a dentist are usually concerned about their teeth and present with specific expectations: a periodic check of the mouth, a new filling or denture, or extraction of a tooth. The clinician identifies the cause of the concern and recommends treatment after considering the many factors that could be influencing the patient's condition. A diagnosis is difficult to make based on physical evidence alone without insight into the psychologic and social context in which a patient lives and has lived. Therefore, before considering a diagnosis or treatment, the clinician should interview the patient to identify and explore all the concerns, related conditions, and expectations that prompted the patient to seek care.

The patient's story

Conducting a useful interview is an art in which the interviewer listens, observes, analyzes, and records the essence of the conversational story and behavior of the patient. Smith and Hoppe explain the importance of actively encouraging the patient to describe the human dimension of the problem. They contend that the patient who is involved in exploring the problem and choice of available treatments is more likely than the passive patient to comply with treatment.

Phase 1—Introductions

The initial phase of the interview is helped by courteously but formally using the patient’s family name (eg, Mr or Mrs Wong), rather than a first name. The overtly familiar approach of using a first name, especially when there is a large difference in age between patient and clinician, can disturb some patients and inhibit the possibility of a free-flowing and respectful dialogue. Personal familiarity when addressing older patients is better postponed until treatment is underway and mutual comfort has grown naturally between both parties.

A simple and direct introduction is a good way to begin an interview, followed sensitively by the question, “How can I help you?” Time for “small talk” should also be allowed at this initial encounter to show the patient that time has been reserved for this personal interaction. It is best not to provide too much guidance to the patient but rather to allow the problem or complaint to unfold during the dialogue. Later, when the patient’s perspective and feelings have emerged, the clinician can be more direct to solicit details and confirm the interpretation of the problem.

Phase 2—Directing the discussion

The more directive phase of the interview begins when details are needed on specific aspects of the problem. For example, when a patient states adamantly, “All I want is a good denture that fits,” the interviewer should direct the conversation to identify what exactly the patient means by “a good denture that fits.” Occasionally, this can reveal that treatment is requested by the patient in response to pressure from family or a close friend, in which case the treatment will need to satisfy a larger circle of participants. An appraisal of the patient’s general appearance can provide clues about the importance placed on dental appearance and whether or not the teeth are disturbing communication and social activities. The clinician may also notice indications of disease that require closer investigation. Angular cheilitis, for example, suggests inadequate occlusal support, a lack of proper denture hygiene, or a nutritional disorder. Swollen fingers or a tremor of the hands suggests arthritis, Parkinson disease, or other systemic disorders that complicate a patient’s tolerance of dentures. Therefore, the dentist must
resist diagnosing an organic disorder until all the human and biologic information is collected, sorted, and aligned to one or more reasonable diagnosis that could explain the patient’s complaint.

At the beginning of this directive phase, as the clinician guides the patient into a transition from the general to the specific and from the past to the present, it can help to inform the patient of the need for more details about the effects of the complaint. Sometimes eliciting this transition will quickly bring focus on a particular problem (eg, “My upper denture slips when I talk.”), but usually, the patient’s story remains vague (eg, “It embarrasses me when I eat.”) until specific prompts clarify each detail of the concerns and symptoms. The exact words used by a patient, such as “pain,” “rocking,” or “ugly,” are frequently more informative than general terms, like “fit,” for describing specific symptoms. Past and present psychologic health is assessed by probing for evidence of chronic pain or emotional instability, including depression and prolonged use of psychotherapeutic medications (eg, tranquilizers and sleeping pills).

The patient’s responses and reactions to questions should be recorded in detail throughout the interview. However, not everyone will willingly and comfortably reveal their feelings and beliefs about their problems, especially if the problems are chronic and previous treatments failed. Some patients become very emotional during the interview, so a tactful statement and a sympathetic posture by the clinician may be needed to defuse emotional outbursts. A clinician can offer a simple statement, such as, “I can understand why you feel so upset; however, tell me more details about the problem.” Above all, a patient’s emotional distress should be allowed to take its course. Patients will gain control when offered an atmosphere of respect and sympathy, and they will return the respect with trust and greater insight into the problem and its possible solutions.

**Phase 3—Explanations**

The hypothesis phase of the interview is usually entwined with the interactive phase as more information surfaces and the clinician can make one or more explanatory hypotheses that are strengthened or weakened by the patient’s interpretation of the illness. Finally, when the patient’s complaints and explanations begin to sound repetitive, it is an indication that the interview has run its course, and further inquiry is unlikely to reveal anything new. This phase should always end with a summary of the story and confirmation from the patient that the clinician has heard and recorded the information correctly. If the patient expresses doubts about accuracy, additional clarification is needed before the clinician attempts to diagnose the source of the problem and offers treatment.

**Questionnaires**

A structured questionnaire alone is not a reliable instrument for gathering information regarding the health and background of a patient. It can alert the patient to the need to provide particular details, but an open-ended interview is the only comprehensive way to obtain valid information about a patient’s concerns and relevant medical and dental experiences. Smith and Hoppe claim through a quotation from David Eddy that “[un]certainty creeps into medical practice through every pore,” and that “interviewing is required for the definitive categorization of most organic diseases and for decisions about disease probability and diagnostic procedures.” It is not at all clear how much diagnostic uncertainty is relieved by this patient-centered interview, but it unquestionably differs from the traditional recording of a patient’s medical-dental history by focusing directly on the patient’s interpretation of the illness. Smith and Hoppe offer the mnemonic POPP (personal dimension, organic-disease dimension, psychiatric diagnosis [if any], and personality features) as a guide for systematically constructing a biopsychosocial profile of the patient, with the provision that more information can be added to it as the physical examination and diagnostic tests are conducted and interpreted. A comparison of interview notes obtained on different occasions can reveal recurrent themes or conflicting symptoms and provide further insight into the patient’s motivation for seeking help and to the prognosis of various treatments.

**Significant events and treatments**

Chewing is disturbed as the dentition deteriorates, and even well-fitting dentures are much less effective than natural teeth. Therefore, the patient’s dental experiences should be investigated in detail after the scope of the complaint has been unraveled and recorded. A historical exploration of denture use includes information about the time and reason for the loss of teeth and satisfaction with the dentures. This reveals the tolerance and expectations of the patient and affords an opportunity to discuss the usual difficulties with dentures and the ability of the patient to cope with tooth loss. It also helps to know who previously made dentures for the patient so that the clinician can make reasonable efforts to obtain previous interpretations of the patient’s needs and past experiences.
Diet and nutrition

Consideration of the patient’s diet has implications for the outcome of denture treatment. Patients with weak natural teeth typically select highly processed food lacking fiber and are at risk of vitamin (eg, C, beta carotene, and folate) deficiencies, which can disturb the oral mucosa. A population-based study found that edentulous adults, when compared with those with natural teeth, had significantly lower levels of plasma ascorbate and plasma retinol, which could disturb their skin and eyesight. On the other hand, another population-based study found that many of the differences in nutritional intake could be explained by demographic, cultural, and behavioral differences, including variations in age, historical background, and smoking habits, rather than number or condition of the teeth. Other more limited investigations found that elderly people, whether healthy or frail, could eat nearly all of the food available to them without complaint, even with uncomfortable and worn dentures. Investigators in the US and Brazil found that, after adjusting for sociodemographic and behavioral characteristics, people on low incomes who had no natural teeth, when compared with people with natural teeth, consumed about 50 grams less fruit or vegetables per day, and the majority were overweight or obese. Consequently, it can be helpful to inquire about a patient’s diet and if necessary offer advice about diet before making new dentures, but it is also realistic to recognize that people who have mouth sores and difficulty chewing do not comply readily with advice on diet.

The Examination

Information on the physical status of the patient is collected deductively and systematically during a structured examination (Box 1–1).

<table>
<thead>
<tr>
<th>Box 1–1 Systemic oral examination for complete denture wearers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Jaw Function</strong></td>
</tr>
<tr>
<td>• Abnormally restricted opening. Less than 30 mm between incisors or more than 45 mm between residual ridges at the midline.</td>
</tr>
<tr>
<td>• Opening deviation. More than 10 mm from the midline on opening the mouth to at least 20 mm.</td>
</tr>
<tr>
<td>• TMJ or jaw muscle pain.</td>
</tr>
<tr>
<td>• Occlusal attrition. More than two-thirds of more than half the dentition.</td>
</tr>
<tr>
<td>• Inadequate occlusal contacts. Less than two opposing molars or premolars bilaterally.</td>
</tr>
<tr>
<td>• Acceptable.</td>
</tr>
<tr>
<td><strong>Maxillary and Mandibular Dentures</strong></td>
</tr>
<tr>
<td>• Use. Denture not worn or missing when one can be managed.</td>
</tr>
<tr>
<td>• Quality (if worn):</td>
</tr>
<tr>
<td>– Stability. Dislodged with light finger pressure to a premolar.</td>
</tr>
<tr>
<td>– Retention. Dislodged or loose when the lips are licked with the mouth open approximately 15 mm.</td>
</tr>
<tr>
<td>– Structure. Missing parts, fractures, visible porosity, or other structural defects.</td>
</tr>
<tr>
<td>– Hygiene. Calculus or visible plaque on more than 50% of the denture base.</td>
</tr>
<tr>
<td><strong>Mucosal Disorders</strong></td>
</tr>
<tr>
<td>• Angular cheilitis.</td>
</tr>
<tr>
<td>• Stomatitis. Generalized or papillomatous (less than 1 cm²).</td>
</tr>
<tr>
<td>• Denture-induced hyperplasia (epulis) or ulceration.</td>
</tr>
<tr>
<td>• Mucosal pathoses:</td>
</tr>
<tr>
<td>– Glossitis</td>
</tr>
<tr>
<td>– White patch</td>
</tr>
<tr>
<td>– Pigmented patch</td>
</tr>
<tr>
<td>– Ulcers</td>
</tr>
<tr>
<td>– Abnormal lip</td>
</tr>
<tr>
<td>– Sinus or fistula</td>
</tr>
<tr>
<td>• Other urgent orofacial needs</td>
</tr>
<tr>
<td>• None of the above</td>
</tr>
</tbody>
</table>
**Extraoral**

Teeth dominate the lower third of the face and can be observed during the interview relative to the patient’s complaints. Visible movements of a maxillary denture will verify that the denture is loose, whereas a denture that looks natural to the dentist but ugly to the patient is an ominous indication that the dentist may not be able to meet the patient’s expectations.23

The area over the temporomandibular joint (TMJ) is palpated in and around the ear, to detect pain, crepitation, or joint sounds. A painful response from the muscles of the head and neck bodes poorly for a comfortable denture, although this is an unusual finding in older denture wearers.24 Clicking sounds within the joint, like most other highly active joints, are not unusual in older patients, and are of little concern without pain. More serious symptoms involving pain, limitation of movement, or extreme deviation when opening the mouth are found in a relatively small (about 15%) proportion of older people.24,25 In addition, there is no evidence that the quality of complete dentures has any influence on TMJ disorders.26

**Intraoral**

**Occlusal contacts**

Tooth contacts influence the position of the mandible and the stability of dentures,27 but probably not as much as was once thought.28 However, the intraoral examination should identify occlusal contacts that occur: (1) when the mandible is relaxed in the retruded intercuspal position (centric relation), (2) when the teeth contact in the maximal intercuspal position (centric occlusion), and (3) during the eccentric jaw movements. The freeway space (ie, separation of the teeth) usually is measured between the maxillary and mandibular central incisors by sitting the patient upright in a relaxed position and gently parting the lips to see the space between the central incisors. The ability to impart relaxed confidence and gentle assistance to a patient will contribute greatly to the validity of the examination and measurements of occlusal contacts and jaw movements.

**Denture quality**

The quality of dentures should be assessed for retention, stability, tooth arrangement, composition and structure, and hygiene.

*Retention* relates to movement of the denture away from the ridge. When the lips are parted widely (approximately 15 mm), the maxillary denture should stay in position on the roof of the mouth without an artificial adhesive (Fig 1-1a), and the mandibular denture should not move from the alveolar ridge when the patient licks the upper lip (Fig 1-1b). However, some patients interpret even the slightest movement of a denture as a sign of impending collapse, while others undergo amazing oral gymnastics without complaint to hold an extremely defective denture in place.

![1-1](image)

*Stability* of a denture depends on the support provided by the residual ridges and the palate (Fig 1-2). It is enhanced by extending the denture base onto the structures surrounding the residual ridge within the limits of jaw and tongue movements. The usual way of evaluating this support is by assessing resistance to finger pressure on the occlusal and lateral surfaces of the denture. Resistance will depend on the activity, shape, and compressibility of the supporting ridges, muscles, and mucosa. This too is not an exact measurement and should be interpreted cautiously and with reference to the patient’s complaints.
Tooth arrangement on the denture influences not only the patient’s appearance but also the stability and retention of the denture bases. The anterior teeth support the lips, cheeks, and tongue in an arrangement that is both pleasing esthetically and tolerated comfortably during normal movements (further details are provided in chapter 6). The central grooves and tips of the cusps of the mandibular premolars and molars are positioned optimally over the crest of the residual ridge, along a line joining the center of the retromolar pad to the incisal tip of the mandibular canines.

The composition and structure of a denture base and denture teeth, whether resin or ceramic, should be intact and clean and embody the appearance of natural teeth, gingiva, and mucosa. Damaged or abraded occlusal surfaces on a denture are not unusual after many years of service, but they can appear early if the denture wearer consumes large amounts of abrasive or erosive foods or tends to grind (brux) on the dentures. The supporting mucosa and underlying ridge will be stressed if the patient clenches or grinds aggressively on the dentures, especially at night during sleep. Although the masseter muscle in older denture wearers is more active during sleep than it is in younger adults with natural teeth, the intensity of the activity is relatively low when compared with bruxism in younger people.

Denture hygiene is assessed by looking for stain, plaque, or calculus on the teeth and denture base. Microbial plaque is difficult to see unless it is very thick or stained by a few drops of a plaque disclosing agent or erythrosine or sodium fluorescein. Halitosis (ie, bad breath) is also associated with poor denture hygiene, especially when the base is old and dentures are worn overnight. The bad odor is usually from volatile sulfur compounds, but can come from an otorhinolaryngologic, gastrointestinal, pulmonary, or other systemic disorder. Placing the dentures in a plastic bag for a few minutes provides a useful way to confirm that the dentures are the source of the sweet, unpleasant smell or that referral to a physician is required.

Oral mucosa

Mucous membranes are inflamed by many systemic disorders, and particularly disorders of the blood, hormonal, metabolic, and immune systems. More commonly, inflammation in the mouth of a denture wearer is caused directly by trauma from the denture base. Consequently, examination of the mucosa should also involve areas of the mouth that are difficult to see, such as the ventral (under) surface of the tongue and the alveolar vestibules lateral to each maxillary tuberosity.

Mucosal inflammation in denture wearers can present as denture stomatitis, angular cheilitis, and hyperplasia of the mucosa.

Denture stomatitis is seen in three forms—local, generalized, and papillomatous—in the palatal mucosa underlying a denture. Movement of the papillomas is easily seen by blowing air from an air syringe across the palate (Fig 1-3). The cause and significance of the milder forms of stomatitis are unclear, although aciduric microflora—Candida albicans in particular—have been highly implicated, along with an acidic biofilm on a denture. Moreover, patients who were at high risk for caries before they lost their natural teeth might later have an elevated risk to denture stomatitis when wearing complete dentures, possibly because both conditions thrive on similar acidogenic microflora and a sweet diet. Candidal overgrowth, or candidosis, can be precipitated by a wide range of conditions, including diabetes, systemic corticosteroids or broad-spectrum antibiotics, poor nutrition, celiac disease, ulcerative colitis, Crohn disease, iron or riboflavin deficiencies, several immunodeficiencies, and local disturbances caused by radiation therapy and nicotine. It tends to grow vigorously in the absence of saliva, which helps to explain why it can grow so easily underneath and in a denture base, as well as in a dry mouth.