

Preface

to the first edition

If the modern practice of dentistry were to be suddenly deprived of the casting process, a serious impasse would be created in our profession.

The restoration of lost tooth structure, the replacement of teeth by means of fixed and removable partial denture prosthesis, and full mouth restorations, in fact the practice of dentistry with our present-day concept would be virtually impossible without the dental casting process.

A textbook on the subject of the cast gold restoration *is* difficult to write because of the requirements for exacting detail in the great number of steps involved. Although over fifty-five years have elapsed since the dental casting technique was made available to the dental profession, teeth which are beautifully restored with cast gold restorations are still too few in number—and this in spite of revolutionary advancements in techniques, materials and teaching methods since the inception of the dental casting procedure.

The casting of objects in gold by the wax elimination process was used some four or five thousand years ago by the Chinese. The famous Italian artisan Benvenuto Cellini describes the use of this method in making statues and rare artistic pieces as early as the fifteenth century. Doubtlessly the influence of his ancient art changed the course of our profession.

Historically the men who have contributed to the dental casting technique are legion; however, the name of William H. Taggart is synonymous with the cast gold single tooth restoration. Dr. Taggart was of an inventive nature and was continually experimenting with methods and materials and eventually developed a technique of casting gold inlays by the invested wax pattern method which he announced to the profession in 1907 — a date to be remembered. Taggart's announcement revolutionized not only the single tooth restoration, but also made possible our present concept of complete oral rehabilitation employing a multiplicity of cast gold prostheses.

Although Dr. Taggart was generally credited as the originator of the dental casting process, others had preceded him, principally Dr. B. F. Philbrook of Denison, Iowa. In 1897, Dr. Philbrook read his significant paper entitled "Cast Fillings." He was ahead of his time and his work remained dormant for nearly twenty years until after Taggart's revelation to the profession. Even though Dr. Philbrook's efforts were not as complete as Dr. Taggart's method, it is just and fitting that he receive recognition for his contribution.

By our present standards, dental castings in this pioneer period left much to be desired—they only somewhat reproduced the original wax pattern and fitted poorly. During this developmental period many methods were used to improve the fit of the cast gold inlays such as overlapping of the margins and swaging.

In 1908, Dr. J. G. Lane of Philadelphia made a valuable contribution by casting into a hot mould using an investment with a high silica content which resulted in better fitting castings.

Following this in 1909, Dr. C. S. Van Horn discovered the value of wax expansion which was an attempt to overcome the undesirable effects of shrinkage of the gold alloy upon being cast.

During the ensuing years much work was done by many men, especially Weinstein and Coleman, who established the shrinkage of dental casting gold alloys to be approximately 1.25 per cent. Later (1944) Hollenback's scientific investigation of this problem at Northwestern University resulted in slightly higher values of shrinkage. With this knowledge, more accurately fitting dental castings resulted by compensating for the shrinkage of the gold upon being cast by the use of wax expansion and by the use of investments which permitted setting and thermal expansion.

In 1930, Dr. Carl Scheu of Lakewood, Ohio, discovered the phenomenon known as hygroscopic setting expansion. He found that plaster or casting investments which are allowed to set in the presence of water expanded in size, a discovery which played an important role in the improvement of our casting procedure.

As early as 1932, Dr. George M. Hollenback consolidated the principles heretofore discovered and developed a methodology which has proved to be accurate to this day. The fidelity with which wax patterns can now be reproduced in gold is such that any discrepancies in our final restorations must be attributable to the great number of steps in the gold inlay procedure, and not to the casting process alone.

The history of the dental casting technique would not be complete without proper reference to Dr. G. V. Black, "The Grand Old Man of Dentistry." It was during the latter part of Dr. Black's life that Dr. Taggart revealed the casting process to the dental profession. The fundamental principles of cavity preparation laid down by Black were as vital to its success then as they are today. Dr. Black was a rare individual; his hand and mind are manifest in the dental procedures of even the present.

It was inevitable that Dr. Ingraham and Dr. Koser, co-authors of "An Atlas of Gold Foil and Rubber Dam Procedures," should combine their talents with that of Dr. Russell Bassett to write this atlas text on the cast gold restoration. The time was propitious: the success of the gold foil atlas as a teaching aid showed the need for a companion text on the dental casting procedure. The authors have combined their talents in the field of clinical dentistry, research, skill, and methodology of imparting knowledge to students at the undergraduate and graduate levels.

Dr. Ingraham is that unusual individual who performs as well as he teaches and teaches as well as he performs — his love for teaching and his constant striving for perfection are spread throughout the pages of this text. This profound desire for excellence of performance and his years of experience as a dedicated teacher have been the source of motivation for many.

Many years of valuable clinical experience in restorative dentistry coupled with years of post-graduate teaching have made Dr. Russell Bassett a valuable contributor to this atlas. In practice he was methodical and self-disciplined — much of the detailed sequence of steps has been compiled by him. This book has been completed because of his persistence and efforts as a co-ordinator.

An atlas is composed chiefly of detail illustrations and their legends arranged in sequence to tell a story. Dr. John Koser was a student and protege of Dr. Ingraham — he learned well the tenets of excellence in restorative dentistry. Fortunately for this atlas, Dr. Koser possesses a rare talent in the field of art. It was because of his understanding of the finest in operative dentistry, combined with his artistic talent that this beautifully illustrated text has been made possible.

The proper use of an atlas of this type provides even the beginning student with a method of instruction so effective that through its application, he is capable of producing an excellent result even on his first attempt. This atlas is for the student and the practitioner who wishes to advance his skill and ability in a field that is difficult to master. Neither the vast fund of knowledge nor the manual skills necessary to master this field of endeavor can be obtained by cursory reading or by one or two contacts. This highly illustrated atlas should be kept open while working in the laboratory or at the dental chair, until through the principles of reinforcement learning, each step has become automatic with the operator.

The dental casting process *is* the giant link in the chain of techniques needed in restorative dentistry. Within this text are the means to do it well.

E. David Shooshan,
Pasadena, Calif.

General Introduction

A sound approach to the restoration of the single tooth provides the means for treating one of the most frequent problems facing dentistry today. Not only must the single tooth be restored to proper function, but also the integrity of the supporting and investing tissues must be safeguarded and protected. This is accomplished by directing careful attention to the anatomy, crown morphology, shape and size of embrasures and position and shape of contact areas. It is obvious that the operator must master the procedures for restoring the single tooth before approaching the more complex problems involved in extensive treatment such as full mouth reconstruction. It is universally accepted that all successful dental procedures must be based on thorough diagnosis and treatment planning. Any concept of restorative dentistry should be complete. It should start with diagnosis and end with the finished product functioning in the mouth. If we think of operative dentistry in this manner and consider the fundamental principles involved and how to apply them, then the quality of our dental health service will be improved. The restoration of lost tooth structure with cast gold has been selected as our example.

Any sound approach to mouth treatment must be compatible with overall office economics. This can be accomplished not only by understanding the fundamentals and by mastering the techniques involved, but by carrying out these procedures in their proper sequence. In this atlas, definite standardized techniques have been presented. However, any sound procedures which do not violate fundamental principles and have been proved to give consistently satisfactory results may be used. Any technique designed to produce consistently accurate results must be based on fundamental principles. An understanding of this philosophy will permit the operator to not only evaluate a technique but to analyze the causes of the difficulties which he may encounter. Each step in any procedure has equal importance and although some steps are easier to accomplish, the same careful attention must be given to each one, or the end result will suffer. In making a single tooth casting, using the indirect technique, there are six major transfers from positive to negative.

Each one of these transfers involves a number of intermediate steps each of which must receive careful attention. The major steps from positive to negative are:

- 1) Cavity preparation
- 2) Impression
- 3) Die
- 4) Wax pattern
- 5) Mold for casting
- 6) The gold casting

The two most difficult steps in making a cast gold restoration are cavity preparation and fabrication of the wax pattern. The transformation of the wax pattern into a gold casting involves factors of time, temperature, weights and measures. If a standardized technique is carefully followed, uniformly good results can be expected. Once the operator trains himself to visualize the finished product and the technique involved before operating, the easier his task becomes. When failure occurs, it is essential to look back to determine which fundamental has been violated. It is not sufficient to place the blame for failure on materials or techniques. Success rests on the operator's ability to recognize the requirements and limitations of each.

There has long been a need for a detailed instructional guide for carrying out the technical procedures involved in cavity preparation, making accurate impressions, fabricating accurate dies, controlled waxing and casting techniques and finishing the restorations. The Atlas approach, with its detailed illustrations of technical procedures and its summary of theoretical information, has proved to be the most concise and effective instructional guide for undergraduate and post-graduate teaching. It is equally valuable for the dental practitioner who desires continued improvement in his ability to render an outstanding health service to his patients.

It is axiomatic that dentistry should be able to offer the finest possible health services to all patients. Now that accurate simplified clinical and laboratory procedures have been illustrated in detail and presented in an Atlas, the profession should employ this guide to provide the public with a more complete and improved dental health service.

—The Authors