COURSE GUIDE

DNT 310
DENTAL LABORATORY PROCEDURES I

Course Team Udoeyo,NseabasiOkon(Course Developer/Writer) FMC, Umuahia
Prof. Afolabi. Adebanjo (Programme Leader) – NOUN
Dr. Shehu Ibrahim Omoniyi (Course Coordinator) NOUN

NATIONAL OPEN UNIVERSITY OF NIGERIA

National Open University of Nigeria
Headquarters
14/16 Ahmadu Bello Way
Victoria Island,Lagos

Abuja Office
5 Dar es Salaam Street
Off Aminu Kano Crescent
Wuse II, Abuja

e-mail: centralinfo@nou.edu.ng
URL: www.nou.edu.ng

Published by
National Open University of Nigeria

Printed 2015

ISBN:

CONTENTS **PAGE**

INTRODUCTION

DNT 310, Dental laboratory procedures I, is a semester course. It is a three- credit unit course of four modules divided into sixteen study units, available to all students of Bachelor of Science Degree (B.Sc.) in Dental Technology.

A dental laboratory procedure is one of the major courses in the study of dental technology. The ability of a dental technologist to demonstrate professional manual dexterity and manipulation of the tools, equipments, and materials applied in dental laboratory procedures.The best possible result depends greatly on his knowledge of the science and art of the tools, equipments, and materials being used.

COURSE AIM

The aim of this course is to provide you with an understanding of dental laboratory procedures which includes the history of dental technology in Nigeria, dental technology procedures, role of dental technologist, impression casting and model making, duplication of models, full and partial dentures, and the role of dental laboratory technologist, as well as the manipulation processes and technical considerations of dental tools, equipments and materials to be able to achieve the best possible result in dental laboratory in day to day work as a dental technologist, it is intended to appreciate the proportion occupied by dental laboratory procedures in the development of modern day dentistry as a whole.

COURSE OBJECTIVES

To achieve the aim set out, the course has a set of objectives. Each unit has specific objectives which are stated at the beginning of the unit. You are advised to read the objectives before you study the unit because you may need to make reference to them during your study to check on your own progress. It is also good that you endeavour to check the unit objectives after completion of each unit to decipher level of accomplishment.

After going through the course, you should be able to:

- enumerate history of dental technology in Nigeria
- list tools and dental materials used in dental laboratory procedures
- discuss dental technology laboratory procedures.
- explain Impression casting and model making
- discuss duplication of models

- discuss procedures of design, construction and fabrication of full and partial dentures

WHAT YOU ARE TO LEARN IN THIS COURSE

The course content consist of a unit of the course guide which tellsyou briefly what the course is about, what course materials you need and how to work with such materials. It also gives you some guidelines for the time you are expected to spend on each unit in order to complete it successfully.

It guides the students concerning the tutor-marked assignment which will be placed in the assignment file. Regular tutorial classes related to the course will be conducted and it is advisable for the students to attend these sessions. It is expected that the course will prepare the students for challenges likely to be met in the field of dental technology learning and practise.

WORKING THROUGH THIS COURSE

To complete this course the students are expected to read each study unit, read the textbooks and other materials which may be provided by the National Open University of Nigeria. Each unit contains self-assessment exercises. In the course students would be required to submit assignments for assessment. At the end of the course there is final examination. The course should take about 15 weeks to complete.

Listed below are the components of the course, what you have to do and how to allocate your time to each unit, in order to complete the course successfully and timely.

The course demands that you should spend good time to read and my advice to students is that they should endeavour to attend tutorial sessions where they will have the opportunity of comparing knowledge with colleagues.

COURSE MATERIALS

The main components of the course are:

1. The Course Guide
2. Study Units
3. References/Further Reading
4. Assignments
5. Presentation Schedule

COURSE UNITS

The study units in this course are as follows:

Module 1 Introduction to Dental Laboratory Procedures

Unit 1 History of dental technology in Nigeria
Unit 2 Dental laboratory procedures
Unit 3 Impression casting and model making
Unit 4 Duplication of models
Unit 5 Full and partial dentures
Unit 6 The role of dental laboratory technologist

Module 2 Special Impression Trays

Unit 1 composition tray
Unit 2 Shellac tray
Unit 3 Acrylic resin tray
Unit 4 Swaged German silver tray

Module 3 Registration Blocks

Unit 1 Blocks with wax rims
Unit 2 Blocks with composition rim
Unit 3 Blocks plaster-pumice rim

Module 4 Mounting Models on a Plane-Line Articulator

Unit 1 Mounting the lower model
Unit 2 Mounting the upper model
Unit 3 Preparations for setting-up

In Module one the first unit focuses on the history of dental technology, the second unit dwell on dental laboratory procedures and the procedures are discussed; The Unit three is about Impression casting and model making, while unit four has to do with duplication of models, unit five discussed full and partial dentures, unit six discussed the role of dental technologist as well as consideration of manual dexterity for full and partial dentures fabrication.

Module two of the study discussed special impression trays;unit one introduce the composition tray. Unit two is about the Shellac tray. Unit three is about acrylic resin tray. Unitsfour dwell on swaged German silver tray and swaging tray as well.

In module three of the study, registration blocks is discussed; as unit one deals with blocks with wax rims, unit two discussed blocks with composition rim, unit three is about blocks plaster-pumice rim.

Module four discussed mounting models on a plane-line articulator; in this module unit one discussed mounting the lower model, unit two discussed mounting the upper model, while unit three deals with preparations for setting-up as well as manipulation and technical considerations.

Each unit consists of one or two weeks work and includes an introduction, objectives, main content, reading materials, exercises, conclusion, summary, Tutor-Marked Assignments (TMAs), references and other resources. The various units direct the students to work on exercises related to the required reading. In general, the exercises test the students on the materials just covered or require the students to apply it in a way that will assist them to evaluate their own progress and to reinforce their understanding of the material. Alongside the TMAs, these exercises will help the students achieve the stated learning objectives of the individual units and the course as a whole.

PRESENTATION SCHEDULE

The course materials have important dates for the early and timely completion and submission of TMAs and attending tutorials. Students are expected to submit all their assignments by the stipulated time and date and guard against falling behind schedule.

ASSESSMENT

There are three parts to the course assessment and these include self-assessment exercises, Tutor-Marked Assignments and end of course examination. It is advisable that students do all the exercises. In tackling the assignments, they are expected to use the information, knowledge and techniques gathered during the course. The assignments must be submitted to the facilitator for formal assessment in line with the deadlines stated in the presentation schedule and assignment file. The work submitted to tutor for assessment will count for 30% of the total course work. At the end of the course the students will need to sit for a final end of course examination of about three hours duration. This examination will count for 70% of the total course mark.

TUTOR- MARKED ASSIGNMENT(TMA)

The TMA is a continuous component of your course. It accounts for 30% of the total score. Students will be given four (4) TMAs to answer.

Three of this must be answered before the students are allowed to sit for the end of course examination. The TMAs would be given to the students by facilitator and returned after the assignment is done. Assignment questions for the units in this course are contained in the assignment file. The students will be able to complete assignment from the information and material contained in the reading materials, references and study units. However, it is desirable in all degree level of education to demonstrate that students have read and researched more into reference materials, which will give a wider view point of the subject.

Make sure that each assignment reaches facilitator on or before the deadline given in the presentation schedule and assignment file. If for any reason the student cannot complete the work on time, it is advisable to contact facilitator before the assignment is due to discuss the possibility of an extension. Extension will not be granted after the due date unless there are exceptional circumstances.

FINAL EXAMINATION AND GRADING

The end-of-course examination for dental laboratory procedures ı will be for about 3 hours and it has a value of 70% of the total course work. The examination will consist of questions, which will reflect the type of self-testing, practice exercise and tutor-marked assignment problems the student have previously encountered. All area of the course will be assessed.

Use the time between finishing the last unit and sitting for the examination to revise the whole course, it might be useful to review the self- assessment tests, TMAs and comments on them before the examination. The end-of-course examination covers information from all parts of the course.

COURSE MARKING SCHEME

Assignment	**Marks**
Assignment 1-4	Four assignments, best three marks of the four counts 10% each of the 30% course marks.
End of course examination	70% of overall course marks
Total	**100% of course materials**

FACILITATORS/TUTORS AND TUTORIALS

There are 15 hours of tutorials provided in support of this course. Students will be notified of the dates, times and location of the tutorials

as well as the name and the phone number of facilitator, as soon as the students are allocated a tutorial group.

The facilitator will mark and comment on student's assignments, keep a close watch on their progress and any difficulties they might face and provide assistance to them during the course. Students are expected to mail their Tutor-Marked Assignment to their facilitator before the schedule date (at least two working days are required). They will be marked by tutor and returned to the students as soon as possible.

Do not delay to contact facilitator by telephone or e-mail if assistance is needed.

The following might be circumstances in which the students would find assistance necessary, hence would have to contact course facilitator if:

- You do not understand any part of the study or the assigned readings.
- You have difficulty with self-tests.
- You have a question or problem with an assignment or with the grading of an assignment.

You should endeavour to attend the tutorials. This is the chance to have face to face contact with course facilitator and to ask questions which are answered instantly. Students can raise any problem encountered in the course of study.

To gain more benefit from course tutorials prepare a question list before attending them. Students will learn a lot from participating actively in discussions.

SUMMARY

Dental laboratory procedures I is a course that intends to provide the students with the knowledge of art and science of dental technology practise, the work of dental technologist begins with impressions of a patient's gum line and teeth from different angles accompanied by detailed information of the patient. The impressions that dental technologists work with could be in form of actual moulds or digital images.

From the impressions, dental technologists create a model of the patient's mouth. Plaster of Paris is used to make the model, which is then fitted to an apparatus called articulator that recreates the movement and bite of the patient's jaw. From this model, the dental technologist can begin studying and surveying the model, out line before sculpting the

dental prosthetic according to specifications which include construction of registration blocks, as well as mounting model on plane articulator among other technical considerations of dental laboratory procedures
Upon completing this course, students will be equipped with the knowledge of dental laboratory procedures and manual dexterity where applicable. Students will be able to understand what dental laboratory procedures is all about, and be able to specify the functions of dental technologist.

You will be able to recognise the need for the study of dental laboratory procedures and bridge the gap between the knowledge of art and science of dental technology practise.

Students will understand the need for special impression tray and its usefulness in dental restoration.

Also students will know the methods of constructing registration blocks, its difference types and usage in manipulating jaw relationship and its usefulness in mounting models on plane line articulator.

In addition, students will be able to answer questions on the subject such as:

- Enumerate history of dental technology in Nigeria
- Discuss duplication of model
- List tools that are used in dental laboratory
- Discuss laboratory procedures of registration block construction
- Discuss special impression tray
- Discuss the procedures of registration block construction
- Discuss difference type of materials use in registration block construction
- Discuss the process of mounting models on a plane-line articulator
- Discuss the technique of mounting lower and upper model respectively
- Enumerate the advantages of registration block during mounting of models on plane-line articulator

The above list is just a few of the questions expected and is by no means exhaustive.

To gain most from this course you are advised to consult relevant books to widen their knowledge on the topic.

Wishing you success in the course, it is my hope that you will find it both illuminating and useful.

MAIN COURSE

CONTENTS **PAGE**

MODULE 1

UNIT 1 HISTORY OF DENTAL TECHNOLOGY IN NIGERIA

CONTENTS

1.0 INTRODUCTION

You are welcome to the first study unit of dental laboratory procedures.In this unit, you will be introduced to history of dental technology in Nigeria. In order to enable you appreciate and understand this unit better, history of dental technology will be discussed under the following three sub-headings:

1. The early history of dental technology
2. The middle age
3. The period of mechanical advancement.

More emphasis will be laid on people that made some discoveries and the challenges of dental technology. I hope you will find the study unit interesting.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss the early history of dental technology
- explain the challenges of dental technology in the early history
- enumerate the progress made in the middle age
- mention people that made invention in dental technology in the middle age
- discuss the achievement made in the period of mechanical improvement
- discuss the present challenges of dental technology in Nigeria.

3.0 MAIN CONTENT

3.1 Early History of Dental Technology

Nigeria does not really have record of events on orthodox dental practice as in Europe, Asia and America. However, oral history had it that the Agatus in Benue State of the middle belt in Nigeria used bones and wire to replace lost teeth.

As it were, the recorded event about Dental Technology in Nigeria followed the end of the 2ndWorld War in 1946 when one S.E Bakerwas deployed to the Royal Army Dental Corps Unit in Lagos.

The teeth used in the ancient appliances were either human or carved from the teeth of animal where wire was used to hold it in a fixed position. Celsus in the first century recommended the use of lint, lead, and other substances for filling of large cavity on a tooth before extraction to prevent breakage. Restorative dental materials were relatively simple in character and few in number at the end of this ancient period inhistory. In general, the structures and applications were crude. However, a beginning had been made and mankind was conscious of the desirability of replacement of lost tooth tissues.

You should note that, the early history of dental Technology in Nigeria have it that the:

a) Agatus in Benue State of the middle belt in Nigeria used bones and wire to replace lost teeth
b) Human and animal teeth were carved and fixed in a position with the aid of wire.

Major challenges of dental technology in the period under review were as follows:

a) Fabrication was done by skilled metal worker and not experienced dental technologist
b) Only few tools and equipment were available
c) Lack of manual dexterity and poor manipulation technique'

3.2 The Middle Age

The middle age in dental technology in Nigeria is considered to be around 1953, the Western Regional Production Development Board, Ibadan advertised to send people on course which attracted many applications. When the selection exercise was completed which was around March, 1954, about five (5) candidates emerged successfully to study Dental Technology. These candidates were Mr. Akadri(who retired as a Lt. Col in Nigerian Army), Mr. Adetunji, Mr. Akila, Mr. Anokwu and one Mrs. Ashogbon.

Efforts for the admission of these candidates into a suitable institution for studies around 1954 failed and so the Dental Mechanic Instructor at Broad street Lagos S.E. Baker was contacted privately to assist in coaching these students. This was almost towards the ending of 1955.
Through Bakers'advice and assistance, instead of training privately in Lagos, arrangement was made on how these five students would travel to United Kingdom (UK) to study Dental Mechanics. This arrangement was concluded by October 1955 and by November, 1955, they finally departed to Britain for the programme.

The replacement of carved bone and ivory or natural teeth by fused mineral product was another step forward for the profession and represents one of the first great improvements in dental practise in the middle age, yet the quest for better technique of manipulation continued. This led to the period of mechanical advancement in dental practise.

3.3 The Period of Mechanical Improvement (1900 till Date)

With the beginning of the twentieth century, came many refinements and improvements in the quality of various materials and processes used in laboratory dentistry. Physical and mechanical tests combined with the fundamentals of engineering practice were applied to structural designs and restorative materials. From studies of physical and mechanical behaviour, certain shortcomings of structures and materials were observed. When shortcomings were detected, the process of improvement began with studies of methods of chemical combination or physical improvements in fabrication. In the field of dental materials

and practices since 1900 several major items have been introduced such as the casting process, the use of acrylic resins to replace the vulcanized rubber in denture base, casting alloy for denture base, stainless steel for orthodontic and other appliances and variety of elastic impression materials. Others include carbide burs and diamond cutting instruments, increased speed for rotary instruments, resin composite and glass ionomer restorative materials, new and modified polymers for restoration and impressions, improved base metal alloys and amalgams, low or no gold casting alloys (palladium based alloy), ceramics fused to metal systems and improved ceramics for single restorations.

During this period much experiment were done with fused porcelain for inlays, jacket crowns, porcelain teeth set into vulcanite bases and other modified porcelain structures. Some years later these ambitions were realised with the introduction of gas and gasoline furnaces for baking porcelain.

Biophysical applications such as stress analysis studies have resulted in better guidelines for the design of restorations in relation to the properties of particular materials and its practical application. Materials for maxillofacial appliances or dental implants have received attention. The interaction between the oral tissues has become increasingly important in the evaluation of dental materials. All these materials and techniques have made dental treatment more acceptable and affordable to both patients and professionals.

It was at Rutherford College of Technology in Britain that they were admitted for their course of study and to be involved in practical work under H**.** Featherstone's Dental Laboratory in Newcastle. At Newcastle, it was discovered that two years earlier some students from other parts of Nigeria have been on course in the same institution and had already written their city and Guilds Intermediate. These students, including one G. Otigba were very instrumental to the admission of new candidates EfiokEyo, a Federal Government of Nigeria candidate was also very helpful to them and other students that were sent from Ghana, Liberia and other countries in West African region as at then.

Pa Eyo is an indelible name in the history of Dental Technology in Nigeria. He eventually became the first indigenous Chief instructor at the Federal School of Dental Technology at No 1, Broad Street, Lagos.
In 1955, the first training institute for Dental Technology was established at No 1, Broad Street, Lagos.

It is equally important to note that between the years 1961 and 1964, the expatriates heading the institution at Broad Street were replaced by the Nigerians who had trained in the United Kingdom (UK).

The school eventually was moved to Federal School of Dental Technology and therapy Trans Ekulu-Enugu in Enugu State. It was also recorded that in 1970, the Armed forces established a Dental Institution at the Military Hospital, Yaba, Lagos. The army institution was later moved to their permanent site in 1977 at Nigerian Army Cantonment, Ojo, Lagos.

The school was accredited for City and Guild Exam Centre in 1984 and in year 2003 was given another accreditation to award HND by the National Board for Technical Education (NBTE).

Furthermore, the profession of Dental Technology witnessed a new dawn of advancement with the Federal University of Technology Owerri, Imo State establishing the department of dental technology in 2003 for the award of Bachelor of Technology (B. Tech.) degree in dental technology.

Also, other colleges of health technologies such as Ogun State College of Health technology, Ilesse, Ijebu-ode, Ogun State which was established in 2007 and Kaduna State College of Health Technology, Markarfi, Kaduna State which was established in the year 2009.

4.0 CONCLUSION

In this study unit, you have learnt about the history of dental technology. The materials, tools and equipment used in the early history and the challenges were also discussed, the improvements made in the middle age and period of mechanical improvement were all discussed. The challenges of dental technology practise were also mentioned. In the next unit we shall be looking at the dental laboratory procedures.

5.0 SUMMARY

In this study unit, you have learnt the materials, tools and equipment used and challenges of dental technology practise in the early history, the progress made in the middle age and the people that made invention within the period and the achievement made in the period of mechanical improvement and the present challenges of dental technology in Nigeria most especially.

6.0 TUTOR - MARKED ASSIGNMENT

1. Discuss how dental appliances were fabricated in the early history of dental technology.
2. Who were the people fabricating these appliances.

3. List four materials that were used in fabricating appliances in the twentieth century.
4. Mention indelible name and three others in the history of Dental Technology in Nigeria.
5. Discuss the current major challenge facing dental technology practice.

7.0 REFERENCES/FURTHER READING

Craig, R.G. (1993). *Restorative Dental Materials.* (9th ed.). Mosby

Gabel, A.B. (1941). The Role of Physics in Dentistry.*J. Applied Physics*, 12:712.

Dental Technologist Registration Board of Nigeria web page

Lufkin, A.W. (1948). *A History of Dentistry.* Philadelphia: Lea and Febiger

Shaw, F.G. & Scott D.C. (1968).*Practical Exercises in Dental Mechanics*. . England: The Dental Technician publications Ltd (3th ed.).

Weinberger, B.W. (1947). 'The Dental Art in Ancient Egypt'.*J. America Dent. Assoc.* 34:170.

Weinberger, B.W. (1948). *An Introduction to the History of Dentistry.* St. Louis: The C.V Mosby Co.

UNIT 2 DENTAL LABORATORY PROCEDURES

CONTENTS

1.0 INTRODUCTION

In the last unit, you studied the history of dental technology. In this unit we will learn the dental laboratory procedures. In this unit you will be introduced to dental laboratory procedures, the definition of some of the terminologies applied and the application of some basic procedures in dental laboratory procedures will be discussed.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss dental laboratory procedures
- list dental laboratory tools
- enumerate the importance sterilisation of dental tools
- explain the application of special tray
- explain the application of registration blocks in dental procedures.

3.0 MAINCONTENT

3.1 Definition

Before we can define dental laboratory procedure, it is important we look at the key words and understand their individual meaning.

Laboratory is a room or a place equipped for the performance of tests, experimentation, investigative processes and for research of reagents and salutary chemical materials. In dentistry, dental laboratory manufacture or fabricate customise a variety of products or appliances to

assist in the provision of oral health care by a licensed dental technologist. These products include crowns, bridges, dentures, and other dental products or appliances. Dental laboratory technologists follow a prescription and apply manual dexterity when manufacturing these appliances which include prosthetic devices such as (denture teeth and implants) and therapeutic devices such as (orthodontic devices).

Procedure is the systematic series of action conducted in a certain order or manner. Put it differently it is an established or a fixed step by step sequence of activities or course of action with definite start and end points that must be followed in the order to correctly perform a task.

Dental laboratory procedures therefore is defined as a process of utilising the equipment, tools, fittings and materials for manufacturing or fabrication of customise variety of products or appliances in an established or a fixed step by step sequence with definite start and end points.

3.2 Scope

There are so many dental laboratory procedures apply in preventive, curative and restorative dentistry, but not all the procedures are included in this study. Because the scope of this study is limited to preliminary dental laboratory procedures while the advanced and specialised procedures will come up in the subsequence courses on dental laboratory procedures II and III.

The scope of dental laboratory procedure is generally considered to comprise of mechanical and technical procedures in restorative, curative, preventive dentistry, such as prosthetics, crown and bridge and other laboratory procedures in dentistry. Dental laboratory procedures include and not limited to impression casting and model making, construction of special tray and registration block as well as mounting of model to articulator.

3.3 Application of Basic Dental Laboratory Procedures

The primary interests to the dental professionals are all derived from the three basic sciences: physics biology and chemistry. The practice of dentistry depends not only on a complete understanding of various applied techniques but also on an appreciation of the fundamental biological, chemical and physical principles that underlies the applied technique. A failure to know the scientific principle on which a technique is established often may lead to an incorrect conclusion for its application. However, an understanding of the well balanced relationship that exists among the biological, chemical and physical

principles on which the various applied dental techniques are established leads to a broader application of the techniques to serve the needs of dentistry.

It is evident that chemistry, physics and related engineering sciences serve as the foundation for science of dental technology practise. The physiological and biological aspect of dental technology practise is also very important to strengthen the whole structure of dental treatment. The fundamental principles of many physical sciences find application in the comparison of the physical characteristics and structural applications of dental technology practise. A more complete understanding of the physical, chemical, engineering and other fundamental principles is important to the dental technology professionals as an aid in understanding such typical phenomena as the melting and freezing point of casting alloy, the volatilisation of liquids with the accompanying cooling action, or the crystal structure produced in solidified metals as compared to the essentially non-crystalline structure of hydrocolloid impression compounds and denture base materials among others.

To understand the complex nature of removable partial dentures, one should have the knowledge of physical or chemical reactions that influence the combination of monomer and polymer in the liquid and solid states. For the design and construction of complete dentures it is desirable to have knowledge of organic and polymer chemistry, together with the mechanics of restorative structures and of mastication, but also biophysical principles is involved in the complete denture restoration. The stress analysis of various types of restorations involves physical principles that are closely related to successful design and the biophysical analysis of the support structures as well.

After many years of human history, mankind continues to be confronted with the problem of replacing tooth tissue lost by either accident or disease. Until such time there was no need for restorative dental appliances, the dental profession will continue to draw from all contemporary arts and sciences to develop further an improved and integrated science of dentistry.

Note: The knowledge of chemistry helps in the understanding the chemical structure, reaction, nature and technicality of dental procedures.

The knowledge of physics play role in the understanding of the physical and mechanical nature of dental procedures and also in selection, manipulation and application.

The knowledge of biology helps in understanding the anatomy and the physiology of the oral cavity and also the physiological response of oral tissue to dental appliances.

4.0 CONCLUSION

This unit has covered the definition of dental laboratory procedures, the scope and application of basic dental laboratory procedures.

5.0 SUMMARY

In this unit, you have learnt the definition of dental laboratory procedures, the importance, the scope and the application of basic dental laboratory procedures. In the next unit, you will learn about impression casting and model making in dental laboratory I hope you will find it interesting.

6.0 TUTOR - MARKED ASSIGNMENT

1. Define dental laboratory procedures.
2. Discuss the importance of dental laboratory procedures.
3. Enumerate the basic sciences applied in the study of dental technology.
4. Discuss the scope of dental laboratory procedures.

7.0 REFERENCES/FURTHER READING

Combe, E.C. (1992). *Note on Dental Materials.* (6th ed.). Churchill Livingstone.

Craig, R.G. (1993). *Restorative Dental Materials.* (9thed.) Mosby.

Eyarefe, O. S. (2013). *Comprehensive Questions and Answers on the Science and Application of Dental Materials.*

John, J.M. (1996). *Basic Dental Materials.* (2nd ed.). New Delhi India: Jaypee Brothers New Shaw.

F.G. & Scott D.C. (1968). *Practical Exercises in Dental Mechanics*. (3rd ed.). England: The Dental Technician Publications Ltd.

UNIT 3 IMPRESSION CASTING AND MODEL MAKING IN DENTAL LABORATORY

CONTENTS

1.0 INTRODUCTION

In the last unit, you studied dental laboratory procedure. In this unit we are going to discuss impression casting and model making in dental laboratory.

There are two techniques of impression-taking by dental practitioners. The first and simpler one involves the use of stock trays for taking impression of the mouth; it is from these negatives that the master-models are made. The second technique is one a dental practitioners who believe that stock trays do not fit the mouth of the patient sufficiently well to give an accurate reproduction of the contours. This longer techniques starts with a preliminary impression taken in resinous compounds carried in a stock tray. Into this is cast ordinary plaster of Paris which makes a preliminary model and it is on that a special impression tray is made. This tailor-made tray is then used to obtain a more accurate impression; it is from this impression the master -model in artificial and upon which the denture is processed. The knowledge you acquire in this unit will enable you understand the procedure for boxing-in which will be discussed in the next unit.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss impression casting and model making
- state the two techniques of impression taken in dental practice
- explain the process of obtaining a master-model
- discuss the need for a master-model.

3.0 MAIN CONTENT

A recurring requirement in the dental office is for study models or diagnostic casts of patients' teeth and adjacent tissues. Various requirements necessitate these models, the most common being for diagnostic purposes. Models are also required in fabricating crowns and dies for prosthodontic appliances.

A diagnostic cast is an accurate replication of the anatomic form of the maxillary or mandibular dental arch showing the relationships of the remaining teeth and the surrounding soft tissues (Figure 1). Diagnostic casts are a supplement to the oral examination, but in some ways they can reveal more. They permit inspection from perspectives that are impossible to obtain when looking in the patient's mouth--the occlusion from the lingual view, for example. They also permit extended observations and comparisons far beyond the patient's endurance for holding his mouth open and are, of course, available for study during the patient's absence. The dentist forms a treatment plan based on the oral examination, an interpretation of other diagnostic data, and a study of the diagnostic casts. The diagnostic casts are used in educating the patient about his/her dental needs and corresponding treatment plan.

A

B

Fig. 1: (a-b).Finished Diagnostic Cast

The casts are the final product and are produced in three distinct steps. First, the alginate impression is made directly in the patient's mouth producing a negative mold. Secondly, the impression is poured with dental stone, producing a positive cast and finally the cast is inspected for defects, repaired if possible, and trimmed to the proper size and shape on a model trimmer.

This module presents a detailed explanation of the importance and procedure for obtaining an accurate alginate impression-the first step in acquiring a diagnostic cast.

Details of the methods of casting impressions taking in the various materials are as follows.

3.1 Composition

Composition impression should not be left standing, especially in a warm room, because the property of flow which the material posses may cause distortion. Grease or mucous must be washed off the surface, lone-standing teeth must be supported by means of pins inserted in the compound and the surface should be treated with a wetting agent to release air bubbles before casting.

Composition impression are cast by the ‘’inverted” method (Figure 2), usually in plaster. This consists of filling the impression without trapping air and then turning it over into a prepared mound of more

plaster. As setting proceeds the base is shaped and the main excess is removed. The model at its thinnest should be about half an inch thick.

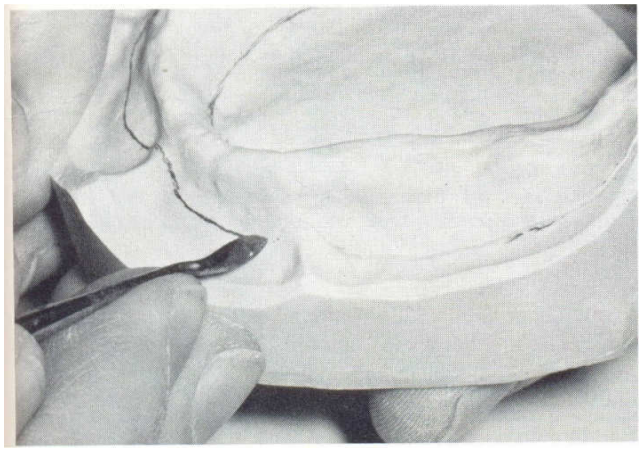

Fig. 2: Plaster of Paris Cast Prepared from Preliminary Impression

3.2 Plaster

These should be first boxed in (see below) and then coated with a separating medium before casting in artificial stone.

If however, boxing-in is not intended, the impression should be coated with a separating medium and filled with artificial stone. The practice inverting impressions to ‘’base” then is not resorted to as the stone plaster falls under the weight of the impression rendering a very thin model.

When filling the impression the stone must overlap the sides to a depth of about three sixteenths of an inch to change the flange completely (Fig.2 a-c). After setting, the stone model is inverted and based with plaster of Paris. Specially prepared rubber model bases are ideal for this task.

By the addition of one-third plaster of Paris to the stone mix the difficulty of basing is overcome and this setting time decreased. Setting expansion is almost negligible.

A

B

Fig. 2: (a-c) Impression Boxed-in and Poured in Artificial Stone to Form the Model

3.3 Procedure for Boxing-in

Attach a strip of wax or wax string to just below the periphery of the impression. (Figure 2a).

- Fill in the lingual areas of lowers before applying the boxing material.
- Encircle the impression with a sheet of modeling wax or wax bandage.
- Apply one thinned coat of alginate solution as a separator.
- Pour artificial stone into the box and vibrate gently.
- Remove impression material by carefully chipping away the impression plaster. Boiling water always loosens the impression material but will damage the model. Trim model to the required outline leaving the sulcus intact.

3.4 Hydrocolloid

Impression from these flexible materials should be cast without delay, or distortion will result due to drying out of the material. If, however, this cannot be performed, the impressions should be wrapped in damp canvas and placed in a polythene bag. Pins may be inserted into impression of lone-standing teeth, before casting to strengthen them.

Alginate impression should be completely immersed in a fixing solution (alum) for not less than thirty seconds and carefully rinsed in cold water or preferably dried.

As it is almost impossible to box-in these materials because of their bad adhesive qualities, due to moisture, they must be cast by the second (upright) method for plaster impressions (Figure 3). No separating medium is used.

Fig. 3: Alternative Method of Casting Impression

Note: model material overlapping the flange of the impression.

Great care should be taken to see that the heels of the impression do not rest on the bench, or a distorted model will result. No attempt to base the impression should be made at this stage as its weight may distort the flexible impression material.

When the artificial stone has set and the model has been subsequently based the impression should be withdrawn from the model carefully before the impression material hardens due to dehydration.

The non-reversible hydrocolloidal material such as the alginates may be used more than once, but the reversible type, which is thermoplastic, may be used repeatedly. The latter material when not in use should be stored in an air-tight jar containing a small amount of water.

3.5 Rubber or Silicone Base

These materials are probably the most accurate and stable of all the impression materials on the dental market. They are very strong and offer great resistance to tearing. With care, a few models may be cast into one impression. However, when they pull out off a perforated tray it is almost impossible to replace them accurately in the tray which, of course, results in an inaccurate second model. This disadvantage also applies to alginate impressions. Rubber or silicone materials need no pre-casting treatment, except wetting. Because they are fairly flexible, they should be cast in the upright position.

3.6 Zinc Oxide Paste

This material is used for obtaining accurate impression when relining a denture. It is smeared on the fitting surface of the ill-fitting denture which is inserted in the mouth, being cast, on withdrawal, in artificial stone without recourse to a separating medium.

Zinc oxide paste can be loosened by a stream of boiling water and subsequently chipped away. The remaining traces may be removed by turpentine. Master models (Figure 4) should be cast be artificial stone and be sufficiently thick to withstand rough usage as well as the pressures exerted in the flask when compressing the resin. There should be no blow-holes in the casts or patches of unmixed plaster. A thick mix well spatulated is essential.

When trimming models, the valley-like portion at the foot of the ridges, called the sulci must remain intact. So also must the muscle attachments. The tuberosities at the distal extremities of the upper model must not be

cut short nor must the retro molar pad areas at the distal ends of the lower model. The plaster at the junction of the hard and soft palates must not be removed. The walls of the models should remain vertical.

Dos

- Trim plaster before it sets too hard.
- Wet all impression prior to casting.
- Cast hydrocolloid impression without delay.
- Strip off the alginate impression material from the model before the alginate hardens.

Don’ts

- Don’t try to remove the composition impression before it is softened.
- Don’t cast alginate impression without reading the maker’s instruction regarding immersion in alum solution.

3.7 Mixing of Alginate

Alginate in powder form consists of a variety of particles of varying sizes and specific gravities, causing some of the particles to settle to the bottom. Consequently, the alginate container should be given a vigorous shake before use. The top of the container should be opened carefully to prevent the very fine particles (dust) from being distributed around the operatory. New improved alginates with glycol added eliminate the presence of airborne particles making them dustless (e.g., Jeltrate Plus).
Use the specific measuring devices (water and powder measurers) provided by the manufacturer for mixing of alginate. The exact amount of water and powder is necessary for the success of the impression. Follow the manufacturer's direction regarding the ratio of water to powder.

Fig. 5a: Electronic Mixing Alginate Impression Material

Fig. 5b: Manual Mixing of Alginate Impression Material

Fig. 5c: A Mixed Impression Material Loaded on Impression Tray

After the water and powder have been measured, place the water in a clean dry bowl. Sift the powder into the water. Adding the powder to the water ensures the powder particles are wet evenly. If mixed in reverse, (the water is added to the powder) the chemical reaction will start early with some particles setting faster than others.

Mix the alginate for the specific amount of time (check the manufacturer's directions) and, using an appropriate spatula (stiff), "swipe" the alginate mass against the sides of the bowl to avoid entrapment of air in the mix. The end result should be a creamy, smooth homogenous mix without any unmixed powder left in the bowl. Inadequate mixing results in grainy mixes and poorer detail in the impression.

3.8 Setting Time of Alginate

Since alginate reacts (gels) chemically, temperature is a factor in the setting time. The colder the temperature of the water the longer it takes for the alginate to set; conversely, the higher the water temperature the

faster the alginate sets. With all other factors constant, an alginate that gels in 4.5 minutes at 68° Fahrenheit (ideal) will require 3.5 minutes at 86° Fahrenheit At 59° Fahrenheit it will take 5.5 minutes. Hence, if the operator wishes the material to gel in the prescribed time, it is essential he make certain the water is at the recommended temperature by testing with a thermometer. To speed or retard the gelation time, the temperature of the water used in the mix can be altered. Two types of alginate are marketed: a fast-setting type that gels in 1 to 2 minutes, and a normal type that gels in 2 to 4.5 minutes. 'The fast-setting type is the most widely used.

The alginate can be checked to see if it has set by touching the leftover material in the bowl for stickiness. If the material is set it will rebound when gently pulled. Alginate improves in elasticity its initial set and is ordinary held in place an extra minute.

3.9 Dimensional Stability

Alginate has a tendency, after it sets (gelation), to lose (syneresis) or absorb (imbibitions) water, depending on the atmospheric conditions surrounding it. If conditions are dry, it Internal stress can be produced in alginate by movement during the gelation period or by one portion of the mass setting faster than another. The internal stresses often result in distortion of the impression.

3.10 Advantages of Alginate

Although there are problems involved in the use of alginate, it does have certain advantages. It makes an accurate impression-although it is not as accurate as certain other materials, it allows for undercuts (the curved surfaces of the teeth), which some other materials do not. The process is not time consuming. The entire process from seating the patient to the trimmed model may take less than an hour, not counting the 45-minute wait for the dental stone or plaster to set Alginate is easy to work with, has good viscosity (resistance to flow), and is low in adhesive qualities. It causes the patient no great discomfort and the dentist no great expense, and requires no extensive armamentarium. Alginate has been used. With success for decades, and though efforts have been made to replace it, none so far have succeeded. By taking reasonable care it is possible to make many impressions without failure (high rate of success with the material).

4.0 CONCLUSION

This study unit have explained in details the impression casting and model making in dental laboratory with more emphases on details of the

methods of casting impressions taking in the various materials such as composition, plaster as well as discussing mixing of alginate,setting time of alginate, dimensional stability, advantages of alginate. The applications of impression materials were also discussed.

5.0 SUMMARY

In this study unit, you have learnt about impression casting and model making as well as steps in obtaining master-models and its purposes in dental laboratory procedures. The effect of temperature on impression materials was also discussed. In the next unit we will discuss duplication of model.

6.0 TUTOR - MARKED ASSIGNMENT

1. List five materials for impression taking and discuss one that is often in used.
2. Discuss in details the setting time of alginate.
3. Explain syneresis and imbibitions.
4. Enumerate advantages of alginate impression material.

7.0 REFERENCES/FURTHER READING

Buonocore, M.G. (1963). 'Principles of Adhesive Restorative Materials.' *J. American Dent. Ass.* 67: 382 – 391.

Craig, R.G. (1993). *Restorative Dental Materials.* (9th ed.). Mosby.

John, J.M. (1996). *Basic Dental Materials.* (2nd ed.). Delhi India: JaypeeBrothers New.

Kakani, S.L. &Kakani, A. (2004).*Material Science*. New Delhi India: New Age International Publisher.

Shaw, F.G. & Scott D.C. (1968).*Practical Exercises in Dental Mechanics*. (3rd ed.). England: The Dental Technician Publications Ltd.

Ralph, W. P. (1973). *Skinner's Science of Dental Materials.* (7thed.). Philadelphia: W.B Saunders Company.

Retief, D.H..(1970). 'The Intra-Oral Factors Affecting Adhesions'.*J. Dent. Ass. South Africa,*25: 392 – 399.

UNIT 4 DUPLICATION OF MODELS

CONTENTS

1.0 INTRODUCTION

Duplicate models are required for many of the techniques of full and partial dentures construction and they may be cast in a variety of materials. Plaster duplicates are required and preserved as study models, stone duplicate are required for processing dentures upon them so that the finished prostheses may be carefully fitted to the master models and surgery time may be saved, investment duplicate are required for cast metalwork, and metal duplicates for swaged metalwork. Duplicate models must be accurate reproduction of the master models, especially for the cast metalwork, and the greatest care must be taken to ensure accuracy. The simplest method of duplication is to pour another mix of plaster into the impression after the first model has been removed. This is not an accurate method but it is adequate for study models. A better technique is one which entails the use of a stock tray and one of the many impressions materials such as the alginates or the rubber or silicon base materials. The major disadvantage of this technique is that the impression material on withdrawal sometimes comes loose from the tray which perforated prevents accurate replacement of the material.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- classify duplicate models and there are so made
- discuss a more satisfactory technique for duplicating models
- enumerate two types of material available for duplicating models
- list the four materials used in multi-duplication of models
- explain why latex is perhaps the easiest material to use in duplication of models.

3.0 MAIN CONTENT

A more satisfactory technique for duplicating models is the one in which a pourable duplicating material is used to fill a duplicating flask (Figure 6a)which surrounds the model. Two types of material are available (a) the alginates type such as Duplit which is mixed with twice as much of the water that is used with ordinary alginate impression materials and (b) the thermoplastic jelly-like compounds which become fluid on heating and gel on cooling. The thermoplastic type is considered to be the more accurate and is used extensively on cobalt-chrome work. Such materials are Croform, Virilium and other similar duplicators.

For multi-duplication of models, materials which are much stronger than ordinary duplicators are required so that they will stand the stresses involved in extracting models. The four materials in general use are (a) latex, (b) Vinamould (c) soft vulcanized rubber and (d) polyvinyl chloride.

Latex is perhaps the easiest material to use because, it involves only a simple two-part plaster mould which does not normally fracture because it is not subjected to pressure and it does not trap air. Three or four layers of modeling wax are laid over the model and either one or two thick sprues are added which act as pouring holes for the latex solution. The assembly is then invested in plaster (Figure 6b) and subsequently topped, after which the mould is placed in warm water to soften and expand the wax when it is carefully opened and the wax boiled away.
(Figure. 6b)

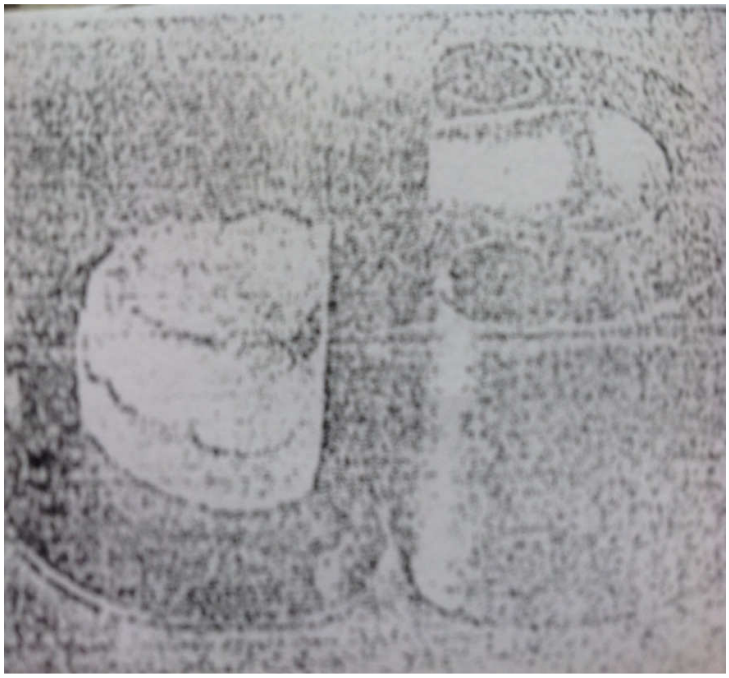

Fig. 6a: Metal Duplicating Flask: Note the Two Large Holes in the Top for Pouring

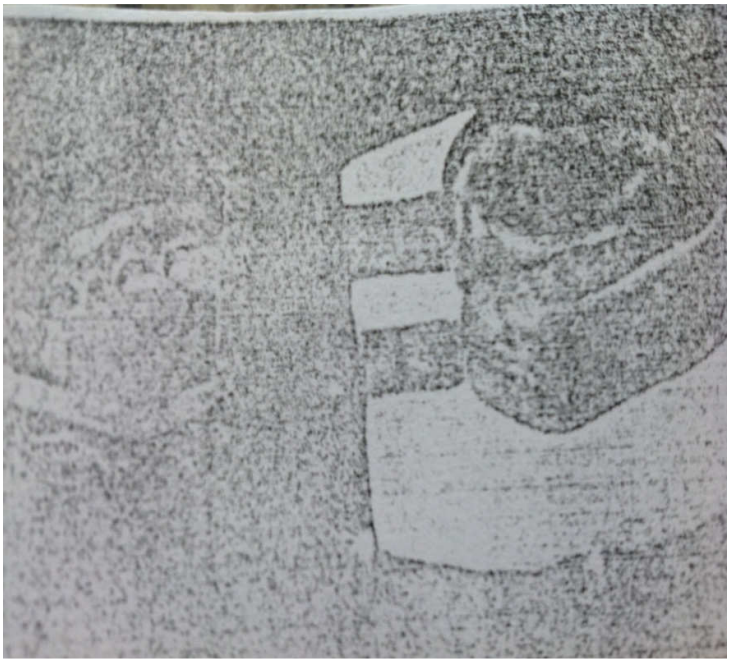

Fig. 6b: (Left) Finished Model after Pouring in Latex Solution and Removal of Sprues. (Right) Wax Pattern of Rubber Mould invested in Plaster for Topping

4.0 CONCLUSION

This study unit have explained in detail duplication of models. Discuss satisfactory technique for duplicating models, method and materials essential for duplication of different kind of models for different purposes. In the next unit we will continue with the full and partial dentures

5.0 SUMMARY

In this study unit, you have learnt duplication of models, purposes and the application of these models to dental restoration.

6.0 TUTOR- MARKED ASSIGNMENT

1. Classify duplicate models and there are so made.
2. Discuss a more satisfactory technique for duplicating models.
3. Enumerate two types of material available for duplicating models.
4. List the four materials used in multi-duplication of models.

5. Explain why latex is perhaps the easiest material to use in duplication of models.

7.0 REFERENCES/FURTHER READING

Bowen, R. W. & Rodriguez, M. S. (1962). 'Tensile Strength and Modulus of Elasticity of Tooth Structure and Several Restorative Materials'. *J. American Dent. Ass*. 64: 378 – 387.

Craig, R.G. (1993). *Restorative Dental Materials.(* 9th ed.). Mosby.

John, J.M. (1996). *Basic Dental Materials.* (2nd ed.). New Delhi India: Jaypee Brothers.

Kakani, S.L., &Kakani, A. (2004).*Material Science.* New Delhi: New Age International.

Ralph, W. P. (1973*). Skinner's Science of Dental Materials.* (7thed.). Philadelphia: W.B Saunders Company.

Shaw, F.G. & Scott D.C. (1968).*Practical Exercises in Dental Mechanics*. (3rd ed.). England: The Dental Technician Publications Ltd.

UNIT 5 FULL AND PARTIAL DENTURE

CONTENTS

1.0 INTRODUCTION

In the last unit, we discussed duplication of models. In this unit, we are going to discuss the full and partial denture design, construction and fabrication. Full and partial dentures are prostheses which replace missing teeth and restore the masticatory, aesthetic and phonetic functions of the mouth. They may be made of resinous plastic throughout or they may be a combination of metal and non-metal. A number of factors must be put into consideration to assuring that the health of the oral tissue is preserved or restored.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- enumerate important of denture
- discuss the method of fabricating full and partial denture
- list different materials used as base plate in fabrication of denture
- explain why claps are included in a partial denture.

3.0 MAIN CONTENT

Design of dentures and other construction is the responsibility of the dental technologist who knows the condition of the oral tissues and associated structures and also the type of patient who will be wearing the dentures. It is the task of the technologist to transform the prescription into a tangible form which will be acceptable not only to himself but to the patient as well.

Full dentures usually cover the greatest permissible hard-tissue area so that maximum adhesion may be obtained and the masticatory load spread over a greater extent of denture- bearing area. Maximum coverage will reduce the pressure on the hard-tissue region and

consequently reduce the rate at which the absorption takes place. Muscle attachments must be adequately relieved. The conclusion should be ‘’balanced” to prevent locking of the teeth during the mandibular movements and the flanges and the palates should be shaped so that the surrounding muscles of the cheeks, lips and tongue assist dental retention. Normally the tongues should be somewhat concave and not excessively thick.

Fig. 7a: Full Upper and Lower Dentures

Partial dentures do not usually cover maximum area, partly because there is a greater amount of frictional retention available around the standing teeth and also because it is more conducive to dental health for the denture-base to be cut away from the gingival margins. When the area of coverage is lessened it is preferable (a)to include occlusal rest in the partial denture to prevent masticatory pressure been applied to a smaller area of the mouth, which will result in an acceleration of resorption of saddle areas and (b) to include clap so that extra retention may be obtained to make up for that which has been lost as a result of reducing the area covered by the denture.

Fig.7b: Upper and Lower Dentures

Dentures must fit well not only on the hard-tissue area but around standing teeth. Accuracy is obtained by taking care at every stage of dental construction from the handling and casting of impression to the processing and finishing of the replacement.

4.0 CONCLUSION

This study unit has explained in detail full and partial dentures. Dentures must fit well not only on the hard-tissue area but around standing teeth. Accuracy is obtained by taking care at every stage of denture construction from the handling and casting of impression to the

processing and finishing of the appliance (denture). In the next unit, we shall discuss the role of dental laboratory technologist.

5.0 SUMMARY

In this study unit, you must have learnt the importance of denture replacement, how it's fit, and stage by stage of ensuring that a finished denture is accurate in the patient's mouth.

6.0 TUTOR- MARKED ASSIGNMENT

1. Enumerate important of denture.
2. Discuss the method of fabricating full and partial denture.
3. List different materials used as base plate in fabrication of denture.
4. Explain why claps and occlusal rest are included in a partial denture.

7.0 REFERENCES/FURTHER READING

John, J.M. (1996). Basic Dental Materials. (2nded.). New Delhi India: Jaypee Brothers.

Ralph, W. P. (1973). Skinner's Science of Dental Materials.(7thed.). Philadelphia: W.B Saunders Company.

Langeland, K. (1967). Skinner's Science of dental Materials (7thed.). Philadelphia Filling Materials. Int. Dent. J. 17: 405 – 440.

Shaw, F.G. & Scott, D.C. (1968). Practical Exercises in Dental Mechanics. (3rd ed.). England: The Dental Technician Publications Ltd.

UNIT 6 THE ROLE OF DENTAL LABORATORY TECHNOLOGIST

CONTENTS

1.0 INTRODUCTION

In the last unit, we discussed full and partial dentures. In this unit, we are going to discuss the role of dental laboratory technologist. This is a follow up of the full and partial dentures fabrication. This is because before any job is done a professional should know what is involved in order to carry out job professional with high knowledge of manual dexterity meeting up the needed standards.

However, a dental laboratory technologist is responsible for making full or partial dentures, making and repairing bridges, making crowns, creating veneers, or designing braces or splints to straighten or protect teeth amongst other appliances. Any type of tooth replacement mechanism that is needed for a patient is made in dental laboratory by a dental laboratory technologist.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- list tools used for making dental appliances
- explain the roles of dental technologist in delivery of dental health care
- enumerate dental materials used in making dental appliances
- discuss sterilisation of dental instrument.

3.0 MAIN CONTENT

3.1 Dental Laboratory Technologist Procedures

The work of a dental laboratory technologist begins with impressions of a patient's gum line and teeth from different angles accompanied by detailed instructions or job order. The impressions that dental laboratory technologists work with could be in the form of actual moulds or digital images.

From the impressions, dental laboratory technologists create a model of the patient's mouth. Plaster is used to make the model, which is then fitted to an apparatus that recreates the movement and bite of the patient's jaw. From this model, the dental laboratory technologist can begin sculpting the dental prosthetic according to specifications.

A wax tooth model is created so the metal framework of the device can be cast. Porcelain is applied in layers to create the shape and colour of the teeth. The dental piece is placed in a porcelain furnace so the porcelain bakes onto the metal frame. Any grinding or adjustment in shape and colour is done before a sealed finish is added.

3.2 Where Procedures are Done

Many dental centres have dental laboratory technologists and procedures are done in the dental laboratories. However, most dental laboratory technologists work in commercial laboratories. In many commercial dental laboratories, dental laboratory technologists specialise in a certain type of dental prosthesis such as dentures or braces.

Dental laboratory technologists also work in hospitals, in research settings, or for dental manufacturers and suppliers. Others work in their own private practice, teach in dental schools, or work in sales for dental prosthetic equipment, instruments and materials.

Fig. 8: A Section of Dental Laboratory where Procedures are carried out

3.3 Tools of a Dental Laboratory Technologist

Dental laboratory technologists utilise a variety of hand tools and computer-aided equipment to craft artificial teeth and dental prosthetics. A typical workbench is outfitted with wax spatulas and carvers, grinding and polishing equipment, Bunsen burners and milling equipment such as Plaster knife, Fahen knife large, Cement spatula, wax knife, Le-cron carver, Zahle carver, Beale carver, Wax carver, Wax porcelain carvers, Ash five, Maxing bowl, Maxing jar, amongst others equipments and machines.

Fig. 9: Some of the Tools Used in Dental Laboratory

3.4 Dental Materials Used in Procedures

In order to make dentures, bridges, crowns, veneers, braces, or other dental pieces or appliances, a dental laboratory technologist uses many different types of materials.

These include plastics, precious and non-precious alloys, porcelain, waxes, monomer, polymer glass and stainless steel. One or more combinations of these materials may be used to create a particular dental prosthetic.

Dental laboratory technologists use their knowledge in dental materials science, fabrication procedures and oral anatomy to determine which materials are the best choices for the device they are making.

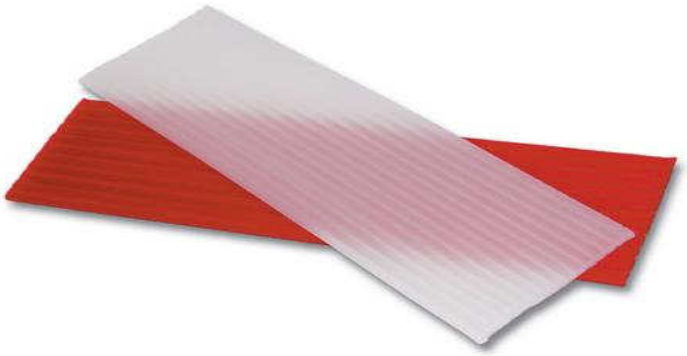

Fig 10a: A Sheet of Molding Wax

Fig. 10b: Container of Plaster of Paris

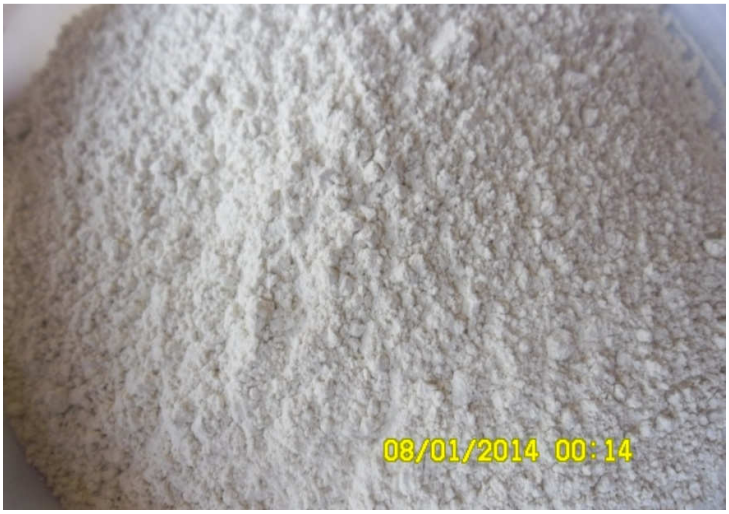

Fig. 10c: Type III Dental Stone Powder

Note: the above are some of the materials in used in dental laboratory.

3.5 Sterilisation of Dental Instrument

1. Put on gloves, goggles and laboratory/clinical coat before beginning the day proceeding. This is to prevent the potential spread of infectious disease.
2. Set up the sterilisation workstation using the glass baking trays and assorted disinfectants. The first baking dish will serve as the washing station. Fill this baking dish with hot water and detergent. Scrub the residue off of the used dental equipment in this dish using the nylon brush.
3. Transfer the scrubbed dental equipment to the second glass pan. Fill this pan with hot water and add five to 10 drops of iodine tincture to the water. Continue scrubbing the equipment in this solution.
4. Transfer the dental equipment to the third glass dish and fill it with a phenol-based cleaner solution. Phenol-based disinfectants often come in concentrate form, so dilute as per the product instructions. Allow the dental equipment to be placed in this solution for 30 minutes.
5. Remove the dental equipment from the phenol disinfectant and wash with cold running water. Place the dental equipment into a pressure cooker with enough water for 1 hour of pressure cooking. A pressure cooker is an adequate alternative to an autoclave for sterilisation.
6. Remove the pressure cooker steam regulator until all the steam pressure dissipates, allowing for removal of the lid. Fill the fourth glass pan with isopropyl alcohol and place the dental equipment

into this solution. Allow the equipment to sit in this solution until it the liquid evaporates.

7. Store the sterilised dental equipment in a clean area until the next usage.

How to Clean and Sterilise Dental Instruments

Dental instruments that are laid out for use during the day must be cleaned and sterilised at the end of the day, whether or not they were actually used. Just by sitting out in a dental office, they can collect bacteria and other contaminants that could be spread to a patient if they are used without proper cleaning and treatment. They must be properly cleaned, sterilised and stored in order to prepare them for future use.

Fig. 10: Sterilising Unit

Things Needed

- Non-foaming detergent
- Disposable drying cloths
- Sterilisation wraps or cassettes

1. Clean the dental instruments manually or through mechanical means like a thermal washer disinfector or an ultrasonic bath. Infection Control Services says that dental instruments cannot be sterilised properly unless they are thoroughly cleaned beforehand. Manual cleaning should be done in a sink specifically reserved for this purpose and they should be cleaned with non-foaming

detergent and a nylon brush. They should be immersed in lukewarm water, scrubbed below the water's surface and then rinsed. If they are being cleaned in a thermal washer disinfector or ultrasonic bath, the process should be done according to the manufacturer's instructions.

2. Afterward cleaning through either manual or mechanical means, the dental instruments should be dried with a disposable cloth.
3. Package the dried items into medical grade sterilisation wraps or sterilisation cassettes to prepare them for sterilisation. They must be properly packaged before they are loaded into the heat sterilisation unit.
4. Sterilise the instruments using a heat, steam, or chemical process. Heat is the usual method used in a dental setting. Use sterilisation equipment that is approved by the National Agency for Food and Drug Administration and Control for dental sterilisation work and operate it according to the manufacturer's specific instructions.
5. Storage of the sterilised instruments in their intact packaging. According to the Centers for Disease Control, the packaging must remain sealed and undamaged in order to retain sterile nature of the instrument. If the packaging gets wet, tears or is damaged in some way, the instrument should be sterilised again through the same.

4.0 CONCLUSION

This unit has explained in detail the role of dental laboratory technologist. Where procedures are done, tools of a dental laboratory technologist, dental materials used in procedures as well as cleaning and sterilisation of dental instrument were also mentioned.

5.0 SUMMARY

In this unit you must have learnt; the role of dental laboratory technologist, where procedures are done, tools of a dental laboratory technologist, dental materials used in the procedures, important of cleaning and sterilising dental instrument. In module two we will discuss special impression trays in details.

6.0 TUTOR - MARKED ASSIGNMENT

1. List tools use for making dental appliances.
2. Explain the roles of dental technologist in delivery dental health care.
3. Enumerate dental materials used in making dental appliances.
4. Discuss sterilisation of dental instrument.

7.0 REFERENCES/FURTHER READING

Craig, R.G. (1993). Restorative Dental Materials. (9th ed.). Mosby.

John, J.M. (1996). Basic Dental Materials. (2nd ed.). New Delhi India: Jaypee Brothers.

Ralph, W. P. (1973). Skinner's Science of Dental Materials.(7th ed.). Philadelphia: W.B Saunders Company.

Langeland, K. (1967). Skinner's Science of dental Materials (7th ed.). Philadelphia Filling Materials. Int. Dent. J. 17: 405 – 440.

Shaw, F.G. & Scott D.C. (1968). Practical Exercises in Dental Mechanics. (3rd ed.). England: The Dental Technician Publications Ltd.

Standards Organisation of Nigeria Act (1990). No. 18 AKSJ Abuja: LegalResource Centre.

Kostic, M. (1997). General Laboratory Safety Procedures and Rules.

MODULE 2 SPECIAL IMPRESSION TRAYS

Unit 1 Composition Tray
Unit 2 Shellac Tray
Unit 3 Acrylic Resin Tray
Unit 4 Swaged German Silver Tray

SPECIAL IMPRESSION TRAYS

Stock impression trays do not give accurate impression because they are usually ill-fitting and do not always full extend into the sulci. Because of these factors the impression is usually short on the periphery and the loaded material, being of varying thickness, undergoes uneven volumetric changes on setting or cooling, causing stresses within the material and distortion. An improvement in this unsatisfactory state of affairs is made by loading the tray with compound, inserting it in the mouth, loosening the impression while in position and withdrawing for cooling. After this stage, a thin layer of another impression material is superimposed after which it is re-inserted. This type of combination is called a ‘’wash’’ impression.

A more satisfactory method of taking impression is by adapting special tray material to the individual model. The material in common use is (a) non-brittle impression compound (b) shellac base-plate (c) cast soft metal such as tin, lead or plumbers solder and (d) heat-cured or self-cured acrylic resin. Swaged metal trays may be made but are not as close-fitting as those in other material.

Special trays must not be too closely adapted to the model, to prevent this, a spacer is placed over the model, this may take the form of two sheets of modeling wax, about ten dental napkins or a piece of thick canvas. Flanges of special trays must not be adapted into undercuts and the posterior border of upper must extend to the junction of the hard and soft plates. The posterior border of lowers must cover the retromolar pads. Trays must not impinge on muscle attachments and handles must be securely fixed.

Handles may be made of the same materials as the trays except for composition and shellac wire is used. The ends of wire handles should extend to the molar regions for adequate retention. For edentulous cases, a half-inch crank should be made in the handles so that the lip and sulcus tissues will not be distorted during impression taking.

Anchorage of the impression material in the tray may now be effectively obtained by means of the new adhesive such as “Fix”. Anchorage may

be obtained by perforating the tray or by lining it with cotton wool after smearing it adhesive wax.

A special tray is defined as, "A custom made device prepared for a particular patient which is used to carry, confine and control an impression material while making an impression''.

Ideal Characteristics of Special Tray

A special tray should be:

- well adapted
- dimensionally stable
- free of voids and projections
- 2-3 mm thick
- with a handle
- rigid even in thin section.

Special tray should not bind to the cast and should be easy to remove

- likewise, special tray should not react with the impression material
- the flanges should be 2-4 mm short of the reflections
- the proposed denture bearing area of the denture should be reflected in the tray's extension.

Materials used to fabricate special tray are as follows:

1. Auto polymerising acrylic resin.
2. Shellac
3. Vacuum or pressure-formed thermoplastic resin sheets.
4. Tray compound

Fabrication: Preparation of the primary cast.

1. Undercuts should be found out with the help of surveyor and should be blocked out.
2. Outline of the border of the tray should be marked with pencil which is 2/3 mm short of the reflection.
3. The relief areas should also be marked in the cast.
4. The border of the tray marked on the cast may be grooved deeper using a carver.

Adapting the Relief Wax: Relief wax should be adapted over the relief areas marked on the cast

Relief areas are: In maxilla Incisive papilla, Canine eminence, Mid palatine periphery, Fovea palatinae, Sharp spiny ridges, Torus palatines, Bony prominences, Undercut ridge. In mandible Crest of the residual ridge, Mental foramen, Genial tubercles, Torus mandibularis, Mylohyoid ridge.

Materials for giving relief include the following:

a. Base-plate wax
b. Non asbestos casting liner.

Adapting the spacer: A spacer should be adapted throughout the extent of special tray (coincide with the second line), except posterior palatal seal area in maxilla and buccal shelf area in mandible. (a) The spacer allows the tray to be properly positioned in the mouth during border moulding procedure. (b) To allow the impression to have an even thickness of impression material. (c) Prevent distortion of the material at final stage. Materials used are (a) Base plate wax (b) Non asbestos casting liner.

Thickness of the spacer for different impression material: Zine oxide eugenol paste 0.5 mm, Alginate 3 mm, Elastomeric 0.5-1.5 mm, Plaster 1.5 mm, Polysulphide, Silicones 1.3 mm - 3 mm, Plaster 2.5 mm.

The use of stoppers: The spacer should be cut out in 2-4 places so that the special tray touches the ridge in these areas. Location: Usually 4 stoppers are placed, size and shape. Stopper can be 2mm square or 2 by 4 mm rectangle or 2 mm mesio-distally, palatally over the crest of the ridge and buccally half way into the sulcus.

There are several ways that stoppers can be produced: (1) During construction of an acrylic tray in the laboratory (2) At the chair side in the mouth. (3) At the chair side on the cast.

Application of separating medium: depending on the material used, a suitable separating media is apply between the spacer and tray material for easy separation of the special tray

Fabrication of handle: Criteria of handle: (1) The handle should be parallel to the long axis of the teeth that are to be replaced. (2) The handle should not arise horizontally from the tray because it may interfere with lip movements. (3) It should be 3-4 mm thick, 8 mm long and 8 mm high. (4) The vertical distance from the sulcus to the handle is 2 cm (5). The handle up stand must be made long enough for the handle to exit through the oral commissure. (6) For mandibular tray two posterior handle should be given as finger rests.

UNIT 1 COMPOSITION TRAY

CONTENTS

1.0 INTRODUCTION

In the last unit of module one, we discussed about cleaning and sterilisation of dental equipment/tools. In this unit you are going to be introduced to special impression tray, which is one of the important appliances used in restorative dentistry. You will also learn about the ideal procedure of constructing a composition special tray. Reason for making a composition special tray in dentistry will also be covered.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the procedure of making a composition special tray
- explain Ideal characteristics of special tray
- discuss the essence of composition special tray
- explain when impression compound can be used for making special tray
- enumerate the importance of spacer
- discuss purpose of impression compound special tray.

3.0 MAIN CONTENT

Impression compounds may be used for special trays only when it is not brittle and weak. Even then, it is of no use for simple edentulous cases, the impression for which to be taken in plaster. When the plaster has set, it strengthens an otherwise weak tray.

3.1 Procedure for Construction of Composition Special Tray

Outline periphery of tray on preliminary modelCover with thick damp canvas (thus retrieving space for impression materials)Soften compound material and flatten to one eight of an inch with rollerSoften again and conform to modelCut roughly to size with scissors while still pliableSoften and conform again. Trim more accuratelyChill and file edges to requirements

3.2 Handle

Shape from suitable wire with bending pliers and adapt to modelReplace tray on model with damp canvas betweenWarm handle in flame and press gently into tray see (Fig. 11)Cover wire ends by pressing the soft composition over wet fingersIf necessary cover with more compositionSmooth with file, scraper or sandpaper

Fig. 11: Composition Tray, Wires Handle Shaped, Pressed into the Tray while Warm and One End Covered

Flame carefully to shineProvide adequate retention for impression material by roughening with hot wax knife on inside of traypre-formed handle may be embedded as above.

4.0 CONCLUSION

In this study unit, you have learnt the meaning of special impression tray as well as impression compound. You also learnt the procedure for construction of special tray using impression compound otherwise known as composition and when to apply it in the construction of special tray.

You also learnt the purpose of special impression tray which is produced for the convenient and comfort of both patients and dental specialist.

5.0 SUMMARY

In this study unit, you have learnt special impression tray and impression compound tray. You also learnt the skills require for construction of special tray using impression compound material and when to apply it in the construction as well as its purpose.

6.0 TUTOR - MARKED ASSIGNMENT

1. Explain the procedure of making a composition special tray.
2. ExplainIdeal characteristics of special tray.
3. Discuss the essence of composition special tray.
4. Explain when impression compound can be used for making special tray.
5. Enumerate the important of spacer in making special tray.
6. Discuss purpose of impression compound special tray.

7.0 REFERENCES/FURTHER READING

Craig, R.G. (1993).*Restorative Dental Materials*. (9th ed.). Mosby.

Gabel, A.B. (1941).The Role of Physics in Dentistry.*J. Applied Physics*,12:712.

Dental Technologist Registration Board of Nigeria web page.

Lufkin, A.W. (1948).*A History of Dentistry.*Philadelphia: Lea and Febiger.

Shaw, F.G.,& Scott, D.C. (1968). *Practical Exercises in Dental Mechanics*.(3rd ed.) England. The Dental Technician Publications Ltd.

Weinberger, B.W. (1947).The Dental Art in Ancient Egypt.*J. America Dent. Assoc.*,34:170.

Weinberger, B.W. (1948).*An Introduction to the History of Dentistry.* St. Louis: The C.V Mosby Co.

UNIT 2 SHELLAC TRAY

CONTENTS

1.0 INTRODUCTION

Welcome to this study unit, in the previous unit we discussed the impression tray using impression compound, and how to make impression tray with compo in dentistry. In this unit, you will learn about shellac impression tray. The knowledge you acquire will guide you in this unit.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the process of making special tray using shellac
- discuss the do's and don'ts in using shellac for special tray
- discuss the advantages and disadvantages of shellac special tray
- discuss the manipulation of shellac used in making special tray.

3.0 MAIN CONTENT

Shellac sheet may be used for special trays particularly when it is about 2mm thick, it is a reasonably strong material, it is easily adapted and makes a good tray; it is used extensively as a tray material.

3.1 Procedure for Constructing Shellac Special Tray

Outline periphery of tray on modelCover with thick damp canvasConform, shellac to model after softening in flameTrim roughly with scissors while pliable or with fretsaw when coldSoften edges and conform againFile to penciled outline and smooth edges (Figure 12).

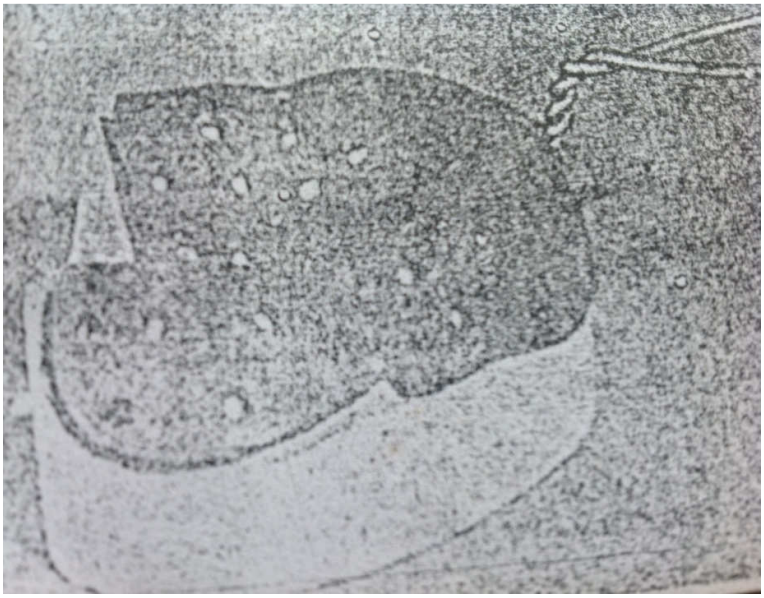

Fig. 12: Shellac Edentulous Tray with Cranked Wire Handle

Note the perforations for anchorage of the impression material.

4.0 CONCLUSION

This unit has explained construction and fabrication of special tray using shellac. The procedures, advantages and disadvantages were also discussed.

5.0 SUMMARY

In this unit, you have learnt the construction and fabrication of special tray using shellac, the procedures, advantages and disadvantages were discussed. In the next unit we will discuss acrylic resin tray.

6.0 TUTOR- MARKED ASSIGNMENT

1. Explain the process of making special tray using shellac.
2. Discuss the dos and don'ts in using shellac for special tray.
3. Discuss the advantages and disadvantages of shellac special tray.
4. Discuss the manipulation of shellac used in making special tray.

7.0 REFERENCES/FURTHER READING

Craig, R.G. (1993). *Restorative Dental Materials*. (9th ed.) Mosby.

Gabel, A.B. (1941). The Role of Physics in Dentistry.*J. Applied Physics*,12:712.

Dental Technologist Registration Board of Nigeria web page.

Lufkin, A.W. (1948). *A History of Dentistry.* Philadelphia: Lea and Febiger.

Shaw, F.G.& Scott, D.C. (1968).*Practical Exercises in Dental Mechanics.* (3rd ed.). England: The Dental Technician Publications Ltd.

Weinberger, B.W. (1947). The Dental Art in Ancient Egypt.*J. America Dent. Assoc.*,34:170.

Weinberger, B.W. (1948). *An Introduction to the History of Dentistry.* St. Louis: The C.V Mosby Co.

UNIT 3 ACRYLIC RESIN TRAY

CONTENTS

1.0 INTRODUCTION

In the last unit, we discussed special tray made with shellac. In this unit, we are going to discuss another type of special tray material called acrylic resin special tray material. Acrylic resin comes in powder (polymer) and liquid (monomer) forms which is moulded over the model before setting. Heat-cured resin also may be used for trays. They undergo polymerisation (addition or condensation) reaction to produce a firm elastic solid.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain acrylic resin special tray materials
- list the two types of acrylic resin material for special tray
- discuss the procedure for making special tray using acrylic material
- discuss the dos and don’ts of using acrylic resin materials for special tray.

3.0 MAIN CONTENT

Auto polymerising acrylic resin otherwise known as self-cure acrylic resin may be obtained for making special trays. This product, as a thin layer, is moulded over the model before setting. Heat-cured resin also may be used for trays (Fig. 13) but for this technique a wax pattern, which is invested to the periphery, is required.

Tray and Handle

Outline the periphery of the tray on the modelCover with one or two sheets of modeling waxTrim to shape and smooth where necessaryCut out the handle from two sheets of waxImpart a crank for the handle

when it is for edentulous trayAttach handle with a hot knife, ensuring that the joint is firmRemove wax tray and invest in a flask to the peripheryTop the flask, warm, before opening and boil out Coat with alginate solution and pack with acrylic resinCure in boiling water for half an hourCool, deflask and finish.

Fig. 13: Acrylic Resin Tray for an Edentulous Case. Note the sturdy handle which is cranked to avoid the lip

Dos

Extend the distal border of upper tray one-eighth of an inch beyond the junction of hard and soft plate.Remove muscles sufficiently.Obtain maximum depth lingually.Remove rust, if any, from wire.Firmly embed the handles and place at an angle as shown to avoid hip compression.

Don’ts

Don’t heat composition or shellac too severely.Don’t file across the edges-flaking occurs. Don’t forget the damp canvas.Don’t over or under extend the tray.

4.0 CONCLUSION

In this unit, we have discussed another special tray material. The dos and don’ts, manipulation and technical consideration of making special tray using acrylic resin were all discussed.

5.0 SUMMARY

In this unit, you have learnt about acrylic resin special tray, the types and the manipulation of acrylic resin materials for making special tray.

6.0 TUTOR - MARKED ASSIGNMENT

1. Explain acrylic resin special tray materials.
2. List the two types of acrylic resin material for special tray.
3. Discuss the procedure for making special tray using acrylic material.
4. Discuss the dos and don'ts of using acrylic resin materials for special tray.

7.0 REFERENCES/FURTHER READING

Combe, E.C. (1992). *Note on Dental Materials.* (6th ed.). Churchill Livingstone.

Craig, R.G. (1993). *Restorative Dental Materials.* (9th ed.) Mosby.

Craig, R.G. (1986). "Review of Dental Impression Materials" In: NIDR International State of the Art Conference on Restorative Dental Materials. Bethesda, MD. Sept 8-10.

Harcourt, J.K. (1978). "A review of modern impression materials."*Aust. Dent.,* 23:178.

John, J.M. (1996). *Basic Dental Materials.* (2nd ed.). New Delhi: Jaypee Brothers.

Shaw, F.G.& Scott, D.C. (1968). *Practical Exercises in Dental Mechanics*. (3rd ed.) England: The Dental Technician Publications Ltd.

Sheldon, Winkler (n.d). *Essentials of Complete Denture Prosthodontics*. (2nded.).

Hobkirk, J. A. (nd). *A Colour Atlas of Complete Denture.*

Basker, R. M. &Devenport. J. C. (n.d.). *Prosthetic Treatment of Edentulous Patient.* (4th ed.).

Smith, W.B. (1994). *The Clinical Handling of Dental Materials.* (2nd ed.). Butterworth: Heinemann.

Wilson, H.J. (1998). "Impression Materials."*British Dental J.*,164:221.

UNIT 4 SWAGED GERMAN SILVER TRAY AND SWAGING

CONTENTS

1.0 INTRODUCTION

In the last unit, we discussed about acrylic resin material for making special tray which is of two types; the auto polymerising acrylic resin (self cure) and heat cure. In this unit, we are going to discuss swaged German silver traycustom made. Let me recall your memory that in one of our previous units, we learnt that special impression trays as the name implies are custom made and it is used for a particular patient only.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain swaged German silver tray what it is all about
- enumerate the procedure of making swaged German silver tray
- enumerate sandcasting
- discuss Zinc Die
- discuss the common faults in swaged German silver tray making
- enumerate the technical consideration of swaged German silver tray.

3.0 MAIN CONTENT

This excise has been retained largely as an introduction to the swaging process. A lead foil pattern is taken of a modified model, the outline traced out on plate metal and the later cut out slightly oversized. This is then softened and conformed, by heating to the zinc reproduction of the original model and later swaged between the zinc die and lead counterdie. A suitable handle is prepared soldered to the tray and the whole polished.

3.1 Procedure

Preparation of sand to climinate contaminationEnsure a reserve of dry sand in case the remainder becomes too dampSpread out in casting pit and sprinkle water evenly over itRub sand through hands to distribute dampnessContinue for about ten minutesTest for correct degree of dampness by squeezing a handfulOn opening hand, the sand should fall away cleanly bearing the palm imprint.

3.2 Sandcasting

Obtain modified model and dust with French chalkPlace sandcasting ring on it and centralize Sprinkle sand around model and press downHalf fill the ring and ram the sand downFill completely and ram againLevel the surface with straight edgeTo extract the model, tap the side of the ring gentlyTurn sandcast over and blow off loose portions, closing eyes while doing so.

3.3 Zinc Die

Pour zinc soon after melting, to minimise cooling shrinkage, and at lowest possible heightStages one- pour into plain sandcast covering palate, if anyStages two- assemble cover plate and pour again until a quarter of an inch from the top. “Piping’’ first occurs here Stages three- Wait for piping to cease and fill up without pouring down the pipe hole Withdraw and clean after about ten minutesDo**not** wet zinc die before pouring counter die, for it is dangerous to pour molten metal on to a wet die.

3.4 Counter die

Smoke surface of die with taper to prevent the lead and zinc fusing.Embed die in sand to periphery of tray.Place over it a counter die ring.

Seal base of ring with sand (if necessary).Pour lead (Figure 14) quickly to prevent “cold lapping”.It should be just molten for a hot die.Fairly hot for a cold die.

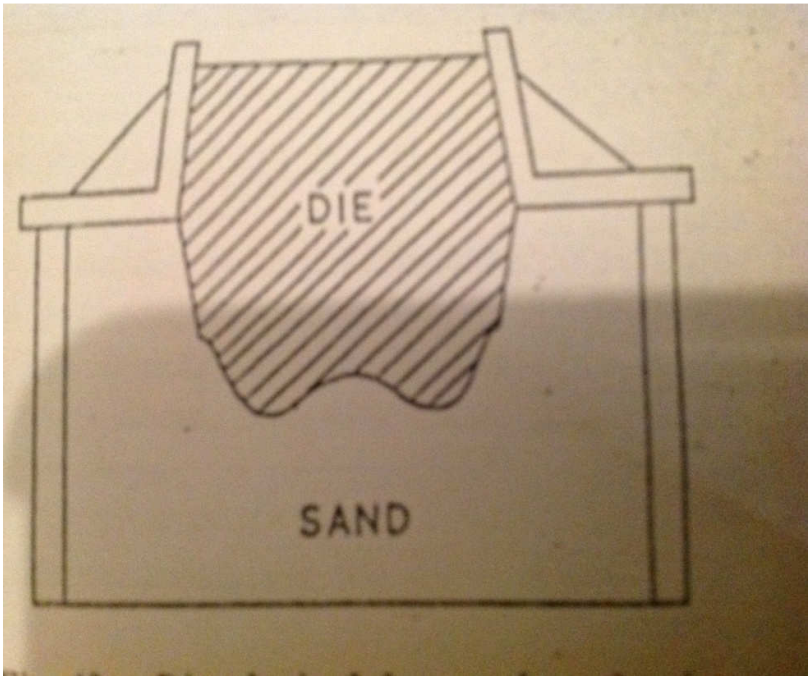

Fig. 14A: Die obtained by pouringZine into Sandcast

Fig.14B: Die with Surface smoked is embedded in sand, Counterdie ring Superimposed and Lead poured to form complete Counterdie

3.5 Palatal Counterdie (Frog)

Assemble die inside large sand-casting ring and pack full with damp sand.Uncover the palate by removing a cylindrical volume of sand about one inch in diameter.Pour lead into the cylindrical recess.A selection of palatal counterdies in progressive sizes may be obtained likewise if necessary.

3.6 Common Faults

Die

Lead contamination is indicated by a soft or fitted pitting surface; slight contamination by a softness in the centre of the plate. Localised roughness is caused by the impact of the molten metal when poured into the sand cast. Whenever, possible pour on to a non-fitting portion from as low a height as possible.

Counter Die

Zinc contamination is indicated when the die and counterdie are fused together, “cold lapping” in the form of waves on the counterdie is caused by pouring too slowly on to a cold die.

3.7 Preparation of Metal

Lead Foil Pattern

Conform lead foil exactly to outline on model as a pattern, withdraw and carefully flatten with back of wax knife Indicate upper surface with mark Place pattern on sheet of gauge 8 German silver plate employing grain to best advantage Scribe around and cut out with plate shears allowing on eight of an inch excess Indicate upper surface of plate with similar mark Soften plate by heating to dull redness and immediately quench in cold water.

This heat treatment is the secret of swaging with scratch mark uppermost conform plate to die with fingers. The pattern may be made also from a thick sheet of casting wax (Number 7).

3.8 Swaging

Tray

Secure zinc die firmly in vice with metal plate on the die, place ‘’frog” in the palate and strike with horn mallet. Continue striking until the frogs seats well. Ensure the plate covers its assignment. Beat out any folds or creases, and soften as above. Half swage while holding with fingers and soften again. Cut away large excesses, if any and soften. Trim and swage between die and counter die. Beat out any further creases with mallet. Soften and finally swage under press. Boil in alum solution or weak acids to remove oxides. Stone and polish.

Handle

Using template cut out two pieces of German silver plate of same gauge as tray. Employ grain to best advantage, as with wood. Extend one piece one-tenth of an inch pass the other. Thoroughly clean the surface to be soldered. Flatten the pieces to ensure close contact for soldering. Flux with borax solution and clip together. Place a suitable piece of silver solder, on the one-teen of an inch excess. Heat the assemblage evenly on the asbestos block until solder flows. A clear ring when dropped indicates a well soldered joint. Boil in alum solution. Trim and polish. Cleanliness is the secret of soldering.

Assembling

Impart suitable angle in handle about three-eighths of an inch from tray end. Grind end of handle to fit contour of tray. Localise soldering area on tray with pencil marks which acts as an anti-flux. Flux carefully inside the pencil mark as well as the end of the tray handle of the solution. Melt suitable piece of silver solder on to the end of tray handle. While holding the later in position on tray with tweezers, heat brush flame until solder flows. Boil in alum solution. Trim and polish (Figure15)

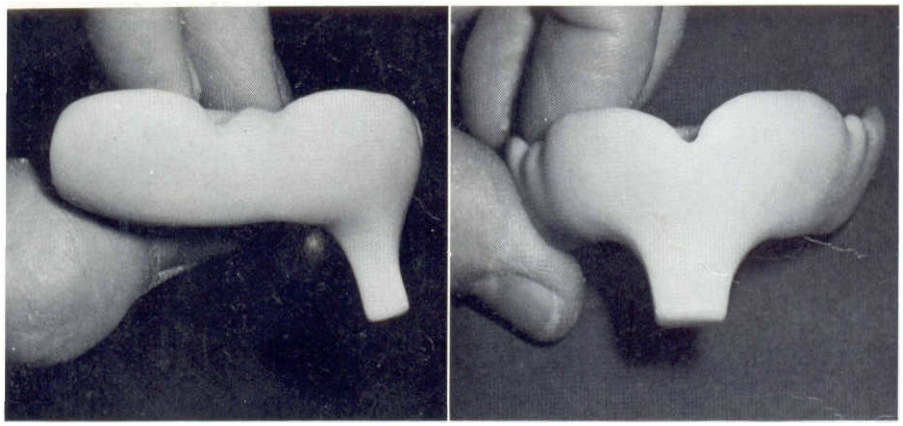

Fig.15: Completed Swaged Tray with handle Soldered and the whole Polished

Dos

Warm cover plate before pouring zinc, it may chill the molten metal prematurely causing the die to “pipe” on the fitting surface. Anneal frequently. Make clips of a one-tenth of an inch thick iron wire or steel.

Don’ts

Don’t wet the sand too much.
Don’t wet the zinc die before pouring counter-die.

4.0 CONCLUSION

This unit has discussed in detail the procedure for making swaged German silver special tray as a type of rigid impression tray.

5.0 SUMMARY

In this unit, we have discussed what swaged German silver is, procedure for making it, die and counterdie of swaged German silver tray and the technical consideration of swaged German silver tray.

6.0 TUTOR - MARKED ASSIGNMENT

1. Explain swaged German silver tray what it is all about.
2. Enumerate the procedure of making swaged German silver tray.
3. Enumerate sand-casting.
4. Discuss Zinc Die.
5. Discuss the common faults in swaged German silver tray making.
6. Enumerate the technical consideration of swaged German silver tray.

7.0 REFERENCES/FURTHER READING

Basker, R. M. & J. C. Devenport. (nd). *Prosthetic Treatment of Edentulous Patient.*

Combe, E.C. (1992).*Note on Dental Materials* (6^{th}ed.) Churchill Livingstone.

Craig, R.G. (1993). *Restorative Dental Materials* (9^{th}ed.). Mosby.

Craig, R.G. (1986). "Review of Dental Impression Materials" In, NIDR International State of the Art Conference on Restorative Dental Materials. Bethesda, Md. Sept 8-10.

Deepak, N. (nd).*Textbook of Prosthodontics.*

Hobkirk, J. A. (nd). *A Colour Atlas of Complete Denture.*

Macgregor, A. R. (nd), *Clinical Dental Prosthetics.* (3rd ed.). p 55-67 .

Pratten, D.H., & Novetsky, M. (1979).Detail Reproduction of Soft Tissue: A Comparison of Impression Materials. J. prosthet. Dent., 41: 418.

Shaw, F.G. & Scott, D.C. (1968). *Practical Exercises in Dental Mechanics*. *(*3^{rd} ed.). England: The Dental Technician Publications Ltd.

Sheldon, Winkler. (nd).*Essentials of Complete Denture Prosthodontics.*

Wilson, H.J. (1998*).* Impression Materials. *British Dental J.*,164:221

Zarb, B. (nd) *Prosthodontic Treatment of Edentulous patient.*(12ed.). pp.225- 247.

MODULE 3 REGISTRATION BLOCKS

Unit 1 Blocks with Wax RimsR
Unit 2 Blocks with Composition Rim

UNIT 1 BLOCKS WITH WAX RIMS

CONTENTS

1.0 INTRODUCTION

In the last module, we discussed special trays materials. In this present module, we are going to discuss registration blocks which are another important appliance in restorative dentistry. After model of the oral cavity is made it is important to produce a bite registration block especially in an edentulous mouth. However, registration blocks formerly known as bite blocks, are the assemblies for recording the centric relationship of the jaws, the occlusal plane, the centre of the face, the high and low smile position of the lips and the corners of the mouth. Registration blocks consist of two parts, the base which should be firm and well adapted and the rim which normally is of a softer and more workable material well secured to the base. Registration blocks are sometimes required for special purposes such as wax wafer recordings and inter occlusal grinding. In the former case and lower-than-normal rims are constructed in composition and in the latter, higher than normal rims are made of plaster and pumice both type being mounted on strong base-plate.

The most common combination of materials listed below is shellac sheet for the base and modeling wax for the rim, for a more secure base, heat-cure or self-cure acrylic resin may be used or alternatively a metal base-plate or frame work which will subsequently be used for the denture. The resin base may also be used for the denture.

Below are the base and rim materials for registration blocks construction;

Base Materials	Rim Materials
Shellac sheet	modeling wax
Modeling wax	Beeswax
Acrylic resin	Composition
Metal	Plaster pumice

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss registration block
- enumerate the types of registration blocks
- explain the function of registration block
- list the base and rim materials for the construction of registration blocks.

3.0 MAIN CONTENT

3.1 Blocks with Wax Rims

The most popular type of registration block is the all wax assembly. Its main disadvantage is that the base softens at mouth temperature and easily distorts making registration difficult. All wax blocks should be straightened with wire along the ridge and across the palate. A firmer base-plate is obtained by using shellac sheet which, for maximum stability, may be adapted over the whole of the denture-bearing area or it may be adapted only to the palate when it is intended to use the same base-plate for the set up. Shellac, like wax, may also be straightened with wire.

Procedure

Upper-shellac base, wax rimOutline periphery of base-plate with pencil and French chalk the model.

Soften shellac sheet and adapt to the palate.While still pliable, trim base-plate until the edge is just lingual to the crest of the ridge.Extend the posterior border to the junction of the hard and soft palate.Re-adapt base-plate after trimming with file.Roughen with hot knife to assist rim retention.

This distance should not be more than one-quarter of an inch from crest of the ridge. (Fig.16)

Sticky wax or wire retainers may be used to this end if preferred.With base-plate position, adapt sheet of wax to cover the model.Trim wax to penciled outline.
The wax may be left covering the palate until final smoothing, thus ensuring, a clean wax-free base plate.

The Rim

	Anterior	Posterior
Height	9mm	6mm
Width	4mm	6mm

Level ridges, if necessary, with oddments of wax. Soften a sheet of wax and roll into a thick pencil shape. Position softened roll directly over the ridge. Compress the wax to the approximate height Mould the excess downward to minimise waxing-up. Smooth sides with hot wax knife, adding wax were necessary. Remove wax sheet from palate and smooth lingual walls. Withdraw from model to trim edges. Reduce rim height if necessary with hot metal “bite-plane”, Smooth finally with small Bunsen flame. Polish wax in cold water with cotton wool.

Fig. 16: Shellac Base-Plate adapted to Plaster Model

Note: Edge is just lingual to the crest of the ridge.

Fig. 17: The Completed Upper Registration Blocks having a Shellac Base

Fig. 18: the All-Wax Upper and Lower Strengthened with Wirealong the Arch

Lower-Wax Base and Wax Rim

Outline periphery of base-plate with pencil and French chalk the model. Adapt wax sheet and cut to shape. Bend and fit the wire just below crest of ridge lingually, to obviate war page when in the mouth. Form and affix wax rim as for upper smooth rim and polish (Figure 18).A shellac base-plate may be used if desired. The posterior width of the lower rim may necessitate widening lingually, to give greater contact with the upper.

Partial Registration Blocks

Partial registration blocks possess the same fundamental feature as full registration blocks in respect of a strong, rigid and accurate-fitting base which may be either of wax strengthened with wire or preferably shellac sheet. The base additionally should cover each saddle and extend onto the labial or buccal side to form a flange which will give adequate support for the wax rims.

This flange must be rendered retentive to the wax rim by means of grooves made by a hot wax knife or, preferably by means of groove and adhesive wax. Shellac and metal bases for partial blocks (Figure 19) must not be locked into undercut areas on teeth when been adapted, because this makes it difficult for them to be withdrawn and often results in teeth breaking off. To avoid this, the teeth should be surveyed and offending undercuts blocked-out with plaster. Bases may be strengthened with wire.

A

B

Fig. 19 (a-b): A Partial Upper Registration Block

Dos

- Clear muscle attachments adequately
- Leave sufficient room for the tongue
- Relate upper and lower rims and ensure that they contact well posteriorly
- Soften wax thoroughly when forming the roll to avoid flaking during trimming
- Secure rim firmly to the base
- If the block is stock to the model, soak in water
- Avoid undue bulk.

Don'ts

- Don't have rims too high, too low or too narrow
- Don't have the occlusal face uneven
- Don't have ill-fitting bases.

4.0 CONCLUSION

In this unit, we have discussed registration block. It covered the process of constructing the registration block. Also covered in this unit is the process of different types of base and rim materials used in dentistry. It also covered the technical consideration in dentistry.

5.0 SUMMARY

In this unit, you have learnt about the registration block, the process of construction, the types of registration block and the uses/application.

6.0 TUTOR - MARKED ASSIGNMENT

1. Discuss registration block.
2. Enumerate the types of registration blocks.
3. Explain the function of registration block.
4. List the base and rim materials for the construction of registration blocks.

7.0 REFERENCES/FURTHER READING

Craig, R.G. (1993). *Restorative Dental Materials.* (9_{th}ed.). Mosby.

Craig, R.G. (1986). 'Review of Dental Impression Materials'. In *NIDR International State of the Art Conference on Restorative Dental Materials.* Bethesda, Md. Sept 8-10.

Harcourt, J.K. (1978). A Review of Modern Impression Materials.*Aust.Dent.*23:178.

Pratten, D.H. & Novetsky, M. (1979). Detail Reproduction of Soft Tissue. A Comparison of Impression Materials. *J. prosthet. Dent.,* 41 pp 418.

Shaw, F.G. & Scott, D.C. (1968). *Practical Exercises in Dental Mechanics*. (3^{rd} ed.). England: The Dental Technician Publications Ltd.

Sheldon, Winkler. *Essentials of Complete Denture Prosthodontics.* (2nd ed.).

Hobkirk, J. A. (nd). *A Colour Atlas of Complete Denture.*

Basker, R. M. Devenport, J. C. (nd). *Prosthetic Treatment of Edentulous Patient.* (4th ed.).

Deepak,Nallaswamy. (nd). *Textbook of Prosthodontics*.

Wilson, H.J. (1998). 'Impression Materials'.*British Dental J.* 164:221.

Roy Macgregor, A. *Clinical Dental Prosthetics.* (3rd ed.). pp. 55-67.

Zarb. Bolender, (nd).*Prosthodontic Treatment of Edentulous Patient.* (12th ed.). pp. 225 -247.

UNIT 2 BLOCKS WITH COMPOSITION RIM

CONTENTS

1.0 INTRODUCTION

In the last unit, we discussed registration blocks with wax rims, as well as its upper and lower procedures for construction and what it is used for in dentistry. In this unit, we are going to discuss another type of block as it is applied in dental practise.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss composition registration block
- enumerate the factors supporting the strength of composition block
- explain the procedure of constructing composition block.

3.0 MAIN CONTENT

3.1 Blocks with Composition Rims

Composition registration blocks are used in the fully adjustable articulator technique to accommodate a wax wafer between the rims so that centric and eccentric occlusions may be registered. This technique necessitates that the composition rims should not be as wax rims and that they should be grooved to lock the wax wafer in position. To facilitate construction of composition registration blocks, an ordinary wax recording of centric occlusal is made to enable the models to be mounted on a plane line articulator.

Procedure

- Adapt the base-plate to cover the whole of the denture area.
- Remove excess material and smooth the edge.
- Provide adequate relief for muscle attachments.
- Acrylic resin bases may be preferred for the technique.
- Roughen the shellac on the ridge crest for retention of the rim.
- Soften the composition, form it into a roll and adapt it into a ridge.
- Secure it firmly to the base and smooth the facial and lingual sides.
- When hard reduce the height of the rim by drawing it over rough sand paper.
- The occlusal surface should be 1mm lower than the occlusal plane marked on the wax rim.
- Between the upper and lower rims, therefore, there will be a space of 2mm.
- Impart grooves in the surface of both rims for retention of the water.

Note the deep grooves in the occlusal surfaces for keying the wax wafer.

4.0 CONCLUSION

This study unit has covered composition registration block and its application in dentistry. It was mentioned at the cause of this study unit how to adapt the base-plate, remove excess and smooth the edge as well as imparting grooves in the surface of both rims for retention of the water.

5.0 SUMMARY

In this unit, you must have learnt how to adapt the base-plate, remove excess and smooth the edge as it is secured firmly to the base with smooth facial and lingual sides as well as imparting grooves in the surface of both rims for retention of the water.

6.0 TUTOR-MARKED ASSIGNMENT

1. List Discuss composition registration block.
2. Enumerate the factors supporting the strength of composition block.
3. Explain the procedure of constructing composition block.

7.0 REFERENCES/FURTHER READING

Roy Macgregor, A. (nd).Clinical Dental Prosthetics. (3rd ed.). pp. 55-67.

Craig, R.G. (1993). Restorative Dental Materials. (9th ed.). Mosby.

Craig, R.G. (1986). 'Review of Dental Impression Materials'. In: NIDR International State of the Art Conference on Restorative Dental Materials. Bethesda, Md. Sept 8-10.

Deepak, Nallaswamy. (nd). Textbook of Prosthodontics.

Harcourt, J.K. (1978). 'A Review of Modern Impression Materials'. Aust. Dent.23:178.

Hobkirk, J. A. (nd). A Colour Atlas of Complete Denture.

Basker, R. M. & J. C. Devenport. (nd.) Prosthetic Treatment of Edentulous Patient. (4th ed.).

Shaw, F.G. & Scott, D.C. (1968). Practical Exercises in Dental Mechanics. (3rd ed.). England: The Dental Technician Publications Ltd.

Sheldon, Winkler. (nd).Essentials of Complete Denture Prosthodontics, (2nd ed.). pp. 2- 5.

Wilson, H.J. (1998). 'Impression Materials'. British Dental J. 164:221.

Zarb.Bolender (nd.) Prosthodontic Treatment of Edentulous patient. (12th ed.). pp.225- 247.

MODULE 4 MOUNTING MODELS ON A PLANE-LINE ARTICULATOR

UNIT 1 MOUNTING THE LOWER MODEL

CONTENTS

1.0 INTRODUCTION

In the last module, we discussed registration blocks, different types of registration blocks and the factors necessitating construction of registration blocks. In this unit, we will discuss mounting the lower model.

A plane line articulator is one which incorporates a single hinge joint and reproduces only the vertical opening movement of the mandible.

When the jaw relationship has been obtained by the clinical operator, the models are assembled and the unit mounted on the articulator. The registration such as occlusal plane, centre line, smile lines, canine line and vertical dimensions should be recorded on the plaster work for reference purposes.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain what a plane line articulator is
- list the jaw relationship obtained by the clinical operator before mounting on articulator
- explain the technique of mounting model on articulator
- discuss the procedure mounting the lower model on articulator

- list the components of a plane line articulator.

3.0 MAIN CONTENT

3.1 Mounting the Lower Model

Definition: A plane line articulator is one which incorporates a single hinge joint and reproduces only the vertical opening movement of the mandible.

During mounting, ensure that the plaster completely adjoins the shoulder of the upper and lower articulator arms because an actual contact in the spots is the only proof that the upper and lower models have completely returned to their original position having been withdrawn from the articulator.

The marks that are to be found on registration blocks are for dictating to the technicians the length, width and position of the teeth to be used when setting-up. When choosing the upper anteriors the neck should extend just above the high smile line and the neck of the lowers just below the low smile line. These length, therefore, indicate the length of the teeth.

The canine line indicates the total width of the six upper anteriors and the occlusal plane the vertical position of the teeth. It is essential to set the occlusal plane of the registration blocks parallel to and midway between, the articulator arms. This ensures that the models are as close as possible to the same relationship on the articulator as the jaws are to the condylar head.

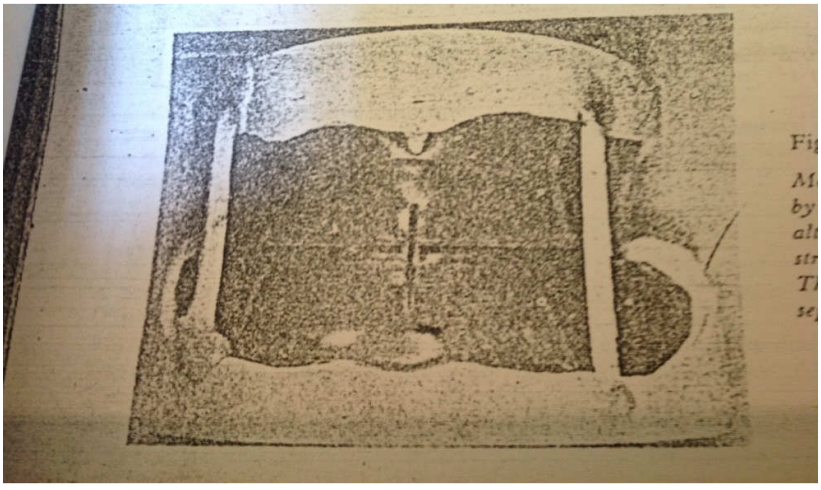

Fig.21: Model and Blocks held together by means of Matchsticks

As alternative method is to use strips of wax instead of sticks. This enables the models to be separated easily when investing.

Procedures

Mounting the Lower Model:

- roughen the base of models to improve union with the mounting plaster
- assemble registration blocks and models and secure the assembly by means of match sticks and sticky-wax (figure 21)
- soak the unit in water for about five minutes
- grease or oil the articulator arm slightly
- mix sufficient plaster for the base only
- place a small amount of plaster on bench mat and position lower arm of articulator in it.

Cover with more plaster

- Lift upper articulator arm and position model over the lower arm
- Take care to place the occlusal plane horizontally
- This may be accomplished by means of spring dividers before the plaster has set
- Shape the sides of the wet plaster and remove the main exces.
- Trim the base with a knife while the plaster is setting
- Alternatively leave until set and remove excess on the model-trimmer
- Make sure that the plaster adjoins the shoulder of the articulator arms (Figure 22).

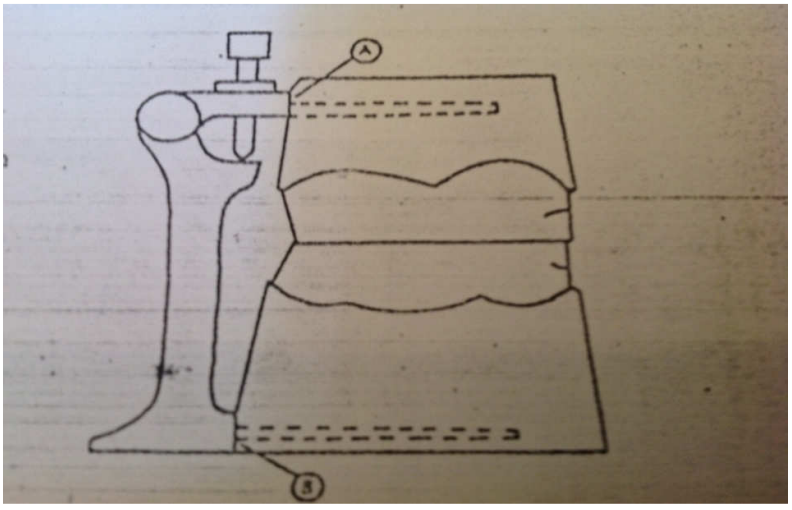

Fig.22: Models and Blocks mounted on Articulator

Points A and B showing plaster adjoining the shoulders of articulator arms.

4.0 CONCLUSION

In this unit, we have discussed mounting the lower model on a plane line articulator; the dental laboratory procedure of this process was also discussed. Plaster of Paris is usually used to mount models on articulator. However it must be of note that stone plaster could also be used for this purpose.

5.0 SUMMARY

In this unit of the study you have learnt:

- mounting the lower model on a plane line articulator
- the dental laboratory procedure of this process.

In the next unit we will discuss mounting the upper model on articulator.

6.0 TUTOR-MARKED ASSIGNMENT

1. Explain what a plane line articulator is.
2. List the jaw relationship obtained by the clinical operator before mounting on articulator.
3. Explain the technique of mounting model on articulator.
4. Discuss the procedure mounting the lower model on articulator.
5. List the components of a plane line articulator.

7.0 REFERENCES/FURTHER READING

Craig, R.G. (1986). 'Review of Dental Impression Materials'. In: *NIDR International State of the Art Conference on Restorative Dental Materials*. Bethesda, Md. Sept 8-10.

Harcourt, J.K. (1978). 'A Review of Modern Impression Materials' .*Aust. Dent.*23:178.

John, J.M. (1996). *Basic Dental Materials.* (2nd ed.). New Delhi India: Jaypee Brothers.

Shaw, F.G. & Scott, D.C. (1968). *Practical Exercises in Dental Mechanics*. (2nd ed.), England: The Dental Technician Publications Ltd.

Sheldon, Winkler (nd).*Essentials of Complete Denture Prosthodontics.* (2^{nd} ed.). 2.

Hobkirk, J. A. *A Colour Atlas of Complete Denture.*

Basker, R. M. & Devenport, J. C. (nd).*Prosthetic Treatment of Edentulous Patient*.edi 4. Deepak Nallaswamy. Textbook of Prosthodontics.

Roy- Macgregor, A. (nd.).*Clinical Dental Prosthetics.* edi 3. p 55-67.
Wilson, H.J. (1998). 'Impression Materials'. *British Dental J.* 164:221.

Zarb, Bolender (nd) *Prosthodontic Treatment of Edentulous Patient*.edi 12. p225 247.

UNIT 2 MOUNTING THE UPPER MODEL

CONTENTS

1.0 INTRODUCTION

In the last unit, we discussed mounting of the lower model and its procedure. In this unit we are going to discuss the mounting of upper model and its anatomical registration marks. The ability to manipulate gypsum material (plaster of Paris) properly during this process shall be discussed. Manipulation of plaster of Paris is very important and to manipulate the material properly there are some factors that come to bear in mind. These factors are known as the technical considerations.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss the mounting of upper model and its purpose
- explain the purpose of manipulating plaster of Paris
- enumerate the technical consideration in handling plaster of Paris during the process of mounting
- list the marks expected to be transferred to the side of upper model for check/references
- enumerate the dos and don’ts in this process.

3.0 MAIN CONTENT

3.1 Mounting the Upper Model

- Soak again in water and raise the arm of the articulator
- Place a small amount of plaster on the model and lower the articulator arm
- Cover with more plaster, flatten the top and make the sides vertical

- Mounting the models in one operation is easily accomplished after a little experience
- The procedure for mounting a full upper or a full lower case is identical to the one described.

Preparation for Setting-Up

- Adjust the articulator set screw and register the centre line
- Mark the occlusal plane check-line (Figure 23)
- Ensure that this is parallel to the occlusal plane
- Place one point of the spring dividers on the check-line at point (A)
- Register the low smile line (B), occlusal plane (C), high smile line (D) and vertical registration (E).

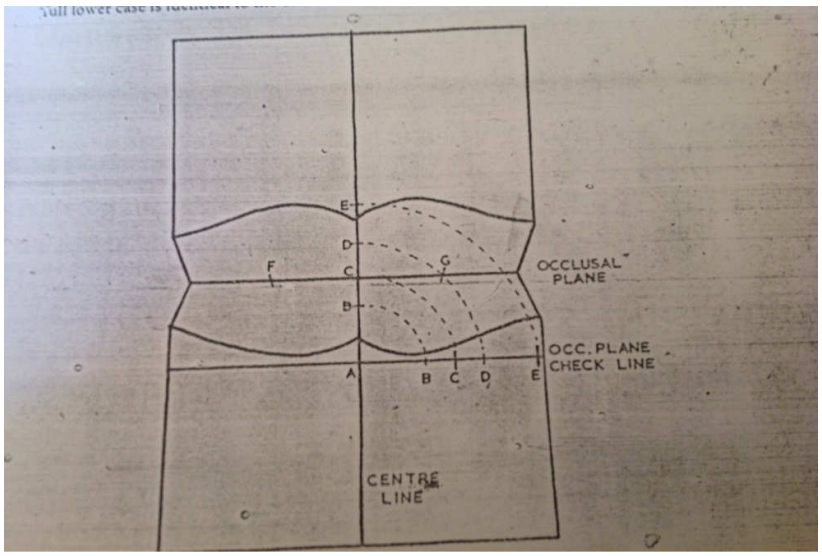

Fig. 23: **Front View of Articulated Models showing the various registrations recorded on the Occlusal plane check-line**

These are low smile line (B), occlusal line (C), high smile line (D), and vertical dimension (E), (F) and (G) are canine lines. Note that the plasterwork has vertical and horizontal faces.

The purpose of these marks is that checks may be made subsequently to ensure that the teeth have been placed correctly.Mark the ridge centers on the models using a pencil (Figure 24). Adapt relief if required and cut posterior dam.

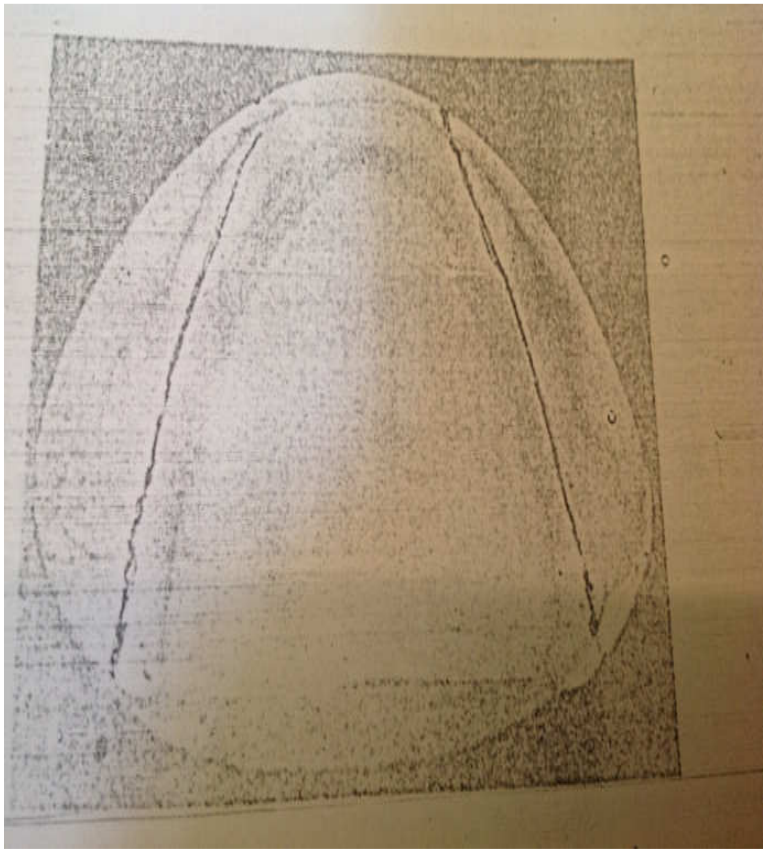

Fig. 24: The Lower Model with Center of Ridge Lines Marked

Dos

- Check the articulator hinge before mounting
- Tighten or slacken as necessary
- Lightly oil the articulator arms
- Ensure that the occlusal plane is horizontal
- The plaster surfaces are vertical and horizontal.
- Strive to keep the sides of the plasterwork vertical and the top horizontal.
- This symmetry will help to avoid unwanted tilts or deviations of the teeth when setting-up.

Don’ts

- Don’t allow the blocks to move during mounting
- Don’t slice the teeth when using model-trimmer
- Don’t remove plaster which adjoins the articulator
- Don’t forget to record the block-recordings on the plasterwork.

4.0 CONCLUSION

This study unit has explained in detail the manipulation and technical consideration of plaster of Paris to achieve the best desired result for mounting of models on articulator. The technical considerations discussed in this unit include; the markings on the registration block, how it can be transferred to the side of the upper mounting model for check and reference purposes, what to do and what not to do were also discussed.

5.0 SUMMARY

In this unit, you have learnt the manipulation and technical consideration of plaster of Paris to achieve the best desired result for mounting of models on articulator, the effects of these technical considerations on plaster of Paris and how to care for the mounting job was discussed under dos and don'ts. In the next unit we will be discussing preparations for setting-up.

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss the mounting of upper model and its purpose.
2. Explain the purpose of manipulating plaster of Paris.
3. Enumerate the technical consideration in handling plaster of Paris during the process of mounting.
4. List the marks expected to be transfer to the side of upper model for check/references.
5. Enumerate dos and don'ts in this process.

7.0 REFERENCES/FURTHER READING

Combe, E.C. (1992).*Notes on Dental Materials*. (6th ed.). Churchill Livingstone.

Harcourt, J.K. (1978). *A Review of Modern Impression Materials.Aust. Dent.*23:178.

John, J.M. (1996). *Basic Dental Materials.*(2nd ed.). Delhi India:Jaypee Brothers New

Hobkirk, J. A. *A Colour Atlas of Complete Denture.*

Basker, R. M. & J. C. Devenport. (nd.) *Prosthetic Treatment of Edentulous Patient*, edi 4.

Deepak, N. (nd.) *Textbook of Prosthodontics.*

Macgregor, R. A. (nd).*Clinical Dental Prosthetics*.edi 3. p 55-67 4.

Shaw, F.G. & Scott, D.C. (1968). *Practical Exercises in Dental Mechanics*. (3nd ed.). England: The Dental Technician publications Ltd.

Sheldon, Winkler. (nd.).*Essentials of Complete Denture Prosthodontics.* edi 2. 5.

Zarb, B. (nd) *Prosthodontic Treatment of Edentulous Patient*. edi 12. p.225-247 3.