ENDODONTIC SIMULATION AND CLINIC MANUAL

Louisiana State University

Health Science Center

School of Dentistry

2015
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CHAPTER I: INTRODUCTION

to the specialty of Endodontics

Endodontics

The branch of dentistry concerned with the morphology, physiology and pathology of the human dental pulp and periradicular tissues. Its study and practice encompass the basic and clinical sciences including the biology of the normal pulp and the etiology, diagnosis, prevention and treatment of diseases and injuries of the pulp and associated periradicular conditions. The scope of endodontics includes, but is not limited to, the differential diagnosis and treatment of oral pains of pulpal and/or periapical origin; vital pulp therapy such as pulp capping and pulpotomy; nonsurgical treatment of root canal systems with or without periradicular pathosis of pulpal origin, and the obturation of these root canal systems; selective surgical removal of pathological tissues resulting from pulpal pathosis; intentional replantation and replantation of avulsed teeth; surgical removal of tooth structure such as in root-end resection, bicuspidization, hemisection and root resection; root-end filling endodontic implants; bleaching of discolored dentin and enamel (teeth); retreatment of teeth previously treated endodontically; and treatment procedures related to coronal restorations by means of post and/or cores involving the root canal space.

Endodontist: A dentist with two or more years of advanced training in the scope of endodontics who has received a certificate in endodontics from an advanced education program accredited by the ADA Commission on Dental Accreditation and who limits his or her practice to endodontics. (Dentists who limited their practice to endodontics prior to recognition of the specialty in 1963 are also recognized as endodontists.) The endodontic specialist is responsible for the advancement of endodontic knowledge through research, the transmission of information concerning the most recent advances in biologically acceptable procedures and materials, and the education of the public as to the importance of endodontics in keeping the dentition in a physiologically functional state for the maintenance of oral and systemic health.
Board-certified endodontist: As defined by the American Board of Endodontics, an endodontist who has passed the certifying examination administered by the American Board of Endodontics. American Association of Endodontists
Objectives of Endodontic Therapy: (Guide to Clinical Endodontics, 4th ed. AAE 2004 page14.)

1. “To alleviate present and prevent future adverse clinical signs or symptoms.

2. To debride and shape the root canal system. Debride is defines as removing dead, contaminated or adherent tissue or foreign material. The purpose of wound debridement is to remove all materials that may promote infection and impede healing. This may be done by enzymatic debridement (as with proteolytic enzymes), mechanical nonselective debridement (as in a whirlpool), or sharp debridement (by surgery). Debride comes from the French debrider, to remove the bridle (as from a horse). (MedicineNet.com)

3. To create the radiographic appearance of a well-obturated root canal system where the root canal filling extends as close as possible to the minor apical constriction of each canal. Gross overextension or underfilling in the presence of patent canals, ledges and perforations should be avoided.

4. To maintain health and/or promote healing and repair of periradicular tissues.

5. If a tooth had a normal periodontal ligament space and an intact lamina dura surrounding the root(s) at the time of obturation the subsequent postoperative radiographic appearance should remain unchanged after a suitable period of time for resolution of any transitory radiographic changes.

6. If the radiolucent area is decreasing in size or not enlarging and the tooth is asymptomatic, healing is considered to be incomplete, and additional follow-up visits with radiographic or digital radiographic images are indicated.

7. If a tooth had a preoperative periradicular radiolucency, the follow-up radiographs or digital radiographic images should optimally demonstrate an intact lamina dura and a normal periodontal ligament space around the root(s) under observation.
8. There may be periradicular bone healing without reformation of a normal periodontal ligament ligament space.” This may be referred to as functional healing.

9. These objectives are achieved but not limited to diagnosis and management of pulpal and periradicular pathology using techniques which fall into the following categories. (Guide to Clinical Endodontics, 4th ed. AAE 2004 page i-ii.)

   a. Nonsurgical endodontic therapy
   b. Surgical endodontic therapy
   c. Vital pulp therapy
   d. Management of traumatic injuries to the teeth and periradicular structures
   e. Restorative dental procedures related to enhancing the outcome of endodontic treatment
   f. Diagnosis and management of orofacial pain
   g. Repair of coronal or radicular defects caused by trauma, resorption or mechanical insults

Summary of Manual and Course
This manual is designed to be the basic reference for your endodontic courses. Members of the faculty will add additional materials for which you are responsible to the Moodle web sites. Reading assignments are also critical to your endodontic education. In this manual, you will find instructions and suggestions on how to successfully complete the Endodontic Lectures and Simulation Laboratory Course. References to articles, web sites, podcasts and various textbooks will be listed next to many of the instructions. The members of the faculty hope that the use of this manual, in combination with lectures, seminars, check list, reading assignments, laboratory demonstrations, in vitro projects, and personal faculty-student doctor communication will help get the student doctor off to an interesting and successful start in endodontics. The student doctor should keep this manual and replace sections as they are updated.

No course can be successful without the cooperation of its participants. We expect from you attendance at all lectures, participation in the Simulation
Clinic, and the completion of assigned projects within allotted times and during scheduled simulation clinic sessions. Attention to laboratory regulations can help in making this course a more pleasant experience for all of us.
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Diplomate of the American Board of Endodontics
Professor & Chair, Department of Endodontics
Room 3315
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Cell 901-218-2637
The LSUHSC, School of Dentistry   Box 135
Administrative Assistant 504-941-8395
New Orleans, La  70119

With regard to the faculty, graduate students and staff, you may expect to be treated with dignity and respect, to be given constructive comments and criticism, to be given feedback both orally and in writing, and that they will be available within the limits of student doctor-faculty ratios and schedules.

Above all, “Be Neat, Be Kind, Be Safe, Do No Harm.” People will not remember what you know; they will remember how you made them feel.”

Special Appreciation:
Appreciation: Past student doctors, staff, alumni and faculty members who have helped in the evaluation of this course and manual resulting in the present format.

References:
Assigned Text: Endodontics: Principles and Practice, Torabinejad and Walton, Fifth Ed. (Vital Source). Other textbooks found in Vial Source may be used as optional references.

Reference Text Books and Journals: The following publications are listed as suggested references if the student doctor feels a need for additional information on a topic.

★ Vital Source search on subject of interest
★ Seltzer & Bender's Dental Pulp: Ken M. Hargreaves, Harold E. Goodis, Samuel Seltzer
Department of Endodontics Faculty Roster

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Cell Phone: (901) 218-2637

FACULTY

<table>
<thead>
<tr>
<th>New Orleans</th>
<th>Full Time</th>
<th>Part Time</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Dr. Van Himel</td>
<td>Dr. George Arch</td>
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<tr>
<td></td>
<td>Dr. Eric Hovland</td>
<td>Dr. Scott Bonson</td>
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<tr>
<td></td>
<td>Dr. Leneise Lynn</td>
<td>Dr. Shane Fowler</td>
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<tr>
<td></td>
<td>Dr. Kent Sabey</td>
<td>Dr. Billie Jeansonne</td>
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<td></td>
<td>Dr. Cathy Hebert</td>
<td>Dr. Chip Simon</td>
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<td></td>
<td>Dr. Chelsea Accardo</td>
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<td></td>
<td>Dr. Cyrus Ardalan</td>
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<td>Dr. Tim Kirkpatrick</td>
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<td>Dr. Mark Roberts</td>
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<td>Dr. Regine Dyer</td>
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<td></td>
<td>Dr. Beatrice Robles</td>
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<td></td>
<td>Dr. Joseph Anzelmo</td>
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<td></td>
<td>Dr. Fred McMullen</td>
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## POSTGRADS

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<tr>
<th>Second Year</th>
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<th>First Year, Air Force</th>
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<tbody>
<tr>
<td>David Buczak</td>
<td>Kayla McDaniels</td>
<td>Mark Scott</td>
</tr>
<tr>
<td>Daniel Gano</td>
<td>Josh Reaves</td>
<td>Gregory Zilinski</td>
</tr>
<tr>
<td>Zack Ritter</td>
<td>Mark Scott</td>
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</tr>
</tbody>
</table>

## STAFF

<table>
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<tr>
<th>Dental ASSISTANTS</th>
<th>Administrative Assistant</th>
<th>Hospital Administrative Clerk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maria Mendez</td>
<td>Cynthia Knispel (Adm. Asst.)</td>
<td>Lori Johnson (Hosp. Adm. Clerk)</td>
</tr>
<tr>
<td>Gloria Mayfield</td>
<td></td>
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<tr>
<td>Cindy Bourgeois</td>
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<tr>
<td>Natasha Crossley</td>
<td></td>
<td></td>
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<tr>
<td>Felisha Jacobs</td>
<td></td>
<td></td>
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<tr>
<td>Jeaneta Starks</td>
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</tbody>
</table>
Lectures
Specific dates and times of lectures can be found in the course outlines, on your class schedule and on the moodle web site (Timeline document) for lectures, seminars and laboratory sessions.

Laboratory Sessions
The laboratory schedule is divided into several basic type sessions. Most of the sessions are with the entire class. However many of them involve small groups. It has been our experience that these small group sessions are popular with students, efficient and result in student learning. The scheduling can become somewhat complex but if the student doctor understands the purpose of each and prepares properly they will be a success. Check time line and web site for your assigned times for specific sessions.

Question & Answer small group discussion / hands-on laboratory session: A series of small group sessions have been scheduled to allow time for you to meet with a member of the faculty and discuss issues a student doctor may not understand. Each student is expected to arrive prepared to ask at least one significant question about endodontics. Fellow students in the group will be asked to contribute to the answers.

Regular Laboratory Sessions
These regular sessions involve the entire class working in the laboratory at the same time. All students, staff, graduate students and faculty must be prepared, work efficiently and be respectful of each other in order for these sessions to be productive. All students are expected to arrive on time and be prepared to start the lab with all necessary instruments and supplies. Details of each session can be found in toward the end of this manual. These laboratory sessions will occur in room 7407 and simulation labs A and B.
Diagnostic Small Group Seminars
The class will be divided into small groups referred to as “Diagnostic Group Seminars”. Two diagnostic seminars are scheduled during the course for each student. Please remember your group number, date, time and room number assignments in course timeline, which is posted on the Moodle web site. Attendance is mandatory. Approximately 10 students will be assigned to each group. A document is posted on the Moodle lecture web site, which includes multiple clinical cases (radiographs, chief complaint, test results etc.), which will be used during these diagnostic small group seminars. Students should review these cases before the discussion sessions occur and be prepared to diagnose the cases in the seminar. Dr. Lynn will be the faculty member in the seminar presenting the cases and helping students with the process of determining a diagnosis.

Cleaning and Shaping Group Seminar
The protocol for this session will be identical to the Diagnostic Group Seminar sessions except that it will occur during one laboratory session and the topic will be cleaning and shaping root canal systems. Students will be expected to show up prepared to discuss various aspects of the topic and to ask questions.
Proper Case Selection Key to Learning and Success in Pre-clinical Course, Student Doctor Clinic and Future Practice

The proper selection of natural teeth is critical to the student doctor’s learning and success in this “clinical simulation” laboratory course. The following list the teeth required and criteria for their selection. The student doctor is encouraged to show digital radiographic images to faculty members or postgraduate students if they have any concerns about their selection. Students will be treating these teeth as hand held (teeth not mounted) and some as teeth mounted in the ModuPro typodont system. Look at directions for each lab session found in this manual to determine which is appropriate. Mounting teeth in this system is technique used for licensure exams. When using the Acadental ModuPro teeth do not mount the teeth with the putty and resin mounting gel until shortly prior to the scheduled lab in which they will be used, preferably the day before starting the project. This will mean selecting teeth and taking radiographic images prior to the lab in which you will receive a starting check. Once the tooth is mounted you will again take an original radiograph.

Extracted Teeth to Be Collected

Number and Type: The following are minimal numbers. Extra teeth (at least one extra tooth per project) should be collected for back-up teeth if procedural errors occur.

1. The following teeth (11) should be collected, stored in a moist environment according to school protocol. Bring these teeth to class unmounted. All work on these teeth will be done while holding the tooth in your hand with the apex in full view.
• Two Maxillary Central Incisors
• One Maxillary Lateral Incisor
• One Maxillary or Mandibular Cuspid
• One Mandibular Incisor
• One Maxillary Premolar
• One Maxillary or Mandibular Premolar
• One Mandibular Premolar
• One Maxillary or Mandibular Premolar
• One Mandibular Molar
• One Maxillary Molar

2. The following teeth (7) should be collected for cleaning, shaping and obturation. The root apices should be in good condition, mounted in the Modupro system according to the instructions given during the first lecture, enclosed in the Modupro box and in the following section, stored in a moist environment, and brought to the appropriate simulation clinic session. Do not mount these before they are needed.

• One Maxillary Central Incisor as back up to Modupro tooth
• One Cuspid (Maxillary or Mandibular)
• One Mandibular Single Rooted Premolar with a Single Canal
• Two Maxillary Premolars with Two Canals
• One Mandibular Molar with at Least Three Canals
• One Maxillary Molar with at Least Three Canals as backup to Modupro

IT IS GOOD IDEA TO COLLECT SEVERAL EXTRA TEETH! Please see each individual project listed in this manual for details when each tooth will be needed.

Disinfection of Human Teeth

Disinfection of Human Teeth for Educational Purposes: Review based on an article by Tate W and White R from the Journal of Dental Education. 1991;55, No 9:583-5. “Acquired Immune Deficiency Syndrome has made health care professionals very aware of the risk of infection by blood-borne pathogens. The nation’s dental schools must not only be concerned with risk of infection in clinical settings but also the additional risk from the extracted teeth used for teaching purposes. Any bloodborne pathogen, including hepatitis B virus,
human immunodeficiency virus, and bacterial pathogens, may be present in pulp, radicular, and periradicular tissue of extracted human teeth. Therefore, the teeth used for teaching purposes must be treated as potential sources of infection to students and faculty and should be disinfected before use.” The authors tested various methods of disinfecting freshly extracted human teeth. Teeth were disinfected with Iodophor, sodium hypochlorite, synthetic phenol, glutaraldehyde, formalin, and saline control or autoclaved for various lengths of time. The teeth were then placed in culture and tested for growth of organisms. The findings of this study resulted in the following recommendations for the handling of extracted teeth. “On the basis of this study and other reports (1-3): teeth without amalgam restorations should be sterilized in a steam autoclave; teeth with amalgam restorations should be disinfected by immersion in 10 per cent formalin for a period of two weeks. Furthermore, the formalin treated teeth should be thoroughly rinsed with tap water before use in order to reduce potentially harmful aldehyde vapors.”

Any teeth used in the Endodontic Simulation Clinic Course must be disinfected using one of the above methods.

References:


LSU Policy for Use of Teeth in Educational Setting:

Extracted teeth collected for pre clinical courses must be placed in a plastic container containing a 1:10 solution of bleach with the biohazard label. When they are brought to the department, they will be placed in a 10% formalin solution for a period of two weeks before using in education exercises. Before these teeth are used in education exercises, they must have been cleaned of adherent material by scrubbing with detergent or by using an ultrasonic cleaner. When an extracted tooth is no longer useable, it must be discarded in the appropriate biohazard box (Sharps box). OSHA considers
extracted teeth to be potentially infectious. Extracted teeth with amalgam must be placed in a special disposal container.

CRITERIA FOR SELECTION: CASE SELECTION
Please remember that case selection in this Simulation Clinic is just as important as case selection in the patient clinic. The skill level of the clinician should be matched to the degree of difficulty of the procedure. The student doctor’s grade and frustration level is usually related to the quality of the teeth selected for this course. Keep the better teeth for cleaning, shaping and obturation cases as these will be graded. The access only teeth are evaluated on a complete/incomplete basis and do not need intact apices. Ingle’s text (pages 246-7, fig. 4:30) uses Zidell’s system for classifying root canals. Using this system, you should be using only class one teeth.

CLASS ONE:
This is a mature uncomplicated canal, straight or slightly curved, with a constriction at the apical foramen. A definite pulp chamber and patent canals should be easily visualized on a radiograph. Each tooth should be radiographed from a buccal and proximal view. The steps for taking this radiograph are shown on the following radiographic images:
**Class Two Canal:**
This is a complicated canal. Although it may have a constricted foramen, the canal configuration may present problems for cleaning, shaping, and obturation. Examples of complicating factors are severe curves, dilacerated curves, bayonet curves, apical bifurcations, apical curves, additional canals, lateral canals, and accessory canals.

**Class Three Canal:**
This is an immature canal. It can present difficulties in the obturation phase of treatment. Complicating factors include blunderbuss apices, open apices, and tubular canals.
ONLY USE CLASS I TYPE TEETH !!!!!!!!!!!! FOR YOUR GRADE’S SAKE and later on in the clinic your patient’s sake.
DIGITAL RADIOGRAPHIC IMAGES IN LAB INSTRUCTIONS

Instructions for using digital radiographs in the lab on training server are as follows and can be found in the Endodontic Manual or moodle web site.

RADIOGRAPHIC TECHNIQUE FOR EXTRACTED TEETH

1. Prior to the scheduled lab period, each student should have already taken radiographs to determine if teeth meet the selection criteria. In order to log onto the computers in the 7th floor labs, students should use the domain name: LSUSD and password: radiology. Please do not use your personal password on these computers.

2. Each tooth treated will require its own Digital Radiography chart. All of your teeth should have the same “Last Name”. Use the following format for creating a patient file in Schick for each tooth:
   a. Open Schick
   b. Choose “New Exam”
   c. Choose “Vertical Endo” for series type when starting a New Exam for anterior teeth and “Horizontal Endo” for series type when starting a posterior tooth.
   d. Click on “Edit Series” to add more rows. (Change “Rows” from 2 to 3 or 4).
   e. LAST NAME = endo_LSUlogonID (no spaces)
   f. FIRST NAME = tooth type
   g. Patient ID = your initials_tooth type
   h. Tooth types
      1) AccessPrep
      2) maxInc.plasticblock
      3) mandpremol
      4) maxpre1
      5) canine
      6) mandmol
      7) maxmol
      8) compmaxpre
      9) access3teeth
   i. Example for Leneise Lynn starting the mandibular premolar
      1) Last Name: endo_llynn
      2) First Name: mandpremol
      3) Patient ID: LCL_mandpremol

3. Radiographs Required for Each Case: Must show at least 4 mm of bone surrounding root apex.
   a. Diagnostic (prior to any treatment)
      i. Facial
      ii. angled
   b. Confirmed Working Length
c. Master Apical File (MAF)
d. Master Cone
e. Check-fill
f. Final
   i. angled
   ii. Proximal

4. There are a limited number of x-ray units available. Do not analyze radiographs while standing at the x-ray unit. Go to your lab station and use your own laptop.

INSTRUCTIONS FOR SUBMITTING RADIOGRAPHS IN WORD FILE


2. Save the template with YOUR last name with the tooth type. For example, the word document template for the first graded exercise has the filename – YourLastName_mandpremol.ppt. Van Himel would save it as Himel_mandpremol.ppt.

3. For those of you, who share the same last name, include enough of your first name to distinguish the files. For example, Leneise Lynn and Jess Lynn would use LynnL_mandpremol.ppt and LynnJ_mandpremol.ppt, respectively.

4. Complete the requested information on all pages of the document. Copy the Schick radiographs and paste them into the appropriate spaces in the word document. These must be diagnostic in quality. Too often with extracted teeth the images are too dark. Be sure to note your exposure time and cone beam to object distance in order to keep the exposures consistent. If your exposure time is at lowest setting exposure remains dark then lengthen the source-object distance.

5. Instructor assignment: Students are assigned to a specific instructor / graduate student for each project. Please note the instructor changes for each project. Once the project is complete, the student doctor must upload the completed word document to the moodle web site for the course. The instructor changes each Project. If you do not send your word document to the correct instructor you will not receive a grade for the case.
LSUSD protocol for use of NOMAD: a Hand-Held X-ray Unit

Introduction

FDA 510(k) approval for the NOMAD hand-held x-ray unit demonstrated substantial equivalence to a portable intraoral x-ray system designed for field use. However, it is not equivalent to a fixed dental x-ray unit. Because of yet unknown risks associated with repeated low doses of radiation to the operator, patients scheduled for routine intraoral radiographs at the dental school will continue to be imaged using fixed wall-mounted/mobile x-ray machines because of lower exposure dosage to the operator resulting from remote activation, higher operating potential and better diagnostic images from the stabilization of the x-ray tube-head. Consequently, it should not be used as a substitute for a fixed, mounted/mobile dental x-ray unit in permanent facilities. Within the purview of the dental school, there will be limited scenarios in which the use of a handheld x-ray unit such as the “Nomad” will be permitted. This will be limited to preclinical teaching laboratory procedures, postgraduate programs, operating rooms, any medically compromised patient where fixed/mobile x-ray units are impractical, and in instances approved by faculty. In addition, the NOMAD may be utilized in off-campus (mobile) dental clinics, humanitarian missions, forensic studies, etc. where fixed/mobile x-ray units are impractical or unavailable.

Training

Undergrad dental and hygiene students will be introduced into the fundamentals of the NOMAD x-ray device during their pre-clinical courses: the accompanying NOMAD training video will be shown in class and some questions included into their core radiology examinations. However, each lab director will be responsible for offering a follow-up demonstration on the proper handling of a hand-held unit prior to its usage.

Any other personnel wishing to use a hand-held x-ray unit must first watch the operator training (Video or PowerPoint presentation) that is located on SOD (M) drive and be given hands-on training and complete an online multiple choice exam. This can be administered by each department.

The CD (MP-0073) includes:
Nomad Utilization

Outside of the Radiology clinical area, students using the NOMAD will be under the direct supervision of the faculty (Undergraduate & Postgraduates) from those disciplines. Standard radiation protection procedures must be followed; the only exception being that the operator of the NOMAD physically being in the operatory with the patient during the x-ray procedure. Standard sensor holding devices should be used with the hand-held x-ray unit. All handheld units must be obtained and returned back to dispensary personnel upon completion of the x-ray procedures. Only in situations such as research studies, where one operator may be taking extreme numbers of images will a radiation monitoring device and protective apron be required.
Chapter 4

Radiographic Technique for Lab

See Chapter in your textbook for Radiographic Imaging and Interpretation of Pulp and Periradicular Diagnosis for information pertaining to using radiographs in the endodontic clinic.

If you attempt to take a radiographic image and believe the equipment is not working properly please report it to a member of the faculty and someone from computer services.

High quality radiographs are essential for successful endodontic therapy. The most critical part of the endodontic technique cannot be seen as in most dental procedures. Poor quality or missing radiographs will result in a reduction of the prognosis of your cases in the clinic and a reduction of your grade in this “simulation clinic” laboratory by one or more letter grades per image.

Table 4-1 lists the radiographs, which should be taken for each case with the exception of the image described in item #5. In the clinic numbers 2, 3, 4, 6 and 7 should be taken in addition to bitewing radiographs. It is difficult to describe a maximum number of films, which should be taken in the clinic. Certainly five to seven is ideal but often-additional exposures will be necessary due to technique error and case difficulty. Students taking more than seven radiographs should work with a member of the faculty to evaluate the case and to validate if the extra films were necessary and address any needs in improving the student doctor’s technique. If a retake image is required in the clinic the student doctor must consult with a member of the faculty prior-to exposing the retake image.
Table 4-1: Required Radiographs, This is not a list of steps to be checked, only the images to be taken!

<table>
<thead>
<tr>
<th>Type Image</th>
<th>Type Projection</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Tooth Selection</td>
<td>Facial and angled</td>
<td>If in clinic a bitewing would be useful.</td>
</tr>
<tr>
<td>Diagnostic</td>
<td>Facial and angled</td>
<td>These may be same images as in #1 above but transferred to word document. In clinic they would be facial and angled.</td>
</tr>
<tr>
<td>Working Length</td>
<td>Angled</td>
<td>All files in canals in one image.</td>
</tr>
<tr>
<td>Master Apical File</td>
<td>Angled</td>
<td>All files in canals in one image.</td>
</tr>
<tr>
<td>Optional Master Cone</td>
<td>Angled so that all canals are visible</td>
<td>Fit check image optional based on student and faculty opinion. All files in canals in one image.</td>
</tr>
<tr>
<td>Down-pack (Check) Film</td>
<td>Angled so that all canals are visible</td>
<td>After Lateral Condensation with 2 accessory cones but before removing excess gutta percha. All files in canals in one image.</td>
</tr>
<tr>
<td>Back Fill</td>
<td>Angled so that all canals are visible</td>
<td>This is after removal of GP to orifice of canal.</td>
</tr>
<tr>
<td>Final Film</td>
<td>Facial and angled</td>
<td>After removing excess gutta percha &amp; placement of interim or core restoration. In clinic one angled image showing all canals is usually adequate.</td>
</tr>
</tbody>
</table>

All required digital radiographic images must be placed in a digital mount in axium / Schick in the students doctors file for the project being accomplished.
All radiographs will be taken in the lab according to the following procedures. At times if the lines in the lab or long, the student may go to the 4th floor endodontic clinic and use one of the clinical units if available.

a. Assure that the sensor is in place in or behind shielding beneath one of the x-ray machines.

b. You should observe a sensor sealed inside of a plastic bag and attached to the floor of the box or cabinet top. If the sensor is not in protective cover, seek help in placing sensor in such a protective device.

c. Do not remove the sensor from the bag nor the bag from its attached position. If you see the bag is torn or otherwise damaged, report this to a member of the faculty or staff so the bag can be replaced. Damage to the sensor could result in cost of $7,000.

d. Place the tooth centered over the sensor and beneath the x-ray tube. Please keep in mind that the source (x-ray tube) / object (tooth) distance has a major affect on the quality of the image. Keep this distant consistent between images. If you have exposure on lowest setting and image is too dark, increase this distance.

e. Once the tooth is properly aligned and barrier system used, expose the sensor using the following setting: 70 kVp, 15mA, 0.2 (+ / - 0.1) seconds depending on the tooth and block thickness. Adjust the time exposure until an ideal exposure is achieved. Record this time so the exposure can be duplicated for additional images. It is also important to keep the source object distance consistent for quality images.

Image should be edited depending on decisions about mounting etc.
EVALUATED AND GRADED PROJECTS

Your projects in this laboratory simulation clinic will be evaluated in a manner similar to that used in the Endodontic Clinic. Although the laboratory and clinic evaluation methods are similar, they are not identical. Therefore, do not
substitute one for the other. Please use the evaluation sections of the word document for each project. The instructor will evaluate and verify completion of individual steps of your work on this sheet. Once a project is complete, the entire body of work will be evaluated and/or graded. The student doctor is responsible for Uploading to Moodle each word document evaluation document with the project once it is complete and on the due date. Projects are due no later than mid night of the end of each individual project, with the exception of exams, which are due at the end of the laboratory period. The instructor receiving the word document for a project will evaluate the project and issue a grade.

It is ultimately the student doctor’s responsibility to assure that all records are in proper order, including electronic signatures.

The different categories of projects to be done during this laboratory class are:

A. Non-graded / Evaluated Projects: No number grades will be issued, only a pass/fail. Since moodle will not allow a P for pass, if a non-graded project is failing an F will be issued for failing. If a non-graded project is passing then and A will be issued for passing. A grade may appear on the evaluated project but only for purposes of informing the student what their grade would be if it were a graded project. However, any step receiving an EPR (Extra Practice Required) will require the student doctor to take appropriate steps as prescribed by the faculty to demonstrate competency. Any project receiving a final evaluation of EPR must be redone using a new tooth. Steps and/or projects that meet the goals as described in this manual will receive an MPE (Meets Performance Expected). Constructive and positive oral and written communication between the student doctor and faculty is expected.

B. Graded / Faculty Assisted Projects: Student doctors working on these projects may receive assistance and ask question of faculty, staff and graduate students. A student must receive a 70 or better on each project in order to pass the course.

C. Pass/Fail Preclinical Practical Exams: Two Independent Clinical Exams will be given and can be found in this Endodontic Simulation Clinic Manual. Student doctors will not receive help during this project and will receive a grade on the project. Parts of the Clinical Exam that do not meet expected competency levels must be redone.

**Grading Scale**

If a student doctor wishes to improve a grade on any project, they may remake any project with written approval of the course director. The highest grade of the two projects will be used. Final grades will be rounded up (example 89.1 rounded to 90)
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90 - 100</td>
</tr>
<tr>
<td>B</td>
<td>80 - 89</td>
</tr>
<tr>
<td>C</td>
<td>70 - 79</td>
</tr>
<tr>
<td>F</td>
<td>0 - 69</td>
</tr>
</tbody>
</table>

Final Course Grade = Average of faculty assisted projects and the independent Competency Projects.

**STEPS TO BE CHECKED**

The student doctor may request an instructor check their project or request an opinion at any time. **However, the student doctor must receive a step check from a faculty instructor or postgraduate student on any step requiring an evaluation and in the check boxes found on the evaluation form. Students must have each step checked prior to going to the next step.** All steps must be eventually checked. The following are the steps required to be evaluated for a completed case:

1. Starting Check:
   1.1. Tooth selected meets the criteria for project as described in manual and lecture.
   1.2. Radiographs are of high quality and properly mounted showing at least 4 mm of space around the apex.
   1.3. Records are properly documents with names, dates etc.
   1.4. Instruments present and neatly arranged.
   1.5. Supplies present and neatly arranged.
   1.6. Cleanliness of work area will be evaluated both at start and during entire process.
2. Access Preparation:
   2.1. Complete caries excavation and defective restorations removed.
   2.2. Outline form (size, shape).
   2.3. Chamber roof removal.
   2.4. Straight-line access to all canals.
3. Apical File One: Largest hand 0.02 tapered instrument that goes to working length passively (without cutting) before shaping the coronal and merging segments of the canal.
3.1. Start with 15/02 instrument and then go either larger or smaller depending on canal.

4. Working Length
4.1. Are preliminary working length measurements recorded?
4.2. Does the radiograph show files at an appropriate position? One angled radiograph with instruments in all canals.
4.3. Was patency confirmed?

5. Apical File Two (AF2)
5.1. What is Size of largest 2% instrument, which goes snugly to working length after shaping the coronal and merging segments of the root canal(s)?

6. MAF Estimated Size:
6.1. MAF is largest files used at working length when instrumentation is complete and the case is ready for obturation.
6.2. Based on the information from #5 (AF2), what is clinicians best estimate of the master apical file (MAF) size and taper, understanding this may change when going through the process of cleaning and shaping?

7. Master Apical File (MAF) / Cleaning & Shaping
7.1. Have all canals been located and shaped?
7.2. Is the MAF at the proper position in relation to working length and to the apex (apical foramen and minor constriction maintained in its original position)?
7.3. Are canal shapes adequate? (Continuously tapering funnel from apex to cavo-surface margin, Original shape maintained, Walls glassy smooth, little or no debris.
7.4. Are the MAF sizes appropriate and fit loosely at WL?
7.5. Is apical resistance form adequate for each canal with patency maintained (Apical opening is as small as possible, apical matrix developed and maintained for compacting obturation material)?
7.6. Does clinician have one radiograph with all Master Apical Files (MAF) in canals to WL?

8. Master Cone (MC) fit check:
8.1. Master cone at correct working length.
8.2. No radiograph is required but may be requested by faculty in some difficult cases.
8.3. Tug back present.
8.4. MC at least same size as MAF if not larger. It must not be smaller.

9. Obturation Check Film
9.1. Length of fill, does the level of fill equal the level of instrumentation?
9.2. Taper is adequate at all levels of the canal space.
9.3. Density of fill is uniform at all levels without voids.
9.4. One radiograph after lateral condensation with two accessory cones but before removal of excess gutta percha extending coronal to cavo-surface margin.

10. Final Obturation

10.1. Does clinician have one radiograph with canals visible and filled to working length?

10.2. Is the MC and Sealer at the proper position in relation to WL and to the apex?

10.3. Are the canals free of voids?

10.4. Is shape adequate and canal walls smooth?

10.5. Is excess GP and sealer removed to cervical line, orifice or depth of planed post?

10.6. Appropriate radiographs (7) taken (Original x2, WL, MAF, Check Film, Final x 2).

10.7. Radiographs properly mounted in evaluation word document.

Overall Case Evaluation will be accomplished on following grade sheet found on each word document for each project:

- a. All documents and teeth turned in on time.
- b. Documents are in proper order.
- c. Entire process for the case will be included in this evaluation.

<table>
<thead>
<tr>
<th>Steps:</th>
<th>Meets Performance Expectations</th>
<th>Minor Help Required</th>
<th>Extra Practice Required</th>
<th>Extra Practice Completed</th>
<th>Faculty Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting Check, Tooth Selection, Radiographs, Records, Instruments, Supplies, Cleanliness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access Preparation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working Length</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apical File One</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apical File Two</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated MAF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAF</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Master Cone Fit</td>
<td></td>
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</tr>
</tbody>
</table>
EVALUATION METHOD (PORTFOLIO)

A portfolio is a collection of samples of a student doctor’s work that is documented and reflects the individual’s interests, abilities, performance, and progress throughout an ongoing period of time. Learning occurs, as the individual is involved in the process of becoming aware of new materials and concepts, experimentation and exploration of the information, and utilization of that information.

Appropriate student doctor assessment should focus on all domains of learning, not just on intellectual and academic areas. It is the ability of the student doctor to assimilate information they have learned and then make active a plan of treatment based on the foundation knowledge that is important. The student doctor’s capacity to integrate basic and clinical science skills and knowledge should be evaluated rather than separate skills alone.

Assessments should acknowledge student doctor strengths and accept individual differences. This approach should ensure a secure, safe, and protected feeling as learning occurs. It is during cases involving procedural errors that this approach is of particular importance. If the student doctor is made to feel incompetent, optimal learning will not occur.

The most effective setting for assessment is one, which most accurately duplicates the desired outcome of dental education and patient care. Verbal and written narratives focus on student doctor performance as well as interactions with patients, faculty and staff rather than being restricted to grading isolated tasks.

Collecting items for the portfolio is only one step in the assessment process. Descriptive narratives are perhaps the most important step in using the portfolio to create a profile of the student doctor’s abilities, to document a need for extra practice and to make specific suggestions for improvement. Teachers sometimes feel limited in their abilities to write narratives, yet most already use the mental processes involved. Narratives should include the
student doctor’s strengths and special interest. Ideally, the faculty should focus on one or two areas at a time with specific suggestions for improvement.

It is important that faculty include narrative evaluations on the evaluation sheet.

The following suggestions are given to help increase self-confidence, reduce apprehensions, encourage the ‘sense about things’ or intuitions, and begin or extend portfolio assessment. The faculty should:

A. Be familiar with the standards and guidelines for each step and the desired overall outcome.

B. Look for evidence which supports or suggests:

A.A.1. Changes in the student doctor’s environment, which might affect learning.

A.A.2. Thinking and problem solving strategies.

A.A.3. Creativity.

A.A.4. Memory of concepts, which have been previously introduced.

A.A.5. The ability to utilize new skills.

B. Look for examples of what the student doctor can do.

C. Identify signals that the student doctor is ready for the next level of learning through reading, elective courses, or continuing education.

D. Present the portfolio to the student doctor.

E. Compile a collection of the student doctor’s work for the permanent record. Once the portfolio is collected, the student doctor should be allowed to look through the portfolio and to reflect on personal growth and development. Allow the student doctor to help select the best samples as materials are routinely thinned out. This will allow the student doctor to improve the quality of the portfolio and their evaluation by performing additional work. This is a part of the learning process. Conferences should be scheduled with the student doctor, using the portfolio as the organizer. The student doctor and all faculty involved in evaluating the student doctor should be
involved to the fullest extent possible. The conference should be planned, including what will be discussed and the order in which the items will be discussed.

A portfolio will be developed for each student doctor which includes preclinical and clinic evaluation sheets, radiographic documentation of cases, documentation of Extra Practice Required (EPR) exercise work, documentation of Clinical Exams, current college computer documentation (points, work in progress and completed cases) and promotion / graduation exit interview check list.

F. Evaluation sheets are designed to allow for student doctor assessment without the grading process interfering with student doctor/faculty interaction. An example of this form can be found in this document. It allows for the faculty to assess the student doctor’s work in one of three categories.

1. Meets Performance Expectations. A faculty signature in this category indicates the student doctor has performed the task independently and at a clinically acceptable level of skill. A positive narrative evaluation should be added to the form.

2. Minor Help Required. This category indicates that the student doctor has performed most of the work, but required faculty advice or minor chairside assistance. This should be considered a positive category, especially for the sophomore student doctor. Narrative evaluations by the faculty should include positive comments as well as suggestions as to how the student doctor might improve in the future. Resources such as textbooks, journal articles, and videotapes might be suggested.

3. Extra Practice Required (EPR). Student doctor work, which does not meet the level of quality expected in the clinic or steps in which the faculty found it necessary to perform all or a significant amount of the work, should be placed into this category. Specified projects will be assigned to the student for any step that the faculty places in this category. Customized work may be assigned in addition to the predetermined tasks. The faculty narrative assessments for this category should not only address the student doctor deficiency but should also include something positive.
4. Extra Practice Completed. Upon completion of the extra practice, required task the faculty will evaluate the work on the evaluation sheet or a separate piece of paper and sign the appropriate blocks. The student doctor will be required to write a self-evaluation along with the faculty evaluation. If additional space is needed additional, sheets may be attached to the evaluation sheet.

H. Radiographic documentation of projects includes original (2 views), working length, master apical file, check film and final films (2 views). The collection of student doctor projects will be used during scheduled or requested assessments to track student doctor progress and determine student doctor needs.

I. Documentation of Extra Practice Required exercise work should be attached to the word document for the project upon completion of the case. This part of the portfolio will document student doctor improvement in areas determined to need extra practice.

J. Documentation of practical exams will be included. Student doctors must successfully complete practical exams at the grade specified previously before passing this course.

K. Documentation of completed projects, grades and work in process as well as incomplete work will be used to assure that the student doctor is progressing in a timely manner. It is the responsibility of the student doctor to check their evaluated projects for accuracy of these evaluations and discuss any concerns or questions with the course director. If a student doctor is determined to be behind in the amount of work completed or in process, a meeting will be scheduled allowing the department and School an opportunity to help the student doctor.

L. Anecdotal Records of communications or other memos concerning the student doctor.

M. Documentation of interviews and observations will be maintained in the portfolio.

COMPETENCY STATEMENTS PERTAINING TO THIS COURSE
LSUSDCS-5 Graduates must be competent in the application of the principles of ethical reasoning and professional responsibility as they pertain to patient care and practice management.

LSUSDCS-6 Graduates must be competent in the use of critical thinking and problem solving related to the comprehensive care of patients.

LSUSDCS-7 Graduates must be competent in the use of information technology resources in contemporary dental practice.

LSUSDCS-10 Graduates must be competent in providing oral health care within the scope of general dentistry, as defined by the school, for the child, adolescent, adult, and geriatric patient, including:

i. pulpal therapy;

n. evaluation of the outcomes of treatment.

EVALUATION CRITERIA:
The following will be evaluated and documented on the endodontic preclinical evaluation sheet. The student doctor may ask the division director and/or the course director to reevaluate a case. In this reevaluation, the entire case will be reviewed, not just one step.

ORGANIZATION, NEATNESS, INFECTION CONTROL, AND CASE SELECTION
Instruments and neatness. The student doctor should:

a. Have all instruments and supplies that will be needed to complete the treatment planned for the day available and in proper order.

b. Remove all extraneous materials from the lab area, including any trash on the floor.

c. Wear appropriate safety equipment (glasses, mask, gloves, etc.).

d. Follow all disease control guidelines as specified in UTHSC preclinical and clinic manuals.

e. Follow disease control guidelines concerning handling of extracted teeth.
Case selection and radiographic quality.
The student doctor should be able to:

- Select an appropriate case for the student doctor's skill level and experience. Student doctors should be competent in using the American Association of Endodontists case difficulty evaluation form for this purpose. Cases must be selected according to criteria listed in the section on natural teeth number and criteria for selection in this manual and in the text under case selection.

- The "Planning Guide" for cleaning and shaping must be completed one or more days prior to the laboratory period in which the tooth is to be instrumented.

- Provide current and properly processed and mounted radiographs.

- Provide radiographs showing entire tooth centered in the film and at least 4 mm of the periapical tissues showing in all directions from the anatomical apex of the root. Be able to identify all canals.

- Be able to identify possible problems such as calcified canals and curvature.

- Complete the cleaning and shaping planning guide.

ACCESS

1. Caries removal and acceptable access preparation. The student doctor will be able to establish:

   a. Preliminary outline form, the accuracy of which is evaluated by the following criteria:

      (1) Position.

      (2) Extent.

2. An appropriate design based on the following:

   b. Correct position on occlusal or lingual surfaces.

   c. Diverging walls from the canal orifice(s).
d. Understanding of purpose.

e. Guidelines found in this manual, text, lecture notes and decision tree.

3. Adequate extension: removal of caries, unsupported enamel, and defective restoration. The student doctor should be able to discuss if the following relates to the access they have prepared:

f. Overextended: too large, unnecessary removal of tooth structure, gouging of floors and walls.

g. Under extended: too conservative, an unexposed orifice, coronal tooth structure interferes with direct access, incomplete removal of roof.

h. All caries, unsupported enamel, and defective restorations removed.

i. All orifices located

j. All pulp horns removed (an explorer should not catch).

k. No chamber or root perforations.

l. A continuously tapering funnel, converging from the cavosurface margin toward the apical constriction.

Working Length:

The student doctor will be able to:

1. Determine and demonstrate the proper reference point(s).

2. Effectively use the electronic apex locator to obtain a preoperative estimate of working length.

3. Produce diagnostic (readable) images.

4. Interpret the radiographic image, especially the relationship of the file to the apical constriction of the root(s).

5. Recognize problems and know what action to take to correct the error.

6. Recognize and record the correct working length(s).
CLEANING AND SHAPING ROOT CANAL SYSTEMS

The student doctor should be able to:

1. Recognize that “Root canal systems must be cleaned and shaped: cleaned of their organic remnants and shaped to receive a three dimensional hermetic filling of the entire root canal space.” - Herb Schilder, Boston University.

2. Discuss the contents of the Endodontic checklist found on the moodle web site and define all terms found within that document.

3. Debride the canal systems to an appropriate taper and size.

4. Preserve working length without creating a ledge or perforating the root canal system.

5. Maintain the original canal shape.

6. Maintain or establish resistance form (apical seat). The largest apical file (LAF) should not pass beyond working length after completion of instrumentation.

7. Establish an adequate canal taper. A finger spreader should readily reach to within one mm of working length during lateral condensation with the master cone in place. Diagrams and cases demonstrating proper taper can be found in this manual and the assigned text.

8. Establish the largest apical file (LAF).

OBTURATION

The student will be able to perform all obturation steps as defined in the endodontic checklist.

CORE BUILDUP &/OR FINAL RESTORATION

The student doctor should be able to:

1. Discuss the importance of restorations relative to the prognosis of the endodontic case.

2. List materials, which could be used to establish the coronal seal and core buildup.
3. Discuss when a post is necessary for retention of the core buildup.

OVERALL EVALUATION BY STUDENT DOCTOR
The student doctor will evaluate the case after completion and determine the postoperative prognosis. They should list any procedural errors that may have occurred and describe how they could have been avoided and what steps were taken to minimize any negative effects. These self evaluations should appear in the project word documents.

REQUIREMENTS / DEADLINES:
The final grade will be determined from the student doctor’s participation in the preclinical projects. In order to maximize the benefits from these projects, attendance is mandatory. All work must be completed within the time specified in the section under PRECLINICAL SCHEDULE AND ASSIGNMENTS in this manual. Failure to turn a project in on time may result in a reduction in the grade of 10 points per day past the deadline. In the case of an exam, this will result in an “F” for the project. Student doctors with an absence must follow school policy in dealing with the absence. Projects must be uploaded to the course moodle web site during the preclinical session or by mid night on the due date unless permission has been obtained from the course director.

SAFETY PRECAUTIONS
Many accidents are avoidable and taking precautions can decrease their frequency. For your safety and well-being, the following safety regulations should be adhered to without exception:

- Safety glasses are to be worn at all times.
- Any open flame source of heat such as Bunsen burners are to be lighted only when the flame is being used. The Touch ‘N Heat device should be used in place of the open flame when possible.
- Flammable liquids (such as alcohol, xylene, chloroform, etc.) are to be kept at a safe distance when a flame is burning in your work area.
- The wearing of masks is required. (A respiratory mask is to be worn when operating a dental handpiece, lathe, or trimmer.)
- Avoid breathing the toxic vapor of solvents (such as xylene, eugenol, chloroform, etc.).
Puncture wounds are very possible with sharp dental instruments. Extra precautions are advised to avoid personal injury when using the small, special endodontic instruments (such as files, reamers, etc.). If a puncture wound occurs with instrument used on tissue which has not been properly sterilized, report it immediately to a member of the faculty or course director. The person injured should then go to dispensary (2nd, 3rd or 4th floor) to have Quick HIV test performed. Contact Ms. Linda Smith, RN to have the blood drawn. room 4312K, office 504-941-8393, cell 504-289-5915. Details on this protocol can be found in the clinic manual and in handouts and notes from disease control lectures previously presented in other courses, from the office of clinical affairs.

Gloves must be worn when handling extracted teeth.

Additional safety precautions pertaining to the laboratory can be found in LSU manuals.

**REGULATIONS**

- Wear only clean laboratory coats or dental smocks during all simulation clinic sessions.
- Smoking is not permitted in the laboratory.
- Bunsen burners are to be furnished by the student doctors. The Department will furnish Touch ‘NHeat units.
- Work is to be as neat as possible, not only at the bench, but also at the x-ray stations and throughout the laboratory.
- Air jets are not to be used to dry the pulp cavity of any tooth.
- Ask questions and seek help on preclinical projects only from the endodontic preclinical faculty or staff.
- No variation or modification of a laboratory technique will be acceptable without the written approval of the course director on the project card.
- Signatures from course instructors are required for completed steps on the project card. Any steps not having a faculty signature and/or a evaluation will receive an EPR for that step and possibly result in a grade reduction and the student not passing the project.
- Preclinical projects and project cards should be submitted promptly in order to avoid a penalty.

- At 11:45 a.m. or 4:45 p.m., student doctors should be finished. At this time, turn in any items that are due.

- The lab bench must be covered with brown paper supplied in the laboratory.

- Please KEEP our ENVIRONMENT GREEN, CLEAN and NEAT!
Each Laboratory Session is described in detail in the following pages of this chapter. Instruments, supplies and other required items are included in for each session. Students adhering to these guidelines and arriving to each session prepared will be successful.

**SESSION I: GOAL-COMPLETE TABLE CLINIC ROTATIONS**

Items student doctors need for this laboratory. Student doctors should not have to go to locker or station between station sessions.

**INSTRUMENTS AND SUPPLIES SET UP**

- Evaluation and planning word document for this lab should be on desktop of your computer as well as the endodontic checklist and schick software program.
- Laboratory jackets.
- Protective eye wear and mask.
- Two (2) extracted teeth for access preparation. These teeth do not need to have good roots. Save the better teeth for future projects.
- Rested body.
- Eager, open and prepared mind

**PROTOCOL**

This lab session will be held on date specified on time line and course outlines from 8:00 a.m. to 12:00 p.m. in the assigned laboratory (Room 7407). At 8:00 a.m. a short presentation will be given to the class. Eight fifteen (8:15) a.m.
will be start of groups rotating between demonstration / hands-on stations. Break stations will be included during which student doctors may leave lab, but MUST return for their next scheduled session. Role will be taken at each station. The following two tables (Table 7-3 and 7-4) list topics to be presented and the student’s schedule.

<table>
<thead>
<tr>
<th>Station #</th>
<th>Location</th>
<th>Time</th>
<th>Task</th>
<th>Faculty / Staff / Teaching Assistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TBA</td>
<td>20 minutes</td>
<td>Access Preparation / Access bur kit</td>
<td>Dr. Marco Galvez Dr. Daniel Gano Dr. Kent Sabey</td>
</tr>
<tr>
<td>2</td>
<td>TBA</td>
<td>20 minutes</td>
<td>Logistics and expectations of lab course</td>
<td>Dr. Himel</td>
</tr>
<tr>
<td>3</td>
<td>TBA</td>
<td>20 minutes</td>
<td>Break: Please return on time</td>
<td>Break</td>
</tr>
<tr>
<td>4</td>
<td>TBA</td>
<td>20 minutes</td>
<td>Importance of tooth selection in lab &amp; Clinic / Morphology</td>
<td>Dr. David Buczak</td>
</tr>
<tr>
<td>5</td>
<td>TBA</td>
<td>20 minutes</td>
<td>NOMAD’ Digital (Axium / Schick) Radiographs in the Lab</td>
<td>Dr. Josh Reaves (Last year Dr. Ratcliff)</td>
</tr>
<tr>
<td>6</td>
<td>TBA</td>
<td>20 minutes</td>
<td>Irrigation Technique, Medicaments and Interim Restorations (chlorhexidine, EDTA, Calcium Hydroxide, restorative materials)</td>
<td>Dr. Kayla McDaniels (Last year Dr. Marconyak)</td>
</tr>
<tr>
<td>7</td>
<td>TBA</td>
<td>20 minutes</td>
<td>File Box and Files / Demonstrate Cleaning and Shaping in Plastic Block / electric motor and gear reduction attachment. Rotary and reciprocation.</td>
<td>Dr. Zack Ritter</td>
</tr>
<tr>
<td>8</td>
<td>TBA</td>
<td>20 minutes</td>
<td>Obturation</td>
<td>Dr. Lynn</td>
</tr>
<tr>
<td>9</td>
<td>TBA</td>
<td>20 minutes</td>
<td>Electric Apex Locater</td>
<td>Dr. Mark Scott</td>
</tr>
<tr>
<td>10</td>
<td>TBA</td>
<td>20 minutes</td>
<td>Diagnostic Techniques: EPT, Cold, Percussion, Palpation, Mechanical Stimulation, Chewing, Periodontal Probe, Air blast, Cold Water</td>
<td>Dr. Gregory Zilinski (Last year Dr. Parker)</td>
</tr>
<tr>
<td>11</td>
<td>TBA</td>
<td>20 minutes</td>
<td>Pick up cassette &amp; Bur Kit and Instruments 4th floor dispensary / Break: Please return on time</td>
<td>4th Floor Dispensary</td>
</tr>
</tbody>
</table>
Table 7-4: Session 1 Group Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Group 1A</th>
<th>Group 1B</th>
<th>Group 2A</th>
<th>Group 2B</th>
<th>Group 3A</th>
<th>Group 3B</th>
<th>Group 4A</th>
<th>Group 4B</th>
<th>Group 5A</th>
<th>Group 5B</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td>Introduction</td>
<td>Introduction</td>
<td>Introduction</td>
<td>Introduction</td>
<td>Introduction</td>
<td>Introduction</td>
<td>Introduction</td>
<td>Introduction</td>
<td>Introduction</td>
<td>Introduction</td>
</tr>
<tr>
<td>8:15 AM</td>
<td>1 access</td>
<td>11 pickup Cassettes break</td>
<td>9 EAL</td>
<td>11 pickup Cassettes break</td>
<td>8 Obturation</td>
<td>7 Files C&amp;S</td>
<td>6 Irrigation etc</td>
<td>5 NOMAD X-RAY</td>
<td>4 Morphology</td>
<td>3 Break</td>
</tr>
<tr>
<td>8:35 AM</td>
<td>2 Logistics</td>
<td>1 access</td>
<td>10 Dx Tests</td>
<td>9 EAL</td>
<td>11 pickup Cassettes break</td>
<td>8 Obturation</td>
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<td>4 Morphology</td>
<td>3 Break</td>
<td>2 Logistics</td>
</tr>
</tbody>
</table>
Introduction: The class will meet in room 7407 for an 8 am starting time. Please make arrangements for your handpieces to be clean and sterile for you to pick up prior to 8 am. It is important that we start on time, as the schedule is tight for the morning. Dr. Himel will give a brier introduction, review the mornings schedule and discuss the logistics of the first six laboratory sessions.

1. Station 1: Access Preparation / Access Bur Kit / Morphology: This table clinic will have at least 3 presenters. During this session the presenters will introduce the student doctor to the idea of locating the pulp chamber. Each student will stay in this group for two rotations. As a group enters the table clinic area the instructor will allow them to take a seat at one of the designated seats. Students should have at least two extracted teeth with them for this session. The presenter will quickly demonstrate an access preparation. Students will then be instructed to locate the pulp chambers and complete access preparation on at least two teeth. We realize the students have not had adequate lectures to accomplish an ideal access. We just want them to find the pulp chamber. Anything else is gravy. The presenters for this group will then evaluate and check off the student doctor’s work giving them positive comments. This is not a graded project so have fun!

2. Station 2: Review of logistics of laboratory.

3. Station 3: Break

4. Station 4: Importance of Tooth Selection in Lab / Morphology: Presenter will have laptop computer with images of various teeth. These teeth should demonstrate various types of morphology, which are important in selecting teeth (acceptable and unacceptable) for the laboratory course. The presenter will use images of their own case as well as from text. Examples calcified pulp chamber, teeth with cast crowns, Calcified root canal systems, fast break, degree, radius and location of curvature, location in mouth etc.

5. Station 5: NOMAD Digital (Axium / Schick) Radiographs in the lab: The presenter(s) will have the group at one of the x-ray stations in order to review the proper way to expose the image and then store the image. They will also review with the students the proper way to enter their images in word document to be turned in for evaluation. By this session all students should be certified in the use of the NOMAD x-ray system. This clinic will serve as their practical training session.

6. Station 6: Irrigation Technique, Medications, interim restorative materials. The main focus of this presentation should be the importance of irrigation and the proper use of the irrigation syringe. Materials such as chlorohexidine, EDTA, Q Mix and Ca(OH)2 should be available and briefly mentioned to demonstrate that multiple types of irrigating solutions are often necessary. Side vented irrigation needles should be used in demonstration. Emphasis placed on not using heavy forces, staying in chamber and coronal segment until apical segment shaped and staying 3 mm short of WL.

7. Station 7: File Box / Files / Demonstrate Cleaning and Shaping in Plastic Block / Gear Reducer (air and electric): Students all have the air gear reduction attachment for their slow speed handpiece. This has set RPM and attaches to the air tubing on the dental units in the lab. They should also be introduced to the electric endodontic motor and gear reduction attachment. This motor will allow the students to use both rotary and reciprocation techniques. The department will provide thirty electric motors in the laboratory for use by students. If lines develop for the use of these motors, students should use their air reduction angle attachment for the rotary files. Reciprocation can only be done on the electric
motors. In addition to being used in laboratory course, the air attachment to slow speed (green ring) will be used for licensure exams such as CITA and other practice sessions for which ample electric motors and not available. The presenter will have a handpiece set up to demonstrate these motors and talk about their purpose. The presenter will then demonstrate various sizes and shapes of instruments while using rotary instruments to clean and shape canals in plastic blocks. Specific sequencing of instruments will not be discussed but only how to use the instruments. Hand instruments (stem winding / hand shake / circumferential), Rotary instruments (circumferentially and advancement 1-2 mm beyond first point of resistance).

8. Station 8: Obturation / Touch N Heat: The presenter will demonstrate cone fit, sealer mix, sealer placement, use of spreader, use of heat tip and use of backfill component of obturation unit. They should then remove excess with Touch N Heat. During the presentation they should stress the importance of well-shaped canal and achieving a seal both coronally and apically.

9. Station 9: Electric Apex Locator: The presenter will use an extracted tooth to demonstrate the use of the Apex locator. Place the apex of tooth in damp sponge. Lip clip should be in sponge. Place file into canal with proper attachment to EAL. Common errors and hints for success should be discussed. Use manual to EAL as guide.

10. Station 10: Diagnostic Techniques: the presenter will introduce the students to the concepts of using various means of testing the pulp and periapical tissues. The presenter is responsible for obtaining all necessary items prior to the morning of the lab. Cold, EPT, Percussion, Palpation, Periodontal Probing, etc.

11. Station 11: Pick up cassette & Bur Kit and Instruments 4th floor dispensary / Break: If students have not previously picked up their instruments at the 4th floor window previous to this date they should do so on this break.
Table Clinic Demonstration of Instruments and Basic Techniques

To receive credit for this pass/fail lab session student must be in attendance at each station & upload the word document template for this project to the course moodle web site. On following slides table clinic topics are listed. On the yellow slides please comment on sessions and ask at least one question under the category to which your comment or question pertains. This is not graded project but must be completed. Answers to all questions will be composed by faculty and graduate students into one document and distributed to the class.

The last page of this and every endo lab session word document will be a practice diagnostic case. Please record your pulpal and periapical diagnosis prior to turning in your project.

General Information

Date(s): See course outline (8-12 am) Room #: 7407

Faculty: TBA

Content Outline

Small group table clinic demonstrations of instruments, supplies and basic techniques will be available for student observation with time available for questions. Graduate students and members of the faculty will give the table clinic demonstrations.

Students should arrive to their assigned table clinic on time in pre-assigned groups. This lab session will be held from 8:00 to 12:00 AM in the preclinical laboratory. At 8:00 AM a short presentation will be given to the class. Eight fifteen (8:15) PM will be start of groups rotating between demonstration / hands-on stations. Break stations will be included during which student doctors may leave lab, but MUST return on time for their next scheduled session. Role will be taken at each station. A list of topics to be presented, times and students in each group can be found in the Endodontic manual on the course web site.

Instructions for labeling word document records and uploading them for credit.

1. Download the Word document template from Moodle.

2. There are templates for each exercise.

3. Save the template with YOUR last name with tooth type.
4. The Word document template for the first graded exercise has the filename YourLastName_TableClinics.ppt. Van Himel would save it as Himel_TableClinics.ppt.

5. If you share the same last name, include enough of your first name to distinguish the files. For example, Leneise Lynn and Jess Lynn would use LynnL_TableClinics.ppt and LynnJ_TableClinics.ppt, respectively.

6. Complete the information on all pages of the Word document. Instructions for completion of this document are found on the document and in the appropriate section of the Endodontic Department Check List.

7. Upload completed Word document onto the Moodle web site for this course.

8. Enter your e-mail address on the first page in appropriate section.
Session II (Group A only): Goal-Start & Complete Hands-on Introduction to Access, Clean & Shape and Obturation

Instrument & Supplies
Some items are furnished by the department Student doctors are responsible for bringing the following to each laboratory session.

1. High and slow speed handpieces.
2. Tackle box from bookstore with supplies, instruments and handpiece attachment as listed on invoice in box.
3. Instrument cassette (hand instruments and bur block) with all instruments on loan from the school.
4. Teeth required for each project. The class should have extra extracted teeth available for this and all other sessions.
5. Calipers (keep these handy in tackle box for use with each project).
7. Laptop computer.
8. Rested body.
9. Eager, open and prepared mind
10.

One half will participate in this 4-hour lab session. This half of the class will be divided equally into 3 small groups (each group having 1/6 of the class). Each of these groups will be assigned to one of 3 labs (Sim lab A, Sim lab B or 7407).

Schedule:

Each group will then spend 1 hour and 20 minutes working on one of three procedures (Access, Clean & Shape, Obturation). Faculty and postgraduate students will supervise a hands-on introduction to these subjects.

Each student must have the following three documents open on your computer desktop at all times in the lab during each session.

1. The ‘Word Document’ 2.YourLastName_AccessPreparations-2.doc
2. Department of Endodontics check list.
3. Schick program

1:00 - 2:10 pm

Group A1 (Rm 7407): Access:
Group A2 (Sim Lab A): Clean & Shape:
Group A3 (Sim Lab B): Obturation:

2:20 -3:30 pm

Group A1 (Rm 7407): Clean & shape
Group A2 (Sim Lab A): Obturation
Group A3 (Sim Lab B): Access

3:40 - 4:40 pm

Group A1 (Rm 7407): Obturation
Group A2 (Sim Lab A): Access
Group A3: Clean & Shape (Sim Lab B)

I. Access Preparation Technique Session:

a. Room: Simulation Lab B
b. Since students were given an introduction to access preparation last week they should be prepared to start immediately cutting access on the following teeth. It is critical that all teeth be collected prior to the start of this lab. You will not have time to look for teeth during lab.
   i. Maxillary Central Incisor
   ii. Mandibular Incisor
   iii. Cuspid
   iv. Premolar
c. Students should turn to the department checklist on access preparation and follow images and instructions.
d. Students not having teeth selected prior to the start of this session will not be able to complete the project and will be required to complete the work outside of scheduled class time. They will receive a failing grade for the project and required to remediate outside of class prior to starting the next scheduled project.
e. Protocol: Each student doctor will have diagnostic radiographs for all teeth to be used in today’s exercises. These radiographs should have been taken prior to this preclinical period with both (buccal & angled view) images in the first two slots in mount in axium / schick file and in the ‘word document’ for the “access” project as described in the beginning of this manual in chapter
5. This is the only way to assure that the students have the proper teeth for each project. An instructor will guide you through the access preparations.

f. The reading assignments in your text, notes from lecture and the checklist should also be used as references. THE STUDENT DOCTOR SHOULD FEEL FREE TO ASK QUESTIONS OF THE INSTRUCTORS AT ANY TIME. YOU WILL NOT BE PENALIZED FOR ASKING QUESTIONS.

g. After obtaining a starting check, the student doctor will cut access preparations and negotiate the root canal systems of the unmounted teeth listed above. A size #8, # 10 and then #15 hand instrument should be placed down the canal and observed extended out of the apical foramen. If a # 15 does not demonstrate apical patency, a smaller # 8 or # 10 stainless steel hand instrument should be used. Occasionally it will be necessary to instrument the coronal root canal segment in order to demonstrate apical patency. In this case a faculty member or graduate student will accomplish this step for the student. INSTRUCTOR CHECK. The student doctor must have the instructor give a written evaluation of these teeth on the appropriate evaluation sheet.

h. RECORD THE WORKING LENGTH FOR EACH OF THE UNMOUNTED EXTRACTED TEETH. Working length is defined as the distance from a reference point on the tooth to the minor apical constriction of the canal (NOT the anatomical apex as generally seen on the radiograph) as measured by the inserted size #15 hand instrument. The student doctor will be able to visually differentiate between the anatomical apex and the apical constriction since these are hand held extracted teeth. No radiographic images are required.

i. The student doctor will cross section the teeth at the cervical line, mid-root and 3 mm from the apex using their high speed handpiece. Student doctors will observe the relationship between the internal and external anatomy of these teeth. This is a complete/incomplete step and must be checked and signed by a member of the faculty.

j. You should open the ‘Word Document’ / YourLastName_AccessPreparations-2.doc

k. The last page of each of your evaluation ‘word docuemnts’ will be a clinical cases for which you will be asked to make a pulpal and periapical diagnosis.

l. The word document for this project should be uploaded to the moodle web site for this course at end of Simulation lab period prior to midnight.
m. Students must place these teeth in an autoclave bag with their name printed on the bag. They must then turn in the bag to the department.

II. Cleaning and Shaping with Irrigation Technique Session:
   a. Students will use a plastic block (Plastic block with curved canal (0.04 taper rotary) # PB04, Dentsply Tulsa) for this project. They have an access preparation cut, and the canals have not been previously shaped.
   b. Students must have all instruments and supplies, especially their endodontic handpiece and file box.
   c. Students will be guided through the technique of shaping a canal following the department’s endodontic checklist.

III. Obturation Technique Session:
   a. Students will use a plastic TrueTooth (TrueTooth Accessed & Shaped Mandibular Molar Replica: 31-001AS www.DELendo.com) for this project. This is a 3-D printed tooth, which has an access preparation cut, and the canals have been previously shaped.
   b. Students will be guided through the technique of obturation of these canals following the department’s endodontic checklist.
   c. The major goal of this session is to introduce the student to materials, instruments and the technique. It will not be possible in this amount of time to expect competency in obturation.

SESSION III (GROUP B ONLY): GOAL-COMPLETE HANDS-ON INTRODUCTION TO ACCESS, CLEAN & SHAPE AND OBTURATION

This session is identical to the previous session II. The other half of the class will participate in this 4-hour lab session. This half of the class will be divided equally into 3 small groups (each group having 1/6 of the class). Each of these groups will be assigned to one of 3 labs (Sim lab A, Sim lab B or 7407).

Schedule:

Each group will then spend 1 hour and 20 minutes working on one of three procedures (Access, Clean & Shape, Obturation). Faculty and postgraduate students will supervise a hands-on introduction to these subjects.
Each student must have the following three documents open on your desktop at all times in the lab during each session:

1. The ‘Word Document’ 2.YourLastName_AccessPreparations-2.doc
2. Department of Endodontics check list.
3. Schick program

1:00 - 2:10 pm

Group A1 (Rm 7407): Access:
Group A2 (Sim Lab A): Clean & Shape:

Group A3 (Sim Lab B): Obturation:

2:20 - 3:30 pm

Group A1 (Rm 7407): Clean & shape
Group A2 (Sim Lab A): Obturation
Group A3 (Sim Lab B): Access

3:40 - 4:40 pm

Group A1 (Rm 7407): Obturation
Group A2 (Sim Lab A): Access
Group A3: Clean & Shape (Sim Lab B)

See Session II for details of supplies, instruments and techniques for this session.
Session IV: 1\textsuperscript{st} Round

Goal-Complete Triple Small Groups

Purple Group (A1 & A2): Access
Green Group (A3 & B1): Clean & Shape
Gold Group (B2 & B3): Obturation

Access through Obturation: The class will be divided into three groups (purple, green and gold) and each group assigned to one of the three labs and work on a different skill set for each of the 4\textsuperscript{th}, 5\textsuperscript{th} and 6\textsuperscript{th} labs. This session the groups will be assigned as follows.

- Purple Group Simulation Lab B (A1 and A2 from 2\textsuperscript{nd} and 3\textsuperscript{rd} sessions): Access
- Green Group Simulation Lab A (A3 and B1 from 2\textsuperscript{nd} and 3\textsuperscript{rd} sessions): Clean & Shape
- Gold Group Room 7407 (B2 and B3 from 2\textsuperscript{nd} and 3\textsuperscript{rd} sessions): Obturation

Purple Group (A1 and A2 from 2\textsuperscript{nd} and 3\textsuperscript{rd} sessions): Access

1. Students should have downloaded the planning guide and evaluation word document from the course moodle web site prior to this lab. Radiographs should have been taken prior to the lab and pretreatment measurements made and entered in the word document for each tooth.
2. Students should have used calipers to measure the length of the teeth prior to mounting the tooth in typodont.
3. Students must have previously selected the following teeth before the start of lab for the purpose of access, cleaning & shaping and obturation. These teeth should be mounted in the typodont in their proper positions prior to the start of the lab session.
      i. Mounting Instructions: Use ModuPro anterior sextant that has a mounting screw, according to instructions found in Acadental Modupro kit and web site.
   b. Mandibular premolar (extracted tooth)
      i. Mounting Instructions: Use ModuPro mounting putty and gel (resin) according to instructions found in Acadental Modupro kit and web site.
   c. Maxillary Premolar (TrueTooth plastic tooth)
      i. Mounting Instructions: Use ModuPro mounting putty and gel (resin) according to instructions found in Acadental Modupro kit and web site.
   d. Cuspid (extracted tooth)
      i. Mounting Instructions: Do not mount this tooth. This is a hand held project.
   e. Mandibular Molar (extracted tooth)
      i. Mounting Instructions: Use ModuPro mounting putty and gel (resin) according to instructions found in Acadental Modupro kit and web site.
   f. Maxillary Molar (Modupro plastic tooth)
      i. Mounting Instructions: Use ModuPro mounting putty and gel (resin) according to instructions found in Acadental Modupro kit and web site.
4. Starting Checks:
   a. Students must obtain a starting check for each of these projects prior to cutting access.
   b. Pre-treatment data entered into word document for project.
   c. Original radiographs of un-mounted teeth placed in word document.
      i. Buccal view
      ii. Proximal view
   d. Tooth must be mature, with canal system requiring shaping. Immature teeth and large canals will not receive a starting check and will be required to find another tooth to replace the mounted tooth.
   e. Students should take required radiographs and images and place them into the word document for this ‘triple small group project which covers the 3rd, 4th and 5th weeks of the laboratory course. Upon completion of all three sections of the document, students will then upload the document onto the moodle web site.

**Green Group (A3 and B1 from 2nd and 3rd sessions): Clean & Shape**

This lab will be a concentrated 4 hours covering this subject, which was introduced in the 2nd and 3rd lab sessions. It will be critical for the student doctor to follow the checklist for cleaning and shaping for each step. As each instrument is used, its use must be recorded on the planning and evaluation word document for this session.

Prior to class each student must study the plastic tooth and plastic block, unless one has already been provided on the word document. They should then take required preoperative measurements as indicated in checklist and below in this document.

**Instrument and Supplies Set Up**

1. The student doctor will have all supplies and instruments.

2. Plastic TrueTooth *(TrueTooth, Accessed Maxillary Central Incisor Replica: 9-001A, [www.DELendo.com](http://www.DELendo.com)) found in supplies from bookstore* and plastic block (plastic block will be handed out during class), which have the access preparations already, prepared. These will NOT be mounted.

3. High and slow speed handpieces.

4. Gear reducer, NSK with gold and green band.

5. Department will supply electric motor and gear reduction attachment.

6. Calipers (keep these handy in tackle box for use with each project).

7. Safety glasses.

8. Laptop computer
9. Endodontic tackle box with all contents

All instruments and supplies should be properly arranged in cassette prior to the start of this simulation laboratory session. This organizational goal includes expendables such as syringes used to deliver irrigation solutions.

Protocol

1. This will be a guided session. All student doctors will have instruments set up prior to the first student doctor starting. Irrigating syringes (Saline, EDTA, NaOCl)

2. INSTRUMENTATION OF A TrueTooth plastic tooth with previously accessed canals and a plastic block. This is a guided session and all students will work together per instructions from the faculty member leading the session with help from other faculty and postgraduate students. The student doctor will obtain working length, and complete cleaning and shaping through master apical file.

   a. Prior to lab the student doctor must have reviewed the “Check List” and the “Planning and evaluation Guide” for cleaning and shaping found in the ‘Word Document” for this series of 3 sessions. Read carefully and LEARN the cleaning and shaping section of the checklist on the moodle web site prior to coming to class.

   b. Starting check and evaluation. Preparation time will save lab and clinic time. You must have instruments neatly arranged.

   c. Open Endodontic Checklist to appropriate section and follow precisely as each step is accomplished. Enter each file name and how used on planning and evaluation word document for this series of 3 sessions.

3. Students should take required radiographs and place them into the word document for this ‘triple small group project which covers the 3rd, 4th and 5th weeks of the laboratory course. Upon completion of all three sections of the document, students will then upload the document onto the moodle web site.

Gold Group (B2 and B3 from 2nd and 3rd sessions):

Obturation

1. Students will set up all supplies and equipment for the start of this procedure at 8 am.
A plastic TrueTooth, Accessed & Shaped Mandibular molar Replica: 31-001AS with access and shaping of canals completed will be used. The purpose of using a pre-shaped tooth is to give each student an ideal opportunity to perform obturation. Often when new students are preforming obturation for the first time they are doing so on teeth they shaped which may be less than idea. It is important for the clinician to understand that the quality of obturation and successful endodontics is dependent upon the quality of canal shaping.

2. Students must follow the instructions for obturating these canals found in the Endodontic department checklist.

3. Students should take required radiographs and place them into the word document for this ‘triple small group project which covers the 3rd, 4th and 5th weeks of the laboratory course. Upon completion of all three sections of the document, students will then upload the document onto the moodle web site.
Session V: 2\textsuperscript{nd} Round

Goal-Complete Triple Small Groups
Purple Group (A1 & A2): Clean & Shape
Green Group (A3 and B1): Obturation
Gold Group (B2 & B3): Access

**Access through Obturation:** The class will be divided into three groups (purple, green, and gold) and each group assigned to one of the three labs and work on a different skill set for each of the 4\textsuperscript{th}, 5\textsuperscript{th} and 6\textsuperscript{th} labs. This session the groups will be assigned as follows.

- **Purple Group (A1 and A2 from 2\textsuperscript{nd} and 3\textsuperscript{rd} sessions):** Clean & Shape
- **Green Group (A3 and B1 from 2\textsuperscript{nd} and 3\textsuperscript{rd} sessions):** Obturation
- **Gold Group (B2 and B3 from 2\textsuperscript{nd} and 3\textsuperscript{rd} sessions):** Access

See session IV for details, only the group assignment changes.

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Session VI: 3\textsuperscript{rd} Round

Goal-Complete Triple Small Groups
Purple Group (A1 & A2): Obturation
Green Group (A3 & B1): Access
Gold Group (B2 & B3): Clean & Shape

**Access through Obturation:** The class will be divided into three groups (purple, green, and gold) and each group assigned to one of the three labs and work on a different skill set for each of the 4\textsuperscript{th}, 5\textsuperscript{th} and 6\textsuperscript{th} labs. This session the groups will be assigned as follows.

- **Purple Group (A1 and A2 from 2\textsuperscript{nd} and 3\textsuperscript{rd} sessions):** Obturation
- **Green Group (A3 and B1 from 2\textsuperscript{nd} and 3\textsuperscript{rd} sessions):** Access
➢ Gold Group (B2 and B3 from 2\textsuperscript{nd} and 3\textsuperscript{rd} sessions): Clean & Shape

See session IV for details, only the group assignment changes.
Session VII: Goal - Start Project Mandibular Premolar

Instruments and Supplies

Three (3) Teeth needed for this Project:

1. Two unmounted extracted premolars (one should be a maxillary and one a mandibular). Access preparations will be cut and evaluated as either complete or incomplete
2. One single rooted extracted mandibular premolar will be treated unmounted. Instructor Evaluation.
3. All items as listed and used in previous sessions.

PROTOCOL

From this point forward, a full set of radiographs will be required for all endodontic projects. The student doctor will be able to relate the importance of these films to the techniques they are performing, especially the value of angled radiographs. Full sets of radiographs are required for the composed of the following images:

<table>
<thead>
<tr>
<th>Table 4-1: Required Radiographs, This is not a list of steps to be checked, only the images to be taken!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type Image</td>
</tr>
<tr>
<td>1 Tooth Selection</td>
</tr>
<tr>
<td>2 Diagnostic</td>
</tr>
<tr>
<td>3 Working Length</td>
</tr>
<tr>
<td>4 Master Apical File</td>
</tr>
<tr>
<td>5 Optional Master Cone</td>
</tr>
<tr>
<td>6 Down-pack (Check) Film</td>
</tr>
<tr>
<td>7 Back Fill</td>
</tr>
</tbody>
</table>
Final Film

Facial and angled

Although required in clinic this will not be required in lab course as we are not placing coronal restoration. After removing excess gutta percha & placement of interim or core restoration. In clinic one angled image showing all canals is usually adequate.

**PROCEDURE:**
Student must follow checklist for all steps. Cut access preparation and negotiate the root canal systems to demonstrate apical patency of the two unmounted premolars. If you cannot negotiate through the apical formaen to demonstrate patency, seek assistance from a member of the faculty. Coronal and merging segment shaping may be necessary in order to obtain this patency. The class will be guided through the first unmounted access. Then, everyone will proceed at their pace. Observe differences in root canal systems between premolars and anterior teeth. At least one tooth will be a mandibular premolar and one a maxillary premolar. (Refer to lecture notes, check list and reading assignments.) These teeth should be cross-sectioned as done with the unmounted anterior teeth in session I. The unmounted access preparations must be completed by 9:30 am.

Everyone will be guided through the access of the mounted single rooted mandibular premolar and start at 9:30 am if not earlier. They will demonstrate improvement in cutting access preparations by cutting access in a mandibular single rooted premolar. If this tooth is determined to have more than one canal, only one canal should be treated for the purposes of this session. However, all canals must be located.

Use the Electronic Apex Locator (EAL) and record the electronic (tentative) working length on your planning sheet. Follow instructions for “Electronic Apex Locator” in the checklist and other reading assignments. Remember, if you cannot easily place a #15 (2 % taper) instrument to working length, gently work the #8 (2 % taper) and #10 (2 % taper) instruments to gauge canal size and create a glidepath for the #15 instrument. See checklist for details. In these small canal cases it will be necessary to flare the S.L.E.D. segment using rotary instruments to free the #15 (2% taper) enough to gain working length.

Take a radiograph of the tooth with the working length file set at the minor apical constriction and the silicone stop set at the reference point. Have your
instructor sign off the working length step. If the instrument being used to
determine working length is loose and will easily go beyond WL, then the next
larger instrument should be used until an instrument that fits easily at WL is
determined.

Clean and shape the mounted mandibular premolar. Refer to reading
assignments, class notes, the addendum of this manual and the planning guide
for cleaning and shaping root canal systems which you have completed prior to
arriving today.

Keep the tooth moist stored in a sealed container. A moist gauze or paper
towel should be placed on top of the tooth prior to closing the container.

Session VIII: Goal- Complete Project Mandibular Premolar

INSTRUMENTS AND SUPPLIES
Same as last session plus obturation supplies and instruments.

PROTOCOL

1. The student doctor should be able to identify all instruments that belong
in the endodontic kit. This will be demonstrated by responding to
instructor request for various instruments. If a student doctor is unable
to identify instruments and/or supplies, it will result in an EPR for the
step in progress. Writing a description of the instrument and its purpose
may satisfy the EPR.

2. The student doctor will complete cleaning and shaping of the mounted
mandibular premolar started at the last session if this was not previously
accomplished. Follow protocol found in this manual, on moodle web site,
and check list for this course.

3. The student doctor will obturate this mandibular premolar started at the
last session and take a check film before removing excess gutta percha.
4. The student doctor will NOT place a dry sterile cotton pellet or coronal restoration in the access preparation before taking a final double projection radiograph (facial and proximal views). Although this will be done in clinic, we will not perform this task on this tooth because of time constraints.

5. The evaluation sheet, planning guide and radiographs must be turned in at the end of this preclinical session uploading the completed word document to the moodle web site for this course. Please make sure all records are filled out completely and all EPRs have been completed. A complete set of sequentially mounted radiographs in Axium / Schick.

6. Any step not signed will result in a grade reduction and an EPR for that step (or other effects as described previously in the manual). Projects turned in late will result in 0.5 points being taken off of the final project grade for every 24-hour period the project is late.

When projects are returned to the student doctor, he/she should review the project, if the grade and evaluation is not understood or the student believes an error has been made they should discuss the project with the faculty member who graded the project.

Session IX: Start Project Two canal Maxillary Premolar

INSTRUMENTS AND SUPPLIES
Everything needed to treat maxillary premolar from access to obturation. Tooth needed for this session: Maxillary Premolar with 2 canals mounted in the Modupro typodont.

PROTOCOL
After obtaining a starting check, the student doctor will cut an access preparation on this tooth when secured in the Moudpro typodont and mounted in the simulator in lab A or B. Obtain working length (EAL and radiographs) on a maxillary premolar (2 canals).

The student doctor should have completed the “Planning Guide for Cleaning and Shaping” prior to the start of this laboratory session.
The student doctor will then clean and shape this premolar according to guidelines in check list. These steps after access can be done in 7407 and not in simulation lab. Only access must be done in simulation lab. As always, all steps must be checked.

A cotton pellet should be placed in the pulp chamber between sessions.

**Session X: Goal-Complete Project Maxillary Premolar**

1. The student doctor will complete cleaning and shaping of the maxillary premolar from Session IX.

2. The student doctor will obturate both canals of this premolar. After taking the check film radiograph, remove excess gutta percha from the pulp chamber to the canal orifice using a heated Touch’NHeat condenser tip. A cotton pellet saturated with alcohol should be used to clean the pulp chamber of sealer

3. This project is due today. The completed word document for this project must be completed and uploaded by deadline.
Session XI: Goal-Start and Complete Project Hand Held Extracted Maxillary Cuspid

INSTRUMENTS AND SUPPLIES
Tooth Needed: Extracted Maxillary Cuspid. Starting check will assure no access preparation or instrumentation has occurred prior to starting check.

PROTOCOL
This is a **timed project** and must be turned in at the end of this lab, even if you have not completed the project! This session will test your organizational skills and concepts of basic “Cleaning and Shaping Planning” and obturation. I know this seems like a great deal of work for one lab, but I know you can do it.

Hand Held Cuspid!

1. The student doctor will clean, shape, and obturate a hand held cuspid. The student doctor should have completed the “Planning Guide for Cleaning and Shaping” found in word document for this project prior to the start of this laboratory session.

2. Obtain working length by observing the patency or scout instrument exit the apical foramen. Pull the file back until it just disappears into the canal short of the apical constriction. **WL radiographs are not required and MUST NOT BE TAKEN FOR THIS PROJECT.**

3. Step checks and advice are available from members of the faculty.

4. The gutta percha can be removed from the cuspid using a combination of a heated Glick instrument or electronically heated condenser tip, and rotary instruments, leaving **at least (it can be more)** 5mm of gutta percha in the apical segment in straight canals or just shy of the initial point of curvature (S.L.E.D.) in curved canals. The student doctors should be able to discuss the importance of minimizing the amount of tooth structure removed during this procedure. This step should not take longer than 2 minutes. If it takes longer, please seek help from a member of the faculty or student teaching assistant. NEVER ACTIVATE the heat tip more than 3 seconds without removing tip from canal. If the heated tip is not removing gutta percha in this time then either the tip is too large and binding on the canal walls or the heat tip machine may not
be working properly. Seek guidance; do not keep attempting to activate the heat! DO NOT FORCE THE HEAT TIP IN CANAL. IF HEAT TIP IS BENDING YOUR ARE DOING SOMETHING INCORRECTLY. PLEASE SEEK ASSISTANCE IF THIS IS HAPPENING.

5. At the end of this session, have the radiographic images (minimum of original, obturation and post space preparation) properly arranged in Axium / Schick.

Session XII: Goal-Start Project Mandibular Molar
Teeth needed for this session:

1. One Hand Held Unmounted extracted Mandibular Molar
2. One Mounted Mature extracted Mandibular Molar (must have at least 3 canals).

The student doctor will cut access in a handheld, unmounted mandibular molar.

Student doctors will cross-section this hand held mandibular molar at the cervical line, mid root area, and 3mm from the apices, as done in Session I. Complete evaluation sheet for this hand held tooth. It is not necessary to turn in the sectioned pieces of these teeth. This access only tooth will not be graded but will be evaluated as COMPLETE or EPR.

Mounting of the extracted mandibular molar in ModuPro Endo arch in the Kavo simulator during access preparation is required for this project. Please DO Not Cut Access with tooth-sextant assembly in your hand! The student doctor may remove the ModuPRO from the Kavo simulator once an instructor evaluates access.

The student doctor will obtain a starting check. All steps must be checked. The student doctor will cut access, determine working length (EAL and radiographic), and begin instrumentation on the mandibular molar. Working length films must show all files in all canals in one film. If it is determined that this is not achievable, the course director must evaluate the case. Student doctors should be able to discuss the differences in root canal system morphology that exist between anterior teeth, premolars, and mandibular molars.
Student doctors should have completed the planning guide for cleaning and shaping prior to the start of this laboratory session.

Session XIII: Goal- Continuation of Project Mandibular Molar

1. The student doctor will continue working on the mandibular molar started during Session XII.
2. The student doctor will complete cleaning and shaping of this tooth.
3. The student doctor will place a temporary restoration in the access.
4. The student doctor will place the tooth in a moist environment.

Session XIV: Goal- Completion of Project Mandibular Molar

1. The student doctor will obturate the mandibular molar, instrumented in previous session.
2. The student doctor will turn in the project, due today.

Session XV: Goal- Project Start Maxillary Molar

INSTRUMENTS AND SUPPLIES
Teeth needed for this session:

a. One Unmounted extracted Maxillary Molar for access only.


PROTOCOL
The student doctor will cut access and negotiate the root canal system of an unmounted extracted maxillary molar for access only. Student doctors will cross-section this tooth as done in previous sessions. COMPLETE / EPR

The student doctor will cut access and obtain working length (EAL and radiographic) in the mounted plastic modupro maxillary molar to undergo cleaning, shaping and obturation. The will then initiate the cleaning and shaping phase of treatment. The guide to cleaning and shaping should have been completed prior to the start of this session.

All steps outlined in the checklist and grade sheet must be followed.
PROCEDURAL ERRORS OF PAST CLASSES: There seem to be more perforations of the pulp chamber in the maxillary molars than other teeth. Almost all of these were through the mesial wall and palatal to the mesiobuccal canal. The buccal canals are more buccal than many student doctors perceive. In addition, the second molars gave student doctors more trouble because the buccal orifices are much closer together than in the first molars.

A major issue with this tooth is the location and instrumentation of the second mesial buccal (MB2) canal. These 4th canals are usually extremely small and curved. Take your time! Follow instructions on decision tree for canals in which the # 15 does not enter canal. Use the # 8 until it is very loose at distance you are able to negotiate. This does not necessarily need to be working length at this point. In other words you are using this instrument as you would an orifice shaper (25/8 etc) in larger canals. The clinician should then continue to # 10 and repeat. Then continue to # 15 and repeat. You may still not be to working length at this point and in the maxillary molar MB2 canal you should not attempt to go to working length at this point. Repeat the series of these three hand instruments one or more times, each time you will be closer to working length. The # 8 will usually reach working length first. When it does, shape with this instrument until a # 10 will go easily to working length. Shape with the larger instrument until a # 15 will go to working length. Once the # 15 goes easily to working length, the canal has been transformed into “C” category in the decision tree. You should then continue shaping the coronal and merging segments using the sequence suggested in decision tree, recapitulating and irrigating between each instrument.

Session XVI: Goal-Continuation of Project Maxillary Molar

The student doctor will continue working on the maxillary molar from Session XIII.

Session XVII: Goal-Completion of Project Maxillary Molar

1. The student doctor will complete obturation of the maxillary molar from Session XIV.
2. At this time, the student doctor will have turned in all projects with complete records.
It is the student doctor’s responsibility to turn in all records. Any missing record will receive an incomplete or a failure for the project.

Please do not leave for the summer until you check that all of your projects and grades have been properly recorded for this course for both the lecture and laboratory Endodontic courses. If you find an error or have questions, please ask prior to leaving for the summer.
Session XVIII: Goal Start & Complete Project
Preclinical Exam, Maxillary Premolar

This is a timed exam and must stop with projects turned in at the end of the scheduled laboratory session. The format of this exam is subject to change. If changes are made they will be announced prior to this class period. It would be wise for the class to prepare extra extracted teeth. The rate of student doctors having difficulty with their teeth has been as high as 20%. Having these extra teeth should reduce the stress level of the clinic exam.

Prior to starting this laboratory exercise, the student doctor must have completed the planning guides for cleaning and shaping and have a faculty member check the form as part of the starting check to acknowledge it was done previous to starting the exam.

PART ONE: The student doctor should have two mounted extracted teeth ready for access preparation. One tooth should be an anterior tooth with a single canal the other a molar with multiple canals. These must be mounted prior to the Clinic Exam.

The student doctor should cut ideal access on both teeth and place hand instruments in all canals. If a hand instrument is not in a canal, the faculty will assume the student doctor did not locate the canal. These instruments will not be returned to student doctors.

You may cut access at anytime during the class period after receiving a starting check. If lines are long for taking and exposing images, do this until the lines are short. These will be evaluated as either a Pass or Fail. A Failing evaluation on any single tooth will require the student doctor to retake this part of the exam prior to passing the exam.

PART TWO: The student doctor will receive a starting check to start treatment on an UNMOUNTED modupro maxillary premolar with two canals and two separate roots. This must be a different tooth from those in Part One. A double projection radiograph must be available (facial and proximal views). The facial view must show all canals. Tooth selection and radiographic images must be done prior to the start of this exam.
Student doctors will clean and shape two canals as indicated on the planning guide for cleaning and shaping. The student doctor must fit a master cone into each canal and leave it in place prior to turning in the project.

Pre and Postoperative radiographs of accessed teeth and instrumented tooth with master cones in the canals should be properly mounted in word document for this project.

Everyone must stop at 15 minutes prior to the end of the Clinic Exam. Turn in the completed projects at the end of the period. No late projects will be allowed, as this is a Clinic Examination.

**Session XIX: Project-Start And Complete Project Access Preparation Exam**

Teeth Needed: One Maxillary Incisor, Any Premolar and Any Molar, all mounted in ModuPro typodont using resin.

This laboratory session will require the student to cut an ideal access preparation in 3 teeth mounted in the modupro simulator. These three teeth must be mounted in the ModuPro simulator and all work done in the simulation lab from starting to completion check. The teeth must not be removed from the simulator for any reason during the project except if permission is obtained from either Dr. Lynn or Dr. Himel.

Assignments: Once the student has completed their access preparations, they should take the teeth and Word document for this project to either Dr. Lynn or Himel for grading purposes.

General Comments:

NEXT SESSION WILL BE REAL PATIENTS!

HAVE A NICE BREAK!!!!