

A Simple Method Adopted for Tooth Sectioning in Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, DUHS

Amynah Charania¹, Humaira Akhlaq² and Zia Iqbal³

INTRODUCTION

From the third world countries including Pakistan, need for effective techniques for the study of histological tooth sectioning at undergraduate level is lacking. This is primarily due to poor resources.

Identification of human remains has always been a challenge for the forensic personnel,^{1,2} however identification through tooth sectioning may be a useful tool. The importance of tooth sectioning is realized in disasters such as earthquake, floods, airplane crashes, cyclones, volcanic explosions and terror acts etc. Also age estimation in living individuals with no valid proof of date of birth is on rise. Many medicolegal solutions are possible just by studying teeth.³⁻⁸

Histological details are important to study the morphology of oral tissues as well as for the identification of pathological conditions.^{9,10} Thin sections of teeth also provide an excellent tool for dental research.

There are many methods to look for anatomy of teeth and depending upon them various types of sectioning is adopted. Routine methods to study the morphology of oral tissues involve preparation of tissue, sectioning, staining and then observing under microscope, a procedure known as Tissue Processing. It can be defined as any treatment of hard or soft tissue necessary to keep it in a life-like manner and to impregnate it with a solid medium so as to give enough rigidity to facilitate the preparation of thin sections for microscopic study.

Methods commonly used for oral tissue preparation are:

- a) Preparation of sections of paraffin-embedded specimens
- b) Preparation of sections of parlodion-embedded specimen

- c) Preparation of ground sections of teeth
- d) Preparation of frozen sections

Procedure for tissue processing involves fixation of tissue, dehydrating in organic solvent, embedding in paraffin wax and then cutting on a microtome. Sections are then mounted on a slide, stained with haematoxylin and then observed under microscope.¹¹ The basic procedures are modified depending on the nature of specimen and the type of microscope to be used for examination.⁹ Many types of microscopes are used for the study of oral tissues, but most commonly used one is the bright field light microscope with a compound lens system.¹¹

As mentioned earlier, we in our setup lack proper resources, for elaborate and expensive lab equipments. Thus simple and alternate procedures may be adopted so that effective teaching at the undergraduate level may successfully be achieved. A simplified cost effective technique is given which was used before but usually not carried out nowadays as newer gadgets (expensive) have replaced the older simpler methods. We being a part of third world nation may adopt the simplified method due to our limited resources.³

In addition, some authors suggested that decalcification-sectioning procedure is often too harsh for archaeological remains and other researchers have found that decalcification tends to produce macerated sections in archaeological materials.¹²

Thus for study purpose at undergraduate level we can prepare histological ground sections of tooth by the help of model trimmer (carborundum stone) instead of using expensive microtome because it is easily accessible, less expensive, simple and one of the oldest method.¹³ The greater advantage of this method is the possibility to distinguish between mineralized and unmineralized tissue by an excellent preservation of tissue. Tooth enamel has 96% of minerals, which are destroyed by ordinary methods of decalcification. Thus, at undergraduate level, microscopic study of ground section of tooth by model trimmer may be one of the satisfactory methods for the preservation of calcified tooth structure. Un decalcified teeth may be studied by making thin ground sections without using any chemical in contrast to routine microtome preparations which involves decalcification, where most of the enamel is lost and histological details are often obscured.¹⁴⁻¹⁶

1. Department of Oral Biology, Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, Dow University of Health Sciences, Karachi, Pakistan.

2. Department of Oral Pathology, Ziauddin Medical and Dental College, Karachi, Pakistan.

3. Department of Anatomy, Dow Medical College, Dow University of Health Sciences, Karachi, Pakistan.

Correspondence: Dr. Amynah Charania, Department of Oral Biology, Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, Dow University of Health Sciences, Karachi, Pakistan.

E-mail: amynahsh@gmail.com

Undecalcified ground sections of tooth is also useful for simultaneous examination of mineralized dental tissue covering the root surface of teeth with periodontal disease.¹⁷

MATERIALS & METHODS

100 teeth extracted due to orthodontic or periodontal reasons were collected from the surgery department of Dr Ishrat ul Ebad Khan Institute of Oral Health Sciences for preparation of ground sections. Teeth included were anteriors and posteriors consisting of 26 incisors, 9 canines, 45 premolars and 25 molars. All grossly decayed teeth were excluded from the study. Other materials required included hard plaster, rubber bowl, plaster spatula, and plaster cutter, glass slab, model trimmer (carborundum stone), Arkansas stone, bench grinder, pumice powder, glass slide, D.P.X solution, cover slip and microscope.

Each extracted tooth was cleaned with hydrogen peroxide to remove the debris on the tooth surface and then washed with running water thoroughly.

Making A Plaster Slab:

A plaster slab of approximately 4x3" was made and the cleaned tooth was embedded (mesiodistally & labiolingually) in the center of the slab in such a way that half of the tooth was embedded while half of it was outside.



Embedded tooth in plaster slab

Preparation Of Ground Sections

To make a ground section, the tooth was trimmed longitudinally in a labiolingual / mesiodistal plane with the help of model trimmer. Plaster slab was placed on the grinding surface of the trimmer and held with one hand from the back of the slab with medium to light pressure. Constant cooling was observed by water spray during grinding to avoid generation of excessive heat and minimize the damage. The tooth was ground down to the desired width (approx 4-5 mm) on both sides. This section was removed from plaster slab and replaced by bench grinder with slow speed further till 2-3 mm. and then to about 1mm. Thus the coarse abrasive wheel was replaced by fine abrasive wheel and the ground surface of the cut tooth is held firmly against the rotating wheel. The tooth was soaked in water throughout to avoid dehydration and cracking of the section.



Model trimmer for initial preparation



Bench grinder for final finishing

Final Finishing and Polishing

Final polishing was done to remove irregularities on tooth section. Slurry of pumice and water was then rubbed with the section on Arkansas stone to make it smooth and paper-thin (approx 0.25 mm).



Arkansas stone for final finishing and polishing

Slide Preparation

A clean slide and cover slip was taken and the section was placed in the center of the slide. The cover slip was mounted by using a drop of D.P.X. solution. The slide was ready for examination under the microscope.



(Prepared ground section slide of a canine tooth)



(Prepared ground section slides of anterior and posterior teeth)

RESULTS

Observation of Slide

The prepared thin ground section was examined for different calcified tooth tissues namely enamel, dentine and cementum under microscope.



(Examination of prepared ground section slide under microscope)

CONCLUSION

For undergraduate students this is one of the effective methods for preparation of ground sections in which the hard tissue details are preserved. The setup used was not very elaborative but was easily available with low cost. The normal anatomy and constituents of tooth was maintained by this method. On the other hand sections prepared by microtome would be expensive, time consuming as the procedure involves decalcification and staining quality of tissue is reduced due to prolonged exposure of acid. Preservation of cellular structure may not be achieved successfully.

Advantages of Ground Sections

This method is useful for the examination of mineralized tissue.

It is a simple method.

No expensive equipment is required.

Can be easily performed in the laboratory.

Decalcification of tooth is not needed.

Disadvantages of Ground Section

Hand grinding is injurious, but it is not replaceable with any other simple methods thus care should be taken during preparation.

Cracks or distortion of the sections may occur during grinding.

Bubbles under cover slip may form when the mounting medium is too thin.

All the soft tissues are lost during grinding.

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