

An Alternative Efficient Technique For Thin Tooth Sectioning

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Background: The importance of tooth sectioning is realized in disasters such as earthquake, airplane crash investigation, terror, micro leakage studies, age estimation etc. The objective of this study was to develop a simple method to make thin sections (approximately 100 μ m) from freshly extracted teeth.

Methods: One hundred and twenty human premolars recently extracted for orthodontic purpose were used for this study. The teeth were stored in 0.5% chlorlaramine for 2 weeks and were not allowed to dry at any stage of the experiment. The teeth were thoroughly washed in distilled water teeth and then were sectioned buccolingually from crown to the root portion.

Results: A detailed embedding-cutting-mounting procedure is described. The prepared thin ground sections were then examined under a Polarised light microscope for the enamel and the dentine, as well as the caries lesions can clearly be distinguished.

Conclusion: This is an effective and efficient method for preparation of ground sections in which the hard tissue details are preserved.

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Key Words: Teeth Sectioning, Dental Caries, Forensic Dentistry, Enamel, Dentine, Secondary caries

Introduction

The importance of tooth sectioning is realized in disasters such as earthquake, airplane crash investigation, terror, micro leakage studies etc. Age estimation in living individuals with no valid proof of date of birth is on rise¹⁻³ to advise legal authorities in their judgment on the chronological age of individuals with a questioned age. The basic procedure for section is modified depending on the nature of specimen and the type of microscope to be used for examination⁴. New tooth sectioning techniques continue to be introduced, and older ones continue to be improved⁵.

Much research has been published over the last few years looking for teeth sectioning but mostly hand lapping is used for making teeth in very thin sections. Hand lapping⁶ is a very slow process and it takes much of the time during research projects⁷. A simple method is described by which thin sections (approximately 100 \pm 20 μ m) from fresh and archaeological teeth and bones can be obtained. The aim being to improve the quality of the sections and substantially reduce the steps and time needed to prepare specimens for histological analysis.

Methods & Materials

This study is part of a research project on caries inhibition by fluoride releasing dental restorative materials which is presented elsewhere⁸. One hundred and twenty human premolars recently extracted for orthodontic purpose were collected for this study. These teeth were free of caries and other defects, the facial surfaces were cleaned of organic and inorganic debris, using slurry of pumice on a ragwheel. The teeth were stored in 0.5% chlorlaramine and were not allowed to dry at any stage of the experiment. On each of the tooth, a cavity (Class V) on cervical margin was prepared on the buccal surface. The occlusal cavosurface margin of each preparation was located on the enamel and the gingival cavosurface margin was located on the dentine. The teeth were restored with a fluoride releasing restorative material.

The teeth were thoroughly washed with distilled water. The teeth were stored individually in a vial and placed in the incubator at 37°C. Individual teeth were mounted on a chuck using sticky wax. The teeth were sectioned buccolingually parallel to the long axis of the tooth using a Microslice 2 Precision Slicing Machine (*Malvern Instruments, UK*) (**FIGURE 1**) to obtain three planoparallel slices of around 0.5 mm thickness, spaced equally across the width of the tooth. The sections were ground to a standard thickness of 100 \pm 20 μ m. This was accomplished by grinding against a 900 grid grinding plate (*StruersRotopol - 1, Copenhagen, Denmark*)

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(FIGURE 2) at 150 rpm with copious distilled water irrigation. Sections were ground on both sides and the position of the section was changed regularly to ensure a planoparallel section. The thickness of each section was measured with a Micrometer (Mitotoyo, Japan) (FIGURE 3).

The restoration were imbedded in quinoline for 3 hours in quinoline. The altered sign of birefringence of the demineralised dentine was used to detect the caries-like lesion in the cavity preparation. The section were viewed using a Micro Star IV (Reichert Model no 1, Cambridge Instrument Inc, Buffalo, NY, USA) with the use of polarised glass (FIGURE 4).

Results

The thickness of each section of tooth was measured with a Micrometer all the sections were of standard thickness 100 ± 20 mm. The prepared thin ground sections were then examined under a Polarised light microscope for the enamel and the dentine, as well as the caries lesions can clearly be distinguished (FIGURE 4).

Discussion

Many aspects of research into the structure of both normal and diseased calcified tissues are hampered by the lack of a technique for preparation of thin ground sections and consistent and desirable thickness⁹. The advantage of this method is the possibility to distinguish between mineralized and unmineralized tissue by an excellent preservation of tissue. Routine thin-sectioning needs equipment, it is time-consuming as hand lapping is used routinely, which is expensive and cause sample wastage during sectioning. The older method of hand lapping is very time consuming and in many instances produce wedge shaped sections rather than plano-parallel ones required for quantitative research⁹.

A number of techniques for cutting of slices have been described previously^{10,11}. Grinding against a 900 grid grinding plate therefore opens up new avenues of planoparallel slices teeth with minimum thickness

more cleanly and efficiently. Because of the development of equipment and materials designed specifically for this technique, consistently good results are obtained¹². The procedure has been found to be reliable and fast enough to be of value in a significant variety of microscope studies especially studying dental caries and forensic dentistry. The preparation of $100 \pm$ mm sectioned teeth specimen are easily done with this improved technique.

Conclusion

The technique described in this report provides a step by step account of the thin sectioning of teeth. This is an effective and efficient method for preparation of ground sections in which the hard tissue details are preserved. The normal anatomy and constituents of tooth was maintained by this method.

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FIGURE 1: Microslice 2 Precision Slicing Machine (*Malvern Instruments, UK*)



FIGURE 2: Grinding Plate, *StruersRotopol - 1, Copenhagen, Denmark*



FIGURE 3: Micrometer (Mitotoyo, Japan)



FIGURE 4: r = restoration, e = enamel, Arrow = “V” shaped notch at the restoration tooth interface under polarised light microscopy.

