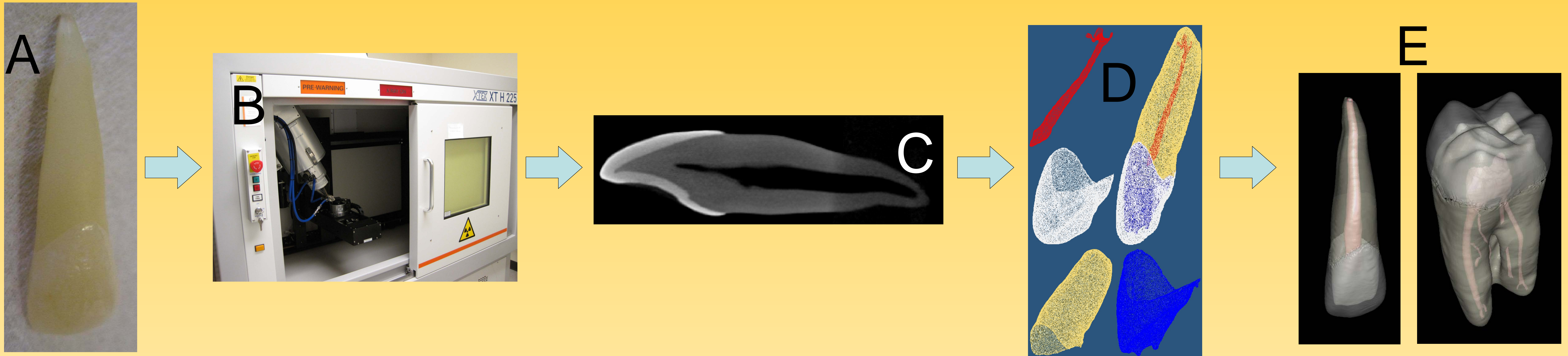# Capturing the Internal Anatomy of the Dentition for Tooth Explorer

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Introduction

Dental students currently learn the internal anatomy of the dentition by looking at different cross-sections that have been sliced from the teeth. This helps them get a general idea of what is inside, but some of the intricacies of the canals and other minute structures are not observable from a single slice. By using a Micro-CT scanner we were able to digitize teeth in their entirety with great detail, revealing some of the structures that single slices missed. The 3-D visualization software that is available today combined with the data we collected will make learning and understanding the internal anatomy of the teeth much easier and will reveal structures that were extremely difficult to observe before.

Materials and Methods

The teeth were first scanned with the MicroCT scanner (X-TEK Systems, Model XTH 225kV), with the settings adjusted to get optimal distinction between the different layers of the teeth. The data produced existed in the form of a few hundred individual slices with different grayscales representing densities. The data was then converted using a program called Avizo into an .STL format, which is a 3D surface in the form of small, connected triangles. The .STL was separated and labeled using a program called Hypermesh into the different anatomical regions of the teeth. We distinguished between the root chamber, dentin and enamel. The finalized .STL files were then inserted into a computer program shell called Tooth Explorer and can be viewed through this program.

Results and Conclusions

The teeth were successfully digitized and the dentin, enamel and root chamber components were separated and correctly identified.

The digitized teeth should help with the visualization of the internal structures of the teeth. They can be viewed from every direction within the computer program shell. Also, students are able to take a plane and slice the tooth any place they would like to see the cross section. The different layers can be faded in and out to reveal the underlying structures.

In the process of scanning and classifying the regions, different structures such as restorations, pulp stones and cracks in the teeth were found. Representative teeth of these different objects could also be digitized and added to the collection of teeth to further instruct students on how these different features interact with the teeth and what they actually look like.

Key to Diagram

A: Real Tooth
B: MicroCT Scanner
C: Digitized Tooth Slice
D: Reconstructed Surface
E: Finalized Tooth

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