Hunter schreger bands and enamel rods under polarized and bright field microscopy

Abstract

An enamel rod is the basic unit of tooth enamel. Measuring 4μm wide to 8μm high, an enamel rod is a tightly packed, highly organized mass of hydroxyapatite crystals, which are hexagonal in shape and provide rigidity to the rods and strengthen the enamel. In cross section, it is best compared to a keyhole with the top, or head, oriented toward the crown of the tooth and the bottom, or tail, oriented toward the root of the tooth. Enamel rods are found in rows along the tooth. Within each row, the long axis of the enamel rod generally is perpendicular to the underlying enamel-dentine junction. The arrangement of crystals within each enamel rod is highly complex. For the most part, the enamel crystals are oriented parallel to the long axis of the rod. The further away the tals are from the central axis, the more their own orientation diverges. The area around the enamel rod is known as interrod enamel. Nonetheless, a histologic distinction is made between the two because crystal orientation is different in each and gives rise to Hunter-Schreger Bands. This article presents enamel rods under light microscopy and polarized microscopy.

Keywords: microstructure, prism, rod, dark and light bands, polarized microscopy

Introduction

Enamel is the hardest tissue in the body covers the crowns of teeth.1–4 The microstructure of enamel is able to withstand masticatory forces. As per literature enamel is composed of inorganic and organic material. The basic structural unit of enamel is the ‘prism’ or ‘rod’, which is composed of hydroxyapatite crystals arranged specifically to enhance the mechanical properties. In cross section, the Enamel. Rods have composed of rounded head or body and a tail (look like key holes) forming a repetitive series of interlocking prisms; rounded head of each prism (rod) lies between the narrow tail portions of 2 adjacent prisms.

Each prism runs a wavy course from near the DEJ (dentine enamel junction) to enamel surface and the paths undertaken by enamel prisms, including any decussations or bending, reflect the movements of the ameloblasts that form them along the odontogenesis.6 It has previously been proved that, under reflected light longitudinally section of enamel shows an alternating series of dark and light bands.7 These features are called Hunter-Schreger Bands (HSBs)8–9 postulated that it was an optical phenomenon related to the changes in the path of enamel prisms as they travel from the DEJ to the enamel surface. It has also been suggested that the appearance of HSBs is related to the synchronous decussation of enamel prisms in the horizontal plane and is probably caused by reflection of light by inter-prismatic material.10

Enamel is made up of 3 structures: rods or prisms, rod sheaths and interrod substance. Each Rod (Prism) is consist of millions of hydroxyapatite crystallites. Each rod is formed by four ameloblasts. The boundary between rod and interrod enamel is marked by a narrow space filled with organic materials known as rod sheath.4 Various authors have studies Hunter Schreger bands in a different teeth.11–13 Very few empirical data are available regarding enamel rods under light microscopy and polarized microscopy. Therefore, authors attempted to visualize enamel rods under light microscopy and polarized microscopy.14

Methods

This study was conducted at D.Y Patil University, School Of Dentistry Nerul Navi Mumbai. Ground section was prepared and was mounted on a glass slide using DPX. The specimen was examined under reflected light, transmitted light and polarized light. The slides were then observed under Leica Research microscope Model No. DM1000LED with Leica Image analysis software (Version 3.8.0) under ×4,10xand 40x objective lens.

Observations

The present study revealed following features as follows:

Enamel under Light microscopy under transmitted light – Showed enamel rods in light brown colour. Enamel rods showed alternate T.S and L.S of hunter Schreger bands (Figure 1).

Enamel under Reflected light (ground section) – showed black and white alternate light and dark bands (Figure 2).

Polarized microscopy - it showed coloured alternate band patterns with regular T.S (yellow arrow) and L.S (white arrow) of enamel rods in specific colours (Figure 3–5).

Figure 1 Enamel under light microscopy under transmitted light – Showed enamel rods in light brown colour. Enamel rods showed alternate LS (white arrow) and TS (yellow arrow) of enamel rods (transmitted light).
Conclusion

Normal histology of enamel has been studied under light and polarized microscopy. New techniques should be developed in future to visualize decalcified thin sections of enamel with intact enamel rods structure and to visualize them in a better way.

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Conflict of interest

Author declares that there is no conflict of interest.

References


