Novel Dental Imaging

Published date: Aug. 19, 2009

Technology description

Background

With recent discoveries in the way that dental disease develops, the desire for the dentist to be able to detect, and subsequently diagnose, early caries has increased significantly. In the case of early lesions the initial loss of mineral from the tooth can frequently be reversed and through the use of good oral hygiene and fluoride the tooth can 'heal itself' and is frequently then more resistant to further attack.

Technology

By adapting technology originally developed for the telecommunications industry the Institute of Photonics has built a confocal microscope suitable for use in the oral cavity. By utilising low cost laser diodes and optical fibres the instrument is capable of recording depth profiles through a lesion. The resulting curves can then be analysed and the depth and state of de-mineralisation within the lesion determined.For treatment to be effective the disease needs to be detected and diagnosed (are the lesions growing or remineralising) as early as possible. Dentists, through their eyes, have always used the optical properties of teeth for diagnosis but the challenge to an optical physicist is to quantify and classify the lesion. Although X-rays can help, generally, if a lesion is visible by X-rays it has progressed beyond the point of self-healing.

Application area

This is clearly aimed at the early diagnosis of lesions and caries in teeth. Ideally this would be used by every dentist for every routine check-up. There are approximately 21,000 dentists in general practise in the UK alone. Devices could be sold as capital equipment or offered on free lease with charges made per image captured. The most likely model would be to offer the equipment at minimal cost to the user and generate revenue through the sale of the necessary sterile, single-use disposable tips. The instrument also has applications to other areas of the body and through the use of different light source fluorescence detection can be used if more applicable for the disease of interest, thus providing a product pipeline.

Advantages

Superior detection compared to dentists' eyes (early lesions appear as white spots on a white background)

Provides diagnosis as well as detection for efficient treatment plans
Suitable for inter-proximal, lingual and bucal lesions
Earlier detection than X-rays, will reduce number of fillings required
Suitable for imaging of every tooth at every visit (inadvisable and expensive with X-ray)
The capital equipment is not expensive and avoids the costs of photographic plates and chemical processing required for dental X-rays
Safer for dentist and dental staff as they will be exposed to fewer X-rays

Institution

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