

## A NEW AND MODERN DIGNOSTIC TECHNIQUE: SWEEP-SOURCE OPTICAL COHERENCE TOMOGRAPHY (SS-OCT)

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### ABSTRACT:

Innovative technique has been introduced in the field of dentistry for the purpose of diagnosis and treatment. Technologies like laser, composite curing techniques, optical imaging have been utilized in the field of dentistry. OCT(optical coherence tomography) is a recent technique which creates cross-sectional high resolution images.SS-OCT(Swept –Source optical coherence tomography) is a variant of optical coherence tomography ,which provides instant imaging with high resolution, non-invasive and ease of handling. This article provides a overview of Swept –Source OCT and its application in the field of dentistry.

**KEYWORDS:** Optical coherence tomography.

**INTRODUCTION:** New and evolving modern diagnostic techniques have been introduced in recent years for caries, periodontal disease, oral cancer, incipient fracture and also to check normal anatomical microstructure. Several promising alternatives are also either in development or under investigation. Some are based on instruments that produce image directly from the patient, while other's utilize saliva (or) other biological specimen's which are taken from the patient and analyzed separately.

Over past three decades, technology has advanced tremendously and has benefited dental material science in a variety of ways, including laser application, imaging technologies, composite technology, "smarter and stronger ceramics".<sup>1</sup>

Earlier detection of caries(initial), contraction gaps produced by composite, soft and hard tissue boundries, tooth- restoration interface were difficult to identify. With recent innovation it has been made easier. This short review throws a light on optical imaging technique.

Tomography now is used as a general term to describe any imaging method that produces images of selected anatomical planes within a structure.

The tomography images obtained from panoramic and computed tomography are result from interaction of biological tissue with x-ray photons. 2X –ray and CT are largest man made radiation exposure and cellular damage.<sup>3</sup>

Recent advances have made the use of optical techniques for imaging.

OCT- A new technique , called optical coherence tomography or OCT, creates cross-sectional high resolution biologic tissues using differences in reflection of light<sup>2</sup>. OCT was first used to image biological structure in 1991 by Huang et al.<sup>4</sup> In –vivo OCT images clearly depict anatomical structure that are important in the diagnostic evaluation of both hard and soft tissue.<sup>2</sup>

OCT is a promising imaging technology, because it performs "optical biopsy"; the real time and in-situ visualization of tissue microstructure; without the need to remove and process specimen's nor radiation dose and non-invasive.<sup>4,5,6</sup>

OCT uses broad –band, near infrared light sources with considerable penetration without known detrimental biological effects.<sup>7</sup> OCT is safe, versatile, inexpensive and readily adapted to a dental environment.<sup>2</sup>

OCT has advanced by means of technologic innovation to the stage of so called Fourier –domain OCT from the earlier conventional time-domian OCT.



The sensitivity advantage has been confirmed both theoretically and experimentally. Most research analysis are based on Fourier analysis system, because of improved sensitivity or signal-to-noise ratio compared with conventional OCT.<sup>8</sup>

SS-OCT(SWEPT –SOURCE OPTICAL COHERENCE TOMOGRAPHY) is a new technique of a fast Fourier transformation algorithm, featuring especially high sensitivity, ease of detection, ease of handling, non-invasive, and ultra-high image.<sup>9</sup>

SS-OCT provides instant imaging with high resolution, which facilitates simultaneous diagnosis on clinical chair side. SS-OCT is a variant of OCT, of which a light source is a tunable laser that sweeps the wavelength over a certain range. SS-OCT time-encodes the wavenumber by rapidly turning the narrowband and source through a broadband bandwidth. Fringe response versus frequency is detected with a balanced detector and the signal is Fourier transformed to obtain a depth-reflecting profile from which a cross-sectional image is reconstructed.<sup>8,9,10</sup>

#### SWEPT –SOURCE OPTICAL COHERENCE TOMOGRAPHY (SS-OCT) APPLICATIONS:

1. Wide range of potential application in diagnosing disease in various structure such as the eye<sup>11</sup>, skin<sup>12</sup>, gastrointestinal tract<sup>13</sup>, respiratory<sup>14</sup> and oral cavity<sup>15,16</sup>.
2. To get information on epithelium, basement membrane, lamina propria of mucosa, salivary gland, ducts and blood vessels<sup>17</sup>.
3. Early detection of enamel caries<sup>18</sup>.
4. More sensitive method for detecting recurrent caries<sup>2</sup>.
5. To check fit and marginal adaptation of the restoration<sup>2</sup>.
6. To check margins of a cemented, functional porcelain-fused to metal crown<sup>2</sup>.
7. To check restoration and tooth interface<sup>2</sup>.
8. Detection of polymersition contraction gaps<sup>6</sup>.
9. To locate hard and soft tissue boundries of the periodontium<sup>2</sup>.
10. Diagnosis of salivary gland disease like sjögren syndrome.<sup>19</sup>
11. Detection of vascular lesion.<sup>6</sup>

#### CONCLUSION:

There has been technological development in both medical and dental field. We need to apply and update the recent technologies available in our field. The SS-OCT is variant of OCT. this has got added advantage of sensitivity, ease of detection, non-invasive and with ultra-high images. This also help in early diagnosis and execute the treatment plan.

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