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Self Made Smartphone Spyglass

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ABSTRACT

With the development of information technology, there is an increase in number of healthcare professionals using smartphones in their clinical practice. The objective of this model is to capture images and videos which is important for training and research. The use of smartphone spyglass will be useful where there is a limited access to higher grade video cameras and microscope. The purpose is to introduce self - made smartphone spyglass. An innovative, portable, affordable and easy to build self-made smartphone spyglass is built using a smartphone attached to lens for recording images and videos which can be streamed to a monitor using a projection software. Smartphone videography will be a valuable instrument in Restorative Dentistry and Endodontics for both teaching and research purpose.

Keywords: Smartphone dentistry, Tele-dentistry, Spyglass, Telescope.

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INTRODUCTION

Endodontics, branch of dentistry which deals with miniscule anatomy has witnessed a tremendous technological and materialistic advance over decades. One among those revolutionized development lead in area of Magnification starting from the traditional blindfolded “tactile-based” endodontics to highly predictable “vision-based” endodontic. Magnifying gadgets such as magnifying glass, loupes, orascope and dental operating microscope have greatly improved the precision and predictability especially in field of microendodontics pioneered by Dr. Gary Carr.^{1,2,3}

In this new era of endodontics, Dental operating microscope have change the perspective of endodontics and about 20% of all endodontists incorporated magnification on daily basis and momentum further increases towards the goal of micro dentistry.²

The enhanced visual vicinity using various magnification devices allows in precise diagnosis of early enamel lesions including microscopic blemish, color alteration, chalky white demineralization around flaking within the crevices and treatments including precise location of canal, identifying missed and extra canals, removal of separated posts, instruments from the canal thereby preventing failures. However magnification devices has own limitations including Loupes are heavier to carry and could not result in higher magnification and Dental Operating microscope is not cost effective, inapplicable in rural areas and need four handed dentistry.^{3,4}

Smartphone usage has increased exponentially ever since its introduction. In the US, 64% of American physicians uses smartphone in their daily practice. As of August 2014, 1.64 billion people worldwide own at least one smartphone. Smartphones have a growing utility in various fields including ophthalmology and ENT confirmed by ASCRS (American society of Cataract and Refractive Surgeons) survey. The inadvertent usage of smartphones even in teledentistry have waved a path for us to design this innovative, simple smartphone spyglass in endodontics.⁵

The newer smartphones are capable of capturing superior quality videos of up to 720p and 1080p in high definition (HD). With the advancement in technology and availability of high-speed wireless fidelity (wi-fi) connection, video streaming can also be done effortlessly. Video streaming devices like Apple TV, Chromecast and Ezcast are newer methods of wireless video viewing with real-time HD video.⁶

Aim: The purpose of this research is to introduce an innovative, simple self-made smartphone spyglass.

MATERIALS AND METHOD

For Non-surgical procedures:

For non-surgical procedures in Restorative dentistry and Endodontics including Diagnosis, Direct and Preventive Restorations, We attached a commercially available 8x-12x portable telescopic lens (Universal Zoom Telephoto Optical Camera Lens, China) for smartphone and then mount the smartphone to an adjustable smartphone clamp which was mounted to a tripod stand for stability and focal length adjustments and video streamed to a monitor.

For Surgical procedure:

This assembly for smartphone along with clamp adaptor can be fitted into the assistant viewer eyepiece of Dental operating microscope and smartphone can be set into the video taking mode. Then it can be wirelessly linked to a monitor.

For Display System:

The assembly of smartphone spyglass can be live streamed to the monitor using screen casting software available in smartphones which can cast to about of 10 devices at a time. The clarity is of High Definition of up to 720p/1080p. For Control of the Recording In Android OS-based smartphones, a wireless mouse can be easily connected to the smartphone, making control for recording in a remote area easy.

This innovative tool captures images and videos during treatment, helps both during teaching and documentation apart from improved ergonomics. (Figure 1)



Figure 1: Innovative tool captures images

DISCUSSION:

The operating microscope has revolutionized and presents a quantum leap in the development of endodontics. The increased magnification and the co- axial illumination have enhanced the

treatment possibilities in non-surgical endodontics. The magnification aids with camera and video monitor attached, enhance the patient education and better documentation.^{1,7}

In the era today, most people are very dependent on their smartphones for their daily activities and work. There are several apps which may help in our management of patient by clever videography system. This stellar tool will be very helpful especially in rural areas and developing countries where there is limited access to higher grade video cameras and microscopes. There is a high potential in this video system as it is portable, affordable and of good quality.⁸

The limitation new improvements in communication technology have made smartphones an indispensable part of daily life, even in rural areas. These devices have great potential to improve patient care and enhance medical education because of their wide adoption and ease of use.^{9,10}

The usage of this innovative tool is helpful in remote areas as this is portable and can also be attached to Dental operating microscope for live streaming in a monitor and also the images are comparable to Dental operating microscope.

The limitations of this videography system is that as quality of video is high which uses a lot of memory in the smartphone. A surgery which lasts for more than 2 hours may not be ideal for video capturing using standard smartphone as the file will be very large. To improve on the length of video, the capacity of the smartphone memory should be increased or to add in an additional memory card for extra storage. An informed consent has been taken in all videos taken in this study. The identity of patients and surgeons remained confidential. Smartphone videography will be a valuable instrument in endodontics for teaching and research.^{11,12}

FUTURE DIRECTIONS:

- Though this is a simple portable device, it requires advancements in further video capturing and live streaming
- The design can be further modified to improve ergonomics.

CONCLUSION:

Through interdisciplinary therapeutic approach involving magnification devices are considered as a boon and savior in preventing endodontic failures. Self-made smartphone spyglass is a simple, innovative tool can aid in various areas in restorative dentistry and endodontics.

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