Stereo-Microscope: Usage In Dentistry-A Review

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Introduction

The Greenough stereo microscope was invented by American Horatio Saltonstall Greenough. [As an aside, Mr. Greenough was the son of, the same named, Horatio Greenough, Traditional boundaries between scientific fields such as molecular biology and developmental biology are rapidly disappearing as researchers seek to connect findings at the molecular level to those derived from cellular, tissue, and organismal studies. Fields including molecular biology, cell biology, neurobiology, embryology, developmental biology and systems biology have increasing needs for imaging systems that span spatial scales from single cells to whole organisms. This has been possible because of stereoscopic.[1]

A stereo microscope uses dual Porro prisms (named after inventor Ignazio Porro). These internally reflective prisms are used to provide erect images to the eyepieces from light paths which pass through two adjacent objectives, as opposed to the single objective designs of Riddell and Wenham. Today, Porro prisms are commonly used in microscopes and binoculars. Porro prism instruments are easy to identify owing to the relatively large tell-tale right angle turn in the viewing path. Greenough stereo microscopes are still widely use today. They provides images of objects that are not reversed as is typical with compound high power microscopes (Wade, 1998). Their design is derived from the monocular compound microscope, but here with dual paired microscopes working in unison.[1]

It is a dissecting optical microscope variant designed for low magnification observation of a sample. This Instrument uses two separated optical paths with two objective and eyepieces to provide slightly different viewing angles to the left and right eyes. The arrangement produces a three dimensional visualization of the sample being examined. In the field of dentistry also, it is bring a revolution by bridging the gap. Itsappropriate knowledge of the dissecting microscope is bound to give excellent results in diagnostic techniques.[2]

Methods

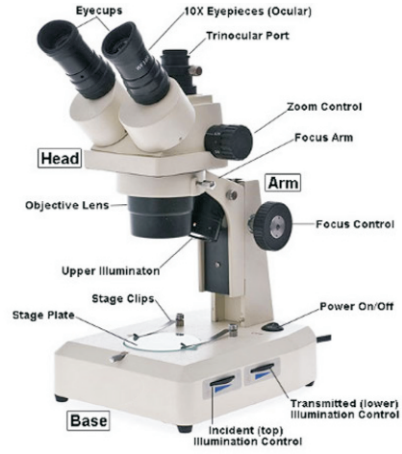
Data Sources: The review of literature was done electronically as well as manually. For electronic search, various scientific journals and web-based search engine - related to Stereomicroscope published either in English or with an English abstract in any other language publications from 2000 to the present August 2017.Screening of shortlisted studies was done and independently categorized. Any kind of disagreement between the authors regarding article and data extraction was sorted.

Stereo Microscope: Operating Tips

- Set the microscope on a flat surface in a stable and comfortable position.
- Turn on The Transmitted/Oblique illuminator. Place a small solid specimen onto the stage such as a card, coin or any other flat, detailed object.
- Turn the Magnification adjustment knob to the lowest power and bring the image into focus using the focus control.
- Adjust the eyepieces for the correct interpupillary distance to suit you. Do this by moving the eyepieces closer together or farther apart until a single field of view is observed (B). Now, set the Dioptric adjustment rings on both eyepieces to the zero position (A).
- Use the Magnification adjustment knob to set the highest magnification. Bring the image into focus with the focusing knob. Centre the image on some clear point of detail on the specimen.
- Adjust the microscope down to the lowest magnification using the Magnification adjustment knob. The image could be slightly out of focus.
- Do not adjust the focus with the focusing knob. Adjust the focus for each eye separately using the eyepiece Dioptric adjustment rings. Your microscope is now "parfocal". This means that as the microscope is zoomed from high to low magnification the image will stay in focus throughout the entire range. Each individual will have a different setting. [3]

Application in Dentistry

This optical instrument which is designed for low magnification observations of tissues. It basically utilises two different optical pathways with two eyepieces providing slightly different viewing angles. It is a multipurpose instrument



and can be used employed for routine laboratory procedures i.e Recording and examining solid samples with intricate surface details, Measuring depth of micro-leakage of endodontic filling material and to view surface details during grossing of specimens in routine histological specimens[4]

In Oral Pathology

Grossing and microscopic examination of the received specimens in a histopathological laboratory is a routine procedure for achieving a final diagnosis. Errors in either of the steps may lead to an inaccurate diagnosis since wrong orientation of the specimen may either cause diagnostic delays or pose a diagnostic dilemma. Stereomicroscope is an important accessory instrument which can be used to study a variety of specimens. It not only enables us to study the surface details but also aids in minute work including dissection and microsurgery to name a few. [5]

In Endodontics

Stereomicroscope can be used to observe the measurement depth of micro leakage of endodontic filling material, and also use to observe the absence of immature root apices, cracks, root caries, fracture and resorption defects and anatomy of root canals.[6]

In Prosthodontics

Stereomicroscope used for checking the marginal infidelity of metal ceramic and all ceramic full coverage crown ,also used for checking the bond strength failure mechanism between zirconia and luting cement.

In Orthodontics

Achieving a satisfactory inclination or torque of the incisors is important for the final esthetic result. Torque expression depends upon a number of factors including the sizeof the bracket slots and arch wires. Use of undersized

arch wires may directly and adversely affect the three dimensional tooth positioning. Stereomicroscope serves as excellent tool for arch wire dimensions (height and width). [7]

Discussion

This is a versatile instrument than can be used formultipurposes to view a variety of specimens. The Unprecedented depth and sharp images dramatically enhance efficiency for a variety of tasks including specimen manipulation.[2,5,8] It design keep astigmatism to a minimum. This effectively eliminates image deforming at pre- and post-focal plane and thus the depth of field is perceived as deeper than before. Oversights are thus minimized for specimen selection, dissection, and manipulation. A 360º view of balanced images is made possible by accommodating vertical and horizontal parameters. Discomfort in the eyes and body, as well as stress from prolonged observation or operation, is effectively eliminated. It ensures efficient screening. The ergonomic design creates a wide working space and comfort. From bright field to fluorescence observation, several different specimens can be viewed at a high resolution recognized as leading the digital imaging world. Henceforth, it assures cost-effective performance and faithful reproduction of images.[7,9]

Conclusion

Grossing of tissue specimens is an important part of final diagnosis of the treatment plan. It also assists in providing additional information which could not only facilitate in orientation of the specimen but also in correct diagnosis. Research in this directions needs to be expanded with employing use of stereomicroscopic for examination of all the tissue specimens received for histopathological diagnosis.

Limitations

This article is one of the first attempt to discuss stereomicroscope in dentistry. Due to deficiency of studies, only important findings can be reported. Secondly, comparative studies using other microscope and stereomicroscopes need to be done to establish it superior to other modes.

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