

**Impact
Factor
2.147**

ISSN 2349-638x

Refereed And Indexed Journal



**AAYUSHI
INTERNATIONAL
INTERDISCIPLINARY
RESEARCH JOURNAL
(AIIRJ)**

Monthly Publish Journal

VOL-III

ISSUE-IX

Sept.

2016

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Smart Phone: A Tool For Microscopic Photography In Histopathology

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Abstract

The present study includes the use of smart phones in educational purposes besides to make phone calls. This may be a costless, easy tool used for educational purposes as well as in the field of research. It may be beneficial for the researchers and students to use this gadget for the purpose of microscopic photography in the developing countries where microscopic accessories are not available easily.

Key Words: Smart phone, Education, Microscopy, Photomicrography

Introduction

The emergence of mobile technology and its increasing capability for photographic usage have made it the future of research worldwide. As smart phones overtake digital photography technology in use and quickly close the gap on being the most common device used for photographic activities, it is no longer valid to equate the photography to a digital camera only phenomenon. An increasingly significant and growing portion of society use smart phone as a primary way to access the photography, click their images. Photographing of microscopic findings enables a cytologist to capture microscopic images that can be used for research, presentations and teaching.

Unfortunately, microscopic photography is not available to all cytologist, pathologists or researchers. Traditional photomicroscopes with mounted cameras are costly, limiting their availability. Whole slide photography is time consuming, and access to digital accounts is also expensive. Recently, cellular phone technologies have advanced to the point that smart phones have photographic capability greater than digital cameras. New smart phone accessories can adapt smart phones to microscope eyepieces, thus facilitating microscopic image capturing. Priced around 4000 rupees, these accessories are affordable and appropriate for use. With the goal of facilitating microscopic image capturing without additional accessories, there is simple method for capturing microscopic images with any smart phone camera.

Materials And Methods

Table: 1. Equipments used in present research work

Sr. no.	Equipment	Utilized for
1	Smart phone	To capture images
2	Charger	To charge batteries of smart phone
3	Microscope	To visualize image on smart phone
4	Laptop/ desktop	To edit photographs for further use

This technique is quick, easy to learn, and can be used by researcher at any microscope. Smart phone microscopic photography enables using the third through fifth fingers of the left hand to steady the hand on the right microscope eyepiece, holding the camera between the thumb and second finger of the left hand and second through fifth fingers of the right hand, to leave the right thumb free. By looking through the smart phone screen while focusing on the light in the ocular of the right eyepiece and slowly bringing the phone closer to the microscope, the view beneath the microscope lens will eventually fill the screen (Annie *et al* 2013, 2014). The right thumb is free to focus the camera and capture the image. The camera's zoom function can remove the circular frame around the image.

Results And Discussion

Additional basic smart phone camera functions can be used to produce high-quality images suitable for use in research and publications. Successful smart phone microscopic photography is dependent on the ability to hold the camera steady and, while initially frustrating to learn, the technique can be readily mastered with practice. Although conceptually simple, smart phone microscopic photography is an invaluable tool for histopathologists, clinicians, and trainees in many fields. This technique enables pathologists who do not own conventional microscope cameras, including those in small practices or developing nations, to obtain high-quality photomicrographs for use in a variety of clinical and educational applications, thus facilitating virtual consultations and the sharing of interesting cases. Smart phone microscopic photography also encourages trainees and clinicians to interact with microscopic images, further generating interest in histopathologic diagnostics, and encouraging a rapport between pathologists and clinicians. This technique and its potential applications are of novel interest and utility for histopathological investigations of researchers.



Figure 1: Holding the smart phone steady, the view below the microscope lens will show the photograph on the screen and an image can be captured by pressing right thumb

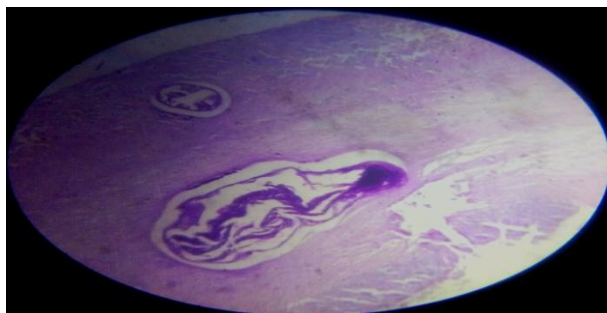


Figure 2: image of infected intestine of fish with helminth parasites captured by smart phone on binocular microscope

Conclusion

Smart phone are the newest research tool, but they will not be the last. The next generation of cytologist, histopathologist will view Smart phone the way we currently view photocopy machines, as essential components of our research.

Rather, digital cameras should be considered from the perspective of our most fundamental goals for improving conditions for our collections materials, facilitating greater research economically and efficiently, and resolving competing demands for resources and maximizing the productivity of researchers. By adopting this mindset with our Smart phone use, we are poised to evaluate objectively the technology that will replace digital cameras by Smart phone. Because fewer materials were used for smart phones, they are less expensive than digital cameras. They run on smaller amounts of power than digital cameras and are small and lightweight when compared to digital cameras. They can easily be carried by anyone, anytime and anywhere. Mobile learning is now convenient and flexible because their portability, they also have Bluetooth and/or Internet connectivity. Internet connectivity enhances student performance because students have easy and fast access to information, making them supportive tools. Smart phones are the closest gadgets that anyone can have.

With hundreds of photographic apps available in the app libraries, researchers can personalize their smart phone.

Acknowledgements

The authors thank to Dr. Sardarpasha A.K., Principal, Azad College Ausa, Dist. Latur, Maharashtra, India.

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