

Simple, Fast and Reliable Method of Taking Photograph with Small Sized Cellotape Assisted Smartphone on Light Microscope: The Urip Susiantoro Approach in Limited Resources Setting

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Authors' contributions

This work was carried out in collaboration between both authors. Author US developed and perfected the techniques and make the outline of the procedure. Author FES designed the article/manuscript and wrote the first draft of the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Documenting an object seen in a light microscope is a challenge, especially in limited setting area, for an example when doing field trip for environmental sampling. Taking photographs directly using smartphone, or so called microscopic photography, is not easy. Here we proposed a simple, fast and reliable method of taking photograph with small sized cello tape assisted smartphone on light microscope. We named this procedure "the Urip Susiantoro approach", methods can be practiced in limited resources setting.

Keywords: Sample; environmental sampling; documentation; macro-mode; visualization; adaptor.

1. INTRODUCTION

Examining clinical specimen using light microscope is a daily, common and routine

procedure in the laboratory. Almost all kind of specimen can be checked using standard microscope. There are various preparatory techniques for light microscopy, depend on the

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consistency nature of the clinical specimens, whether it is solid or liquid [1,2]. Actually, in principles, this preparation effort directed to the main goal of laboratory examination which is to make a correct diagnosis [3]. Even several Medical professional organizations issue guidelines on how to handle clinical specimens prior to examination [4].

After getting the correct identification of the clinical sample that was examined, then correct and definite diagnosis can be made. Sometime the laboratory technicians or the doctors need or have to documented it for several reason, e.g. case report publication, insurance or research/study etc [5].

The documentation of the appearance of microscopic clinical sample can be done by way of making photographs, and techniques developed over time [6]. In the classic approach nowadays, it can be done directly thru the ocular lens using smartphone camera [7]. Recent advancement of the information technology made it possible to take picture from the microscope using macro mode that usually exist in smart phone; in principles it is like taking close-up shots of an object from a very close range [8]. That kind of so extreme approach the picture taken appears life-size or larger in the resulting image.

This option, even though applicable, but most of the time it is not reliable due to the instability of the hand when pointing at the camera of the smartphone. The image usually blurred, cut off or sometimes there is a black spot as a result of part of the edge of the ocular lens that being photographed [8]. The Morrison technique, A free-hand method for capturing photomicrographs using a smartphone proposed by Morrison and Gardner was actually proposed to overcome the unwanted effect of smartphone photography [9]. This Morrison technique give an alternative, but still it rely on the finger of the hand that being a kind of adapter for other fingers holding the smartphone.

Our experience on doing the microscopic examination in the field while doing the environmental sampling, where resources is usually limited and photographs must be taken as soon as possible due to the pile of samples to be examine; then these has taught us local wisdom on how small thing that usually available in the laboratory or office setting actually can

help examiner to adjust the smartphone for taking photographs on clinical specimen more reliable and simple to apply. The aim of this report is to share our knowledge and experience on the using on small sized cello tape as an adapter for smartphone camera while trying to capture photographs thru ocular lens of the microscope, and this approach is suitable in very limited resources, e.g. when doing the field trip or environmental sampling in limited resources setting.

2. METHODOLOGY

This approach was developed and perfected by Urip Susiantoro, an experienced laboratory technician in the department of Parasitology, Faculty of Medicine, Universitas Kristen Indonesia, Jakarta-Indonesia. This approach only needed a small size cello tape. Actually, the body of this cello tape used as a primitive adaptor or holder for the camera of the smartphone to keep it steady and ready for taking picture. The reason why to use the small size of cello tape because it is exactly almost the same size as the diameter of the ocular lens, so it will fit perfectly as an external adaptor-like to put and rely the camera of the smart phone.

The steps were as follows: after finding the right object to be documented, put it in the center of the ocular lens (it would be great if the ocular lens have an internal pointer, so that the object can be set next to the pointer), then take one or two small size cello tape (two is more preferable), the next step is to put the cellophane in the ocular lens (it is recommended to use the ocular lens which has a pointer), then right away put the camera of the smartphone exactly in the hole of the cello tape and use the body of the cellophane/cello tape to support the smart phone, it is advisable to hold the smartphone only with one hand (preferable the stronger and most stable one), then slowly adjust the camera settings so that it can capture the image from the ocular lens, then carefully set to the macro mode (if available) or manually sets the camera into larger view setting, the other free hand can give a big favor by adjusting the micrometer of the microscope or perhaps setting the aperture of the microscope for the lightning, so that the visualization of the object can be maximized in appearance, and then finally after the right image already captured by the camera, the free hand can be started pushing the button of picture taking.



Fig. 1. A. small sized cello tape used as an external adaptor-like for the smartphone. **B.** Setting the smartphone so that it can rely on the cello tape. **C.** Left hand can hold the smartphone, and with the free right hand can adjust the microscope settings (e.g. aperture for light), and after the best image seen, the right hand's finger can push the button of the camera

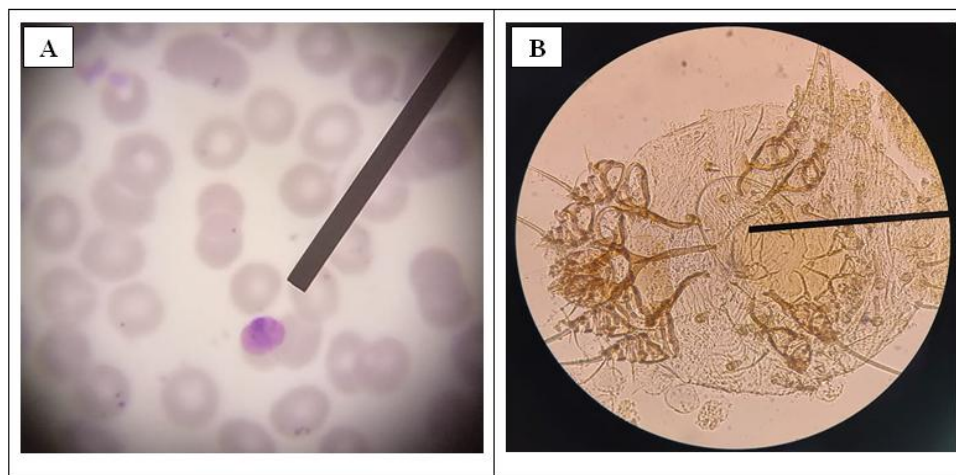


Fig. 2. A. Thin blood smear slide showing the image of *Plasmodium falciparum*'s developing gametocyte. **B.** Skin scraping slides using KOH 10% showing *Sarcoptes scabiei* with smaller *S. scabiei* and the impression of hatching egg shell inside the body of the bigger one. All picture taken by Urip Susiantoro using the technique which he created and perfected using cello tape assisted smartphone in Olympus CX21 light microscope (all slides belongs to the dept. of Parasitology, faculty of Medicine, Universitas Kristen Indonesia, Jakarta-Indonesia)

The result of the photographs taken using the Urip Susiantoro technique is nice and as beautiful as the real object. It is usually quiet small, but with the enlargement feature that usually exists in the smartphone, it is so easy to make the picture bigger, and adjusted in size as needed. It is recommended that each first photograph taken saved to the memory of the smartphone before the picture being photographically adjusted.

3. DISCUSSION

Unfortunately even until nowadays, the advancement of microscopic photography, in the context of daily routine work in the laboratory, is not always available to all examiner (doctors in the laboratory, clinical or laboratory pathologists, laboratory technicians or to trainees) [10]. Old fashioned photomicroscopes with fixed mounted cameras are sophisticated, in-efficient, costly and limited in usage due to their availability (this sophisticated microscope will not able to be taken and operated in the context of working in the field, or outside the laboratory, e.g. while doing the environmental sampling in remote area with limited resources) [6].

Furthermore, if the examiner trying to examine the whole slide then it will be spend much more time, energy and perhaps other resources (e.g. financial) compared than just checking it via microscope without making photographs, and must be taken into account that every approach to digital accounts is also not cheap. This kind of microscope is usually not easy to operate in the field (outside the laboratory) due to certain requirement that must be fulfilled in order the microscope can be operated and functioned well.

Recently, cellular phone technologies have advanced to the point that smart phones have photographic capability exceed than many point-and-shoot cameras. It is user's friendly, easy to carry and to operate, it has big storage capacity and there is software available to make the picture better. New age smart phone even have accessories that can adjust the smart phones to microscope ocular lens or eyepieces, thus facilitating microscopic image capturing, even though it is quite expensive, but still affordable and appropriate in some settings. The limitation perhaps (1) it is still quiet thick for trainees and clinicians to carry in their pocket, (2) even though this device actually plug and play but it is not likely to bring them into the microbiology

laboratory or to a colleague's microscope and just plug it, and the last but not least (3) this device perhaps seldom to be available in developing nations [7].

In limited setting area, where researchers usually went for a field trip for environmental sampling, it is so often that the places visited is not suitable for doing the electric source light microscopic examination (e.g. no electricity). For such condition, adjustment must be conducted in order to get the photographs of sample being examined.

Unlike the expensive accessories for smartphone, small sized cello tape being used as an external adaptor, is easy to find, cheap and usually can be found everywhere. By using cello tape, fear of damaging or scratching the microscope lens can be avoided because by using this cello tape, it add more spaces to the camera, or in a simple word can be say that it keep away the camera or the edge of the smartphone the lens. In other word, this approach is noninvasive to the microscope.

The benefit of using this cello tape listed as follows: simple, fast, reliable, easy to learn, affordable, user's friendly and the last but not least that it prevents the camera or the smartphone from the potency of damage the outer surface of the ocular lens. Once someone used to it, it is very easy to implement and not necessarily depending on hard resources (e.g. Electricity). Limitation to this methods is for someone to become familiar with this approach, he/she should be practiced it more often. If possible, even to practice it on both monocular and binocular type of light microscope.

4. CONCLUSION

We proposed a simple, reliable and fast method of taking photograph using small sized cello tape aided smart phone in light microscope. This technique is easy to apply, cheap, noninvasive to the microscope and do not need other additional device or resources. Limitation to this technique perhaps that everyone who is interesting to use this method must practice it more often. Clinical significance for scientists working in the field, in area which is remote and limited in resources, this procedure can be best apply in order to documentation or take picture of the sample using smartphone. This approach is very easy and reliable, if someone already perfected these methods.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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