A Simple, Versatile Device for Multiplanar Photography

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Background: Taking pictures of protruding body parts (such as fingertips, toes, nipples, auricles, hands, and feet) from multiple directions is difficult. To solve this problem, we developed a simple and easy-to-use device, using mirrors.

Methods: The device is composed of 4 trapezoidal plane plastic mirrors firmly connected to each other. It is possible to photograph the object from 5 directions at once, including the real image of the object at the center, and 4 images that are reflected in the mirrors around the sides.

Results: The device allowed photographing various body parts from multiple directions at once.

Conclusion: This simple and easy-to-use device helps us to take additional photographs in a single shot, which previously took more time and effort. (Plast Reconstr Surg Glob Open 2020;8:e2916; doi: 10.1097/GOX.0000000000002916; Published online 15 June 2020.)

INTRODUCTION

Recording and evaluating specific parts of the body continue to be highly important activities for plastic and reconstructive surgeons. Photographic recordings and moving images are widely used in plastic and reconstructive surgeries, but they are planar and contain only 2-dimensional data. Recently, opportunities to use 3-dimensional images and moving images have increased. However, it is not easy to photograph or video capture a body part from multiple directions at the same time. To solve this problem, we developed a simple and easy-to-use device, using mirrors. With our device, it is possible to photograph a target object from multiple directions simultaneously. The mechanism and usage of this newly developed device will be discussed here.

METHODS

This device is composed of 4 trapezoidal plane plastic mirrors. The 4-plane mirrors are connected in such a way that the mirrors face inward, and there is a hole at the center of the device. The device is bowl shaped, with a hole at the bottom. When the device is placed on the floor, each mirror is at an angle of 45 degrees to the floor. When the photographer looks into the object placed at the center of this device from above, he/she can photograph the object from 5 directions at once, including the real image of the object at the center, and 4 images that are reflected in the mirrors around the sides (Fig. 1). The 4 mirrors of this device are firmly connected to each other, forming a robust ring. In addition, the mirrors are made of plastic and are lightweight and durable. Therefore, this apparatus can be used not only on the floor, but also in the air, with the photographer holding the apparatus using one hand and taking pictures using the camera held in the other hand. The photographer can place this device safely at any location on the patient’s body and use a camera or a video camera to shoot multiple images or to take video footage simultaneously.

RESULTS

Using this device, we are able to simultaneously photograph or video capture a body part from 5 directions (Figs. 2, 3). (See Video [online], which displays a video of the hand taken from 5 directions. A fully synchronized video from 5 directions can be taken using the device.) There was no need to change the camera and video equipment or the settings that are used regularly at our institution.

When the photographer tried to photograph a large object, it was necessary to prepare a larger device (Fig. 4). In addition, using the ring flash sometimes resulted in halation due to the reflection in the mirror when we photographed some objects. Therefore, the angle of the flash was adjusted to avoid halation.

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DISCUSSION

The simple device that we developed using mirrors made it possible to easily photograph an object from 5 directions simultaneously. Various areas of the body are treated as plastic surgery targets, and surgeons are required to appropriately take photographs and video records of these parts. It is also important to take continuous records over time and often from multiple directions. Using our device has various merits when performing these recordings.

First, it is possible to finish shooting a target from multiple directions in a short time. We often have difficulties when photographing children who are restless or when the target body part is in an area that could make a patient feel embarrassed. Complete recording in a short time is very helpful for both the photographer and the patient. Second, the working mechanism of the device is simple and easy to understand. There is no need for large-scale devices, power supplies, personal computers, or instruction manuals. All that the photographer needs to do is to simply point the device at an appropriate angle and shoot as normal. This device could be used in any environment, such as outpatient offices, operating rooms, and hospital wards, and can be easily carried between hospital wards and operating rooms.

In recent years, the number of devices and opportunities to perform 3-dimensional imaging when recording the body has been increasing. However, the more complex the imaging environment and equipment, the more physical and psychologic burdens arise for the photographer and the patient being photographed. In 3-dimensional imaging, additional equipment and devices are required.

Fig. 1. The structure and usage of the 5-plane photography device having a 4-sided mirror. The original digital camera system with a ring flash could be applied in most cases; however, care should be taken to avoid halation when photographing some objects.

Fig. 2. Using a device containing a 3 x 3 cm² hole, the reconstructed nipple and areola can be photographed from 5 directions simultaneously.

Fig. 3. Five directions of the auricle using a device containing a 6 x 4 cm² rectangular hole are shown.
both for taking photographs and for browsing the images. Our device eliminates these problems.

There have already been reports of using mirrors to capture objects from multiple directions. In 1972, Tsuchiya et al. reported a method of photographing teeth placed on a table using 4-plane mirrors. Frey et al. invented a 3-dimensional video analysis of facial movements using mirrors, although that system has not become a standard method. Kühnel et al. developed and reported a facial imaging device combined with mirrors. We reported a method of photographing both the front and the upper surface of the breast simultaneously using a single-plane mirror. Our current device is a stable structure with a combination of trapezoidal plane mirrors. It is simple, easy for photographers to handle, and safe for patients. Although based on a very primitive principle, it is a versatile device that can be used in various applications other than medicine.

There are some limitations that should be discussed regarding this device. It is necessary to change the size of the device according to the target object. Because the size of the hole at the bottom of the device is fixed, it can only photograph objects that can fit into the hole. In addition, because the device is suitable for capturing single objects, it is recommended that pictures of the entire body be taken along with more focused pictures of the target object to assess the relationship between left and right pair objects or between the target object and the entire body. However, it is not complicated to switch between taking photographs from the usual angle and through this device. Furthermore, technical problems should be solved to produce sets of the device in multiple sizes.

In the future, it may be possible to take pictures of the breast, the entire head, or—in theory—the whole body. Applications of this apparatus in various fields are expected. We are confident that this device will be widely used all over the world due to its simplicity and versatility.

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