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A Guide to Forensic Photography: An Indispensable Tool in Modern Forensic Medicine Practice and Medicolegal Cases

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Abstract

Forensic photography has become an important tool in the medicolegal system, so as to it give a complete picture for investigating crime scenes. It is the easiest and effectual way to capture the crime scene, in a way what could've happened that even the most illustrative and descriptive words could not do. However, appropriate selection and implementation of the proper photography and computer equipment combined with effective training and correct workflow patterns is required for incorporating photography into the field of forensic practice with proper documentation. This paper highlights basic aspects to gain clear and focused photographs both in living individuals and Medicolegal Postmortem examination. The paper contains the propositions for a draft protocol for Forensic Photography in Crime Scene Examination, Medicolegal examination, postmortem examination and examination of exhibits. The authors aim to make a guiding document by virtue of their experience so as to guide the young Forensic Medicine experts/ Forensic Scientists.

Keywords: Forensic Photography; Crime Scene reconstruction; Postmortem Photography; Medicolegal Examination.

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Introduction

Forensic photography has become an important tool in the medicolegal system, so as to it give a complete picture for investigating crime scenes. It is the easiest and effectual way to capture the crime scene, in a way what could've happened that even the most illustrative and descriptive words could not do. Forensic Photography can portray an accurate depiction of the events that occurred at a scene, allow for proper identification and reconstruction of the crime scene and victim(s), and can be used as valuable physical evidence in court. Belgium in 1851 was the first country to introduce Forensic photography and became advanced in imaging technology in the 1870s. The word photography is taken from the Greek word "Photos" meaning "Light" and graphics which means "Write."[1] However, appropriate selection and implementation of the proper photography and computer equipment combined with effective training and correct workflow patterns is required for incorporating photography into the field of forensic practice with proper documentation. This paper highlights basic aspects to gain clear and focused photographs both in living individuals and Medicolegal Postmortem examination. The authors aim to make a guiding document by virtue of their experience so as to guide the young Forensic Medicine experts/Forensic Scientists.

Minimum Equipment Required

1. Camera - Single Lens Reflex (SLR) or Mirrorless Interchangeable Lens Camera (MILC), Lenses covering normal to wide-angle fields of view and macro capabilities.

2. Flashlight and unit.
3. Tripod.
4. Scale/rulers (ABFO scale, Measuring tape).
5. Storage media cards/hard disk for archiving.
6. Backdrops (Black /Dark blue/Grey).

This is just an indicative list and can be modified added as per the new technological advancements, department work load and local requirement.

Basic Concepts of Photography

The following are certain basic concepts that are necessary to understand to yield proper photographs.[2]

1. *Shutter:* The shutter determines the amount of time the light is allowed to fall on the digital sensor. A fast shutter speed freezes moving object which in turn helps us to visualize its position at any given moment and slower shutter speed results in blurring and emphasizing the moving object.[3]
2. *Aperture:* It is the size of the lens opening that controls the brightness of light necessary to capture an image. Representing the size of the aperture is done by its f-number or f-stop. F 2.8 shows maximum aperture and f 32 shows minimum aperture.[4]
3. *Camera ISO:* It is an international standard that indicates the sensitivity of a sensor denoted by a numerical value. ISO sensitivity depends on light. Lesser light with higher ISO sensitivity is needed to make a proper exposure.[4]
4. *Flash or external light source:* It produces an instantaneous flash of artificial light that helps to light up a subject.[4]
5. *The depth of field:* It is the amount of area in front of (foreground) and behind (background) an object that remains in focus. The larger the aperture, the less is the depth of field and smaller the aperture, more is the depth of field.[4]
6. *Proper exposure:* It measures the amount of light falling on a subject or the amount of light emitted or reflected by a subject. It is measured by an exposure meter.[2]
7. Overexposed images are difficult to produce and can be corrected by closing up the diaphragm (f stop) and accelerating the shutter.[2]
8. Poorly exposed images that do not show any mark of background shadiness, should be corrected by unlocking the diaphragm (f-stop) from f 5.6 to f 4 and slowing the shutter speed down from 1/250–1/125.[5]

Propositions of Forensic Photography

I. Proposition of photography in crime scene

The following steps may be followed to obtain proper photographs of the crime scene.

1. Securing the scene: once the crime has been established.
2. The photograph should be containing date and time.
3. Minimal access before photography.
4. Photography should be conducted as soon as possible.
5. There should not be any disturbance/ reallocation which may hamper evidence.
6. Assessing conditions: Conditions like light and weather should be assessed, and camera settings should be adjusted accordingly.
7. Shooting the scene: Photographer should capture wide-angle shots as well as close-up shots to visualize the whole scene and to show the relationship of the evidence to the entire scene.
8. The relevant evidence and findings should be numbered.

II. Proposition for photography in living persons in medicolegal examination.

Persons are photographed for various reasons including administrative identification, documentation of injuries, sexual assault survivor examination, sexual assault accused examination etc.

1. Verify date/time in-camera settings.
2. The photograph should be containing date and time.
3. Identification photographs of the subject captured in the field should use a neutral backdrop such as a wall or other unbiased background.
4. No police-related signs or symbols such as police cars, crime scene tape, or police officers, should appear in the background unless there are safety concerns that require it, as these photographs can be deemed prejudicial.
5. Notation of identifying marks, dress, or evidence located on the person or clothing Capture a full-body photograph with the subject facing the camera, head-to-toe, including footwear.
6. If the subject is wearing garments that conceal

identity or characteristics such as a hat or sunglasses, be certain to capture images with and without those items.

7. Capture a close-up photograph of the subject's full face and profile.
8. Capture close-up photographs of any relevant injuries or evidence.
9. The photographs of the injuries or evidence such as bite marks, puncture wounds, or blood spatter will be used for comparison or measurements.
10. If the subject would be disrobed or photographs are to be captured of areas of the body that would require exposing the genitals, breasts, or other sensitive areas, they should be draped in a professional manner or the identity of the subject at this stage should be shrouded. The subject's dignity should also be given due consideration.

III. Proposition for photography in Medicolegal Postmortem examination[6]

1. Verify date/time in-camera settings.
2. The photograph should be containing date and time.
3. Photography should be carried out in a systematic and clock-wise manner and overall view, mid-range, and closeup should be taken in every case.
   - *Overall view:* for seeing the relationship of body with injury/other objects.
   - *Mid-range:* relationship photograph with another immediate body part.
   - *Close-up:* for details of injury or item in view.
4. When photographing a crime scene involving a death, care should be taken to photograph the decedent as thoroughly as possible. This documentation may include injuries, identifying marks, evidence or personal effects on the body, clothing, medical intervention, as well as the presence or absence of post-mortem changes.

Minimum photographs in routine postmortem cases are recommended by authors as:

Postmortem External Examination (PE)

- PE1-Full front view of the body of clothing as the case brought to the center.
- PE2-Full back view of the body with clothing.
- PE3-Right side of the body.
- PE4-Left side of the body.
- PE5-Face front view and both sides.
- PE6-Full front view of the body without clothing.
- PE7-Full back view of the body without clothing.

From anterior aspect

- PE8- Head and Neck
- PE9- From shoulders, chest, and abdomen with upper limbs on sides
- PE10- From pelvis to upper part of thighs
- PE11 -From the lower part of thighs, legs and feet dorsum
- PE12 -Soles close-up

From posterior aspect:

- PE13- Head and Neck.
- PE14 -From shoulders, chest, and abdomen with upper limbs on sides.
- PE15 -From pelvis to upper part of thighs.
- PE16 -From the lower part of thighs and legs.
- PE17- Right-hand front and back Left-hand front and with open webs

Postmortem Internal Examination (PI)

- PI1-Photographs of the scalp after reflecting skin from all sides.
- PI2- Photographs of the skull (External table/ Internal table/after removing dura matter).
- PI3- Photographs of Cerebrum, ventricles, Cerebellum, Brain stem, (before dissection/ after dissection).
- PI4-Photographs of eyes (Conjunctiva, Sclera).
- PI-5Photographs of mouth (mucosa, gums, teeth, frenulum).
- PI-6 Photographs of neck structure (layer by layer).
- PI-7 Photographs of the chest cavity (before removing organs/after removing organs).
- PI-8 Photographs of organs (Pericardium, Heart, Lungs) (before dissection/after dissection).
- PI-9 Photographs of the abdominal cavity (before removing organs / after removing organs).
- PI-10 Photographs of organs (liver, spleen, kidneys,) (before dissection/after dissection).

- PI-11 Photographs of Stomach (content, wall).
- PI-12 Photographs of Intestine (content, wall).
- PI-13 Photographs of Pelvic cavity (before removing organs/after removing organs).
- PI-14 Photographs of Uterus, ovary, scrotum (before dissection/after dissection).
- PI-15 Photographs of limbs (fracture, muscle contusion).
- PI-16 Photographs of vertebrae, spinal cord.

III. Proposition for photography in Particular Medicolegal Postmortem examination cases.[6]

Custodial death[7]

National Human Right Commission (NHRC) has standing guidelines regarding the photography in postmortem examination of custodial death cases.

- A total of 20-25 colored photographs covering the whole body should be taken. Some photographs of the body should be taken without removing the clothes.

The photographs should include the following:

a. Profile photo-face (front, right lateral and left lateral views), back of the head.
b. Front of the body (up to torso-chest and abdomen) and back.
c. Upper extremity: front and back.
d. Lower extremity: front and back.
e. Focusing on each injury/lesion-zoomed in after properly numbering the injuries.
f. Internal examination findings (2 photos of soles and palms each, after making the incision to show absence/evidence of any old/deep-seated injury).
g. Photographs of all orifices.

- In firearm injuries, while describing, the distance from the heel, as well as midline, must be taken in respect of each injury which will help later in the reconstruction of events.
- Photographs should be taken after incorporating post-mortem number, date of examination, and a scale for dimensions in the frame of the photograph itself.
- While taking photographs the camera should be held at a right - angle to the object being photographed.
- Video-filming and photography of the post-mortem examination should be done by a person trained in forensic photography and videography.
- A good quality digital camera with 10X optical zoom and minimum 10 megapixels should be used.

Exhumation case

- Photographs of site (before and after removal)
- Photographs of soil (before and after removal)
- Photographs of the corpse (before and after removal)

Unidentified Dead Body

- Photograph of two Identification marks (mole, scar, tattoo)
- Photographs of wearing apparel.

Sexual assault case

- Photograph of Injuries (face, breast, inner thigh, back).
- Photograph of bite marks.
- Photograph of genitalia (vaginal, vulva, perianal, anal).
- Photographs of all orifices.
- Photographs of wearing apparels (stains, tear, markings).

Hanging Case

- Photographs of post-mortem lividity.
- Photographs of the neck from all sides (Ligature mark).
- Photographs of the face (dribbling of saliva/ stain).
- Photograph of nails (Cyanosis)
- Photograph of eyes (Conjunctiva)
- Photograph of seminal discharge
- Photograph of soiling
- Photographs of neck layer by layer
- Photographs of bony structures of the neck (hyoid, thyroid cartilage).
- Photographs of ligature material (before and after removing).

Strangulation Case

- Photograph of inner mucosa of lips
- Photograph of teeth/gum/frenulum
- Photograph of the neck from all side
- Photograph of nails (Cyanosis)

- Photograph of eyes (Conjunctiva)
- Photograph of seminal discharge
- Photograph of soiling.
- Photographs of wearing apparels (stains, tear, markings).

Drowning Case

- Photographs of nostrils, mouth
- Photographs of hands and sole
- Photographs of the oral cavity, respiratory tract
- Photographs of lungs (before dissection/ after dissection)
- Photographs of esophagus and stomach content.

Poisoning Case

- Photographs of hands, oral cavity, injection marks.
- Photographs of the esophagus, stomach content, and wall.

Accident Cases: Photographs of injury (pattern, marks)

Firearm Cases

- Photographs of both hands (front, back, finger webs)
- Photographs of entry and exit wounds (pattern, characteristics, path)
- Photographs of the projectile (before and after removing)
- Photographs of wearing apparels (stains, tear, markings)

Stab injury case

- Photographs of injury (defense wound, injury pattern, and characteristics).
- Photographs of wearing apparels (stains, tear, markings).

IV. Proposition for exhibit photography

1. Verify date/time in camera settings.
2. Photographs of packing along with seal and reference.
3. Photographs should be captured with a scale anytime the relative size of an item is in question; however, if using a scale, the photographer shall be certain a photograph is first captured without the scale.
4. Avoid or minimize obscuring portions of the subject with the scale.
5. The photographer should consider camera settings such as focal length, aperture, and subject-to-camera distance to minimize distortions and control depth of field.
6. The camera's native ISO, the ISO that the camera's sensor was designed for, should be used to ensure the best color, contrast, saturation, and minimize artifacts from noise.
7. An image format that allows for the highest resolution and least compression available on the camera should be used.
8. Photographs should be captured with a proper white/blue backdrop.

V. Proposition for deletions or modification of photographs

1. Original images should not be deleted or modified by the operator. All photographs, including poor quality images or unintended images, should remain part of the case file.
2. All photographs should be part of the case file, whether or not they are captured with the photographer's primary camera or any other camera, such as a backup camera, cell phone camera, or point-and-shoot device.

VI. Proposition for storage of photographs

1. Images are documentation that could be introduced as evidence. It is the responsibility of the Forensic photographer/Record Keepers to maintain all photographs so they are available for the intended purposes.
2. Digital photographs should be adequately backed up to prevent loss and back-ups properly maintained to prevent degradation.
3. The doctor conducting autopsy can have one copy of photographs for academic, research or court use with the understanding that these will not be used for any other purpose.
4. These photographs should be made available to police or court only on written request as any other document in medico-legal practice.
5. If photographs are required to be used for research purposes then a copy of the project and ethical clearance should be asked from the researchers with written undertaking about proper use and not disclosing the identity of the victim.
6. Photographer can also work as record keeper for photographic documentation of the unit under supervision.

Discussion

In this paper, the authors have suggested a vivid and effective way to perform meticulous and quality photographs of crime scenes, postmortem examinations, and exhibits that should allow the examiner for performing exact interpretation and to ease and standardize the execution of the photography. For best photography, a Digital camera is recommended covering normal to wide-angle fields of view with macro capabilities, which help us to cover close and wide photos of scenes, autopsy, and exhibits examination. Dark or grey backdrops give the best visualization with proper color contrast, background surface should be water or more stain-free to avoid artifacts.

In many situations, photographic artifacts misleads and create issues in Medicleogal investigation. Placing or holding the camera at a proper angle gives the best capture, photos from different angles and different ranges (close, mid, wide) should be considered to assure complete coverage of the scene. All the photos should be properly tagged and marked for future reference. Appropriate illumination source essential for photography, especially in forensic photography unpolarised light without proper filters misguides experts and it makes interpretation difficult. As technology is advanced there are different varieties of illuminating sources, depending on the circumstances experts are preferred UV, IF, and induced fluorescence.

Transferring and storing data should be managed with the greatest care. Photographs stored in a digital system should be protected with password with limited access. Special memory storage devices can also be used for storing images it is crucial for preserving data and recreating data for future evidentiary and academic purposes, in many situations negligence made the police investigation difficult.[8] By following a standardised protocol, one can decrease artifacts due to the wrong selection of background, wrong angle, and light leading to the wrong picturization of the scene. Additionally, standardized photography can be performed within a reasonable period without missing evidence, including positioning, lighting, and using tags. The proposed protocol makes it possible to port crucial findings of all type of cases which usually a forensic expert come across in his/her daily life.

Conclusion

Forensic photography provides fair and accurate evidence that is used to document all reports during a forensic investigation and is an integral part of criminal investigation procedures and an element of legal proof, both for the living and autopsy cases. Best photographic protocol and techniques should be used to obtain the best results in accordance with the Indian evidence Act.

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