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PHOTOGRAPHY IN FORENSICS – A REVIEW

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ABSTRACT: Forensic Photography is an accurate record of an object or scene, which is of legal interest. It supports both archive data maintenance and investigative processes. It is also used as evidence in medico legal issues in the court. Basic idea about exposure, depth of field and framing a shot is critical to take a proper photograph. This review aims to describe various aspects of forensic photography and its applications.

Key words: Crime scene, Forensic photography.

INTRODUCTION

Often referred to as "crime scene photography," forensic photography is a significant technological advancement that is essential to both criminal investigations and medicolegal challenges.[1] The term photography is derived from the Greek words "PHOTOS" and "GRAPHOS," which mean "LIGHT" and "WRITE," respectively.[2] Forensic photography was first developed in Belgium in 1851, and in the 1870s it advanced to a highly developed technology. New technologies have expanded its application since then.[3] A photo is an accurate and a more permanent and clear record of patient's findings than a detailed record or a research record. Detailed analysis of head and neck injuries, lip bites, bruises, and nail marks are needed in cases of abuse for forensic evaluation. Photographs play an important role in this and often the dentist can identify an undisclosed case of human abuse.[4]

BASIC PRINCIPLES IN FORENSIC PHOTOGRAPHY [5].
To capture images that will be recognised by the court as evidence, the California Medical Training Center supports a few concepts in forensic photography:
• Do not photograph more than one victim, subject, or suspect on the same roll of film.
• Each film should begin with a close-up of the subject's face.

• Avoid brightly illuminated backgrounds since details may be washed away.
• A green or blue surgical towel might be utilised as a backdrop for discoveries on the extremities. Color reflection and camouflage occurs when taking photos against a bright or cluttered background.
• A macro lens with a focal length of 100-105mm is ideal for capturing pathologies or injuries.
• The lens plane and the plane of the finding must be parallel. Multiple photos should be taken if the finding is present on a curved surface like nose, palate etc.
• Additional images in tangential or oblique angles must be obtained if the findings are textured like indentations, swelling, laceration, etc.
• For Every finding, at least three photographs should be taken.
• A regional photo should also be taken to inform the viewer on the approximate position and location of the finding on the body. The aspect must be broad enough to incorporate certain key anatomic landmarks relevant to the findings.
• At least one mandatory zoom-in shot with a scale adjacent to the finding should be taken. The subject/victim/suspect should be given an identification number, which must be present on the image. L-shaped scale are ideal while taking bite marks pictures.
• Film negatives must not be exposed to light or heat, since this will cause the films to deteriorate. They should be kept in a secure location with limited access.
• In the case of digital photography, access to images, negatives, hard discs, CDs, and flash drives must be recorded properly in a log book along with details like the person's name, date, time, and reason of access. Password-protected digital storage is recommended.
• Peer evaluation can help you enhance the photography skills in terms of technique, content, and interpretation.
• During development, storage, recovery, and analysis, absolute secrecy and confidentiality should be maintained.

BASIC EQUIPMENT IN FORENSIC PHOTOGRAPHY [6]
• Camera-DSLR.
• Wide angle lens
• Normal lens
• Close-up lenses or accessories
• Electronic flash(s)
• Filters
• Tripod
• Extra camera and flash batteries
• Locking cable release
• Notebook and pen
• Flashlight
• Remote or sync cord for electronic flash(s)
• Owner’s manuals for camera and flash
• Ruler
• Index cards, felt pen
• Gray card
• Film

ROLE OF PHOTOGRAPHER IN CRIME SCENE:
A forensic photographer, also known as a crime scene photographer, is an expert at creating precise and comprehensive images that document the crime scene. The photographer captures hard evidence of crime scene objects [7]. Long-range shots or overall snaps, mid-range or medium shots, and short-range or close-up shots should all be included in crime scene photos.[8] A photographer utilises a better camera to capture the entire crime scene, and they use appropriate lighting, lenses, and angles to create professional images that are examined, enlarged, and shown in court during trials. The photos or images are saved in a device when they are captured. During judicial procedures, crime scene photography plays a critical role in assisting the court of law [9].

DIFFERENT TYPES OF PHOTOGRAPHY
Digital photography
Images captured using digital photography are saved in a computerised file format known as a digital image file. Any computer file type that contains a graphical image or picture rather than text or programme data is referred to as a digital image file. [10,11]. Digital SLR cameras are ideal for forensic photography. It's a versatile camera with a lot

of features. Digital SLR cameras are ideal for forensic photography. It's a versatile camera with more options. DSLRs have a mechanically moving mirror and an interchangeable lens system. [12]. These days, complementary metal-oxide semiconductors (CMOS) and charge coupled devices (CCDs) are the two most widely used image-capturing technologies. CCD sensors have geometric green, red, and blue portions known as pixels that are sensitive to the colours of light they correspond to. The resolution of a image obtained is determined by the number of pixels. The image becomes crisper as the number of pixels increases. [10,13].

Ultraviolet photography

The reflected or direct method and the UV fluorescence method are the two types of ultraviolet photography. Reflected ultraviolet photography necessitates the use of ultraviolet lighting and filtration to ensure that only the ultraviolet energy reaches the film. In the ultraviolet fluorescence technique, the subject is exposed to UV radiation, and the camera captures any visible light that is released (if any fluorescence occurs). In the UV fluorescence technique, a source of ultraviolet light is focused at the subject in a fully darkened room and filtered using an ultraviolet transmission filter - or excitation filter. The object emits visible fluorescence and reflects UV light. An UV absorption filter (or a barrier filter) prevents the ultraviolet from entering the lens, and a black-and-white or colour film records any visible fluorescence emitted in the 400-700nm range. [14]. UV light does not penetrate the skin surface and thus gives a highly detailed image of the surface. Ultraviolet images unlike Infrared and Alternate light imaging depict the surface disruption of the skin when used in bite mark photography.

Infrared photography

High-speed infrared reflectance photography is used in infrared photography. Because infrared radiation is invisible, it may necessitate the employment of special procedures. An Infrared filter is placed over the lens so that only the Infrared part of the spectrum is transmitted through the lens to the sensor. Infrared photography can be done in the near infrared range of 700 nm to 1000 nm. [15]. IR Photography is of particular importance in bite mark analysis, as it shows the depth of the bite into the dermis. IR has the ability to see through blood. Hence the identification of bruises under vasculature are difficult to see by naked eyes. So in these cases IR photography can be used. But the IR photos show less detail than Alternate light imaging and visible techniques.

Alternative Light Source Photography (ALS)

ALS imaging is a special technique where a multiwavelength emitter is used, which can be tuned to emit a desired specific wavelength of light. The filter is used to block the reflected light and then transmit a lower frequency of light to the sensor, thereby, capturing a fluorescing image of the desired area. ALS photography are used in bite marks analysis and fingerprints. The ALS image shows considerable details of the bruise below the level of the epidermis.

Multiple exposure photography

Utilizing digital photography and computerized image processing employing layers methodology to create a simple and effective digital multiple exposure technique. This method combines many photos into one that can be manipulated more simply on a computer. The fundamental benefit of combining many photos into one image is that it enables for better visibility of specific parts of a latent without compromising the rest of the image. The process involves superimposing two or more different images of the same latent print acquired with a digital camera when the camera and latent print are both perfectly still. By Using image processing and repeated exposure techniques in digital photography, it is possible to take better images of latent fingerprints. [16].

Panoramic Photography

A panoramic image is made up of a series of discrete photographs that cover a large field of view and capture information about the area around the camera. Individual photos are stitched together to form a single huge composite image or panorama. The number of shots necessary to create a panorama might vary dramatically depending on the lens being used and the size of the region being captured. Due to the high-resolution sensors included in modern digital cameras, digital photos are now capable of capturing large volumes of data from a scene. [17].

CONCLUSION

Almost every forensic case demonstrates the use of photography as a potent tool in the fight against crime. The heart of criminal investigation and reconstruction is photography. In most forensic investigations, photography is a vital instrument. Providing all medico-legal units with the requisite photographic equipment and a trained photographer is a critical step in the field's development.

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