

Forensic Digital Photography: A Review

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ABSTRACT

Forensic digital photography is an essential technique used in forensic odontology which aids in the investigation, record purposes, crime and medico legal issues. The technological developments in modern dental photography have continued to facilitate and enhance the practice of forensic dentistry. This evolution to a contemporary photographic process is revolutionizing the way, the forensic odontologist deal with the cases involving identification, human abuse and perhaps most significantly, the bite mark cases. Evidence collection and preservation using forensic digital photography is a crucial aspect in future legal proceeding. This article summarizes the role of forensic digital photography in forensic odontology.

KEYWORDS: Digital, Forensic, Odontology, Photography

INTRODUCTION

Keiser-Neilson in 1970 defined Forensic Odontology as "that branch of forensic medicine which in the interest of justice deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of the dental findings".¹ Photography is probably, the best method to collect and preserve evidence in forensic cases, especially in the cases of dental identification, human abuse and bitemark cases.² Forensic photography is essential for fair trial. Accurate reproduction of a scene (including a crime scene, fire scene or accident scene) using photography is critical for the benefit of a court or to aid in an investigation.³ Though in its infancy in dentistry, digital photography, digital imaging and its management is exploding at an extraordinary rate.⁴

DIGITAL PHOTOGRAPHY

Digital cameras currently provide an easy and quick method of recording images and various types of cameras are been employed to do so.⁵ The need to accurately photograph injury patterns as they appear on skin is paramount to the pathologists as well as legal experts. Since vast amounts of time often elapse between the commission of crimes and the trial of the accused, photographs are the only permanent record of the injuries to the victims. Therefore, it is imperative that the forensic investigator be able to properly photograph injury patterns as a means of preserving such evidence.⁶ Digital photography means that the images are stored in a computerized file format often referred to as a digital image file. A digital image file signifies any computer file format that contains a

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graphical image instead of text or program data.^{4,6}

TYPES OF DIGITAL IMAGES

There are basically two types of digital images—a bitmapped image and a vector based image. A 'bitmapped' image consists of information for placement of each and every pixel. JPEG, PNG, GIF, TIFF and BMP are probably the most common type bitmapped digital image. The other type of digital image is called a vector-based image. This kind of image is produced in “paint or draw” and “illustration” programs. Such programs are not normally used in capturing photographic images but are used in manipulating or enhancing images.^{4,6}

NEW AGE DIGITAL CAMERAS

The new generation of digital cameras has everything from the simplest point-and-shoot consumer camera to the most complex professional camera, and a combination of several “prosumer” cameras in between. Digital image capture is unlike film in that a specialized computer chip in the camera reads the light coming through the lens and electronically saves the image on magnetic media, eliminating the need for film. Typical image capture devices used today include the charge coupled device (CCD) and complementary metal-oxide semiconductor (CMOS). CCD sensors are arranged with geometric green, red, and blue areas known as pixels that are sensitive to their corresponding colors of light.⁶ In digital imaging, the number of pixels used to record the image corresponds with the resolution.⁷ The more pixels there are, the sharper is the image.^{6,7}

The forensic photographer must develop a Standard Technique such that a systematic and organized approach to full spectrum digital photography is utilized each and every time a photographic session occurs. Additionally, this

protocol should include taking close up photographs with and without a scale. The scale serves as a reference to record the relative size of the injuries in the photographs. The evolution of scales for forensic photography resulted in the development of a two-legged (right-angled) scale, known as the ABFO 2 scale, which is used by modern crime scene photographers. This scale was developed by a photogrammetrist (Mr. William Hyzer) and a forensic dentist (Dr. Thomas Krauss) for the purpose of minimizing photographic distortion and ensuring accuracy in measurement. The photographer should retain the scale used in the photograph.⁸

DIGITAL PHOTOGRAPHIC SYSTEM

A camera is only a part of a photographic system. With digital photographic systems, the camera and flash perform the same function, but place the image on the digital sensor instead of film when capturing the light image. The digital camera, however, also has software (sometimes referred to as firmware) that converts the image to a digital format. The picture or digital image is digitized by the sensor within the camera and is converted into a computerized image file. At this point, the digital images can be transferred (downloaded) into a computer where they can be displayed, edited, manipulated, e-mailed, printed or incorporated into any document almost instantly.^{4,8}

An upcoming newer approach, Forensic 3-dimensional photogrammetry is used for the evaluation of a forensically relevant object, such as a bitemark or other patterned injuries and it depends primarily on the proficiency in the preparation and subsequent photographic recording of these objects.⁹ The Forensic 3-dimensional photogrammetry replaces the old standard documentation method of laying a ruler or yardstick next to the object being

photographed. In order to photo-grammetrically compare and evaluate injuries, special series photographs are taken and computer evaluation is done. This method can also be employed for the evaluation of small injuries such as matching tyre tracks on the head.¹⁰

Digital photographic capture process consists of the following path: Subject, Lens, Sensor, image digitized to file and then transferred to a computer. After the image file has been placed onto a computer's hard drive, it can be retrieved and viewed almost instantly at the viewer's discretion.^{4,10} The camera body is the least critical element in obtaining a good dental image. Very expensive camera and lenses are not necessary but its flash system, lenses, film, exposure and proper processing are considered to be crucial.¹¹

RECORDING / CAPTURING THROUGH DIGITAL PHOTOGRAPHY

Presently, digital dental photography is captured through many ways like with that of a traditional film camera and then the image can be digitized into a computer file using a scanner or by using an intraoral camera connected to a video capture card, USB or an IEEE 1394 Port (firewire). A standard video (VCR) camera or camcorder can also be used and digitized by being processed by a video capture card or imported through an IEEE1394 port or by using a web style camera that normally connects to the computer. The image can also be captured with a still 'photographic style' digital camera and then subsequently, the computerized files can be downloaded from the camera to a computer with various mechanisms. Lastly, the images can also be transferred from one computer to another through file transferring.^{4,11}

In addition to the digital photography, various softwares have been devised to aid in the image enhancement, like Adobe Photoshop, Picasa,

CSI Pix, iClone and Lucis Pro 6.0. The uses of computer softwares have presented new concerns regarding their application in both forensic odontology and general dentistry. They enable clear visualization of the images and are less time consuming. The 3-D images can be freely moved, rotated or zoomed to any specific region of interest. They are basically used to store, sort and match antemortem and postmortem records in a speedy and accurate manner. Hence the use of these softwares has made the work of the forensic experts much easier and faster.

DISCUSSION

Digital photography converts the images almost immediately into a digital file, and has many beneficial advantages in forensic odontology. Photographic documentation of dental identification cases can be easily stored and catalogued.¹ Digital photography allows for immediate retakes when needed. Exact duplicates of the images can be made and media can be reused leaving behind the additional cost of film or its chemical processing. There is ease of manipulation in the forensic data or images.^{4,11} With the advance in information technologies, there has been an increase in number and types of crime. Forensic science practitioners have to keep up with this advance closely. Every researcher has his/her hands upon an image or photograph for the purpose of forensic identification.¹²

Forensic identification is a multidisciplinary team effort that typically involves the coordination and cooperation of law enforcement officials, forensic pathologists, forensic odontologists, forensic anthropologists, criminalists and other specialists as deemed necessary.¹³ The CAD supported photogrammetry plays an important role in the cases of soft tissue injury.¹⁴

Forensic digital photography is a vital and integral part of forensic science that is most widely utilized for the identification of the living and deceased persons. It has also evolved as a new ray of hope in assisting forensic odontology and forensic medicine as well.¹⁵

CONCLUSION

Digital photography offers significant benefits to both the fields of dental practices as well as Forensic medicine. When evidence based dentistry is gaining roots worldwide, digital photography plays an important role in providing the evidence.¹⁶ The inherent efficiencies of digital photography make it extremely beneficial, however, the practitioner needs a basic understanding of computer technology and standard photography for proper utilization. Proper selection and implementation of the appropriate photography and computer equipment combined with necessary training and correct workflow patterns, makes incorporating digital photography into the field of forensics, an easily obtainable goal.^{4,16}

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