H67 Forensic Photography: Focus on Small Findings Using Digital Consumer Cameras

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After attending this presentation, attendees will understand how a clear, specific instruction for sharp, focused images with consumer cameras can assist trainee doctors in taking better pictures, particularly of small findings.

This presentation will impact the forensic science community by explaining how the importance of having medical personnel able to take sharp, focused pictures of very small findings is not restricted only to doctors; it equally affects forensic nurses, mortuary technicians, and others.

Background: While forensic literature abounds with the mention of petechial hemorrhages or congestive hemorrhages, reliably photographing them using digital consumer cameras has neither been officially attempted nor documented comprehensively in an actual setting. The challenge consists in capturing hemorrhages as small as 0.3mm in diameter. An easy-to-understand instruction set was developed and the success in applying it to five test users was recorded. The impact on the quality of a series of test target photos was scored.

Methods and Materials: Given "feature" size for pinpoint hemorrhages of approximately 0.3mm and given image dimensions of 3,000 pixels with any "feature" requiring a minimum of 40 pixels for adequate digital representation, total metric image size should not exceed approximately 22mm. A step-by-step guide on how to reliably produce focused pictures of small targets with such dimensions was devised. Using a typical compact digital consumer camera (Canon® Powershot® G16, Backside Illuminated-Complementary Metal-Oxide Semiconductor (BSI-CMOS) sensor 1/1.7" with 4,000 x 3,000 pixels equating to 12 megapixels), compared the resulting digital image focus of four targets was compared. These targets contain submillimeter-sized features. Images were taken by five test users (trainee doctors in the same institute, with a self-reported basic to intermediate proficiency level, not advanced or professional). Image quality was compared before and after exposing the test users to a step-by-step guide on how to reliably produce focused images. General recommendations were made available from the outset. In a step-by-step instruction, suggest four criteria were suggested: (1) the use of an aperture priority above 5.6; (2) sensitivity (ISO) of not above 800; (3) an exposure of no longer than 1/60 second; and, (4) an optimal angle perpendicular to the feature being photographed. A score was devised that rated the photos on the basis of these criteria. Thus, an optimal image would yield 40 points.

Targets: This study used a printed array of small dots, a bank note featuring tiny anti-forgery perforations, a textile band featuring fabric structure, and a plastic model of a heart valve that contained small ink spots.

Results: Instructing this visual and easy-to-follow, step-by-step guide for correct setup and image-taking approach resulted in better images. The image series before the instruction across all five participants yielded an average of 25+/-1.8 score points per image; afterward, a mean score of 29.5+/-3.3 score points was achieved (statistically significant, Wilcoxon $p<0.04$); however, these efforts did not achieve perfect 40 score points in all instances.

Discussion: Quality improvement usually requires precise instructions and easy-to-follow approaches. Introducing high-tech to a medical frontline workflow does not succeed without these. General recommendations for forensic photography, typically citing the rule of thirds (usually not even applicable in macro photography) or vague explanations regarding image noise, seemed not overly helpful. The results of this study and where efforts need to be further improved to maximize outcome will be presented and discussed.

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