Original Research

**IMAGING AND IMAGE MANAGEMENT – A SURVEY ON CURRENT**

**OUTLOOK AND AWARENESS IN PATHOLOGY PRACTICE**

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**Abstract**

Flexibility of digital imaging enabled it to be an integral part of pathology practice. An assessment of guidelines of imaging is essential to manage photographs properly. The purpose of the study was to assess awareness of oral pathologists about various aspects of medical photography. Questionnaire based on availability of facilities, usage, technical details and ethical issues of medical photography sent to oral pathologists in India. Photographs were taken mostly for the purposes of publication. Significantly less number of respondents received any training or gone through any publications/ books (p = 0.000). Consent was usually taken by significant number of respondents (p = 0.000) but in a verbal form. Majority of people use image editing software but only 21.5 % of them are unaware of deleterious effect of image editing. Unanimity of opinion in image storage, sharing, copyright and accessibility issues are not yet formed. This survey draw attention towards lack of proper understanding about the technical details, medical protocols and ethical issues related to medical photography. These findings recommend implementation of basic training for medical photography and policy for image management in every health care institution.

**Key words:** Medical photography, Photomicrography, Consent, Confidentiality, Copyright

**Introduction**

Pathology is a visual science which demands clinical, macroscopic and microscopic pictures for its core process; diagnosis. This visual art also branches into medical documentation, interpersonal communication, educational and motivational purposes, and legal issues. As “a picture speaks thousand words”, photographs reduce misunderstandings due to variations in descriptive methods.[1]

Emergence of digitalization made photography more flexible, but the same phenomena compels us to be more vigilant about even minor details. Therefore, this survey was aimed to investigate the awareness and attitude of oral pathologists about medical photography/photomicrography and to figure out the areas to be more taken care off.

**Methods**

An anonymous questionnaire was prepared and sent to oral pathologists in India including postgraduate students. The questionnaire was based on various aspects of medical photography/ photomicrography including availability of facilities, usage of photographs, technical details and ethical issues. Responses were received from 135 oral pathologists. Responses were statistically assessed using binomial test.

**Results**

Out of all oral pathologists who responded to the survey, 42.2 %were postgraduate students, 57.8 % were faculties of various dental colleges in India. Among the faculties participated in the survey, 30.4 % have less than 5 year experience while 17% have 5 to 10 years and 10.4 % have more than 10 years experience.Most common usage of medical photographs was for publications followed by medical recording and teaching. Usage for patient education, medico legal issues and telemedicine appeared to be minimal.

**Availability of facilities and resources**

Even if all participant in the survey were dealing with different aspects of medical photography, significantly less number of people received any training (P value 0.00) or gone through any publications/ books (P value 0.00) about medical photography. 54.8 % have availability to accessory equipments other than camera and 68.1% have camera with microscope adapter for taking photomicrograph. Figure 1 indicates percentage of oral pathologists who has accessibility to various facilities.

**Figure 1: Accessibility to various facilities to oral pathologists**

**Consent**

Significant number of individuals take consent(P value 0.00), but 60% of them take verbal consent only.Figure 2 shows type of consent taken by oral pathologists. 68.9% of them inform the patient about the purpose of photograph. 58 % of individuals participated in the survey did not used to mention about patient’s right to withdraw consent. 68.1 % of individuals think photographing internal organs/ pathological, microscopic documentation need patient’s consent.

**Figure 2: Type of consent taken**

**Confidentiality**

Proportion of oral pathologists concerned about imparting anonymity to patient photographs is statistically significant (P value 0.00). 65.9 % of them knew that photograph be considered identifiable by the inclusion of jewellery, tattoo or scar mark.

**Image editing**

68.1 % of oral pathologists use image editing software. Most common usage of image editing software is for cropping and brightness/contrast enhancement. 21.5 % of individuals were unaware of deleterious effect of certain image editing procedures.

**Storage and sharing of images**

Considering all data storage devices, most of pathologists uses own and department computer for storage of images. Less percentage of people uses pendrive,CD and cloud type storage. Figure 3 shows percentage of usage of data storage devices.

**Figure 3: Percentage of usage of data storage devices.**

For sharing the data, pendrive, CD, and email are used regularly. 15 % of them use newer networking modes like whatsapp and other sharing apps.

**Technical details**

Most of pathologists are using compact camera, 16.3 % uses DLSR Cameras, and 30% uses mobile phone cameras. Most common problems encountered during intra oral/extra oral photography are improper focusing, incorrect exposure and lack of accessibility to intra oral lesions.

Common problem encountered during photomicrography is lack of clarity, incorrect exposure and vignatting of images. 73 % individuals use JPEG (Joint Photographic Experts Group) format for images.

**Copyright and access to photographs**

According to significant percentage of oral pathologists copy right of patient photographs/ photomicrograph should belong the concerned doctor/ dentist. Figure4shows opinion of oral pathologists about to whom the copy right of medical photographs should belongs to.

**Figure 4: Opinion of oral pathologists about copy right of medical photographs**

Most of oral pathologists stated that the ultimate right to access particular patient photographs/ photomicrograph should be limited to concerned doctor/ dentist. Figure 5 demonstrates opinion of oral pathologists about people who can have access to particular photograph.

**Figure 5: Opinion of oral pathologists about accessibility to particular photograph.**

**Discussion**

In the era of telepathlogy and pathology informatics, imaging became an integral part of pathology practice. This survey noted that most common need of medical photographs is for publications followed by medical recording and teaching. According to the survey conducted by Horn et al among laboratory staff including pathologists regarding photography of gross surgical specimens, most common application appeared to be for teaching purposes followed by clinical rounds, legal documentations and consultation services. [2]

Before capturing an image for any purpose, it is essential to take written consent from patients especially when the patient photograph is accessible to public.Obtaining consents is a major concern for significant numbers of oral pathologists but most of them take verbal consent. The study by Taylor et al among plastic surgeons also shows same result. [3]

Bhangoo etal surveyed 117 emergency departments in the UK, out of which 21 departments have a written policy for photography. Among these, only 17 departments have specific consent form. [4]

Consent form should include purpose of documentation and information about the right of patient to withdraw consent at any time until information has released to public. [3] Lau etal noted that medical photography on the internet such as medical web sites and professional e-mails is generally less acceptable to patients.

Nowadays many journals demand written consent prior to publication. [5] For photographing internal organs and microscopic details, permission of the patient is not necessary. But take care not to record the patient’s name with the stored image.[6]Although consent is not required for an anonymised image to be used for educational or solely treatment purpose, existence of a written statement provide legal protection whenever necessary. If the patient is unable to give consent when the image was taken, image cannot be used until the patient has the capacity to give consent. The immediate family member may give permission if the patient is permanently incapacitated. [4], [7]

It is appreciable that significant number of oral pathologists participated in this survey impart anonymity to patient photos. Taylor et al noted that attempts to protect patient anonymity appeared to less frequent among surgeons participated in their study. [3] But Lau et al felt definite preferences of patients to the use of non-identifiable photographs for all purposes (p < 0.001)[8]

Identifiable photographs not only include images involving patient’s face, but also apply to images displaying any identifiable features such as jewellery, tattoos, skin lesions scars etc. [8] So blackening or pixellating the eyes of patient’s image cannot be considered completely anonymous if any other identifiable features are present.

Most of our respondents uses compact cameras as they are easy to handle and capable of giving a promising result. 30% respondent uses mobile phone cameras. Even if high-end mobile phones make image capturing very easy, issue faced by use of phones is patient’s acceptability. Lau et al states there was a low level of acceptability by patients to the use of personal cameras and phones compared to hospital equipment. [8]

Most common problems reported with intra / extra oral photography were improper focusing and lack of accessibility to intra oral lesions; which can be corrected by appropriate use of good lens, retractors and mirrors. A ring flash is useful in certain cases of intra oral photography where shadow of a directional flash would obscure important detail. [9]We noted that only 54 % of oral pathologists have availability to such accessory equipments.

Lack of clarity was the problematic arena with photomicrographs. Sufficient megapixel camera with microscope adapter and dust free eyepiece, objective and glass slide surface can solve this problem to a certain extent. Most important consideration in photomicrography is the configuration of the microscope optics. The microscope needs to be configured for Kohler illumination.[10]

68% individuals participated in the survey have camera with microscope adapter.In case of lack of camera and microscope adapter, smartphone adapter can be economically feasible alternative for taking photomicrographs with smartphones. [11]

As per this survey, the most common usage of medical photographs is for publications, so image size and Dpi becomes very important. Image size is measured in “megapixels”. But the megapixels of camera has does not necessarily define the quality of the image. Dpi (dot per inch) defines the number of pixels that are packed into a defined area. Most of journals requests images of 300 dpi. [10]

73 % of oral pathologists participated in the survey use JPEG format for image storage. An image can be stored in lossless TIFF (tag image file format) and lossy JPEG format.JPEG images are generally sufficient to make diagnoses, easier to store and manipulate.[12],[13] TIFF schemes can be considered when a high end image is required because it make a file smaller without degrading the image.[14]

Another issue to be addressed is image editing which is a double-sided sword. In our study, it was noted that 68 % of oral pathologists use image editing software. Therefore, the question is how much editing should be permissible. Modifications that do not alter the content of image [cropping (unless it affects image interpretation), brightness contrast enhancement, sharpening etc] are acceptable. Non-linear changes (different pixels of image be treated in different ways) and image merging are not acceptable. Selective colour change applications (for e.g. from light brown to dark brown) can make error in case of IHC interpretation. [10]

In this context, it is important to note that 21 % of respondents were unaware of deleterious effect of certain image editing procedures. Pinco et al observed that manipulation digital image of cytology specimens, significantly affects its interpretation by both cytotechnologists and cytopathologists.[15]Rao et al noticed in their study conducted among dental professionals that there is only low level of sensitivity to identify digitally manipulated medical photographs. [16]

When digital manipulation is unavoidable, it is suggested that the manipulated and original images be archived to know the extent to which an image has been altered. [17]Image Authentication System follows an image so that any processing of image is thoroughly documented. [4], [14]

According to Institute of Medical Illustrators model policy, storage of images must be; traceable, retrievable and secure. [18]This survey noted that most of the pathologists used own and department computer for storage of images. 42.3 % of them did not use institutional data base system. Horn et al noted in his study that 79.6% of respondent store digital images on a central database. [2]WhileTaylor et al pointed that most surgeons stored the images on their personal computers; with very few having security measures other than password protection. [3]

Storage of images in institutional data base system should be encouraged in our country and such devices should be protected from unwanted encroachments. If the reporting pathologist does not employ proper documentation, back-up it may be considered as negligence in a court of law.[1]

Regarding accessibility to particular medical photograph, there is no unanimity of opinion among our respondents. Majority (41.5%) felt that any dentist/ doctor in the particular department should have access to photographs taken by anyone in that department. The development of institutional policy regarding liberalization of accessibility of images depending on the purpose can avoid great confusion.

When images have to be shared to pathologists for treatment purpose, these other persons are also bound to treat the information as confidential. [13]15 % of our respondents used custom-built software applications (apps) for sharing medical photographs. Study conducted by Payne et al. shows increased use of smart phones and applications among young doctors in U.K. The study shows that 79.0% of medical students and 74.8% of junior doctors owned a smartphone and majority of students and doctors owned 1–5 medical related applications. [19]

While using networking modalities and custom-built software applications (apps) to share medical photographs, health care professionals should take utmost care to prevent unnecessary leakage of information. A permanent invisible may be added to identify the origin of a particular image. It requires specific software for visualisation of digital watermark. [4], [14]

According to Majority of oral pathologists participated in the survey, copy right of particular image should belong to concerned dentist/ pathologist, but 21.5% of them believed that copyright should belong to concerned institution.

Institute of Medical Illustrators (IMI) model policy and guidelines states that copyright of images of patients belongs to the institutional trust and trust acts as the data controller for images. For publication, transfer of copyright should be refused. In the private sector, clinician can acts as the data controller for images taken.[18], [20]

Even if each health care professional should be aware about above mentioned facts, this survey point out that significantly less number of individuals received any proper training or gone through any learning modalities for a better understanding.

**Conclusion**

Even if trained medical photographers take the best medical photographs, such facilities are not always available especially in Indian scenario. In this context, this survey reveals that we should have better understanding about the technical details, medical protocols and ethical issues related to medical photographs. Selection of appropriate photography equipments combined with the necessary training programmes and implementation of proper workflow pattern can raise the standard of photographs. It is advisable to have a unanimous and well-defined policy for image management in health care institutions.

**References**

1. Leong FJ, Leong AS: Digital imaging in pathology: theoretical and practical considerations, and applications. Pathology 2004; 36:234–241.
2. Horn CL, DeKoning L, Klonowski P, Naugler C. Current usage and future trends in gross digital photography in Canada. BMC Medical Education 2014; 14:11.
3. Taylor DM, Foster E, Dunkin CSJ, Fitzgerald AM. A study of the personal use of digital photography within plastic surgery. Journal of Plastic, Reconstructive & Aesthetic Surgery 2008; 61:37-40.
4. Bhangoo P, Maconochie I K, Batrick N, Henry E. Clinicians taking pictures—a survey of current practice in emergency departments and proposed recommendations of best practice. Emerg Med J 2005; 22:761–765.
5. Grooves T, Croot J. Using pictures in the BMJ. BMJ 2005; 330:916.
6. [Tranberg HA](http://www.ncbi.nlm.nih.gov/pubmed?term=Tranberg%20HA%5BAuthor%5D&cauthor=true&cauthor_uid=12558741), [Rous BA](http://www.ncbi.nlm.nih.gov/pubmed?term=Rous%20BA%5BAuthor%5D&cauthor=true&cauthor_uid=12558741), [Rashbass J](http://www.ncbi.nlm.nih.gov/pubmed?term=Rashbass%20J%5BAuthor%5D&cauthor=true&cauthor_uid=12558741). Legal and ethical issues in the use of anonymous images in pathology teaching and research. Histopathology 2003; 42: 104 -109.
7. Supe A. Ethical considerations in medical photography. Issues in Medical Ethics 2003; 11(3): 83 – 84.
8. Lau CK, Schumacher HHA, Irwin MS. Patients’ perception of medical

photography. Journal of Plastic, Reconstructive & Aesthetic Surgery 2010;

63: 507 – 511.

1. Nayler J R. Clinical Photography: A Guide for the Clinician. J Postgrad Med 2003; 49:256-62.
2. Hamilton PW. How to take and process digital images for publication. Diagnostic histopathology 2010; 16(10): 476 – 483.
3. Roy S, Pantanowitz L, Amin M, Seethala RR, Ishtiaque A, Yousem SA, et al. Smartphone adapters for digital photomicrography. J Pathol Inform 2014; 5:24.
4. Kocsis O, Costaridou L, Mandellos G, Lymberopoulos D, Panayiotakis G. Compression assessment based on medical image quality concepts using computer-generated test images. Comput Methods Programs Biomed 2003; 71:105-115.

1. Scheinfeld N. Photographic Images, Digital Imaging, Dermatology, and the Law. Arch Dermatol 2004; 140:473-476.
2. Micklem K,Sanderson J. Digital imaging in pathology. Current Diagnostic Pathology 2001; 7: 131- 140.
3. Pinco J,Goulart RA,Otis CN, Garb J ,Pantanowitz L. Impact of Digital Image Manipulation in Cytology. Arch Pathol Lab Med 2009; 133:57–61.
4. Rao SA, Singh N, Kumar R, Thomas AM. More than meets the eye: digital fraud in dentistry. Journal of Indian society of pedodontics and preventive dentistry 2010; 4(28): 241 – 244.
5. Barry CJ, Yogesan K, Constable IJ, Eikelboom RH. A case for electronic manipulation of medical images? J Audiov Media Med 1999; 22:15-20.
6. Institute of Medical Illustrators; Law and Ethics Department. A model policy on photography and video recording of patients: Confidentiality and Consent, Copyright and Storage; Dec 2002.
7. Payne KFB, Wharrad H, Watts K. Smartphone and medical related App use among medical students and junior doctors in the United Kingdom (UK): a regional survey. BMC Medical Informatics and Decision Making 2012; 12:121.
8. Department of Health. Confidentiality: NHS Code of Practice; Nov 2003.