

ORIGINAL ARTICLE

Imaging and image management: A survey on current outlook and awareness in pathology practice

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ABSTRACT

Background: Flexibility of digital photography enables it to be an integral part of pathology practice. An assessment of guidelines of imaging is essential for proper usage of photographs. **Objectives:** The purpose of the study was to assess awareness of oral pathologists about various aspects of medical photography. **Methods:** Questionnaire based on the availability of facilities, usage, technical details and ethical issues of medical photography was sent to postgraduate students and teaching faculties of Oral Pathology in various localities in India. **Results:** Photographs were taken mostly for the purposes of publication, medical documentation and education. Significant number of postgraduate students and faculties of Oral Pathology didn't receive any training or hadn't gone through any publications/books ($P = 0.000$) about medical photography. Consent for patient photography was taken by significant number of respondents ($P = 0.000$) but in a verbal form. Majority of people used image editing software, but 19.0% of faculties and 21.1% of postgraduate students were unaware of deleterious effect of image editing. Firm and sensible instructions concerning image storage, sharing and accessibility were not yet created. **Conclusion:** This survey drew 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 for students and faculties in every health care institution.

Key words: Confidentiality, consent, copy right, data protection, medical photography, photomicrography

INTRODUCTION

Pathology is a visual science which demands clinical, macroscopic and microscopic images for its core process; diagnosis. As "a picture speaks thousand words," photographs reduce misunderstandings created by 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. This study also tried to figure out areas of medical photography that need more clarification.

METHODS

A questionnaire-based survey was conducted among oral pathologists. An anonymous questionnaire was prepared and sent to oral pathologists including postgraduate students

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and teaching faculties located at various states of India. The questionnaire was based on different aspects of medical photography/photomicrography including availability of facilities, usage of photographs, technical details and ethical issues. One hundred and thirty-five responses were received out of which 60 responses each from students and faculties were randomly selected. Responses were statistically assessed using binomial test and Chi-square test.

RESULTS

Most common usage of medical photographs was for publications followed by medical recording and teaching. Usage for patient education, medicolegal issues and telemedicine appeared to be minimal.

Availability of facilities and resources

Number of participants in this survey who didn't receive any training or had not gone through any publications/books about medical photography was statistically significant ($P = 0.000$). Less than 50% of postgraduate students and faculties had accessibility to accessory equipments other than a camera and 56.1% and 58% of students and faculties respectively had a camera with microscope adapter for taking photomicrographs. Graph 1 indicates percentage of oral pathologists who had accessibility to various facilities.

Consent

Significant number of students and faculties took consent for patient photography ($P = 0.00$), but most of them took verbal consent only. Graph 2 shows type of consent taken by oral pathologists.

About 65.4% of students 68% of faculties informed the patient about the purpose of photograph. But most of them never mentioned to the patient about his/her right to withdraw the consent. Seventy-two percentage of students and 68.3% of faculties thought that photographing internal organs/pathological, microscopic documentations needed patient's consent.

Anonymity of photographs

Proportion of oral pathologists concerned about anonymity of patient photographs is statistically significant ($P = 0.00$). 69.8% of faculties knew that anonymity of photograph could be hampered by inclusion of personalised jewellery, tattoo or scar mark in the photograph. While only 59.6% students knew about above mentioned fact.

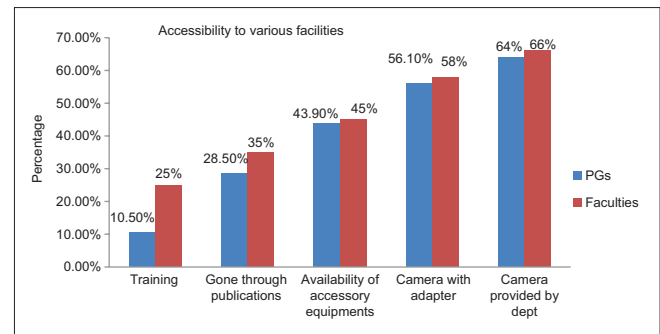
Image editing

About 66.7% of postgraduate students and 68.3% of teaching faculties used image editing softwares. Cropping and

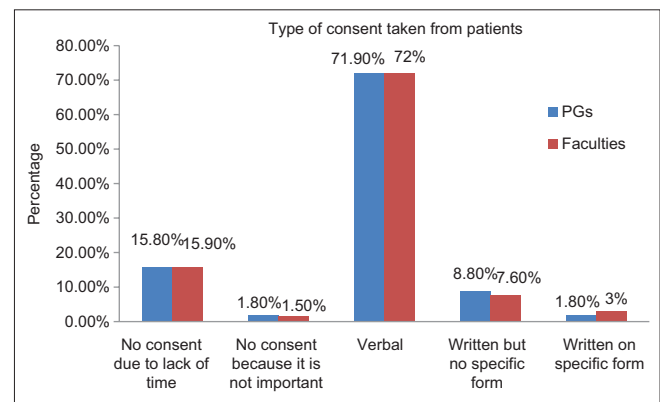
brightness/contrast enhancement were the most common type of image editing. 19.0% of faculties and 21.1% of postgraduate students were unaware of deleterious effect of image editing.

Storage and sharing of images

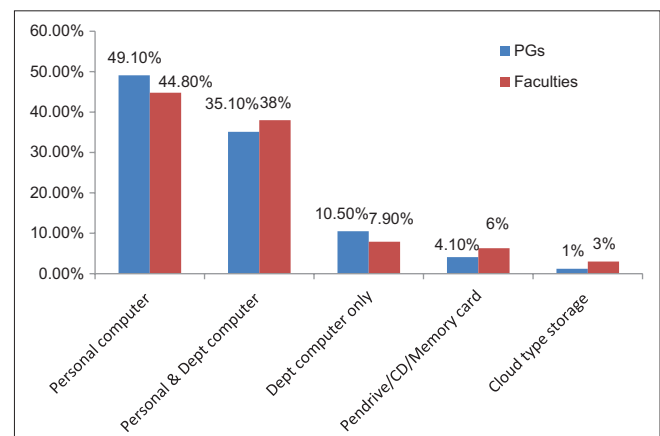
Considering all data storage devices, most of the pathologists used their personal computer for storage of images. Less percentage of people used pendrive, compact discs and cloud type storages. Graph 3 shows percentage of usage of data storage devices.



Graph 1: Accessibility to various facilities for oral pathologists for patient photography and photomicrography



Graph 2: Type of consent taken from patients



Graph 3: Percentage of usage of data storage devices by the participants in the survey

For sharing the data, pendrive and E-mail were used regularly. It is important to note that 4.8% of faculties and 21% of students used newer networking modes like whatsapp and other sharing apps.

Technical details

Most of the participants were using compact cameras compared to digital single lens reflection cameras. 15.9% of faculties and 38.6% of postgraduate students depended on mobile phone cameras for capturing images.

Most common problems encountered during intra oral/extra oral photography were improper focusing, incorrect exposure and lack of accessibility to intra oral lesions. Common problem encountered during photomicrography was lack of clarity, incorrect exposure of images. Joint photographic experts group (JPEG) format was the most common file format for image storage.

Copyright and access to photographs

According to significant percentage of participants the copy right of patient photographs/photomicrograph should belong to the concerned doctor/dentist. Graph 4 shows opinion of oral pathologists about to whom the copy right of medical photographs should belong.

Most of the participants stated that any dentist/doctor in the particular department should have access to photographs taken by anyone in that department. Graph 5 demonstrates opinion of oral pathologists about people who can have access to particular photograph.

DISCUSSION

In the era of telepathology and pathology informatics, imaging has become an integral part of pathology practice. This survey noted that the most common need of medical photographs is for publications followed by medical recording and teaching. According to the survey conducted by Horn *et al.* about the applications of photography in pathology, the most common

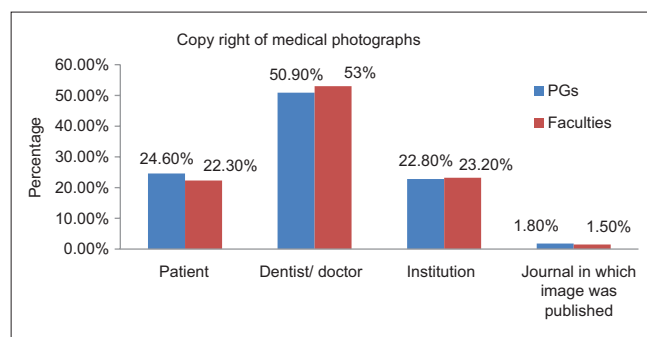
application was for educational purposes followed by medical recording and consultation services.^[2]

Before capturing an image for any purpose, it is essential to take written consent from patients especially when the patient photograph would be accessible to public. Obtaining consent is a major concern for significant numbers of oral pathologists but most of them do take verbal consent. The study conducted by Taylor *et al.* among plastic surgeons also noticed that consent was usually taken by surgeons but only in a verbal form.^[3] According to the survey conducted by Bhangoo *et al.* in 117 emergency departments in UK, only 21 departments were found to have a written policy for photography.^[4]

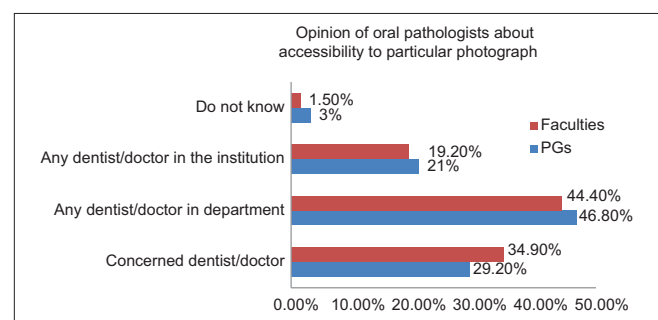
The consent form should include the purpose of documentation and information about the right of the patient to withdraw consent at any time until information has been released to the public.^[3] Lau *et al.* noted that using medical photographs on the internet such as medical web sites were generally less acceptable to patients.

Nowadays many journals demand written consent prior to publishing a photograph.^[5] For photographing internal organs and microscopic details, permission of the patient is not necessary. But do not record the patient's name with the stored images.^[6] Although consent is not required for an anonymized image to be used for educational or solely treatment purpose, the existence of a written statement provide legal protection whenever necessary. If the patient is unable to give consent, the photograph cannot be published until the patient has the capacity to give the consent. If the patient is permanently incapacitated, the immediate family member can give the permission.^[4,7]

It is appreciable that a significant number of postgraduate students and faculties of oral pathology who participated in the survey were aware of the importance of anonymity of patient photos. Taylor *et al.* noted that attempts to impart anonymity to patient photos were less frequent among surgeons who participated in their study.^[3] But Lau *et al.* felt definite preferences of patients to the use of nonidentifiable photographs for all purposes ($P < 0.001$).^[8]



Graph 4: Opinion of oral pathologists about the copy right of medical photographs



Graph 5: Opinion of oral pathologists about accessibility to particular photograph

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 in the images cannot be considered completely anonymous if any other identifiable features are present.

Most of our respondents used compact cameras as they are easy to handle and capable of giving a promising result. Our survey noticed that 38.6% of postgraduate students used mobile phone cameras. The main issue faced by mobile phone cameras were low patient's acceptability. Lau *et al.* states that 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/extraoral photography were improper focusing and lack of accessibility of intraoral lesions. This can be corrected by appropriate use of good lenses, retractors and mirrors. A ring flash is useful in certain cases of intraoral photography where the shadow of a flash would obscure important detail.^[9] We noted that only 43.9% of postgraduate students and 45% of faculties of oral pathology had availability to such accessory equipment.

Lack of clarity was the problematic arena with photomicrographs. A sufficient megapixel camera with a 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] Smart phones can be effectively used for photomicrography with the help of a smart phone adapter to the microscope.^[11]

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

Most of the oral pathologists who participated in this survey use JPEG format for image storage. JPEG images are generally sufficient to make diagnoses, easier to store and manipulate.^[12,13] Tag image file format (TIFF) schemes can be considered when a high-end image is required. TIFF makes 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 most of the oral pathologists use the image editing software. Therefore, the question is how much editing should be permissible. Modifications that do not alter the content of the image (cropping [unless it affects image interpretation],

brightness contrast enhancement, sharpening, etc) are acceptable.

Nonlinear changes (different pixels of the image be treated in different ways) and image merging are not acceptable as they can lead to serious misinterpretations. Selective color change apps (e.g., from light brown to dark brown) can make errors in case of immunohistochemistry interpretations.^[10] In this context, it is important to note that 19.0% of faculties and 21.1% of postgraduate students were unaware of the deleterious effect of image editing. Pinco *et al.* observed that the digital manipulation of cytology images significantly affected their interpretation.^[15] Rao *et al.* noticed that it was very difficult to identify digitally manipulated medical photographs.^[16]

Nowadays image manipulation can be detected with the help of image authentication system that documents every change made in the image.^[4,14] 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]

According to Institute of Medical Illustrators (IMI) model policy, storage of images must be traceable, retrievable and secure.^[18] This survey noted that most of the oral pathology postgraduate students and faculties stored the images in personal computers. Horn *et al.* noted in his study that 79.6% of respondent stored digital images in a central database.^[2] While Taylor *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 database 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 or backup, it may be considered as negligence in a court of law.^[1]

Regarding accessibility to a particular medical photograph, there was no unanimity of opinion among our respondents. Majority felt that any dentist/doctor in the particular department should have access to photographs taken by anyone in that department. The development of an institutional policy regarding liberalization of the accessibility of images depending on the purpose can avoid great confusion. When images are shared with consultant pathologists, they are obliged to treat the images as confidential.^[13]

4.8% of faculties and 21% of postgraduate students used custom-built software apps for sharing medical photographs. A study conducted by Payne *et al.* shows increased use of smart phones and apps among young doctors in United Kingdom. The study shows that 79.0% ($n = 203/257$) of medical students and 74.8% ($n = 98/131$) of junior doctors had a smartphone. The majority of students and doctors owned 1–5 medical related apps.^[19]

While using networking modalities and apps to share medical photographs, health care professionals should take utmost care to prevent unnecessary leakage of information. A permanent invisible watermark, which can be identified by the specific software, will be useful to identify the originality of a particular image.^[4,14]

According to majority of oral pathologists who participated in the survey, the copyright of a particular image should belong to the concerned dentist/pathologist, but 22.8% of postgraduate students and 23.2% of faculties believed that the copyright should belong to the concerned institution.

IMI model policy and guidelines state that copyright of images of patients belongs to the institutional trust and trust acts as the data controller for images. For publications, transfer of copyright should be refused. In the private sector, the clinician can act as the data controller for images taken.^[18,20]

CONCLUSION

Even though trained medical photographers take the best medical photographs, such facilities are not always available especially in the current 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. A selection of appropriate photography equipment combined with the necessary training programmes and implementation of a proper working 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.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Leong FJ, Leong AS. Digital imaging in pathology: Theoretical and practical considerations, and applications. *Pathology* 2004;36:234-41.
2. Horn CL, DeKoning L, Klonowski P, Naugler C. Current usage and future trends in gross digital photography in Canada. *BMC Med Educ* 2014;14:11.
3. McG Taylor D, Foster E, Dunkin CS, Fitzgerald AM. A study of the personal use of digital photography within plastic surgery. *J Plast Reconstr Aesthet Surg* 2008;61:37-40.
4. Bhangoo P, Maconochie IK, 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;22:761-5.
5. Groves T, Croot J. Using pictures in the BMJ. *BMJ* 2005;330:916.
6. Tranberg HA, Rous BA, Rashbass J. Legal and ethical issues in the use of anonymous images in pathology teaching and research. *Histopathology* 2003;42:104-9.
7. Supe A. Ethical considerations in medical photography. *Issues Med Ethics* 2003;11:83-4.
8. Lau CK, Schumacher HH, Irwin MS. Patients' perception of medical photography. *J Plast Reconstr Aesthet Surg* 2010;63:e507-11.
9. Nayler JR. Clinical photography: A guide for the clinician. *J Postgrad Med* 2003;49:256-62.
10. Hamilton PW. How to take and process digital images for publication. *Diagn Histopathol* 2010;16:476-83.
11. 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.
12. 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;71:105-15.
13. Scheinfeld N. Photographic images, digital imaging, dermatology, and the law. *Arch Dermatol* 2004;140:473-6.
14. Micklem K, Sanderson J. Digital imaging in pathology. *Curr Diagn Pathol* 2001;7:131-40.
15. 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.
16. Rao SA, Singh N, Kumar R, Thomas AM. More than meets the eye: Digital fraud in dentistry. *J Indian Soc Pedod Prev Dent* 2010;28:241-4.
17. Barry CJ, Yogesan K, Constable IJ, Eikelboom RH. A case for electronic manipulation of medical images? *J Audiov Media Med* 1999;22:15-20.
18. Institute of Medical Illustrators; Law and Ethics Department. A Model Policy on Photography and Video Recording of Patients: Confidentiality and Consent, Copyright and Storage; December, 2002.
19. Payne KB, 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 Med Inform Decis Mak* 2012;12:121.
20. Department of Health. Confidentiality: NHS Code of Practice. Available from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/200146/Confidentiality_-_NHS_Code_of_Practice.pdf. [Last accessed on 03/08/2015]