Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 7, Issue, 06, pp.17454-17456, June, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

OCCURRENCE OF CR ARTIFACTS AND REMEDIAL MEASURES TAKEN IN A TERTIARY HOSPITAL

Aziz Uz Zama, Sushil Yadav and *Rahul P. Kotian

Department of Medical Imaging Technology, School of Allied Health Sciences,
Manipal University, Manipal, India

ARTICLE INFO

Article History:
Received 10th March, 2015
Received in revised form
07th April, 2015
Accepted 15th May, 2015
Published online 30th June, 2015

Key words:
Computer Radiography,
Artifacts,
Image Plate,
Quality Assurance.

ABSTRACT

Background: Computed radiography which can capture a latent analog images, which is been then digitized in the Reader. During the translation process there is a chances were artifacts can be produced in the image which can result in non-clinically acceptable for diagnosis.
Aim: The aim of this study is to evaluate the CR artifacts, with frequency of occurrence and the types of artifacts occurring with remedial measures.
Materials and Methods: Sampling was done by convenience sampling method considering inclusion and exclusion criteria and a sample of 550 was taken frequency of images with artefact and without artefact was calculated Further the artefacts were categorised in two groups as Image processing artefacts and Image Acquisition artefacts and their frequency of occurrence was calculated and statically analyzed.
Result: Out of 550 images with artefact were 184 (33%) and without artefact was 366 (67%). Among 184 images with artefacts, 102 images were with image acquisition artefacts which form 55.4% and 82 images were with image processing artefacts which form 44.5% of total images with artefacts.
Conclusion: Appropriate periodical maintenance and QA may be helpful to produce optimum quality image and quality patient care, decreasing CR artefacts and avoiding repeat radiographs thus optimizes the radiation exposure to patient and radiographer.

***Citation*:** Aziz Uz Zama, Sushil Yadav and Rahul P. Kotian, 2015. "Occurrence of CR artifacts and remedial measures taken in a tertiary hospital", *International Journal of Current Research*, 7, (6), 17454-17456.

INTRODUCTION

Computed radiography which is referred as a cassette-based digital imaging helps to obtain the images using a cassette that contains a storage phosphor plate. These CR cassettes are often called and referred as imaging plates (IP). As this technology has evolved and developed, more and more clinical practices has involved has been completely replaced the conventional film–screen systems with computed radiography (CR). The Dark room problems mainly such as odour, hazards from chemical developer and fixer and the darkroom integrity maintenance in QA, is been able to eliminated by the use of CR system (Collectible, 2008). The Further development has led to clinically-specific CR systems, making digital radiography (DR) made more accessible than ever before (Mattoon and Smith, 2004). In most places in India with major hospitals, research and diagnostic centres uses computed radiography for general radiography which even helps in improving the work flow.

Corresponding author: Rahul P. Kotian,
Department of Medical Imaging Technology, School of Allied Health Sciences, Manipal University, Manipal, India.

When Un-like competing digital technology, CR system is particularly suitable especially for the bedside radiographic examinations, were we usually found the worst radiographic images seen in general radiography because of the emergency conditions of the patient under which the radiographic examinations is done.

Artifacts

It is one of the feature which is caused by an image can mimic or masks the clinical features of radiology imaging which can lead to Mis-diagnosis of the pathology and classified accordingly by their features in appearance such as software related artifacts, hardware related artifacts, or artifacts caused due to operator errors. By the standard way and the mechanism of interference this artifacts can be classified by image acquisition artifacts and Image processing artifacts or display.

Objectives

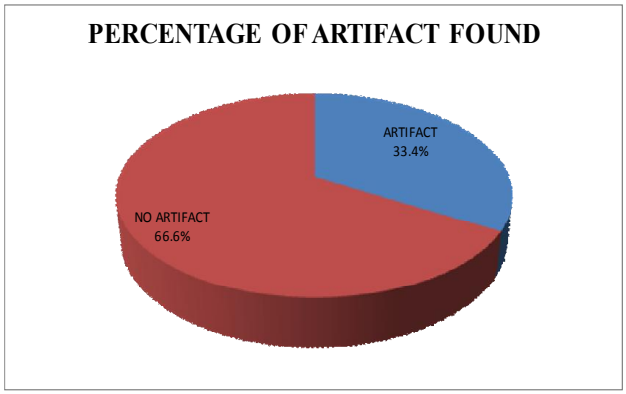
The purpose of this study is to evaluate the CR artifacts, with frequency of occurrence and the types of artifacts occurring with remedial measures.

MATERIALS AND METHODS

A convenience study was conducted with 550 samples which were the patient who has been referred to computed radiography. Frequency of images with artefact and without artefact was calculated. Then the cassette which showed artefacts was identified with the help of their respective identification number. The frequency of artefact for different anatomical region such as skull, chest, spine, upper limb, lower limb, abdomen, pelvis and mammography was calculated. Further the artefacts were categorised in two groups as Image processing artefacts and Image Acquisition artefacts and their frequency of occurrence was calculated. Image acquisition artefacts were further categorised into Un-collimated Images, Twin Artifacts (Double Exposure) and Inappropriate Exposure Factors and Image processing artefacts into Artifacts due to cracks on imaging plate, Artifacts due to dust particles on imaging plate, Plate reader artifacts and Cassette-related artefact. The data obtained was statistically analyzed using SPSS version 16 software.

RESULTS

Out of 550 images the frequency of images with artefact was found to be 184 which form 33% of the total acquired sample. The frequency of images without artefact was 366 which include 67% of the acquired sample.



Among 184 images with artefacts, 102 images were with image acquisition artefacts which form 55.4% and 82 images were with image processing artefacts which form 44.5% of total images with artefacts.

Reason	(n)	Percentage
1.Image Acquisition Artifacts	102	19%
2.Image-Processing Artifacts	82	15%
Total	184	

Image acquisition artefact included 18 un-collimated images, 10 twin artefacts and 70 inappropriate exposure factors. Image processing artefacts included 26 artefacts due to cracks on image plate, 54 due to dust particles in image plate, 8 plate reader artefacts, and 1 was Cassette-related artefact. Artefact that needed replacement of hardware was 14.6% which includes artefacts due to crack on IP and cassette related artefacts. Other 85.3 % of the artefacts can be rectified by periodic maintenance and utilizing proper image acquisition techniques.

Shows reason for image acquisition Artefact

Reason for Image Acquisition Artefact	(N)	Percentage
Un-collimated Images	18	17.6%
Twin Artifacts (Double Exposure)	10	9.8%
Inappropriate Exposure Factors	70	68.6%

Shows reason for image processing Artifact

Reason For Image Processing Artifact	(n)	Percentage
Artifacts due to cracks on imaging plate	26	31.7%
Artifacts due to dust particles on imaging plate	54	65.8%
Plate reader artifact	8	9.7%
Cassette-related artifact	1	1.21%

Total of 22 image receptors were used in the study. There were five image receptors which produced maximum number of artefacts. These five cassettes produced 112 images with artefact which form 60.8% of total images with artefact. Among those images, there were 49 image processing artefacts and 51 image acquisition artefacts.

IP Size	Number	Artifacts in each IP	Percentage
17x14	5	90	48.9%
14x14	6	51	27.7%
10x12	10	42	22.8%
8x10	1	1	0.5
	22	184	

DISCUSSION

There are many studies done CR artifacts which will help one to recognize the artefact and its cause so that it can be eliminated or considered and avoid misdiagnosis. This will improve quality imaging, time, un-necessary exposure, repeat study and patient care. Yuk-Kwan Chen *et al*. performed a study to analyse image artefact, types of artifacts and occurrence frequency in CR system The artefacts were divided into 1.operator errors, 2.scanning errors and 3.PSP plate defects. During the study 3 observers evaluated 15,912 digital images and identified total of 643 image artifacts. Maximum number of artefact found was 1.due to operator error (n-554), 2.defects of plate (n-60) and 3.scanning error (n-29). Authors concluded that most of artefacts can be eliminated if the operator is experienced and appropriate use of techniques (Chiu *et al*., 2008). Kevin Hammerstrom *et al*. conducted a study to recognize and prevent CR artefacts at, Images from cassettes with imaging plates (IPs) Fuji(197), Agfa (35), and Kodak (37) CR from four radiology departments were analysed. Cassettes and IP were inspected for physical wear and tear and the images were inspected for the artefact if any. Physical damage to the cassettes was more extensive on those cassettes which were used frequently. Small size of cassette was found to be in comparatively good physical condition in compare to the 35 × 43. At least half of the radiographic images on IP Scars were visible. Authors concluded that it is essential for quality control program for computed radiography to monitor which should not just include cleaning of cassettes and imaging plates on a regularly, but also include inspecting regularly visual observation of radiograph that to decrease the occurrence of image related artifacts (Hammerstrom *et al*.,

2006). Kalathingal *et al*. performed a study to see the rate of extent on surface scratches on photo-stimulable phosphor. Randomly seven sets of IP were selected out of 15 sets. Each IP were exposed with 65 kVp and 7 mA for 0.80s. All selected image plates with soft cloth using alcohol lightly wiped and re-exposed. Both the sets of images were subjectively rated by two investigators and rated using five point scales for artefacts, maximum artefact being 5 and minimum being 1. The mean category score for un-wiped group was Then categorised the image plates into two pre-cleaned and post cleaned IP. The mean category value before cleaning was 2.57 and post cleaning was 2.35. Authors concluded that wiping of IP may not be necessary always. System designed to minimize handling of the IP may minimize scratching of the film (Kalathingal *et al*., 2010). We found in present study that 85.3 % of the artefacts can be rectified by periodic maintenance and utilizing proper image acquisition techniques which is similar to finding of Yuk-Kwan Chen *et al*. which concludes in their study that most of the artefacts can be eliminated with the experienced operator and using appropriate techniques. It was found to be 48.9% of images with artefacts in largest sized image receptor in present study. This may be because of those largest sized cassettes were used most frequently. Kevin Hammerstrom *et al*. reported similar result in their study that larger image receptors produce more images with artefacts and small size of cassettes were found to be in relatively good condition.

Conclusion

The main goal of any radiographic examination is to evaluate anatomy being examined. Artefacts in the image may hinder the visualization of pathology or may mimic pathology in normal condition. Though it is not possible to eliminate artefact completely, it is important to recognize and minimize the artefact in a given radiographic condition. Appropriate periodical maintenance and QA may be helpful to produce optimum quality image and quality patient care, decreasing CR artefacts and avoiding repeat radiographs thus optimizes the radiation exposure to patient and radiographer.

REFERENCES

Chiu, H.L., Lin, S.H., Chen, C.H., Wang, W.C., Chen, J.Y. and Chen, Y.K. *et al*. 2008. Analysis of photostimulable phosphor plate image artifacts in an oral and maxillofacial radiology department. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*., Nov;106(5):749–56. Available from:http://www.ncbi.nlm.nih.gov/pubmed/18547836

Collectible Q.A. 2008. A brief overview. (October).

Hammerstrom, K., Aldrich, J., Alves, L. and Ho, A. 2006. Recognition and prevention of computed radiography image artifacts. *J Digit Imaging*. Sep., 19(3):226–39.Availablefrom:http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3045153andtool=pmcentrezandrendertype=abstract

Kalathingal, S.M., Shrout, M.K., Comer C. and Brady C. 2010. Rating the extent of surface scratches on photo stimulable storage phosphor plates in a dental school environment. *DentomaxillofacialRadiol*., 39:179–83.

Mattoon, J.S., Smith, C. 2004. CE Breakthroughs in Radiography : Limitationsoftraditional. (January):1–8.

****