Comparative Study of CR Artifact Due To Technical and Movements Errors

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ABSTRACT

Objective

To determine utility evaluation of patient preparation techniques and effective handling of the equipment Available and Evaluation of routine practices followed by the technologist and to understand the basic compromises noticeable while using CR.

Methods

40 X-Rays were studied at the department of radiology CS Subharti Hospital Meerut from September 1, 2017 to June 25, 2018. various factors which causes artifacts seen on films were noted.

Results

Out of 40 cases, It was observed that maximum no. of artifacts are caused by image processing 20(50%) while minimum artifacts are caused by patient movement 9(22.5%). Artifact caused by image acquisition i.e 11(27.5%). In comparative study 31(77.5%) was caused due to technical error which include Image Acquisition Artifact and Image Processing Artifact. Minimum error i.e 9(22.5%) was caused due to Patient Movement.

Conclusion

Artifacts on radiographic images are distracting and may compromise accurate diagnosis. Although most artifacts that occur in conventional radiography have become familiar, computed radiography. Understanding the potential sources of CR artifacts will aid in identifying and resolving problems quickly and help prevent future occurrences.

Key Words

Assessment various factors which causes artifacts.

INTRODUCTION

Earlier manual processing was in common practice which transforms the latent image into a visible image. it consists of developing, rinsing, fixing, washing and drying procedures. For automatic processing there are "squeegy" rollers that remove the chemicals and thus the film goes from the developer solution straight into the fixer.but there are some limitations involved like it is more complicated and time consuming procedure Now due to certain limitations film processing is replaced by Computed Radiographic(CR) system..[(1)] CR Readout Process Image acquisition is made using an imaging plate, which is a PSP-based plate made of barium fluorohalide One imaging plate is used for each exposure. The imaging plate is enclosed in a cassette, which is similar to a screen film cassette. The plate is now exposed to x-rays using standard radiographic equipment. During the exposure, electrons in the phosphor plate are excited to a higher energy

state; these excited electrons are trapped and form a latent image. This latent image is processed and retrieved by placing the imaging plate in a CR reader, which is also called a digitizer.

Artifact a structure or an appearance that is not normally present on the radiograph .it may be due to technical errors (errors related to the technique of taking the radiograph) or movement terrors (errors related to the patient motion including voluntary and involuntary action) Artifacts can be generated at each step of the CR image workflow.CR Artifacts are broadly classified into three categories –

A) 1mage Acquisition Artifact

B) Image Processing Artifact

C) Software Induced Artifact.

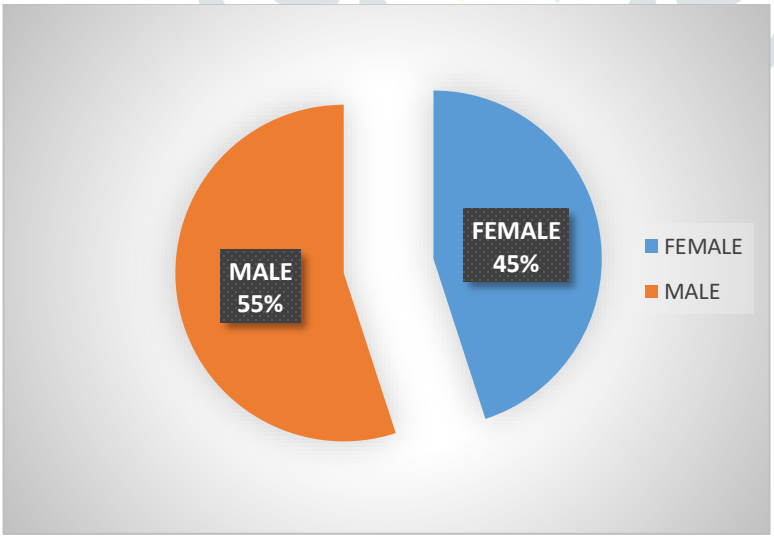
PATIENTS AND METHODS

The study was carried out at CS Subharti Hospital Meerut from November 1, 2017 to April 25, 2018 and included 40 assessment various factors which causes artifacts. Patients of both genders and all ages and both indoor and outdoor were included. Radiographic images which are having various types of artifacts.

Radiographic images produce by CR-IR 359FUJIFILM Corporation 26- 30, NISHIAZABU 2-CHOME, MNATO- KU, TOKYO 106-8620, JAPAN. After receiving the requisition from the consultant or clinicians Radiography should be obtained, Procedure is explain to the Patient to avoid patient motion and unnecessary exposure to the patient. A record of radiographic views advised and referring OPD/Ward was kept. After inspecting the processed image presence of unwanted appearances on the radiograph should be checked and all the films were examined to determine radiological findings.

RESULTS

Total radiological investigations during the study were 40 and assessment various factors which causes artifacts made 4% of the workload. On the basis of inclusion criteria, a total 40 patients of both sex and different age group, were included in the present prospective cohort study. An informed consent was obtained from all the patients before they were subjected for evaluation. Out of 40 patients included in this study, 22/40 (55%) patients males and 18/40 (45%) patients females.



Out of 40 cases, It was observed that maximum no. of artifacts are caused by image processing 20(50%) while minimum artifacts are caused by patient movement 9(22.5%). Artifact caused by image acquisition i.e 11(27.5%)

TABLE 3.1: DISTRIBUTION OF ARTIFACTS ON THE BASIS OF CAUSES.

Causes of artifact	Total no Cases having Artifacts	Percentage (%)
Patient movement	9	22.5%
Image Acquisition artifact	11	27.5%
Image Processing artifact	20	50.0%

GRAPH 3.1: DISTRIBUTION OF ARTIFACTS ON THE BASIS OF CAUSES

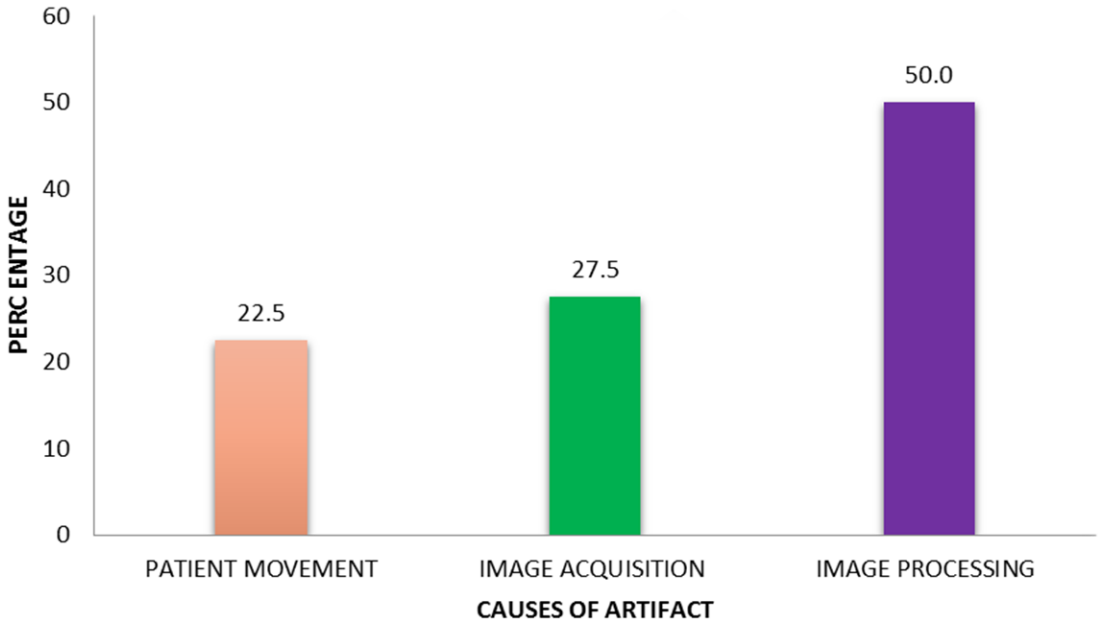


TABLE 3.2: DISTRIBUTION OF CASES INDICATING YPES OF ERROR

Types of error	Total no cases having Error	Percentage (%)
MOVEMENT ERROR (patient movement)	**9**	**22.5**
TECHNICAL ERROR (Image acquisition Artifact + image processing Artifact)	**31=11+20**	**77.5**

In comparative study 31(77.5%) was caused due to technical error which include Image Acquisition Artifact and Image Processing Artifact. Minimum error i.e 9(22.5%) was caused due to Patient Movement.

GRAPH 3.2: DISTRIBUTION OF CASES INDICATING TYPES OF ERROR

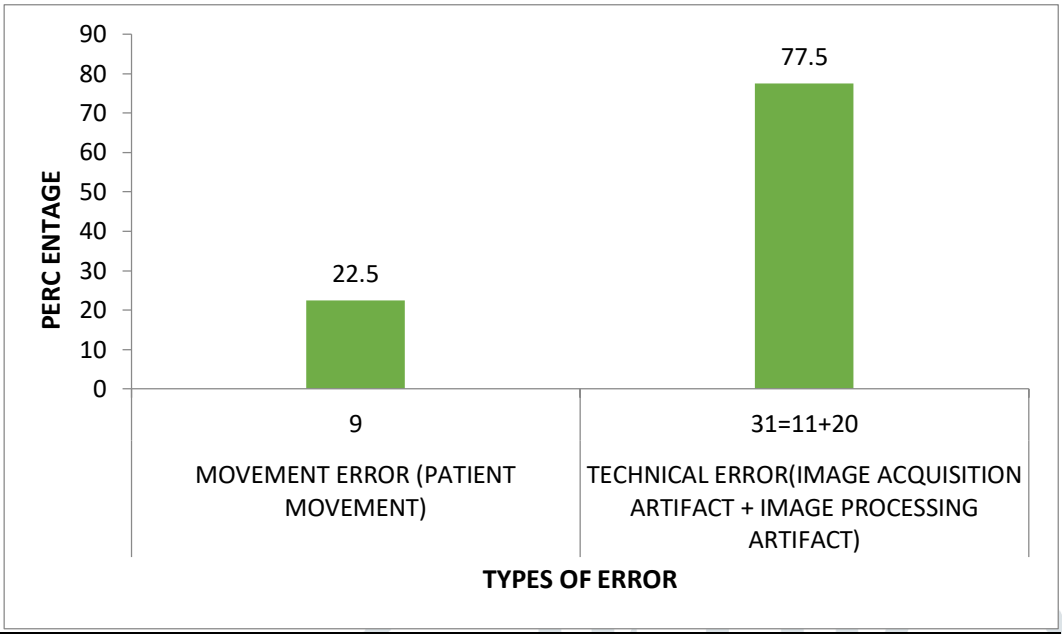
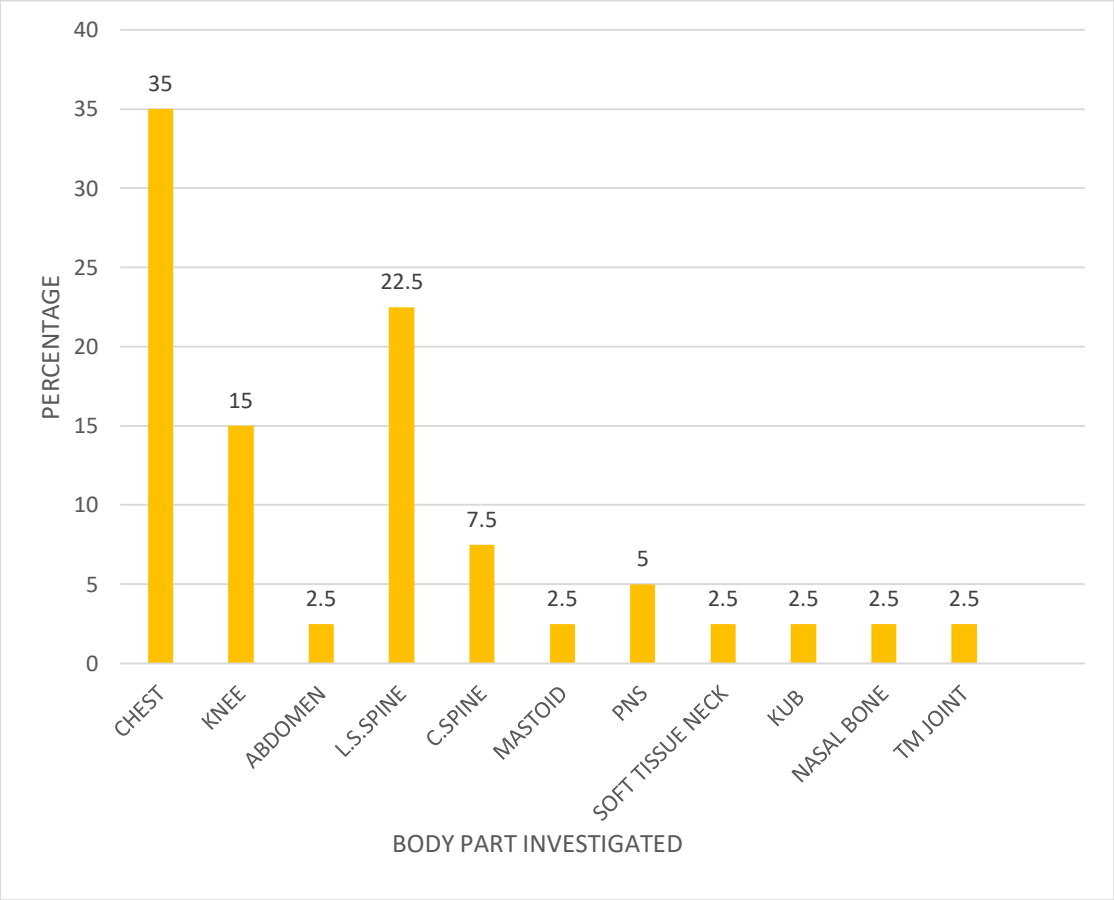


TABLE 3.3: DISTRIBUTION OF CASES ON THE BASIS OF BODY PART INVESTIGATED

BODY PART INVESTIGATION	TOTAL NO OF CASES	PRECENTAGE(%)
CHEST	14	35
KNEE	6	15
ABDOMEN	1	2.5
L.S.SPINE	9	22.5
C.SPINE	3	7.5
MASTOID	1	2.5

PNS	**2**	**5**
SOFT TISSUE NECK	**1**	**2.5**
KUB	**1**	**2.5**
NASAL BONE	**1**	**2.5**
TM JOINT	**1**	**2.5**

GRAPH 3.3: DISTRIBUTION OF CASES ON THE BASIS OF BODY PART INVESTIGATED



Various body part showing artifacts were studied in 40 patients .out of 40 cases maximum 14(35%) in Chest, 9(22.5%) in L.S. Spine, in Knee 6(15%), in C .Spine 3(7.5%), in PNS 2(5%). Minimum 1(2.5%) in KUB, Mastoid, Abdomen, Soft Tissue Neck, Nasal Bone and TM Joint.

Fig 4. 1 :This artifact occurs because of malfunction of roller in computed radiography reader,

Fig 4.2:This is due to CR reader

DISCUSSION

The use of computed radiography (CR) and a picture archiving and communication system (PACS) has seen an increase in both clinician and radiologist acceptance. The economic benefits as well as productivity gain associated with the system is fairly well established.

Computed radiography offers many advantages over the conventional radiography. With new technological breakthroughs and the development of systems that are more cost-effective, there has been an increase in its use in the recent years. However, like all imaging modalities, one must be aware of the various artifacts that are likely to lead to misdiagnosis. COMPUTED RADIOGRAPHY (CR) offers several advantages. These include having a wide exposure latitude which means that CR can provide diagnostic quality images when the imaging plate has been underexposed or overexposed; lower repeat rate, especially with portable x-ray equipment; broad dynamic range allowing a single exposure to show both bone and soft tissue, and the large bit depth which enables the gray-scale resolution to compensate for the lower spatial resolution. However, as in all imaging modalities, there are potential hardware and software artifacts that may lead to a wrong radiological diagnosis. Being aware of these artifacts would ensure a correct diagnosis and the appropriate treatment given to the patient. Maximum artifact were caused by image processing artifact 20(50.0%) while minimum artifact were caused by patient movement 9(22.5%) moderate artifacts 11(27.5%) were caused by image acquisition artifact. This study comprised of 14 cases of CHEST(35.0%), and 9 cases of L.S.Spine (22.5%), 6 cases of knee (15%) , 3 cases of C.Spine (7.5%) ,2 cases of PNS (5%), KUB, Mastoid, Abdomen, Soft tissue neck ,Nasal bone and TM joint 1(2.5%) of each case.

We studied the 40 cases. The parameters evaluated on x-ray examination were collimation, exposure parameters (KVp, mAs etc.), field of view, patient position, placement of IR

Beam centering, collimation, Filters, Grid, and Beam Angulation (if required)

Review capability of a PACS workstation should be available to the radiologist; authorized health care providers should be able to review images remotely. A method for digitally transmitting the image data should be available.

CONCLUSION

To study effects of artifacts in images of various ailments, 40 patients have been studied to determine the sources of artifacts

Artifacts on radiographic images are distracting and may compromise accurate diagnosis. Although most artifacts that occur in conventional radiography have become familiar, computed radiography. Understanding the potential sources of CR artifacts will aid in identifying and resolving problems quickly and help prevent future occurrences.

One can now determine the root cause and take preventative measures to reduce reoccurrences. Computed radiography artifacts are distracting, could possibly interfere with the quality of interpretation and will reduce the life of an imaging plate. When proper maintenance of equipment is taken into consideration and quality control practices implemented all artifacts can be significantly reduced making the choice to go digital worthwhile. Imaging artefacts are distracting and can cause diagnostic inaccuracies. Although some of the artefacts found in early-generation CR systems have been addressed, such as those caused when collimation was not parallel to cassette edges .CR imaging continues to have its own set of artefacts. These artefacts can present differently on a CR image when compared with other, more traditional, modalities. If CR system users are aware of the probable causes of artefacts, it will be easier to efficiently eliminate them. After summing up the entire discussion it is concluded that by proper handling of equipment's and effective patient preparation techniques COMPUTED RADIOGRAPHY (CR) Artifacts, which disturbs and reduce the quality of image, can be minimized up to a certain level.

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