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COMPARISON OF RETAKE ANALYSIS BETWEEN COMPUTED RADIOGRAPHY AND DIGITAL RADIOGRAPHY

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ABSTRACT

Reject/Retake analysis, one of the key quality control tools in medical imaging field1. It provides detail about unnecessary radiation exposure to patients as well as waste of time3.Results will be useful for training needs and to prepare clinical presentation targeting staffs weakeness1 also to highlight wrong identifications, positioning errors, wrong radiographic technique, bad image processing, and equipment malfunction etc4.The aim of the present research study involves a comparative study between image Retake analysis to compare the outcomes between CR technology and DR technology program in digital environment.

KEYWORDS: **comparison of retake, computed radiography, digital radiography**

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INTRODUCTION

The history and theory of film less radiography first introduced in1970. The film less radiography is first introduced in 1981 FUGI introduced a special cassette with photo stimulable phosphor plate(PSP). 1983 first clinical application in Japan. In 1990 digital or direct digital radiography system introduced.CR systems make use of image plates having a detective layer of photostimulable crystals that contain different halogenides such as bromide, chlorine, or iodine (eg, $BaFBr:Eu^{2+}$). The phosphor crystals are usually cast into plates into resin material in an unstructured way (unstructured scintillators). Image plates replace the conventional films in the cassette[5]. Digital radiography flat-panel systems with integrated readout mechanisms were introduced in the market by the end of the 1990s. Flat-panel systems, also known as large-area X-ray detectors, integrate an X-ray-sensitive layer and an electronic readable system based on TFT arrays. Detectors using a scintillator layer and a light-sensitive TFT photodiode are called indirect-conversion TFT detectors. Those using an X-ray-sensitive photoconductor layer and a TFT charge collector are called direct-conversion TFT detectors. The reference to amorphous silicon (a-Si), which is used in TFT arrays to record the electronic signal, should not be confused with a-Se, the material used to capture X-ray energy in a direct digital detector. This electronic readable system allows an active readout process, also called the active matrix readout, in opposition to the storage phosphor systems where no active readout elements are integrated within the detector. The entire readout process is very fast, allowing further developments in digital real-time X-ray detectors. School of Exercise and Health Sciences, University of Wester, Sydney, Australia has done this study in 2006.The total number of examinations for the 4 weeks of the digital batch, the number of examinations was 1615 examinations, and according to PACS records, the number of images forwarded for reporting was 3063 images. The number of images in the reject folder was 189 images, bringing the total number of stored images to 3252. The number of repeated views was 152 images, which makes 4.7% of the total views taken. Exposure errors: In the digital batch, exposure errors made 0.87% of the repeats[1]. Positioning errors: In digital batch, 3.2% fell in this[1]Overall, 6,002 images were rejected out of a total of 66,063.fluctuated between 8%and 10% and dipped slightly below 8% during December 2007 and February 2008. The mean rate was 8.7%, and all monthly rates fell within 2 standard deviations of the mean (7.2 %<×< 10.3%). When the reject rate was stratified by clinical area,[3.] The aim of this study was to Comparison of the computed radiography and digital radiography and the calculation of the rejected film analysis and measures of reduction.

METHODOLOGY

Study Designs
Hospital based observational prospective study.

Study Location
Department of Radiodianosis and Imaging, Kasturba Medical College Manipal, Manipal University

Duration of the study
Twelve Months

Sample Size
4000

$$n = \frac{\left(Z_\alpha \sqrt{2PQ} + Z_\beta \sqrt{P_1Q_1 + P_2Q_2}\right)^2}{(P_1 - P_2)^2}$$

Where

$$P = \frac{P_1 + P_2}{2}, \quad Q = 1 - P$$

$$Q_1 = 1 - P_1 \ \& \ Q_2 = 1 - P_2$$

Study criteria
Inclusion criteria

- All retake images which are taken by qualified staff.

Exclusion criteria
All retake images which are taken by student.

Sources of data

Patient data relevant to the study will be obtained from the following sources:

- PACS &RIS,
- FUJI FILM FCR,
- COMED TITAN 2000,

PHILIPS DIGITAL DIAGNOST VERTION 3.0.5

Study procedure

- Details of all the images which is rejected or repeated in CR and DR will be collected. Like Name of the patient,with Preparation error, factors and equipment problems, Required anatomy is absent, positioning error etc.
- Categories the data with the help of staff.
- Descriptive statistical analysis will be done using the collected data for the proper completion of our objectives.

Statistical analysis

- Student t- test
- The data obtained will statistically analyzed using SPSS version 16 software

RESULTS

In K M C Hospital a total of 344 (8.6%) X Rays where repeated out of 4000 X Rays images in Diagnosis Department. A total of 151 (7.55%) X Rays where repeated in Computed Radiography and 193 (9.65%) X Rays where repeated in Digital Radiography out of 4000 X rays. In Computed radiography Patient Preparation Error is 15(9.9%), Exposure Factor or Equipment error is 16 (10.6%) and Required Anatomy is absent 108 (71.5%) and Patient Position error 55(36.4%) In Digital radiography Patient Preparation Error is 34(17.6%), Exposure Factor or Equipment error is 18(9.3%) and required anatomy is absent 101(52.3%) and patient position error 132 (68.4%) In Computed Radiography, the most frequent factor responsible for re – take X Rays was Required Anatomy is absent 71.5% and Patient Position error 36.4%. In Digital Radiography, the most frequent factor responsible for re – take X Rays was Patient Position error 68.40% and Required Anatomy is absent 52.30%.

DISCUSSION

As a marketing strategy, most CR and DR providers are promoting digital imaging as the answer to reducing repeated exposure, which is based on early reports when digital radiography emerged as a new technology[4] some latest publications also had comments unsupported by proper analysis.5Repeat image analysis is one of the major quality improvement tools used in imaging departments, regardless of the technology.[1] Problems were encountered with the integrity and the consistency of the data that was collected from both equipment. These problems resulted from a combination of factors, [2]The 'natural' tendency to mask poor-quality practice or the lack of consistency of all the staff to follow the procedure to mark or classify rejected images may easily lead to underreporting or misreporting of rejected images. We have found a simpler, independent, and feasible way to face firstly the methodology to get automatically retake. Unnecessary radiation exposure to patients due to image retake can be reduce This study clearly demonstrated the number of X-ray re-take in K M C Hospital is (8.6%).The imaging modalities which are in K M C Hospital are CR and DR .CR is showing the rejection rate of (7.55%) and DR showing the rejection rate of (9.65%). The digital image repeats rate of CR system described in literature range from 3% to 10% and DR system is 1.5% to 6 %. The image repeat rate of both systems in this study was within known limits. Showed 9.65% images repeat rate in DR system, which was higher than the re-take rates in this study. And other study showed that Digital Radiography resulted more number of errors related to Required Anatomy is Absent, hence, reducing the overall re-take rate and the results are consistent with the presented findings. Other studies from the literature showed that Digital Radiography provided the best quality X-ray Images in comparison to Computed Radiographic techniques for obtaining X-rays Images. In Digital Radiography, Re-take were mostly due to either Improper Patient Preparation or Required Anatomy is Absent that seems to be minimized in Computed Radiography,. Nevertheless, in Computed Radiography, Required Anatomy is Absent and Improper Patient Position was the main factor responsible for the highest re-take examination, which highlights the importance of advanced training requirement for radiographic technician.

CONCLUSION

Digital Radiography resulted in increase of retake X-rays as compared to Computed Radiography shown marked increase in rejection in the field of Patient Position Error and Patient Preparation Error. These errors remained a problem for retake X-rays even in Digital Radiography and Computed Radiography indicating the need for improvement in training for X-ray technicians

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