Increasing of radiographic clinical value by using of Radio Photo Electrostatic imaging system (Xeroradiography)

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ABSTRACT

Ordinary Radiographic film sensitive emulsion is formed by crystals which are composed by millions of ions. According to the film texture, image constructive units number that interfere the image resolution are not increased more than a certain limitation in area unite. This innovation is to present an imaging system that to compare with common similar system has precedence such as highly image resolution, image edge sharpnessenhancement, contrast improvement, patient does reduction, rapid processing and cost decrease.

The "Xero" technique is different physical method for imaging procedures in which instead of using the photochemical function, electrostatic effect has been used. The latent electrostatic images develop through toner powder, Because the toner powder particles are fine grain as small as a few compound molecules, Consequently, in the new method, image constructive units number which are described as the toner powder particles are much many more in number than crystals of radiographic films. Xeroradiophotography system is designed and constructed based on xero physical phenomenon in which image can be formed by taking advantage of both, X-Ray and visible light complex procedure for the purpose of X-Rays quality and patients body tissue side effect reduction at the time of exposure. This system has already been made as the first archetype in the world that is possible for optimum improving soon.

Key words: Xeroradiography; Latent imagem; Electrostatic; Resolution; Sharpness.

INTRODUCTION

Diagnostic imaging systems are very important in medicine; therefore, relevant specialists should be obligated to improve medical imaging system efficiency by current systems defect modification to arise more accurate imaging diagnosis.

Problem explanation :

A) Image formation mechanism: radiographic films sensitive emulsion is constructed by silver halogen crystals. Any of these crystals is formed by one up to ten millions compound of silver and bromide ions with iodine[1].

B)Unilaterally contrast: Different densities on the processed image that comes from latent image in radio-chemical procedures are constituted by crystals function, where-as unexposed by lower than threshold of radiation prerequisite density effect on the film contrast; thus, radio-chemical images possess unilaterally contrast [2].

C) The radiographic image resolution: Image resolution is directly related to image forming units number per area unit. With consideration of crystal size to compare with toner fine grains, the radiographic image resolution is lower, particularly in usual radiographic images that are formed through image intensifier screens. Intensifier application for the reason of radiation protection is inevitable and intensifying sensitive screen is likewise made of crystals complex that leads multiple resolution reduction [3].

D) Equipment: The usual radiographic image making are carried out via photo chemical procedures. Photo protector stroke resistance cassette, intensifier screen, special films, film processing devices, film processing agents and other accessories. These stages particularly with regard to update technology view point are expensive and time squandering [4]. One of the methods that has been used, parallel to conventional radiography in recent years is digital radiography. In this method the X-Ray latent image is first converted to visible light, and then video signals (via specific camera) [5]. Recorded images in the memory are printed on the special thermal paper. To compare these images with usual radiographs, a fact comes out that the digital images have no preference over ordinary radiographic images in all aspects. Such as resolution, contrast, image edge sharpness and preparation expenses [6]. Comparison of two methods, the shorter processing time is the only mentionable value of digital radiography [8].

MATERIALS AND METHODS

Development of xeroradiographic image is defined as the selective deposition of imaging material onto a surface in response to electrostatic forces. Development consists of attracting small charged dust particles, called toner, to the electrostatic latent image on the selenium surface of the plate. The exposed xero radiographic plate is placed on the top of a dark box into which an aerosol of charge toner particles is sprayed through a nozzle [4]. The electric charge on the toner particle is produced by friction betweenthe toner and the wall of nozzle. The basic problem of Xeroradiography method is the requirement of high dose radiation exposure onto the patient for image making [4].

For this reason despite of its considerable benefits, the utilization of this method is confined, and seldom practicallyused. The cause of high does exposure in Xeroradiography is the lack of intensifier screen and photo image formation, actually only use of X-Rays to create images, whereas in photochemical method the role of X-Ray is about 5% to image making and 95% of image is constituted thorugh photo-image intensifier. Xeroradiophotography mechanism is similar to xeroradiography, but in this system for the patient's dose reduction, photo intensifier screen has been used; however, by the means of photo intensifier screen, the image resolution and edge sharpness are diminished. In Xeroradiophotography system a specific mechanism has been designed, despite of image making through intensifier screen, for compensation of resolution and sharpness reduction.

RESULTS

Xeroradiophotography has all Xeroradiographic positive specification. Meanwhile , the patient does is even less than conventional radiography , likewise in this system, all the image making stages are done at once (3 to 8 seconds). This system could be installed beneath the radiographic table. In 3 to 8 seconds after exposure, the whole printed images on the paper or transparent sheet come out from the system.(fig 1). The system specifications are as follow:

1- Image contrast increasing.

2- Image resolution and edge sharpness enhancement (at least one hundred times more than that of photo chemical procedure).(fig 2,3)

3- fast operating and radiographic time reducing (about 3 to 8 deconds).

4- considerable expenses decreasing (no need of film, cassette, intensifier screen, film processing, processing agent and the other accessories).(fig 4)

5- Economic frugalitybecause of less expense.

6- possibilityof Electrostatic digital technology utilization.

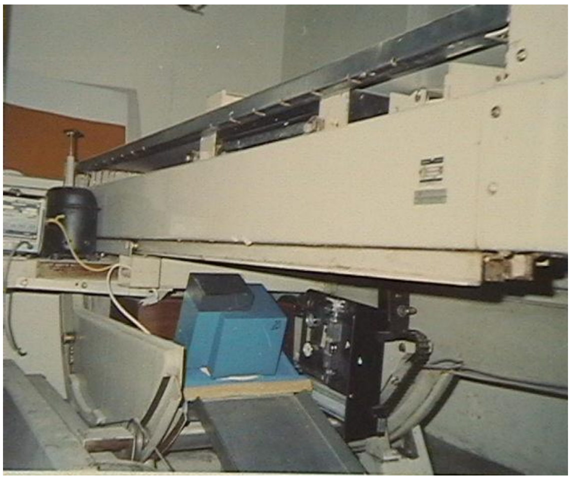

Figure 1. The first picture of Xeroradiophotographic system prototype.

DISCUSSION

Xeroradiography: is a method that production of a visible image utilizing the charged surface of photoconductor (amorphous selenium) as the detecting mediums partially dissipating the charge by exposure to X-Ray to form an electrostatic latent image and making the similar to any other non-radiographic image visible by Xerographic processing [5].

Another method that has been used, parallel to conventional radiography in recent years is digital radiography. In this method the X-Ray latent image is first converted to visible light, and then video signals (via specific camera) [6].

Figure 2. The first soft tissue image between digits has more desirable contrast to compare with usual radiography

Recorded images in the memory are printed on the special thermal paper. To compare these images with usual radiographs, a fact comes out that the digital images have no preference over ordinary radiographic images in all aspects. Such as resolution, contrast, image edge sharpness and preparation expenses [7]. Comparison of two methods, the shorter processing time is the only mentionable value of digital radiography [8].

This innovation is to present and imaging system that to compare with common similar system has precedence such as highly image resolution, image edge sharpness enhancement, contrast improvement, patient dose reduction, rapid processing and lower cost. also this method is similar digital radiography if we used of optical condenser and tuner powder for development. xeroradiophotography can to compound Xeroradiomethod with digital radiography. There for compound method have any ability both two methods together all of specific ability of Xeroradiophotography, chiefly resolution image that in digital radiography is less and patient dose is too much in Xeroradiography, mine wale in this innovation images resolution and edge sharpness is too much more than both two methods.

Figure 3. The first Xeroradiophotography of the inventor's hand has shown the better bone structure resolution and edge sharpness to compare with usual radiograph of the same hand.

Figure 4. The usual radiography of the same hand

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