Khan, F., Ahmad, K., Ahmed, A., & Haider, S. (2017). Applications of biotechnology in agriculture- Review article. *World Journal of Biology and Biotechnology, 2*(1), 139-142.
DOI: https://doi.org/10.33865/wjb.002.01.0014

(Online) ISSN2522-6754 | 2017 | (Print) ISSN 2518-6746
WORLD JOURNAL OF BIOLOGY AND BIOTECHNOLOGY
Volume: 02 | www.sciplatform.com | Issue: 01

APPLICATION OF MEDICAL IMAGES FOR DIAGNOSIS OF DISEASES- REVIEW ARTICLE

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ABSTRACT

Medical imaging provides information regarding the body part, and their tissues. Any disorder in their structure and function is detected easily and then correlates with clinical findings. This all provide the suitable treatment guidelines with less pain and convenient ways. With the passage of time as technology advances, the accuracy and efficiency in medical imaging get also advanced. Different kinds of algorithms are developed to enhance the sensitivity of medical imaging process lines.

Key word: Medical images, disease diagnosis, computer technology.

INTRODUCTION

Medical imaging provides basic knowledge in visualization of body parts, their treatment and also tracking disease. The clinical care and diagnostic of diseases are impracticable without medical imaging. They provide a enormous amount of data generated on a daily basis from various modern image technologies (https:// www.medicalradiation.com/types-of-medical-imaging/). Bioinformatics plays a key role in medical imaging technology as providing soft computing in pattern recognition. Different kinds of computer languages are used in the image formation. In medical imaging field, Machine learning is a key player. It is used to solve diagnostically challenging problems by introducing algorithms.

Beam CT Technology (CBCT) images are used in Dental diagnosis, treatment planning (Scarfe *et al.*, 2006) Cardiac Computed tomography (CT) is used in cardiac vascular and heart diseases diagnostics (Boyd and Lipton, 1983). Ultra sound imaging or sonography is often used in medicines. Similarly ultrasound techniques are used with advancement like color Doppler energy imaging (CDE). It is used for the diagnosis vascularization in female reproductive tract and fetal development stages and deformities (Guerriero *et al.*, 1999). For the soft tissues of gastrointestinal tract endoscopy methods are used. In which wireless capsule endoscopy is used for identification of colon cancer and polyps. This is painless and convenient to patients (Fujimoto *et al.*, 1995; Van Gossum *et al.*, 2009). In gastrointestinal surgery with 3D laparoscopy (Birkett *et al.*, 1994) techniques are used which considered more convenient and easier with instruments. Another important technique Magnetic Resonance imaging (MRI) is used to diagnosis the breast cancer at high risk level (Fujimoto *et al.*, 1995; Appleyard *et al.*, 2001). For optical biopsy and evaluation of coronary artery diseases, Optical Coherence Tomography technology is used (Lehman, 2006; Fritscher-Ravens *et al.*, 2009). In this review article some techniques which used in diagnosis of diseases are trying discussed.

Beam CT technologies CBCT: It is an important diagnostic tool for dental problem assessment and helpful for the selection of suitable treatment (Figure 1). In CBCT scanners are made on volume tomography and extend the 2-D digital display on available area detector combine with 3-D x-ray beam. It is rapid process it carries out in 10-70 second. It also has 98% reduce dose as compare to conventional fan scan system (Lehman *et al.*, 2007). CBCT displays maxillary images on personal computer by converted and imported into proprietary programs and software is available. This software facilitates the clinicians to provide chair side real time image display.

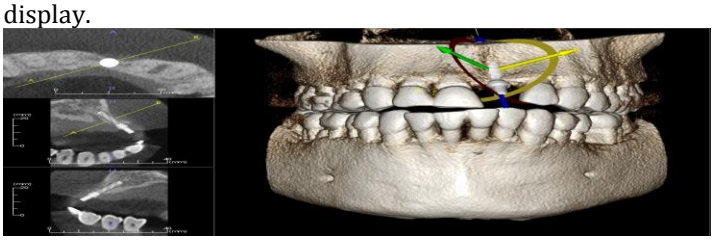

Figure 1. Beam CT technologies CBCT.

Cardiac computed tomography (CT): Cardiac vascular and heart diseases are the most demanding for advance diagnostic imaging systems (Figure 2). As cardiac diagnosis are more complex due to fast movement of the heart and cardio vascular system of heart. CT scanners provide the cross sectional imaging method which has high resolution with the range of 1-5 images per second. Now days advance CT scanners are used to visualized the major coronary arteries and imaging of normal and ischemic myocardium and also present the volume of the major cardiac chambers. The high density resolution scanners are under developing process which can produce 36-54 images in a second (Cohnen *et al.*, 2002).

Color doppler energy imaging (CDE): This is helpful in monitoring the female reproductive health (Figure 3). It provides the information about diagnosis of vascularization in the female reproductive tract by producing 3-D images. It is

useful to evaluate the vasculature and polycystic ovaries and correlate the finding in following in-vitro fertilization.

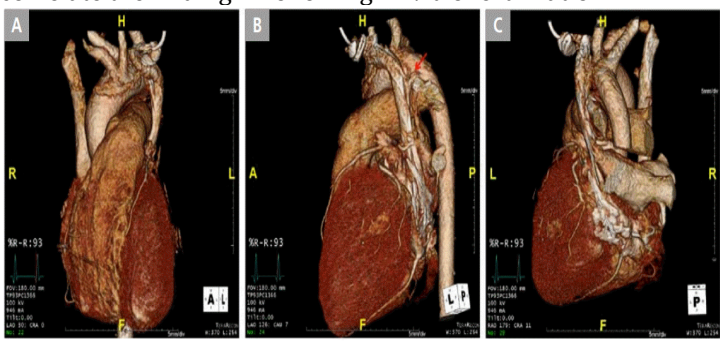

Figure 2: Cardiac computed tomography.

It provides helpful information which can differentiate ovarian masses and also in pregnancy. It can be better replace with conventional color Doppler (Liberman *et al.*, 2003).

Figure 3: Color doppler energy imaging

Wireless Capsule Diagnostic Endoscopy: Endoscope system is the combination of a light source, a light sensor with different wave lengths, signal processor, a video signal generator and a switch (Rieber *et al.*, 1997). As with the advancement of technology, wireless capsule diagnostic endoscopy is introduced (Figure 4).

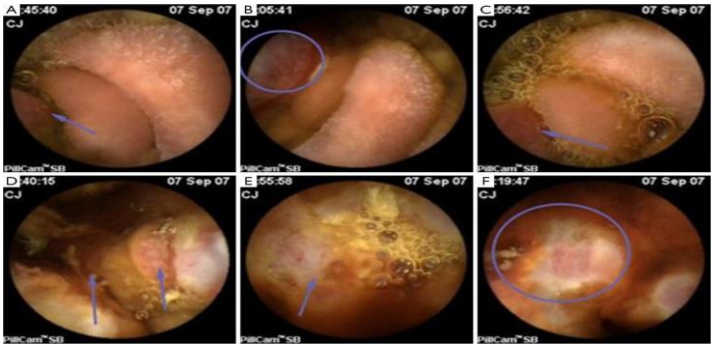

Figure 4: Wireless capsule diagnostic endoscopy.

It is more supportive to assess the patients who have bleeding with negative results on gastroscopy and colonoscopy .It is proven as simple and painless procedure in which capsule is easily swallowed. It is preferable over the conventional endoscopy. For the images production miniature camera with light source, batteries, and radio transmitters are used Wireless generates images by mean of telemetry to aerials taped to the body which permits images to be captured. The images produced by wireless endoscopy provide guidelines for future treatment of patients. Wireless capsule diagnostic endoscopy is used to assess the uncontrolled gastro-intestinal bleeding (Ozawa and Iketani, 2000). It is considered much better than colonoscopy for the diagnosis of polyps and cancer. As capsule endoscopy is safe method to detect and visualizing the colonic mucosa, without giving any kind of sedative drug (Fuster *et al.*, 1992). As patients feel inconvenient, discomfort and embarrassment during colonoscopy (Fuster *et al.*, 1992; Heron *et al.*, 2000).

Magnetic Resonance Imaging (MRI) to Evaluate Breast Cancer: In time diagnosis of breast cancer is a key for successful treatment. In 1990's the mammography played a vital role in the detection of breast cancer with clinical examination (Fig. 5). As the diagnosis obtained from mammography has some limitations and can produce false negative result (Rieber *et al.*, 1997; Liberman *et al.*, 2003). MRI imaging shows the improve results for diagnosis as compare to mammography of women at high risk with recent diagnosis of breast cancer (Lehman *et al.*, 2007). The mammography shows low sensitivity in cases of high risk. In such cases MRI as a screen tool have been published (Lehman, 2006).

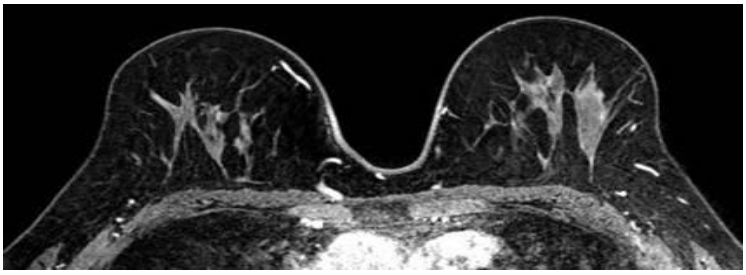

Figure: 5. Magnetic resonance imaging (MRI).

Optical Coherence Tomography (OCT) Technology: OCT mediates the function of 'optical biopsy 'without need for confiscation (Figure 6). OCT is more emergent technology for intravascular imaging as it gives high resolution which allows the imaging of high risk of plaque morphologies like image of atherosclerotic human aorta in-vitro. It provides such images which are not detected or impracticable to detect by intravascular ultrasound (Lehman, 2006) and used to evaluate the coronary artery diseases (Fritscher-Ravens *et al.*, 2009).

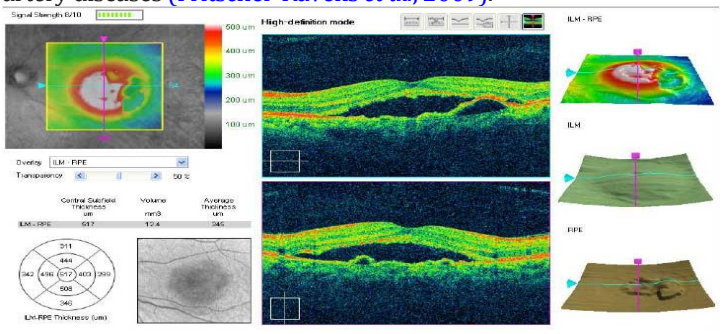

Figure 6: Optical coherence tomography (OCT).

3-D Laparoscopy in gastrointestinal surgery: The 3-D laparoscopy is comparable with 2-D laparoscopy in gastro intestinal surgery (Birkett *et al.*, 1994). It is found that relationship between these two techniques, 3-D technique is easier and instrumentation manipulation is more convenient and faster than 2-D technique (Figure 7).

Fig. 7. 3-D Laparoscopy in gastrointestinal surgery.

DISCUSSION

Medical imaging is the procedure and process of production of visual representations of the interior of a body for clinical analysis. It is helpful in visual representation of the physiology of some organs or tissues. Medical imaging provides information about internal structures hidden by the skin and bones, as well as to diagnose diseases. Research approaches in the area of instrumentation, image acquisition such as radiography, modeling and quantification are usually the preserve of biomedical engineering. Many of the techniques developed for medical imaging also have scientific and industrial applications.

A magnetic resonance imaging instrument (MRI scanner) scanner is powerful magnets to polarize and excite hydrogen nuclei of water molecules in human tissue, producing a detectable signal which is spatially encoded, resulting in images of the body. The MRI machine emits a radio frequency pulse at the resonant frequency of the hydrogen atoms on water molecules. Radio frequency antennas send the pulse to the area of the body to be examined.

Nuclear medicine uses main characteristics of isotopes and the energetic particles emitted from radioactive material to diagnose or treat various pathology as notably oncology, neurology, and cardiology. Computer processes data received from radiation detectors and computationally builds an image of the structures scanned is valuable. Imaging techniques using this method are better to conventional tomography as they can readily image both soft and hard tissues. Primarily used for breast imaging. These digital infrared imaging thermographic techniques are based on the principle that metabolic activity and vascular.

Day by day advancement in computer algorithms and software we can also advance our field of medical images and use in treatments. Now a days treatment with nano-particles are used in cancer treatment. Transplantation of vital organs is made possible and successfully done. So, bioinformatics play a vital role in the advancement of medical science and image construction.

CONCLUSION

It is concluded from above review that medical image is the blessing of computer science with association of Bioinformatics. One cannot deny the importance of disease diagnosis from pathogenic to chronic. Sometimes the clinical tests are not sufficient for disease diagnosis, then medical image are advised. As the technology is advanced the conventional image methods are replaced with modern medical image techniques. These modern medical images provide safe use, accuracy and rapidly done.

REFERENCES

Appleyard, M., A. Glukhovsky and P. Swain, 2001. Wireless-capsule diagnostic endoscopy for recurrent small-bowel bleeding. New England journal of medicine, 344(3): 232-233.

Birkett, D., L. Josephs and J. Este-McDonald, 1994. A new 3-d laparoscope in gastrointestinal surgery. Surgical endoscopy, 8(12): 1448-1451.

Boyd, D. P. and M. J. Lipton, 1983. Cardiac computed tomography. Proceedings of the IEEE, 71(3): 298-307.

Cohnen, M., J. Kemper, O. Mobes, J. Pawelzik and U. Modder, 2002. Radiation dose in dental radiology. European radiology, 12(3): 634-637.

Fritscher-Ravens, A., P. Scherbakov, P. Bufler, F. Torroni, T. Ruuska, H. Nuutinen, M. Thomson, M. Tabbers and P. Milla, 2009. The feasibility of wireless capsule endoscopy in detecting small intestinal pathology in children under the age of 8 years: A multicentre european study. Gut, 58(11): 1467-1472.

Fujimoto, J. G., M. E. Brezinski, G. J. Tearney, S. A. Boppart, B. Bouma, M. R. Hee, J. F. Southern and E. A. Swanson, 1995. Optical biopsy and imaging using optical coherence tomography. Nature medicine, 1(9): 970-972.

Fuster, V., L. Badimon, J. J. Badimon and J. H. Chesebro, 1992. The pathogenesis of coronary artery disease and the acute coronary syndromes. New England journal of medicine, 326(4): 242-250.

Guerriero, S., S. Ajossa, M. P. Lai, A. Risalvato, A. M. Paoletti and G. B. Melis, 1999. Clinical applications of colour doppler energy imaging in the female reproductive tract and pregnancy. Human reproduction update, 5(5): 515-529.

Heron, D. E., L. T. Komarnicky, T. Hyslop, G. F. Schwartz and C. M. Mansfield, 2000. Bilateral breast carcinoma. Cancer, 88(12): 2739-2750.

Lehman, C. D., 2006. Role of mri in screening women at high risk for breast cancer. Journal of Magnetic resonance imaging, 24(5): 964-970.

Lehman, C. D., C. Gatsonis, C. K. Kuhl, R. E. Hendrick, E. D. Pisano, L. Hanna, S. Peacock, S. F. Smazal, D. D. Maki and T. B. Julian, 2007. Mri evaluation of the contralateral breast

in women with recently diagnosed breast cancer. New England journal of medicine, 356(13): 1295-1303.
Liberman, L., E. A. Morris, C. M. Kim, J. B. Kaplan, A. F. Abramson, J. H. Menell, K. J. Van Zee and D. D. Dershaw, 2003. Mr imaging findings in the contralateral breast of women with recently diagnosed breast cancer. American journal of roentgenology, 180(2): 333-341.
Ozawa, R. and K. Iketani, 2000. Electronic endoscope system. Google Patents.
Rieber, A., E. Merkle, W. Böhm, H.-J. Brambs and R. Tomczak, 1997. Mri of histologically confirmed mammary carcinoma: Clinical relevance of diagnostic procedures for detection of multifocal or contralateral secondary carcinoma. Journal of computer assisted tomography, 21(5): 773-779.
Scarfe, W. C., A. G. Farman and P. Sukovic, 2006. Clinical applications of cone-beam computed tomography in dental practice. Journal-Canadian Dental Association, 72(1): 75.
Van Gossum, A., M. Munoz-Navas, I. Fernandez-Urien, C. Carretero, G. Gay, M. Delvaux, M. G. Lapalus, T. Ponchon, H. Neuhaus and M. Philipper, 2009. Capsule endoscopy versus colonoscopy for the detection of polyps and cancer. New England journal of medicine, 361(3): 264-270.

Date Published (D-M-Y): 15-4-2017