OPEN ACCESS Freely available online

Journal of Biomedical Engineering and Medical Devices

ISSN: 2475-7586

Short Communication

Medical Imaging: Its Recent Advances and Modalities in Modern Healthcare

Liy Shetty*

Department of Medicine, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA

DESCRIPTION

Medical imaging has long been an indispensable tool in the field of healthcare, enabling physicians to gain insights into the inner workings of the human body without invasive procedures. Over the past few decades, significant advancements in technology have transformed medical imaging, leading to improved diagnostic accuracy, better patient outcomes, and enhanced research capabilities. This article delves into the world of medical imaging, highlighting its various modalities, recent advancements, and the impact it has on modern healthcare [1].

Medical imaging modalities

Medical imaging encompasses a range of techniques that allow healthcare professionals to visualize internal structures and functions of the body.

X-ray imaging: X-rays were the first form of medical imaging and remain widely used. They are particularly effective at visualizing bones and identifying fractures or abnormalities in the skeletal system.

Computed tomography: Computed Tomography (CT) scans combine X-ray technology with advanced computing to create detailed cross-sectional images of the body. They are especially valuable for diagnosing conditions in soft tissues and organs [2].

Magnetic resonance imaging: Magnetic Resonance Imaging (MRI) employs strong magnetic fields and radio waves to generate detailed images of the body's internal structures. This modality is often preferred for imaging the brain, spinal cord, and musculoskeletal system.

Ultrasound: Ultrasound imaging uses high-frequency sound waves to create real-time images of organs and tissues. It is commonly used for monitoring pregnancies and evaluating abdominal and cardiac conditions.

Nuclear medicine: This modality involves introducing small amounts of radioactive materials into the body and capturing the emitted radiation to create images of functional processes within organs. Positron Emission Tomography (PET) and Single Photon Emission Computed Tomography (SPECT) are common techniques in nuclear medicine [3].

Recent technological advancements

Advances in medical imaging technology have revolutionized the field and led to improved diagnostic capabilities and patient care.

3D and 4D imaging: Traditional two-dimensional images are now augmented by three-dimensional and even four-dimensional (adding the dimension of time) images, offering a more comprehensive view of anatomical structures and allowing for better preoperative planning.

Functional imaging: Modern medical imaging doesn't just focus on anatomy; it also delves into the functional aspects of the body. Functional MRI (fMRI) can map brain activity, while PET scans can highlight metabolic processes, aiding in early disease detection.

Minimally invasive procedures: Imaging guidance has revolutionized minimally invasive procedures, such as interventional radiology and image-guided surgeries. These procedures reduce the need for open surgeries, leading to shorter hospital stays and quicker recovery times.

Point of care imaging: Portable and handheld imaging devices have made it possible to perform imaging at the patient's bedside, in remote locations, or in emergency situations. This has proved invaluable in critical care and resource-limited settings [4].

Impact on healthcare

The impact of medical imaging on healthcare cannot be overstated. It has brought about numerous benefits

Early detection and diagnosis: Medical imaging allows for the detection of diseases and conditions at their earliest stages, enabling prompt intervention and improved outcomes. For instance, mammograms have been pivotal in detecting breast cancer before it reaches an advanced stage.

Correspondence to: Liy Shetty, Department of Medicine, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA, E-mail: jay_shetty@mgh.hardvard.edu

Received: 29-Aug-2023, Manuscript No. BEMD-23-26182; **Editor assigned:** 01-Sep-2023, PreQC No. BEMD-23-26182 (PQ); **Reviewed:** 15-Sep-2023, QC No. BEMD-23-26182; **Revised:** 22-Sep-2023, Manuscript No. BEMD-23-26182 (R); **Published:** 29-Sep-2023, DOI: 10.35248/2475-7586.23.8.271

Citation: Shetty L (2023) Medical Imaging: Its Recent Advances and Modalities in Modern Healthcare. J Biomed Eng Med Devices. 8:271.

Personalized treatment: With detailed imaging data, physicians can tailor treatment plans to the individual patient. This leads to more precise surgeries, treatments, and therapies, reducing the risk of complications.

Research and education: Medical imaging contributes to medical research by providing insights into disease progression, treatment effectiveness, and underlying mechanisms. It also serves as a valuable educational tool for training healthcare professionals.

Reduced need for invasive procedures: Medical imaging has minimized the need for exploratory surgeries, which were once common for diagnosing internal issues. This has led to shorter hospital stays, lower healthcare costs, and reduced patient discomfort.

CONCLUSION

In the future, one can expect further integration of AI and machine learning for more automated and precise diagnoses. Additionally, advancements in molecular imaging could enable us to visualize cellular and molecular processes, leading to even earlier disease detection and targeted therapies. Medical imaging has evolved from its humble beginnings to become a cornerstone of modern healthcare. It has transformed diagnostics, treatment planning, and research, making healthcare more patient-centered, efficient, and effective. As technology continues to advance, the potential for medical imaging to push the boundaries of what is possible in medicine is truly exciting, promising even more breakthroughs in the years to come.

REFERENCES

1. Mahapatra D, Bozorgtabar B, Garnavi R. Image super-resolution using progressive generative adversarial networks for medical image analysis. Comput Med Imaging Graph. 2019;71:30-39.
2. Jiang M, Zhi M, Wei L, Yang X, Zhang J, Li Y, et al. FA-GAN: Fused attentive generative adversarial networks for MRI image super-resolution. Comput Med Imaging Graph. 2021;92:101969.
3. Burduja M, Ionescu RT, Verga N. Accurate and efficient intracranial hemorrhage detection and subtype classification in 3D CT scans with convolutional and long short-term memory neural networks. Sensors. 2020;20(19):5611.
4. Li S, Zhang G, Luo Z, Liu J, Zeng Z, Zhang S. From general to specific: Online updating for blind super-resolution. Pattern Recognit. 2022;127:108613.