Since 2004 For free Circulation

ISRRT INTERNATIONAL SOCIETY OF RADIOGRAPHERS & RADIOLOGICAL TECHNOLOGISTS

Radiographers' Journal

The official magazine of Society of Indian Radiographers (SIR)
Published by Radiographers' Association of Maharashtra (RAM)

February, 2023

Mobile:
+91 93220 35920

Email:
shankar.bhagat@gmail.com

Website:
www.radiographers.org

Editorial

Dear Radiographer Friends,

I am extremely happy with your response and admiration on our first issue of e-journal, and I sincerely assure you that our team will try to keep up to your expectations in this issue and subsequent ones.

Dear Friends, Let me Congratulate you all for our 22nd Foundation Day (24th February) of Radiographers' Association of Maharashtra (RAM).

The foundation was laid on the theme of 'Preserve - Protect & Promote'. The leaders of our Association worked on this Theme since then with many fruitful results. We feel proud of Them and expect the same from the upcoming leadership of our Association.

I am happy to release this second issue of our e-journal on this auspicious occasion of our Foundation Day. Kindly go through it and convey your suggestions promptly so that corrections if any will be made in coming issues, also please share your experience and help in fostering friendship amongst the professionals.

Please be kind enough to forward this issue to other Radiographers too.

With warm regards

Shankar Bhagat
Editor In-Chief

RAM Foundation Day
24th February

Patient Care in Radiology Department

Aruna Chatterjee, Radiographer, (Retired), Meherbai Tata Memorial Hospital, Jamshedpur.

A hospital is a medical institution which provides treatment and cure of disease. The people who visit hospitals are old, young, wealthy as well as poor. For quick and easy categorisation, certain identifiers are used for record maintenance and for further investigation in other departments. One such investigation is carried out in the Radiology Department where imaging procedures are performed.

Patient care is a very important aspect of the Radiology department.

·First and foremost, one should be a good listener and observant too.

- One should also practice self-restraint while speaking to the patient and their family.
- Watch his gait; an abnormal style of walking points to some malfunctioning of a system in the body.
- Make them feel comfortable; most people are apprehensive and shy as they are unfamiliar with the hospital environment.
- Since patients are apprehensive, it is difficult for them to understand and follow instructions.
- Some patients may be aggressive. In such situations the Radiographer must speak calmly, show tolerance and understanding.
- Some patients will be having physical as well as mental trauma. Encourage the person to feel relaxed.
- Remember to make eye contact while speaking to the patient. You bestow trust and confidence in him.
- Children should be given more time. If they warm up to you, you have their confidence.

Identity:- Before any procedure like special investigation, CT simulation and MRI, the identity of the patient must be re-checked and confirmed.

- Addressing a patient by his/her name makes them feel important and valued.
- Waiting:- The waiting area should have a magazine and newspaper stand suitable for all ages.
- A colourful display of indoor plants and flower arrangements in corridors and waiting area can have a calming effect on the patient’s peace of mind.
- Separate waiting area should be provided for serious patients on trolley/wheel chair; for children a sort of play area would be good.
- Undressing:- A clean gown should be provided to each patient.
- Comfort:- A patient must never be allowed to descend from the table without someone being at hand to provide support.
- A wheel-chair must always be steadied when a patient is getting into or out of it.
- Consent forms:- These are usually signed by adult patients or their parent or guardian.

The hospital premises, with its clean hygienic environment, silence and discipline can be quite intimidating to the strongest of minds. But, a smiling face and a quiet, comforting tone soon puts them at ease.

While listening to them one should make it a point to include the family or anyone else who accompanies the patient. During interaction with patients always make eye contact and give them your undivided attention.

Some of them may be suffering from physical or even mental trauma. One needs to be a patient listener and gently guide them to provide the necessary details.

If the patient is a child, extra efforts should be made to win the child’s confidence and he/she should be given more time.

It requires excellent communication skills to deal with people of all ages and backgrounds.

Patient Care in Radiology is as important as the imaging procedures or the work performance of the medical staff.

Be a Good Reader

Got the issue of the magazine, downloaded it, read it and deleted it. Only this does not prove you a good reader. You can agree with or add to the content published in the magazine, so in such cases please write us your comment or feedback. Similarly, debate openly on the issues rose in the magazine and the questions raised and send it to us in writing. With this act of yours, where other readers will be benefited; we will also get guidance in various forms. So, whenever the time demands, do not forget to pick up the pen.

And one more thing, we have conveyed this issue to you, as an enlightened Radiographer, now it is your responsibility to forward this issue to other Radiographers.

Thanks in advance,
Editor

Is Radiation Barrier Gives 99.9% Protection?

Pradnya Jadhav, Radiographer, ESIC Hospital, Pune, Maharashtra.

For the first three decades of medical imaging's existence (1897 to the 1930s), there was no standardized differentiation between the roles that we now differentiate as radiological technologist (a technologist in an allied health profession who obtains the images) versus radiologist (a physician who interprets them).

Radiography origins and fluoroscopy origins can both be traced to 8 November 1895, when German physics professor Wilhelm Röntgen discovered the X-ray.

X-rays were put to diagnostic use very early; for example, Alan Archibald Campbell-Swinton opened a radiographic laboratory in the United Kingdom in 1896, before the dangers of ionizing radiation were discovered. Epidemiological studies indicate that Radiographers employed before 1950 are at increased risk of leukemia and skin cancer, most likely due to the lack of use of radiation monitoring and shielding.The relationship between radiation and cancer was found to correlate with women who were in the menopausal stages of their lives. In today's workplace, radiation exposure is monitored very closely and cancer cases in technologists has been found to have decreased tremendously due to the current prevention methods.

For instance: A single chest x-ray exposes the patient to about 0.1 mSv. This is about the same amount of radiation people are exposed to naturally over the course of about 10 days. Fundamental to radiation protection is the avoidance or reduction of dose using the simple protective measures of time, distance and shielding.

To measure personal dose uptake in occupational or emergency exposure, for external radiation personal dosimeters are used,and for internal dose to due to ingestion of radioactive contamination, bioassay techniques are applied.

Radiation Shielding: A Key Radiation Protection Principle
Lead acts as a barrier to reduce a ray's effect by blocking or bouncing particles through a barrier material. When X-ray photons interact with matter, the quantity is reduced from the original x-ray beam.Time, distance, and shielding are the three basic concepts of radiation protection that apply to all types of ionizing radiation. Shielding simply means having something that will absorb radiation between the source of the radiation and the area to be protected. Radiation shielding is based on the principle of attenuation, which is the gradual loss in intensity of any energy through a medium.

Imaging procedures performed in remote locations, such as operating rooms, cardiac catheterization labs, and special procedure rooms pose an added challenge to protect against radiation exposure. Lead barriers are excellent for imaging procedures using ionizing radiation such as fluoroscopy, x-ray, mammography and CT. The use of shielding provides a barrier between you and the source of the radiation.Mobile lead shields of at least 0.25 mm lead equivalency are recommended to be used by anyone working near the table during fluoroscopy procedures when possible.Lead garments, lead gloves, thyroid shields, leaded glasses, lead drapes, as well as mobile and stationary lead barriers between the patient and personnel all reduce exposure to scatter radiation.Primary radiation barriers protect from primary x-ray beam exposure.

These include the doors, lead lined walls, and floors. Secondary radiation barriers are those that protect against scattered radiation (secondary). These include lead aprons, gloves, thyroid shields, and lead vinyl strips.The greater the distance from the source of radiation, the less the intensity of the dose.

Concrete, water, special plastic shields, air stops, and lead are all barriers that stop different types of rays and particles, reducing the overall dose a person receives. In medical environments, the most common shielding materials used include lead, lead-free shielding, and lead composites.Lead is very effective at shielding gamma radiation. Because of the density of lead, its high atomic number, and stable isotopes, lead is ideal for stopping gamma and x-ray radiation.

Is X-ray radiation harmful to humans?
Ans- When X-ray radiation is absorbed within our bodies, it can damage molecular structures and potentially cause harm. Very high doses of radiation cause damage to human cells, as evidenced by skin burns, loss of hair, and increased incidence of cancer.

What is a protection barrier for radiation?
Ans- Shielding: Barriers of lead, concrete, or water provide protection from penetrating gamma rays. Gamma rays can pass completely through the human body; as they pass through, they can cause damage to tissue and DNA.

What is the best radiation shielding?
Ans- Lead has long been considered "the element of choice" for radiation shielding due to its attenuating properties. Lead is a corrosion-resistive and malleable metal.

Justification, optimization, and adherence to dose limits can significantly decrease exposure when followed. Following the ALARA principle, health care workers should confirm that the benefits of the exposure outweigh the risks and strive to decrease radiation exposure as far below the dose limits as practical.

Concluding Statement
The most important goals of regulation of radiation medicine are to assure the safety of patients, workers, and the public and to ensure that the benefits of regulating ionizing radiation will outweigh the risk


SEQUOIA HEALTHCARE
Diagnostic Imaging - REACH for All
Radiology Equipment Accessibility for Cost Effective Healthcare
Clarity 1.5T MRI scanner
16 Ch MRI scanner with MUSIC 66 X 16 and all applications.
Inspiration 64
Smart Large bore 64-slice CT Scanner
MRI High - Pressure - Injector
DSA High - Pressure Injector
SPECT Gamma Camera
Cloud Magnet Ferro Detector
Digital Tomosynthesis Mammography System
Mammo - Navigator
Contrast Media Injector
Sequoia Healthcare Pvt. Ltd. Plot No.27, Survey No.125, KIADB Industrial Area, Chikkaballapur - 562101, Karnataka
+91 84319 20843
sales@sqhpl.com
www.sqhpl.com
Building No.1, District No.7, URANUS Avenue, AMTZ Campus, Near Pragati Maidan, VM Steel Projects, S.O Visakhapatnam - 530031

22nd National Conference of Society of Indian Radiographers 10-12, 2023 at Marinha Duorado Resort, Goa.

Inauguration of Conference by Chief Guest S A Wajid and SIR Office bearers

Inauguration of Radiographers Journal

Inauguration of book Hystero Salpingography written by Nisar Shaikh

Delegates

Organizing team

Felicitation of newly installed SIR President Shri Vilas Bhadane

Organizing team

The Cultural Event

Newly Installed SIR Team

The Cultural Event


BLUENEEM®
BLUENEEM® UROLOGY
YOUR FELT NEEDS PARTNER
BLUENEEM® INTERVENTIONAL SYSTEMS
YOUR INNOVATION PARTNER
BLUENEEM PEDIATRIX
OUR KIDS DESERVE THE BEST
CLINICIANS' TRUSTED PARTNER
EXPLORE COMPLETE PRODUCT RANGE
LEADER IN DESIGN, DEVELOPMENT AND END-TO-END MANUFACTURING OF MINIMALLY INVASIVE MEDICAL DEVICES
OPTIXCORE
BIOPSY GUN - FULLY AUTOMATIC
CYTOCORE
BIOPSY GUN - SEMI AUTOMATIC
TRACER™
HYDROPHILIC GUIDEWIRE
+91 80 2976 1335/36
+91 97399 72854, 97399 72855
contact@blueneem.com
marketing@blueneem.com
CE 0123

COVID-19: Radiographers must need to know?

Ramesh Sharma, Rtd. Chief Technical Officer , NCI-AIIMS, New Delhi.

The aim is to review current literature related to the Radiography / management, and Working With COVID Patients, with New Norms,

As radiographers work on the frontline, they should be aware of the potential risks associated with Covid-19 and engage in optimal strategies to reduce these. Their role in vetting, conducting and often reporting the imaging examinations is vital, as well as their contribution in patient safety and care. Medical Imaging should be limited to critically ill patients, and where it may have an impact on the patient management plan.

Radiography practice has to significantly adjust to these new requirements to support optimal and safe imaging practices for the diagnosis of Covid-19. The adoption of low dose CT, rigorous infection control protocols and optimal use of personal protective equipment may reduce the potential risks of radiation exposure and infection, respectively, within Radiology departments.

Medical imaging plays an important role in supporting clinical decision making in the diagnosis, management and treatment of Covid-19 patients. Medical imaging may be useful for differential diagnosis between Covid-19 and other viral respiratory illnesses with similar symptoms. Chest radiographs, chest CT, lung ultrasound, as well as MRI are included in the arsenal of medical imaging, each one with advantages and limitations.

Chest radiographs:(CXR) are the most widely used imaging modality for suspected and confirmed Covid-19 cases. Mobile radiographs are being used with increasing frequency to avoid possible transmission during patient transfer to imaging departments, as well as the traditional role in imaging critically unwell patients.

Chest Computed Tomography: (chest CT) has a limited but important role in clinical management of Covid-19 patients. CT should be reserved for seriously ill patients, with emerging awareness of high prevalence of pulmonary thrombosis. In addition, it can be used in the case of inconclusive chest radiographs or unavailability of PCR tests. In the case of follow-up imaging where CT is required for clinical decision making, low-dose chest CT may be considered, as it can offer up to an 8-fold dose reduction.

Technical considerations for Covid-19 imaging :CXR imaging of suspected or confirmed Covid-19 cases should be performed with portable equipment within specifically designated isolated rooms for eliminating the risks of cross-infection within the Radiology department. An anteroposterior (AP) chest radiograph is performed on the patient's bed, despite known limitations of this technique, such as sub-optimal evaluation of the cardiothoracic ratio. In contrast, when CXR is performed within Radiology, a posteroanterior (PA) standard technique must be used, as indicated. Due to known risks of cross-infection, extreme care must be taken in relation to the optimal use of personal protective equipment (PPE) and decontamination of surfaces. Suboptimal image quality may occur due to rotation, incorrect exposure and reduced inspiration. It is therefore always important for the radiographer to check that all the technical and image quality criteria are fulfilled for every examination, where possible, and that neither patients' nor radiographers’ safety is compromised. A plethora of guidelines on radiographic imaging considerations during the Covid-19 pandemic. Regarding chest CT imaging, a standard unenhanced CT protocol and multidetector (MDCT) CT scanners can be used; the examination is carried out during the end-inspiration phase, when patients can follow breathing instructions. Reconstruction to 1.25 mm slice thickness and multi-planar reconstruction is suggested. In case of clinical indications of pulmonary embolism and elevated D-dimers levels, a contrast-enhanced CT should be performed. Low dose CT should be used in paediatric and pregnant patients, to minimise radiation.

Safety for patients and staff

Infection control :Optimal infection control procedures must take place within the Radiology department, to minimise the potential risks of transmission of the virus to radiographers and other healthcare staff. Decontamination of the imaging equipment is vital, and it has been widely discussed within the literature. A recent study within Radiology departments suggested that imaging equipment such as CT scanner components must be disinfected every time after contamination with 2,000 mg/L chlorine-containing disinfectant and the CT gantry must be fully wiped with 75% ethanol. Also, after decontamination the CT room must be closed for 1 h for ventilation and air circulation. CSTR disinfection ultrasound probes. Radiology departments are encouraged to contact their vendors in order to specify the optimal disinfectants for every piece of equipment. In addition, all healthcare staff associated with cleaning, must be trained in optimal decontamination strategies, and Radiology managers must develop specific infection control protocols to enhance safety within the departments.

Personal protective equipment (PPE): is vital for radiographers and other frontline healthcare professionals, as they can help minimise the likelihood of infection. A shortage of PPE has been reported globally given the high demand. A typical set of PPE for healthcare professionals consists of a long-sleeved gown, gloves, eye protection and a fluid repellent surgical mask or disposable respirator (N95, FFP2 or FFP3). This is the full PPE suggested by the European Centre Prevention and Control It suggests the use of aprons instead of a gown for non-aerosol generating procedures In addition, the sessional use of PPE, or reuse have been also recommended in case of extreme shortages, while the use of double gloves is not suggested.

Key Lessons for Radiographers During COVID-19 : Some key lessons learned and some strategies that will remain post-pandemic. These new norms show how radiographers have pivoted to accommodate change. The impact of the COVID-19 pandemic on radiographers has been unprecedented. The threat of COVID-19 has underscored the importance that radiographers be nimble.

New Norms : As vaccination rates increase and the pandemic, hopefully, begins to abate, there are no plans to return to the pre-pandemic status quo, the team said. Many of these changes will linger as new norms. As the medical imaging profession moves forward, some of these new norms will remain intact as they have brought value to the current clinical practice. These may be lessons to learn for maintained advantages after COVID-19.

Facility management: Including radiographers in the design of future X-ray facilities. For example, at AIIMS Hospital, radiographers explored conducting chest X-rays through a glass panel in ward settings – a strategy that proved technically feasible and that saved PPE use.In hindsight, one would reflect that the medical imaging profession should play a contributory role in the design of our future wards.”

Mental health: Radiographer mental wellness is not a new concern, but the pandemic did offer a stark reminder of the need to recognize the warning signs of psychological distress. Efforts, such as COVID-19 care packs that can be sent to a radiographer’s home, can be integral in helping staff feel supported and encouraged, the team said. Additionally, folding a daily check-in into the daily roll call also provides an opportunity for radiographers to share their concerns or raise any issues.

References:

1.Nyashanu M., Pfende F., Ekpenyong M. Exploring the challenges faced by frontline workers in health and social care amid the COVID-19 pandemic: experiences of frontline workers in the English Midlands region, UK. J Interprof Care. 2020;34(5):655–661. PubMed/Google Scholar

2. Akudjedu T.N., Mishio N.A., Elshami W., Culp M.P., Lawal O., Botwe B.O., et al. The global impact of the COVID-19 pandemic on clinical radiography practice: a systematic literature review and recommendations for future services planning. Radiography. 2021;27(4):1219–1226.PubMed /Google Scholar.

3. Cowling C. A global overview of the changing roles of radiographers. Radiography. 2008;14:e28–e32. Google Scholar.

4. Yielder J., Davis M. Where radiographers fear to tread: resistance and apathy in radiography practice. Radiography. 2009;15(4):345–350.Google Scholar.

RADIATION PROTECTION

Shish Milan, Radiotherapy Technologist, State Cancer Institute,
Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India

INTRODUCTION: The medical use of ionizing radiations, whether for diagnosis or therapy, not only results in the irradiation of the patient but may also result in some degree of exposure of radiation therapist, radiographers, other workers of the department. Protection is “Reactive” while “safety” is proactive and indicating positive gain. The protection of people and the environment from the harmful effects of ionizing radiation, includes both particle radiation and high energy electromagnetic radiation.

OBJECTIVE OF RADIATION PROTECTION: To prevent clinically significant radiation-induced deterministic effects by adhering to dose limits that are below the apparent or practical threshold. To limit the risk of stochastic effects (cancer and hereditary effects) to a reasonable level in relation to societal needs, values, and benefits gained.

BIOLOGICAL EFFECTS OF RADIATION

Deterministic effect / non-Stochastic effect Example: - Organ Atrophy, fibrosis
Stochastic effect Example: - Cancer

THREE PRINCIPLE OF RADIATION PROTECTION:

JUSTIFICATION: Any decision that alters the radiation exposure situation should do more good than harm.
OPTIMIZATION: The likelihood of incurring exposure, the number of people exposed, and the magnitude of their individual doses should all be kept as low as reasonably achievable, taking into account economic and societal factor.
DOSE LIMITATION: The total dose to any individual from regulated sources in planned exposure. situations other than medical exposure and patients should not exceed the appropriate limits specified by the Commission.

ALARA "As Low As Reasonably Achievable": It is the basic principle of Radiation protection procedures. We know that lower doses carry lower risk, and this concept helps to maintain cost effective safety. Use every reasonable effort to minimize dose. It help to prevent unnecessary exposure as well as overexposure. Radiation Therapy as a profession is very safe. If the ALARA rules are followed. Three major principles to assist ALARA are TIME, DISTANCE & SHIELDING.

TIME: Lesser the time of operation, lesser will be the radiation dose received. The exposure time must be kept to minimum possible to ensure minimum dose, Therefore the radiation source must be on for minimum time.

DISTANCE: Larger the distance lesser will be the radiation dose, keep as far away as possible from the radiation source.Double the distance from the source; dose rate falls to ¼ the original value.Half the distance from the source; dose rate increase to 4 times the original value.

Shielding: Larger the shielding thickness, lower the exposure rate hence make use as much shielding as possible.Shielding reduced exposure rate.

RADIATION PROTECTION INSTRUMENTS:

IONIZATION CHAMBER: Measures x-ray or gamma radiation generally - can be equipped to measure beta. Measures intensity from 1mR/hr. to several thousand R/hr.Most commonly used to measure patients receiving brachytherapy or diagnostic isotopes.

PROPORTIONAL COUNTER: Generally used in laboratories to measure beta or alpha radiation. Can discriminate between these particles. Operator must hold the counter close to the object being surveyed to obtain accurate reading.

GEIGER-MULLER DETECTOR: Generally used for nuclear medicine facilities.Unit is sensitive enough to detect individual particles. Can be used to locate a lost radioactive source. Has an audible sound system.Alerts to presence of radiation. Meter readings are generally displayed in mR/hr.

GAMMA AREA MONITOR: Primarily meant to serve as a Gamma Zone Monitor to indicate dose rates and alarm status (visual and audible), once the dose rates exceed the present level fixed by the user.

PERSONNEL MONITORING: The purpose of monitoring and exposure assessment is to gather and provide information on the actual exposure of workers and to confirm good working practices contributing to reassurance and motivation.

AIM OF PERSONNEL MONITORING

- Monitor and control the individual dose.
- Report and investigate over exposure and recommend necessary remedial measure, if needed.
- Maintain life time cumulative dose.
- Radiation oncologists, Medical physicist, Radiation Safety officers, Radiotherapy technologists, source handlers, maintenance staff and any nursing or other staff who must spend time with patients who contain radioactive sources are the ones who need personal monitoring.
- Monitoring includes not just measuring and determining the equivalent dose; It includes interpretation and assessment.

TYPES OF PERSONNEL DOSIMETERS:

FILM BADGE: It is used to measure the individual dose from X- Rays, B-Particle, Gamma – Radiation, Thermal Neutrons. Consist of Stainless Steel holder, Photographic film & Filters fixed in particular window. Film size of 4 X 3 cm wrapped inside by a light polythene or paper cover. There are two films in the badge one is slow and another is fast. Supply of film is for a period of one month (4 weeks).

POCKET DOSIMETER: Film Badge and TLD will not show accumulated exposure immediately. It is small and Portable.It gives instant exposure or dose rate and total dose. It can track dose received from day to day activities.

THERMO LUMINESCENT DOSIMETER (TLD): Looks like a film badge. Contains a lithium fluoride crystal. Responds to radiation similarly to skin. Measured by a TLD analyzer. Crystal will luminescence if exposed to radiation, then heated. More accurate than a film badge.

OPTICALLY STIMULATED LUMINESCENT (OSL): OSL dosimeters are currently the most common type of personnel dosimeter used in the United States. The basic principle of operation is similar to that of the TLD. However, green laser light, rather than heat(as in TLD), is used to stimulate release of the stored energy.

COCNCLUSION: Radiation Protection is essential as no exposure to radiation can be quantified as safe.Effective dose equivalent limits for occupational and general population have been recommended by the regulatory board of that country i.e. AERB.The values quoted for radiation workers are such that the hazards that the doses represent to health is small compared with ordinary hazards of life.Use Personnel monitoring devices.Follow the basic principle of radiation safety.

Radiographers' Journal invites concerned articles.

Publication should be in MS word format.

Mail your articles on shankar.bhagat@gmail.com

AI in Radiography

Saleem Batcha, DRDT, RSO, Chief Radiographer, (Ret.) Tamilnadu.

Artificial intelligence in radiography:
Artificial intelligence (AI) involves using computers to do things that traditionally require human intelligence. AI can process large amounts of data in ways that humans cannot. The goal for AI is to be able to do things like recognize patterns, make decisions, and judge like humans.

Now is the time for us to learn. what does the future hold.

What is AI in radiography?
AI methods excel at automatically recognizing complex patterns in imaging data and providing quantitative, rather than qualitative, assessments of radiographic characteristics.

What is an example of artificial intelligence in radiology?
By tracking retinal movements, AI in radiology has the potential to diagnose Alzheimer's, Parkinson's, and amyotrophic lateral sclerosis as examples of neurodegenerative disorders (ALS). Speech analytics is another method for detecting neurological abnormalities because Alzheimer's alters patients' language patterns.

Why is AI used in radiology?
According to experts, the benefits of AI for radiology are numerous. "It can reduce workload by doing tedious tasks like segmenting structures. That can then enable more quantitative imaging, which most believe will improve the 'product' of radiology," Erickson says.

What are the different types of artificial intelligence in radiology?
Machine learning (ML) and deep learning (DL) are subsets of AI. Machine learning implies training algorithms to solve tasks independently using pattern recognition. For example, researchers can apply ML algorithms to radiology by training them to recognize pneumonia in lung scans.

What is the future of AI in radiology?

It is highly likely that in the future, the creative work of radiologists will be necessary to solve challenging problems and to oversee diagnostic procedures. AI will absolutely become part of their routine in diagnosing basic cases and helping to assist with repetitive jobs

What are the types of artificial intelligence?

According to the current system of classification, there are four primary AI types: reactive, limited memory, theory of mind, and self-aware.

3 Types of Artificial Intelligence
Artificial Narrow Intelligence (ANI)
Artificial General Intelligence (AGI)
Artificial Super Intelligence (ASI)

What is the latest technology in radiology?

Virtual and augmented reality (VR and AR) technology is being adopted in radiology. On the patient side, 3D medical imaging from the patient is being used for patient education about their disease or procedure.

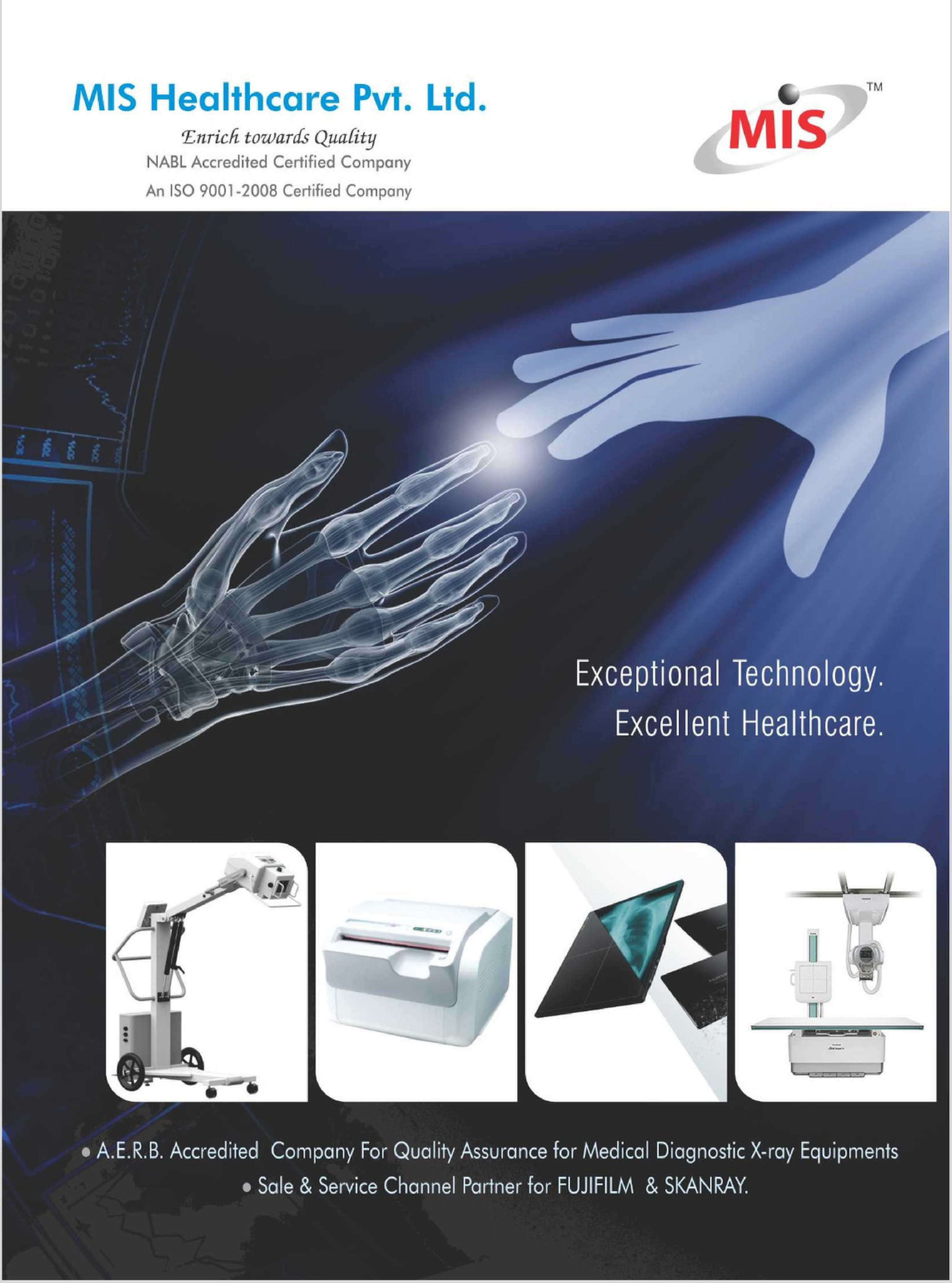
What are the advantages of artificial intelligence?

Advantages of Artificial Intelligence
- Reduction in Human Error.
- Zero Risks.
- 24x7 Availability.
- Digital Assistance.
- New Inventions.
- Unbiased Decisions.
- Perform Repetitive Jobs.

Congratulaions

Vilas Bhadane
President, SIR

Jagdish Jagtap
Secretary General, SIR


MIS Healthcare Pvt. Ltd.
Enrich towards Quality
NABL Accredited Certified Company
An ISO 9001-2008 Certified Company
MIS™
Exceptional Technology.
Excellent Healthcare.
• A.E.R.B. Accredited Company For Quality Assurance for Medical Diagnostic X-ray Equipments
• Sale & Service Channel Partner for FUJIFILM & SKANRAY.

Activities of SIR Tamilnadu & Pondicherry Chapter

SIR Tamil Nādu and Pondicherry chapter was formed in the 2008 under the able-guidance of Mr.K.Munirathinam with 50 members. We have conducted huge membership campaigns in various platforms and able to add up 700 more life members in the past 3 years now it is grown up with nearly 1300 members.

SIR TN & PY has been playing a Pivotal role in the academics of Radiology Technology students by holding One-day CME and Two-days of State conference every year with its last State Conference being held at Solai resort, Trichy with 600 participants being benefitted. It was a wonderful conference in all aspects in the history of SIR TN PY.

To update the knowledge and encourage the students community, SIR TN & PY conducts regular academic activities and issues best scientific paper awards in the name of Prof. Panneerselvam, Mr. MG Pandeyan and Mr. K. Munirathinam along with Certificates and Cash prizes for Quiz events .

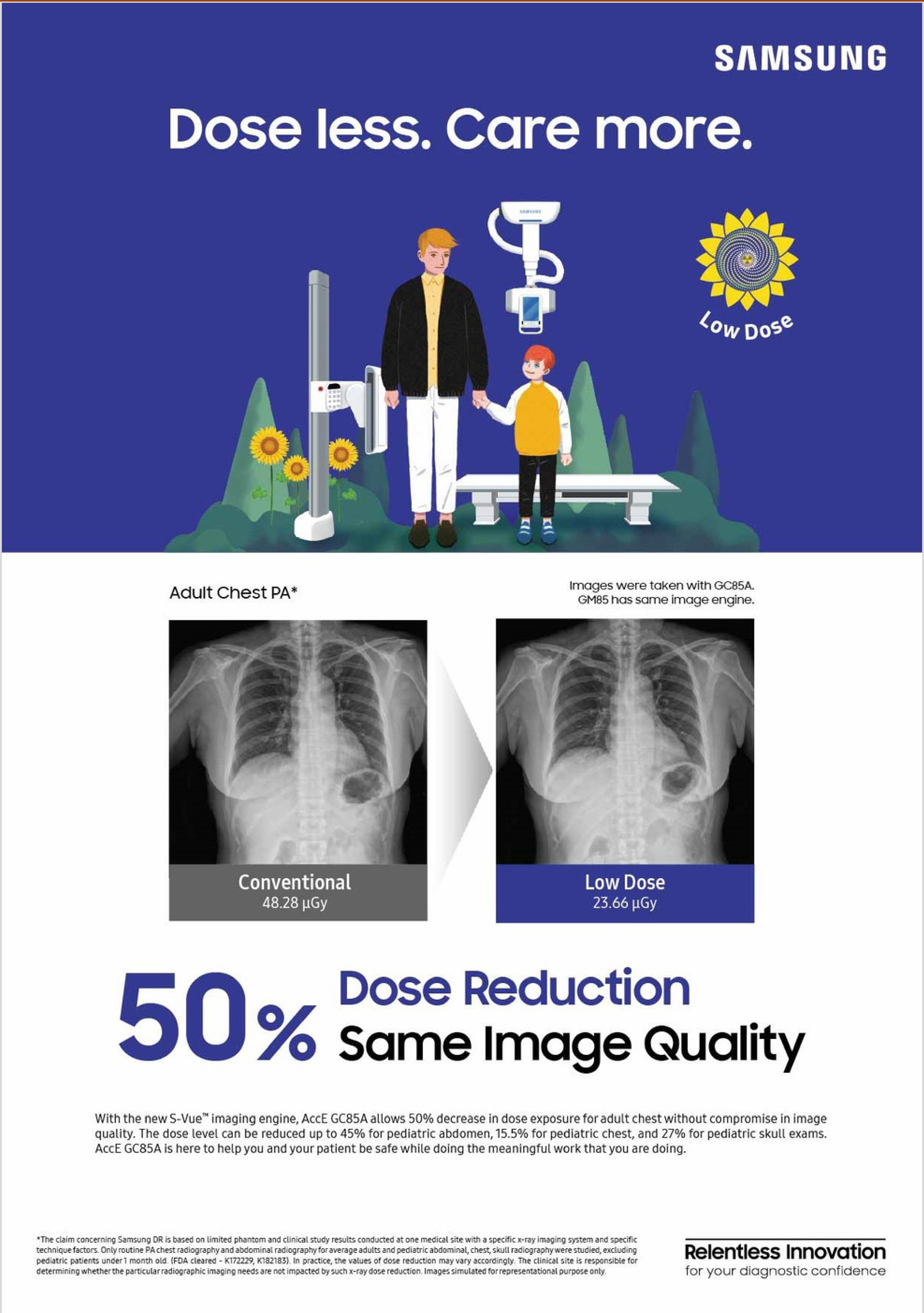
We have represented the Platinum Jubilee celebration of Indian Radiological and Imaging Association (IRIA) Tamilnadu and Puducherry chapter on 18th December 2022, held at the Leela Palace, Chennai. On behalf of SIR TN PY chapter Mr. C. Marimuthu, General secretary took part in the panel discussion along with eminent Radiologists and Physicist and made an appeal to have a separate session for technologist in the IRIA events since we have the ability to inspire, engage, educate and entertain masses of students and budding technologist. Mr.K.Munirathinam, Co -Chairman of SIR, Mr. Kesavalu and Mr. K. P. Udayakumar , Advisory committee members from SIR TNPY chapter were honoured by the IRIA in this occasion for their valuable contribution to the society.

SIR TN PY office bearers are honoured in the Platinum Jubilee celebration of Indian Radiological and Imaging Association (IRIA) Tamil Nādu and Puducherry chapter

SIR TN & PY and In-Med Prognostics Pvt. Ltd jointly organized CME on Volumetric analysis of brain on 03-04-2022 at Hotel Vestin Park, Chennai.

5th State Conference of SIR TN & PY on 23RD and 24TH of July 2022 was held at Solai Resorts, Trichy with 600 participants. Radiography book titled "Short and simple Guide to Radiography and imaging technology"authored by Mr. C. Marimuthu, General Secretary, SIR TN PY and 2nd edition of book titled "Special Contrast Procedures" authored by Mr. Tamijselvan, Vice President SIR TN PY were released on this occasion and both the books were distributed free of cost to the students attended this conference, it was sponsored by the SIR TN&PY.

SIR TN & PY and Vinayaka Mission University jointly organized National Conference in the view of International Day of Radiology 2022 with 700 participants on 10-12-2022 at Salem. This is the 2nd program in collaboration with Vinayaka Mission University, Salem.


SAMSUNG
Dose less. Care more.
Low Dose
Adult Chest PA*
Images were taken with GC85A.
GM85 has same image engine.
Conventional
48.28 µGy
Low Dose
23.66 µGy
50% Dose Reduction
Same Image Quality
With the new S-Vue™ imaging engine, AccE GC85A allows 50% decrease in dose exposure for adult chest without compromise in image quality. The dose level can be reduced up to 45% for pediatric abdomen, 15.5% for pediatric chest, and 27% for pediatric skull exams. AccE GC85A is here to help you and your patient be safe while doing the meaningful work that you are doing.
*The claim concerning Samsung DR is based on limited phantom and clinical study results conducted at one medical site with a specific x-ray imaging system and specific technique factors. Only routine PA chest radiography and abdominal radiography for average adults and pediatric abdominal, chest, skull radiography were studied, excluding pediatric patients under 1 month old. (FDA cleared - K172229, K182183). In practice, the values of dose reduction may vary accordingly. The clinical site is responsible for determining whether the particular radiographic imaging needs are not impacted by such x-ray dose reduction. Images simulated for representational purpose only.
Relentless Innovation
for your diagnostic confidence

Black Bone Imaging –a Partial Flip Angle Technique in Acute Head Trauma

Mamta Panda, PG Student, M.Sc. Medical Imaging Technology (MSMIT),Bapubhai Desaibhai Patel Institute of Paramedical Sciences, Charotar University of Sci. and Technology, Email: mpanda483@gmail.com

Motivation for Black Bone Imaging MRI

CT is the modality of choice for examination and scrutiny of pediatric skull fractures and brain haemorrhages in acute head trauma evaluation, however, particular attention must be paid to potential cancer risks from associated ionizing radiation, in particular for young patients who are comparatively more radiosensitive than adults.

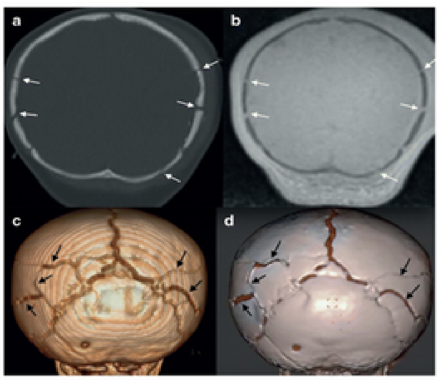


Figure 1: A 9-month-old patient with several skull fractures on CT head (a), and black BB MRI (b) and the corresponding 3D scan (c, d).

Radiation doses are in the range typically seen with CT scans with adult scan parameters not adjusted for children.Furthermore, the hazardous effect of ionizing radiation on children is well-publicized, and the need for safeguarding against radiation exposure remains a source of concern making radiation protection paramount.

Paediatric CT has a much higher lifetime radiation risk than adult CT, so efforts should be made to limit its practice, in addition,highlight the necessity of alternative neuroimaging techniques such as neurological MRI.

A limitation of the CT scan is the lack of sufficient demonstration of soft tissue. MRI is the answer for the imaging of soft tissues and the black bone sequence (a 3D low flip angle gradient echo) is a modified one, low flip angle gradient MRI sequence has paved the way for gain in bone specificity,providing high image contrast between bone and other tissues, as a result, ease clinical interpretation.

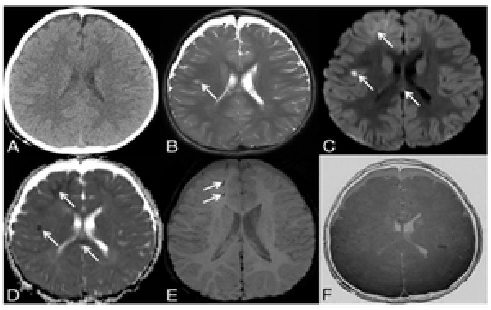


Figure 2: CT axial image is not able diagnose brain haemorrhage (A) whereas MRI images are able to evaluate cerebral haemorrhage (B), (C), (D), (E) and BB inverted image (F)

Acute Head Trauma Imaging by Black Bone MRI

Black bone MR imaging can be a viable alternative to head CT in the initial evaluation of pediatric neuroradiology with head trauma and can be considered a primary neuroimaging screening technique.

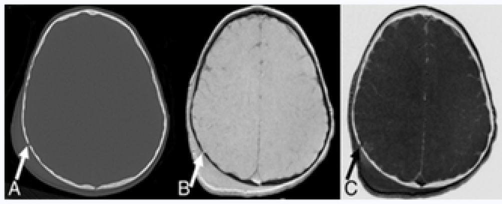


Figure 3: CT scan (B) MR Image with Black bone sequence (C) Inverted BB image

MR Neuroimaging offers higher sensitivity and specificity in diagnosing cerebral hemorrhage compared with CT although it is a nonionizing technology with excellent contrast resolution.

Despite this, CT highpoints the need for MR imaging for acute care and long-term evaluation of children with brain injury.The radiation-free method further supports the use of brain MR imaging as the initial neuroradiological technique for an acute head injury in the pediatric population.

Key Features

When referring to MRI scans, the term Black Bone (BB) imaging involves the utilization of short echo time (TE) and short repetition time (TR), and a low flip angle (5- degrees). With such parameters, Cortical bone appears as a low-intensity (black hypointense) structure, whereas fat and water signal are suppressed to achieve uniform soft-tissue contrast. Furthermore, Scan time is reduced as a result of the short TEs and TRs, and volume acquisition. An adult skull typically takes 4 minutes for a BB scan.Initially Implemented for craniofacial imaging, BB-MRI has Figure 4: An 18-month-old female with multiple skull fracture (a) Head CT axial (b) axial black bone MRI

been further broadened to image the spine and long bone.

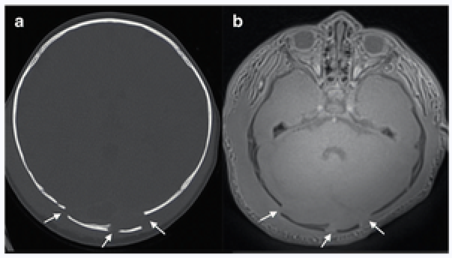


Figure 4: An 18-month-old female with multiple skull fracture (a) Head CT axial (b) axial black bone MRI

Conclusions

The frequency of pediatric CT procedures has continued to increase,with growing concerns about radiation protection. Although Lifetime radiation risks for children are not negligible, efforts should be made toward the implementation of non-ionizing neurological techniques.

Scanning Parameters

Parameter	**Value**
TR	8.6 ms
TE	4.2 ms
Slice thickness	2.4 ms
Slice spacing	-1.2mm
Scan FOV	24cm
Phase encode	256
Frequency encodes	256
Receive bandwidth	31.25
ZIP	2512

FOV, field of view; TE, echo time; TR, repetition time; ZIP, zero-fill interpolation

Neurological MR complemented by a BB sequence is a considerable nonionizing alternative to CT head for the examination of craniofacial skeletons. However, accuracy in the detection of linear fractures and fractures of an aerated bone in young children remains limited.

References

1. M.H.G. Dremmen, M.W. Wagner, T.Bosemani et al. Does the Addition of a “Black Bone” Sequence to a Fast Multisequence Trauma MR Protocol Allow MRI to Replace CT after Traumatic Brain injury in Children? AJNR Am J Neuroradiol.Nov2017.38:2187-92
2. Kuusela, L., Hukki, A., Brandstack, N. et al. Use of black-bone MRI in the diagnosis of the patients with posterior plagiocephaly. Childs NervSyst 34, Springer .1383–1389 (2018). https://doi.org/10.1007/s00381-018-3783-0.

Use of Gold Nanoparticles as a new Contrast Media in CT Scan

Himani Kheary, Intern in Radiation & Imaging Technology, NIMS University, Jaipur, Rajasthan

This article is going to give us the new conceptual idea about now we canal so use Gold Nanoparticles as a new contrast media in CT scan because till now we had studied about various crucial uses of an iodinated contrast media in CT but as we know that everything contains some kind of draw backs in its nature of use because nothing can be 100% perfect foe any kind of use. Till now we mostly used an iodinated contrast media which can be divided into 2 forms such as

Ionic Iodinated Contrast Media

Diatrizoate (Gastrografin)
Meglumine iotroxate (Biliscopin)
Iothalate (Conray)

Non-Ionic Iodinated Contrast Media

Iodixanol (Visipaque)
Iohexol (Omnipaque)
Iopromide (Ultravist)

Iodinated Contrast Media proved useful in the better diagnosis of pathology inside the human body due to its ability to distinguish between different tissues on the basis of X-ray attenuation which depends upon two types of interactions between photon and matter which are Compton scattering and photo electric absorption. Both these interactions depends upon physical density, but also depends upon atomic number of the matter. As iodine (53) has a high atomic number compared to most tissue in the body and the administration of iodinated material produces images contrast due to differential photoelectronic absorption but along with the benefits, Iodinated contrast media contents some drawbacks in its nature of use such as renal toxicity and speedy clearance by means of the kidney, which provides short imaging times after administration hampered their clinical application.

CT contrast agents based on nano particle like polyethylene glycolcoated gold nanoparticles have been designed to beat their disadvantage and to produce even higher properties.

It is also noticed that a successful imaging agent must change image signal in order to improve image contrast have little toxicity and high uptake in the target tissue and also a prolonged bloodstream circulation time.

Now a days gold nanoparticles can be used as contrast agents in the CT due to their unique properties which an advance contrast agent should carry like biocompatibility with the biological tissues in the main property of gold nanoparticles which defines that it is not being toxic, injuries and physiologically reactive and also should not cause immunological rejection when it is administered inside the human body.

Another property is the high atomic number and density of gold nanoparticles compared to those of iodine compounds which proved its possibility to use gold nanoparticles as a contrast agent in CT Scan Imaging.

Material and Methods of Gold nanoparticles

Sixty milligram Chloroauric Acid (HAucl4) should be dissolved in 20 ml of deionised water and stirred for 15 minutes at 90 0C. After that, the solution temperature should be fixed and 60 mg of polyethylene glycol, 50 mg of oelic acid, 50 mg of oleyoelimine And 100 mg of sodium citrate were added to the stirred solution.

After that, the resulting solution should be stirred for 2 min to cool at room temperature.

Imaging Protocol:-

The gold nanoparticles contrast agent is imaged using a 16 Slice (Siemens) CT scanner. The vials containing gold nanoparticles agent sample with some concentration should be placed in the imaging phantom. Phantom containing gold nanoparticles should be in the concentration of 0.7 mm with a tube voltage of 80, 110, and 130kev and the following tube converts 50, 80, 110, 140, 170, and 200mA, using a helical brain protocol after that the image reconstructed using the standard protocol.

Conclusion:- CT is one of the most important sources Of ionizing radiation in medical applications and the main aim of the CT along with the diagnosis of the pathology is radiation protection, Which is totally based on the principle of ALARA which states that radiation exposure should be left as low as reasonably achievable and also that the optimal quality of diagnostic image must be obtained at the lowest possible radiation dose.

The whole procedure conclude that batter contrast enhancement should be provided using gold nano particles compared basic iodinated contrast media.

Diffusion-Weighted Imaging and its advancements

Santosh Ojha, Assistant Professor, Dept. of Medical Imaging Technology, Bapubhai Desaibhai Patel Institute of Paramedical Sciences, Charotar University of Sci. and Technology, Email: santdastan@gmail.com

Diffusion is the random thermal movement of molecules across the membranes. By tracking the motion of the water molecules in a tissue, the mapping of the tissue can be done using the Magnetic resonance phenomenon. The movement of the molecules can be directional or random in all directions.

The diffusion weighting imaging (DWI) technique maps the motion of water molecules at the micro-level, allowing the differentiation of normal and abnormal tissues. DWI considers that water molecules can freely diffuse in any direction i.e., Isotropic diffusion. Since the water diffusion is restricted in abnormal tissues, DWI is widely used in the diagnosis of acute ischemic stroke, brain injury, and inflammations resulting in a reduced apparent diffusion coefficient thus appearing bright in tracer images and darker in ADC maps [Figure 1]. Also, DWI can be used to differentiate malignant from benign lesions, and tumors from edema and infarction since these lesions possess different ADC values.

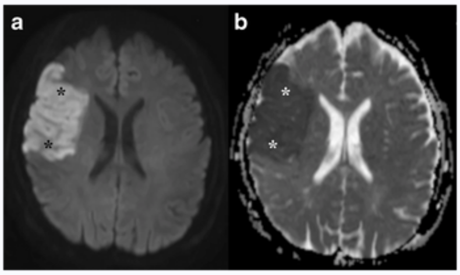


Figure 1: Acute Stroke –a. Increased signal intensity on DWI which corresponds the area of low ADC valuein tracer image and b.darker in ADC map.

However, due to the presence of structures such as cell membranes, all the tissues are characterized by anisotropic diffusion. Diffusion Tensor Imaging (DTI) was developed to describe this anisotropic diffusion. Earlier to measure the anisotropic diffusion, the orientation of the axons in a tissue sample has to be known.DTI is an imaging technique in MRI that can be used to depict the orientational features of the diffusion process of water molecules. It allows the investigation of the complicated anatomy of fiber tracts in the human brain by estimating the limited diffusion of water molecules in tissues and generating neural tract pictures.

Diffusion tensor imaging generates multiple parameters like apparent diffusion coefficient (ADC) and fractional anisotropy (FA), which can be used to study the pathological as well as the normal-appearing areas of the brain. This technique is rapidly becoming a standard for the radiological assessment of white matter disorders, as it can reveal abnormalities in white matter fiber structure and provide models of brain connectivity. The application of DTI includes the study of a variety of Congenital neurological defects such as schizophrenia, Alzheimer's disease, autism as well as conditions such as multiple sclerosis, and traumatic brain injury. However, the limitation of the Tensor imaging lies in its inability to demonstrate the diffusion in the crossing of the fiber tracts.

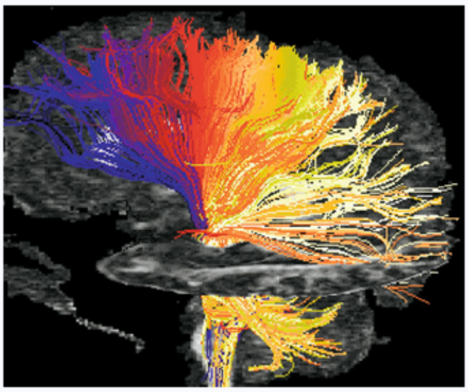


Figure 2: Tractography image of corona radiata

Another application of DWI is Diffusion kurtosis imaging (DKI), an advanced neuroimaging technique that is an extension of diffusion tensor imaging (DTI) by estimating the kurtosis (skewed distribution) of water diffusion based on a probability distribution function. Diffusion kurtosis imaging (DKI) is a dimensionless measure of the deviation of a water diffusion profile from a Gaussian distribution that can be used to estimate excess kurtosis. The evaluation of non-Gaussian diffusion in the brain is a new and promising diffusion technique that can be performed in a clinically feasible time frame, giving us an advantage over the DTI technique. Adding imaging parameters to a traditional diffusion technique, including a minimum of 15 directions and an additional b value, allows measurement of kurtosis as a complement to the traditional DTI dataset. Kurtosis imaging allows for the evaluation of isotropic structures such as the cortex and basal ganglia, which is a major drawback of DTI. DKI can also improve the evaluation of the geometry of crossing fibers for optimizing white matter fiber tracking.

DKI and DTI are compared for their efficacy in detecting neural tissue alterations & which demonstrates that DKI offers a more comprehensive approach than DTI in describing the complex water diffusion process. DKI provides independent and complementary information to that acquired with traditional Diffusion sequences. The additional information is thought to indicate the complexity of the microstructural environment of the damaged tissue and lead to broad-reaching application in all aspects of neuroradiology. The major clinical applications of DKI include the detection of Ischemic tissue characterization and Infarction, Neurodegenerative Disease, Demyelinating Diseases by Fiber Tracking, and early Stroke assessment and detection.

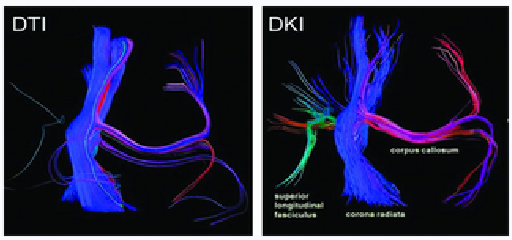


Figure 3: Figure Illustrating the difference in sensitivity of DTI & DKI fiber tracking – better demonstration of crossing fibers in DKI(Image courtesy Paydar A et.al)

References:
1. Baliyan V, Das CJ, Sharma R, Gupta AK. Diffusion-weighted imaging: technique and applications. World journal of radiology. 2016 Sep 28;8(9):785.
2. Drake-Pérez M, Boto J, Fitsiori A, Lovblad K, Vargas MI. Clinical applications of diffusion weighted imaging in neuroradiology. Insights into imaging. 2018 Aug;9(4):535-47.
3. Arab A, Wojna-Pelczar A, Khairnar A, Szabó N, Ruda-Kucerova J. Principles of diffusion kurtosis imaging and its role in early diagnosis of neurodegenerative disorders. Brain research bulletin. 2018 May 1;139:91-8.
4. Alexander AL, Lee JE, Lazar M, Field AS. Diffusion tensor imaging of the brain. Neurotherapeutics. 2007 Jul 1;4(3):316-29.
5. Le Bihan D, Mangin JF, Poupon C, Clark CA, Pappata S, Molko N, Chabriat H. Diffusion tensor imaging: concepts and applications. Journal of Magnetic Resonance Imaging: An Official Journal of the International Society for Magnetic Resonance in Medicine. 2001 Apr;13(4):534-46.
6. Mori S. Introduction to diffusion tensor imaging. Elsevier; 2007 May 17.
7. Steven AJ, Zhuo J, Melhem ER. Diffusion kurtosis imaging: an emerging technique for evaluating the microstructural environment of the brain. American journal of roentgenology. 2014 Jan;202(1):W26-33.
8. Lu H, Jensen JH, Ramani A, Helpern JA. Three-dimensional characterization of non-gaussian water diffusion in humans using diffusion kurtosis imaging. NMR in Biomedicine: An International Journal Devoted to the Development and Application of Magnetic Resonance In vivo. 2006 Apr;19(2):236-47.
9. Paydar A, Fieremans E, Nwankwo JI, Lazar M, Sheth HD, Adisetiyo V, Helpern JA, Jensen JH, Milla SS. Diffusional kurtosis imaging of the developing brain. American Journal of Neuroradiology. 2014 Apr 1;35(4):808-14.

Arterial spin labeling (ASL) MR perfusion

Suman Rai, Ranchi Cancer Hospital and Research Center, Ranchi, Jharkhand

Arterial spin labeling (ASL) MR perfusion is an MR perfusion technique which does not require intravenous administration of contrast (unlike DSC perfusion and DCE perfusion). Instead, it exploits the ability of MRI to magnetically label arterial blood below the imaging slab. The parameter most commonly derived is cerebral blood flow (CBF).

It is a non-invasive and non-ionizing MRI technique that measures tissue perfusion (blood flow), by using magnetically-labeled arterial blood water protons as an endogenous tracer.

Advantages over other perfusion technique

- ASL is a very suitable technique to use in pediatrics, in which the use of radioactive tracers may be restricted.
- It is also safe to use in patients with impaired renal function and those who may need serial follow-up.

Types of ASL : A number of techniques have been described to achieve ASL perfusion, classified based on the magnetic labeling :

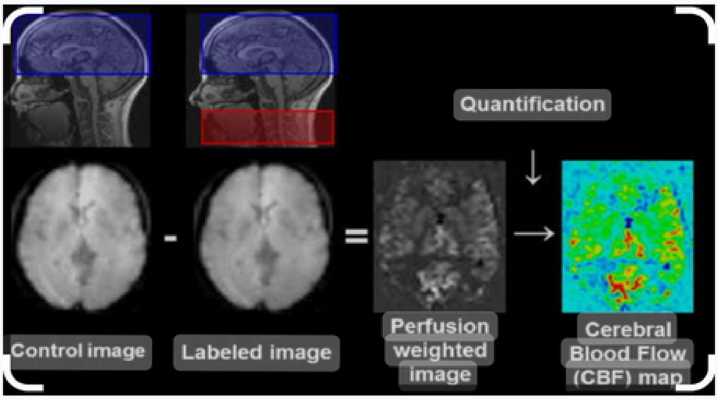
1. pulsed (PASL)
2. continuous (CASL)
3. pseudo continuous (PCASL)
4. velocity-selective ASL (VS-ASL)

Basic principles

The main idea in ASL is to obtain a labeled image or tagged image and a control image, in which the static tissue signals are identical but the magnetization of the inflowing blood is different. The water molecules in the arterial blood are magnetically labeled (tagged) by using a radiofrequency pulse that saturates water protons. Subtraction between labeled (tagged) and control images eliminate the static signals and the remaining signals are linear measures to the perfusion, which is proportionate to the cerebral blood flow (CBF).

ASL signal-to-noise ratio is very low, because the signals from the tagged blood is only 0.5 – 1.5% of the entire tissue signals. Echo planar imaging (EPI) is used for ASL acquisition because of its high signal to noise ratio. EPI can lead to distortions in regions of high magnetic field. Three-dimensional sequences have been recently introduced to ASL acquisition to increase the SNR and provide less image distortion.

ASL data must be acquired before gadolinium administration since gadolinium will cause T1 shortening leading to a decrease in the measurable signals in both the labelled and controlled images.



आप भी अपना पाठक धर्म निभाएँ

पत्रिका का अंक मिला, डाउन लोड किया, पढा और डिलीट कर दिया. केवल इससे पाठक धर्म नहीं निभ जाता. पत्रिका में प्रकाशित सामग्री से आप सहमत हो सकते हैं या उसमें आप कुछ और जोड़ सकते हैं, तो ऐसे मामलों में अपनी टिप्पणी अथवा प्रतिक्रिया हमें अवश्य लिख भेंजे. इसी प्रकार पत्रिका में जो मुद्दे उठाए गए हों, जो प्रश्न खड़े किए गए हों, उन पर भी खुल कर बहस करें और हमें लिख भेंजे. तात्पर्य यह है कि आप केवल पाठक ही न बने रहें, पाठक धर्म भी साथ में निभाते रहें इससे जहां अन्य पाठक बंधु लाभान्वित होंगे वहीं हमें भी विभिन्न रूपों से मार्गदर्शन मिलेगा. हाँ तो, जब भी समय की मांग हो, कलम उठाना न भूलें.

और एक बात, ये अंक हमने आप तक पहुंचाया, एक प्रबुद्ध रेडियोग्राफर के नाते अब ये आप की ज़िम्मेदारी बनती है कि इस अंक को आप भी और रडीओग्राफेर्स तक पहुंचाए यानि फॉरवर्ड करें.

अग्रिम धन्यवाद.
संपादक

CYBERKNIFE

Poola Nagaraj, Chief Radiographer, SCCL Area Hospital, Ramagundam, Telangana

Cyberknife is a robotic radio surgery system. that is the only whole body robotic radio surgery system in the world designed to treat tumors anywhere in the body including brain, spine, lung, liver, pancreas and prostate etc..

1.compact linear accelerator – this compact x band 6 mv linear accelerator emits pencil shaped beam that con be precisely delivered from any directions giving the advantages of superior co formality when treating patient.

2. Robotic manipulator- the compact linear accelerator is mounted on the robot which is capable of delivering repeatable accuracy of 0.2mm.

3. X-ray source and imaging detectors-low energy x-ray source generate two perpendicular, oblique x-ray images which are detected by the image detector in real time and the positional changes are made accordingly. This images are generated through the treatment and corrections are made by sending to the robotic manipulation.

4. Robotic treatment couch- The robotic treatment couch automatically and accurately aligns the patients in one simple step thus significantly reducing the patient set up time.

5. Different tracking systems- cyberknife is equipped different types of tracking systems which enable us to deliver the sub-millimeter accuracy. The system includes 6D SKULL TRACKING. SYNCHRONY RESPIRATORY TRACKING X-sight spine tracking lung optimizing treatment in tempo adoptive imaging systems.

ADVANTAGES OF CYBERKNIFE

- Shorter duration of treatment.
- Delivers treatment with sub-millimeter accuracy.
- Treat extracranial and intracranial lesions.
- Enable treatment of lesions previously determined too difficult to treat.

Letter from Reader

I went through the first e- Journal for Radiographers. It has been presented in a very good way.

1. Robotic Automation x rays is an excellent innovation. It will be helpful in the case of infected patients, but if it will be used on a regular basis, then job opportunities will be lesser.

2. Breast tomosynthesis was a new topic and informative.

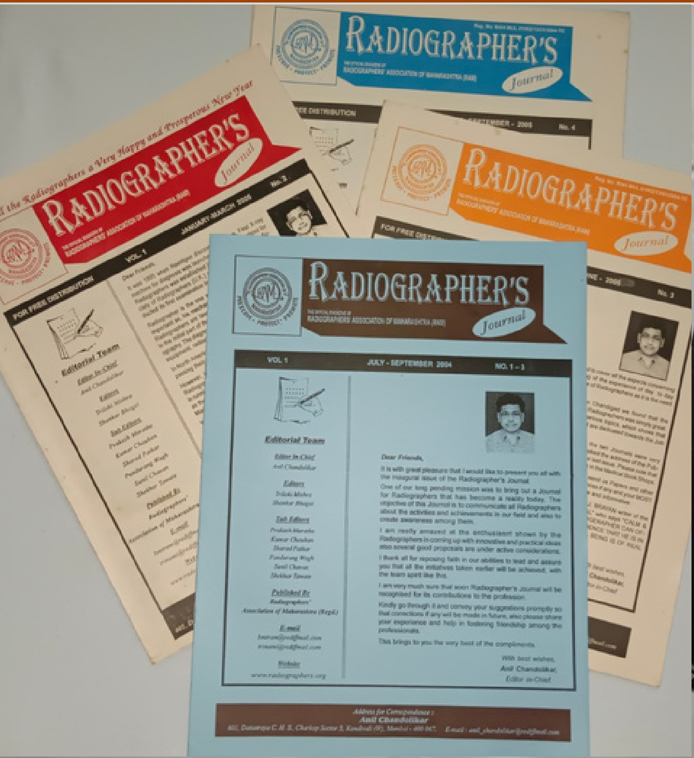
3. The impact of Covid on the Radiographer students was a good article.

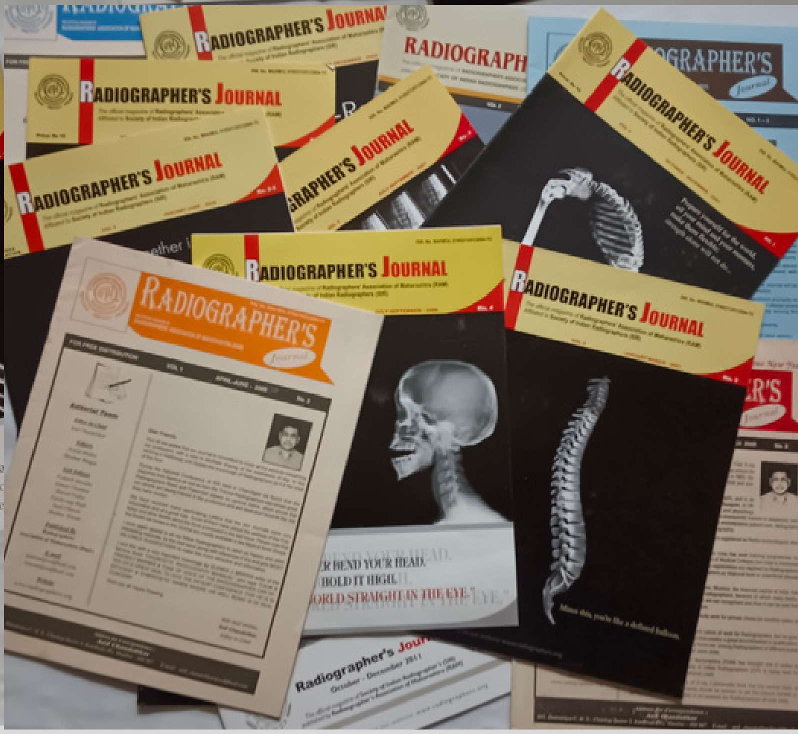
4. The basics of radiation have been rightly included in the first e Journal.

I liked the journal and congratulate you and the entire team for their efforts in bringing this journal.

Thank you,

Regards,
Aruna Chatterjee,
Radiographer, (Retired)
Meherbai Tata Memorial Hospital
Jamshedpur





Advertising in Radiographers' Journal

Advertise your business or market your product on "Radiographers' Journal" - monthly ebulletin.

Radiographers' Journal is circulated electronically to thousands of Radiographers across the globe and posted on Social media platforms.

Monthly Tariff for Advertisement

- Full page - Rs. 3000/-
- Half page - Rs. 1500/-
- Quarter page. - Rs. 1000/-

For **yearly subscription of advertisement 50% discount in above charges**

To book your advertisement call on **+91 9322035920**