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Implementation of NABH in Radiology Department

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Introduction: National Accreditation Board for Hospitals and Healthcare Providers (NABH) is a quality assurance program that ensures healthcare facilities meet national and international quality standards. NABH provides guidelines for healthcare facilities to establish and maintain quality standards. This paper presentation will discuss how to implement NABH in a radiology department, the benefits of implementing NABH, and the challenges faced during implementation.

Implementation of NABH in Radiology Department: The implementation of NABH in a radiology department involves the following steps:

Preparation: The first step in implementing NABH is to prepare for the process. This involves identifying the quality indicators that are relevant to the radiology department and developing a plan to meet these indicators.

Self-Assessment: The next step is to conduct a self-assessment of the radiology department to determine its current level of compliance with NABH standards. This involves assessing the quality of services provided, the infrastructure and equipment available, and the qualifications and training of staff.

Gap Analysis: After the self-assessment, a gap analysis is conducted to identify areas of improvement in the radiology department. This involves comparing the current level of compliance with the desired level of compliance.

Development of Quality Improvement Plan: Based on the results of the gap analysis, a quality improvement plan is developed to address the areas of improvement identified.

Implementation of Quality Improvement Plan: The quality improvement plan is implemented in the radiology department. This involves training staff, upgrading infrastructure and equipment, and establishing quality assurance processes.

Evaluation: After the implementation of the quality improvement plan, an evaluation is conducted to determine the effectiveness of the plan in improving compliance with NABH standards.

Benefits of Implementing NABH in Radiology Department: The implementation of NABH in a radiology department offers numerous benefits. These include:

Improved Quality of Care:
NABH ensures that healthcare services provided by the radiology department meet quality standards, leading to improved patient outcomes.

Increased Efficiency:
Implementation of NABH processes and procedures optimizes resources, leading to increased efficiency and reduced waiting times.

Enhanced Patient Experience:
NABH ensures that patients receive prompt and quality services, leading to a better patient experience.

Improved Staff Morale:
Implementation of NABH processes and procedures provides staff with clear guidelines and expectations, leading to improved staff morale.

Challenges Faced During Implementation: The implementation of NABH in a radiology department is not without its challenges. These challenges include:

Resistance to Change: Staff may be resistant to changes in processes and procedures, leading to a slower implementation process.

Lack of Resources:
The implementation of NABH may require additional resources, including infrastructure, equipment, and training.

Time-Consuming: The implementation of NABH is a time-consuming process that requires significant effort and resources.

Conclusion: In conclusion, the implementation of NABH in a radiology department requires preparation, self-assessment, gap analysis, development of a quality improvement plan, implementation of the plan, and evaluation. The benefits of implementing NABH in a radiology department include improved quality of care, increased efficiency, enhanced patient experience, and improved staff morale. The challenges faced during implementation include resistance to change, lack of resources, and time-consuming process. By implementing NABH, a radiology department can provide consistent and high-quality healthcare services, leading to improved patient outcomes.

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Environmental Impact of Radiography

Assessing the Environmental Implications of Radiography Practices

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Abstract: Radiography is a widely utilized diagnostic imaging technique that plays a critical role in modern healthcare. However, the significant growth in radiography practices has raised concerns about its environmental impact. This review article explores the environmental implications of radiography, focusing on energy consumption, disposal of imaging equipment, and radiation safety measures. Through an examination of current research and industry practices, this article aims to raise awareness about the environmental challenges associated with radiography and propose potential solutions to mitigate its ecological footprint.

Introduction: Radiography is a fundamental diagnostic tool in medical imaging, utilizing X-ray technology to produce images of internal structures within the body. It has revolutionized healthcare by enabling non-invasive examination and diagnosis of various medical conditions. Nonetheless, the widespread use of radiography has led to concerns regarding its impact on the environment. This review delves into the key aspects of radiography's environmental impact, including energy consumption, imaging equipment disposal, and radiation safety measures.

Energy Consumption in Radiography

Radiography equipment, particularly X-ray machines, requires significant amounts of energy to function effectively. The energy consumption of radiography devices is not only attributed to the X-ray generation process but also to the supporting infrastructure, such as cooling systems and data storage solutions. Various studies have been conducted to evaluate the energy consumption of radiography facilities, and these findings underscore the need for energy-efficient equipment and optimized usage protocols. Implementing advanced imaging technologies, adopting power-saving features, and optimizing operational practices are some potential solutions to reduce the energy consumption in radiography.

Disposal of Imaging Equipment

With technological advancements, radiography equipment is frequently upgraded or replaced, resulting in a considerable amount of electronic waste (e-waste). Improper disposal of imaging equipment poses a significant environmental hazard due to the presence of hazardous materials, including lead and other heavy metals, in the devices. The existing disposal practices reviews in radiography, highlights the importance of environmentally responsible e-waste management. The adoption of recycling programs, adherence to electronic waste disposal regulations, and implementing sustainable design practices are essential steps to minimize the environmental impact of imaging equipment disposal.

Radiation Safety Measures

Radiation safety is of paramount importance in radiography to protect both patients and healthcare professionals from unnecessary exposure. The use of X-ray technology carries potential health risks, and appropriate safety measures are essential to mitigate these risks. The exposure of radiation safety measures highlight the significance of maintaining radiation safety standards, the development of dose reduction strategies, and the advancements in digital radiography techniques to minimize radiation exposure. Ensuring that radiography practices adhere to established safety guidelines is crucial in safeguarding the environment from radiation contamination.

Green Initiatives in Radiography

In recent years, there has been a growing awareness of the environmental impact of medical practices, including radiography. Consequently, various green initiatives have been proposed to reduce the ecological footprint of radiography. Reviewers examine some successful green initiatives, such as energy-efficient radiography equipment, eco-friendly imaging facilities, and sustainable resource management strategies. Additionally, the role of governmental regulations, industry associations, and healthcare institutions in promoting environmentally friendly radiography practices is discussed.

Conclusion

Radiography is an indispensable diagnostic tool in modern medicine, but its environmental impact should not be underestimated. This review article highlights the significant areas of concern, including energy consumption, imaging equipment disposal, and radiation safety measures, and their implications on the environment. By promoting energy-efficient practices, responsible e-waste management, and stringent radiation safety protocols, the radiography industry can take crucial steps towards minimizing its environmental footprint and contributing to a sustainable healthcare system.

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Report on on the "6th State Conference of SIR TN&PY - BARANI-2023"

Reported By Mr.C. Marimuthu, Organizing Secretary

The 6th State Conference of SIR TN & PY with the theme **"Basics & Advances of Radiographic Applications in Newer Imaging - BARANI-2023"** was held on August 5th and 6th, 2023, at the Francis Xavier Engineering College Auditorium, Tirunelveli. The event was jointly organized by Kauvery Hospital, Tirunelveli, and witnessed a significant turnout of around 500 attendees, including students, technical experts, and teaching faculties from across Tamil Nadu and neighboring states.

The inauguration of the conference was graced by esteemed individuals from various domains, marking the beginning of the event on a noteworthy note. **Dr. S. Nancy Dora,** Professor & Head of Radio-diagnosis at Govt. Tirunelveli Medical College, lent her presence as the Chief Guest, emphasizing the significance of the conference's theme, "Basics & Advances of Radiographic Applications in Newer Imaging - BARANI-2023."

The event saw the participation of several distinguished guests, including:

- **Dr. Lakshmanan.K,** Medical Director of Kauvery Hospital Tirunelveli, who brought his expertise and insights to the conference.
- **Mr. Vairamuthu.P,** Head of Operations of Kauvery Hospital, contributed to the event with his experience and leadership in hospital administration.
- **Mr. K. Munirathnam,** the Founder President of SIR TN&PY, exemplified the commitment to the field of radiography and imaging.
- **Mr. C. Marimuthu,** the Vice President and General Secretary of SIR TN&PY, played a pivotal role in organizing and coordinating the conference.

Furthermore, the presence of other integral organizers such as Mr. M. Saravana Kumar, R. Vijayaraghavan, Prof. S. Panneer Selvam, Mr. K. Somasekar, Mr. I. Ganesan, and Mr. E. Murugesh highlighted the collaborative efforts that led to the success of the conference.

That's wonderful news! It's always heartening to hear about professionals being recognized for their lifetime achievements and contributions to their respective fields. **Mr. V. Rajamanickam** has been awarded for his lifetime achievement in the radiology field, it's a testament to his dedication and expertise.

The Scientific Programme of BARANI-2023 comprised six guest lectures, eleven proffered papers, twenty-four students' oral presentation papers, two trade presentations, and twenty students' poster presentations. Eminent faculties from various institutions across Tamil Nadu presented guest lectures and proffered papers. The trade presentations focused on sharing knowledge about new equipment, current software updates in CT & MRI, and the reconstruction process.

The first day of the conference concluded with a Gala Dinner and DJ program, where students actively participated in music, dance, and talent exhibits, creating a lively atmosphere.

A highlight of the conference was the presentation of competitive papers by students, judged by faculties from Coimbatore and Chennai, including Mrs. Akila, Mr. Devarajan, and Mr. Jerald. Among the 24 students' oral papers, three best papers were selected and awarded the Prof. Paneer Selvam Endowment Award, the K. Munirathinam Endowment Award, and the MG Pandeyan Endowment Award, along with cash prizes.

A Preliminary Quiz was conducted, engaging around 300 students, and the top 18 participants were selected and divided into 6 teams for the Final Mega Quiz. The mega quiz was conducted by ART, Chennai Coordinators, resulting in the recognition of three winners who received certificates and books.

The poster presentations were judged by experienced professionals.The judging panel included Mr. Mohan from Sree Balaji Medical College in Chennai, Mr. Tamijeselvan from MTPGH in Puducherry, and Mr. Murugesh from Omandurar Medical College in Chennai. The participants who created the top three posters were recognized with certificates and books as their prizes. Such events are important for fostering knowledge sharing, collaboration, and innovation within the medical community.

The Valedictory Program and prize distribution ceremony took place with the presence of dignitaries from Kauvery Hospital, Tirunelveli, along with Founder Chairman, Vice President, Organizing Secretaries, Scientific Chairman, Scientific Secretary, Treasurer, and Judges of various events of BARANI-2023.

The conference concluded as a great success, with productive scientific discussions on various topics that were well-received by both students and delegates. The event provided a platform for knowledge sharing, skill development, and networking in the field of radiographic applications and imaging.


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Quiz

Likhit Singh, Sanjay Gandhi Memorial Hospital, Delhi

1. Which individual is credited with the discovery of X-rays?
a) Marie Curie
b) Wilhelm Conrad Roentgen
c) Nikola Tesla
d) Thomas Edison

2. What is the primary purpose of using collimation in radiography?
a) To protect the patient from radiation
b) To focus the X-ray beam on the region of interest
c) To reduce the exposure time
d) To minimize the scattering of X-rays

3. Which imaging technique is commonly used to visualize blood vessels?
a) Magnetic Resonance Imaging (MRI)
b) Computed Tomography (CT) scan
c) Positron Emission Tomography (PET)
d) Angiography

4. In dental radiography, which type of X-ray film provides the highest image resolution?
a) Intraoral film
b) Panoramic film
c) Extraoral film
d) Occlusal film

5. Which medical condition can be detected through a mammogram?
a) Osteoporosis
b) Breast cancer
c) Pneumonia
d) Kidney stones

6. Digital radiography is superior to film-based radiography because:
a) It allows for faster image acquisition
b) It results in higher patient radiation dose
c) It requires no exposure to X-rays
d) It presents a lower risk of image manipulation

7. The ALARA principle in radiography stands for:
a) As Low As Radiology Allows
b) All Lungs And Radiology Assessments
c) Artifacts Limiting Areas of Radiographic Anomalies
d) As Low As Reasonably Achievable

8. Which radiographic technique is commonly used to evaluate bone fractures?
a) Fluoroscopy
b) Dual-energy X-ray absorptiometry (DXA)
c) X-ray radiography
d) Magnetic resonance imaging (MRI)

9. Which of the following is a potential risk of radiation exposure in radiography?
a) Improved image quality
b) Increased patient cooperation
c) Radiation-induced cancer
d) Faster image acquisition

10. What is the purpose of radiopaque contrast agents used in radiography?
a) To enhance soft tissue visualization
b) To minimize patient radiation dose
c) To reduce image exposure time
d) To improve patient comfort during the procedure

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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

Awareness on Radiation Safety and Protection

(Student Technologists working in ionizing radiation zone)

V. Arun Pandiyan. 2nd Year B.Sc. Radiography and Imaging Technology, SMVEC and SMVMCH, Puducherry.

Introduction

Radiation is the compact pockets of energy which travels as a wave and also can transfer energy from one point to another. The radiation exposure in our day to day life originates from,

- Natural Background Radiation (Cosmic rays, Radon, Thoron, Terrestrial exposure, etc.)
- Man Made Radiation Exposure (X-ray, CT scan, Nuclear medicine, etc.)
- Consumer products (Tobacco and building materials like brick, concrete, etc.)

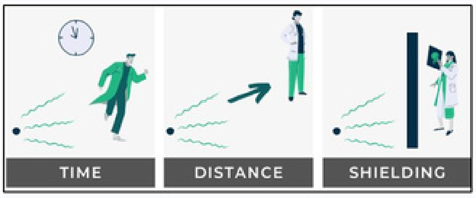
Occupational Exposure (Personnel working in radiation zone)Among the above mentioned exposures, background radiation accounts to be the highest contributor of radiation exposure which is unavoidable and in lesser tendency to cause potential damage. Next to that, the major contributor of radiation exposure is **manmade radiation exposure (Medical Exposures)**.

The radiation is mainly of two types namely, Ionizing radiation (causes harm) and Non-Ionizing radiation (causes minimal harm only with prolonged exposure). The field of medicine in the aspect of diagnosis and treatment has changed drastically after the advent of X-ray by **Wilhelm Conrad Roentgen** in 1895. Then a medical department which uses radiation for medical diagnostic purposes were formed and named as **Radiology**. The modalities which uses ionizing radiation as a source for imaging purposes are X-ray, CT scan, Dental and OT radiography. Whereas MRI and USG uses non-ionizing radiation. This article is to provide awareness to the student technologists about the role of medical exposures and steps necessary to safeguard one from the radiation.

Steps Necessary to Safeguard from Ionizing Radiation

You can't see or feel radiation, but it has the potential to cause severe illness or death unless it is used under permissible limit with adequate radiation safety and protection standards. Radiation protection aims to reduce unnecessary radiation exposure with a goal to minimize the harmful effects of ionizing radiation. The three primary principles that needs to be followed to safeguard during a radiological examination are,

1. Time – Reducing the time spent in the radiation zone and reducing the radiation exposure time while handling the ionizing radiation equipment. (Complete the work as early as possible and leave the area).



- Distance – Increase the distance between yourself and the radiation emitting equipment with a minimum of 6 feet from the source (Radiation exposure decreases when you increase the distance from it).
- Shielding – Use adequate shielding like lead apparels, lead barrier and built in protection like walls. (Whenever you are operating or having your presence during operating a ionizing radiation equipment, use adequate shielding. If lead apparels are insufficient stay outside the examination zone).

Radiation Protective Apparels

- The apparels were made up of lead in the form of apron, thyroid collar, gloves, goggles, glass, etc.
- The radiation protective apparels should not be taken off while you are present in the radiation zone during a radiological examination.
- The apparels must be used along with the personal radiation monitoring devices like TLD.

The apparels must be used along with the safe work practices mentioned above for effective safeguarding and protection of an individual.

Radiation Safety

“As Low As Reasonably Achievable” (ALARA)

By this principle a technologist has the responsibility to reduce radiation exposure to the patient as low as possible without degrading the image quality. Hence for the student technologists, it is mandatory to know the thumb rule that influences the image quality as well as the radiation dose to the patient.

Warning Placards

The technologists have the responsibility to protect the patient as well as themselves from the radiation. So, to educate the patients as well as to give caution to the student radiographers about the presence of radiation hazard many warning placards will be displayed in the radiation zone as given below.

Do's and Don'ts;

- Don't avoid the procedure if it's important for your health
- Do ask the medical staff what measures will be taken to reduce any risks
- Do seek advice before the procedure if you are concerned
- Tell the X-ray technologist in advance if you are, or might be, pregnant.
- Ask if a protective shield can be used.
- If you or your children are getting an X-ray, ask whether a lead apron or other shield should be used

The most important goals of using ionizing radiation in treatment and diagnosis is to assure the safety of patients, workers and the public and to ensure that the benefits of regulating ionizing radiation will out weight the risks.

The Risks of Occupational Radiation Exposure& Eyes Protection in ERCP

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

Endoscopic Retrograde Cholangio Pancreatography (ERCP) is a vital diagnostic and therapeutic procedure used in pancreaticobiliary diseases. By employing fluoroscopy, an advanced real-time imaging technique, medical professionals gain invaluable insights into the patient's anatomy and guide their interventions with precision.

While the primary purpose of fluoroscopy is to visualize internal structures by passing X-rays through the patient's body, it's important to recognize that radiation doesn't stop there. During the process, X-rays bounce off the patient's body, resulting in scattered radiation that can reach the medical professionals in the room, potentially posing health risks.

The Risks of Occupational Radiation Exposure

We highlighted the risks associated with occupational radiation exposure to the lens of the eyes during ERCP procedures. The lens of the eyes, highly sensitive to radiation, faces a higher risk of radiation-induced damage without adequate protection. Awareness of these risks is essential to prioritize the well-being of medical professionals.

To mitigate the risks of radiation exposure, medical professionals must prioritize protective measures. Lead glasses have emerged as a trusted solution for reducing radiation exposure to the eyes. New innovations offer a diverse range of lead glasses, including stylish options, ensuring optimal protection during fluoroscopy procedures.

By understanding the risks involved and implementing effective protective measures, such as the use of lead glasses, medical professionals can safeguard their well-being while providing exceptional patient care. Stay informed, prioritize radiation protection, and trust reliable products of lead glasses to ensure safety during endoscopic procedures the initial effects of exposure to radiation can be subtle and invisible, and so the damage being done goes undetected at first. The eyes are very delicate organs and are easily damaged by scatter radiation. Everyone who works with x-rays or other forms of ionizing radiation should be equipped with special lead glasses. A solution to reducing scatter radiation exposure through the use of our scatter armor scatters shields. These shields are placed between the radiation source and the healthcare worker to reduce scatter radiation. There are a variety of sizes to fit the specific needs of the healthcare facility and specific procedures.

Now manufacturers feature a wide selection of lead glasses, including esteemed brands like Nike and Gucci, for superior radiation protection. We can choose from sleek Nike styles like the Nike 7184, luxurious Gucci designs, and special FITOVERS® for prescription glasses wearers. The new diverse options ranging from EVO and Zion to innovative styles like Flip Top Radiation Protection Glasses are available.

Protect Your Eyes from Radiation

"Half of Interventional Cardiologists may have pre-cataract lesions"

Interventional Radiologists, Cardiologists and medical staff who stand close to the patient and the X-ray source are at high risk of radiation associated cataract. Now we can protect eyes with lightweight, comfortable, 0.75 mm Pb, lead equivalent glasses. All lead glasses have 0.75 mm LE protection, including front and side protection models.

Lead goggles used to be bulky, uncomfortable, and inconvenient to wear. With modern technological advancements, you now have several choices in leaded eye wear. Now these are comfortable & light weight also.

Radiation protection Lead glasses available now are :

1) Nike 7284 Lead Glasses

Nike 7284 is a full rim frame for men and women made of injected plastic.

This model features a rounded edges shape, a single bridge, and durable hinges.

FRAME SIZE: 54mm – 16mm – **145mm, Universal**
WEIGHT: 64 G
PRESCRIPTION: Plano, Single Vision
COLORS: Brown Basalt – Clear Fade, Clear – Cool Grey
PROTECTION: 0.75mm LE
INCLUDES: Anti-fog spray, safety strap add-on, protective case

1) FITOVERS® brand, Orion

Fits frames not exceeding 140mm width x 43mm height.

- Wrap around Radiation protection
- 0.50 mm side shield protection
- Hypo-allergenic Crystal Nylon™ Frame
- Designed to be worn over medium prescription eyewear frame shapes
- Non Rx

Frame Size: Universal
Weight: 84 G
Prescription: Plano
Colors: Black, Blue Marble
Protection: 0.75 mm LE
Includes: Anti-fog spray, safety strap add-on, protective case

3) Flip Top Radiation Protection Glasses

"Flip Top" radiation goggles are an all new product, designed to reduce scatter radiation by as much as 70% (actual reduction is dependent upon imaging technique used)

- Lightweight
- Large protective area: 52mm x 154 mm
- Flips open when not needed.
- Adjustable nose bridge
- Can be used as a stand alone radiation reduction goggle or fits easily over your existing glasses.

Frame Size: Universal
Prescription: Plano
Colours: 800275 Amber
Weight: 44G
Protection: 0.07 mm LE
Includes: Anti-fog spray, safety strap add-on, protective case.

Importance of Wearing Lead Glasses: When it comes to protecting yourself from radiation effects on the eyes, always practice the ALARA Principle. (As Low As Reasonably Achievable) and its three important rules, namely Time, Distance, and Shielding. Wearing your protective eyewear is a key part of the Shielding Rule. Leaded glasses attenuate scatter radiation so that it doesn't reach your eyes. Lead (Pb) is a heavy, dense metal that shields against the harmful effects of radiation. Your leaded eyewear lenses must have a minimum of 0.75 mm Pb. If your eyewear also has peripheral or side protection, this should have a minimum of 0.5 mm Pb.

Wearing leaded glasses will protect the eyes from 100% of the damaging effects of scatter radiation. We can concentrate on taking care of your patients, secure in the knowledge that our superior leaded glasses are taking care of your eyes. Don't risk the health of the eyes so always wear lead glasses for the most technologically advanced radiation protective eyewear available today.

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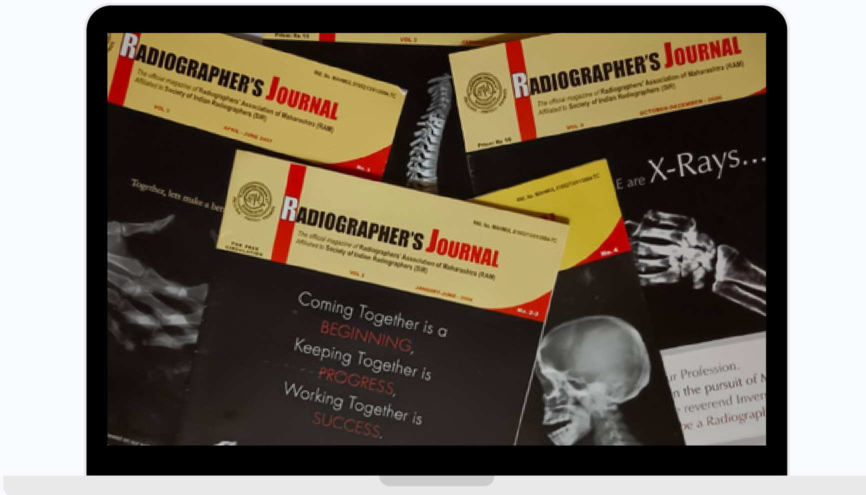

Role of Radiological Technologist in Healthcare

"A review on the third largest group of Healthcare Professionals in the Nation"

D. Premkumar, 2nd Year B.Sc. Radiography and Imaging Technology, SMVEC and SMVMCH, Puducherry.

Introduction

Radiology has been a distinct medical specialty which has evolved as one of the most important destination for many diagnosis and treatment in healthcare sector. Over the last two decades there have been a drastic changes in the field of medicine, technology, and national healthcare funding which has collaterally influenced the necessity of radiologist as well as radiological technologist in the healthcare system. Radiology is now the key diagnostic tool for many diseases and has an important role in monitoring treatment and predicting expected outcome. In this article we have discussed about the various roles of a radiological technologist in healthcare sector.

A radiological technologist are the healthcare professionals who has specialization in handling ionizing and non-ionizing radiation for imaging and mapping of various pathological conditions which aids to diagnosis and treatment. A professional radiological technologist has the tendency and capacity to assist **radiologists (doctors specialized in radiology)** for diagnosis and treatment planning. In past years radiological technologists were called as "X-ray technician, radiographers, etc." These names indicate a radiological technologist who has specialization only on a single radiological modality. Whereas in modern era, all the radiological technologists has specialization in most of the modalities which is the reason to re frame the occupation as **Radiological Technologist**. This is also due to the advancement of the field and relevant technical and clinical knowledge gained by the technologists. The various roles of a radiological technologists were mentioned below.

Radiological Technologist as a Protector

- As the field is mainly based on the usage of radiation for diagnosis and treatment planning. Precise knowledge about the usage of radiation on patients is crucial as over exposure may lead to several side effects to the patient. So, the radiological technologists and radiologists must have adequate knowledge on handling the radiation exposure to the patients leading to patient safety standards.
- To aid patient safety, it mandatory to follow safe work practices, radiation safety and protection while examining the patient. Some of the thumb rules are,

1. **Justification –** Justify the necessity of the examination before it is performed.
2. **Optimization –** Optimize the radiation exposure factors depending upon the patient (adult and pediatric).
3. **ALARA –** Keep the radiation exposure as low as possible without affecting the image quality.
4. **Dose Limits –** Ensure that all the radiation exposures were under the permissible dose limits prescribed the national radiation regulatory body.

Radiological technologist as a Teacher

Everyone must embrace all the opportunities to share knowledge to others and teach others. So medical profession is not an exemption to this. The radiological technologist can also be a teacher in teaching student technologists and other medical

professionals. As the future of radiology rests in the hands of the next generation radiological technologists and radiologists, the knowledge about the below mentioned topics must be taught clearly in every point.

- The work ethics, professionalism, radiological techniques for imaging and post processing, and the future of radiology with their experience.
- The radiation safety, protection, and safe work practices depending upon the modality of choice as each modality has distinct do's and don'ts relies on it.

Radiological technologist as an Innovator / Scientist

A Radiological technologist with additional qualification and knowledge in clinical research can lead their way towards innovation in various modalities with their ideas for better healthcare to the patients. One of the recently advanced fields is implementation of **Artificial Intelligence** into various radiological modalities where various radiological technologists are taking part in several companies to make this possible.

Finally to conclude the traditional darkroom culture is outdated and currently various digital modalities with higher efficiency and lesser radiation dose has been updated. Due to the technical advancements of radiology towards CT and MRI, the demands for radiological technologists and radiologists have also taken a leap.


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Life Time Achievement Award by SIR Tamil Nadu & Pondicherry Chapter

Report by C.Marimuthu. GS, TN& PY Chapter

Mr. V. Rajamanickam

Mr. V. Rajamanickam, a distinguished individual in the field of radiography, was honored with the prestigious **"Lifetime Achievement Award"** by the Society of Indian Radiographers Tamil Nadu and Pondicherry Chapter during the grand inaugural ceremony of the 6th State conference of SIR TN PY at Tirunelveli on August 5th 2023. This esteemed recognition highlights his exceptional contributions and remarkable accomplishments in the realm of radiography.

Throughout his illustrious career, Mr. Rajamanickam's unwavering dedication, commitment, and service to the radiography community have been exemplary. His efforts have not only elevated the standards of radiography practice but have also greatly impacted the lives of fellow radiographers and the healthcare sector as a whole.

The "Lifetime Achievement Award" bestowed upon Mr. Rajamanickam stands as a testament to his outstanding achievements, leadership, and significant role in advancing the radiography field in Tamil Nadu and Pondicherry. It is a well-deserved honor that acknowledges his tireless efforts and invaluable contributions over the years.

Mr. V. Rajamanickam was born in Alagiamanavalam in the Trichy district on September 29, 1958. His educational background includes completing his Pre-University Course (PUC).

In 1978, he enrolled in the Darkroom Assistant Training program at Stanley Medical College, Chennai. He began his career by being posted at the Government Hospital in Ambur, Vellore District, starting from January 22, 1981. His commitment to professional development led him to undergo Certified Radiological Assistant Training at Madras Medical College, Chennai, in 1987. He earned a promotion and was stationed as a Radiographer at the Government Hospital in Ambur in 1990.

In 1994, Mr. Rajamanickam was transferred to the Government K.A.P. Viswanatham Medical College Hospital in Tiruchirappalli (Trichy), where he continued to work until his retirement in 2016. His tenure in Trichy included serving as the editor of "Voice of Radiographer," the first Tamil journal for radiographers in Tamil Nadu and Pondicherry. He actively participated in numerous welfare activities aimed at benefiting radiographers.

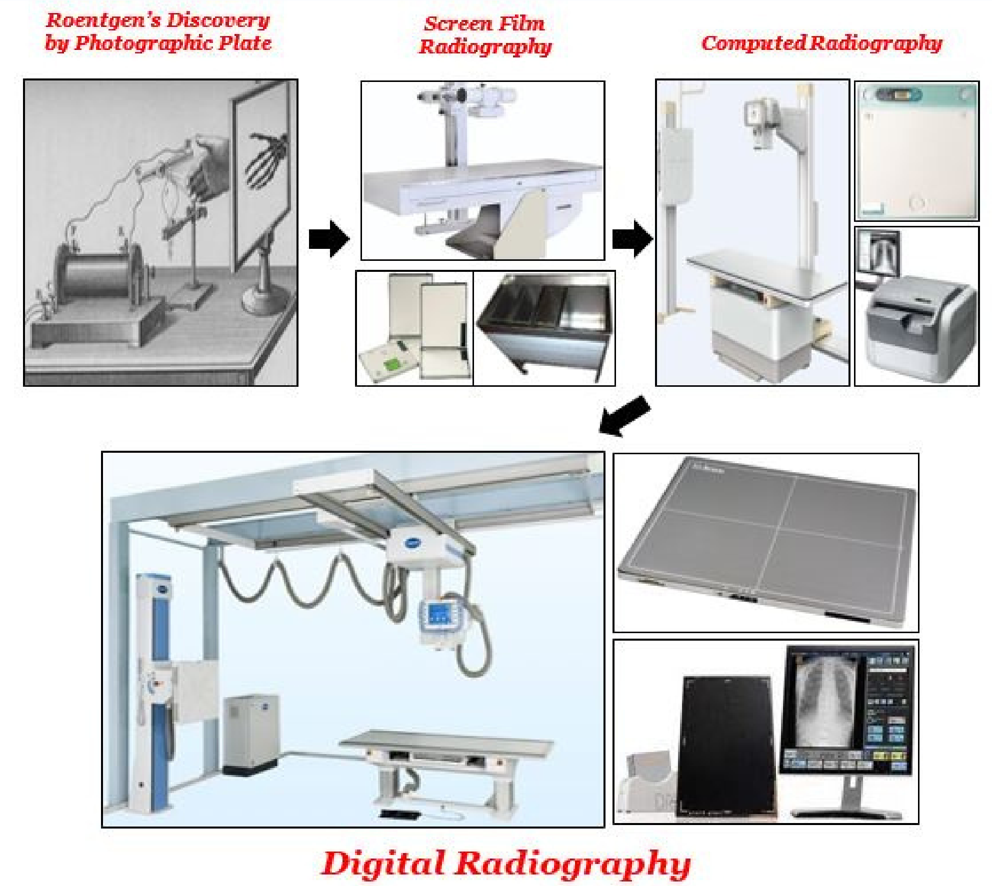
Even after retirement, Mr. Rajamanickam's dedication to the field remained strong. He extended his service by teaching radiography students at Apollo MedSkills Para Medical science from 2016 to 2020. Many of his students have achieved successful positions in various hospitals across Tamil Nadu.

Evolution of X-Ray Instrumentation and Image Acquisition Technology

S. Renu and R. Rajeswari, 2nd Year B.Sc. Radiography and Imaging Technology, SMVEC and SMVMCH, Puducherry.

Introduction

The discovery of the x-rays in 1895 by Roentgen was the beginning of a revolutionary change in the field of medicine as it opened a new way of diagnostic approach in healthcare. After roentgen's discovery, the method was used to image foreign bodies in the body which enabled surgeons to pre map the site with the foreign body's presence aiding to decide the surgical approach. Once the clinical application of x-rays were successfully applied and utilized by many physicians, the technical disadvantage that collaterally influences the clinical radiation exposure started to evoke. To overcome this, the X-ray instrumentation and image acquisition technology has evolved through three major technological developments since its discovery. They are illustrated as follows,



During the early discovery of x-rays, the radiation emitting source (x-ray tube) doesn't have any protection around it as the nature and characteristics of the ray was unknown. After some days, there were potential harm noted in the individuals worked with the equipment which lead to the development of radiation safety standards of the facility by providing radiation protective tube housing and layout designs. The x-ray instrument also evolved with stationary table to movable floating ceiling suspended design for ease handling. Also, the radiation exposure to make a diagnosable radiograph was high due to the decreased image resolution. This was overcome by implementation of several technologies as follows.

Photographic Plate – It was the initial image formation receptor during roentgen's discovery which is based on the fluorescence caused by the x-rays. But due to poor image resolution and higher dose, it led to the advancement towards screen film radiography.

Screen Film Radiography – This technology needs a photosensitive film, conventional radiography cassette, and Film processing area (Darkroom) with adequate chemicals. The film is loaded between the cassette and image is acquired. Then the film is processed in darkroom for image formation. The approximate time for film processing ranges from (2 – 4 minutes). The film loading and unloading is done only inside the darkroom as the films are photosensitive. This workflow demands a separate darkroom assistant, maintenance costs of film processing chemicals, increased film costs, etc.

Computed Radiography – In this type of imaging the darkroom is replaced with computers which reduce the space and maintaining costs. CR has a phosphor cassette which is used for imaging that is processed with computer controlled reader. This replaces loading and unloading of films in each radiography and related image processing time which is reduced to approximately less than 2 minutes. The film is printed with a dedicated printer after image is post processed which reduces film wastage.

Digital Radiography – DR uses only detectors to capture image. The detector is optically connected with a computer via Bluetooth/Wi-Fi. It does not require a cassette, reader, etc. So, the space for film processing is very less (i.e.) the whole setup can be installed within an x-ray room. The image processing time is approximately less than 30 seconds. This technology uses amorphous selenium or amorphous silicon or charge coupled device for image processing which is some of the latest image processing techniques.

Thus the advancement towards all the technical aspects is to give higher resolution images with lesser radiation dose in lesser time.

Star Member Award by SIR Tamil Nadu & Pondicherry Chapter

Report by C.Marimuthu. GS, TN& PY Chapter

Eleven dedicated members of the Society of Indian Radiographers Tamil Nadu and Pondicherry Chapter were honored with the prestigious "Star Member Award" during the grand inauguration ceremony of the 6th State conference of SIR TN PY in Tirunelveli on August 5th, 2023. This distinguished accolade was bestowed upon them as a tribute to their outstanding commitment, active involvement, and significant contributions to the life membership drive and various societal activities aimed at fostering the growth and progress of the Society of Indian Radiographers TN PY Chapter.

Mr. Vijayaragavan.R

Mr. Thulasidass S

Mr. Dinesh. S

Mrs. Mahalakshmi.M

Mr. Cyril Francies.M

Mr. Inbasagar.R

Mr. Raja.R

Mr. Tamijeselvan S

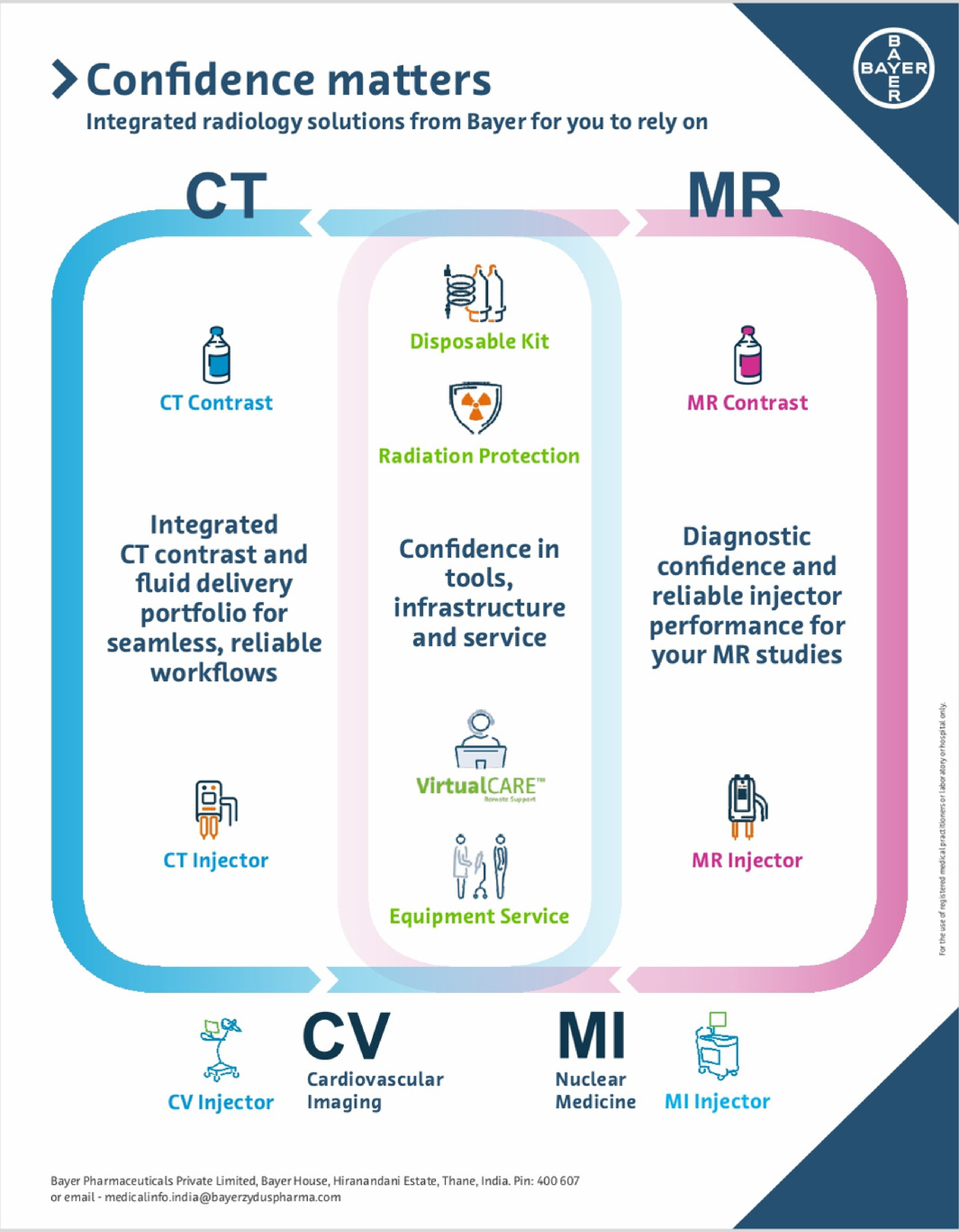
Mr. Praveenkumar.S

Mr. Ganesan.M

Mr. Mohan.K

The **"Star Member Award"** serves as a testament to the exemplary dedication demonstrated by these individuals. Their tireless efforts and enthusiastic participation have not only strengthened the bonds of the radiographer community in Tamil Nadu and Pondicherry but have also played a pivotal role in advancing the goals and objectives of the SIR TN & PY CHAPTER. Through their remarkable contributions, they have helped shape the landscape of radiography in the region and have actively contributed to the development and success of the society.

This recognition is a well-deserved honor that highlights their remarkable achievements and unwavering commitment to the advancement of radiography and the welfare of radiographers in Tamil Nadu and Pondicherry.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CT Contrast
MR Contrast
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Integrated CT contrast and fluid delivery portfolio for seamless, reliable workflows
Confidence in tools, infrastructure and service
Diagnostic confidence and reliable injector performance for your MR studies
VirtualCARE™
Remote Support
CT Injector
MR Injector
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Geriatric Radiography

J Venkat, MBA, Ireland recognized Radiographer (CORU), Asst. Professor, Global Hospital, Chennai

Elderly patient's profile
The profile of elderly patients can vary greatly depending on various factors such as their overall health, lifestyle, and social support

Age: Elderly patients are typically classified as individuals who are 65 years of age or older. Within this group, there is further categorization into young-old (65-74 years), middle-old (75-84 years), and oldest-old (85 years and above).
Health conditions: Elderly patients often have a higher prevalence of chronic health conditions compared to younger individuals. Common health issues include hypertension, arthritis, diabetes, cardiovascular diseases, respiratory problems, cognitive decline (e.g., Alzheimer's disease), and mobility issues.
Functional limitations: As individuals age, they may experience functional limitations that affect their daily activities. These limitations can include reduced mobility, balance problems, decreased sensory acuity (vision and hearing), and limitations in performing activities of daily living (ADLs) such as bathing, dressing, and feeding.
Mental health: Elderly patients may experience mental health challenges such as depression, anxiety, and loneliness. Grief and loss are also significant issues as they may face the loss of loved ones, or friends, or a decline in their own health.

Equipment and accessories
Radiographic Table: A radiographic table with adjustable height and weight capacity is essential for accommodating elderly patients who may have difficulty getting on and off the table.
Supporting materials: Proper footstool, arm handle, soft pillows, and footrest in that table are used to minimize discomfort of the geriatrics
Digital Radiography System: Digital radiography systems provide fast and high-quality images, allowing for quick diagnosis and reduced patient exposure to radiation.
Portable Radiography: Since elderly patients are difficulty to come to X-ray room, Portable radiography machines are used to do the procedures in their rooms and also in their homes
Patient Positioning Aids: Positioning aids such as sandbags, immobilization devices, and foam pads help stabilize and position elderly patients for accurate imaging while maintaining their comfort.
6.Patient Communication Tools: Communication devices like intercom systems or hearing aid-compatible headphones allow technologists to communicate effectively with elderly patients during imaging procedures.

Exposure factor considerationsin special care
1. A number of problems arise because of the fact the skeleton becomes brittle due to the loss of bone substance.
2. The thoracic spine may become bowed, for example, which will cause positioning problems for the vertebral column generally, supine X-rays, etc...
3. As calcium is lost from the bones, it tends to be laid down in alternative places such as the costal cartilage, the wall of the aorta, the trachea, the bronchi, and the thyroid gland.
4. Osteoporosisis always seen in radiographs. Hence, there is a general need to reduce exposure factors.
5. Shorter exposure may decrease the movement artefact. For shorter exposure, the 15% rule is used to determine the optimal kilovoltage peak (KVP). The rule states that a 15% increase or decrease in the KVP will effectively double or halve the exposure to the image receptor, respectively. This means that a15% increase in the kVp will lead to an exposure approximately 2 times higher at the image receptor. So, half of the time can be used to obtain the same exposure

Difficulties during radiography
Radiography, or X-ray imaging, can present certain difficulties when performed on elderly patients due to their unique physical and cognitive characteristics.
Limited mobility: Elderly patients often experience decreased mobility, making it challenging for them to get into the required positions for X-ray imaging. They may have difficulty standing, sitting, or lying down as necessary, which can affect the quality of the images obtained.
Fragile bones: Aging bones tend to become more brittle and prone to fractures. The risk of fractures may increase during positioning for X-rays, particularly if the patient has osteoporosis or other bone-related conditions. Extreme care must be taken to ensure the patient's safety and minimize the risk of injury.
Pain and discomfort: Older adults may have chronic pain, arthritis, or other conditions that cause discomfort during movements or when maintaining certain positions. Radiography procedures may exacerbate their discomfort, making it important to communicate effectively with the patient and adjust positions to alleviate pain as much as possible.
Cognitive impairment: Some elderly patients may experience cognitive decline or dementia, which can affect their ability to understand instructions and follow directions during the X-ray procedure. Extra patience, clear communication, and potentially involving family members or caregivers in the process may be necessary to ensure cooperation and safety.
Sensory impairments: Elderly individuals may have vision or hearing impairments that can impede their understanding of instructions and increase their anxiety during the radiography process. Radiographers should be mindful of these impairments and adapt their communication methods accordingly.

Anxiety and claustrophobia: Many patients, including the elderly, may experience anxiety or claustrophobia when placed in confined spaces or when exposed to medical procedures. This can be particularly challenging for certain types of radiographic examinations, such as CT scans or MRI scans. A proper explanation of the procedure, reassurance, and potentially the use of sedation or relaxation techniques can help alleviate these anxieties.

Multiple comorbidities: Elderly patients often have multiple comorbidities, such as heart disease, diabetes, or respiratory conditions. These conditions can complicate the radiography process and require careful monitoring and coordination with the patient's overall healthcare team to ensure their safety and well-being during the procedure.

Technical considerations

Positioning: Elderly patients may have limited mobility and flexibility due to age-related conditions such as arthritis or joint stiffness. Care should be taken to position the patient comfortably while maintaining proper alignment for the required radiographic views. Pillows, cushions, or sandbags can be used to support the patient and help maintain positioning.

Exposure Factors: Elderly patients often have thinner and more fragile tissues, which can affect the amount of radiation required to produce an adequate image. Adjusting the exposure factors, such as reducing the kilovoltage (kVp) or milliampere-seconds (mAS), can help minimize radiation exposure while still achieving diagnostically acceptable image quality.

Shielding: Proper use of radiation shielding is crucial to protect elderly patients, especially those who may be more susceptible to radiation effects. Lead aprons and thyroid shields should be used whenever possible to minimize radiation exposure to sensitive organs

Image Acquisition Time: Elderly patients may have difficulty holding their breath or maintaining a particular position for an extended period. Whenever possible, choose acquisition techniques that minimize exposure time and allow for shorter breath-hold times.

Image Analysis: Radiographic images of elderly patients may exhibit age-related changes, such as osteoporosis or degenerative joint disease. Radiologists and technologists should be familiar with these changes to avoid misinterpretation or over diagnosis.

Communication and Patient Care: Clear communication with elderly patients is essential. Explain the procedure, its purpose, and any discomfort they may experience. Ensure that the patient is comfortable and provides necessary assistance during positioning and immobilization.

Collaboration with Other Healthcare Providers: Collaboration with geriatric specialists or other healthcare providers who are familiar with the specific needs and considerations of elderly patients can be beneficial. They may provide insights into patient care, medication management, or additional precautions to be taken during radiographic procedures.

Projections with unconventional special positioning for geriatric imaging

When it comes to geriatric imaging, various conventional and unconventional techniques can be employed to ensure optimal positioning and image quality.

Tilted positioning: In some cases, elderly patients may have difficulty standing or maintaining an upright position for imaging procedures. Tilted positioning can be used to accommodate their needs. For example, tilting the imaging table or chair at an angle can help achieve a more comfortable and stable position for the patient while still obtaining the necessary images.

Supportive devices: Geriatric patients often experience mobility issues or have trouble maintaining specific positions required for imaging. Supportive devices such as cushions, wedges, or specially designed supports can be used to provide stability and comfort during imaging. These devices can help in maintaining proper positioning and reducing patient discomfort.

Supine or semi-supine positioning: Traditional imaging techniques often require patients to be in an upright or seated position, which may not always be feasible for elderly individuals. In such cases, supine (lying on the back) or semi-supine positioning can be used. This allows for easier access and positioning for imaging procedures, particularly for examinations of the chest or abdomen.

Flexed or modified limb positioning: Geriatric patients may have joint stiffness or limited range of motion. In order to accommodate these limitations, flexed or modified limb positioning can be employed. By adjusting the positioning of limbs or joints, the imaging technologist can optimize the patient's comfort while still obtaining the necessary diagnostic images.

Bedside or portable imaging: For geriatric patients who are bedridden, critically ill, or have mobility limitations, bedside imaging or portable imaging devices can be used. These devices can be brought directly to the patient's location, whether it is a hospital room, nursing home, or home setting. Bedside or portable imaging reduces the need for patient transportation and provides a more convenient and comfortable option for geriatric individuals.

Conclusion

It is important to note that the choice of positioning techniques should always consider the specific clinical requirements, patient comfort, and safety. Radiographers should evaluate each case individually and determine the most appropriate unconventional special positioning technique based on the patient's needs and the desired diagnostic outcomes.

Lymphangiogram

Dr.Murugesh.E (Rishi), BOT, CMT, M.Sc (PSY), DRDT, MRT, Radiographer/Imaging Technologist,
Department of Radio-diagnosis, Govt. Omandurar Medical, Omandurar Govt. Estate, Chennai

Lymphangiogram is a special X-ray of the lymph nodes and lymph vessels. Conventional lymphography has long been the method of choice for imaging the lymphatic system.

The lymph nodes and vessels are not seen on a normal X-Ray, so a dye is injected into the body to highlight the area being studied under fluoroscopic guidance.

Lymphangiogram / Lymphography have the unique ability to demonstrate derangement's of the internal architecture of normal-sized lymph nodes.It helps to more accurately stage some lymphomas (especially Hodgkin disease).

Indications

- Unexplained peripheral swelling
- R/O Thoracic Duct Injury in Pt's with Chylous Effusion
- Patency of deep lymphatic trunks
- Suspected carcinoma
- Hodgkin's disease - Staging
- Negative CT scan w/suspected lymphoma

Contraindication & Caution

- Contrast Sensitivity
- Cardiac disease
- Severe hepatorenal disease
- Vascular involvement due to Diabetes
- Advanced pulmonary disease
- Prolonged radiation exposure

Relative Contraindication:

- Interruptions of lymphatics by surgery or pathology
- Patients with tremors are poor candidates

Procedure requirement:

- Fluoroscopy unit with cine and spot film
- Methylene Blue dye
- Lipidol Contrast

Lymphangiography set:

- Siliconized stainless steel needle, 17 mm long
- Wing to hold the device during puncture
- PVC extension tube, 75 cm long
- Female Luer-lock hub with cap

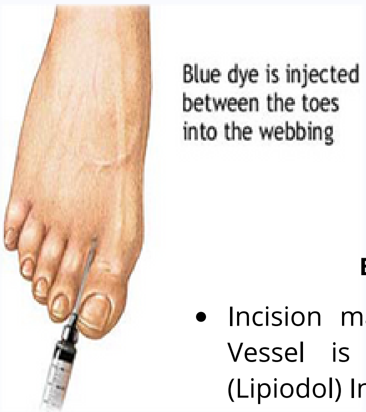
Patient Preparation:

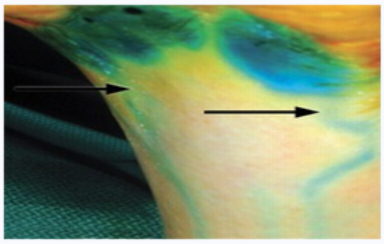
- Inform patient beforehand that the procedure will take two days
- Day #1 About 4-5 hours
- Day #2 About 1 hour
- Caution them of the temporary skin & urine discoloration caused by the indicator dye
- Have patient empty bladder

NPO not necessary – * Fatty Food to be taken adequately before procedure**

Procedure:

- Feet are cleaned
- Lidocaine used for local anesthesia & Methylene Blue dye injected to localize lymph vessels

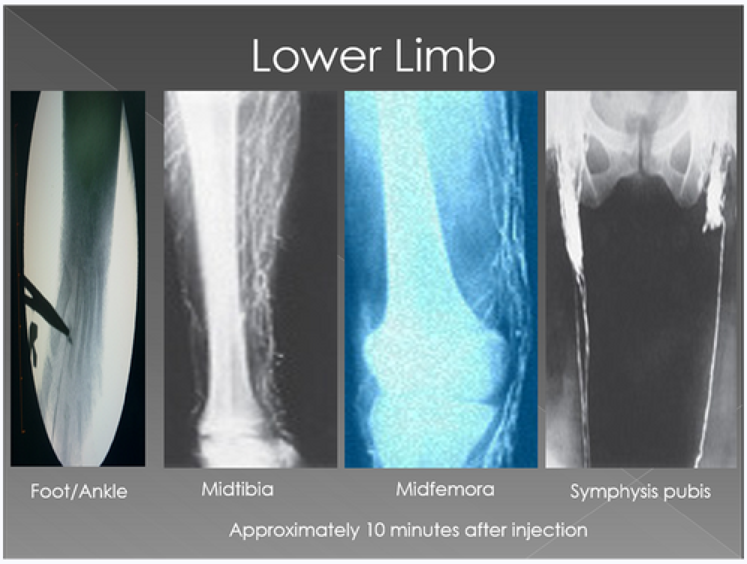


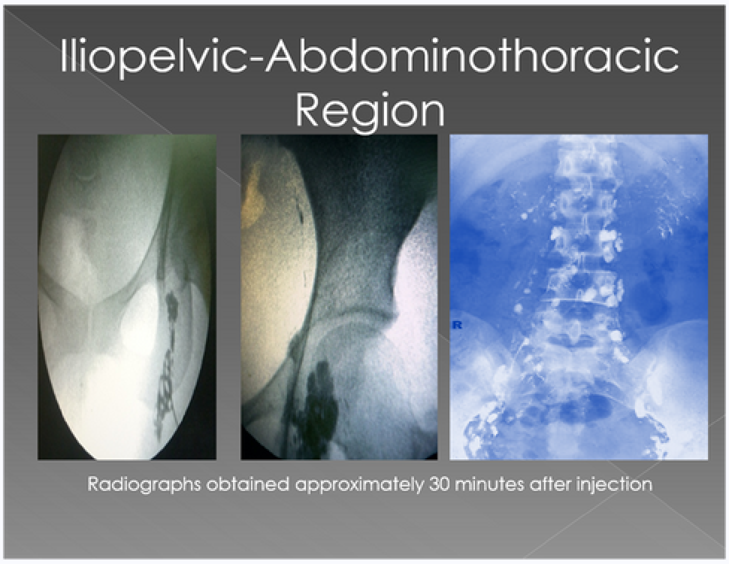


Blue dye taken by the Lymphatics

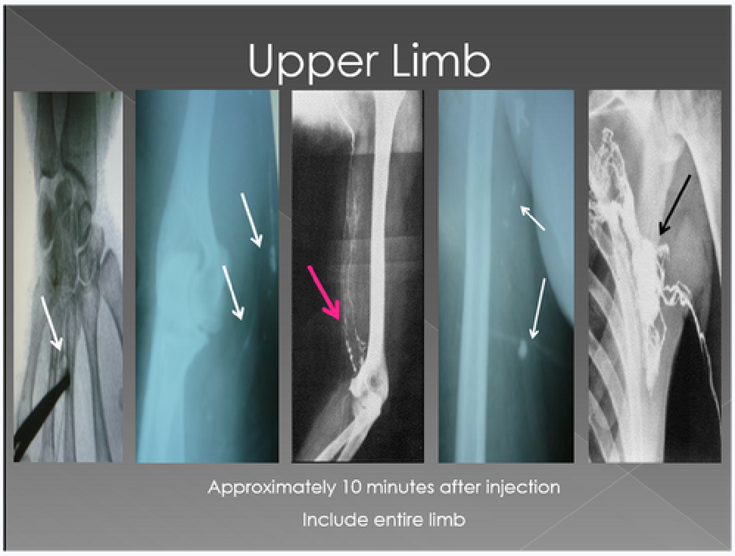
- Incision made to expose lymph vessels, Vessel is cannulated & Oily Contrast (Lipiodol) Injected
- 5-10 ml is administered over 1-3 hours at a rate of 0.1-0.2 ml./min by injector

- Scout film is taken before the injection of dye/contrast
- Lymphangiography - Films are taken immediately after injection of contrast media
- Flow of contrast is visualized under Fluoroscopy
- Images are taken as per Region of Interest





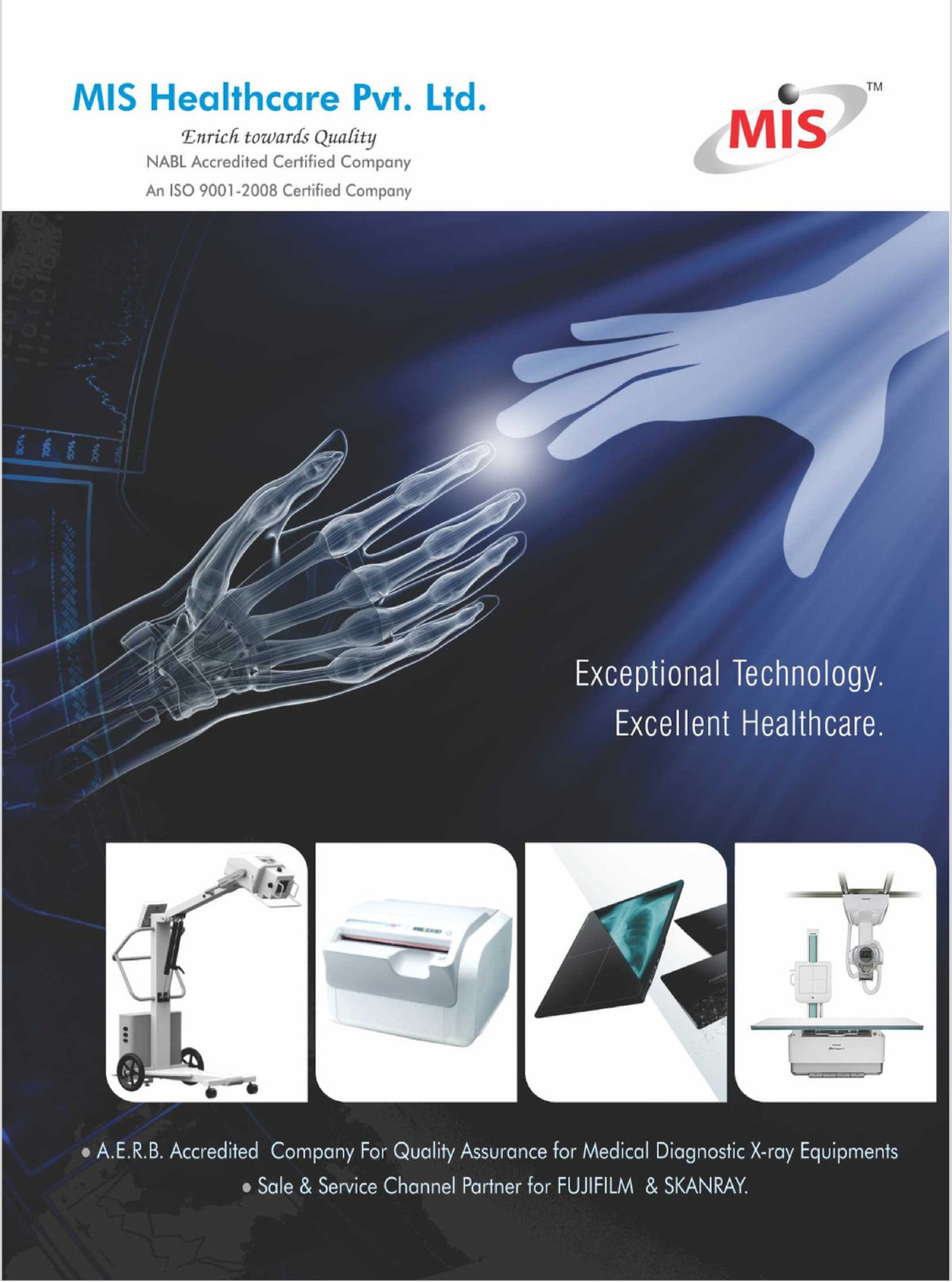
Lymphatics seen taken at several time interval showing ducts and nodes



After Lipidol, Nodes and Chains

Post Procedure Care & Follow-up:

- Blue coloration due to dye - Avoid Confusion it being Cyanosis
- Crepe Bandage
- Limb Elevation
- Wound Care
- Suture removal after 7 days
- Transient Resp. Depression – Contrast Trapping in Lung Capillaries -- "AVOID SMOKING"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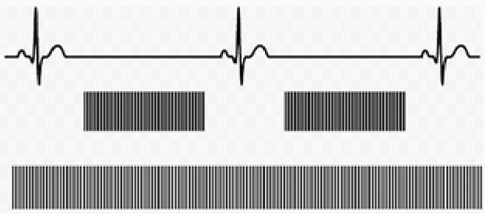
Importance of Cardiac Gating in Cardiac MRI Scan

Sonaxshi Kar (MMRIT 1st Year), Tripura Institute Of Paramedical Sciences, Amtali, Hapania, Agartala, Tripura

Introduction: The oldest and most straightforward way to reduce cardiorespiratory artifacts is to synchronize MR data acquisition to the cardiac or respiratory cycles. This process is known as gating. Gating's another name triggering. The two terms are often used interchangeably.

Prospective gating and retrospective gating:
In the strictest sense, however, triggering is a form of prospective gating where MR data acquisition only begins after the detection of a desired physiologic event (an R-wave, peripheral pulse, or specified level of inspiration). Gating, a somewhat broader term than triggering, may be either prospective or retrospective. In retrospective gating, MR data are acquired continuously (not in response to a particular cardio respiratory "trigger" event). The EKG, pulse, or respiratory level is recorded simultaneously with the MR data. The MR data can then be reordered, grouped, or correlated with the phase of the cardio respiratory cycle. Retrospective gating is the method typically used for cine-cardiac motion studies.



Prospective and retrospective gating images

Difference between Prospective and Retrospective Gating:
With prospective gating, the X-ray beam is on for about 20% of the R–R interval. With retrospective gating, the X-ray beam is on an entire cardiac cycle and the maximal tube current is at 65–85% of the R–R interval. The tube current outside of the pre-defined interval is 25% of the maximal tube current.

Purpose of gating in MRI:
Gating are used to improve temporal resolution and minimize imaging artefacts caused by cardiac motion.

Gating is useful when imaging any area that contains pulsatile flow or the heart itself. This includes the chest and great vessels, the abdomen, the spinal cord, and the brain. Virtually any area where pulsatile motion degrades the image lends itself to going of some sort. The decision to use ECG or peripheral gating is often difficult. ECG gating is more time–consuming because of the electrode placement, and because arrhythmias can alter the ECG to such an extent that the system cannot detect and adequate R wave. These difficulties are usually not present with peripheral gating, but this is not adequate when imaging the heart itself. Generally peripheral gating is adequate for the brain, spine and vessels away from the heart. ECG gating should be used for the heart itself.

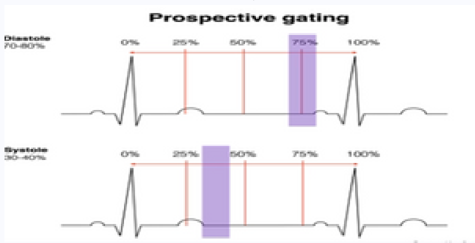
Gating is a rather lengthy process as the scan time is determined by the patient's heart rate. Usually there is no control over the TR, weighting or slice number when using gating, gating is relatively time consuming, especially if the heart rate is slow for this reason a patient with bradycardia and poses a challenge in MRI because scan times are very long. Gating in patients with bradycardia will result in longer R to R intervals and hence longer effective TRs and longer scan times. For this reason, many sites reserve gating for cardiac and or chest imaging only.

ECG Gating:
Gating represents a filtering mechanism, preventing distraction and sensory overload or a protective mechanism, securing uninterrupted processing of stimuli.

One of the most important requirements for successful cardiac MR imaging is the accurate synchronization of data acquisition with respect to motion of the beating heart. The images produced then accurately reflect the state of the heart during its different stages of contraction and relaxation and have minimal motion artifacts. To achieve synchronization, the electrical activity of the heart is used to control timing of the MR acquisition. This technique is called electrocardiographic (ECG)-gating. To generate an image, k-space data are typically collected across multiple heart beats. For some sequences, such as spin echo anatomic imaging or contrast-enhanced infarct imaging, echoes are typically collected during the end of the cardiac cycle, when there is minimal motion during diastole. For functional imaging, such as cine gradient echo imaging or phase contrast flow quantification, data are collected throughout the cardiac cycle and then partitioned into separate k-space frames, each corresponding to a short segment of the cardiac cycle. Each k-space then reflects a snapshot of the heart during the cardiac cycle.

Schematic diagram of standard electrocardiogram (ECG)

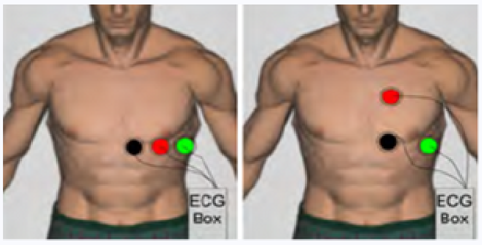
Working principle of ECG gating:
Cardiac gating or ECG-gated angiography in CT is an acquisition technique that triggers a scan during a specific portion of the cardiac cycle. Often this technique is conveyed to obtain high-quality scans void of pulsation artefact. The basic principle of ECG gating is that stimulation of a muscle alters the electrical potential of the muscle fibres.



Prospective gating

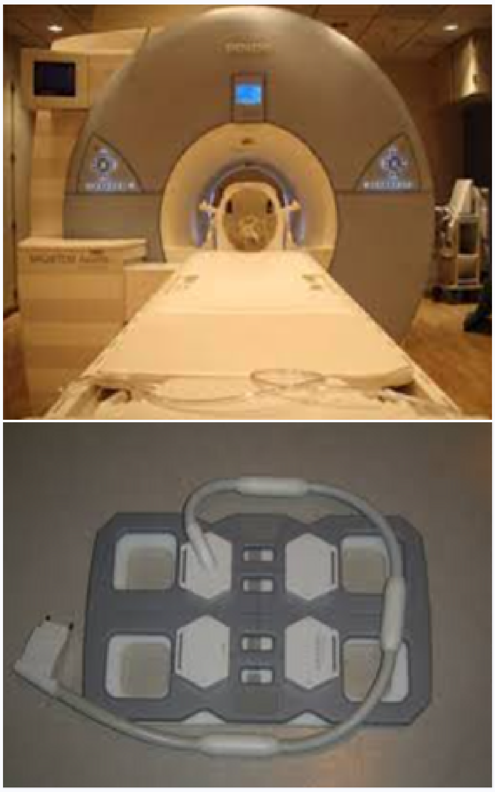
ECG Leads placement:
ECG electrodes are placed relatively close to each other on the left-hand side of the upper torso as illustrated

in Figure shown. Obtaining a good ECG signal requires the lead alignment with the strongest ECG vector and good adhesion between the ECG electrode and the patient's skin.



Typical placement of ECG surface electrodes in an MRI

Necessary equipment for cardiac MRI:



5tesla magnet used in cardiac imaging and RF coil used in cardiac MRI

Cardiac MRI general principles:

Fast MRI sequences will be the technique of choice in cardiac exploration (ultrafast spin echo, fast gradient echo). As well as the RF pulse and gradient sequence, other options can be associated which also accelerate acquisition:

- Single-shot sequences
- Parallel imaging with phased array coils, in some cases dedicated to cardiac imaging.
- Optimized K-space filling: segmented K-space, K-space data sharing, partial K-space.

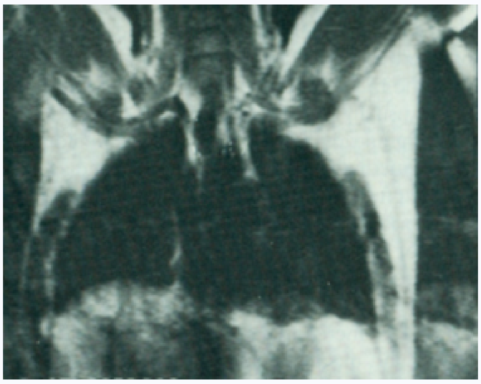
On the other hand, sequences of the echo planar type fail to yield good results due to magnetic susceptibility (pulmonary air, calcification).

Cardiac gating is a method that reduces motion artefacts in cardiac MR images caused by the phase mis-mapping produced as a result of heart motion and pulsatile blood flow.it uses the electrical signal of the heart or the mechanical flow of the vascular bed, to trigger each pulse sequence.

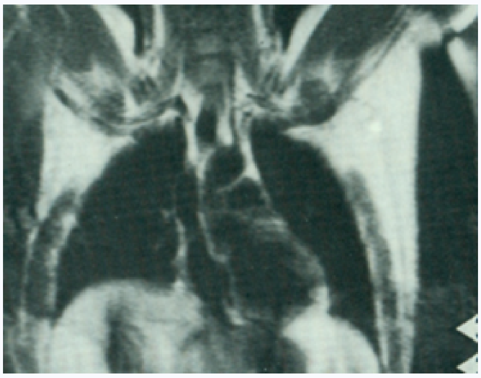
Two methods are used:

- ECG gating uses electrodes and lead wires placed on the patient's chest to detect the electrical activity of the heart.
- Peripheral gating uses a photo-sensor placed on the patient's finger to detect a pulse in the capillary bed.

The images below illustrate the effects of simple prospective cardiac and respiratory gating, alone and in combination, to improve MR images of the chest and upper abdomen. The heart is still not perfectly sharp because respiratory diaphragmatic motions have not been corrected.



Ungated



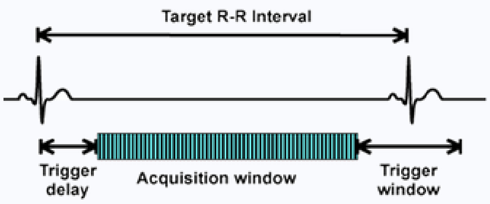
With cardiac gating

Navigator Technique

The navigator technique is used for patients who are not able to hold their breath. During free breathing, the motion of the diaphragm changes the position of the heart, greater vessels and liver causing inconsistent image quality. This is because the same anatomical position is not found for each sampled k-space point. A navigator consists of an intermittent two-dimensional pulse that excites a cylinder of spins, followed by a readout gradient in the direction of the long axis of the cylinder to acquire a 1-dimensional profile of the area of interest. The sequence employs a low flip angle (10) to minimize saturation. The sharp change in the signal intensity of the lungs and liver along the axis of the box is used to determine the position of the diaphragm. The navigator pulse is about 20ms long and is executed every 200ms. A scan acceptance window is calculated from the preliminary pre-scan data after which the actual scan acquisition starts. The navigation box detects the position of the diaphragm during each slice acquisition and imaging only occurs when the diaphragm falls within the acceptance window.

Cardiac Gating Parameters

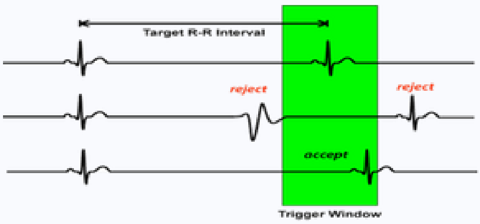
- Cardiac gating is typically performed using the detection of the R-wave since this is usually the most prominent feature of the EKG. The R-wave coincides with the beginning of ventricular systole. In prospective cardiac gating, MR data acquisition begins after being triggered by the first R-wave. The acquisition is completed before the next R-wave in a period known as the R-R interval. The cycle repeats with the next R-wave.



Target R-R interval

- The R-R interval in milliseconds (msec) and the heart rate in beats per minute (bpm) are inversely related by the formula:R-R (msec) = 60,000 ÷ heart rate (bpm).
- •Heart rates of 60–100 bpm, therefore, correspond to R-R intervals of 1000–600 msec.

- The repetition time (TR) in a prospectively gated sequence cannot be freely set but must be a multiple of the average R-R interval. Thus for a patient with heart rate = 60, the only choices for TR would be 1000 ms, 2000 ms, 3000 ms, etc. The R-R multiple chosen is sometimes called the gating factor.
- Trigger delay is the time interval between the first R-wave and the beginning of data acquisition. For systolic imaging the trigger delay should be set to in the range of 0−50 msec, but for diastolic imaging delays on the order of 150−250 msec are typical.
- The acquisition window occupies the bulk of the R-R interval and is the time when MR data is collected. For most prospective cardiac MR studies, the acquisition window occupies the middle 85-90% of the R-R interval.



The final 10-15% of each R-R interval is typically reserved as the trigger window. The trigger window serves as a buffer period to allow for slight variations in heart rate. In that way, if the next R-wave occurs slightly earlier or later than expected, it will still be detected. R-waves occurring outside the defined trigger window are rejected.

Triggering parameters

RR interval - This is interval from one QRS complex peak to the next peak on an ECG scan. The number of slices that can be acquired in a package is dependent on the RR interval. If more slices are required the sequence can be acquired in two packages (ie. 2 RR intervals).

Cardiac Frequency - RR interval is dependent on cardiac frequency i.e. number of heart beats per minute.

Trigger Delay -The delay from detection of the R-peak to start of acquisition.

RR Window - The RR window sets an acceptable lower and upper limit for the RR-interval and determines the permitted percentage variation in the interval length. The RR-interval lower limit determines the fastest accepted heart rate and the upper limit determines the slowest accepted rate. An RR window of 10 and 15 sets an acceptable RR interval of between 90%(110 minus 10%) and 115% (110+15%).

Arrhythmia Rejection

Useful in cases of patients with marked cardiac arrhythmia. Data acquired outside the permitted R-R window is rejected. In prospective triggering, arrhythmia rejection skips two R-R intervals (i.e. one R-R interval after the irregular beat). The system then resumes data acquisition after the next R-peak.

Positioning the electrodes in a Philips and GE scanner. The wireless VCG sensor has dual lead VCG monitoring capabilities based on 4 electrodes:

- Position the first electrode (green) approximately 1 cm left of the xiphoid.
- Position the second (white) and third (red) electrode to form a triangle around the nipple. The distance between the electrodes should be approximately 15 cm.
- Position the fourth (black) electrode to the left of the top electrode, near the axilla.

Connect the green, white, red and black leads to the VCG electrodes as shown in the diagram.

Positioning the electrodes in a Siemens scanner

The wireless ECG sensor has a monitoring capability based on 3 electrodes:

1. Position the first electrode (white) approximately 1 cm left of the sternal angle.
2. Position the second (green), third (red), and fourth (black) electrode to form a triangle around the nipple. The distance between the electrodes should be approximately 5 to7 cm.

Connect the white, green, red and black leads to the ECG electrodes as shown in the diagram.

Various Cardiac MRI Protocols achieved by cardiac gating :

A three plane SSFP (TrueFISP, B-FFE or FIESTA) localizer must be taken initially to localize and plan the sequences. These are fast single shot localizers with an acquisition time of under 25s which are excellent for localizing chest structures.

Conclusion:

We have demonstrated that the cardiac gating device, used with an ECG-gated fast gradient-echo imaging technique, significantly reduces the image artifacts due to cardiac motion. Compared to breath-hold imaging techniques, it provides better tag-myocardium contrast in the image, and therefore improves the efficiency of image analysis. Its clinical advantage is to assist cardiac MRI studies in which patients are unable to hold their breath for prolonged or repeated intervals. In addition, using this cardiac gating method, we were able to acquire high-resolution tagged cardiac images with more stripes across the heart wall, and more temporal phases through one cardiac cycle, without the need for suspended respiration. This will permit us to quantify more rapid and complex trans mural myocardial motion during systole and early diastole, as well as potentially to detect smaller myocardial function defects in patients.

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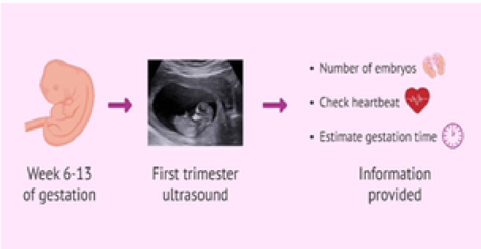
Topic - Role of Ultrasonography in detection of first trimester of pregnancy

Ajoy Paul, (BMRIT 2nd Year), Tripura Institute of Paramedical Sciences, Agartala, Tripura.

Introduction:
First trimester of pregnancy is the most fascinating period of human development. The last menstrual period (LMP) is generally used as a landmark for pregnancy dating, and the first trimester of pregnancy is defined as 12 weeks after the LMP, ultrasound is a commonly performed exam by an obstetrician or healthcare provider within the first 12 weeks of post conception.



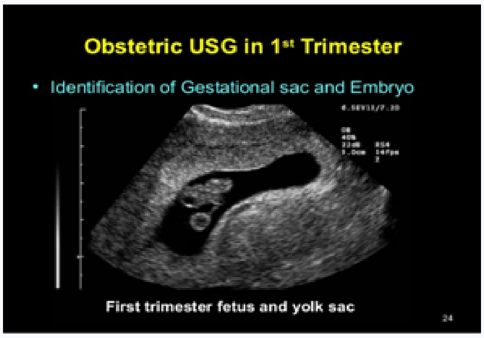
Aims and objectives:
Ultrasonography first-trimester aim to study various fetal development markers, e.g., gestation sac, yolk sac, fetal heart motion, CRL length, and fetal anatomy in both normal and abnormal pregnancies.

Anatomy: Anatomical survey in the first trimester include in -

- The ability to image the fetus in it's entirely in the view.
- Lack of bone ossification which obstructs view later in gestation.
- Increased fetal mobility.
- It allows imaging from many different angles.
- The uterus, cervix, adnexa should be examined.

Indications: First-trimester ultrasound examination is indicated for the following:

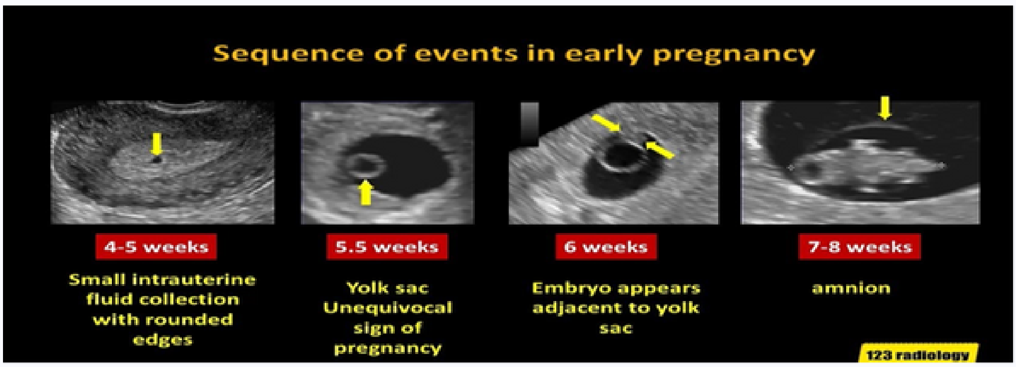
- Confirm presence of intrauterine pregnancy and multiple pregnancy.
- Evaluate:
  a. Suspected ectopic pregnancy.
  b. Pelvic pain.
  c. Maternal pelvic masses and / or uterine abnormalities.
  d. Suspected hydatidiform mole.
- Identify cause of vaginal bleeding.
- Estimate gestational age.
- Diagnose or evaluate multiple gestations.
- Confirm cardiac activity.
- Use as adjunct to procedures such as chorionic villus sampling, embryo transfer, and localization and
- removal of an intrauterine device.
- Assess for certain fetal anomalies (e.g., anencephaly) in high-risk patients.
- Measure nuchal translucency when screening for fetal aneuploidy.



Equipment:
Modern ultrasound unit with a low frequency (3-3.5) MHz curvilinear probe with acoustic gel.

Procedure:
Trans abdominal scanning is done with a distended bladder by using real-time scanners with alow-frequency probe (3/3.5 MHz). After this patient was asked to void urine and if needed nowadays we perform transvaginal sonography was done with the real-time sector scanner using a high-frequency (5/7.5 MHz) endovaginal probe.The scanning was done according to the technique and the procedure is explained in detail to the patient and consent was taken. The endovaginal transducer was covered with a sterile condom lubricated with gel before insertion. The patient was placed in the lithotomy position with a slightly reversed Trendelenburg tilt. The transducer was inserted approximately 6-8 cm into the vagina. Scanning was done in both coronal and sagittal planes. The manipulations used for obtaining images in various planes and depths were tilting or angling the shaft by its handle. Push-pull rotation thus bringing a deeper or closer region organ into the focal zone and a rotating motion of the handle along the longitudinal axis of the probe thereby rotating the scanning plane to achieve sections along a full 360° of the pelvis.

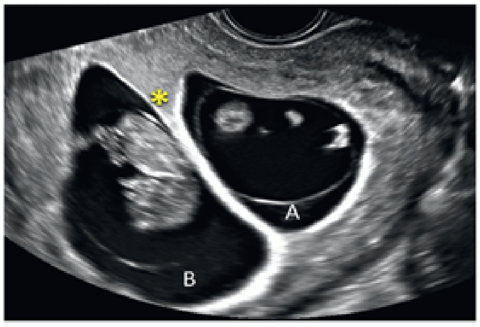
Data collected are maternal age, gestational age (GA), crown–rump length (CRL), biparietal diameter (BPD), head circumference (HC) and abdominal circumference (AC). The CRL was measured to the nearest mm in a sagittal plane with the fetal head in a neutral position. The BPD and HC were measured on a transverse view of the fetal head in a plane showing both thalami and the third ventricle. The AC was measured on a transverse section of the fetal abdomen, just above the level of the cord insertion. The GA was assessed from CRL measurement using the equation of Wisser (GA = 35.72 + (1.082 × CRL × 1/2) + (1.472 × CRL) − (0.09749 × CRL × 3/2).



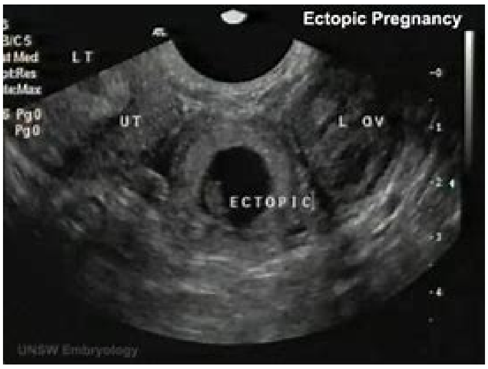
EIC & Pathology:-

- Uterus – long, trans both ovaries.
- Adnexa.
- Cervix & pouch of Douglas.
- Gestation sac – long & trans yolk sec visible.
- Fetal pole.
- M mode fetal heart.

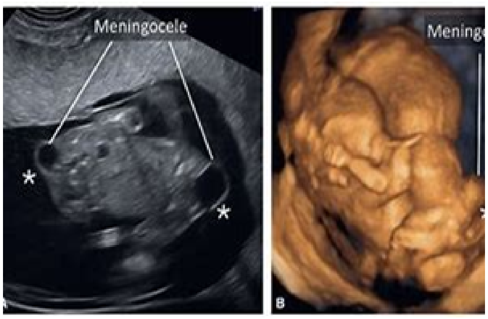
Trimester abnormal bleeding.



Showing multiple pregnancies



Ectopic Pregnancy



Meningocele

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Contrast Media and Breastfeeding

Hemant Prakash Joshi, Radiographer, Esic Mc & Hospital, Gulbarga, Karnataka.

Administration of either an iodinated or a gadolinium-based contrast media occasionally is indicated for an imaging study on a woman who is breast-feeding. Both the patient and the patient's physician may have concerns regarding potential toxicity to the infant from contrast media that is excreted into the breast milk.

The literature on the excretion into breast milk of iodinated and gadolinium-based contrast media and gastrointestinal absorption of these agents from breast milk is very limited; however, several studies have shown that

1. less than 1% of the administered maternal dose of contrast medium is excreted into breast milk
2. less than 1% of the contrast medium in breast milk ingested by an infant is absorbed from the gastrointestinal tract.

Therefore, the expected dose of contrast medium absorbed by an infant from ingested breast milk is extremely low.

Iodinated X-ray Contrast Media (Ionic and Non-ionic)

The plasma half-life of intravenously administered iodinated contrast medium is approximately two hours, with nearly 100% of the media cleared from the bloodstream within 24 hours. Because of its low lipid solubility, less than 1% of the administered maternal dose of iodinated contrast medium is excreted into the breast milk in the first 24 hours. Because less than 1% of the contrast medium ingested by the infant is absorbed from its gastrointestinal tract, the expected dose absorbed by the infant from the breast milk is less than 0.01% of the intravascular dose given to the mother. This amount represents less than 1% of the recommended dose for an infant undergoing an imaging study, which is 2 mL/kg. The potential risks to the infant include direct toxicity and allergic sensitization or reaction, which are theoretical concerns but have not been reported.

Gadolinium-based contrast media

The plasma half-life of IV gadolinium-based contrast agents is two hours, with ~100% excreted in 24 hours. It is estimated that <0.0004% of the maternal dose is absorbed by the infant, and it is also thought that any gadolinium in breast milk is in a stable chelated form:

- current guidelines do not support the cessation of breastfeeding after contrast administration
- a conservative approach, only if the mother remains concerned about any potential effects, may wait 12-24 hours, expressing and discarding milk over that period, but there is no benefit to waiting >24 hours

Recommendation: Mothers who are breast-feeding should be given the opportunity to make an informed decision as to whether to continue or temporarily abstain from breast-feeding after receiving intravascular administered iodinated contrast media. Because of the very small percentage of iodinated contrast medium that is excreted into breast milk and absorbed by the infant's gut, we believe that the available data suggest that it is safe for the mother and infant to continue breast-feeding after receiving such an agent. If the mother remains concerned about any potential ill effects to the infant, she may abstain from breast-feeding for 24 hours with active expression and discard of breast milk from both breasts during that period. In anticipation to this, she may wish to use a breast pump to obtain milk before the contrast study to feed the infant during the 24 hour period following the examination.

Explanations for Quiz

Likhit Singh, Sanjay Gandhi Memorial Hospital Delhi

1. b) Wilhelm Conrad Roentgen - Wilhelm Conrad Roentgen is credited with the discovery of X-rays in 1895. His experiments with cathode ray tubes led to the accidental discovery of X-rays, which revolutionized the field of medical imaging.

2. b) To focus the X-ray beam on the region of interest - The primary purpose of using collimation in radiography is to limit the size of the X-ray beam to the specific area of interest. Collimation reduces unnecessary exposure to radiation and helps improve image quality by reducing scatter radiation.

3. d) Angiography - Angiography is a specialized imaging technique used to visualize blood vessels. It involves injecting a contrast agent into the blood vessels and capturing X-ray images to assess the flow and condition of the vessels.

4. a) Intraoral film - In dental radiography, intraoral films are commonly used to provide high-resolution images of the teeth and surrounding structures. These films are placed inside the patient's mouth to capture detailed and localized dental images.

5. b) Breast cancer - Mammograms are X-ray examinations that are primarily used for breast cancer screening and early detection. They can help detect tumors or abnormalities in breast tissue before they can be felt manually.

6. a) It allows for faster image acquisition - Digital radiography allows for faster image acquisition compared to film-based radiography. Digital images can be seen instantly on a computer screen, eliminating the need for developing films, which saves time and allows for quicker diagnosis.

7. d) As Low As Reasonably Achievable - The ALARA principle in radiography stands for "As Low As Reasonably Achievable." It is a radiation safety principle that emphasizes minimizing radiation exposure to patients and healthcare workers while still obtaining diagnostically useful images.

8. c) X-ray radiography - X-ray radiography, also known as plain film radiography, is commonly used to evaluate bone fractures. X-ray images provide a detailed visualization of the bones, allowing healthcare professionals to assess the presence, location, and severity of fractures.

9. c) Radiation-induced cancer - Radiation exposure in radiography, although generally low and controlled, carries a small risk of causing radiation-induced cancer. The risk is typically minimized by following appropriate radiation safety protocols and using the ALARA principle to keep radiation doses as low as reasonably achievable.

10. a) To enhance soft tissue visualization - Radiopaque contrast agents, such as iodine-based dyes, are used in radiography to enhance the visibility of soft tissues during imaging procedures. These contrast agents selectively absorb X-rays, making soft tissues more visible on X-ray 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.

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