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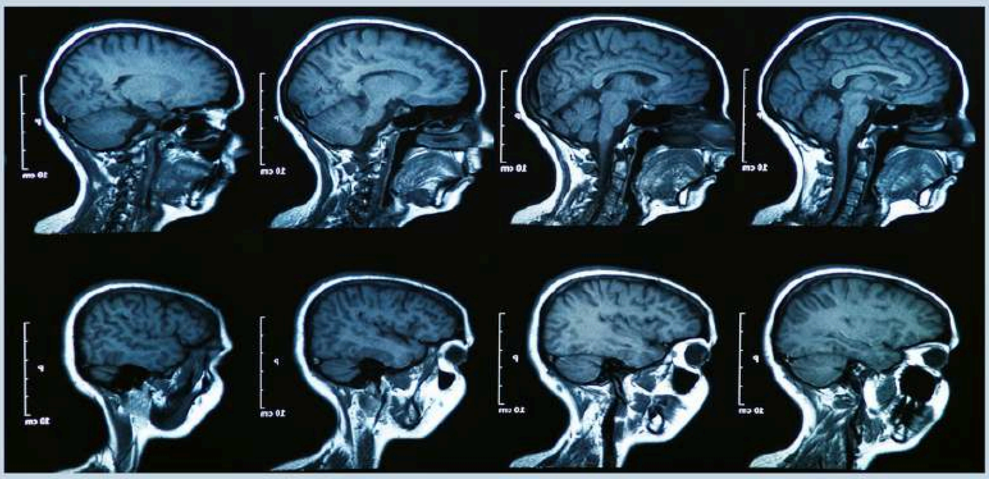
ISRRT
INTERNATIONAL SOCIETY OF RADIOGRAPHERS & RADIOLOGICAL TECHNOLOGISTS

Radiographers' Journal

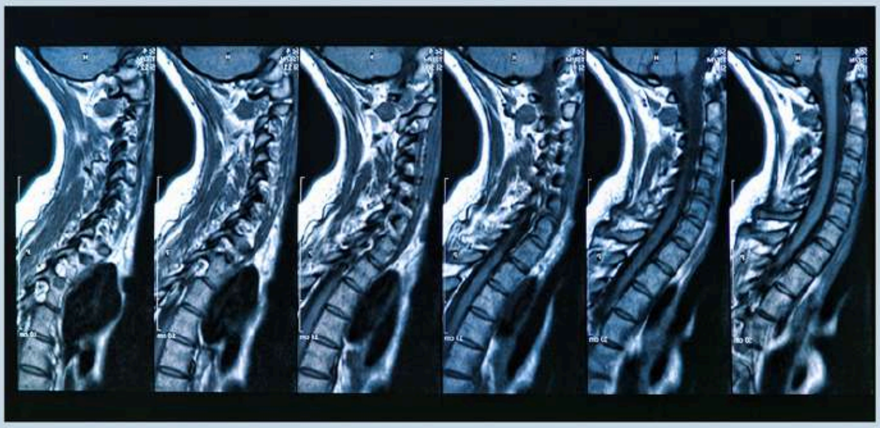
The official magazine of Society of Indian Radiographers (SIR)
Published by Radiographers' Association of Maharashtra (RAM)

November 2025









Radiography: where precision meets compassion for better patient care. Happy World Radiography Day!

Editorial

Shankar K. Bhagat
Editor-in-chief

Dear Esteemed Readers,

As we step into the concluding months of 2025, we proudly present the November issue of the Radiographers Journal, enriched with insightful contributions from professionals across the field. Each month, our journal showcases the collective efforts of radiographers, educators, clinicians, researchers, and students who continue to advance the domain of medical imaging. This issue reflects the evolving landscape of radiology—where clinical expertise meets technological innovation, and where patient-centered care remains at the heart of every advancement.

This month also marks a significant occasion—World Radiography Day, celebrated globally on 8th November to honour the discovery of X-rays and acknowledge the dedication of radiographers who work tirelessly to support accurate and timely diagnosis. Hospitals, colleges, and radiology institutions across the country observed the day with great enthusiasm through awareness programmes, academic seminars, workshops, cultural activities, and patient education initiatives. We are delighted to share selected photographs of these celebrations in this issue, showcasing the commitment, unity, and pride within our radiology community.

We begin this issue with a compelling piece titled "Unsung Heroes of Healthcare: Radiographers at Work." This article sheds light on the critical yet often under-recognized role of radiographers within the healthcare system. It highlights their responsibilities, professional challenges, and the indispensable contribution they make in emergency care, routine diagnostics, and interventional procedures. It stands as a tribute to radiographers who serve as the backbone of diagnostic pathways.

The second article, "Pediatric Chest Radiography: Techniques & Considerations," emphasizes the specialized skills required in imaging young patients. The author discusses radiation safety principles, immobilization techniques, positioning standards, and psychological approaches to reduce anxiety in children and ensure cooperation. The article reinforces ALARA practices and clinical excellence in pediatric imaging.

Our next feature, "Imaging in the Diagnosis and Staging of Prostate Cancer," provides an in-depth review of the imaging modalities used in assessing prostate malignancies—from ultrasound and CT to multiparametric MRI and PET-CT. It discusses emerging diagnostic biomarkers and the critical role of imaging in staging, treatment planning, and follow-up surveillance.

One of the most progressive discussions in this issue is "The Artificial Intelligence Revolution in Breast Imaging: Synthetic Contrast Advances MR." The piece explores cutting-edge developments in AI-driven synthetic contrast technologies that enhance MR imaging and reduce dependency on gadolinium-based contrast agents. It highlights improved diagnostic accuracy, workflow optimization, and the promising future of AI in early breast cancer detection.

Keeping pace with innovation, "Innovative, Photo-Realistic Medical Imaging through Cinematic Rendering" illustrates how cinematic rendering is transforming radiological interpretation. The article explains how realistic 3D visualization enhances surgical planning, patient communication, and interdisciplinary collaboration. Its wide applicability in trauma imaging, oncology, and complex anatomical evaluation is presented through recent research examples.

In "Coronary Magnetic Resonance Angiography: A Review," readers will find a comprehensive evaluation of CMRA technology, including its technique, diagnostic performance, strengths, and limitations. The review compares CMRA with CT coronary angiography and outlines its expanding role in non-invasive cardiac diagnosis, especially for young patients and those requiring repeated imaging.

Finally, "CO_2 Angiography in Renal Imaging: A Game-Changer for Contrast Safety" explores the use of carbon dioxide as an alternative contrast agent for patients with renal insufficiency or contrast allergies. The article discusses safety considerations, imaging protocols, and case studies demonstrating its value in interventional radiology.

Together, these articles reflect a dynamic progression in clinical practice, technology adoption, and patient-centric innovation. As imaging continues to evolve, radiographers must remain adaptable, informed, and dedicated to advancing standards of care. We extend heartfelt thanks to all contributors for their valuable work and encourage more professionals to share knowledge and experiences.

Wishing you insightful reading and continued excellence.
Warm regards,

Shankar K. Bhagat
Editor-in-Chief
Radiographers Journal

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Congratulations to the newly appointed Office Bearers of the Society of Indian Radiographers! This milestone marks the beginning of an exciting journey of leadership and innovation in the field of radiography. As you step into your new roles, your expertise and dedication will undoubtedly contribute to advancing the profession, fostering growth, and addressing challenges with insightful solutions. Your commitment to excellence and collaboration will be instrumental in shaping the future of radiography in India. Here's to a successful and impactful tenure, filled with achievements and progress that will inspire your peers and set new benchmarks for the Society!

Shankar Bhagat, President, SIR.

C. Marimuthu, Secretary General, SIR.

G. Venkatramanappa , Treasurer, SIR.

Linse George, Jt. secretary , SIR.

K. Munirathinam
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Sunil Chavan
Co-Chairman, SIR

S. A Wajid
Chief Advisor, SIR

K Damodara Naidu
Director, Academics, SIR

IMAGINE 2025 Report

23rd National Conference of the Society of Indian Radiographers (SIR)

IMAGINE 2025 — the 23rd National Conference of the Society of Indian Radiographers (SIR) in association with Karnataka Medical Radiographers and Allied Technologists Association (KMRATA) and Karnataka State Government Radiology Imaging Officers Central Association (KSTGRIOCA) — was successfully conducted from October 31 to November 2, 2025, at Kasturba Medical College (KMC), Mangalore. The conference served as a distinguished platform that brought together radiographers, imaging technologists, educators, and researchers from across India. It fostered the exchange of ideas, innovations, and best practices aimed at advancing radiographic science and imaging technology. The conference was inaugurated in the presence of distinguished dignitaries including Chief Guest: Dr. H. S. Ballal, Pro-Chancellor, MAHE and Guest of Honour: Lt. Gen. (Dr.) M. D. Venkatesh, Vice-Chancellor, MAHE. Guests: Vilas Bhadane, President SIR, Jagdish Jagtap - Secretary General SIR, S A Wajid - SIR Sr. Advisor, Srinivasulu Siramdas - President, Medical Radiology, Imaging & Therapeutic Technology Professional Council, Ashok Walmiki - President, KSTGRIOCA, - Umakanth M D - President, KMRATA.

Their inaugural addresses emphasized the importance of technological adaptation, continuous skill enhancement, and interdisciplinary collaboration in medical imaging education and practice.

Other eminent personalities like Captain Brijesh Chowta, Member of Parliament, Dr. UT Ifthikar Fareed, Chairman of the Karnataka State Allied Health Council and Sudheer Kumar Reddy, Commissioner of Police, Mangaluru City also graced the conference with their presence.

Participation and Attendance

IMAGINE 2025 witnessed an impressive participation of around 700 registered delegates representing diverse academic institutions, clinical establishments, and research centers nationwide. Attendees included radiographers, technologists, students, postgraduates, PhD scholars, radiologists, and industry professionals, reflecting the collective strength and unity of the imaging community.

Scientific Programme Highlights

The **scientific programme** was meticulously curated to balance academic depth with clinical relevance. A total of **45 eminent speakers** from India and abroad delivered lectures, workshops, and discussions on the latest developments in imaging sciences.

Key features included:

- **Four hands-on masterclasses** on Artificial Intelligence, Cardiac Imaging, Radiation Protection, and Advances in MRI.
- **104 abstracts submitted**, comprising **53 oral and 51 poster presentations,** showcasing innovative research and practical applications in radiography, radiologic technology, and imaging informatics.
- Keynote address delivered by Dr. Dasharathraj Shetty (Manipal Institute of Technology): **"Speaking the Same Language: How Radiographers and AI Technocrats Can Build Better Solutions Together."**
- **Alumni and adjunct faculty talk** by Dr. Mithun Shekhar, Assistant Professor, Department of Radiodiagnosis, KMC Manipal& Mr Amal Shaji, Assistant Professor, Department of Medical Imaging Technology, Yenepoya (deemed to be) University, Bangalore and Dr. Elizabeth Joseph respectively.
- Sessions by **International speakers** Mr. Manzoor Ali and Mr. Sameer R. Khiste provided valuable insights on global advancements in imaging and radiography practice.

Scientific deliberations spanned topics such as CT, MRI, Ultrasound, Digital Radiography, and Molecular Imaging, alongside emerging domains like AI integration, workflow optimization, automation, radiation safety, and ethical practice. These sessions reaffirmed the pivotal role of radiographers and technologists in ensuring diagnostic precision, patient safety, and technological excellence.

Industry- Academia Collaboration

The industry exhibition at IMAGINE 2025 showcased a strong collaboration between academia and industry. Leading corporate sponsors and exhibitors like Boston Ivy Healthcare Solutions Private Ltd (United Imaging), Samsung India Electronics Pvt. Ltd., Wipro GE Healthcare Private Limited, presented cutting-edge diagnostic technologies, imaging systems, and software solutions, offering delegates an immersive experience with the latest tools and trends in medical imaging.

We gratefully acknowledge the support of our sponsors, whose contributions were instrumental in the success of the event.

Social and Cultural Events

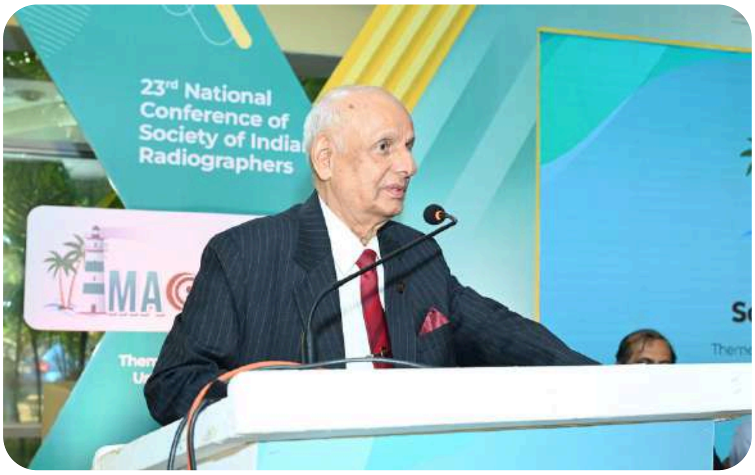
Beyond academics, the conference celebrated the spirit of togetherness through a vibrant cultural evening, where delegates experienced the rich heritage and hospitality of Mangalore. The local entrepreneurship-based flea market added a unique dimension, supporting small businesses while reflecting the theme of community wellness and creativity

Conclusion

IMAGINE 2025 marked a significant milestone in the academic and professional journey of India's radiography fraternity. By seamlessly integrating scientific excellence, professional networking, and cultural exchange, the conference reaffirmed the commitment of radiographers and imaging technologists toward innovation, patient-centered care, and lifelong learning.

Glimpses of IMAGINE 2025

23rd National Conference of the Society of Indian Radiographers (SIR)



Glimpses of IMAGINE 2025

23rd National Conference of the Society of Indian Radiographers (SIR)





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X-Ray Accessories

QUIZ to Recapitulate

Pawan Kumar Popli, Chief Technical officer-Radiology (Retd.), AIIMS, New Delhi

1. With reference to darkroom practice, what does **PQ** stand for?

2. During an **MCU**, which side oblique radiograph is taken while micturating in a female patient?

3. **I**n the case of **Hirschsprung's disease**, what bowel preparation is given for a **Barium Enema**?

4. What is **ICRP**?

5. In the case of **acromegaly**, which single view of the skull is important?

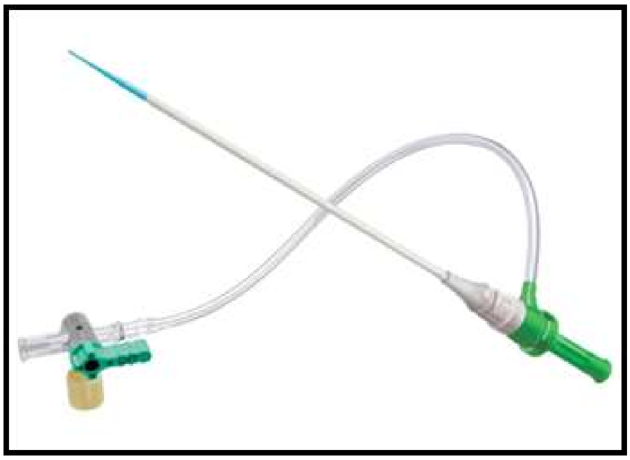
6. **MIP** in **CT** stands for what?

7. For which investigation was the first **AI-based CAD** approved by the **FDA**?

8. Name the view.

9. Identify the view and its Purpose.

10. Name the object



- Please send your answers through email on **pkpopli@gmail.com** on or before **10th December 2025.**
- Send your **Name with Hospital/Institution Information** and Passport size **photograph** along with the answers.
- **Best 3 participants** (early birds and correct) in each month will get the prizes **(Sponsored by JBD Publications).**
- Correct answers will be published in the next issue.
- If required /requested by participants more details about any question can be provided in upcoming issues under title **"Your Requests"**

Answers for the Quiz - October 2025 issue

1. Thin Barium Sulphate suspension.

2. For male urinary bladder-AP view 10-15 degree caudad angle is given to visualize neck of bladder free of pubic bones.

3. To Change catheters without losing access to the vessel.

4. To optimizing the magnetic field homogeneity.

5. 10 feet.

6. -20 degrees or 20 degrees upwards.

7. If a woman has missed her period, she should be considered pregnant and Radiology investigations / procedures should be postponed until the pregnancy is ruled out.

8. Esophageal Stenting

9. CT ring artifact, Primary action - recalibration of detectors

10. PTBD Catheter

The following readers participated in the Quiz – October 2025 issue.

Darji H. Kiritbhai
IKDRC - ITS
Medicity - Ahmedabad,Gujarat

Sriram. R,
DAE Hospital
Kalpakkam, Tamil Nadu

Ravindra Kumar
PGIMER, Chandigarh

Gulshan Kumar
Subharti College of Allied and Healthcare
Meerut, Uttar Pradesh

Keerthika
Panimalar College of Allied Health Sciences,
Chennai, Tamil Nadu

Abirami Sivaraj
Panimalar College of Allied Health Sciences
Chennai, Tamil Nadu

Kratika Rawal
Subharti College of Allied and Healthcare
Meerut, Uttar Pradesh

Radhika
Subharti College of Allied and Healthcare
Meerut, Uttar Pradesh

Simi Paxleal J
Dr. Jeyasekharan Medical Trust
Nagercoil, Tamil Nadu

Jenisha Shrestha
Assistant Professor
School of Allied Health Sciences
Reva University Bengaluru, Karnataka

B. Varunraj
Karpaga Vinayaga Institute of Medical
Science and Research Centre.
Chengalpattu, Tamil Nadu

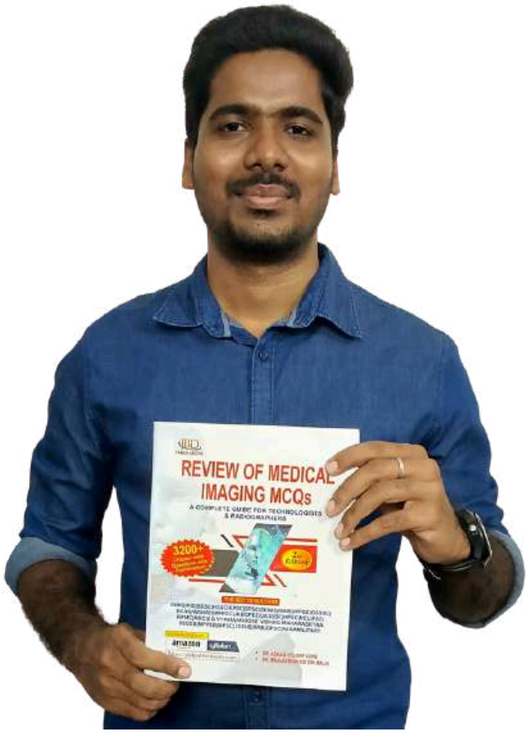
M. Gokul Shankar

Rohith M

G.Mubarak

M. Sugesh

Tagore Institute of Allied Health Sciences, Chennai, Tamil Nadu



September 2025 Quiz Winner with a Prize
Sriram. R, DAE Hospital, Kalpakkam, Tamil Nadu

World Radiography Day - 2025 Celebrations

Lilavati Hospital
Mumbai, Maharashtra

HCG Manvata Hospital
Nashik, Maharashtra

MGM Hospital, Navi Mumbai, Maharashtra

Shatabdi Hospital
Mumbai, Maharashtra

RKM Hospitals Vijayapura
Karnataka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Sales : +91-63648 82806 | Service : +91-63648 82820 | Mail : pinnacle@innvolution.in | Website : innvolutionimaging.com

ICMR Small Extramural Grant Awarded to Department of Medical Imaging Technology Manipal College of Health Professions (MCHP), MAHE, Manipal, Udupi, Karnataka

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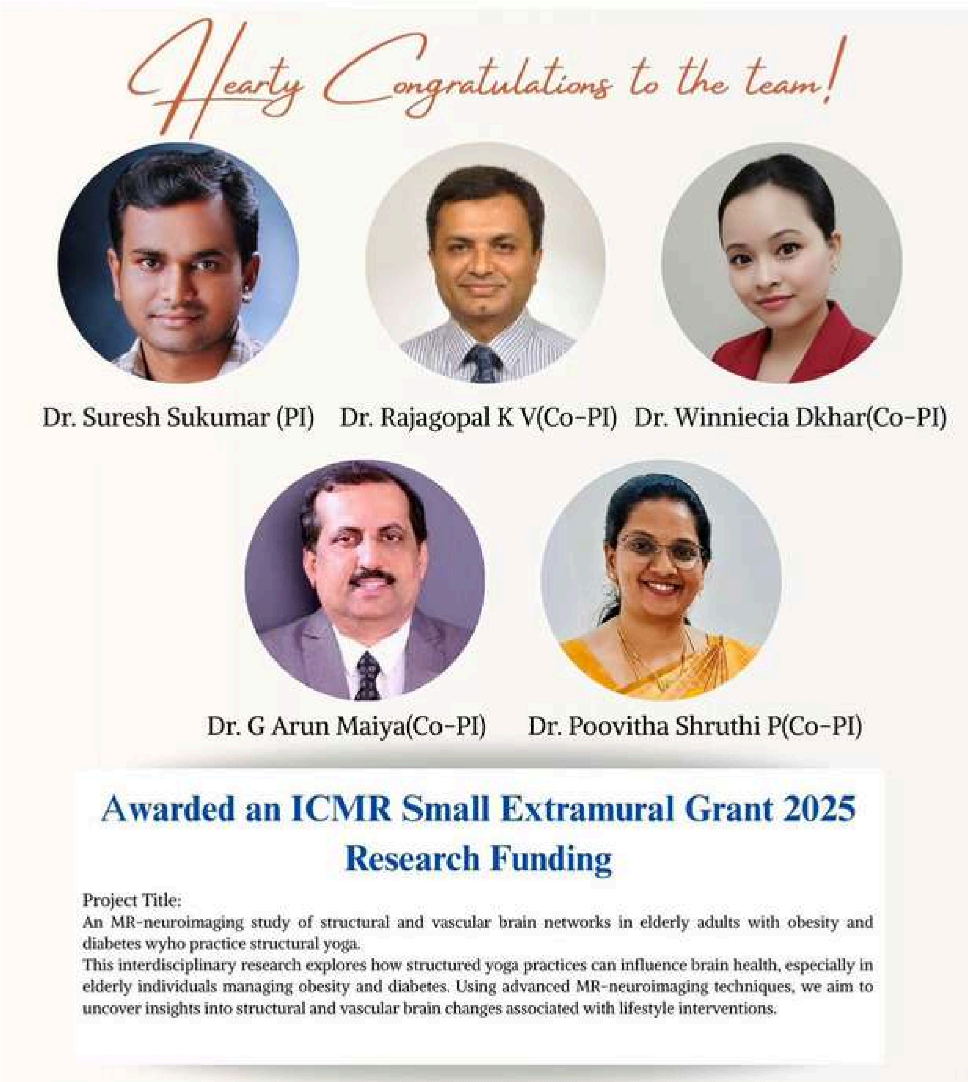
INVESTIGATOR- INITIATED RESEARCH PROPOSALS FOR SMALL EXTRAMURAL GRANTS - 2025 (Call Released on 02-January-2025)

List of Selected Projects

IIRPSG-2025-01-03486	Dr Suresh Sukumar	An MR-neuroimaging study of structural and vascular brain networks in elderly adults with obesity and diabetes who practice structural yoga	Manipal College of Health Professions,	Udupi, Karnataka



The Department of Medical Imaging Technology, Manipal College of Health Professions (MCHP), MAHE, Manipal, is proud to announce that Dr. Suresh Sukumar, Professor, and Dr. Winniecia Dkhar, Associate Professor and Head of the Department, have been awarded the prestigious ICMR Small Extramural Grant 2025, totaling ₹49 lakhs. This accomplishment is a significant stepping stone for medical imaging technology, enabling it to move forward and be in line with the broader medical profession.

The funded project, titled "An MR-neuroimaging study of structural and vascular brain networks in elderly adults with obesity and diabetes who practice structured yoga," is an interdisciplinary initiative aimed at exploring the impact of structured yoga practices on brain health, especially among elderly individuals managing obesity and diabetes. Through advanced MR-neuroimaging methods, the research team will investigate how lifestyle interventions influence both structural and vascular changes in the brain.

This achievement is also a symbol of growth and strength of medical imaging professionals.

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

Interview

Rahul Pandey, Country Head, Radiology – Bayer South Asia

Bayer Radiology: Pioneering Innovation for Decades

For over ten decades, Bayer Radiology has been a global leader in diagnostic imaging, playing a vital role in advancing radiology practice through pioneering contrast agents, injection systems, and integrated digital solutions. Starting from the launch of one of the first contrast media in the 1930s, Bayer has continually evolved into a trusted partner for radiologists worldwide, providing not only products but comprehensive workflow solutions that enhance diagnostic precision and patient care. The company's commitment to innovation and connectivity is exemplified by its expanding footprint in South Asia, where it combines global expertise with local innovation hubs to shape the future of radiology.

Q. How has Bayer's extensive history in radiology shaped its approach to innovation and patient care in today's South Asian market?

With a legacy spanning more than 100 +years, Bayer has consistently been at the forefront of radiology innovation, starting with early developments in contrast media in the 1930s. This deep-rooted heritage drives our commitment to advancing diagnostic imaging beyond individual products towards integrated solutions that empower radiologists. Today, Bayer leverages this experience to deliver precise, efficient, and connected imaging tools designed to improve workflow, enhance diagnostic confidence, and ultimately benefit patient care across South Asia and worldwide.

Q. Could you provide an overview of Bayer Radiology's current product and technology offerings that support radiologists in clinical and operational workflows?

Bayer's radiology portfolio combines high-quality contrast agents like Ultravist for CT and Gadovist for MRI with cutting-edge injection systems such as MEDRAD Centargo, designed to streamline clinical workflows. Alongside these products, Bayer integrates advanced software solutions encompassing dose management, workflow optimization, and AI-based diagnostic support. This comprehensive suite enables radiology departments to increase throughput, reduce technologist workload, and enhance the accuracy and safety of imaging across multiple modalities including CT, MR, and interventional procedures.

Q. How does Bayer translate this strong legacy into its current strategy for the India and South Asia markets?

Our strategy focuses on three pillars — innovation, access, and education. We aim to bring cutting-edge technologies to meet the growing demand for high-quality imaging. Our Radiology R&D center in Bengaluru plays a key role in driving AI, software, and connectivity innovations that enhance clinical workflows and reduce technologist burden. India's emergence as a global innovation hub enables us to build intelligent imaging ecosystems that localize solutions but maintain global standards. This approach ensures that radiology departments are not just equipped with devices but are connected, efficient, and data-driven.

Q. Could you elaborate on MEDRAD Centargo and how it fits into Bayer's vision for smarter, connected radiology workflows?

MEDRAD Centargo is a multi-patient CT injection system specifically designed for busy, high-throughput imaging environments. Its under-two-minute setup, auto-priming patient lines, and barcode-enabled documentation are game-changing features that reduce manual, repetitive tasks and allow technologists to focus more on patient care.

Centargo also stands out because it integrates seamlessly with Bayer's informatics and workflow platforms. This integration automates data capture, enhances traceability, and optimizes throughput without compromising safety. Through Centargo, we are moving from single-device innovation toward a connected, intelligent imaging suite that helps improve operational efficiency and clinical precision.

Q5. What role does digital transformation play in Bayer's vision for the future of radiology?

Digital transformation is central to our future vision. Our collaborations with various technology partners help us build AI-enabled devices and smart platforms that support radiologists in clinical decision-making and workflow automation.

As imaging demand grows globally, especially in South Asia, maintaining efficiency, accuracy, and patient safety becomes paramount. Bayer is committed to delivering solutions that connect data, automate routine processes, and allow radiologists to focus on what matters most—delivering excellent patient care.

MEDRAD Centargo, a multi-patient CT injection system designed for high-throughput imaging, marks a shift from single-device innovation to a connected, intelligent imaging suite that enhances efficiency and clinical precision.

World Radiography Day - 2025 Celebrations

Ramniranjan Jhunjhunwala College
Mumbai, Maharashtra

National Cancer Institute
Nagpur, Maharashtra.

Niramaya Hospital Chinchwad
Pune, Maharashtra

Radblox Healthcare Services

MMM Hospital, Chennai, Tamil Nadu

Radiation Dose to Patients From Common Imaging Examinations

	Procedure	**Approximate effective radiation dose	Comparable to natural background radiation for	*Estimated lifetime risk of fatal cancer from examination
ABDOMINAL REGION	Computed Tomography (CT) — Abdomen and Pelvis	10 mSv	3 years	Low
	Computed Tomography (CT) — Abdomen and Pelvis, repeated with and without contrast material	20 mSv	7 years	Moderate
	Computed Tomography (CT) — Colonography	10 mSv	3 years	Low
	Intravenous Pyelogram (IVP)	3 mSv	1 year	Low
	Radiography (X-ray) — Lower GI Tract	8 mSv	3 years	Low
	Radiography (X-ray) — Upper GI Tract	6 mSv	2 years	Low
BONE	Radiography (X-ray) — Spine	1.5 mSv	6 months	Very Low
	Radiography (X-ray) — Extremity	0.001 mSv	3 hours	Negligible
CENTRAL NERVOUS SYSTEM	Computed Tomography (CT) — Head	2 mSv	8 months	Very Low
	Computed Tomography (CT) — Head, repeated with and without contrast material	4 mSv	16 months	Low
	Computed Tomography (CT) — Spine	6 mSv	2 years	Low
CHEST	Computed Tomography (CT) — Chest	7 mSv	2 years	Low
	Computed Tomography (CT) — Lung Cancer Screening	1.5 mSv	6 months	Very Low
	Radiography — Chest	0.1 mSv	10 days	Minimal
DENTAL	Intraoral X-ray	0.005 mSv	1 day	Negligible
HEART	Coronary Computed Tomography Angiography (CTA)	12 mSv	4 years	Low
	Cardiac CT for Calcium Scoring	3 mSv	1 year	Low
MEN'S IMAGING	Bone Densitometry (DEXA)	0.001 mSv	3 hours	Negligible
NUCLEAR MEDICINE	Positron Emission Tomography — Computed Tomography (PET/CT)	25 mSv	8 years	Moderate
WOMEN'S IMAGING	Bone Densitometry (DEXA)	0.001 mSv	3 hours	Negligible
	Mammography	0.4 mSv	7 weeks	Very Low

*Risk Level	Negligible	Minimal	Very Low	Low	Moderate
Estimated additional risk of fatal cancer for an adult from examination	Less than 1 in 1,000,000	1 in 1,000,000 to 1 in 100,000	1 in 100,000 to 1 in 10,000	1 in 10,000 to 1 in 1,000	1 in 1,000 to 1 in 500
Note: These risk levels represent very small additions to the 1 in 5 chance we all have of dying from cancer.					

Important: Pediatric patients vary in size. Doses given to pediatric patients will vary significantly from those given to adults.

RadiologyInfo.org — The radiology information resource for patients

RSNA — Radiological Society of North America

ACR — American College of Radiology — Quality is Our Image

For the most current information, visit radiologyinfo.org.

** The effective doses are typical values for an average-sized adult. The actual dose can vary substantially, depending on a person's size as well as on differences in imaging practices.†

†Mettler, F.A., et al. "Effective doses in radiology and diagnostic nuclear medicine: a catalog." *Radiology*, July 2008; 248(1):254–263.

06.15

World Radiography Day - 2025 Celebrations

विश्व रेडियोलोजी दिवस पर सेलिब्रेशन कार्यक्रम आयोजित

ऋषि की आवाज ब्यूरो रोहतक। विश्व रेडियोलोजी दिवस के अवसर पर पं भ० द० शर्मा स्वास्थ्य विज्ञान विवि रेडियोलोजी विभाग व रेडियोग्राफर एसोसिएशन के तत्वाधान में विभाग के सेमिनार हाल में कार्यक्रम आयोजित किया गया। विभागाध्यक्षा वरिष्ठ प्रोफेसर डा० ज्योत्सना द्वारा दीप प्रज्वलित कर व सर रोंजन की प्रतिमा पर पुष्प अर्पित कर कार्यक्रम का शुभारम्भ किया गया।बैचलर इन रेडियोग्राफी छात्र सुमित खुराना द्वारा द्वारा रिप्रेजेंटेशन के माध्यम से एक्स रे की खोज व उसके बाद की विभागीय यात्रा को सभी के समक्ष रखा गया। कार्यक्रम की अध्यक्षता करते हुए विभागाध्यक्षा वरिष्ठ प्रोफेसर डा० ज्योत्सना ने विभाग के चिकित्सक ,कर्मचारियों व छात्रों को शुभकामनाएँ प्रेषित करते हुए बताया कि जर्मन वैज्ञानिक विल्हैल्म कोनार्ड रोंजन द्वारा एक्स रे की खोज के बाद चिकित्सा जगत में मरीजों के ईलाज के संदर्भ में बेहद क्रातिकारी बदलाव आए, अल्ट्रासाउंड, सीटी स्कैन व एमआर आई के माध्यम से डायग्नोसिस के साथ साथ कैंसर थैरेपी में भी किरणों का प्रयोग वरदान साबित हुआ है। एक्स रे खोज के बाद से मरीज की बिमारियों के निदान की प्रक्रिया पुरी तरह से बदल गयी।उचित डायग्नोसिस की वजह से मरीज के सटीक ईलाज की संभावना मजबूत हुई।

डायग्नोस हेतु रेडियेशन का प्रयोग जितना आवश्यक, उतना ही रेडियेशन के दुष्प्रभावों बारे जागरुकता आवश्यक: डा० सीमा रोहिल्ला

वरिष्ठ प्रोफेसर डा० सीमा रोहिल्ला ने बताया कि हस्पताल में आने वाले अधिकतर मरीजों का रेडियोलोजी तकनीक के लिए विभाग में जाना रहता है जिस वजह से विभाग की उत्कृष्टता का विशेष महत्व है। मरीजों की जांच के साथ साथ रेडियेशन सेफ्टी के संदर्भ में आमजन को जागरूक करने की दिशा में भी विभाग प्रयासरत रहता है। चिकित्सक समुदाय को कोई भी रेडियोलोजी से संबधित जांच लिखते हुए उसकी आवश्यकता पर गंभीरतापूर्वक विचार करना चाहिए , हर अनावश्यक जांच से मरीज का बचाव रखना चिकित्सक की डयूटी है। अक का आगमन जहां रेडियोलोजी प्रोफेशन में कार्यकुशलता बढायेगा वहीं पर नयी चुनौतिया भी पैदा करेगा जिस पर कार्य करना आवश्यक है। रेडियोलोजी जांच के दौरान चिकित्सक व रेडियोग्राफर्स को भी रेडियेशन प्रयोग से संबधी आवश्यक सभी सावधानियों का पालन करना चाहिए।

कार्यक्रम में पीजीआई रेडियोग्राफर्स एसोसिएशन के प्रधान दिनेश अरोडा, चैयरमेन जयसिंह छिक्कारा,महासचिव संजय सिंहमार ने सभी उपस्थितजनों का स्वागत करते हुए सभी को विश्व रेडियोलोजी दिवस की शुभकामनाएँ प्रेषित की।आहवान किया कि हम सभी मरीजों की जांच के दौरान रेडियेशन के प्रयोग में आवश्यक सावधानी अवश्य बरतें। रेडियेशन जोखिम से बचाव की पूर्ण जानकारी होना सभी पेशेवरों के लिए अहम है।

विश्व रेडियोग्राफी दिवस पर एमडीएम हॉस्पिटल में हुआ कार्यक्रम

हुक्मनामा समाचार

जोधपुर। विश्व रेडियोग्राफी दिवस के अवसर पर शनिवार को मथुरादास माथुर अस्पताल के डायग्नॉस्टिक विंग में कार्यक्रम का आयोजन किया गया।

कार्यक्रम के मुख्य अतिथि डॉ. एसएन मेडिकल कॉलेज के प्रधानाचार्य एवं नियंत्रक डॉ. बीएस जोधा थे। विशिष्ट अतिथियों में मथुरादास माथुर अस्पताल अधीक्षक डॉ. विकास राजपुरोहित, डॉ. कीर्ति चतुर्वेदी, डॉ. दलपत सिंह राजपुरोहित, डॉ. राजेन्द्र चौधरी तथा राजस्थान रेडियोग्राफर एसोसिएशन के प्रदेश अध्यक्ष अचला राम चौधरी उपस्थित रहे। कार्यक्रम में वक्ताओं ने एक्स–रे के जनक विलियम कोनराड रोन्जन द्वारा की गई खोज के 130 वर्ष पूर्ण होने पर श्रद्धांजलि अर्पित करते हुए उनके मानवता हितार्थ योगदान को नमन किया।

मुख्य अतिथि डॉ. बीएस जोधा ने अपने संबोधन में कहा कि रोन्जन के त्याग और मानवता के प्रति समर्पण से हमें प्रेरणा लेकर मरीज हितार्थ बेहतर सेवा प्रदान करनी चाहिए। उन्होंने रेडियोग्राफी में प्रयुक्त आयनिक विकिरण के खतरों और उसके सुरक्षित उपयोग के प्रति भी उपस्थित जनों को जागरूक किया। कार्यक्रम में संभागीय महासचिव चक्रवर्ती सिंह राणावत, नरेश शर्मा, धर्मेंद्र शर्मा, मोहन सिंह राठौड़, कमल सिंह, किशन गोपाल, जय शर्मा, वीरेंद्र कुमार, नरेंद्र सिंह, प्रदीप कुमार सहित अनेक चिकित्सक व रेडियोग्राफर उपस्थित रहे। कार्यक्रम का संचालन डॉ. सुनील विश्नोई ने किया।

Unsung Heroes of Healthcare: Radiographers at Work

Firdous Nazir, Radiographic Technologist, DMST, Pulwama, Jammu & Kashmir

Radiographers are the quiet strength of modern medicine. They translate invisible radiation into images that guide life-saving decisions. They stand behind the glass, not in the spotlight, yet without them, diagnosis stops.

Before I begin, I wish all my colleagues, students, and healthcare professionals a **Happy World Radiography Day**. May we continue to serve with dedication and compassion, carrying forward the legacy of **Sir Wilhelm Conrad Röntgen** with pride and purpose.

The Heart of Radiography

- Radiography blends science with empathy.
- Radiographers position patients with accuracy.
- They select correct exposure factors for diagnostic clarity.
- They follow radiation-safety protocols for every case.
- They comfort patients who are anxious or in pain.

Every image that helps a doctor diagnose starts with a radiographer's knowledge and composure. They make the unseen visible, the uncertain clear.

Story 1: The Midnight Trauma Call

It was midnight at GMC Anantnag. A young man from a highway crash arrived unconscious and bleeding. The trauma team needed chest and pelvic X-rays immediately before shifting him to CT.

Inside the imaging room, the radiographer worked fast. The patient was on oxygen and connected to monitors. Positioning had to be perfect without causing further harm. The cassette went under the stretcher, exposure was set manually, and the beam was aligned under pressure.

Within minutes, the images revealed fractured ribs and pelvic disruption. The surgeons stabilized the patient and proceeded with surgery. He lived because imaging gave clarity when seconds counted.

Lesson: In trauma care, a radiographer's calm precision can mean survival.

Story 2: Inside GMC Anantnag

The radiology department at GMC Anantnag rarely slows. Morning to midnight, emergencies flow in — road accidents, chest trauma, fractures, and medical cases.

One winter evening, a man arrived after falling from a rooftop. He was pale and unable to move. The doctor suspected spinal injury. I was on duty.

Using the portable X-ray unit, I took lateral and AP spine views directly on the stretcher. The patient was in pain, so every move had to be slow and calculated. Exposure was adjusted by experience, without automation. The images revealed a lumbar compression fracture. Orthopaedic

surgeons immobilized him immediately, preventing permanent nerve damage.

That night reminded me that radiography is not about pushing buttons. It is about judgment under pressure.

Lesson: Good radiographers do not depend on ideal conditions. They create them.

Story 3: The Compassionate Approach

An elderly man with severe arthritis came for a chest X-ray. He could hardly stand upright. The radiographer adjusted equipment height, gave support, and explained each step clearly. One clean exposure was enough.

The patient smiled and said softly, "Allah aapko kamyab kare. You made this easy."

Sometimes the most valuable skill in radiography is kindness. Machines cannot calm fear, but people can.

Lesson: Technical accuracy matters, but empathy completes the image.

Story 4: The Flooded Roads of 2025

In August 2025, heavy rains caused severe flooding across South Kashmir. Roads leading to GMC Anantnag were submerged in water. Normal transport had stopped. Many healthcare workers found it difficult to reach duty.

That morning, I decided to make my way to the hospital, no matter how difficult the journey. The only vehicle that could move through the flooded lanes was a tractor. Local volunteers were using it to help people cross waterlogged areas. I joined them and began the slow, bumpy ride through the submerged streets.

Cold rain fell continuously. The sound of the tractor's engine mixed with the splash of water. What is usually a fifteen-minute route took more than an hour. I carried my protective apron and essentials, knowing the hospital would need full imaging support that day.

When I reached GMC Anantnag, the hospital building was safe. Inside, the emergency section was already handling trauma and chest infection cases caused by slips, falls, and exposure to cold. The generators supplied intermittent power, but work continued without pause.

Throughout the day, our radiography team performed numerous X-rays. Despite wet clothes, exhaustion, and limited lighting, every film mattered. Each diagnosis helped a patient receive timely treatment.

As I left that evening, I saw the tractor still parked near the gate. It reminded me of what radiography stands for — not just machines and exposure settings, but resilience, duty, and courage in the face of challenge.

Lesson: Radiographers keep healthcare alive, even when roads disappear.

Why Radiographers Matter

·Radiographers form the backbone of diagnostic medicine.

- They support trauma and emergency management.
- They assist surgery, orthopaedics, and chest medicine daily.
- They ensure safe imaging for neonates, children, and critical patients.
- They operate equipment under high stress without error.

Without their presence, modern healthcare would lose direction. They are the unseen bridge between injury and intervention.

Technology and Humanity

Digital systems at GMC Anantnag speed up imaging, but machines cannot replace awareness. A radiographer reads situations beyond numbers — the tremor in a patient's hand, the fear in their eyes, the discomfort of lying still.

At the Dolphin Institute of Medical Sciences and Technology, I remind students that radiography begins with heart, not hardware. The most advanced detector still depends on a steady human hand and a compassionate mind.

Challenges Radiographers Face

Heavy workload: Continuous emergency calls and long shifts.
Recognition gap: The public rarely knows who captures their diagnostic images.
Old equipment: Many hospitals still rely on basic or outdated systems.
Safety pressure: Balancing ALARA principles with fast workflow.
Limited advancement: Fewer training and research opportunities in smaller regions.
Even with these barriers, radiographers keep working with accuracy and discipline. Their satisfaction lies in the success of a diagnosis, not in applause.

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Education and Mentorship

As an educator, I teach my students that radiography is both a science and a service.

They learn exposure techniques and positioning, but also tone, patience, and ethics. I tell them to respect every patient, no matter their background or condition.

One of my guiding principles is simple: A good radiographer never forgets that behind every film is a living person.

When Work Becomes Service

A few months ago, a small child came for a chest X-ray after an accident. Frightened and crying, he refused to lie down. I showed him the X-ray tube and said, "It's a camera that helps doctors find where the pain hides." He smiled and cooperated.

The film revealed a mild lung contusion. The doctors treated him quickly. A few days later, he waved at me in the corridor. That moment was worth more than any award.

Lesson: Every image is an act of care.

Voices from the Field

- Across India, radiographers mirror the same dedication.
- In Delhi, one handled an entire night of trauma cases alone after a highway pile-up.
- In Kerala, another identified early tuberculosis in a child during a school health camp.
- In Jammu & Kashmir, technologists braved rain, floods, and long nights to keep departments running.

Their names may not appear on discharge slips, but their work appears in every diagnosis.

Recognition and Respect

- Hospitals must bring radiographers into decision-making processes. Their ground experience improves workflow, safety, and cost-efficiency. Recognition can come through:
- Continuous training and CME programs.
- Involvement in radiation-safety and quality-control committees.
- Representation in professional events and research.
- Acknowledging radiographers strengthens the entire health system.

Final Reflection

Radiography has given me both purpose and perspective. It has shown me that true service is quiet. We do not prescribe medicine, but our work determines treatment. We may not be in headlines, but we are always in the background of recovery stories.

To every radiographer in cities, villages, and hospitals across India — this is your story too. You are the unseen foundation of healthcare. You carry machines on your back, films in your hands, and hope in your heart.

The next time someone looks at an X-ray, let them remember: behind that image stands a radiographer who showed up through rain, night, and flood — so that healing never paused.

Diagnostic Radiology QA Accessories

PRODUCTS & SERVICES

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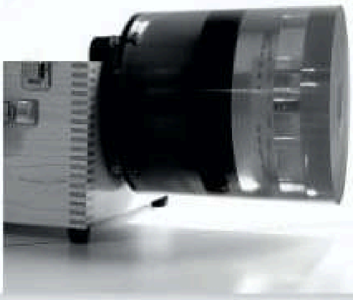

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World Radiography Day - 2025 Celebrations

K B Bhabha Hospital
Mumbai, Maharashtra

General Hospital Bailhongal
Belagavi, Karnataka

UP X-ray Technician Association

Holy Cross Hospital
Kozhikode, Kerala

World Radiology Day was celebrated in the Hospital under the stewardship of Dr. Neha Joshi, Head of the Radiology Department. The Insurance Commissioner , Sh. T Renuka Prasad and the Medical Superintendent Dr. Sanjay Vansh inaugurated the event. Sh. Praveen Kumar Dabas, Deputy Director (General) , Mr. Bishan Singh Senior Technical Assistant Radiology, Mr. Stephen Robert, Radiation Safety Officer and all the Staff of the Department were present.

Pediatric Chest Radiography: Techniques & Considerations

Nongmaithem, Sandhya Devi, MMRIT Student**, Subarna Debnath,** Asst. Professor,
Regional Institute of Paramedical and Nursing Sciences (RIPANS), Aizawl, Mizoram

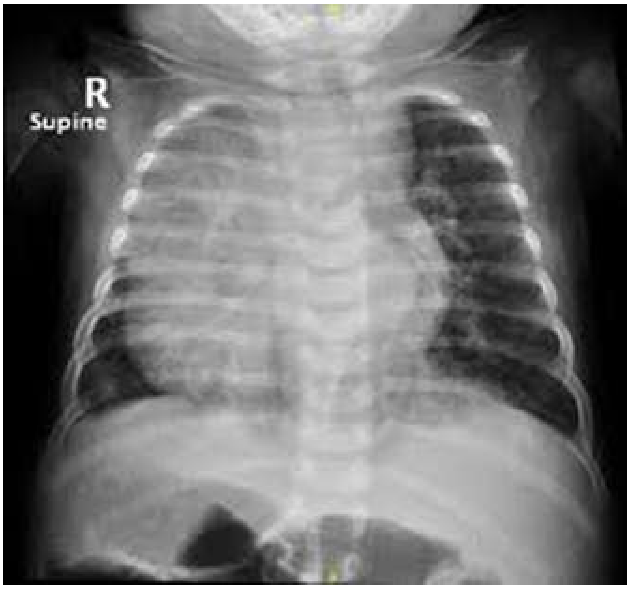
Chest Radiography is the first-line and most frequently performed imaging examination in pediatric patients. Respiratory disorders is one of the most common illnesses during childhood, especially in younger children, infant and neonates. Pediatric Chest Radiography focuses on checking abnormalities and complications in the thoracic cavity.

Abstract

This short paper has the aim to make known the techniques and considerations for pediatric chest radiography using any imaging modalities such as x-rays, Ct scan, MRI. The proper care and steps need to be performed while handling younger and neonatal patients considering their involuntary movements and non-cooperation due to their young age as well as the radiation doses.

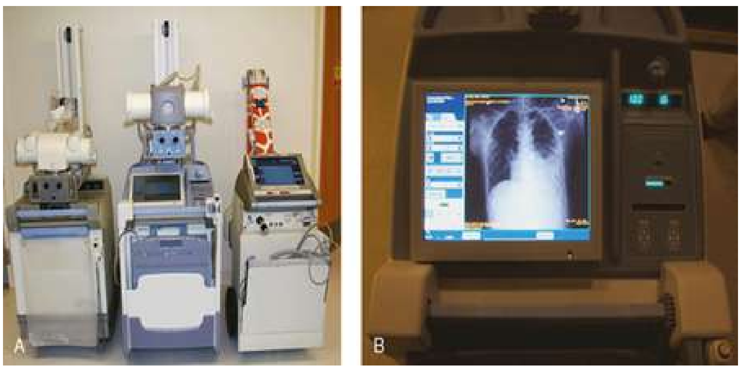
Modalities

X-rays are the most common modalities used for chest examination, such as congenital heart disease, pneumothorax, airway disease, foreign body aspirations, etc.



https://radiopaedia.org/cases/congenital-heart-disease-pre-and-post-operative-chest-x-rays

Diagnostic chest radiography can be generated with very low radiation dose by applying ALARA principle (As Low As Reasonably Achievable). Portable radiography known as mobile radiography is desired for NICU/SNCU patients, but most medical facilities preferred departmental films for better image quality besides the huge radiation exposure to the surrounding environment.

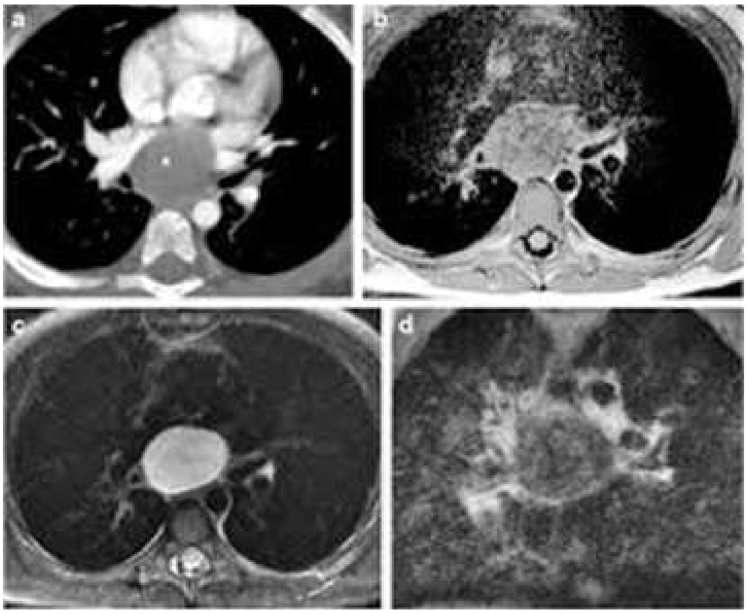


CT scan provides cross-sectional detailed images of the body. Pediatric chest CT scan can be taken in soft and HRCT imaging techniques to assess parenchymal lung disease such as cystic fibrosis or bronchiectasis, pneumonia, pyelonephritis and appendicitis.

https://radiopaedia.org/articles/cystic-fibrosis-pulmonary-manifestations-1

Techniques like AEC and iterative reconstruction can possibly reduce the tube voltage and current in HRCT examinations for low patient dose.

Pediatric chest MRI is alternative to CT scans for evaluating lung conditions, mediastinal structures (like tracheobronchomalacia) and the bony thorax.



https://link.springer.com/article/10.1007/s00247-022-05409-4

While patient cooperation is crucial and can be challenging due to motion from breathing and rapid heart rates. Most of the potential risks from MRI examination is related to sedation and contrast use.

Techniques

Positioning

To ensure a smooth workflow, preparation of the room, machines and arranging emergency kits beforehand are extremely useful. Along with basic preparation of the patient that are required for the x-ray examination.

Infants and younger children are best examined in supine, unless any special equipment is used. The arms must be extended, holding them next to the ears and the head should face forward, and should not be turned even slightly. In a clear and calm manner, they are need to be handled or talked to. Parental assistance is required by allowing them to use proper shielding equipment such as lead apron, gonads and thyroid shield etc.

As for ensuring proper inspiration and expiration with limited motion requires a clear and calm communication techniques to gain trust from the child. Use small detector and tight collimator to reduce scattered and control patient dose

The antero-posterior supine view is commonly opted for neonates, infants or critically ill younger patients, while the postero-anterior erect view is mostly performed for cooperative children for better visualization of the heart, thus providing better image quality. The lateral view is not often performed but is used for assessing the mediastinum, costophrenic recess, retrosternal or retrocardiac regions while the decubitus view is for detecting any pleural effusion or air trapping.

Exposure factor

Shorter exposure time allows for acquiring the image faster while minimizing motion blur, especially for uncooperative infant and younger children. Grids are not used for x-ray as the tissue volumes irradiated is small and therefore there is only little scatter. Different sizes of cassettes are used depending on the size of the patient. kVp of 60-80 are commonly used with 1-2 mAs, SID being 110 cm

- kVp: 60-80 kVp depends on age and size.
- mAs: 1-5 lower kVp improve contrast for tiny chest, very low mAs reduce radiation dose.
- Higher mA+ Short exposure time reduce motion blur for fast breathing/crying babies.
- Using Automatic Exposure Control (AEC) carefully on manual setting is necessary to get accuracy.
- SID should be kept minimum of 100-180cm.

Immobilization

The difficulty of chest examination varies depending on the age of the patient, especially for pediatric patients, often requiring a very well-trained radiographer who is familiar with the working environment, has experience with variety of distraction and immobilization techniques.

Proper immobilization techniques and devices should be used to minimize any voluntary motion, while the intrinsic motion can be controlled by short exposure time. These devices may include the use of adhesive tape, velcro strap or belt, towels, foam wedges or blocks, stretchy gauze bandage,

compression band which are used to hold chest and abdomen to prevent breathing motion, and so on.

When upright examination is necessary, a device called Pigg-o-Stat which is the golden standard for pediatric chest x-ray, examination. It allows restriction of motion while putting the infant in an upright position, securing the child. These techniques reduce the need for repeated or double exposure. Immobilization devices are not necessarily required for cooperative patient.

Considerations

If additional information is required, chest x-ray is employed for extra studies. But chest radiography involves the use of ionizing radiation. Children are more sensitive to radiation and receive more exposure throughout their lifetimes than adults. Thus, ALARA provides low doses of radiation, which greatly reduces the possibility of radiation-induced cancer. While conducting chest imaging in children, several points are to be kept in mind to provide precise results with least exposure to radiation all while giving the best comfort to the patients. Some of these include utilization of techniques appropriately, reducing radiation, getting the child in an appropriate position, and dealing with issues of sedation or anesthesia. Minimizing the radiation dose is of paramount concern while imaging pediatrics. This includes appropriate use of imaging parameters, regulation of the X-ray beam, and adherence to guidelines as advised by the American Academy of Pediatrics.

Conclusion:

Pediatric chest radiography remains one of the most valuable diagnostic tools in evaluating thoracic disease in children. Careful selection of exposure factors, appropriate positioning and use of immobilization techniques are essential to obtain diagnostic quality images. Strict adherence to the ALARA principle, along with child-specific protocols, ensures patient safety without compromising image quality and accurate imaging for better patients care and continues to play a vital role in diagnosis.

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- Contemporary Imaging of the Pediatric Chest by David Manson

World Radiography Day - 2025 Celebrations

**IIT Bombay Hospital
Mumbai, Maharashtra**

**AIIMS Raibareli
Uttar Pradesh**

**Mahatma Gandhi District Hospital
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Imaging in the Diagnosis and Staging of Prostate Cancer

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Abstract

Prostate cancer remains one of the most prevalent malignancies among men worldwide, posing a significant challenge to healthcare systems due to its heterogeneous biological behavior. Accurate diagnosis and staging are crucial for guiding patient management, prognostication, and therapeutic decision-making. Imaging plays an integral role across the disease continuum—from early detection and risk stratification to local and systemic staging. The advent of multiparametric magnetic resonance imaging (mpMRI) has revolutionized the diagnostic paradigm, allowing improved lesion localization, risk stratification, and targeted biopsy guidance. In the staging domain, hybrid modalities such as positron emission tomography/computed tomography (PET/CT) and positron emission tomography/magnetic resonance imaging (PET/MRI) using prostate-specific membrane antigen (PSMA) tracers have substantially enhanced sensitivity and specificity for nodal and distant metastasis detection. This review article summarizes the current role of imaging modalities in the diagnosis and staging of prostate cancer, including recent advances in mpMRI, PET-based techniques, radiomics, and artificial intelligence (AI) integration. Future perspectives highlight the role of molecular imaging and image-guided precision therapies as part of a personalized medicine approach.

Introduction

Prostate cancer is the most commonly diagnosed non-cutaneous malignancy in men and a leading cause of cancer-related mortality globally [1]. Early and accurate diagnosis, coupled with precise staging, is essential to determine appropriate management strategies—ranging from active surveillance to radical therapy. Historically, prostate cancer diagnosis relied on prostate-specific antigen (PSA) testing and digital rectal examination (DRE), followed by systematic transrectal ultrasound (TRUS)-guided biopsy. However, these conventional approaches suffer from significant limitations, including overdiagnosis of indolent tumors and under-sampling of clinically significant cancers [2]. The last decade has witnessed remarkable advances in imaging technologies that have transformed the diagnostic and staging landscape of prostate cancer. Multiparametric MRI (mpMRI) now serves as the cornerstone imaging modality for lesion detection, characterization, and guiding targeted biopsy. Furthermore, the emergence of PSMA-targeted PET tracers has dramatically improved the detection of metastatic and recurrent disease, even at low PSA levels [3]. Together, these modalities enable a more accurate, non-invasive assessment of disease extent and biological aggressiveness, facilitating risk-adapted treatment strategies. This article provides an in-depth review of imaging modalities in the diagnosis and staging of prostate cancer, with emphasis on mpMRI and PSMA PET-based imaging. The discussion includes their technical principles, diagnostic performance, comparative advantages, limitations, and future directions

Epidemiology and Clinical Context

Prostate cancer accounts for approximately 15% of all newly diagnosed cancers in men worldwide, with an estimated 1.4 million new cases annually [4]. Incidence rates vary geographically, being highest in developed nations due to widespread PSA screening and improved life expectancy. Despite high incidence, mortality rates have stabilized or declined in many countries owing to early detection and effective treatments [5]. Imaging serves multiple clinical purposes across the prostate cancer continuum: Detection: Identification of clinically significant tumors. Localization: Determining lesion site and extent within the prostate. Staging: Assessment of extracapsular extension (ECE), seminal vesicle invasion (SVI), nodal, and distant metastases. Guidance: Targeted biopsy and treatment planning. Surveillance: Monitoring treatment response or recurrence.

Imaging Modalities in Prostate Cancer

Transrectal Ultrasound (TRUS)

TRUS remains a standard imaging tool for prostate evaluation and biopsy guidance. It provides real-time visualization of the prostate anatomy, enabling systematic sampling of tissue cores. However, TRUS lacks adequate sensitivity and specificity for detecting clinically significant cancer, as many lesions are isoechoic to surrounding tissue [6]. Innovations such as contrast-enhanced ultrasound (CEUS) and elastography have attempted to improve accuracy by assessing vascularity and tissue stiffness, respectively, but their clinical uptake remains limited.

Multiparametric Magnetic Resonance Imaging (MRI)

Principles and Protocols

MRI combines anatomic imaging (T1- and T2-weighted sequences) with functional techniquessuch as diffusion-weighted imaging, apparent diffusion coefficient mapping, and dynamic contrast-enhanced MRI. Optional sequences include spectroscopic imaging and diffusion tensor imaging. The Prostate Imaging-Reporting and Data System provides standardized acquisition, interpretation, and reporting guidelines [7].

Diagnostic Role-MRI is now recommended prior to biopsy in men with elevated PSA or abnormal DRE findings [8].

- Detection of suspicious lesions.
- Localization for MRI-targeted biopsy.
- Risk stratification by correlating imaging features with Gleason grade.
- Assessment of extracapsular extension and seminal vesicle invasion.

Accuracy and Performance
Numerous studies have validated the superior performance of mpMRI over conventional methods. The PROMIS trial (2017) demonstrated that mpMRI had a sensitivity of 93% for clinically significant cancer, compared to 48% for TRUS-guided biopsy [9]. MRI-targeted biopsies detect more clinically significant cancers and fewer insignificant ones.

Limitations
- Variability in interpretation (inter-reader variability).
- False negatives in small or low-grade tumors.
- Contraindications to MRI (e.g., pacemakers, metallic implants).
- High cost and limited availability in resource-limited settings.

MRI-Guided Biopsy Approaches
- Cognitive fusion: Radiologist mentally correlates MRI findings during TRUS biopsy.
- Software fusion: Real-time co-registration of MRI and TRUS images using fusion platforms.
- In-bore MRI-guided biopsy: Direct needle placement under MRI guidance.

MRI-TRUS fusion-guided biopsy provides higher diagnostic yield and cost-effectiveness compared to systematic biopsy [10].

Computed Tomography (CT)
CT has limited sensitivity for intraprostatic lesion detection but remains useful for staging, particularly for nodal and skeletal metastases in advanced disease. However, conventional CT cannot reliably differentiate benign from metastatic lymph nodes unless enlarged (>8–10 mm) [11].

Bone Scintigraphy
Traditional 99mTc-MDP bone scintigraphy has been widely used to assess skeletal metastases. Although inexpensive and widely available, it lacks specificity and may yield false positives due to degenerative changes or fractures [12]. Its role is now largely supplanted by PSMA PET/CT, which offers superior sensitivity.

Positron Emission Tomography (PET)-Based Imaging
Earlier PET tracers such as 11C-choline, 18F-choline, and 18F-fluciclovine (Axumin) showed moderate sensitivity for recurrent prostate cancer, particularly at higher PSA levels (>1 ng/mL) [13]. However, they demonstrated suboptimal accuracy for small-volume disease.

Key Advantages:
- Detects metastases even at low PSA levels.
- Superior accuracy over choline and fluciclovine PET.
- Enables whole-body assessment in a single scan.

Clinical - The trial demonstrated that PSMA PET/CT had 27% greater accuracy than conventional imaging (CT and bone scan) for initial staging (92% vs. 65%) [14]. Hybrid Imaging: PET/MRI combines the molecular sensitivity of PET with the superior soft-tissue contrast of MRI. It allows simultaneous acquisition, improving detection of both local and distant disease, and reducing radiation exposure compared to PET/CT [15].

Imaging in Staging of Prostate Cancer
Local Staging (T-Staging)
mpMRI is the modality of choice for assessing:
- **Extracapsular extension (ECE):** Irregular bulging, obliteration of rectoprostatic angle.
- **Seminal vesicle invasion (SVI):** Low T2 signal extending into the seminal vesicles.
- **Neurovascular bundle involvement:** Important for surgical planning and nerve-sparing prostatectomy [16].

Regional Lymph Node Staging (N-Staging)
PSMA PET/CT surpasses MRI and CT for detecting nodal metastases, identifying even subcentimeter nodes invisible on morphologic imaging [17].

Distant Metastatic Staging (M-Staging)
Bone and visceral metastases are most effectively detected by PSMA PET/CTand PET/MRI, outperforming traditional bone scans [18].

Emerging Technologies and Research Trends
Radiomics and Artificial Intelligence
Radiomics involves the extraction of quantitative features from imaging data to identify patterns associated with tumor biology. Machine learning algorithms applied to mpMRI and PSMA PET can assist in:
- Automated lesion detection.
- Risk stratification.
- Prediction of treatment response and outcomes [19].

Theranostics and PSMA-Targeted Therapy
PSMA-based imaging has paved the way for theranostics, combining diagnosis and therapy. Radioligand therapy using enables targeted treatment of metastatic castration-resistant prostate cancer, guided by PSMA PET imaging [20]. WB-MRI with diffusion-weighted imaging (DWI) is gaining traction as a radiation-free alternative for systemic staging, particularly for bone metastases, providing high sensitivity and quantitative assessment of disease burden [21].

Future Perspectives
Future developments aim to integrate multiparametric and multimodal imaging data within precision oncology frameworks. Potential directions include:
- AI-driven image interpretation for automated lesion characterization.
- Radio genomic correlations linking imaging phenotypes with genetic alterations (e.g., PTEN, BRCA2).
- Integration of PET/MRI and PSMA theranostics into standard care pathways.
- Low-cost mpMRI protocols (parametric MRI) to improve accessibility in low-resource settings [22].

Discussion

The evolution of imaging in prostate cancer reflects the broader shift toward precision medicine. mpMRI has revolutionized the diagnostic algorithm, reducing unnecessary biopsies and improving detection of clinically significant disease. PSMA PET/CT, on the other hand, has redefined staging by enabling unparalleled accuracy in detecting nodal and metastatic involvement. These technologies have direct clinical impact on patient management, influencing decisions regarding surgery, radiation, and systemic therapy. However, widespread implementation remains challenging. Cost, scanner availability, need for standardized interpretation, and training represent key barriers. Moreover, integrating imaging biomarkers with genomic and clinical data is an ongoing effort requiring multidisciplinary collaboration.

Ultimately, imaging in prostate cancer has transitioned from a purely anatomical to a molecular and functional discipline, aligning with the goals of personalized oncology.

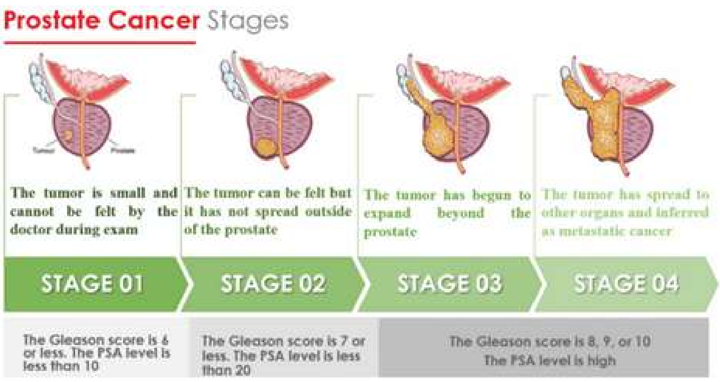

Figure: 1 Staging of Prostate Cancer [23].

Conclusion

Imaging plays a pivotal role in the modern diagnosis and staging of prostate cancer. Multiparametric MRI serves as the gold standard for local disease assessment and targeted biopsy guidance, while PSMA PET/CT and PET/MRI provide unmatched accuracy in staging and detecting recurrence. The integration of radiomics, AI, and molecular imaging heralds a new era of precision diagnostics and image-guided therapeutics. Future research should focus on cost-effective imaging strategies, standardization of interpretation criteria, and validation of imaging biomarkers for clinical decision support.

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The Artificial Intelligence Revolution in Breast Imaging: Synthetic Contrast Advances MR

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Abstract
Through the creation of synthetic contrast enhancement, this article examines how artificial intelligence (AI) has the potential to completely change breast magnetic resonance imaging (MRI). Intravenous contrast agents are frequently used in traditional breast MRI procedures to enhance breast tissue visibility and draw attention to any malignancies. These substances do, however, carry the danger of allergic responses, nephrogenic systemic fibrosis (NSF) in kidney disease patients, and higher expenses. This article explores the drawbacks of conventional contrast agents and presents the novel method of generating synthetic contrast-enhanced pictures from unenhanced MRI scans using artificial intelligence (AI), specifically Generative Adversarial Networks (GANs). Large datasets of paired unenhanced and contrast-enhanced images are used to train these GANs, which then learn to "hallucinate" the enhanced image and replicate the effects of contrast agents. The potential advantages of this technology are discussed in the article, including increased patient comfort by doing away with the need for intravenous injections, increased cost-effectiveness by using fewer costly agents, and improved patient safety by lowering the risks related to contrast agents. Additionally, it investigates how synthetic contrast might enhance diagnostic precision and possibly identify minute alterations that are difficult to spot using conventional techniques. The difficulties in creating and deploying this technology are also discussed in the essay, such as the requirement for thorough clinical validation, the generalizability of synthetic images across various scanners and procedures, and guaranteeing their correctness and dependability. Lastly, it examines the future of breast MRI, stressing the continuous research into improving AI models, investigating novel uses, and the possibility of a paradigm shift in the detection and diagnosis of breast cancer, which would ultimately result in safer, easier, and more efficient patient treatment.

Keywords: synthetic, Intravenous contrast agents, MRI, artificial intelligence (AI),

Introduction

Breast cancer is still the primary cause of cancer-related deaths for women globally, which emphasizes how important early identification and precise diagnosis are. The mainstay of breast cancer screening for a long time, mammography can have limited sensitivity, especially in women with dense breast tissue. With its exceptional soft tissue contrast and capacity to identify minute alterations suggestive of cancer, magnetic resonance imaging (MRI) has become a potent adjunctive technique. Breast MRI is essential for pre-operative planning, high-risk screening, and tracking the effectiveness of treatment. The intravenous injection of contrast agents, usually gadolinium-based substances, is a crucial part of many breast MRI exams. These substances make blood vessels more visible and draw attention to regions with higher vascularity, which are frequently linked to malignant development. Even while contrast-enhanced MRI has greatly increased the accuracy of diagnosis, there are still some restrictions and possible negative effects.

The possibility of negative reactions to the contrast agents themselves is a major worry. Despite being widely regarded as safe, these substances have the potential to cause allergic reactions in certain people, which can range from minor skin rashes to more serious anaphylactic events. Additionally, gadolinium-based contrast agents have been connected to nephrogenic systemic fibrosis (NSF), an uncommon but dangerous syndrome that is especially common in patients who already have kidney disease. Because of this danger, patients must be carefully screened before receiving contrast, and in some susceptible groups, using contrast-enhanced MRI may not be possible. In addition to safety concerns, the price of contrast agents raises the total cost of the MRI process, which may prevent some patients from getting one. Furthermore, some people may experience discomfort or anxiety from the intravenous injection itself, which makes the test much more difficult.

Research into alternate methods for improving breast MRI imaging has been prompted by the difficulties with conventional contrast agents. The use of machine learning and artificial intelligence (AI) to create artificial contrast enhancement is one exciting field of study.

By efficiently simulating the effects of injected contrast agents without the dangers and expenses involved, this novel technology seeks to produce virtual contrast-enhanced images from unenhanced MRI scans. Researchers are creating algorithms that can precisely forecast how breast tissue would appear with contrast based only on the information provided in the unenhanced scan by training complex AI models on massive datasets of matched unenhanced and contrast-enhanced images. By making breast MRI safer, more accessible, and more comfortable for patients while preserving or even increasing diagnostic accuracy, this method has the potential to completely transform the field. The ensuing sections will examine this technology's specifics, including its possible advantages, the difficulties encountered during development, and its bright future in the battle against breast cancer.

The challenges of traditional contrast agents

Although essential for improving breast MRI images, traditional contrast agents have a number of drawbacks. Even though they are typically small, allergic responses can happen, and more dangerously, nephrogenic systemic fibrosis (NSF) can develop in patients with kidney issues. These hazards can prevent the use of contrast in susceptible groups and call for thorough patient screening. Additionally, the cost of contrast agents raises the MRI's total cost, which may restrict access. Lastly, some patients may experience anxiety or discomfort from the intravenous injection itself, which makes the treatment less bearable. These drawbacks show that in order to increase breast MRI safety, accessibility, and patient satisfaction, alternative imaging techniques—like synthetic contrast enhancement—are required.

The rise of synthetic contrast: AI to the Rescue

A potential remedy for the problems with conventional contrast agents in breast MRI is the emergence of synthetic contrast. This cutting-edge method uses machine learning and artificial intelligence (AI) to create virtual contrast-enhanced images from unenhanced MRI scans. Large datasets of paired unenhanced and contrast-enhanced photos are used to train sophisticated algorithms, especially Generative Adversarial Networks (GANs). Based only on the data in the unenhanced scan, these GANs are able to "predict" how breast tissue will appear with contrast after learning the complex link between the two. Within the GAN, the discriminator network aims to differentiate between authentic contrast-enhanced images and the synthetic ones produced by the generator network. The generator successfully replicates the effects of contrast enhancement without the requirement for actual contrast agent injection by continuously improving its capacity to create realistic and accurate synthetic images through this adversarial training process. This AI-powered method has the potential to completely transform breast MRI by providing a more secure, economical, and patient-friendly substitute for conventional contrast-enhanced imaging.

AI's Methods for Learning Contrast Enhancement:

Large datasets of paired unenhanced and contrast-enhanced MRI images are used to teach AI to learn contrast enhancement. One The main idea is to train the AI to identify the minute alterations in breast tissue that take place following a contrast agent injection. This is accomplished by employing complex algorithms, especially Generative Adversarial Networks (GANs), which are frequently based on deep learning. Numerous instances of unenhanced MRI scans are shown to these networks along with their equivalent contrast-enhanced counterparts. 2. The AI successfully comprehends how the injection of the contrast agent alters the appearance of various tissues by learning to recognize the patterns and connections between the two. The AI basically learns to "hallucinate" the contrast enhancement, mimicking the effects of the injected agent without actually needing it. This ability to learn complex patterns from large datasets is what enables AI to generate synthetic contrast with increasing accuracy and realism. For example, it learns how tumors enhance, how blood vessels become more visible, and how healthy tissue responds. This learning process involves adjusting the internal parameters of the AI model, allowing it to gradually refine its ability to predict the contrast-enhanced image from the unenhanced one.

The Generator-Discriminator Duo:

The delicate interaction between two neural networks—the discriminator and the generator—that make up a Generative Adversarial Network (GAN) is at the core of synthetic contrast generation. Consider the generator as an artist entrusted with transforming unenhanced MRI scans into artificially improved visuals. Its objective is to create artificial images that are so lifelike that they can't be distinguished from actual contrast-enhanced scans. In contrast, the discriminator takes on the role of a critic, examining the visuals that are shown to it and attempting to ascertain if they are authentic or artificial. It's similar to an experienced art expert attempting to identify a fake.

At first, the generator's output may be rudimentary and simple enough for the discriminator to identify. Nonetheless, both networks get better via an ongoing feedback and improvement process. The generator responds by learning to produce increasingly lifelike forgeries, while the discriminator learns to spot the minute warning indications of artificial images. Both networks gain proficiency as a result of this adversarial training process, which pits them against one another. The discriminator improves at spotting fakes, and the generator improves at producing artificial images that replicate the effects of contrast augmentation. The generator eventually masters the technique to the point where its artificial images are nearly identical to actual contrast-enhanced scans, so "hallucinating" the contrast enhancement from the unenhanced input. The secret to maximizing the potential of synthetic contrast in breast MRI is this generator-discriminator combination.

Mimicking the effects of contrast agent

It takes more than just enhancing the image to replicate the effects of contrast in synthetic breast MRI. Conventional contrast agents, usually based on gadolinium, reveal variations in tissue permeability and blood flow. Greater contrast enhancement results from the increased vascularity and leaky blood vessels frequently seen in cancerous tissues.

One the AI must thus be trained to mimic these intricate physiological functions. It must comprehend how various tissue types improve, how tumor edges sharpen, and how the texture of the image as a whole change. Understanding the complex connections between pixel intensities in unenhanced pictures and the related changes seen following contrast injection is necessary for this. The AI mimics the dynamic changes brought about by the contrast agent by learning to selectively enhance particular areas and characteristics within the image rather than just adding brightness. It may learn, for instance, to highlight the brighter regions that correspond to tumor enhancement while largely ignoring other regions. The AI learns the fundamental physics and physiology of contrast enhancement by training on enormous datasets, which is necessary for this. In order to enable radiologists to precisely evaluate tumor size, location, and features, it is intended to provide synthetic images that not only resemble actual contrast-enhanced scans but also transmit the same clinically significant information. Synthetic contrast is a viable substitute for conventional contrast-enhanced MRI because of its capacity to replicate the intricate effects of contrast.

The potential benefits of synthetic contrast

Synthetic contrast in breast MRI has the following possible advantages:

- Improved Patient Safety gets rid of dangers like allergic reactions and NSF that come with contrast chemicals.

- Better Cost-Effectiveness increases accessibility by reducing the need for pricey contrast agents.
- Improved Patient Comfort: Removes the uneasiness and fear associated with intravenous injections.
- Potentially Higher Diagnostic Accuracy AI systems have the ability to identify minute alterations that conventional contrast misses.
- Enhanced Accessibility allows patients who are unable to receive contrast to undergo breast MRI.
- Faster Scan Times: By removing the need for administering contrast, this method may shorten the whole scan time.
- Decreased Healthcare Burden: Healthcare systems may experience less strain as a result of reduced expenses and increased efficiency.
- Better Workflow: Eliminates the need for a contrast injection, simplifying the MRI procedure.
- Personalized Medicine: It may be possible to customize AI models for specific patients.
- Future Uses: In addition to breast imaging, the technology can be used for additional MRI applications.

Overcoming the challenges

Significant obstacles must be overcome before synthetic contrast may be widely used in clinical settings, despite its enormous potential. One It is crucial to guarantee the synthetic images' dependability and precision. To ensure that these AI models faithfully capture the intricate circulatory patterns and minute tissue alterations essential for cancer detection, they must undergo extensive validation. Any errors could result in a delayed course of therapy or a misdiagnosis, underscoring the necessity of thorough testing and quality assurance. Moreover, these models' generalizability is essential. They must be strong enough to function reliably with a variety of MRI scanners, imaging techniques, and patient demographics. Large, diverse datasets must be used for training, and thorough validation research is necessary to guarantee consistent performance in every imaging situation. The smooth integration of synthetic contrast into current clinical procedures presents another difficulty. To interpret these AI-generated images, radiologists must receive training, and strong quality control procedures must be in place to track the models' performance over time. Lastly, the successful integration of this technology into standard clinical practice depends on regulatory approval and broad medical community support. By addressing these issues with continued investigation, thorough validation, and cautious use, synthetic contrast will become widely used, revolutionizing breast MRI and enhancing patient care in the process.

The future of breast MRI: A paradigm shift

Advances in artificial intelligence and the creation of synthetic contrast are driving a paradigm shift in the field of breast MRI. The goal of ongoing research is to improve the accuracy and dependability of synthetic images, enhance AI models, and increase their capabilities. In addition to replacing conventional contrast-enhanced images, researchers are investigating how these models could be able to extract even more useful diagnostic information from unenhanced scans, possibly exposing minute characteristics suggestive of early-stage malignancies. Early and more precise diagnosis could result from this, greatly enhancing patient outcomes. Additionally, there is great potential for improving screening methods and customizing treatment regimens through the creation of personalized AI models that are based on the unique traits and risk profiles of each patient. The methods created for the creation of synthetic contrast could be applied to various MRI applications in addition to breast imaging, transforming the detection and treatment of numerous illnesses. Researchers, physicians, and regulatory agencies will need to work closely together to incorporate synthetic contrast into standard clinical practice. To prove the clinical usefulness of these AI models and validate their performance, extensive clinical trials are necessary. Effective synthetic contrast picture interpretation will require radiologists to receive training, and strong quality assurance procedures will be essential for keeping an eye on the functionality and security of these AI-powered instruments. The technology has the potential to revolutionize breast cancer screening and detection as it develops and becomes more widely accepted. Synthetic contrast has the potential to greatly enhance patient care by making breast MRI safer, more accessible, more pleasant, and possibly even more informative. A significant development in medical technology, this move toward AI-powered imaging opens the door for a time when machine learning will be essential to revolutionizing healthcare and enhancing patient outcomes. The goal of this paradigm change in breast MRI is to use AI to transform medical imaging and usher in a new era of precision and customized medicine, not only to replace contrast agents.

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Abstract

Virtual reality pictures that are photorealistic are created by cinematic rendering. When creating a picture, it takes into consideration both direct and indirect illumination using a global illumination model to provide rendering of high quality. Monte Carlo integration is used to solve complex integral equations numerically, which are the mathematical models utilized in this visualization approach. In order to compute the final image, hundreds of light rays are tracked using a numerical rendering approach called path tracing. "Cinematic rendering" is a new 3D reconstruction technology that may create realistic 3D images from normal CT and MRI data, however it is not yet approved for usage in therapeutic settings. in producing remarkably lifelike characters—thus the term "cinematic rendering." The method used in cinematic rendering is based on path-tracing techniques. A volumetric dataset is used to duplicate the many pathways taken by billions of photons moving in all directions. The multidimensional and noncontinuous rendering equation of each particle is solved using the Monte Carlo integration formula to replicate real light propagation, resulting in a randomized finite number of light routes with an adequate and correct distribution. Thus, important sampling, a parallelization, and optimization strategy can be used to mimic light bouncing, reflection, and scattering. In order to achieve photorealistic quality, high dynamic range rendering light maps are applied to the rendering scene to simulate realistic lighting effects from real-world settings. Soft shadows, depth of field, subsurface scattering, refraction, absorption, and ambient occlusion are just a few of the intricate lighting effects that may be produced with this method. A natural lighting scene can be created by modeling camera settings including motion blur, shutter speed, exposure, and aperture. The outcome is still a physically accurate 3D representation of the imaging data by fusing the realistic simulation of photon trajectories with the simulated natural lighting.

Cinematic Rendering's benefits over Volume Rendering

Each pixel in a cinematic rendering is made up of billions of light rays that go through the voxels and interact with the environment. On the other hand, volume rendering uses the one light ray per pixel concept. As a result, the final pixel in volume rendering depends only on the light characteristics of the voxels along the light ray going to that pixel. The lighting effects of nearby voxels are also considered in cinematic rendering, producing effects like shadowing and reflections. Currently available 3D reconstructions are planar picture representations of volumes. Therefore, the reconstruction algorithm's use of reflections and shadows is essential for expressing depth perception and relationships in the through plane (with respect to the monitor screen).The more realistic light simulation of cinematic rendering improves the evaluation of spatial relations, especially in the through plane, when compared to the results of volume rendering, even if it has no effect on spatial resolution. Instead of using volume rendering's artificial light source, cinematic rendering uses intricate high dynamic range rendering maps to produce a natural lighting environment. Compared to a volume-rendered image, which focuses on enhancing depth and shape perception, a 3D image produced with cinematic rendering's different lighting effects is generally more realistic and aesthetically pleasing.

Software

For scientific purposes, we have installed this software on a workstation (syngo.via Frontier). Compared to Volume Rendering, this new method provides a much more lifelike representation of CT and MR data sets. Cinematic rendering considers the intricate relationship between photons and the human body, producing incredibly photorealistic images with an unparalleled level of realism, in contrast to volume rendering, which uses straightforward ray casting to compute the images. Clip planes allow you to cut into the volume, exactly like you can with Volume Rendering. Traditional Volume Rendering methods use present brightness, turbidity, and color parameters while operating on the supposition of an artificial light source. Effects like ambient influences, shadowing, refraction, occlusion, dispersion, and soft shadows achieve a large dynamic range because Cinematic Rendering physically simulates light diffusion. This is accomplished by recording a so-called spherical panorama, for instance, using a reflecting ball.
The lighting conditions are recorded so that they can be applied to all subsequent synthetic parts. Unlike basic volume rendering based on ray casting, cinematic rendering relies on the Monte-Carlo route tracing of volumetric data. Additionally, the film industry uses these and other techniques like motion blur and variable aperture width. Thus, the term "Cinematic Rendering" was used to describe this novel method.

Post-Processing Tools

Cinematic rendering's postprocessing tools, which can be used to create, modify, and enhance the final image, are among its most significant aspects.

Multiple View Options

The final created image can have a variety of view settings applied. A light map offers a variety of options to replicate various lighting conditions in the rendering scene's surroundings. The ability to use various transfer functions to transform the intensity and opacity values of the original CT datasets into a variety of predetermined color palettes is a key component of postprocessing in cinematic rendering. This allows for improved augmentation of specific tissue types. The exposure option mimics exposure to light time, which would change an image's brightness. Similar to photography, aperture and focus plane choices impact how sharply different areas of the image are rendered. One can adjust these parameters to focus on a specific area of interest, blurring the volumes in the foreground and background (e.g., with a wide aperture and closer focal plane) or to maximize the depth of field and, consequently, the evaluable data and volume in a given image (e.g., with a small aperture or distant focal plane). In postprocessing a generated image, it is possible to replicate two key concepts of light ray propagation: diffuse reflection (the reflection of light off a surface at numerous angles) and specular reflection (the reflection of light off a surface at one angle). Specular and diffuse reflection alternatives that replicate light reflection at one angle and at various angles, respectively. Lastly, a variety of colors can be presented to include or exclude specific anatomic components using the window level and width option, which is similar to what is used in traditional CT reconstructions.

Masks and Clip Airborne

Image editing can reveal and display a ROI with the help of masks and clip planes. Masks can be used, such as the heart-isolation mask, which separates the heart from every other structure. The coronary tree, calcium and bone, and the lungs and airways are examples of anatomical elements that can be isolated or eliminated in a similar manner. You can also apply a crop box and a clip plane to cut into rendered volume. To better show the ROI, the plane can then be moved, slanted, or rotated. Using a punch tool, areas can be eliminated from the finished image.

Anatomy

has grown in importance as a teaching tool for anatomy, nevertheless. When traditional planar, cross-sectional, and 3D generated graphics are incorporated into their anatomy education, students react well. Adding more lifelike images that more closely resemble real cadaveric specimens could bring value to cinematic rendering, which has the potential to improve virtual anatomy even further. There may be a more seamless transition from cadaver through 3D representations to conventional planar CT reconstructions because cinematically generated images are more realistic than volume-rendered images. Masks, clip planes, and crop boxes are examples of real-time modifications that can help create a repeatable virtual dissection. Despite the likelihood that cadaver dissection will continue to be a crucial component of medical education,

Applications

Preoperative and pre interventional planning, medical education, communication between doctors and patients, early illness identification, improved description and classification of lesions, and more are just a few of the many and diverse possible uses for cinematic rendering.

3d Printing

A quickly developing technology, three-dimensional printing has drawn more interest in the medical industry. It is already being utilized for surgical planning in a number of disciplines, such as interventional radiology, maxillofacial surgery, and thoracic surgery, as well as in medical education. However, the procedure is slow and not widely accessible at the moment. When 3D printing is unavailable, cinematic rendering can be used as a substitute since it shows anatomic features with better depth, shape, and structural delineation, giving them a photorealistic appearance.

Pre-Operative Settings

VR can be utilized as a preoperative and pre-radiotherapy planning aid in trauma patients, providing information about fragment size and position in respect to surrounding structures. Referring surgeons find VR to be highly acceptable and satisfactory. Oncology imaging could also benefit from the use of 3-D virtual reality. VR can be used for preoperative planning, tumor respectability assessment, and evaluation of tumor origin in challenging anatomical situations, such as the pelvis.

Post-Operative Settings

Following surgery, the VR approach can also give patients helpful information. For instance, it can be used to visualize the outcome of endovascular aortic repair and the connection between stent grafts and arterial vessels. Visualizing the intricate post-operative anatomy following coronary artery bypass graft surgery is another use for the VR technology. Here, it may be challenging to understand the variable course of bypass grafts, which frequently cross the axial picture plane multiple times in various directions, with just 2-D post-processing methods. VR offers visual information about veins and arteries that is often acquired through traditional catheter angiography. In this case, virtual reality is not only quick and affordable, but also non-invasive.

The main Advantages of Using Cinematic Rendering

- Boost cooperation and communication with patients.
- Improving communication to make the diagnosis process as efficient as possible. Using creative
- Visualization to collaborate with peers in an efficient and simple manner

Understanding Anatomy more quickly and easily

- Reduced rate of mistake
- Increased confidence and better results
- Planning and strategy prior to surgery

Disadvantages of Using Cinematic Rendering

- Increased Demand for Computational Power.
- Possibility of Artefact's.
- Cinematic rendering's complexity may necessitate certain software and knowledge, which could add to image professionals' burden.

Future Scope for Cinematic Rendering

Improved Diagnostics and Imaging in Medicine

Better Visualization: Compared to traditional volume rendering, cinematic rendering offers a more accurate and comprehensive 3D depiction of anatomical structures, which facilitates the diagnosis and comprehension of complicated illnesses.

Preoperative planning; In order to facilitate surgical planning and maybe enhance surgical results, preoperative planning can be utilized to visualize the spatial interactions between tumor, blood vessels, and surrounding tissues.

Early Disease Detection: By making small changes in tissues and organs easier to see, cinematic rendering may help diagnose diseases early and with greater accuracy.

Post-operative Assessment: It can be used to analyse the outcomes of procedures like endovascular aortic repair and to show how stent grafts and arterial arteries interact.

Medical Education and Training

Virtual Anatomy Classes: Rather than using dissected human parts, anatomy can be taught using 3D datasets from CT and MRI using cinematic rendering.

Use for surgical purpose: The use of cinematic rendering for pre-interventional and pre-surgical planning is also advantageous. Traditionally employed in neurosurgery and orthopaedic surgery, image-based treatment planning is also being used more and more in other surgical disciplines, including genitourinary surgery, cardiothoracic surgery, and minimally invasive cardiac and vascular procedures. Cinematic rendering creates a single, extremely realistic 3D picture of the structures of interest, while surgical planning is traditionally accomplished by mentally combining many images, perhaps taken with different modalities.

Patient education; has the ability to improve patient compliance and outcomes by providing patients with clear explanations of complicated medical diagnoses and treatment strategies.

Advancement

New developments in cinematic rendering techniques include neural rendering to create realistic images and movies, cloud rendering to offload computational workloads, and ray tracing to create photorealistic graphics.

Ray tracing: This method transforms VR/AR experiences and architectural visualization by simulating the behaviour of light to produce incredibly realistic representations with precise reflections, shadows, and global lighting.

Cloud rendering: This method uses distant servers, or the cloud, to process and produce visual images or animations, relieving local hardware of some of the computing strain and speeding up rendering times.

Neural Rendering: By adding learnable elements to the rendering pipeline, neural rendering pushes the limits of visual fidelity by creating photo-realistic image and video content.

Cinematic Rendering: In comparison to traditional volume rendering, cinematic rendering is a new post-processing technique for 3D visualization of CT scan data that provides a more lifelike depiction of anatomy.

Volume Rendering:

This is a common post-processing method for 3D images that is frequently used to show complex anatomical information. Each voxel includes one or more types of tissue, and the overall look of the voxel is determined by a weighted sum of color and opacity values.

Disease

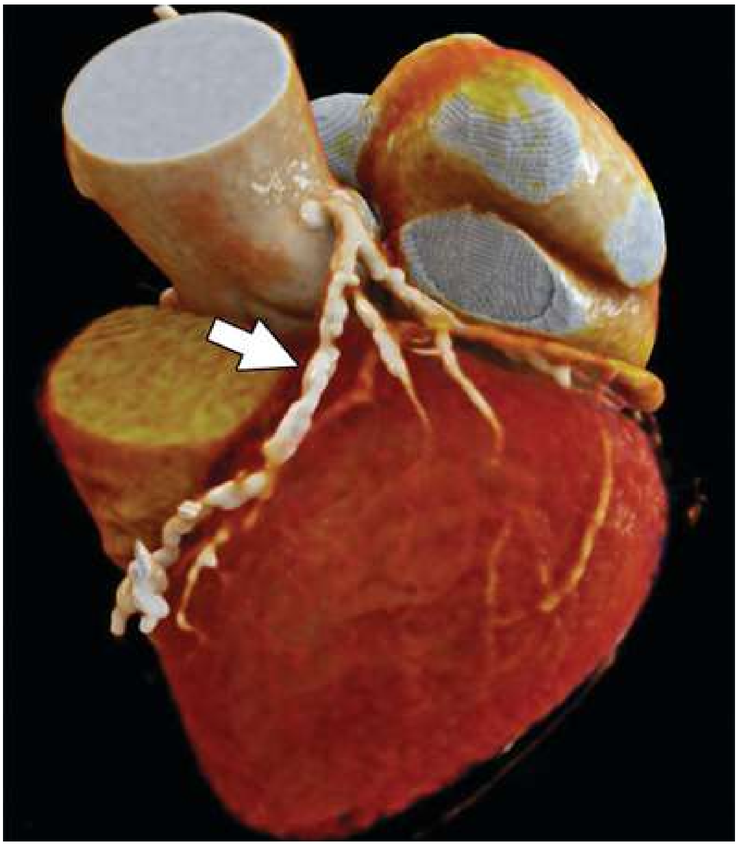

Fig. 1A - A 65-year-old woman is having her heart and coronary arteries CT-angiograph. because she has chest pain.

A reconstruction of the heart in a movie depicts the left anterior descending coronary artery's calcification (arrow).

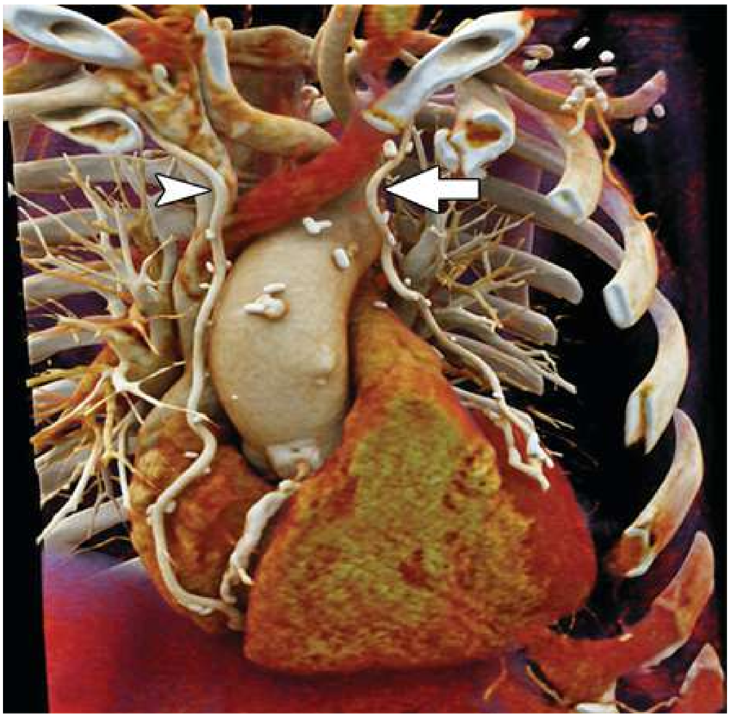

Fig. 1B -A 65-year-old woman is having her heart and coronary arteries CT-angiograph because she has chest pain. The right coronary artery (arrowhead) and LAD (arrow) calcification are seen in this cinematically produced reconstruction of the coronary tree.

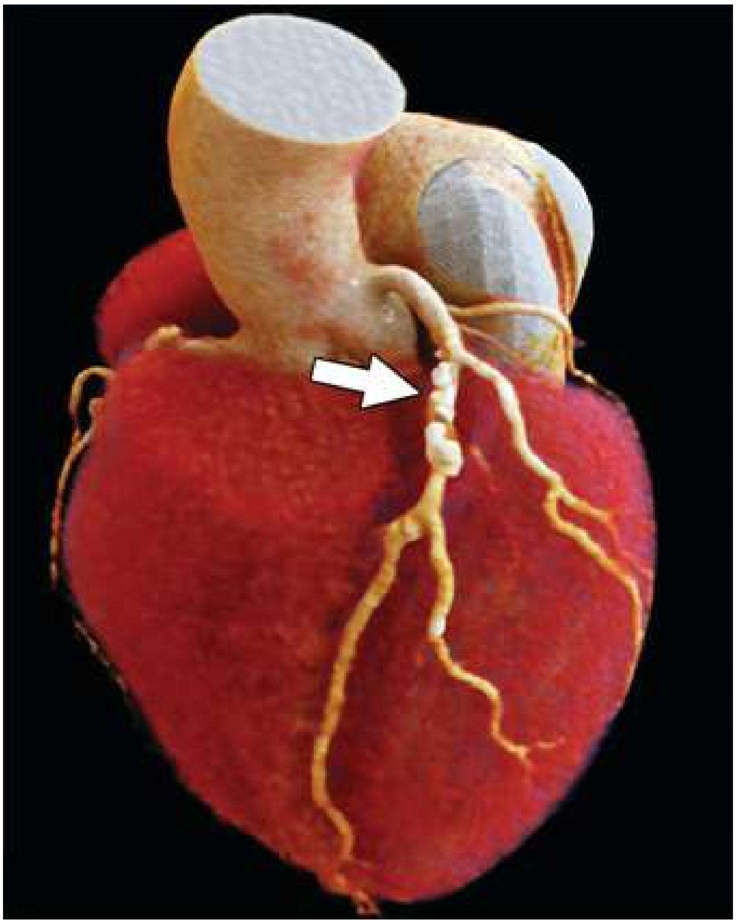

Fig. 2A - CT angiography of the heart and coronary arteries is being performed on a 70-year-old man who has chest pain.

The left anterior descending coronary artery (LAD) has a significant amount of calcification (arrow) in this cinematically produced reconstruction of the heart with heart isolation.

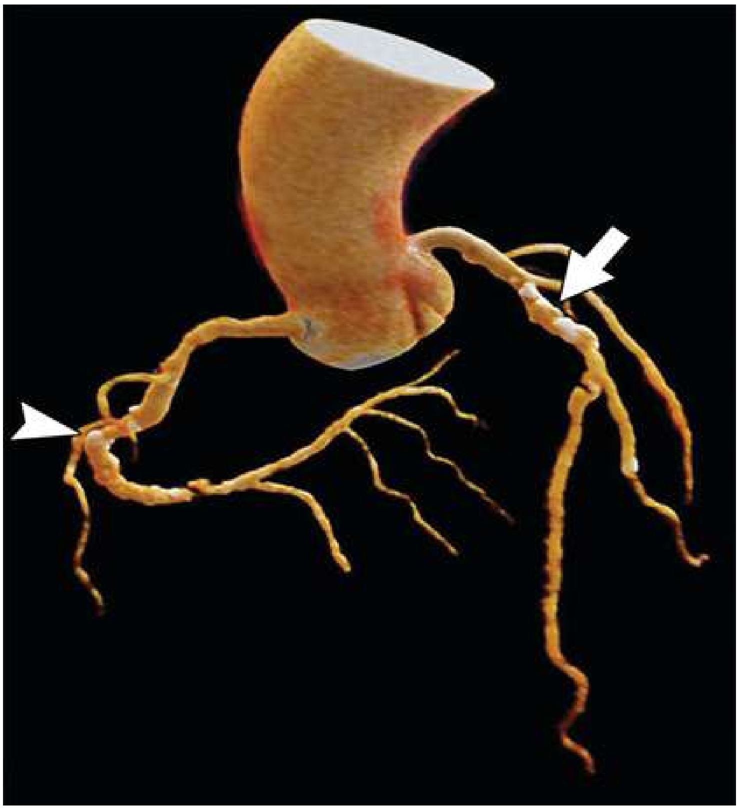

Fig. 2B - A 70-year-old guy who has chest symptoms is having his heart and coronary arteries CT-angiograph.

The left internal mammary artery (arrow) and the right internal mammary artery (arrowhead) graft to the right coronary artery are depicted in the cinematically rendered reconstruction following bypass surgery using a clip plane through the rib cage. With a photorealistic look of anatomic components and enhanced depth and form perception, cinematic rendering enables a thorough examination of coronary artery anatomy and coronary artery disease as well as a thorough evaluation of complex anatomic relations following bypass surgery.

Heart and coronary arteries - Due to significantly enhanced image quality, sensitivity, and specificity, coronary CT angiography has grown in importance as a tool for detecting coronary artery disease, evaluating congenital heart disease, guiding treatment, and evaluating before and after radiologic procedures. Although multiplanar 2D reconstructions will still be the primary method for detecting and classifying individual coronary artery stenosis, cinematic rendering can offer a comprehensive view of the coronary artery tree, enabling quick visualization of the disease's location and severity (Fig. 1). The identification and classification of anatomically complicated congenital defects, as well as the preprocedural and postprocedural evaluation of suggested and prior procedures (such as valve replacement and coronary artery bypass grafting), may also benefit from the added diagnostic value of cinematic rendering (Fig. 2).

Fig. 3A - Shows a 60-year-old woman with a headache having a CT angiography of her Willis circle. volume-rendered model of the head and intracranial arteries using a clip plane reveals a right posterior connecting artery paraclinoid aneurysm (arrow).

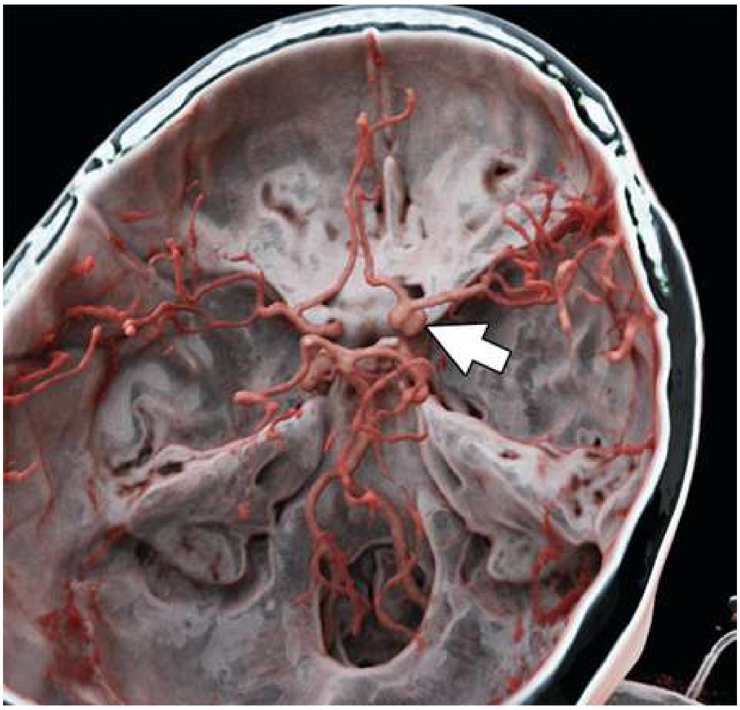

Fig. 3B - shows a 60-year-old woman with a headache having a CT angiography of her Willis circle.

B. The right posterior communicating artery's paraclinoid aneurysm (arrow) is visible in this cinematically rendered reconstruction of the head and intracranial arteries using a clip plane. The image provides better depth and shape perception, making it easier to see the intracranial arteries and bones' anatomical intricacies.

Intracranial and carotid arteries: CT angiography with volume rendering has increased in use for early disease identification and complication prevention because to its high accuracy in detecting intracranial aneurysms and carotid artery disease. It can be challenging to evaluate carotid and cerebral vascular architecture using 2D reconstructions due to their intricacy. With improved resolution and depth awareness, cinematic rendering offers a more realistic depiction, enabling one-stop visualization and picture modification of the carotid arteries and their branches (Fig. 3). Similar to coronary arteries, multiplanar reconstructions will probably continue to be the primary method for detecting and grading stenosis; however, cinematically rendered imagery may enhance the identification of aneurysms.

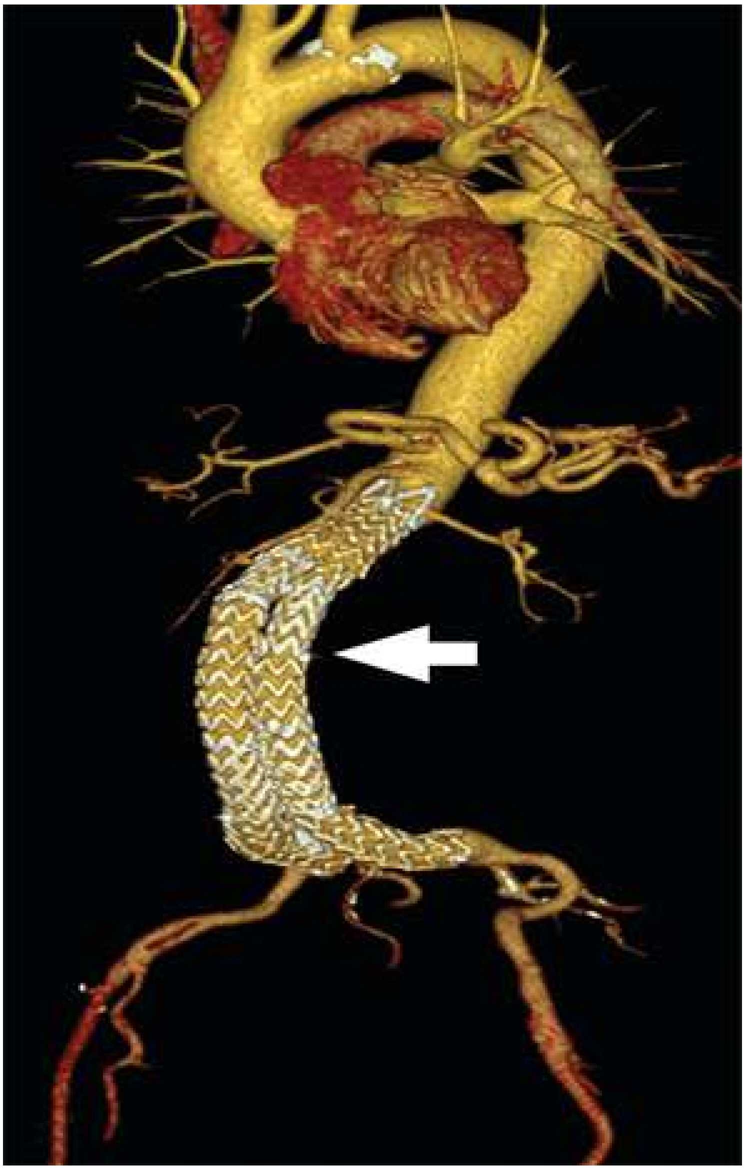

Fig. 4A - 76-year-old man having CT angiography of the aorta following endovascular treatment of an infrarenal aneurysm.

The aorta is isolated and the aortoiliac stent is visible in the volume-rendered reconstruction of the aorta following bone removal (arrow).

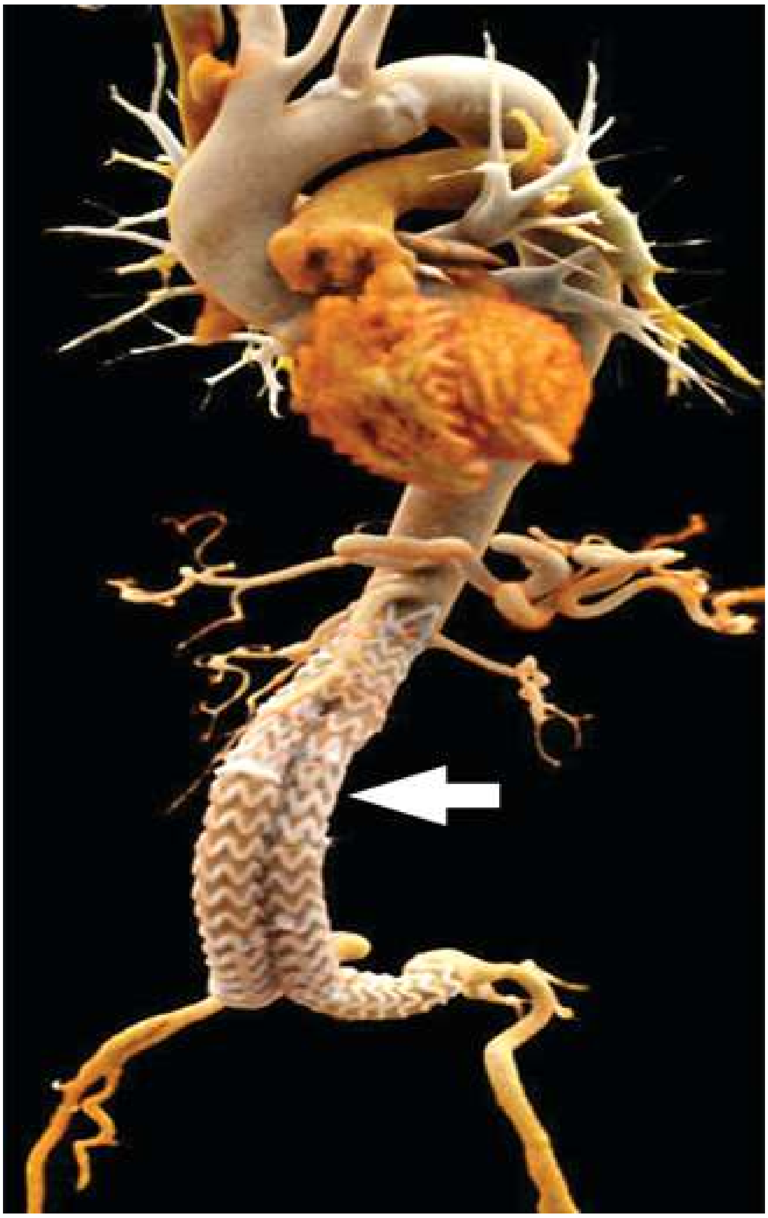

Fig. 4B - 76-year-old man undergoing CT angiography of aorta after endovascular repair of infra renal aneurysm.

Cinematically rendered reconstruction of aorta after bone removal shows more realistic representation of aorta, its branches, and aortic stent (arrow) than in A.

Aortic and lower extremity runoff - Atherosclerosis, aneurysms, dissection, and stenosis are among the other common sites of vascular diseases that can cause serious and sometimes fatal complications in the aortoiliac and lower extremity arteries. Characterizing and identifying these lesions is crucial to determining the location, extent, and severity of the disease as well as to aid in follow-up and treatment (Figs. 4).

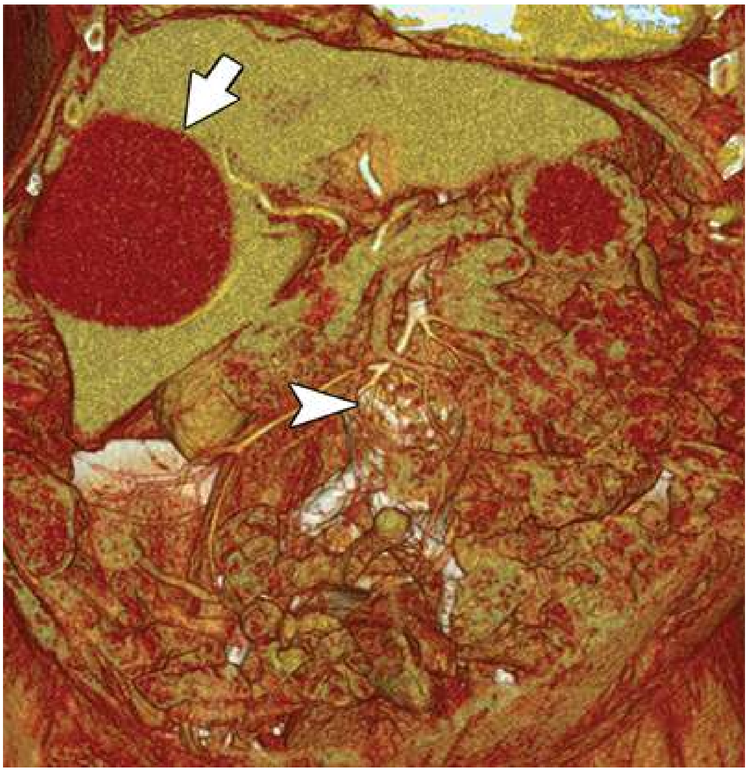

Fig. 5A - A 77-year-old man is having CT angiography as a follow-up procedure following an abdominal aortic aneurysm. Aortoiliac aneurysm (arrowhead) and a cyst (arrow) in the right hepatic lobe are visible in the volume-rendered reconstruction of the abdomen using clip plane.

Fig. 6A - A 60-year-old man with known metastatic liver disease is having a follow-up contrast-enhanced abdominal CT scan.

A clip plane applied to a volume-rendered reconstruction reveals several liver cancers (arrow).

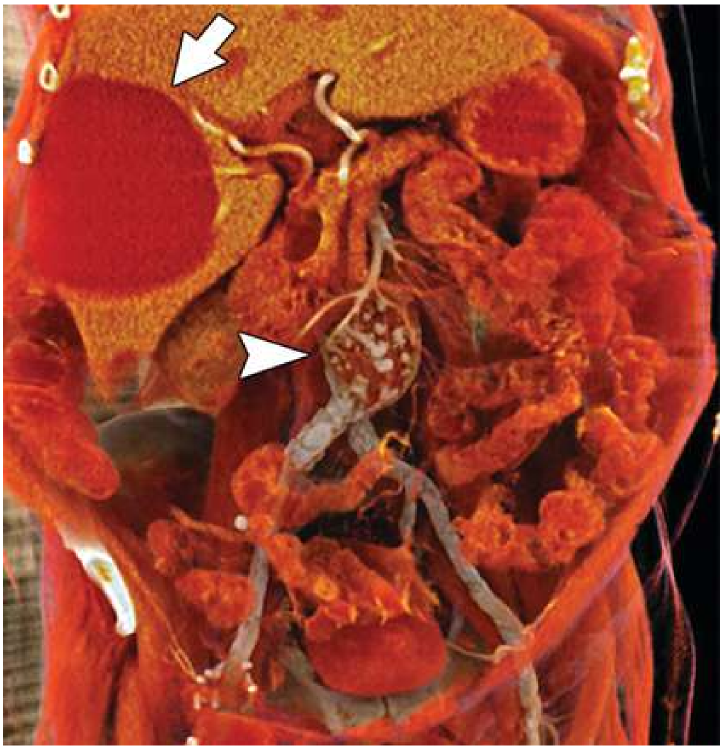

Fig. 5B - A 77-year-old man is having a CT angiography as a follow-up procedure following an abdominal aortic aneurysm.

A liver cyst (arrow) and an aneurysm (arrowhead) are visible in this cinematically produced reconstruction of the abdomen using a clip plane. Compared to A, this reconstruction exhibits significantly better depth and shape perception. Better structure definition is made possible by a larger color palette.

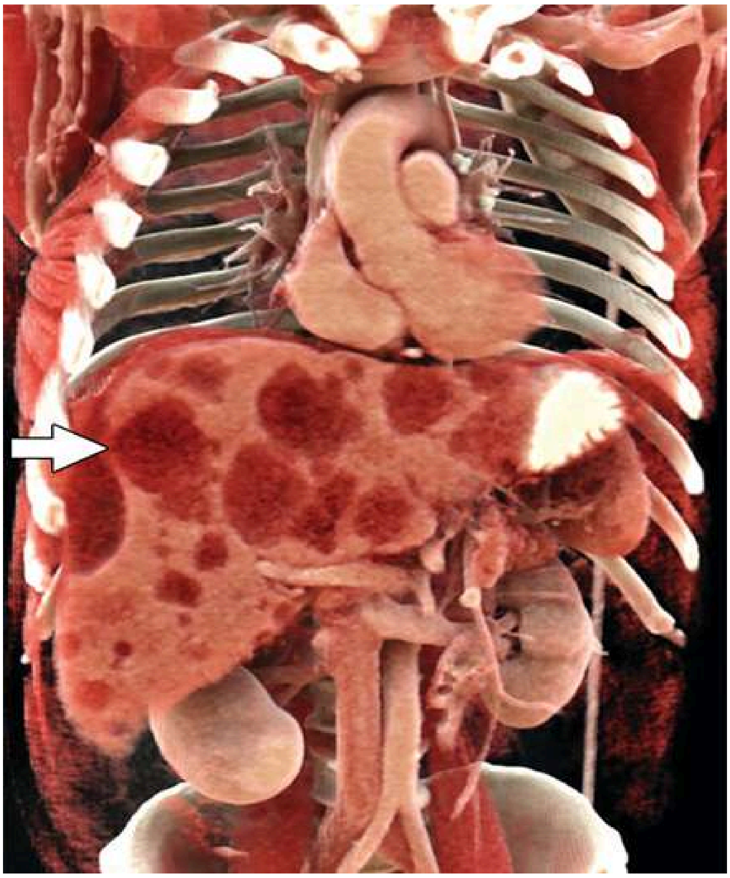

Fig.6B - Shows a follow-up contrast-enhanced CT scan of the abdomen in a 60-year-old man with known metastatic liver disease.

Compared to A, this cinematically rendered reconstruction with clip plane applied displays several liver tumors (arrow) with better anatomical detail and depth perception.

Abdominal

When it comes to liver and renal imaging, three-dimensional reconstructions can be a valuable tool for evaluating tumor burden, vascularity, and anatomic relationships to other structures. This can enhance respectability and perhaps improve tumor categorization and staging. Furthermore, in determining vascular anatomy, 3D imaging can be a useful tool for the preoperative and postoperative evaluation of liver and kidney grafts. Virtual colonoscopy is already proof that the intricacy of gastrointestinal anatomy makes it a good candidate for 3D visualization techniques. With the help of cinematic rendering, doctors and surgeons can better plan treatments and diagnose gastrointestinal disorders like tumor, herniation, strictures, and occlusions (Figs. 5 and 6).

Conclusion

Techniques for three-dimensional reconstruction, including volume rendering, are becoming more and more significant in several medical domains. Compared to volume rendering, cinematic rendering, a new 3D reconstruction technique, offers a realistic representation of imaging data and may improve diagnostic utility, especially in terms of greater shape and depth perception and a more natural and physically accurate image. Virtual anatomic visualization could undergo a paradigm shift as a result of this innovative method. However, more research is required to ascertain whether cinematically rendered pictures can be used for diagnosis in comparison to volume-rendered and cross-sectional images alone.

Limitations

The quality of the source dataset largely determines the quality of the final image produced by the cinematic rendering method. The 3D reconstruction will therefore be of lower quality if there is any decrease in image quality patient-, or scanner-based artefacts.

Since cinematic rendering uses a more complicated method than volume rendering, it takes more processing power to create 3D images, and the software must restart its calculations each time an image is altered. The implementation of this technology in everyday clinical practice, when time is a limited resource, is hampered by the resulting longer postprocessing periods compared to older procedures. which created the image by applying a mask and a clip plane. In the future, rendering performance may be increased by using graphics processing units rather than the currently employed central processing units.

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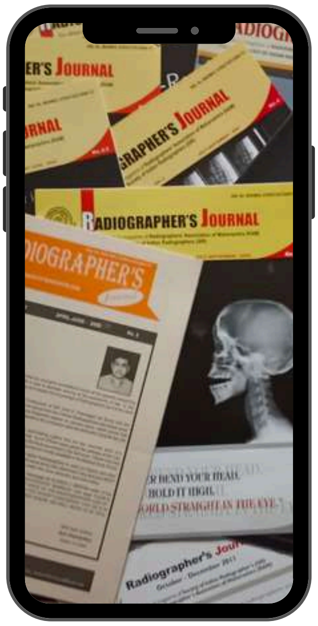

World Radiography Day - 2025 Celebrations

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Coronary Magnetic Resonance Angiography: A Review

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Abstract
A helpful non-invasive, radiation-free imaging technique for the treatment of patients with coronary artery disease (CAD) is cardiac magnetic resonance imaging (CMR).Magnetic Resonance in the Coronary Since angiography (coronary MRA) spares patients from iodinated contrast and ionizing radiation, it is becoming more widely accepted as a substitute for coronary computed tomography angiography (CCTA).Its adaptability, superior soft tissue characterization, and appropriateness for repeat imaging are further benefits. Even though CMRA showed early promise, its general clinical use is still restricted because of its lengthy and unpredictable scan periods, difficult scan planning, poor spatial resolution, and motion-related image quality degradation. But due to technical constraints including low signal-to-noise ratios, lengthy acquisition times, and decreased spatial resolution, it cannot be used in clinical settings on a regular basis. Deep learning reconstruction, compressed sensing, and super-resolution imaging are some of the innovative technologies that can explicitly address each of these problems. Investigations into MRA began in the late 1980s. Those initial trials generated more attention in this area even though no coronary stenoses were identified. In order to get coronary MRA data successfully, a number of significant challenges need to be addressed.

The coronary arteries have a limited diameter and are comparatively convoluted. Thus, it is necessary to have both adequate volumetric coverage and a high spatial resolution.
The coronary lumen and surrounding tissue must contrast more strongly for the coronary arteries to be visible. Additionally, the natural periodic contraction of the heart and breathing cause the heart to move significantly.

Keywords: Coronary magnetic resonance angiography, coronary computed tomography angiography, cardiac magnetic resonance imaging, coronary artery disease, magnetic resonance angiography

Introduction:
Magnetic Resonance in the Coronary Since angiography (coronary MRA) spares patients from iodinated contrast and ionizing radiation, it is becoming more widely accepted as a substitute for coronary computed tomography angiography (CCTA). However, a number of factors, including as inferior image quality, lengthy acquisition periods, and the high level of operator experience required to acquire diagnostic image quality, have limited its clinical application. A leading cause of death in the US and the third leading cause of death worldwide, coronary artery disease (CAD) is accountable for Every year, 17.8 million people die. The prevalence of atherosclerotic cardiovascular illnesses is rising quickly in developing nations like China and India along with economic transformation and modernization. Compared to the majority of developed Western countries, the mortality rate from cardiovascular disease is significantly greater in these nations. Comparing the initial incarnations of this technology, created 20 years ago, to the current state, scan acquisition durations have been steadily lowering and image quality has improved due to advancements in image acquisition, reconstruction, and motion correction. For more than 25 years, coronary magnetic resonance angiography (CMRA) has been developed as a non-invasive, non-ionizing substitute for imaging the coronary artery lumen. It has shown consistent progress with encouraging outcomes in the detection of coronary artery narrowing.. Significant progress has been achieved in noninvasive cardiac imaging over the last ten years, including the advent of cardiovascular magnetic resonance imaging (CMR) and coronary computed tomography angiography (CCTA), which have called into question the function of the invasive standard. The prevention of subsequent cardiac events is largely dependent on the diagnosis and treatment of coronary artery disease (CAD) and the myocardial ischemia that results from it. Non-contrast coronary magnetic resonance angiography (coronary MRA) has the primary benefit of evaluating coronary artery architecture and function without the use of contrast agents or ionizing radiation. The mid-diastolic or end-systolic rest phase can be automatically determined with little assistance from the user thanks to recently developed Deep Learning (DL) software. This could make it easier to acquire scans more consistently while also lowering the amount of technical training needed.

Additionally, this would support other recent technological advancements like 2D iNAV, which tracks the heart during scan acquisition to guarantee 100% respiratory gating efficiency, and automated cardiac scan acquisition planning system. The capacity of coronary MRA to evaluate coronary anatomy and function in patients with chest pain or other clinical manifestations that point to the presence of CAD is set to be specifically impacted by recent advancements in magnetic resonance imaging. new opportunities for future advancement in coronary MRA imaging have been made possible by the potential to use deep learning approaches to improve image quality in applications with low signal-to-noise ratios. The examination technique known as magnetic resonance angiography (MRA) creates images of the body's two- or three-dimensional structures using electromagnetic waves. It then uses magnetic resonance phenomena to extract electromagnetic signals from the body and reconstruct human data.

Present non-contrast coronary Magnetic Resonance Angiography status

The gold standard for diagnosing severe coronary artery disease (CAD) with a diameter stenosis greater than 50% is currently catheter-based X-ray coronary angiography (CAG). Nonetheless, about 50% of patients who are referred for diagnostic CAG do not have severe stenosis.7 radiation and contrast media as well as the potential risks associate with this invasive procedure. but also face the possible hazards of this intrusive operation, as well as exposure to contrast media and ionizing radiation Additionally, patients' discomfort during the intrusive operation is not insignificant. 8 As the technique advances, MRA may be used to its advantage in the following ways: (1) as a "one-stop-shop-test" when combined with other anatomical and functional MRI techniques; (2) as a robust method against calcium "blooming," which impairs CTA assessment; and (3) without exposure to ionizing radiation or contrast media.9 In contrast to adults, children who have coronary MRA had smaller coronary diameters, higher resting heart rates, and trouble maintaining a posture for extended periods of time. In certain situations, cardiac MRI under sedation or coronary CTA, which has a higher spatial resolution by nature, may be deemed suitable.

Preparing for the clinical acquisition of coronary MRA:

Preliminary techniques required for coronary MRA coverage include respiratory gating and the three-dimensional (3D) free-breathing whole-heart MRA acquisition methodology already used for coronary electrocardiography (ECG). Based on ECG gating during the diastolic or systolic phase—the phase with the least coronary artery motion—a patient-specific acquisition window is established. In order to assess the motion pattern of the right coronary artery (RCA), transaxial cine MR images with a steady-state free precession (SSFP) sequence are obtained before the coronary MRA acquisition for the static phase selection. The respiratory navigator's recommended placement is the dome of the right hemidiaphragm, although vendor-specific implementation details are typically used.11 Narrowing the ECG and respiratory gating width improves image quality, but narrow windows have the inherent drawbacks of decreasing data acquisition success rate and lengthening image acquisition time, which may result in increased patient motion disturbance. The present standard configuration of a tiny gathering window of 5–6 mm in the respiratory navigator results in a low imaging efficiency (30–50%).Sublingual nitroglycerin (NTG) is advised to enhance luminal vision in terms of signal-to-noise ratio (SNR), vessel diameter, and vessel sharpness of the coronary MRA when there are no obvious contraindications. A study comparing the image quality of gradient echo sequence with SSFP for coronary MRA at 3 T found that the gradient echo sequence had a longer measured artery length and better picture quality.

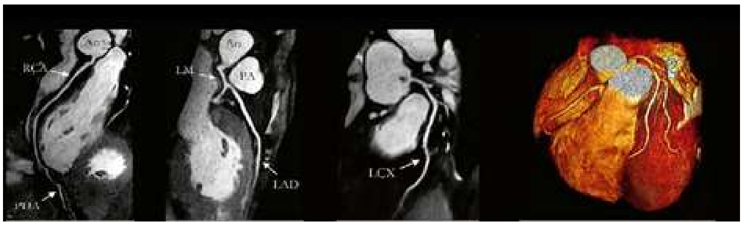

Fig 1- Represents Coronary MRA

Coronary CMR Plaque Imaging

By making use of the T1 shortening effects of plaque characteristics (intraplaque hemorrhage, thrombus, lipid core, thin-cap fibroatheroma, calcification, macrophages, and cholesterol clusters), coronary CMR imaging can detect high-risk coronary plaques with or without exogenous contrast agents. CMR detection of high-risk plaque is significant for prognosis even if coronary luminal stenosis is not present.14 However, widespread clinical translation is limited by similar technical challenges to coronary CMR angiography, including respiratory motion artifacts, extended and erratic scan durations, and coronary CMR angiography and plaque imaging misalignment due to sequential data acquisition. However, coronary plaque-misregistration might not be prevented because the respiratory motion characteristics are partially shared between the black-blood and bright-blood datasets. The 3D whole-heart non-contrast-enhanced Bright-blood and Black-blood phase-SensiTive (BOOST) inversion recovery procedure for simultaneous coronary angiography and thrombus detection was developed by Ginami et al. to get around this. visualization of intraplaque hemorrhage. This is accomplished by acquiring two distinct bright-blood datasets in turn, which are then combined in a reconstruction akin to phase-sensitive inversion recovery (PSIR) to produce a third, black-blood dataset. Coronary angiography and independent estimation and correction of respiratory motion are made possible by the two distinct weighted bright-blood datasets, which also lessens the likelihood of misregistration artifacts. The coregistered black-blood PSIR dataset may make it possible to visualize thrombus and intraplaque hemorrhage.

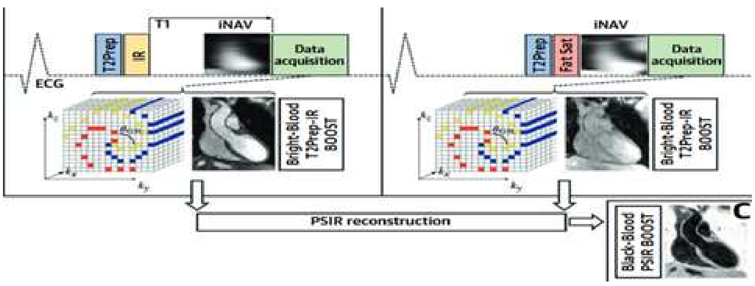

FIG 2- The BOOST framework allows for simultaneous 3D whole-heart noncontrast black-blood and bright-blood CMR for thrombus visualization and coronary angiography.

CMR Evaluation of Myocardial Viability and Function

Clinicians can more precisely choose patients who are most suited for coronary revascularization thanks to CMR's special capacity to measure the transmural extent of infarction scar within each myocardial segment.Comparing CMR to the noninvasive gold standards of nuclear perfusion and fractional flow reserve, respectively, has demonstrated that it can accurately and consistently evaluate myocardial ischemia in large multicenter clinical investigations. By adding anatomic coronary information to these parameters, CMR may be promoted as the most comprehensive single imaging modality for CAD assessment.

Conclusions and Future Directions-

Angina, heart failure, progressive left ventricular dysfunction, arrhythmia, and/or sudden myocardial infarction are clinical manifestations of chronic coronary syndrome, a persistent and complex disorder linked to coronary artery atherosclerosis. Early detection of CCS permits customized patient risk assessment, immediate therapeutic intervention initiation, and ongoing observation of possible complications. Even with the remarkable advancements in coronary CMR angiogram technology, academic research centres still primarily use these sequences. Before coronary CMR angiography may realistically compete with invasive coronary angiogram and coronary CTA, multicentre clinical validation and prognostic trials using beta-blockers and nitrates similar to coronary CTA and procedure simplifications are obviously needed.

But when paired with the previously mentioned technology, the growing availability of more potent (3.0-T and beyond) and intelligent (with more sensors and artificial intelligence) CMR scanners could usher in a new era of coronary CTA equivalent images. quality without using ionizing radiation or nephrotoxic contrast chemicals. CMR atherosclerosis imaging can be prognostically enhanced by additional developments in single-scan multi-contrast angiography and plaque characterization. Lastly, the clinical integration of myocardial scar imaging and perfusion with coronary CMR angiography may make CMR the most complete non-invasive single imaging modality for CAD assessment.

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Co_2 Angiography in Renal Imaging: A Game-Changer for Contrast Safety

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Introduction:

An essential imaging technique for evaluating the renal vasculature in patients with suspected or confirmed renovascular disease as well as those in need of interventional treatments like renal sympathetic denervation (RDN) is renal angiography. Although iodinated contrast media have been used as standard agents for angiographic imaging in certain situations, their use is prohibited in patients with chronic kidney disease (CKD) and clinically significant iodinated contrast media allergies because of the possibility of contrast-induced nephropathy and hypersensitivity. An important alternative for these individuals at higher risk is carbon dioxide (Co_2) angiography.

What is Carbon Dioxide Angiography?

The specialized imaging method known as carbon dioxide (Co_2) angiography uses injected Co_2 gas as a contrast agent rather than iodinated contrast medium to image blood vessels, including the renal blood channels. Because Co_2 is non-nephrotoxic and does not cause allergic reactions, it can be used for renal angiography in patients with chronic kidney disease, a history of renal insufficiency that increases the risk of contrast-induced nephropathy, or individuals with challenging vasculature.

By injecting Co_2 into the vascular system, it displaces blood and produces a negative contrast on digital subtraction angiography, which makes it possible to see the renal arteries and surrounding vasculature. In patients with complex vascular disease or renal insufficiency, Co_2 angiography may be useful in guiding diagnostic or interventional procedures, such as angioplasty or stenting.

Mechanism of Action of Co_2 as a Contrast Agent:

Renal angiography uses carbon dioxide (Co_2) as a negative contrast medium. To see the blood vessels using digital subtraction angiography (DSA), it forces blood out of the vessels. Unlike iodinated contrast, Co_2 is safe for anyone with allergies or kidney pathologies. Co_2's properties allow it to be easily taken in by the lungs, expelled, and quickly distributed throughout the bloodstream. It produces accurate images without the risk of allergic reactions or kidney damage by injecting a gas bubble that delineates the walls of blood vessels.

Indications For Co_2 Renal Angiogram:

In renal angiography, CO_2 is used primarily for patients with compromised kidney function or a known allergy to iodinated contrast media. It is also employed in situations that necessitate multiple angiographic treatments, where it is crucial to reduce contrast material usage. Other indications include assessing renal artery stenosis, aneurysms, arteriovenous malformations, and guiding endovascular procedures like angioplasty or stenting, especially for patients who are high-risk or sensitive to contrast.

Contra Indications For Co_2 Renal Angiogram:

Co_2 angiography is not recommended for patients with established right-to-left cardiac shunts, pulmonary hypertension, or severe chronic obstructive pulmonary disease (COPD), because gas embolism in such situations may cause severe complications. It should also be avoided in cerebral and coronary circulation due to the potential for poor imaging quality and neurotoxic or cardiotoxic impacts. Moreover, Co_2 use is not advisable for pregnant patients or individuals who are unable to hold their breath, as it might heighten procedural risks.

Advantages of Co_2 Renal Angiogram:

In renal angiography, Co_2 is a safe and effective substitute for iodinated contrast chemicals, particularly for those with kidney problems or contrast allergies. It is rapidly cleared via the lungs, is non-nephrotoxic, and does not induce allergic responses. Its low viscosity facilitates improved vessel filling, especially in the pelvis and lower abdomen. When used with proper technique, Co_2 is also economical and allows for repeated imaging without compromising renal function, making it a useful choice for high-risk patients.

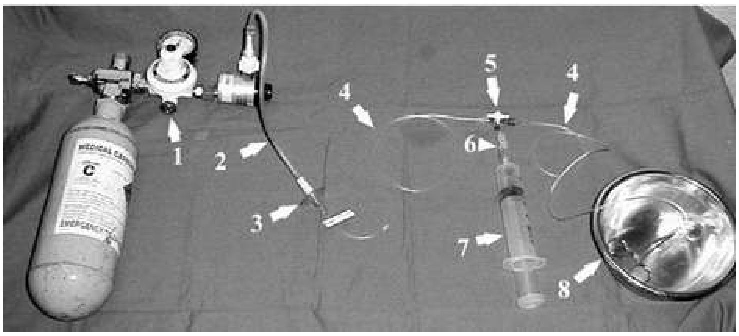
Limitations of Co_2 Renal Angiogram:

There are several significant disadvantages to Co_2 angiography. Because of its buoyancy and rapid absorption, it may result in suboptimal images of upper body vasculature. In small or slowly flowing vessels, the picture quality might not be as good as that of iodinated contrast. Patients may experience discomfort during the treatment, and improper injection might cause vapor lock or gas embolism. These elements necessitate cautious techniques and expert management to guarantee safety and efficacy.

Clinical Applications of Co_2 in Angiography:

It prevents nephrotoxicity and allergic responses. Co_2 is mainly utilized in renal angiography for patients with iodine contrast allergy or renal impairment. It is particularly useful for assessing renal arteries for vascular malformations, aneurysms, or stenosis. Co_2 is also beneficial during interventional treatments like stent placement or angioplasty because it offers live vascular imaging that doesn't damage kidney function. It is a preferred choice for high-risk patients who need repeated or extended imaging because of its safety and efficacy.

Co_2 Angiography system:



The picture shows a full Co_2 angiography delivery system setup, with each part that is necessary for safe and controlled gas injection highlighted. (1) The system starts with a medical-grade carbon dioxide cylinder that is connected to a pressure regulator. This regulates the flow and pressure of the gas. (2) A connecting tube connects the bladder syringe to a luer lock, which is the main way for gas to move. (3) A filter with particles that are 0.2 microns in size is attached to make sure that only clean, filtered Co_2 gets into the system. (4) The gas is safely moved between parts using two low-pressure connector tubes. (5) A three-way stopcock is built in so that the gas can be directed where it needs to go, such as filling, injecting, or venting. (6) Each 60 mL Luer Lock syringe has a sliding two-way valve that lets you control the gas injection process very precisely. (7) The syringes are used to manually deliver Co_2 during angiographic procedures. (8) Finally, a bowl of sterile saline acts as an underwater seal, which is a safety measure that keeps room air from getting into the system by accident. This setup is carefully made to keep things clean, stop air from getting in, and make sure that Co_2 is delivered safely and accurately during vascular imaging.

Case Studies of Co_2 Renal angiography:

Case-1:

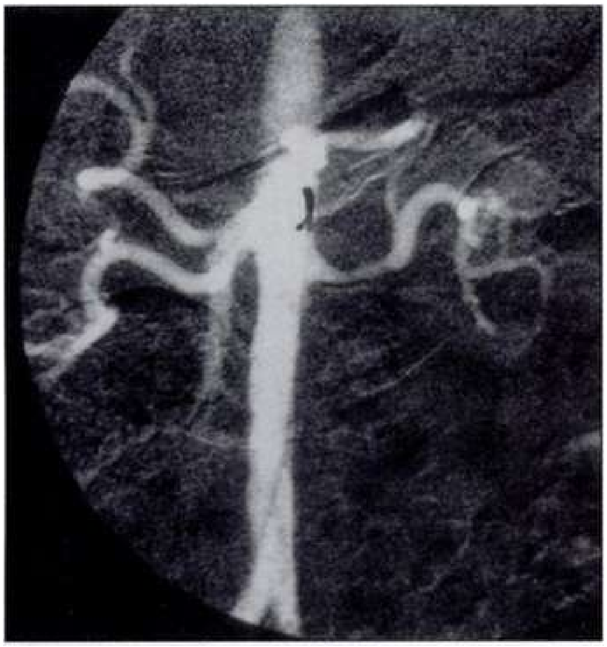


Figure-2. A 54-year-old man with volatile hypertension. A Co2 digital subtraction aortic angiogram that was obtained using 35ml of carbon dioxide in 1-2 seconds shows left renal artery stenosis.

Case-2:

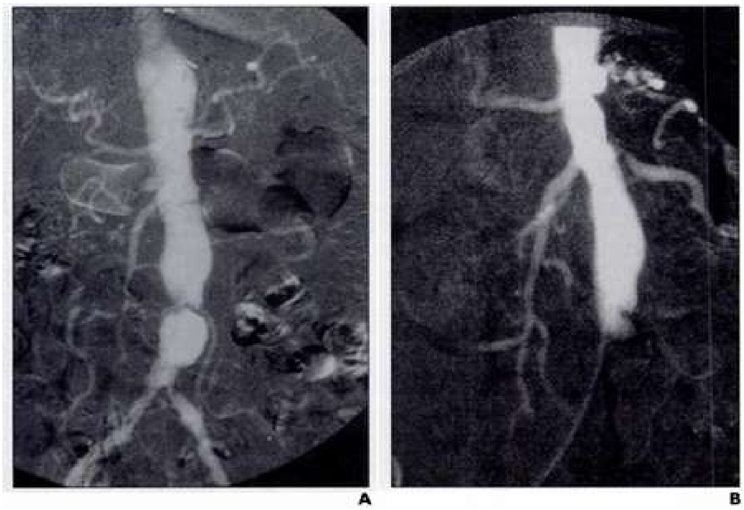


Figure 3: 72-year-old man with labile hypertension.

A - Co_2 digital subtraction aortic angiogram with the patient in supine position does not allow visualization of the left renal artery.

B - Co_2 digital subtraction aortic angiogram with patient in right lateral decubitus position causes carbon dioxide to rise and opacify left renal artery, revealing underlying stenosis.

Case-3:

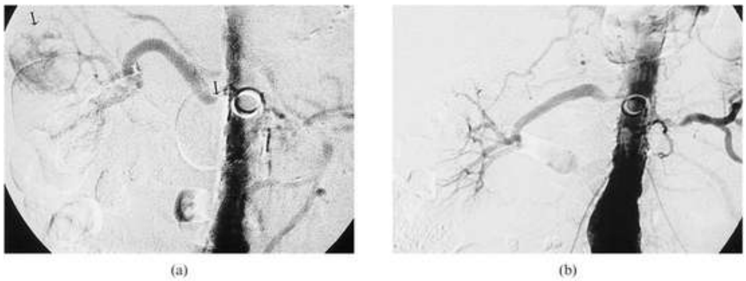


Figure-4. Renal Angiography using Carbon Dioxide.

(a) Patient in right lateral decubitus position. Co_2 renal angiogram demonstrating a right renal artery stenosis at the ostium (arrow). The abnormal vascular blush in the right mid pole (arrow) corresponds to a renal cell carcinoma.

(b) Corresponding renal angiogram with iodinated contrast medium. This confirms the right renal artery stenosis. No tumour blush was seen at any point in the angiographic run.

Case-4:

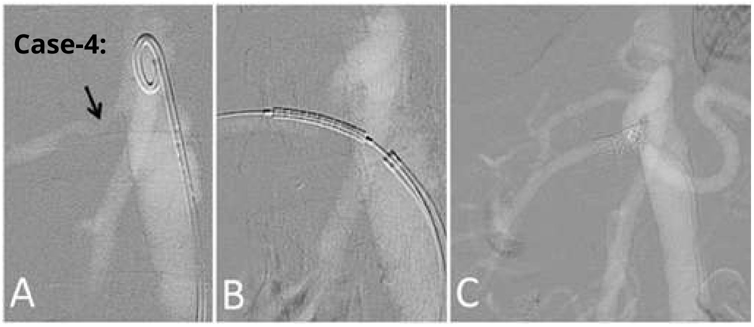


Figure-5. Carbon dioxide-guided renal artery interventions in patients with Takayasu arteritis and renal insufficiency.

A to C. Baseline angiogram

(A) shows right renal artery stenosis (arrow).

(B) After stent positioning

(C) Deployment, the final angiogram showed a good outcome.

Case-5:

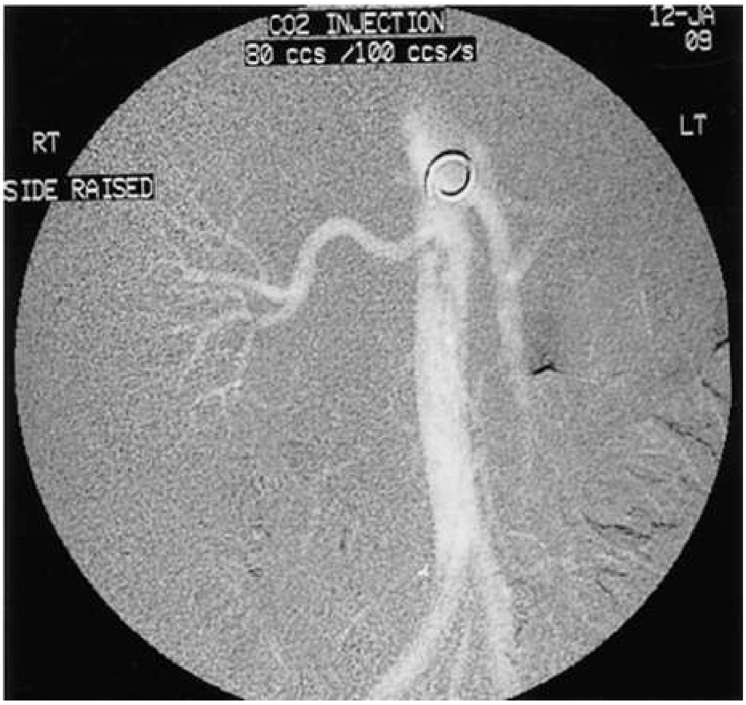


Figure-6. Patient in Right lateral decubitus projection. An example of the image quality attainable using Co_2 angiography.

Conclusion :

For renal vascular imaging and therapies, Co_2-angiography is a safe, non-nephrotoxic substitute for iodinated contrast that is particularly helpful in patients with renal insufficiency. When traditional contrast is ineffective or contraindicated, it allows for efficient diagnosis and treatment, including angioplasty and stenting, without running the risk of further renal injury. In complex renal patients, Co_2 angiography is a dependable option since automated delivery systems further improve safety and image quality.

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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

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