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Radiographers' Journal

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Editorial

Shankar K. Bhagat
Editor-in-chief

Dear Readers,

The February 2026 issue of the Radiographers Journal reflects the dynamic evolution of medical imaging, where technology, clinical expertise, sustainability, and patient-centered care intersect more closely than ever before. This month's contributions from our esteemed authors highlight how radiographers continue to adapt, innovate, and lead within an increasingly sophisticated healthcare environment.

We begin with an insightful article on Innovation in Positioning Radiography, which revisits one of the most fundamental yet often underestimated aspects of imaging practice—patient positioning. While advanced imaging modalities continue to dominate discussions, this article reminds us that optimal positioning remains the cornerstone of diagnostic accuracy. The contributors explore modern positioning aids, digital alignment tools, trauma-adapted techniques, and ergonomic strategies that enhance both image quality and patient safety. Particularly relevant are the discussions on positioning modifications for elderly, bariatric, and critically ill patients—areas where radiographers' skill directly impacts outcomes.

In New Developments in Training for Vascular Imaging, the focus shifts to evolving educational strategies in interventional radiology and vascular imaging. With procedures becoming increasingly complex, structured training models, simulation-based learning, and competency-driven certification pathways are emphasized. The article also reflects on the growing integration of hybrid operating rooms and advanced imaging platforms such as Digital Subtraction Angiography and Cone Beam CT, underscoring the need for radiographers to maintain technical precision while adapting to real-time procedural demands.

Trauma imaging remains a critical domain, and the article on Radiographic Signs that Predict Need for CT in Trauma Patients addresses an important clinical decision-making challenge. With the increasing availability of CT scanners, including advanced systems like Computed Tomography, the question of appropriate utilization becomes essential. This contribution discusses key radiographic indicators—such as widened mediastinum, complex fracture patterns, and occult pneumothorax—that may necessitate further cross-sectional imaging. The emphasis on evidence-based imaging pathways and radiation dose optimization highlights the radiographer's responsibility in balancing diagnostic thoroughness with patient safety.

A particularly forward-looking article in this issue is Sustainability & AI in Medical Imaging. As healthcare systems globally grapple with environmental responsibility, this paper explores energy-efficient imaging systems, waste reduction in contrast media use, and digital workflow optimization. The integration of Artificial Intelligence in modalities such as Magnetic Resonance Imaging and CT is discussed not merely from a technological standpoint but through the lens of workflow efficiency and carbon footprint reduction. AI-driven protocol selection, predictive maintenance, and dose optimization are presented as tools that can simultaneously improve quality and sustainability.

Innovation takes a remarkable leap in Robotic Assistance in Cerebral Angiography: Innovations and Implications. As neuro-interventional procedures become more precise and minimally invasive, robotic-assisted platforms are redefining procedural ergonomics and radiation safety. The article examines how robotic systems enhance catheter navigation during Cerebral Angiography, potentially reducing operator radiation exposure while improving procedural stability. The discussion also addresses training adaptations and ethical considerations as automation increases within interventional suites.

Finally, X-Ray Defecography revisits a specialized yet clinically significant fluoroscopic examination. Often under-discussed, this procedure plays a vital role in evaluating pelvic floor dysfunction. The article details patient preparation, positioning nuances, radiation protection measures, and interpretation basics. By focusing on technique standardization and patient dignity during sensitive examinations, the authors reinforce the radiographer's role in compassionate and technically sound practice.

Collectively, this issue encapsulates the spirit of modern radiography—rooted in foundational skills, strengthened by structured education, guided by evidence-based imaging, and propelled by technological advancement. As radiographers, we stand at the intersection of precision, innovation, and responsibility.

The Radiographers Journal is a platform built for professionals, by professionals. We warmly invite our readers to share feedback on this issue—its relevance, clarity, and practical applicability in your clinical settings. We also encourage submissions in the form of original research, case studies, technical notes, review articles, and expert opinions.

Let this edition inspire continued professional growth and reaffirm our commitment to excellence in imaging practice. Together, we can strengthen our professional community and advance the standards of radiography.

14th State Conference of Radiographers' Association of Maharashtra

Date: 28th February & 1st March 2026

Venue: Saboo Hall, Ramniranjan Jhunjhunwala College, Opp. Ghatkopar Railway Station, Ghatkopar (W), Mumbai

RADIOVISION 2026

Organised by

Radiographers' Association of Maharashtra (Mumbai Unit)

In association with

Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College

(Empowered Autonomous Status)

Radiographers' Association of Maharashtra (RAM)

Radiographers' Association of Maharashtra (RAM), affiliated with the Society of Indian Radiographers (SIR), is a registered organisation under the Government of Maharashtra since 2001. As we proudly celebrate 25 years of empowering Radiographers, RAM remains committed to its vision of serving and promoting the professional interests of Radiographers across the state.

Our primary objective is to support unemployed and aspiring Radiographers by providing quality education, skill-based training, and professional guidance. Through continuous learning initiatives, we strive to enhance competence, confidence, and employability within the profession.

RAM regularly conducts seminars, workshops, and professional events focused on academic growth, technological advancement, and holistic development, ultimately contributing to the wellbeing and safety of patients. We actively foster academic excellence and promote a strong sense of professional unity and collaboration among our members.

We encourage our members to actively participate in public affairs and social initiatives, thereby contributing to public welfare and healthcare awareness.

To further academic and professional exchange, RAM publishes the Radiographers' Journal, providing a platform for sharing knowledge, research findings, and innovative practices. We also actively support and conduct research studies and encourage the publication of scientific literature in the field of Radiological Technology.

Ramniranjan Jhunjhunwala College

Hindi Vidya Prachar Samiti's Ramniranjan Jhunjhunwala College of Arts, Science and Commerce, established in 1963 by visionary philanthropist Shri Nandkishore Singh Jairamji, is an Empowered Autonomous Institution committed to academic excellence and holistic student development.

Over six decades, the college has evolved into a dynamic multidisciplinary institution, offering a wide spectrum of programmes across Science, Commerce, Management, Technology, and Liberal Arts, including emerging and future-ready domains such as Data Science, Artificial Intelligence, Biotechnology, and Visual Effects (VFX). With the successful implementation of NEP 2020, the college emphasizes skill-based, multidisciplinary education, community engagement, Indian Knowledge Systems, innovation, and sustainability.

Strategic collaborations with institutions such as the Maharashtra State Skill University have strengthened experiential learning and employability. The college's commitment to quality has been widely recognized through prestigious accolades, including the University of Mumbai's Best College Award, the IMC RBNQ Award for Performance Excellence in Education, and DBT Star College status.

Accredited by NAAC since 2001 and re-accredited in 2024 with an 'A' Grade (CGPA 3.10), the college also upholds ISO certifications, conducts regular environmental audits, and demonstrates global responsibility as a UN Sustainable Development Goals (SDG) signatory.

Further affirming its leadership in higher education, the college is recognized as a Mentor College under the UGC PARAMARSH Scheme and has been ranked 20th Best Autonomous College in Maharashtra (Education World 2025–26). Ramniranjan Jhunjhunwala College continues to set benchmarks in academic innovation, governance excellence, and societal impact.

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Conference Schedule

28th February 2026

2.00 pm to 4.00 pm: Pre Conference Workshop for Students*
4.00 pm to 4.30 pm: Inauguration of Conference
4.30 pm to 600 pm: Silver Jubilee Celebrations of Radiographers' Association of Maharashtra

* **Workshop Topics for Students (Participants may join any one workshop)**
- **Personality Development** Only 40 seats (First-come, first-served basis)
- **Communication Skills** Only 40 seats (First-come, first-served basis)
- **Leadership Skills** Only 40 seats (First-come, first-served basis)

1st March 2026

8.00 am to 9.00 am: Registration & Breakfast
9.00 am to 9.15 am: Inauguration of Scientific Programme
9.15 am to 1.00 pm: Presentations by Experts
12. 00pm to 1.00 pm: Quiz for College Teams
1.00 pm to 2.00 pm: Lunch Break
2.00 pm to 5.45 pm: PPT Presentation Competition for Students
5.45 pm to 6.00 pm: High Tea
6.00 pm to 6.30 pm: Prize Distribution & Valedictory Function

Radiographers interested in presenting academic papers or presentations are kindly invited to contact the Scientific Committee Chairpersons for further details.

PPT Presentation, Poster Presentation & Quiz Competitions for Student Radiographers

We are excited to announce a PPT Presentation, Poster Presentation & Quiz Competitions that provides a platform for student radiographers to display their knowledge, skills, and creativity in radiology.

Overview:
- **Event:** PPT Presentation, Poster Presentation & Quiz Competition
- **Target Audience:** Student Radiographers
- **Purpose:** To give students an opportunity to demonstrate their expertise, innovation, and public speaking abilities in the field of radiology.

Categories:

PPT Presentations:
- **Topic:** Relevant radiology-related content.
- **Focus:** Public speaking and effective presentation skills. Participation
- **Limit:** Two participants per institute.
- **Time:** 10 minutes total (8 minutes for the presentation, 2 minutes for Q&A).

Poster Presentations:
- **Topic:** Academic posters highlighting research, innovations, or developments in radiology. Participation
- **Limit:** No limit on the number of participants per institute.
- **Poster Size:** A3 (11.7 x 16.5 inches)

Quiz Competitions:
- **Teams:** 4 Students per team
- **Limit:** One Team participation per institute.

Eligibility: Open to all students of Medical Radiography & Imaging Technology and Internship Students

Rewards & Prizes:
Top performers: Receive a Prize and Certificate of Appreciation.
Other participants: Receive a Certificate of Participation.

Important Dates: Last Date for registration for Competitions: 31st January 2026

Additional Information:
No TA/DA: No travel or accommodation support will be provide, accommodation guidance will be provided.
Submission Requirements: Abstract and a certificate from the Head of Department.
How to Participate: Interested participants should contact the Scientific Committee Chairpersons for detailed submission guidelines and further instructions

Link for more details and Online Registration:

https://radiographers.org/events-calender/

- Only 600 Registrations available on First-come, first-served basis
- Separate registration is required to attend the Conference, Workshops, Inaugural Function, and RAM 25th Year Celebrations.
- Early registration is recommended
- No Spot Registrations available

Scan QR Code for more details and Online Registration:

Innovation in Positioning Radiography

Mugelan R A, M.Sc. MIT, M S Ramaiah University of Applied Sciences, Bangalore

Introduction

Diagnostic radiology is keeps continuously growing with a focus on improving image quality, enhance the diagnostic accuracy, and ensuring the safety of patients. The standard radiographic positioning and procedures have been the base of medical imaging for many years, but there are some drawbacks when it is dealing with some complicated trauma or the patient who is unable to move freely due to severe pain. So, the radiographic positioning innovations are prioritizing patient safety and comforting the patient over the image acquisition. Now a days our aim is to find the hidden pathologies that may be missed in standard views because of some problems. We should minimize the radiation dose by using ALARA (as low as reasonably achievable) principle and improving the patient comfort.

In the modern era we are introducing new innovations in the radiographic positioning to overcome from the obstacles which is facing by both the patient like pain, unable to move the region of interest and the radiographers or radiologist are trying to get the optimal view of the specific region of interest, and also AI is used to guide the radiographers to obtain the view the particular area.

Now we are going to explore some specific methods and innovations developed to overcome the limitations.

Methods

The Clear View{1}:

The clear view method was developed to overcome the specific anatomical superimposition of the thoracic cage over the proximal humerus in lateral projection and that's why the name "clear view" was given the clear view technique is different from the standard transthoracic technique by changing the position of the patient rather then the x-ray beam alone .

Patient Positioning

In [fig.1] The patient is positioned in a seated or standing position.

- By leaning the patient forward to an angle of 35-45 degree, so the thoracic cage moves anteriorly and the humerus stands vertically.
- The affected limb should be adducted and internally rotated.

Beam Alignment:

[fig.1] In this image the x ray beam, which is perpendicular to the image receptor, where the x ray beam enters from the medial aspect of the arm and it exits from the lateral aspect of the arm.

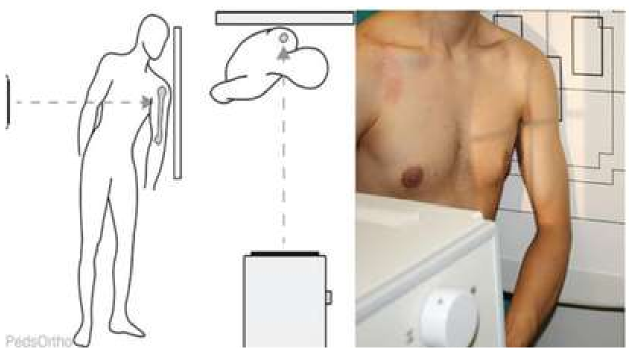


Fig.1 Clear View Projection

Purpose:

- The purpose of the clear view is able to determine the proximal humerus fracture angulation and displacement .
- Secondarily , it helps to asses the pain score compared to the historical views.

The Modified Trauma Axial (MTA) Shoulder View:

The MTA view specially developed for immobilize the trauma patients, specifically who all are in supine on trolly or unable to sit or unable to a abduct the arm due to the certain risk factors like fracture or dislocation.

Patient Positioning:

- The patient was in supine position .
- The head should be tuned away from the injured site to avoid the exposure of the lens of the eye and thyroid.
- The affected arm should be neutral rotation or resting at the side
- The image receptor is just placed above to the shoulder ,resting against the neck

Beam Alignment:

The x-ray tube or central beam is angled 45 degree towards the feet (caudally) and the central ray centered at glenohumeral joint [fig.2].

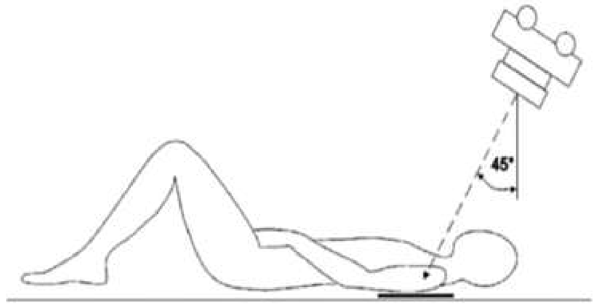


Fig.2 Modified Trauma Projection

Purpose;

The MTA view mimics the axillary viewbut it relies on the angulation of the tube rather than the patient motion.

3.Modified Fulcrum Bending (MFB) Radiography:

The MFB helps to assessment of the spinal flexibility by the combination of biomechanical forces : axial and transverse loading. Axial loading (traction) is more effective in severe and the transverse loading is the main corrective in the small curves.

Patient Positioning:

- The patient should be positioned in true lateral position.
- The fulcrum is positioned directly underneath of the apex of scoliotic curve means convex side
- The fulcrum should be wrapped in extra padding layers, so it makes the patient comfortable.

Fig.3 MFB Technique

- The placement of fulcrum should be determined by biomechanical principles of theorthotic treatment.
- This MFB technique applies the traction by manual. This was performed by the two highly trained orthopedic staff. One staff applies traction to the upper limb and another one applies traction in the lower limb.
- To reduce the active muscular resistance ,allow the patient to relax the muscles completely but not changing the position at least maintain for 60 sec before the radiographs taken.

Beam Alignment:

A AP spot film is taken when the traction is performed.

Purpose :

It helps to predict more precisely of the scoliotic curve flexibility

Fig.4 Cone Beam CT

The Cervical Facet View:

It is a fluoroscopic technique which is developed to visualize the cervical articular pillars for the surgical interpretation of the screw fixation.

Patient Positioning:

The patient is positioned on the table in prone position or else patient is positioned in supine position or lateral position depending upon the physician interest.

Fig .5 a: A radiograph of cervical facet view.

- The table is tilted 15-20 degree so the head is down, and the foot is high, so it is called Trendelenburg position. This helps to pull the shoulder superiorly and helps to move away from the cervical spine area.
- The C-arm is angled either cranially or caudally to match the angle of the facet joints which is parallel tothe facet joints
- It is usually done from C3-C7

Purpose :

This view determines the starting point and the medial lateral trajectoryof the screw implant and lateral view is not required when the cervical facet view is performed.

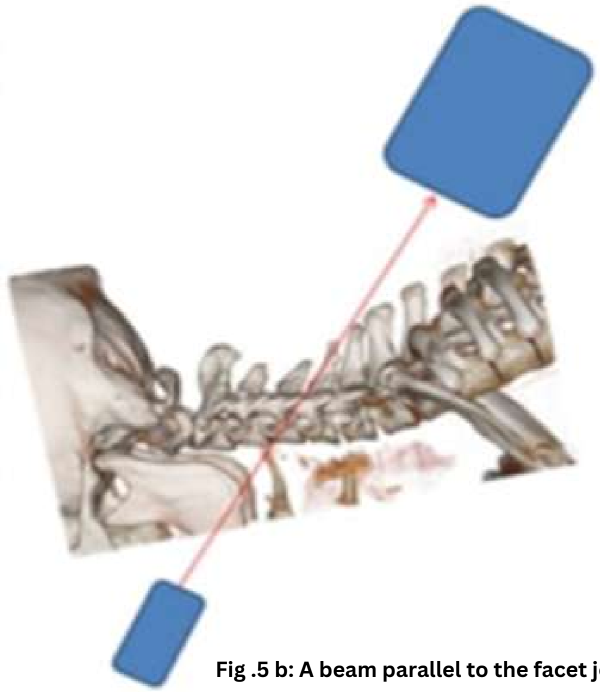


Fig .5 b: A beam parallel to the facet joints

Result:

The Clear View:

Clearview vs axillary view:

When the clear is compared to the axillary view which requires the arm abduction but the clear view which doesn’t required the arm abduction and enhance the arm abduction and enhance the patient comfort.

Clear view vs transthoracic lateral view:

- Transthoracic is a traditional alternative method but it had some drawbacks like superimpose of the ribs and it requires high radiation to get good image quality of the humerus.
- In the clear view gives good diagnostic image quality and less radiation required to obtain the view when compared to the transthoracic lateral view.

Fig.6: TTL view

Fig. 7 clear view

The pain scores are collected from the patient during the radiographic positioning of clear view which is ranging from the 0-1.2 but in the standard position causes severe pain because of the manipulation of the humerus.

The Modified Trauma Axial (MTA) Shoulder View:

- The modified trauma axial projection is well at identifying the higher number of the dislocation when it comparedto standard radiographs like antero-posterior view and y projection
- The main advantages of the MTA projection is to visualize the hill sacs lesions and aslo to visualize the Bankart fracture

A) Glenoid view

b) Lateral view of scapula

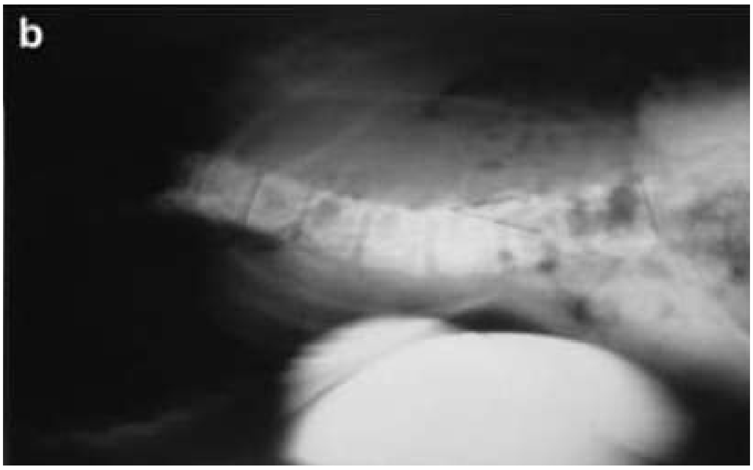
c) MTA projection

- When the patient have severe pain and unable to move the affected arm , we will use the modified trauma projection because it doesn't require abduction or any movement of the arm
- But in the standard axillary view is dropped because of the severe pain.
- In this article it has a higher technical success rate compared to the standard radiographic methods
- The MTA view also provide theclear and unobstructed view of the glenohumeral joint space.it helpsto find the reduced joint space or dislocation of the joint without the osseous overlap seen in the projection.

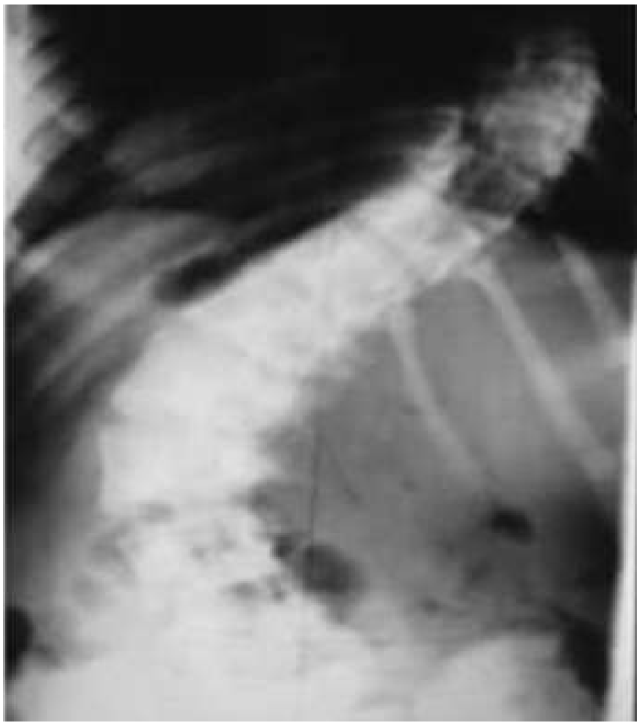
Modified Fulcrum Bending View

This study shows the significant increase in the mean flexibility of modified fulcrum when its compared to standard significant.

- It shows that the increasing the visualization of flexibility because of the technique.
- There is an advantage in modified fulcrum view which is effective for both the thoracic and lumbar scoliosis but in other methods that only show one type of scoliosis.



A) Modified fulcrum view



Standardized view ap view

- In this study there is some disadvantages which is likely when the patient balance on the fulcrum, the assistants applying the traction. but it have the ability to show the scoliosis more efficiently.

Weight Bearing Cone Beam CT (WB-CBCT):

- This study is used to comparing the radiation dose of WB-CBCT with the conventional x-rays or conventional CT.
- It gives the 3D volumetric images with low doseto the patient compare to medical CT. In fact it is safer than the multiple views of the x-ray and conventional ct
- The total imaging time reduced compared to conventional systems.
- And also it reduces the number of the appointments and helps to increasing the technician productivity.
- In this article it shows the failure of the standard x-rays provides reproducible measurement due to rotation error
- WB-CBCT helps to eliminate the error by using the software to align the axes perfectly.
- The CT scans fails to identify the pathologies which is depend on the gravity and the muscle activation like syndesmosis , subtalar joints and lateral impingement and the fare foot .
- This article compares the WB-CBCT to the stimulated weight bearing CT , which is failed to produce the muscle activation of the standing but it can reproduce the force.

Cone beam CT

X-Ray Radiograph

The Cervical Facet View:

- In this article the author mentioned that there is some limitations in the standard AP view because the articular pillars appear as continuous due to cervical lordosis and overlapping of the bone
- In facet ap view , we can successfully opened the joint spaces by using the tendelenburg position and parallel to alignment of the beam
- The lateral view fluoroscopy is taken for trajectory and depth. However it is non-diagnostic patient because of patient shoulder obscure.
- So the modern modified facet view doesn't required lateral view.
- In this article there is an historical failure's in the standard imaging but in facet view provides the safety compared to standard imaging.

Discussion

The five articles which is collectively represents the radiographic innovations and highlight the paradigm shift in the medical imaging while these authors address the different anatomical images like the shoulder , the spine and the foot .
These all research prove that the standard radiograph is often fail to balance diagnostic precision with the patient safety and reality.

The Immobile Patient in Trauma:

- Now we compare the chun at el. (THE CLEAR VIEW) and abu award (THE MTA VIEW) these both addressing the limitation in axillary projection in trauma.
- So both authors identify the immobile patient mean diagnostic view requires arm abduction but the injury itself makes impossible
- However the solutions are given by the chun at el by modifying the patient position ,the patient should be lean forward to clear the thorax from the imaging field.so this method allow the patient to use gravity for isolate the humerus without causing any pain .
- In tam and abu awwad article , tehy modifying the geometry of the beam and employing the 45 degree of the angulation caudally to navigate around to the static patient .
- From this both authors achieving the good result by eliminating the non diagnostic film. It collectively demonstrates the historical projections like transthoracic lateral or y projections which is giving poor sensitivity. But in orthogonal views it is compromised with patient comfort.

Static Vs Functional Imaging:

- Omid –kashani et al (modified fulcrum bending and godoy – santos et al (WB-CBCT) both challenging the supine position.
- godoy – santos et al . In the standard CT we perform the foot in supine which having the chance of missing the pathologies such as flatfoot collapses and syndesmotic widening.by introducing the weight bearing – cone bam CT we can easily identify the pathologies which is missed in the CT.
- Omid –kashani et al . In this article the author speaks about standard supine side bending films is fails to show the true flexibility of the scoliotic spine because of the corrective force
- In the fulcrum method we are introducing the traction so it shows the true potential of the correction.

So the anatomical structure behave differently under the different conditions like through the gravity or traction.

Geometric precision and surgical safety.

- So every other authors worked for the diagnostic capability, jackson at el(FACET AP VIEW) and with th tam and abu awwad is demonstrating the geometric precision to overcome the superimposition of the anatomical region of the interest
- In the c spine , the ap is useless for screw targeting due to the picket fence which overlap the articular pillars.
- By using the trendelenburg position and the beam alignment helps the procedure to be in targeted area.
- The standard view requires the surgery but in specialized view it doesn't required.
- This suggest the future have some innovation in minimally invasive surgery depend upon the specific radiographic projections.

Limitation:

- There is s clear acknowledge with the certain limitations .jackson et al telling that the reliability of C6-C7 junction because of the variable anatomy of each patient
- In omidi-kashani et al. Tells the modified fulcrum require multiple assistant for the traction to apply
- Godoy – santos et al . The cost is high and availability of the systems as barrier to the widespread adoption

Conclusion

In conclusion the five articles giving the alternative methods to the conventional radiography techniques.by using the gravity and the force and modify the geometry of the beam for the complex anatomy these advancements the adaptive radiography.

References:

- Chun, Y. M. (2024). The Clear View: A Novel Radiographic View for Proximal Humerus Fractures.
- Tam, S., & Abu Awwad, R. (2023). A pictorial presentation and the clinical use of the modified trauma axial (MTA) shoulder x-ray view.
- Omidi-Kashani, F., et al. (2013). Comparison of Modified Fulcrum Bending and Standard Lateral Bending Views in Orthopedic Scoliosis.
- Godoy-Santos, A. L., et al. (2021). Weight-bearing cone-beam computed tomography in the foot and ankle specialty.
- Jackson, D. M., et al. (2012). A novel radiographic targeting guide for percutaneous placement of transfacet screws in the cervical spine.

New Developments in Training for Vascular Imaging

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Abstract

When it comes to the diagnosis, planning, and monitoring of vascular illnesses, vascular imaging is essential. The emergence of sophisticated modalities like intravascular ultrasound (IVUS), MR angiography (MRA), and CT angiography (CTA) and the growing complexity of imaging technologies are causing a major shift in vascular imaging teaching paradigms. Current advancements place a strong emphasis on simulation-based training, competency-based education, and the incorporation of artificial intelligence (AI) for picture interpretation. The development of competence in radiation safety, post-processing methods, and multimodal imaging interpretation are currently the main objectives of contemporary training programs. Tools for simulation and virtual reality have become popular ways to get hands-on expertise without putting patients at danger. Applications of AI and machine learning are also being included to training programs to help students recognise patterns and make decisions. To encourage collaborative practice, interdisciplinary training including cardiologists, vascular surgeons, and radiologists is also being emphasised. These developments seek to improve patient outcomes by lowering the learning curve and increasing diagnostic precision. Adaptive learning techniques and ongoing professional development will be crucial as technology advances in order to stay up to date with new tools and approaches. A paradigm change towards more integrated, technologically driven, and learner-centred educational approaches is reflected in this abstract, which emphasises current trends and future directions in vascular imaging training.

Introduction

Vascular surgery has changed as a result of advancements in medical imaging. Patients' recovery periods and results have improved as a result of the shift to minimally invasive procedures, which mostly rely on imaging technologies for guiding. Nevertheless, there isn't any official instruction on multimodal vascular imaging or its advancements. Although duplex ultrasonography, digital subtraction angiography, and computed tomography angiography are still the most often utilised imaging modalities in vascular surgery, there hasn't been much progress in their instruction and training during the previous 20 years The aim was to prepare the upcoming generation of vascular specialists to become proficient in open surgery, endovascular training, medicinal therapies, and vascular diagnostics. Understanding the role of a vascular expert and distinguishing it from other specialities like interventional cardiology and interventional radiology can be difficult, though.(1) Percutaneous coronary intervention (PCI) operations have been guided more and more by intravascular imaging during the past three decades, including intravascular ultrasound (IVUS) and more recently optical coherence tomography (OCT). In particular, these imaging modalities assist interventionists in optimising stent implantation in a number of ways: 1) educating them about the need for lesion preparation; 2) guiding the selection of the ideal stent length to cover residual disease adjacent to the lesion, thereby minimising geographic miss (GM) (6–8); 4) guiding optimal stent expansion; 5) identifying acute complications (such as edge dissection, stent mal apposition, and tissue protrusion); and 6) elucidating the mechanism of late stent failure (e.g., stent thrombosis, neointimal hyperplasia, stent under expansion, stent fracture, neoathero sclerosis, stent thrombosis, stent fracture, stent under expansion, stent fracture, neoatherosclerosis).(2) The most significant development in cardiovascular fellow-ship training in the last two decades may be the most significant change that can be made with the most recent version of the core cardiovascular training statement (COCATS4). A consensus statement from the 1995 COCATS, which was held at Heart House in Bethesda, Maryland, produced the first guidelines for adult cardiovascular medicine training.(3)

Fenestration Identification and Location

For the purpose of clinical decision-making, especially when determining the risk of dissection progression and organising interventions like thoracic endovascular aortic repair (TEVAR), it is essential to precisely identify and localise flap fenestrations, which are tiny tears that permit blood flow between the true and false lumens, in patients with type B aortic dissection (TBAD). This study evaluated the capacity of three imaging modalities to identify and describe fenestrations: CT angiography, standard MRI/MR angiography, and 4D flow MRI. For fenestration detection, 4D flow MRI was comparable to CT angiography and showed better sensitivity than standard MRI/MR angiography in 19 patients (14 of whom also underwent CT angiography). According to reviewer assessments, 4D flow MRI found a comparable number of fenestrations to CT angiography (26 vs. 25) and more than MRI/MR angiography (e.g., 33 vs. 30 for one reviewer). The detection yield was further enhanced by combining MRI/MR angiography with 4D flow MRI. Significantly, 4D flow MRI was able to identify tiny, haemodynamically active fenestrations, many of which showed bidirectional flow, with antegrade flow during systole and retrograde flow during diastole. To sum up, 4D flow MRI is a useful addition to traditional imaging since it provides functional and anatomical details on the number, location, and flow properties of fenestrations.

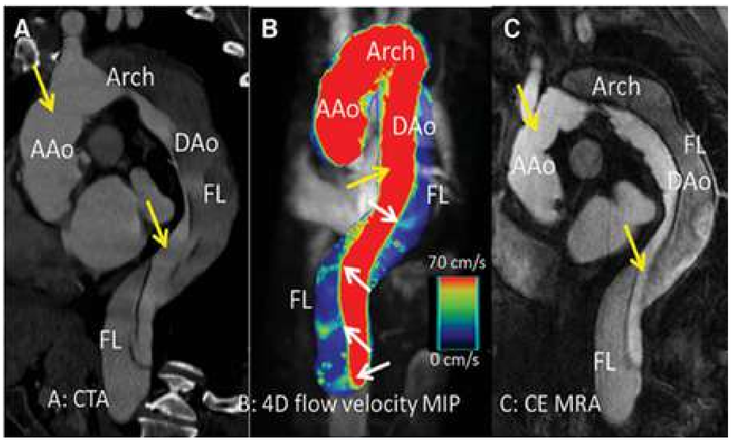

Figure 1: A, B, and C display CT angiography, contrast-enhanced MR angiogram, and an oblique sagittal 4D flow MRI velocity maximum intensity projection (MIP) image superimposed on magnitude pictures, respectively. Dissection architecture (ascending aorta [AAo], aortic arch [Arch], and descending aorta [DAo]), true lumen [yellow arrows], and fake lumen [FL] are all visible in both A and C; however, they may be limited by blurring artefacts related to pulsatile flap motion. There are four different fenestrations (white arrows) from the corresponding flow jets into the fictitious lumen during systole in the 4D flow velocity MIP picture. (4)

Imaging

Advanced imaging techniques that can resolve both anatomical detail and dynamic flow characteristics are necessary for the accurate detection and assessment of dissection flap fenestrations in type B aortic dissection (TBAD). Three different imaging modalities were used in this study: computed tomography (CT) angiography, flow in four dimensions (4D) MRI, and imaging with magnetic resonance (MRI) MR angiography.

a)Angiography with MRI/MR: Siemens Aera or Avanto 1.5-T scanner was used for MRI and MR angiography. Several sequences were used, such as steady-state free precession (true FISP), pre- and post-contrast T1-weighted VIBE, and axial and coronal T2-weighted HASTE. MR angiographic scans included static and Enhanced time-resolved contrast imaging in the Oblique left anterior plane. While MRI avoids ionising radiation and provides good soft tissue contrast, its ability to accurately identify minor fenestrations is limited by its comparatively low spatial resolution and propensity for motion artefacts.

b) MRI with 4D Flow: The thoracic aorta was covered in a left anterior oblique orientation during the acquisition of the 4D flow MRI employing respiratory navigator gating and ECG. Important acquisition parameters were velocity encoding of 150–270 cm/s, temporal resolution of 36–39 ms, and spatial resolution of 2.1–2.9 × 2.8–4.0 × 2.5–5.0 mm. Cycle Cardiovascular Imaging's (Cvi42) postprocessing software was used to create 3D velocity maximum intensity projection (MIP) images and simplify visualisations. This modality allowed for the examination of bidirectional flow patterns across the dissection flap as well as the detection of haemodynamically active fenestrations by providing both morphological and functional information.

c) CT Angiography: CT angiography was the gold standard for detecting anatomical fenestration. Using dual-source scanners (Siemens Somatom Definition/Force), ECG-gated scans were carried out after intravenous contrast injection. The reconstructions were carried out using a 0.4 x 0.4 × 0.75 mm spatial resolution. Despite offering high-resolution anatomical data, CT angiography has little haemodynamic information and might have been impacted by motion-related artefacts.(5)

Analysis of Data

To evaluate the presence, quantity, location, and flow characteristics type B aortic dissection patients' flap fenestrations, all imaging data were examined retrospectively. The images from each modality—CT angiography, MRI/MR angiography, and 4D flow MRI—were independently examined by two skilled cardiovascular radiologists. Modalities were evaluated independently, in random patient order, and with a minimum of two days between reviews in order to minimise recall bias. A study of the fenestrations was made for patients (n = 14) who had both CT angiography and MRI investigations. MRI and 4D flow MRI fenestrations were compared to those seen on CT angiography, which was utilised as the reference standard. Additionally, fenestrations on CT scans were measured for axial diameter. To assess interobserver agreement, the weighted kappa (κ) statistic was employed. Analysis of variance (ANOVA) was used to analyse fenestration sizes, and Spearman's rank correlation coefficient was used to evaluate associations between CT-measured fenestration size and flow parameters (number of systolic and diastolic phases shown in 4D flow MRI).

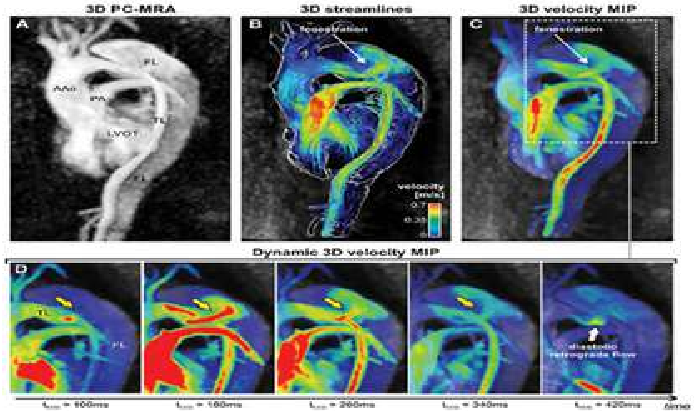

Figure:2 Flow MRI scans in four dimensions are displayed for a patient with type B aortic dissection. The architecture of the ascending aorta (AAo), pulmonary artery (PA), left ventricular outflow tract (LVOT), true lumen (TL), and false lumen (FL) are shown in a three-dimensional (3D) phase-contrast MR angiography using 4D flow data. Visualising complex f low patterns can be aided by late systolic phase 3D streamlines using time-resolved velocity data acquired with 4D flow MRI.C These three-dimensional velocity maximum intensity projection (MIP) images, which were captured during the same late systolic phase as B, can be utilised to detect smaller velocity or volume flow, such as that which happens during diastole or minor fenestrations, or bulk flow. D. Magnified 3D velocity MIP images taken with multiple phases through systole and early diastole show a high-velocity flow jet through a large proximal descending aorta fenestration, along with associated jet impingement and helical flow in the false lumen, followed by early diastolic retrograde flow into the true lumen. (5)

Preoperative Planning Using Image Post-Processing

Enhancing preoperative planning for vascular surgery requires sophisticated picture post-processing. The majority of surgeons frequently size endografts using clinical imaging tools like centreline software (such as Tera Recon or syngo.via), although more advanced 3D visualisation technologies provide more information. One method for creating photo-realistic, three-dimensional depictions of vessels and surrounding tissues is called cinematic rendering, which was created by Siemens Healthineers. This instrument, which is presently only available for research purposes, enables a multi-layered investigation of anatomy, from skin to bone, allowing surgeons to mentally practise intricate operations. For example, in the repair of an open thoracoabdominal aortic aneurysm, cinematic visualisation helps determine the best intercostal area for thoracic entry and locate important branch arteries for bypass or reimplantation. This level of anatomical comprehension can greatly enhance surgical accuracy and results. Because there is a lack of formal training in vascular imaging modalities other than ultrasound, these image post-processing techniques are still underutilised despite their potential. More knowledge and instruction about these instruments may result in better surgical planning, lower operating risks, and more individualised vascular care treatment plans.(1)

The Vascular Imaging Learning Curve

Vascular imaging in vascular surgery still has a high learning curve because of the field's quick technical advancements and the lack of formal training provided during residency. In traditional vascular surgery training, advanced modalities such as magnetic resonance imaging (MRI) and intravascular ultrasound (IVUS) are not thoroughly taught; instead, students receive only brief rotations in duplex ultrasound, computed tomography (CT), and interventional radiology. This limitation limits surgeons' use of imaging for surveillance, procedure planning, and patient selection. Vascular surgeons frequently feel unprepared to properly interpret and integrate imaging results, even though multimodal imaging is being used more


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and more to do minimally invasive treatments. Vascular surgery does not have a structured framework for imaging subspecialization, in contrast to cardiology, which has standardised training programs and advanced imaging fellowships. Vascular professional societies can build core competencies in vascular imaging by following the paradigm provided by the American College of Cardiology's COCATS project. One suggested remedy is the creation of advanced vascular imaging fellowships that are interdisciplinary and modelled after cardiology positions. These one- to two-year programs would cover image fusion technologies, CT, MRI, IVUS, and optical coherence tomography (OCT). Ideally, a group of vascular surgeons, cardiologists, neurologists, and radiologists would provide the instruction. Vascular specialists could enhance picture interpretation, increase procedural accuracy, and develop new imaging applications with the help of this training. (1)

Unscathed AAAs

Unruptured Abdominal Aortic Aneurysms (AAAs) are abdominal aortic dilatation of ≥3.0 cm that do not show signs of rupture. They are frequently asymptomatic and found through screening, especially in high-risk populations like males 65 and older. When symptoms are present, they may include a pulsating abdominal mass and back or stomach pain. The size, growth pace, symptoms, architecture, and patient fitness of the aneurysm all affect how unruptured AAAs are managed. AAAs with symptoms, asymptomatic aneurysms ≥5.5 cm in men and ≥5.0 cm in women, or those expanding more than 1 cm year are usually candidates for surgical treatment. There are two primary surgical options: open surgical repair (OSR) and endovascular aneurysm repair (EVAR).

EVAR: A stent graft is inserted through the femoral arteries during EVAR, a minimally invasive procedure. It provides fewer early complications, faster operating times, and shorter hospital stays. On the other hand, EVAR is linked to endoleaks and increased long-term re-intervention rates. Patients who are unfit for OSR or who have favourable anatomy and a fair life expectancy are typically advised to have it done.

OSR: A direct abdominal incision is made during OSR, and a prosthetic graft is used to repair the aneurysm. Although it has a higher short-term risk, it has better long-term results, such as fewer late rupture and re-intervention rates. For younger, healthier patients or those whose anatomy is not appropriate for EVAR, OSR is recommended. Because of the potential for problems, postoperative surveillance is essential following EVAR. This usually entails routine imaging to identify endoleaks or graft migration. On the other hand, because of its endurance, routine observation is typically not required following OSR. the decision between EVAR and OSR ultimately comes down to weighing the short-term surgical risks against the long-term results, patient comorbidities, anatomy, and preferences, all while following guidelines from organisations like NICE, ESVS, and SVS.

Ruptured AAAs

The rapid rupture of an abdominal aortic aneurysm causes ruptured abdominal aortic aneurysms (rAAAs), which are life-threatening crises that frequently result in mortality due to internal bleeding and hypovolemic shock. After surgical correction, they have a significant in-hospital mortality rate of about 35% and are the initial presentation in about 50% of patients with AAAs. There are two primary therapeutic options: Open Surgical Repair (OSR) and Endovascular Aneurysm Repair

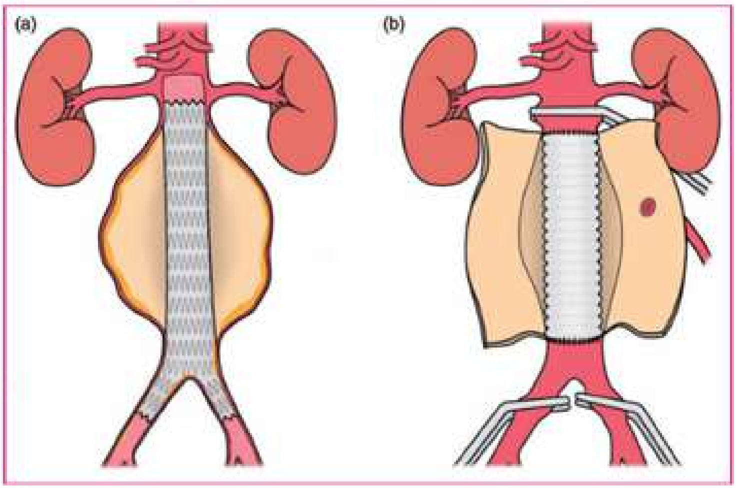


Figure 3 AAAs are repaired surgically.
(a) AAA cross section after EVAR treatment. (b) OSR

(EVAR). In order to remove the aneurysm, EVAR uses a stent graft inserted through the femoral arteries, whereas OSR needs direct abdominal access in order to replace the aneurysmal portion with a graft.

EVAR: Compared to OSR, EVAR is linked to a far lower in-hospital mortality rate (22.6% vs. 40.9%). It is especially helpful for individuals who are at high surgical risk and elderly (particularly males over 70). Local anaesthesia can be used for EVAR, which lowers perioperative mortality even more. But only if the patient's anatomy permits appropriate graft implantation is EVAR practical.

OSR:When EVAR is physically impossible or the patient is younger (men under 70), OSR may be preferred. OSR may be more durable over the long term in some groups, despite being more invasive. regardless of the strategy, quick action is essential. A door-to-intervention period of less than 90 minutes is advised by guidelines in order to maximise survival.(6)

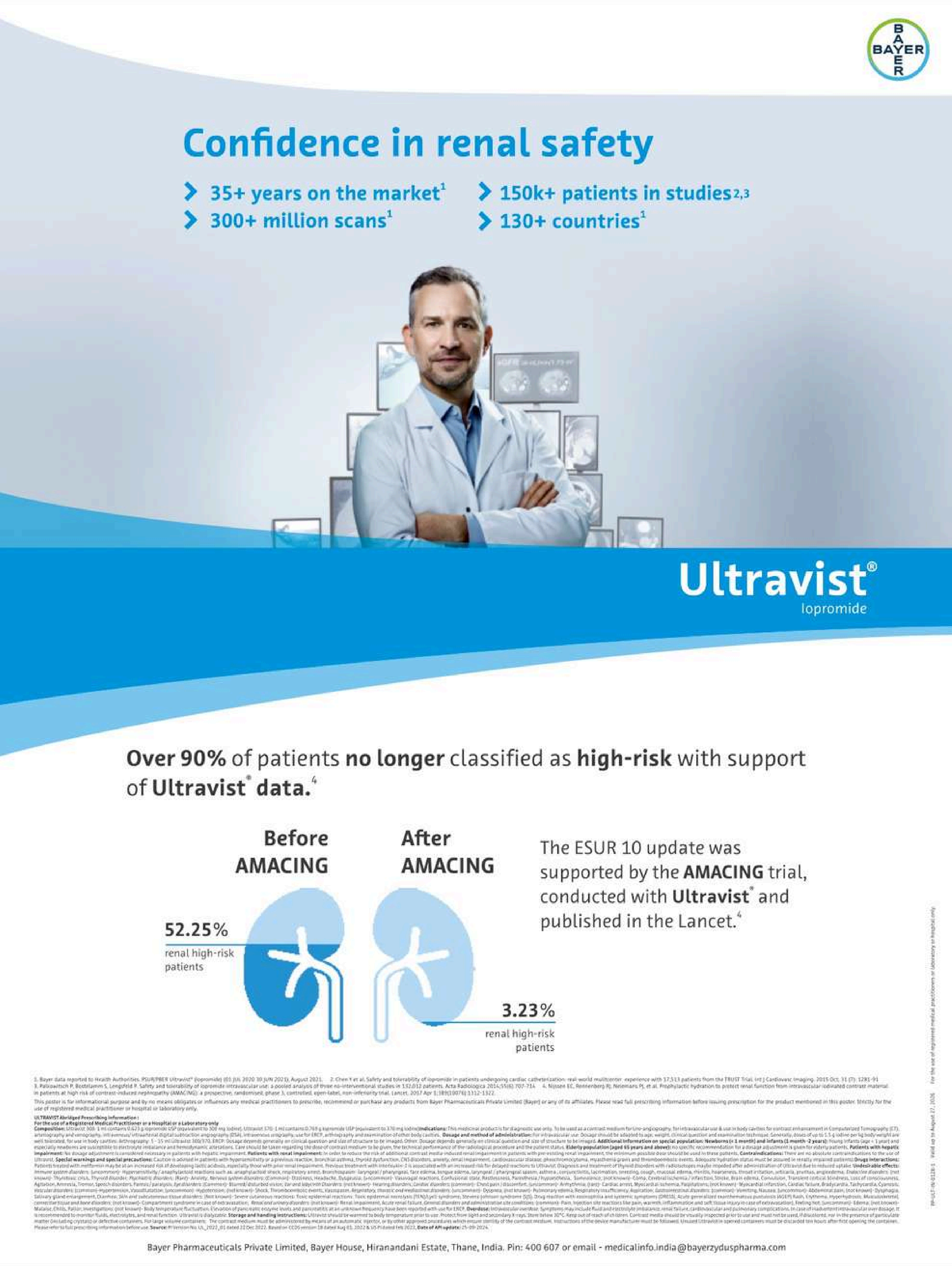
Plaque type assessment before to intervention in relation to acute stent outcomes

a) Distal embolization and lipid plaque: When lipid-rich plaques, especially thin-cap fibroatheromas, burst, necrotic core material is released into the circulation. Smaller downstream arteries may get blocked as a result of thrombus development and distal embolization. The potential for such emboli to cause myocardial damage, particularly in acute coronary syndromes, highlights the therapeutic importance of detecting and treating susceptible plaques.(7)

b) Calcification: Plaque burden is indicated by coronary artery calcification, which can hinder stent expansion during PCI. While OCT analyses both thickness and arc, IVUS is highly sensitive at detecting calcium but is unable to determine thickness. Poor results are correlated with thick, widespread calcium, which may necessitate the use of plaque modification procedures to guarantee the best possible stent deployment.

c) Stent sizing by IVUS: In IVUS stent size, the external elastic lamina (EEL) is measured at both proximal and distal reference points. It is common practice to average these results and round down by 0.5 mm to get the stent diameter. By optimising expansion and reducing the danger of restenosis, this method allows for precise stent selection.

d) OCT-based stent size: External elastic lamina (EEL) at proximal and distal reference segments is used for OCT stent sizing. If EEL is visible at 180° or more, the lesser diameter is


BAYER
Confidence in renal safety
35+ years on the market[1]
300+ million scans[1]
150k+ patients in studies[2,3]
130+ countries[1]
Ultravist®
Iopromide
Over 90% of patients no longer classified as high-risk with support of Ultravist® data.[4]
Before AMACING
After AMACING
52.25%
renal high-risk patients
3.23%
renal high-risk patients
The ESUR 10 update was supported by the AMACING trial, conducted with Ultravist® and published in the Lancet.[4]
1. Bayer data reported to Health Authorities. PSUR/PBER Ultravist® (Iopromide) (01 JUL 2020 30 JUN 2021), August 2021. 2. Chen Y et al. Safety and tolerability of iopromide in patients undergoing cardiac catheterization: real-world multicenter experience with 17,513 patients from the TRUST Trial. Int J Cardiovasc Imaging. 2015 Oct; 31 (7): 1281-91 3. Palkowitsch P, Bostelmann S, Lengsfeld P. Safety and tolerability of iopromide intravascular use: a pooled analysis of three non-interventional studies in 132,012 patients. Acta Radiologica 2014;55(6):707-714 4. Nijssen EC, Rennenberg RJ, Nelemans PJ, et al. Prophylactic hydration to protect renal function from intravascular iodinated contrast material in patients at high risk of contrast-induced nephropathy (AMACING): a prospective, randomised, phase 3, controlled, open-label, non-inferiority trial. Lancet. 2017 Apr 1;389(10076):1312-1322.
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chosen and rounded down. Lumen diameter is utilised when EEL is not visible. In spite of OCT's poor tissue penetration, this guarantees precise stent selection.(2)

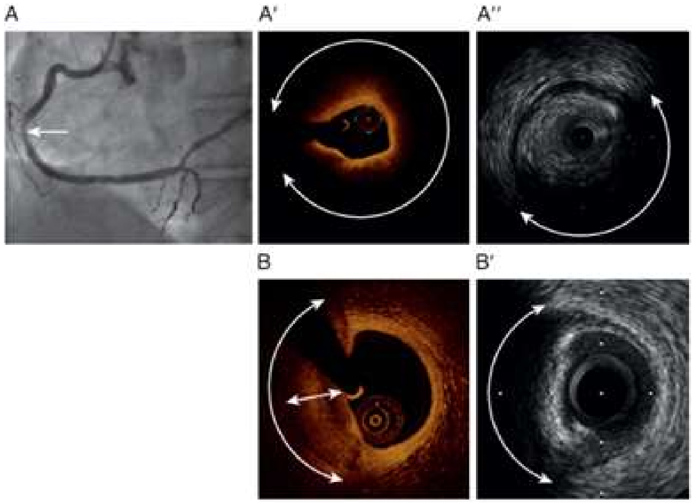

Figure 4. A patient with stable angina who experienced periprocedural myocardial infarction following stenting has OCT and IVUS pictures (A0) and (A00) that match to the arrow in (A). big lipid-rich plaque was identified by OCT (A0) as having a diffuse border with attenuation (double-headed arrow), and IVUS (A00) identified a big attenuated plaque as having a sechoattenuation without a hyperechoic leading edge (double-headed arrow). Both (B) (OCT) and (B0) (IVUS) display calcified plaque. OCT (double-headed arrow, 1.05 mm) is the only way to measure calcium thickness, and both IVUS and OCT can measure the calcium angle, which is 130.

Advanced training

The American College of Cardiology's release of COCATS 4 has brought about a revolutionary change in the development of cardiovascular training. When it was first created in 1995, the Core Cardiovascular Training Statement (COCATS) offered fundamental recommendations for fellowships in cardiology With the introduction of entrustable professional activities (EPAs) in this contemporary framework, all qualified cardiologists should be able to carry out these responsibilities on their own. These days, milestones help fellows-in-training (FITs) go from novice to independent practitioner through a series of skill-building phases. Continuity of care, teamwork, and lifelong learning are increasingly prioritised in training. Furthermore, by encouraging bidirectional feedback, COCATS 4 equips instructors and trainees to participate in constructive, formative assessment. Moreover, COCATS 4 broadens its scope to include critical care cardiology and multimodality imaging, reflecting developments in the field and bringing training into line with contemporary clinical requirements. These modifications to COCATS 4 guarantee that cardiologists are better equipped to provide high-quality, patient-centered treatment in a changing healthcare environment while also improving the calibre and adaptability of training.(3)

Complication

a)Early complication: Acute kidney injury (AKI), abdominal compartment syndrome (ACS), and myocardial infarction are among the early postoperative problems that arise after the treatment of an abdominal aortic aneurysm (AAA). About 8% of EVAR patients and 7.1% of OSR patients experience cardiac events. After OSR, AKI is more common (43%) than EVAR (26%), frequently as a result of contrast nephropathy and aortic clamping. A decompressive laparotomy is necessary for ACS, which is more prevalent in ruptured AAAs and is identified by intra-abdominal pressure more than 20 mmHg. Venous thromboembolism and pulmonary problems (8.3% OSR vs. 3.1% EVAR) are additional concerns that call for careful observation and preventative measures.

b)Late complication: Graft infection and endoleaks are late complications following abdominal aortic aneurysm (AAA) repair, especially after endovascular aneurysm repair (EVAR). Even though they are uncommon (~0.2%), graft infections can be fatal, with a mortality rate of up to 40%. The most frequent long-term problem with EVAR is endoleaks, of which type II is the most common (10.2%), which can cause rupture and expansion of the sac. Type I and Type III leaks are more likely to explode and typically need immediate attention. Graft migration, thrombosis, and the development of pseudoaneurysms are other late problems. Long-term monitoring is essential for identifying these issues early and directing reintervention as required.(6)

Reference

- Sinha K, Berczeli M, Lumsden AB, Roy TL. Imaging: New Frontiers in Vascular Training. Methodist DeBakey Cardiovasc J. 2022 Jun 3;18(3):39–48.
- Maehara A, Matsumura M, Ali ZA, Mintz GS, Stone GW. IVUS-Guided Versus OCT-Guided Coronary Stent Implantation. JACC Cardiovasc Imaging. 2017 Dec;10(12):1487–503.
- Sinha SS, Julien HM, Krim SR, Ijioma NN, Baron SJ, Rock AJ, et al. COCATS 4. J Am Coll Cardiol. 2015 May;65(17):1907–14.
- Cheng TW, Farber A, Rajani RR, Jones DW, Flynn D, Rybin D, et al. National criteria for academic appointment in vascular surgery. J Vasc Surg. 2019 May;69(5):1559–65.
- Allen BD, Aouad PJ, Burris NS, Rahsepar AA, Jarvis KB, François CJ, et al. Detection and Hemodynamic Evaluation of Flap Fenestrations in Type B Aortic Dissection with 4D Flow MRI: Comparison with Conventional MRI and CT Angiography. Radiol Cardiothorac Imaging. 2019 Apr;1(1):e180009.
- Kyriacou H, Mostafa AMHAM, Sumal AS, Hellawell HN, Boyle JR. Abdominal aortic aneurysms part two: Surgical management, postoperative complications and surveillance. J Perioper Pract. 2021 Sep;31(9):319–25.
- Virmani R, Burke AP, Farb A, Kolodgie FD. Pathology of the Vulnerable Plaque. J Am Coll Cardiol. 2006 Apr;47(8):C13–8.

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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

QUIZ to Recapitulate

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

1. In Odelca camera (MMR) films are exposed by which color of light?

2. What turns the X-ray tube glass transparent to brownish color?

3. What is RVG and where it is used?

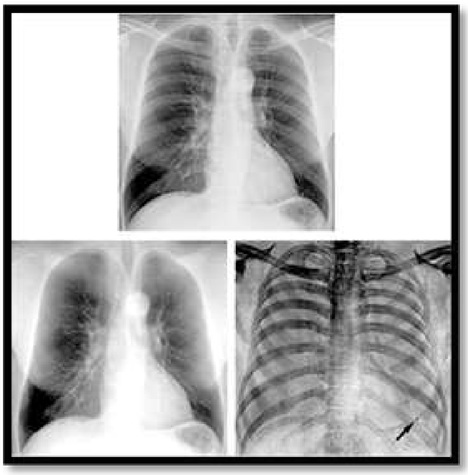
4. What procedure is TART?

5. List the three places cesium Iodide is/was used in Radiology?

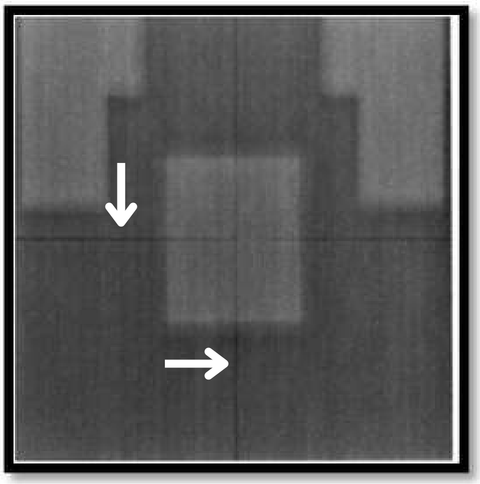
6. Where is centering point for adult hip AP view?

7. What angle is formed by the leg and thigh while taking AP View of the knee?

8. Name the procedure/Technique.



9. Identify the artifact and suggest remedy.



10. Identify the image

- Please send your answers through email on **pkpopli@gmail.com** on or before **10th March 2026.**
- 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 - January 2026 issue

1. No light is safe.

2. Thin layer of Lead or silver or liquid metal.

3. To protect the film from back scatter

4. Trans Arterial Chemo Embolisation

5. Xenon

6. 18-20 lp/mm.

7. 5 gauss (0.5 mT) and 9 gauss (0.9 mT) respectively

8. Vertebroplasty

9. Tomography

10. Direct puncture Cerebral Ventriculography

Radiographic signs that predict need for CT in trauma patients

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

Introduction

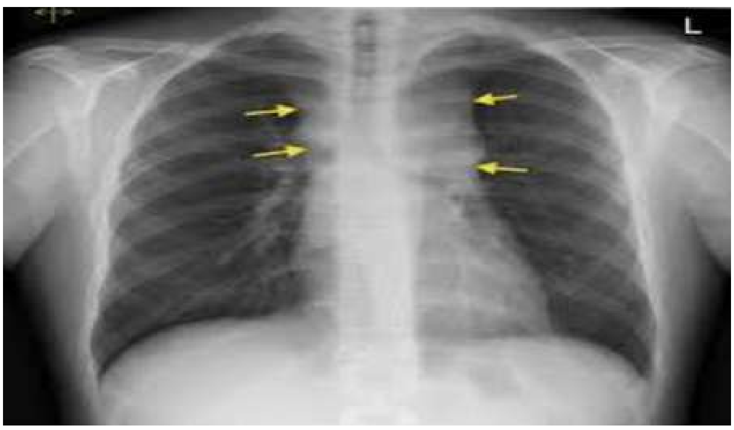
Trauma imaging follows a stepwise approach. Plain radiography is often the first investigation performed in emergency settings. It is fast, widely available, and useful for rapid triage. However, plain radiographs have limitations. Many injuries are subtle, occult, or complex. Computed tomography provides detailed cross sectional imaging and has become the cornerstone of modern trauma assessment. The challenge for clinicians and radiographers is deciding when a normal or equivocal radiograph is not enough. Certain radiographic signs strongly predict significant underlying injury and indicate the need for urgent CT. Recognizing these signs improves diagnostic accuracy, reduces missed injuries, and directly impacts patient outcomes. This article discusses key radiographic signs across body regions that should prompt CT evaluation in trauma patients.

Principles behind escalation from X ray to CT

Plain radiography provides a two dimensional representation of complex anatomy. Overlapping structures, poor patient positioning, and subtle injury patterns limit sensitivity. CT overcomes many of these limitations by offering multiplanar views and high contrast resolution. The decision to proceed to CT should not rely solely on obvious fractures. Indirect signs, alignment abnormalities, and soft tissue clues often signal deeper injury. Radiographic predictors act as red flags. When present, they suggest that injury severity exceeds what is visible on X ray.

General radiographic red flags in trauma

- Certain findings apply to multiple body regions. Poor visualization of anatomy due to patient condition or technical factors is itself an indication for CT. Inadequate views in an uncooperative or immobilized patient increase the risk of missed injury.
- Disproportionate pain compared to radiographic findings is another key predictor. When a patient has severe pain, swelling, or functional loss but minimal X ray findings, CT should be considered.
- Soft tissue swelling, gas, or foreign bodies on radiographs often indicate deeper structural damage. Joint effusions seen as fat pad signs or capsular distension suggest intra articular injury even when fracture lines are not visible.
- Multiple injuries on a single radiograph increase the likelihood of additional occult injuries. High energy mechanisms such as road traffic accidents, falls from height, and crush injuries lower the threshold for CT



Chest radiography signs predicting need for CT

- Chest X ray is routinely performed in trauma patients. While it identifies major injuries, many life threatening conditions may be underestimated.
- Widened mediastinum is a classic predictor of major vascular injury. Although not specific, it should prompt CT angiography to exclude aortic injury. Loss of normal aortic contour and deviation of trachea or nasogastric tube strengthen suspicion.
- Rib fractures, especially multiple or displaced fractures, predict associated injuries. Lower rib fractures raise concern for liver and splenic injuries. Upper rib fractures suggest high energy trauma and possible great vessel injury. CT is essential to assess underlying lung contusion, pneumothorax, hemothorax, and vascular damage.
- Pulmonary contusions may appear subtle or delayed on X ray. Patchy opacities, especially when inconsistent with clinical findings, warrant CT for accurate assessment.
- Persistent hypoxia with relatively normal chest X ray is another strong indicator. CT may reveal occult pneumothorax or pulmonary contusion not visible on radiographs.

Abdominal radiography signs predicting need for CT

- Plain abdominal radiographs have limited sensitivity in trauma but certain signs are important.
- Free intraperitoneal air indicates hollow viscus injury and mandates urgent CT for localization and extent. However, absence of free air does not exclude injury.
- Loss of psoas shadow suggests retroperitoneal hemorrhage. This finding should prompt CT evaluation of retroperitoneal structures.
- Pelvic fractures seen on X ray are strong predictors of associated abdominal and vascular injuries. Even minimally displaced pelvic fractures can be associated with significant bleeding. CT is required to assess pelvic organs, vessels, and fracture complexity.

- Presence of foreign bodies such as glass or metal fragments indicates penetrating trauma. CT helps map trajectory and detect organ injury.

Spine radiography signs predicting need for CT

- Spinal injuries carry high risk of neurological compromise. Plain radiographs are often inadequate, especially in high energy trauma.
- Loss of normal spinal alignment is a critical predictor. Any step off, angulation, or abnormal curvature should prompt CT. Subtle subluxations may indicate unstable injuries.
- Compression fractures with more than mild height loss raise concern for burst fractures. Posterior vertebral body involvement cannot be assessed on plain films alone. CT is necessary to evaluate spinal canal compromise.
- Inadequate visualization of the cervicothoracic junction is a common problem. If this region is not clearly seen, CT is indicated regardless of apparent normal findings.
- Prevertebral soft tissue swelling on cervical spine radiographs suggests underlying injury. Even without visible fracture, CT is required to exclude ligamentous or subtle bony injuries.
- Multiple level spinal tenderness or altered consciousness lowers reliability of radiographs. CT becomes the imaging modality of choice.

Head radiography signs predicting need for CT

- Skull radiographs are less commonly used today, but when performed, certain signs are important.
- Depressed skull fractures on X ray indicate high risk of intracranial injury. CT is mandatory to assess brain parenchyma and hemorrhage.
- Fractures involving the skull base may show subtle signs such as air fluid levels in paranasal sinuses or mastoid air cells. These findings should prompt CT to evaluate for basilar skull fracture and associated complications.
- Penetrating injuries with retained foreign bodies always require CT for trajectory assessment.
- Persistent neurological symptoms despite minimal radiographic findings indicate need for CT brain imaging.

Extremity radiography signs predicting need for CT

- Plain radiographs of limbs are common in trauma. Certain signs predict complex injury patterns.
- Intra articular fractures with unclear extent on X ray require CT for surgical planning. Subtle joint surface irregularities often underestimate injury severity.
- Fracture dislocation patterns, especially around ankle, elbow, and knee, indicate ligamentous and cartilage injury. CT helps define fracture geometry and joint congruity.
- Comminuted fractures suggest high energy trauma. CT is useful to assess fragment orientation and associated soft tissue injury.
- Subtle cortical irregularities with large soft tissue swelling may represent occult fractures. CT or MRI should be considered when clinical suspicion is high.
- Midfoot injuries with minimal radiographic findings but abnormal alignment raise suspicion of Lisfranc injury. CT is often required to confirm diagnosis.

Pelvic radiography signs predicting need for CT

- Pelvic X ray is a key trauma screening tool. Certain findings are strong predictors of severe injury.
- Disruption of pelvic ring integrity suggests instability. CT is mandatory to assess fracture pattern and associated hemorrhage.
- Symphyseal widening and sacroiliac joint asymmetry indicate ligamentous disruption. CT helps classify injury and guide management.
- Avulsion fractures in young patients may appear minor but can be associated with muscle and tendon injuries requiring further evaluation.
- Soft tissue asymmetry or obscured pelvic lines suggest hematoma formation. CT is essential for bleeding assessment.

Soft tissue and indirect signs

- Soft tissue signs are often overlooked but highly predictive. Joint effusions indicate intra articular injury. Fat pad signs in elbow and knee are classic examples.
- Gas in soft tissues suggests open injury or infection. CT helps assess extent and foreign body presence.
- Unexplained swelling or loss of normal fat planes indicates underlying injury. CT provides detailed soft tissue evaluation.

Role of mechanism of injury

Radiographic signs should always be interpreted in context of injury mechanism. High speed collisions, falls from height, and crush injuries increase likelihood of severe internal injury. Even subtle radiographic findings in these settings justify CT.

Low energy mechanisms with disproportionate radiographic findings also warrant escalation. Elderly patients and those with osteoporosis have higher risk of occult fractures.

Limitations of relying solely on radiographs

Normal radiographs do not exclude serious injury. Many life threatening injuries are radiographically occult. Reliance solely on X ray delays diagnosis and treatment. Radiographs should be viewed as screening tools rather than definitive tests in trauma.

Importance of communication

Clear communication between radiographer, radiologist, and trauma team is essential. Radiographers should report technical limitations and patient factors affecting image quality. Radiologists should clearly state when findings are inconclusive and recommend CT where appropriate.
Structured reporting helps highlight red flag signs. Explicit mention of indirect signs guides clinicians toward appropriate escalation.

Clinical impact of early CT escalation

Early CT based on radiographic predictors reduces missed injuries. It shortens time to diagnosis and improves surgical planning. Studies show reduced morbidity and hospital stay when CT is appropriately utilized in trauma.

Balancing radiation dose and diagnostic benefit is important. However, in trauma settings, the benefit of accurate diagnosis often outweighs radiation risk.

Conclusion

Radiographic signs that predict the need for CT play a critical role in trauma imaging. These signs include alignment abnormalities, indirect soft tissue clues, multiple fractures, and discrepancies between clinical findings and X ray appearances. Awareness of these predictors allows timely escalation to CT, reducing missed injuries and improving patient outcomes. Plain radiography remains valuable for initial assessment, but its limitations must be recognized. A vigilant, systematic approach and strong clinical correlation ensure that CT is used judiciously and effectively in trauma care.

Sustainability & AI in Medical Imaging

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Abstract
Global warming poses significant health risks, requiring healthcare providers, including radiologists, to minimize carbon emissions while addressing emerging medical challenges. Artificial intelligence applications in radiology can accelerate magnetic resonance imaging, enhance appointment scheduling, and decrease redundant scans, thereby reducing environmental impact. The article explores methods to optimize AI's ecological footprint against its advantages, emphasizing healthcare accessibility, financial efficiency, and improved clinical results. Reducing the environmental impact of healthcare operations, particularly in clinical radiology and radiotherapy (CRR), is essential for minimizing ecological damage. This research seeks to develop guidelines for implementing environmentally responsible practices in these fields. Major environmental concerns in clinical radiology and radiotherapy (CRR) encompass power consumption, disposal of medical waste, and transportation impacts. Including encouraging eco-friendly commuting and leveraging AI technology to optimize healthcare resources utilization. Environmental sustainability is greatly influenced by medical imaging practices. This article encourages imaging professionals to adopt environmentally conscious techniques to reduce their carbon footprint.

Keywords: Environmental sustainability, Artificial intelligence, green imaging, recycle, green practices, carbon foot printing

Introduction

According to the World Health Organization, the most significant hazard to human health has emerged as climate change(1). The detrimental impacts of climate change on public health and welfare are a major global issue(2).To contribute to environmental sustainability and mitigate the detrimental effects of climate change, immediate and deliberate action needs to be taken(2).The healthcare industry is a resource-intensive sector which uses plenty of water and electrical power and generates an extensive spectrum of trash in several waste categories, including regulated medical waste(2). Globally, the healthcare industry produces over 4 million tons of trash a year, the majority of which pollutes the environment(3). Medical imaging has been estimated to be responsible for up to 1% of worldwide GHG emissions, whereas health care accounts for 8% to 10% of overall greenhouse gas (GHG) emissions in the US. New research revealed that radiological contrast media waste is increasingly contaminating aquatic environments, mostly as a result of a boom in contrast-enhanced CT and MRI procedures during the last decade(4).

AI can help facilitate radiology's increased sustainability by optimizing the administration of imaging resources. It is necessary that the radiologists and AI scientists understand the dual nature of AI; while it has the potential to improve sustainability in medical imaging, it also has an adverse effect on greenhouse gas emissions. We possess the capacity to make rational decisions and formulate strategies to optimize AI's beneficial effects while limiting its negative environmental effects(1).

Adverse Effect of AI in Medical Imaging on Environmental Sustainability

The global health care system, encompassing medical imaging, has to deal with the significant quantity of greenhouse gas (GHG) emissions produced during the provision of treatment while simultaneously managing the health implications of climate change. The amount of greenhouse gas emissions from data centres and computational activities in radiology is escalating. The reason for this is the swift rise in big data and artificial intelligence (AI) applications, which has led to substantial energy costs for creating and implementing AI models.(1)

Applications of artificial intelligence in radiology contribute to substantial greenhouse gas emissions, but if utilized attentively they also have the potential to positively impact environmental sustainability. The entire AI and informatics infrastructure must be reevaluated to determine how the development and implementation of AI technologies in radiology affect GHG emissions both directly and indirectly. This involves considering into parameters like data storage, energy source selection, and AI model development and deployment.(1)

AI Models Fabrication and Implementation- AI model deployment, validation, and training require a large amount of computing power, resulting of substantial power consumption and production of greenhouse gases. Guidelines for sustainable AI software are insufficient, and there is no precise data on emissions from AI in radiology. The energy consumption and associated greenhouse gas emissions of AI model development vary according to the size and complexity of the database; the type of AI model; The amount of memory utilized, the number, kind, and processing time of computer cores, the algorithm run time, and the efficiency of the data centre.

AI model training uses a lot of energy more than 626 000 kg of carbon dioxide, and some models release as much CO2 as several automobiles over the span of their lifespans. Due to frequent use, significant emissions might also result from the inference phase, which is where predictions occur. Emissions may be estimated using a variety of criteria with the application of tools such as the Machine Learning Emissions Calculator. Numerous aspects are taken considered by this calculator, including the hardware type, training duration, and the geographical area. Reducing the number of processor cores and using energy-efficient technology may substantially reduce emissions.(1)

Recommendations for AI Software Sustainability in Radiology

In radiology to reduce greenhouse gas (GHG) emissions and enhance environmental sustainability, sustainable AI software development and implementation are significant. By complying to these guidelines, the radiology sector can aim for a more sustainable AI integration that achieves a balance between the advantages of AI and the need to mitigate its negative effects on the environment.

Specific Efficiency Criteria - For radiology AI models, clear efficiency criteria and reporting guidelines are crucial to advancing sustainability. These measurements might assist


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stakeholders understand the GHG emissions related to various AI technologies by being comparable to the Energy Star rating system used for appliances.

Awareness about energy utilization - Several aspects, such as the model's complexity, the kind of algorithms utilized, and the data centres efficiency, can greatly affect the energy needs and greenhouse gas emissions for developing AI models. To choose AI software effectively, among should be aware of these considerations.

Optimization mechanism- The optimal trade-offs between energy usage and training speed may be found by putting open-source optimization tools into practice. Energy savings from this method might be substantial, with deep learning models potentially saving ranges from 15% to 76%.

Maintenance of resources - GHG emissions may be reduced during AI simulations by employing techniques like cutting down on CPU and GPU core counts without appreciably lengthening execution times. For example, emissions were reduced by 33% when CPU cores were reduced from 60 to 30.

Alternative strategies - Energy usage may be further decreased by investigating other energy sources and applying small machine learning (TinyML). Compared to conventional approaches, TinyML's use of tiny, low-powered edge devices to run AI models may be greener.

Research initiatives - Initiatives to educate and explore the environmental effects of AI in radiology are severely needed; these efforts may help guide plans to reduce greenhouse gas emissions and encourage sustainable practices in the radiology community.(1)

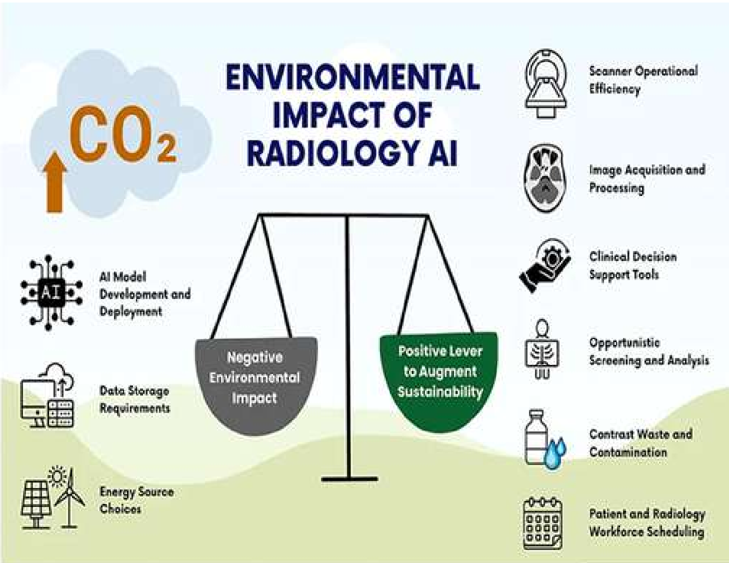

Figure.1 Artificial intelligence (AI) in radiology has negative impact on the environment as well as substantial potential and strategies for improving sustainability.(1)

Goals for greening radiology:

i. Reducing water and energy use - The need for sustainable technology for medical imaging is illustrated by the notion that MRI and CT scanners consume an enormous quantity of electricity—enough to run a small town—particularly in developing countries. cryogen free MRI, monitoring energy consumption, encourage low-energy imaging modalities and turning off workstation monitors while not in use may substantially reduce energy consumption. Hospitals may save energy with a payback period of approximately 2.2 years by implementing efficient lighting and control systems. Motion and daylight sensors, which may save energy usage by around 7%, are common the controllers. In comparison to conventional incandescent bulbs, energy-efficient bulbs such as fluorescent and LED lights use less energy and last longer. LEDs use around 75% less energy, which makes them a better option for hospitals.

ii. Implementing biodegradable materials - Using biodegradable goods instead of single-use ones, such as cornstarch-based drinking cups.

iii. Minimizing waste- The cost of managing paper might be up to 31 times higher than the cost of purchasing it. Primary care providers can save over $86,000 over five years by using electronic health records (EHR), mostly because of reduced medication costs and fewer billing mistakes. Organisation should consider green purchasing using tools like National Association of State Procurement Officials (NASPO's) green shopping recommendations to buy from energy-efficient businesses, reuse goods. Compared to reusable alternatives, which are more sustainable, single-use medical products result in increased pollution and resource consumption.

- **Reusing-** Healthcare is one of the industries that must transition from a single-use model to a circular economy in order to benefit the environment. Medical equipment must be developed and produced in a circular economy to ensure it is recyclable, upgradeable, and modular. Use reusable surgical gown and refilling hand sanitizer instead of single use gowns.
- **Teleradiology-** Teleradiology and hybrid practice positions are in greater demand because to the COVID-19 pandemic experience, and they may help reduce transportation-related pollution and energy consumption.
- **Anesthesia Gas-** In most surgical procedures, gas anesthetics are a major source of greenhouse gas emissions.

iv. Recycling and/or efficient trash disposal - Separating trash into solid and medical waste during radiology operations can assist decrease hazardous waste and increase recycling, especially prior to, during, and following the procedure.(4)

Fig.2- Ten ways to render artificial intelligence (AI) in radiology more sustainable, with an emphasis on reducing greenhouse gas (GHG) emissions and optimizing image processing and acquisition with AI technologies.(1)

Proposals for greener CRR practice

There are several ways to offer ES in Clinical radiology and radiotherapy (CRR) practice, ranging from simple adjustments to more extensive and persistent modifications that call for the participation of multiple stakeholders. Therefore, promoting education and practitioners' and other stakeholders' active involvement is key to achieving a greener clinical practice.

1.Regulated resource consumption : four-step strategy for green habits centred around water and energy conservation, waste reduction, the use of biodegradable products, and being

certain that garbage is disposed of or recycled properly. Integrating auto-shutdown features into imaging and related equipment allows for energy economy. Since motion-sensitive lights and light-emitting diodes have the potential for preserving around 75% of energy, their use was suggested. eliminating consequently radiological requests and exams, appropriately disposing of waste, implementing circular economy ideas into effect, such as recycling and reusing equipment parts, and encouraging paperless CRR practices.

2.Periodic Auditing for Resource and Energy : Energy consumption and waste management in CRR departments should be regularly audited in order to monitor performance and avoid complications. Similarly, radiopharmaceutical doses for CRR activities should be simplified for optimal waste management.

3.Development of policies and establishment of ES working groups : To build environmental sustainability into clinical radiology, policymakers should form bodies to influence and fund the laws and policies. The international CRR community can use committees or teams to monitor and encourage greener practices across departments in sub-regions globally, in collaboration with equipment manufacturers.

4.Education and research in sustainability : To increase awareness among practitioners, ES should also be incorporated into clinical radiology and radiography education and training, as well as continuous professional development (CPD) programmes. Prioritizing sustainability in healthcare and research requires specialized funding quota structures.(3)

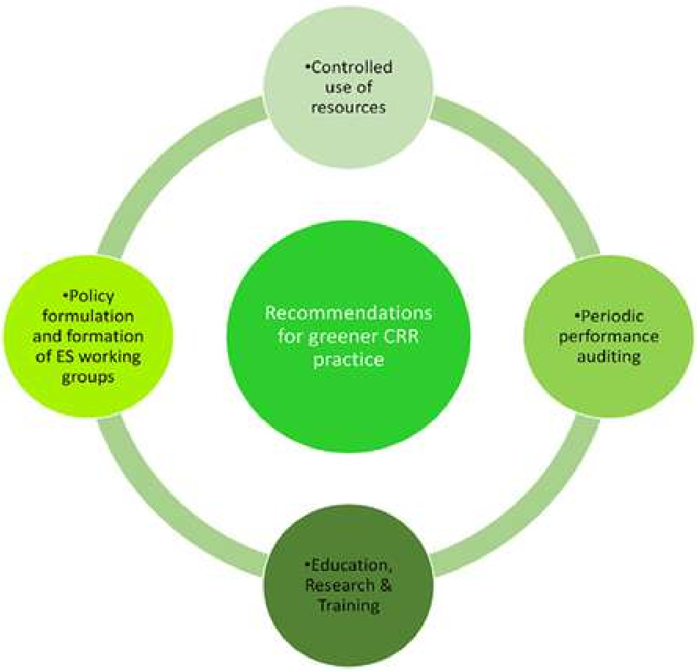

Fig.3- Greener CRR practice recommendations(3)

Importance of Sustainable Waste Management in Radiology

Waste management in the field of radiology can help improve cost savings and reduce the carbon footprint. This was demonstrated by a department that saved almost €10,000 and 20,513 kg of CO2 per year. Improper disposal of contrast media can lead to soil and water pollution, but proper disposal allows for recycling.

Clinical waste can also be incinerated to produce electricity, and recycling with the recovery of silver from old radiographs generates revenue and minimizes storage. waste disposal training for staff can improve practices such as their clinical and recycling waste, specifically in CT and interventional radiology. Staff and patients should have easy access to recycling choices, and buying patterns should be changes to avoid non- recyclable supplies in order to achieve long-lasting improvements.(5)

Conclusion

Reducing the detrimental environmental effects of healthcare requires the implementation of AI-supported sustainable practices in medical imaging. Reusable medical equipment has been selected over single-use items in order to minimize resource consumption and pollution. Significant energy usage savings can result from the implementation of energy-efficient procedures, such as the employing of cryogen-free MRI systems and monitoring to optimize energy consumption. Handling the complications imposed on by climate change and moving forward a more sustainable future in radiology necessitate prompt and deliberate effort.

References

- Doo FX, Vosshenrich J, Cook TS, Moy L, Almeida EPRP, Woolen SA, et al. Environmental Sustainability and AI in Radiology: A Double-Edged Sword. Radiology. 2024 Feb 1;310(2): e232030.
- Hanneman K, Szava-Kovats A, Burbridge B, Leswick D, Nadeau B, Islam O, et al. Canadian Association of Radiologists Statement on Environmental Sustainability in Medical Imaging. Can Assoc Radiol J. 2025 Feb;76(1):44–54.
- Anudjo MNK, Vitale C, Elshami W, Hancock A, Adeleke S, Franklin JM, et al. Considerations for environmental sustainability in clinical radiology and radiotherapy practice: A systematic literature review and recommendations for a greener practice. Radiography. 2023 Oct;29(6):1077–92.
- Sumner C, Ikuta I, Garg T, Martin JG, Mansoori B, Chalian M, et al. Approaches to Greening Radiology. Academic Radiology. 2023 Mar;30(3):528–35.
- Mariampillai J, Rockall A, Manuellian C, Cartwright S, Taylor S, Deng M, et al. The green and sustainable radiology department. Radiologie. 2023 Nov;63(S2):21–6.

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.
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SIR

PROF. KAKARLA SUBBARAO NATIONAL CME 2026

Best Scientific Paper Award
Presentation of
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Auditorium-Trauma Block
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Prof. Kakarla Subbarao was a World-renowned Radiologist and Former Director of Nizam's Institute of Medical Sciences, Hyderabad and founder Chairman, KREST. For his contributions to the field of Medicine. Prof. Kakarla had been honoured with **Padmasri** in 2000 by the Indian Government. He was the author of many Medical Books especially Diagnostic Radiology and Imaging foot Prints in Radiology, A Treatise on Disorders of Foot etc., He was honoured with Many awards such as Radiologist of the Millennium, Indian Roentgen, Son of India etc.,

He was the fellow of Royal College of Radiologists and founder Director of Nizam's Institute of Medical Sciences, Hyderabad.

The Society of Indian Radiographers, Telangana State Chapter is conducting every year a competition for Prof. K.S.R Best Scientific Paper Award for the Student Radiographers Life Time Achievement Award for Eminent Radiographers in Association with the Dept. of Radiology & Imageology NIMS and KREST, Hyderabad.

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The Students of Diploma/Degree pursuing or Internship only can participate in the Competition.

Students are advised to submit their abstracts along with the certificate issued by their Head of the Department for oral and poster presentations on or before **10.02.2026**.

The time allotted for the oral presentation for virtually and physically is 15 minutes. (12 minutes for oral presentation and 3 minutes for discussion)

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Robotic Assistance in Cerebral Angiography: Innovations and Implications

Pralay Paul, Palak Gaur, M. Sc. Research fellows, **Amit Bisht,** Assistant Professor,
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Introduction

Introduction to Cerebral Angiography and Robotics in Medical Procedures

Cerebral angiography remains the gold standard for diagnosing and treating various cerebrovascular disorders, including aneurysms, arteriovenous malformations (AVMs), stenoses, and ischemic strokes. Traditionally performed manually, the procedure requires navigating delicate and complex cerebral vasculature using catheters and guidewires under real-time fluoroscopic guidance. While effective, manual cerebral angiography poses several challenges, such as operator fatigue, radiation exposure, and procedural variability, all of which can impact both patient safety and clinical outcomes.

In recent years, robotic assistance has emerged as a groundbreaking innovation in neurointerventional radiology. Robotic systems offer enhanced precision, stability, and remote operability, allowing clinicians to perform complex maneuvers with submillimeter accuracy while reducing physical strain and radiation risks. These systems often integrate advanced imaging, artificial intelligence (AI), and remote-control interfaces, supporting more consistent and controlled procedures.

The application of robotics in cerebral angiography is not only improving the efficiency and safety of traditional interventions but is also paving the way for remote stroke treatments through telerobotics. As healthcare moves toward more technologically integrated practices, robotic assistance holds significant promise for expanding access to specialized care, particularly in underserved areas.

This chapter explores the technical capabilities, benefits, clinical applications, limitations, and future directions of robotic systems in cerebral angiography.

Evolution of Robotic Assistance in Medical Procedures

The evolution of robotic assistance in medical procedures has transformed the landscape of modern healthcare, moving from experimental innovations to routine clinical practice. The journey began in the 1980s with early robotic systems like the PUMA 560, which assisted in a brain biopsy, marking the first use of a robot in a surgical procedure. By the late 1990s, more sophisticated systems emerged, notably the da Vinci Surgical System, which revolutionized minimally invasive surgery by translating a surgeon's hand movements into precise robotic actions. This platform demonstrated improved dexterity, reduced invasiveness, and enhanced visualization, leading to its widespread adoption in urology, gynecology, and cardiothoracicsurgery.

As technology progressed, robotic assistance expanded into orthopedic, cardiac, and endovascular interventions. In interventional cardiology and neurovascular procedures, robotic systems improved catheter stability and reduced radiation exposure for both patients and operators.

Recent advancements focus on neurointervention, where robotic systems like the CorPath GRX offer submillimeter precision and remote operation capabilities, crucial for navigating the complex cerebral vasculature. Integration with artificial intelligence and advanced imaging technologies further enhances their utility.

From aiding basic surgical tasks to enabling remote, AI-supported procedures, robotic assistance has evolved into a critical tool in precision medicine, with growing potential across all medical specialties.

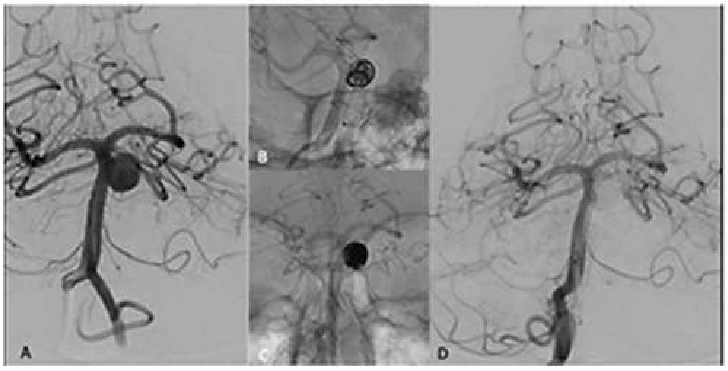

Figure 1. shows anterior-posterior digital subtraction angiography (DSA) pictures taken during the robotically assisted neurointerventional technique.
(A) Preoperative imaging of a right vertebral injection reveals a 12 mm × 11 mm sidewall basilar trunk aneurysm. (B) DSA per-procedure imaging demonstrating the first coil inserted inside the aneurysm and the Atlas stent positioned at the basilar artery beneath the bifurcation and across the aneurysm neck. (C) The final coil cast is shown in the final DSA. (D) Final DSA demonstrating a patent stent and an occluded aneurysm with no perioperative problems.

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Technical Specifications and Capabilities of Robotic Systems in Cerebral Angiography

Robotic systems in cerebral angiography have introduced a new era of precision, safety, and operator efficiency in neurointerventional procedures. A landmark innovation is the CorPath GRX system by Corindus (a "Siemens Healthineer" company), which exemplifies the cutting edge in robotic neurovascular technology. This system integrates micromotor-driven catheters, multi-axis robotic arms, and submillimeter-precision guidewire control, all operated from a remote console featuring joysticks, touchscreens, and radiation shielding.

These systems allow real-time, radiation-free manipulation of endovascular tools, supported by high-resolution imaging modalities such as digital subtraction angiography (DSA) and 3D rotational angiography. Advanced imaging integration enhances procedural accuracy and supports complex interventions like aneurysm coiling, thrombectomy, and stent placement. Software capabilities include AI-assisted navigation planning, semi-automated device manipulation, and early-stage remote procedural execution (telerobotics).

Clinically, robotic systems demonstrate equivalent or superior procedural success compared to manual methods, while reducing operator radiation exposure by over 95% and alleviating musculoskeletal strain. Their consistent, repeatable movements enhance reproducibility and training potential across operators and institutions.

Despite these strengths, challenges remain. Current systems offer limited tactile feedback, reduced compatibility with certain neurovascular devices, and high acquisition and maintenance costs. Furthermore, adoption is hindered by the need for extensive training and workflow adaptation.

Looking ahead, enhancements like haptic feedback, AI-driven decision support, and miniaturized systems tailored to neurovascular anatomy are in development. As robotic platforms evolve, they are expected to play a transformative role in remote interventions and expand access to expert care, especially in underserved regions.

In summary, robotic systems in cerebral angiography present a sophisticated integration of mechanical precision, imaging intelligence, and ergonomic design, poised to redefine safety, accuracy, and accessibility in neurointerventional radiology.

Figure 2: Robotic System CorPath GRX. (A) A robotic arm equipped with a sophisticated cassette. (B) The procedure's configuration. The main neurointervention was seated in a radiation-shielded workstation in the angiography room's corner. The team at the patient's bedside included two neurointerventionalists and a specialist robotic technologist who managed the perfused lines and hubs and loaded the devices.

Benefits of Robotic Assistance in Cerebral Angiography

Robotic assistance in cerebral angiography offers numerous benefits, significantly enhancing procedural precision and operator safety. It enables highly controlled catheter and guidewire manipulation, reducing the risk of vascular injury and improving outcomes in complex neurovascular procedures. By allowing remote operation from radiation-shielded workstations, it minimizes radiation exposure and operator fatigue. Robotic systems also improve ergonomics, reducing musculoskeletal strain from prolonged procedures. Additionally, they support standardization and reproducibility, promoting consistent results across operators. The potential for remote interventions through telerobotics further expands access to specialized care, particularly in underserved regions. These advantages collectively enhance the safety, efficiency, and accessibility of neurointerventional care.

Clinical Applications of Robotic Assistance in Cerebral Angiography

Robotic assistance in cerebral angiography is increasingly being utilized across a range of diagnostic and interventional neurovascular procedures. In diagnostic angiography, robotic platforms enable remote-controlled navigation of guide catheters through the aortic arch into cerebral vessels such as the internal carotid and vertebral arteries. This minimizes micro-movements and enhances procedural stability, reducing the risk of vessel injury. In interventional applications, robotic systems support complex procedures with greater precision. For aneurysm coiling, they offer fine stepwise control of microcatheters and coils, reducing the risk of aneurysmal rupture from abrupt movements. Similarly, in arteriovenous malformation (AVM) embolization and dural arteriovenous fistula (DAVF) treatment, robotic control allows for super-selective catheterization of tortuous vessels with improved safety.

Robotic assistance also holds promise in stroke management, particularly for mechanical thrombectomy in large-vessel occlusions. Though still in early stages, robotic systems could enable remote stroke interventions, significantly reducing treatment delays in underserved areas.

Furthermore, these systems are particularly beneficial in managing complex cerebrovascular conditions such as Moyamoya disease and chronic stenosis, where precise, stable navigation is essential.

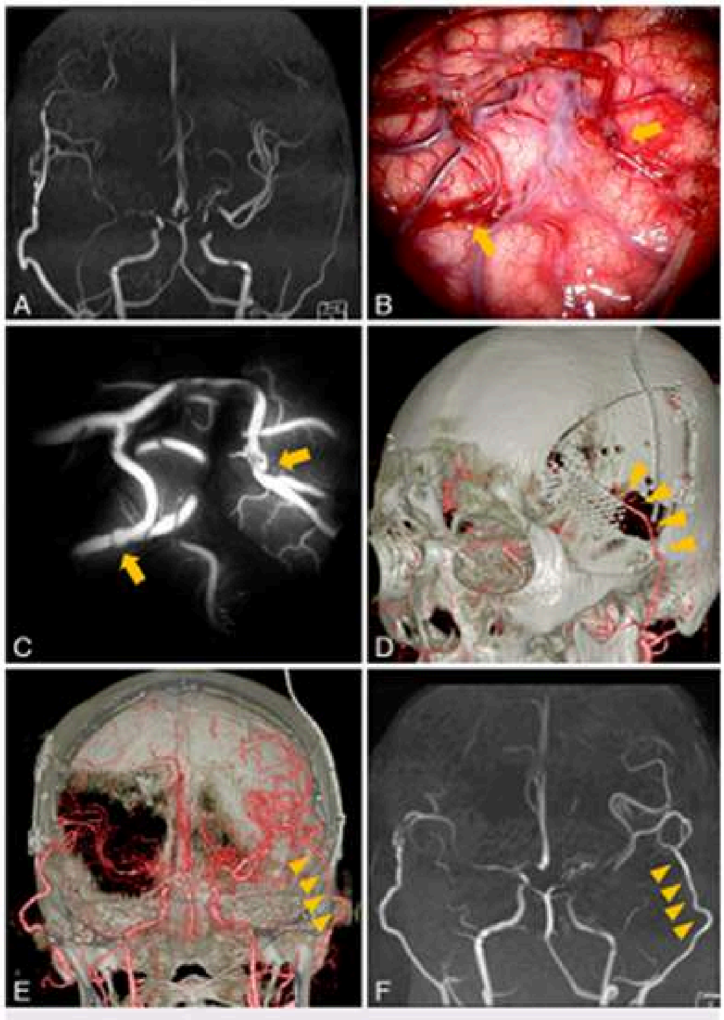

Figure 3: shows successful bypass on both sides post-treatment, confirmed by intraoperative imaging, IV3D-DSA, and postoperative MRA visualization.

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Overall, robotic platforms enhance the safety, precision, and reach of neuroendovascular procedures, paving the way for advanced and equitable stroke and cerebrovascular care.

Challenges and Limitations of Robotic Assistance in Cerebral Angiography

Robotic assistance in cerebral angiography, while innovative, presents notable challenges and limitations. A major drawback is the lack of haptic feedback, limiting the operator's ability to sense resistance within delicate vessels. Device compatibility remains an issue, as many robotic systems are not optimized for neurovascular tools. High costs for equipment, maintenance, and training hinder widespread adoption, especially in low-resource settings. Additionally, there is a steep learning curve and potential workflow disruptions during setup. Telerobotic applications face technical barriers such as connectivity reliability and cybersecurity concerns. Addressing these limitations is essential for broader, safer integration into neurointerventional practice.

Future Directions of Robotic Assistance in Cerebral Angiography

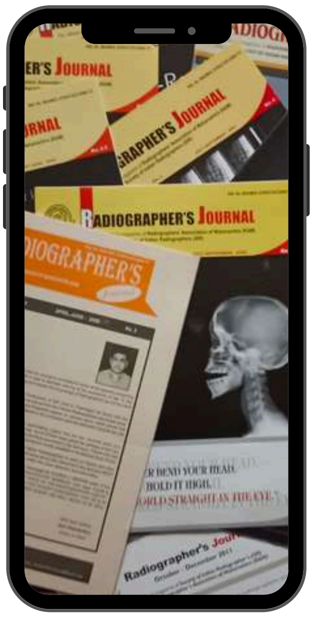
The future of robotic assistance in cerebral angiography focuses on enhancing precision, safety, and accessibility. Innovations such as haptic feedback will improve tactile sensitivity, while AI integration will enable real-time decision support and semi-autonomous navigation. Telerobotic systems are expected to expand access to specialized care, particularly in remote or underserved areas. Miniaturized, neurovascular-specific robotic platforms will better accommodate complex intracranial anatomy. Improved workflow integration with imaging systems and augmented reality is anticipated to streamline procedures. Additionally, large-scale clinical validation and cost-effectiveness studies will be crucial for widespread adoption, ultimately transforming neurointervention into a safer, more efficient, and equitable field.

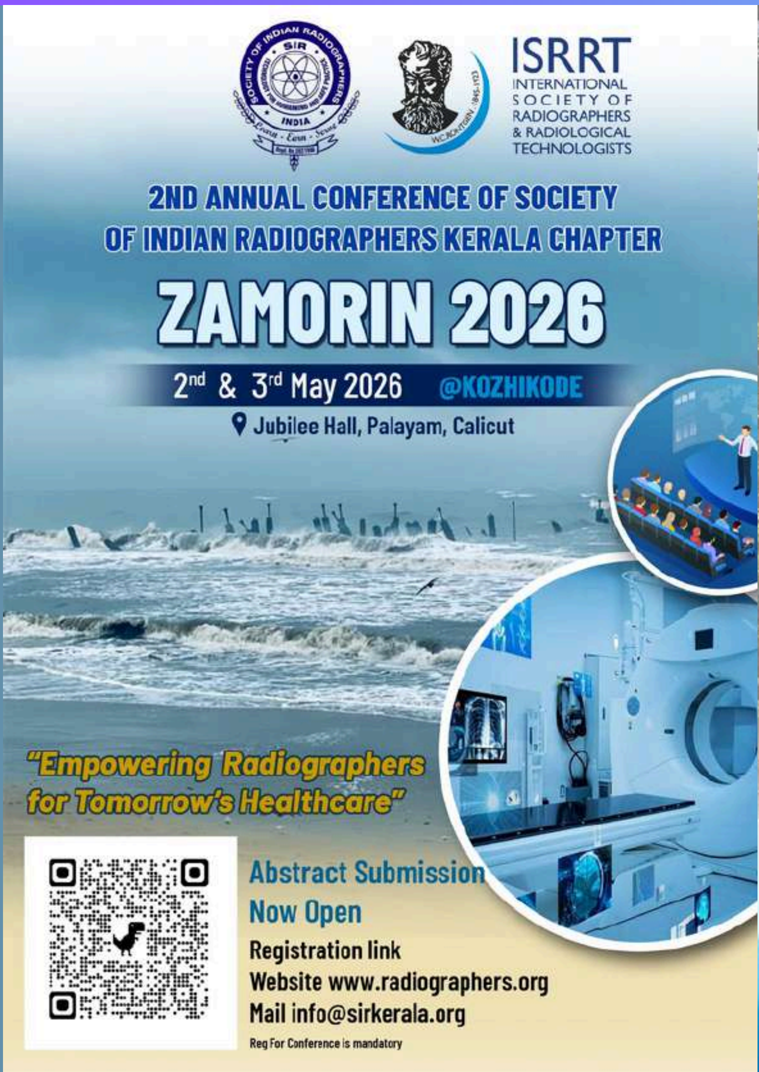
Conclusion

Robotic assistance in cerebral angiography represents a transformative advancement in neurointerventional care, offering enhanced precision, reduced radiation exposure, improved ergonomics, and the potential for remote interventions. By addressing limitations of manual techniques, these systems contribute to safer, more consistent procedures and broaden access to expert care. However, challenges such as limited haptic feedback, high costs, and device compatibility must be overcome. With ongoing innovation in AI integration, haptic technology, and telerobotics, the role of robotics in neurointervention is set to expand, ultimately reshaping clinical practice and improving outcomes in cerebrovascular diagnosis and treatment worldwide.

References

- Łajczak, P. M., Jóźwik, K., Nowakowski, P., & Nawrat, Z. (2024) Machine meets brain: A systematic review of the effectiveness of robotically performed cerebral angiography interventions. World Neurosurgery, 186, 235–241.e1. [https://doi.org/10.1016/j.wneu.2024.04.012]
- Shah, R., et al. (2020) First-in-human robotic-assisted neuroendovascular intervention. Journal of Neurointerventional Surgery, 12(8), 781–784.
- Majmundar, N., et al. (2021) Robotic neurointervention: Current perspectives and future directions. Frontiers in Robotics and AI, 8, 638245.
- Sajja, K., et al. (2021) Robotic-assisted neurointervention: Feasibility, benefits, and limitations. Interventional Neurology, 10(2–3), 95–102.
- Bhoja, R., Bailey, L., Marinaro, J., & Asadi, H. (2022) Robotic neurointervention: Current perspectives and future directions. Journal of Neurointerventional Surgery, 14(2), 109–116. [https://doi.org/10.1136/neurintsurg-2021-017867]

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Dear Radiograhers & Students,
It gives me immense pleasure to extend my warm greetings to all delegates, faculty members, and participants of the State Conference of the Society of Indian Radiographers, Kerala Chapter.
This conference provides a valuable platform for radiography professionals to come together, exchange knowledge, share experiences, and discuss recent advancements in medical imaging and radiological sciences. In an era of rapidly evolving technology, continuous professional development and academic interaction are essential to enhance the quality of patient care and professional standards.
I am confident that the scientific sessions, workshops, and deliberations during this conference will enrich our knowledge, inspire innovation, and strengthen unity among radiographers across the state. Such gatherings also reaffirm our collective commitment to ethical practice, skill development, and the growth of our profession.
I congratulate the organizing committee for their dedicated efforts in arranging this conference and wish the event a grand success. I hope all participants find this conference academically rewarding and professionally fulfilling.
With best wishes,
Linse George
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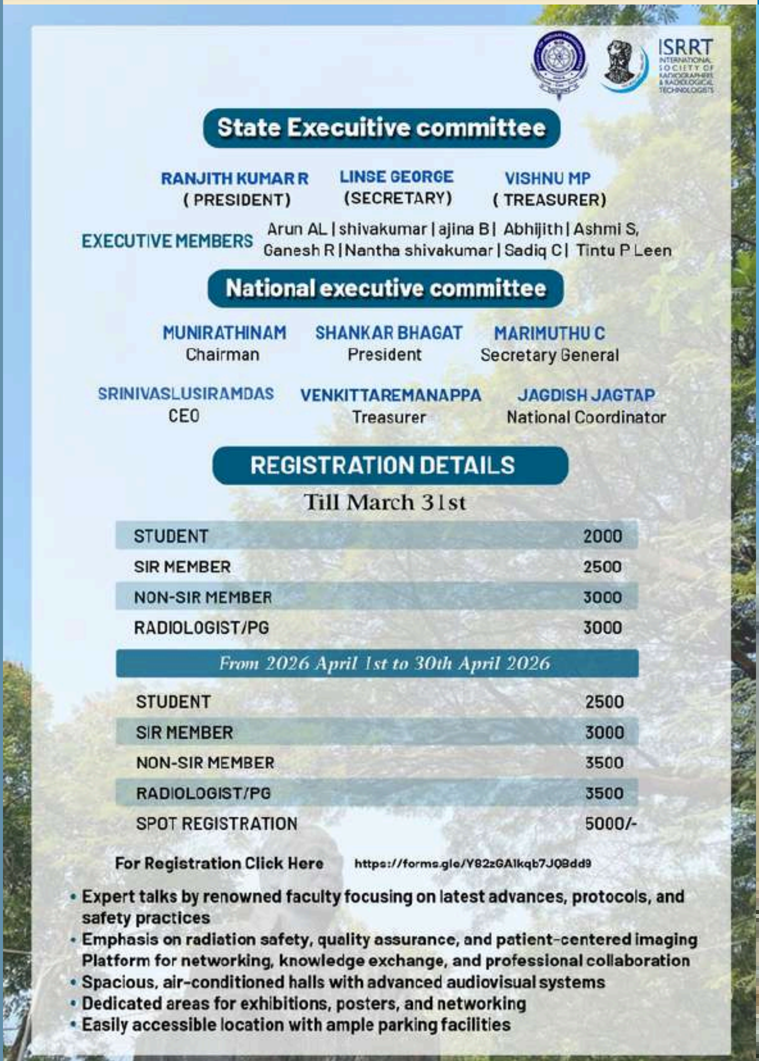
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X-Ray Defecography

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Introduction

Defecography is a specialized fluoroscopy x ray examination designed to evaluate the process of defecation. It provides a dynamic assessment of the rectum, anal canal and the pelvic floor muscles during the rest, straining and evacuation. Many patients suffer from chronic constipation or defecation difficulty despite normal findings on routine investigation. In such cases, defecography plays a crucial role by revealing functional abnormalities that cannot be detected on static imaging. Conventional radiology shows only structured anatomy, whereas defecography demonstrate real – time movement and coordination of pelvic structures. This makes it a valuable tool in diagnosing pelvic floor dysfunction, guiding appropriate treatment, and preventing unnecessary surgeries. Fluoroscope is a real time imaging which captures the real time of the motion of the pelvic floor.

Scope :

- It gives the shape and structure of the rectum .
- The main function of this so to visualizethe rectal emptying and muscle coordination

Epidemiology of Rectal Contras

- Now a days 25% of women are get affected by the pelvic floor dysfunction because of the multiple vaginal deliveries menopause.
- It can also affect men but compared to women it is less
- Many patients are affected silently because of the embarrassment.
- It is gold standard for diagnosing of outlet obstruction constipation.

Basic Physiology of Defecation:

- Normal defecation is a complex, coordinated process involving
    1) Rectal distension
    2) Relaxation of internal and external anal sphincters
    3) Relaxation of the puborectalis muscle
    4) Increase in the intra – abdominal pressure .
- The puborectalis muscle plays a key role by maintaining the anorectal angle, which prevents involuntary stool passage.
- During defecation, this muscle relaxes, allowing the anorectal angle to straight and feces to be expelled.
- Any disruption in this coordination leads to defecatory disorder , which are well demonstrated by defecography.

Indication for Defecography

Chronic constipation

- Excessive straining during bowel movements
- Sensation of incomplete evacuation
- Pelvic floor dysfunction
- Fecal incontinence
- Obstructed defecation syndrome
- Suspected rectocele or rectal prolapse
- Failure of conservative treatment

Contraindication of Defecography :

- Acute anorectal inflammation
- Recent colorectal surgery
- Bowel perforation
- Relative Contraindications
- Pregnancy
- Severe anal pain
- Inability to cooperate

Physiology of the defecation :

First the puborectalis is contacted

- The pelvic floor is voluntarily contracted
- Relaxation of the puborectalis
- Decent of perinium
- Opening of the anal canal

Indications:

- Obstructed defecation syndrome (ODS)
- Pelvic organ prolapse
- Rectal prolapse
- Rectal intussusception
- Enterocele and sigmiodocele

Types of Defecography :

X-Ray (Conventional) Defecography

- Uses fluoroscopy and barium paste
- Widely available and cost-effective

MR Defecography

No radiation

- Better soft tissue details
- Limited availability and higher cost

Patient Preparation :

- Explanation of procedure to reduce anxiety
- Informed consent obtained
- Mild rectal enema if required
- No heavy bowel preparation needed
- Removal of metallic object's
- Patient wears hospital gown

Contrast Media Used:

- Thick barium paste is introduced into the rectum
- Mimics stool consistency
- In females, vaginal contrast may be used
- Oral contrast may be given to evaluate enterocele

Positioning for Defecography:

Patient positioning is crucial in defecography because the examination aims to simulate natura defecation as closely as possible Correct positioning ensures accurate assessment of anorectal and pelvic floor function

1. Standard Position Physiological Position

- Seated Position on Radiolucent Commode
- The patient is seated on a radiolucent commode defecography chair) attached to the fluoroscopy table
- This position best mimics normal defecation
- It is the preferred and standard position

Projection Used

- Lateral View (Most Important View)
- The patient is positioned in a true lateral position
- The sagittal plane of the body is parallel to the image receptor
- X-ray beam is directed horizontally through the pelvis
- Entire anorectal region, pelvic floor, and sacrum must be included

This view allows:

- Measurement of the anorecta angle
- Assessment of pelvic floor descent
- Visualization of rectocele, prolapse, and intussusception

Position During Different Phases

The same seated lateral position is maintained while images are taken

1) Resting phase - patient relaxed
2) Squeeze phase - patient contracts anal sphincter
3) Straining phase - patient bears down
4) Defecation phase - patient evacuates contrast
5) Post-evacuation phase - residual contrast assessed

1] Resting Phase

Description

- The patient is seated comfortably and asked to relax completely
- No voluntary contraction or straining is performed

Purpose:

- Establishes the baseline anatomy of the rectum and anal canal
- Serves as a reference for comparison with other phases

What is evaluated :

- Resting position of the pelvic floor
- Shape and position of the rectum
- Anorectal angle at rest
- Anal canal closure
- Pelvic floor at normal height

2] Squeeze Phase

Description

The patient is instructed to voluntarily contract the anal sphincter, as if trying to prevent defecation.

Purpose : Tests the strength and coordination of the external anal sphincter and pelvic floor muscles

What is evaluated :

- Elevation of pelvic floor
- Narrowing of anal canal
- Change in anorectal angle

3] Straining Phase

Description

The patient is asked to bear down as if attempting to pass stool, but without evacuating

Purpose

- Evaluates the mechanics of defecation and pelvic floor relaxation
- What is evaluated
- Descent of pelvic floor
- Opening of anal canal
- Increase in anorectal angle

4] Defecation Phase

Description:

- The patient is instructed to actively evacuate the barium paste

Purpose:

- This is the most important phase, as it directly visualizes actual defecation

What is evaluated:

- Completeness of rectal emptying
- Pelvic organ movement
- Rectal wall abnormalities

5] Post-Evacuation Phase

Description:

- Images are taken after defecation is completed

Purpose:

- Assesses residual contrast and pelvic floor recovery

What is evaluated:

- Amount of contrast remaining in rectum
- Return of pelvic floor to resting position

Squeeze Phase **Straining Phase** **Defecation Phase**

Pubococcygeal line (PCL)

- A straight line drawn from the inferior border of the pubic symphysis to the hip of coccyx.
- It shows the normal resting level of the pelvic floor muscles.
- It helps to quantify the pelvic organ prolapse.
- And also helps to find the pelvic floor dysfunction during defecation


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Pubococcygeal line (PCL)

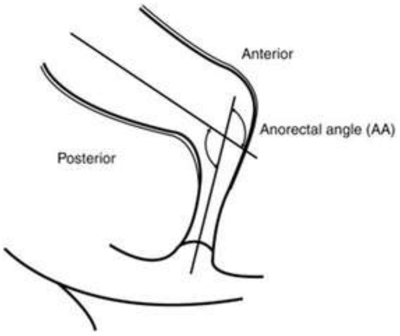
- M LINE
- M-LINE it is perpendicular line drawn from the PCL
- It is used to measure the distance from the PCL to anorectal junction.

The Anorectal Angle:

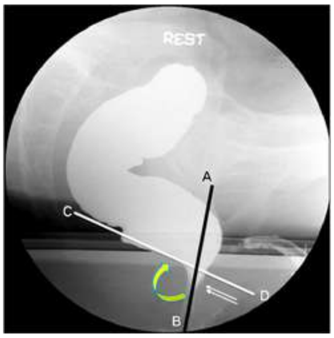
- It is defined as the angle between the centre of the anal canal and the posterior wall of the rectum

Normal values :

- In rest position it range from the90-100 degree
- When squeezing ranges from the 70 degree –90 degree
- In squeezing the angle sharpens
- During the defecation it ranges from the 110 degree to 180 degree
- In defecation the angle straightens and it allow to exit
- It helps to access the fecal incontinence orchronic constipation



The Anorectal Angle



Anorectal Angle in Defecography

Evolution of the Rectocele:

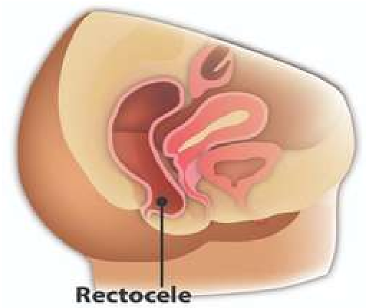
- An anterior bulging of the rectal wall into vagina

Grading:

- Small : <2cm
- Medium: 2-4cm

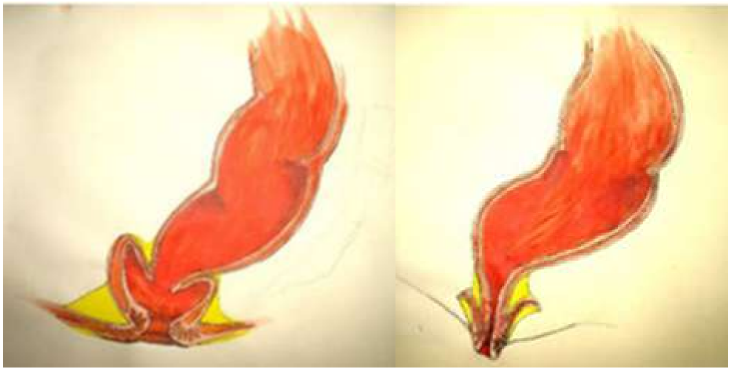
Large : 4 cm

Significance : only the rectoceles that trap barium during the evacuation are considered clinically significant.



Evaluation of Intussusception

- It appear like funnel –within a funnel sign
- The rectal wall telescopes into itself
- The prolapse stays inside the rectum
- The prolapse exits the anal cage



Evaluation of Intussusception

Additional / Optional Position

- Though not routine, sometimes used;
- Standing position
- Helps assess severe pelvic organ prolapse
- Supine or lateral decubitus position

Used only if patient cannot sit
Less physiological and less accurate .

Additional or Alternative Position :
Standing Position

- Occasionally used in severe pelvic organ prolapse
- Demonstrates gravity-dependent descent

Supine or Lateral Decubitus Position

- Used only if patient cannot sit
- Considered non-physiological
- Less accurate for functional assessment

Role of Radiographer in Positioning

The radiographer plays a vital role by:

- Explaining the procedure clearly
- Ensuring patient comfort and dignity
- Achieving correct lateral alignment
- Monitoring patient during straining and defecation
- Minimizing radiation exposure

Comparison :

X – ray Defecography

- Uses ionizing radiation
- Better evacuation dynamics
- Widely available
- Limited organ detail

MRI Defecography

- No radiation
- Better soft tissue evaluation
- Expensive
- Multicompartment evaluation

The following readers participated in the Quiz – January 2026 issue.

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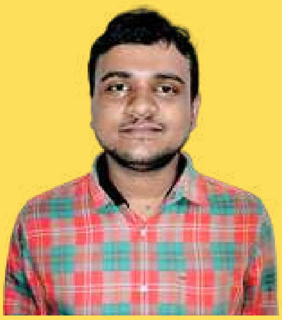

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