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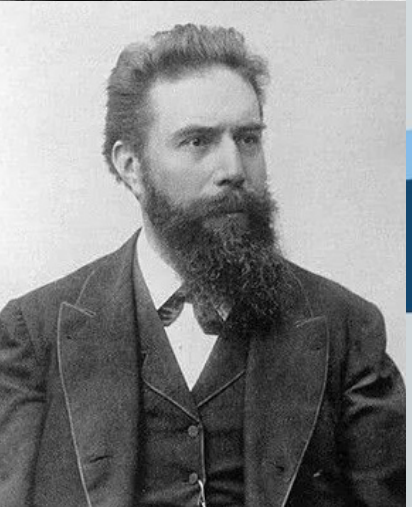
October, 2023



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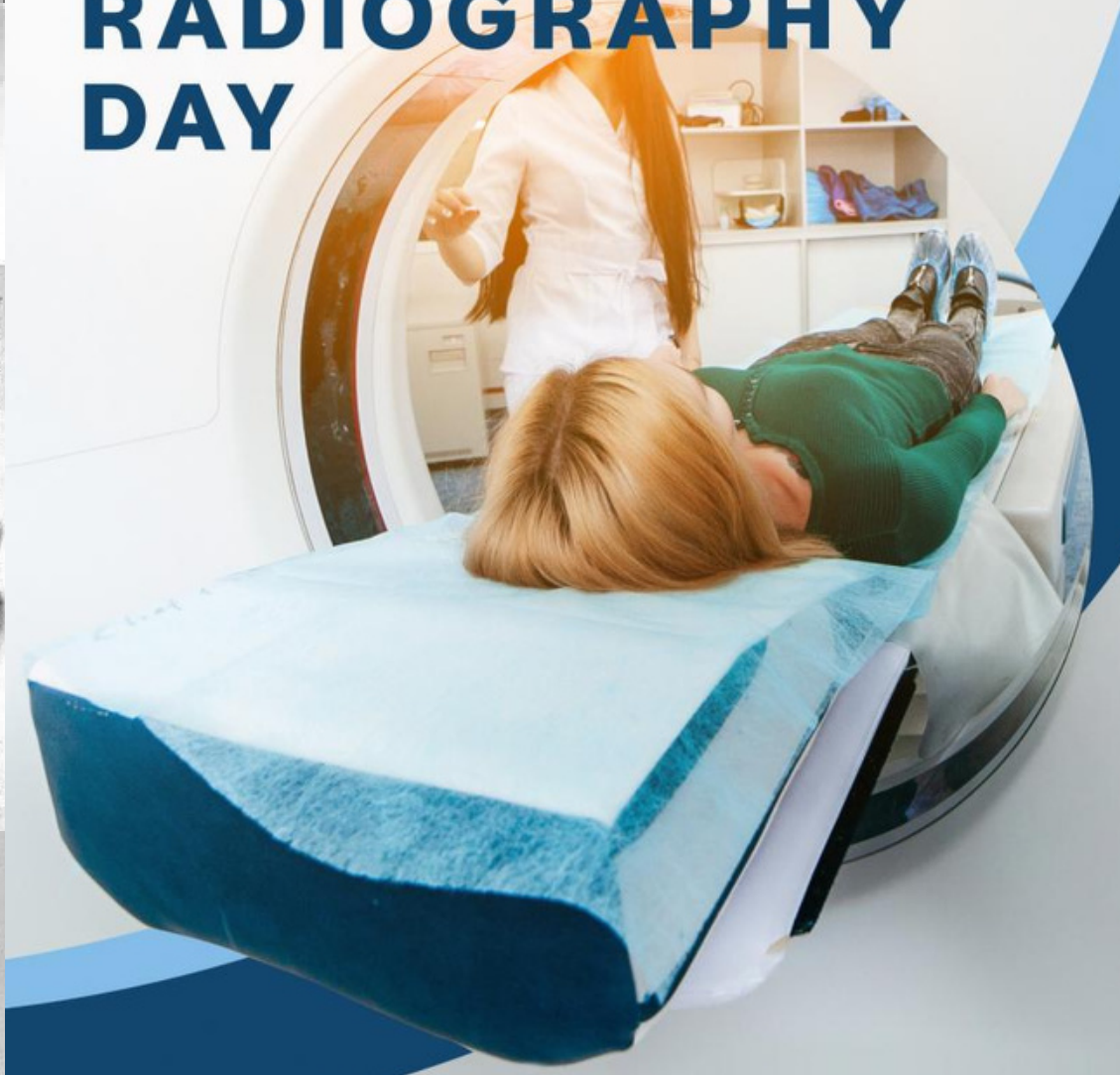
## WORLD RADIOGRAPHY DAY



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# Skeletal Age

**Hemant Joshi ,** Radiographer, ESIC MC & Hospital Gulbarga, Karnataka.

## Basic Principles

Skeletal age is considered the most important and most representative criterion of biological maturity. Skeletal age determination is carried out for the purpose of evaluating growth in paediatric patients and for the diagnosis of many endocrine disorders and paediatric syndromes. It also allows for growth prediction, so skeletal age determination is important for orthopaedic procedures in which it is essential to know the remaining potential for longitudinal growth. In rare cases, skeletal age determination is also required in judicial proceedings to determine, for example, whether a suspect should be charged as a juvenile or an adult. Because radiographs alone do not meet the legal requirement of establishing age with a "probability bordering on certainty," these cases additionally require a physical and dental examination (including a panoramic radiograph).

When conventional radiographs are used, present skeletal age and predicted adult height can be calculated on the basis of statistical tables. After 2 months of age, these values can be determined on a radiograph of the left hand because the hand bones, with their numerous secondary ossification centers, are considered representative of the skeletal system as a whole. For decades, skeletal maturity was determined by making a visual assessment of the skeletal development of the hand and wrist. With the development and use of digital imaging techniques, there have been increasing attempts to determine the morphologic hallmarks of ossification using computer-assisted techniques to permit a more effective and objective determination. Practical implementation is difficult, however, because of interindividual differences in the rates of bone growth and the variable shape and size of many ossification centers.

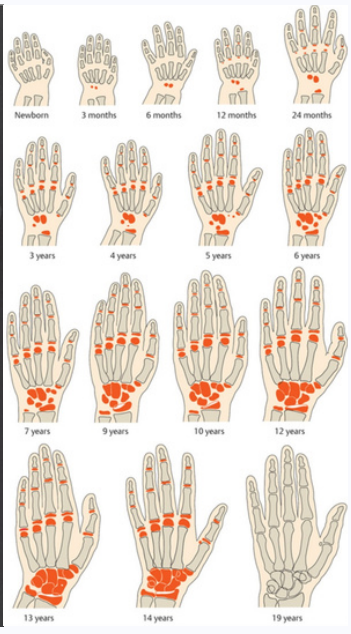
## Bone Development

The assessment of skeletal maturity is a process that evaluates the size and shape of bones and their degree of mineralization to predict the time remaining to full maturity. This process requires a fundamental knowledge of bone growth. Basically, the development of the skeleton proceeds in three consecutive stages:

**Before birth:** Ossification of the skeleton begins during the second month of intrauterine development. At birth, the diaphyses of all the tubular bones are present along with the epiphyseal ossification centers of the distal femur, proximal tibia, talus, calcaneus, and cuboid.
**After birth:** Postnatal longitudinal growth of the tubular bones parallels the ossification of the epiphyses and apophyses. Maturation of the epiphyses and ossification of the epiphyseal plates follows a timetable that is subject to intraindividual and interindividual variations. The first ossification centers in the wrist become radiographically visible during the third month of life. The epiphyses of the radius and short tubular bones do not appear until the second year of life.
**Puberty:** Skeletal development concludes with epiphyseal closure during puberty. Sesamoid bones do not appear until after 12 years of age and are variable in their temporal development and number.

## Indicators of Skeletal Development in the Hand

The skeletal development of the hand can be divided into six stages. Specific ossification centers in different age groups are the best predictors of skeletal maturity The various methods of determining skeletal age are based on this developmental pattern.  shows the order of appearance of the individual ossification centers, and  lists the ages at which ossification centers appear in the carpals and metacarpals.




**Radiographers' Journal invites**

**concerned articles.**

**Publication should be in MS word format.**

**Mail your articles on**

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## Six stages in the ossification of the hand and wrist bones

| Group | Age | | Ossification centers that best predict skeletal maturity | Developmental stages (relevant to skeletal age determination) |
|---|---|---|---|---|
| | Girls | Boys | | |
| Infants | Up to 10 months | Up to 14 months | Carpal bones and radial epiphysis | Ossification centers appear first in the capitate and hamate, finally in the distal radial epiphysis |
| Toddlers | 10 months to 2 years | 14 months to 3 years | Number of epiphyses visible in the tubular bones of the hand | Ossification follows this scheme:<br>• Proximal phalanges<br>• Metacarpals<br>• Middle phalanges<br>• Distal phalanges (exceptions: distal phalanx of thumb earlier and middle phalanx of fifth ray later than the rest; finally all epiphyses are formed) |
| Prepuberty | 2–7 years | 3–9 years | Size of the phalangeal epiphyses | Width of epiphyses approaches width of diaphysis; distal epiphyses are most relevant |
| Early and mid-puberty | 7–13 years | 9–14 years | Size of the phalangeal epiphyses | Width of distal and middle epiphyses greater than width of metaphysis |
| Late puberty | 13–15 years | 14–16 years | Degree of epiphyseal fusion | Fusion follows this scheme:<br>• Distal phalanges<br>• Metacarpals<br>• Proximal phalanges<br>• Middle phalanges |
| Postpuberty | 15–17 years | 17–19 years | Degree of epiphyseal fusion of the radius and ulna | Epiphyseal fusion in the ulna occurs before the radius |

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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,
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**In Health Professions Education**

**under the Faculty of Allied Health Sciences**

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Viva Voce held on: 12/09/2023.

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Date: 05.10.2023.

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# Radiation Safety in Dentistry- Guidelines

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

Dental radiography is a valuable diagnostic tool in modern dental practice and its judicious use allows dental practitioners to diagnose and monitor oral conditions that would otherwise be difficult to identify. However, the use of dental radiological procedures must be carefully managed, as x-radiation has the potential to damage healthy cells and tissues. Although the radiation dose to individuals is low during an average dental radiological examination, repeated low dosages over time could pose a potential health hazard. However, to date, there is no known occurrence of malignant or genetic changes due to dental radiography. Nevertheless, it is incumbent upon all members of the dental profession to be vigilant and to exercise precautionary measures to ensure health and safety of patients, personnel and the public.

**Compliance to requirements on radiation safety aims to ensure the following:**

- Minimise radiation risk to patients
- Ensure adequate protection of dental personnel operating dental radiation equipment,
- Ensure adequate protection of members of the public in proximity to areas public in proximity to areas where such equipment is operated.

**Dimensions of X-Ray Room / Area: The desired minimum internal dimensions of the room are:** 2.0 meters (length by 3.5 meters (width) for panaromic and cephalometric x-ray.

**Structural Shielding:** For dental radiography, the required thickness of shielding at doors and walls is: 1.0 mm lead equivalence (Pbeq) for intra-oral dental x-ray, and1.5 mm Pbeq for x-ray OPG.

Signs and Warning lights: A basic warning notice and ionizing radiation symbolshall be provided on entrance door to any x-ray room / area. Additionally, a warning light to indicate when radiography is in progress should be provided outside the room.

**Protection for the radiographer:** The use of protective panels with glass (1 mm Pbeq) for staff to stand behind, or a protective apron for staff to wear is recommended. Appropriate personal protective equipment should be worn in cases where an operator has to stand less than 2-3 meters from the radiation source.

**Protection for the Patient:** The patient must at all times be provided with a lead apron with a lead equivalence of not less than 0.25 mm for reproductive organ protection. The use of a thyroid shield for children is important, especially during occlusal radiographic examination. In addition, protective aprons should be provided for any adult who provides assistance in supporting a patient.

Lead aprons must not be folded. Aprons should be correctly stored, for example, over a suitable hanger. The apron condition must be routinely checked, including a visual inspection at annual intervals. Thyroid collars should be provided in those few cases where the thyroid may be in the primary beam.

**Patient Positioning:** The patient's head and the primary beam should be aligned such that the primary beam is not directed at the patient's reproductive organs and body.

**Female Patient of Child-bearing Age:** The dental practitioner/personnel undertaking dental radiography should always enquire into the pregnancy status of any female patient of childbearing age.

**Procedures Specific to Intra-Oral Radiography:** Whenever practicable, techniques using film holders incorporating beam-aiming devices should be used for bitewings and periapical radiography. If rectangular collimation is used, a beam-aiming device is essential for accurate alignment with the intra-oral film.

**Image Receptor, Processor and Viewer:** For intra-oral radiography, the fastest available films consistent with satisfactory diagnostic results should be used. Intra-oral films of ISO speed group E, or faster, are preferred as they significantly reduce the amount of radiation by approximately 50 %. Where automatic processing is used, the processor should be properly cleaned and maintained. In the case of manual processing, maintenance should be done in accordance with the manufacturer's instructions.

**Quality Assurance:** The purpose of Quality Assurance (QA) is to ensure consistently adequate diagnostic information, while radiation doses are controlled to be As Low As Reasonably Achievable – the ALARA principle

**The procedures below summarize the steps to keep to a minimum radiation exposure to personnel and others.**

**A)** Dental radiographic equipment mu.st only be operated by personnel trained in its safe use.

**B)** The controlled area must not be used for more than one radiological investigation at the same time.

**C)** All persons, except for the patient and those whose presence are require. Must leave the room when a radiographic examination is in progress.

**D)** The operation of the x-ray equipment should be controlled from outside the controlled area or behind a protective screen.

**E)** The dental film should be kept in position with a holding device whenever possible. If unavailable the film should be held in place by the patient himself/herself. The dental personnel must not hold the film in place for the patient during the procedure.

**F)** Where there is a need to support children or weak patients, holding devices should be used. If parents, escorts or personnel are called to assist, they must be provided with protective clothing/aprons and be positioned to avoid the primary beam. No one must regularly perform these duties.
**G)** It must be emphasized that precautions to minimize radiation exposure should be taken all the time for women of child-bearing age, as a woman may be unaware of her pregnancy status.
**H)** The patient must be provided with a lead apron at all times for reproductive organ protection. The use of a thyroid shield for children is especially important, especially during occlusal radiographic examination.
**I)** The patient's head should be positioned in such a way that the primary beam is not directed at the reproductive organs, and is not unnecessarily irradiating the patient's body.

**Conclusion:** Even though radiation dose in dental radiography is very low, it is important for the dental practitioners to follow these guidelines to ensure all dental personnel, patients and public are protected from unnecessary ionising radiation. Dental practitioners should not be complacent about the low risks of dental radiography. They are professionally responsible to use radiography appropriately in their practices and to maintain good, safe radiation procedures at all times.

**Ref:** Radiation protection in Dental Radiology:iaea.org./ publications

## Srinivasulu Siramdas awarded with the Best Principal of Allied Health Sciences


- Mr. Srinivasulu Siramdas, Principal College of Allied Health Sciences NIMS Hyderabad and CEO of Society of Indian Radiographers -SIR has been awarded with Best Principal of Allied Health Sciences in IDEAL TEACHING PROGRAM 2023 - (ITAP-2023) held recently in Hyderabad from Dr. Karunakar Reddy, Vice Chancellor of Dr. Kaloji Narayan Rao Health University and Dr. Bheerappa Nagari, Director and Vice Chancellor of prestigious Nizam's Institute of Medical Sciences HYDERABAD.
- Mr. Srinivasulu is serving over 31 years in NIMS as RSO for Radio-Diagnosis NIMS and he has been appointed as Principal of NIMS College of Allied Health Sciences NIMS.

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- Mr. Srinivasulu is serving over 31 years in NIMS as RSO for Radio-Diagnosis NIMS and he has been appointed as Principal of NIMS College of Allied Health Sciences NIMS.
- Mr. Srinivasulu and Mr. Damodara Naidu, the former President of SIR and Director Academic has a pivotal role in introducing Degree Courses in Telangana.
- Mr. Srinivasulu Contribution to the Society of Radiographers is remarkable and represented SIR in Rajyasabha standing Commitee when Allied Healthcae Professionals bill was referred to Standing Committe by Rajyasabha along with Mr. Shankar K Bhagat the National Coordinator, SIR and Mr. Pawan Kumar Popli Vice President of SIR.
- Mr. Srinivasulu is also the member for State Council of Clincal Establishments in Telangana Government. He also the member for Syllabus Committee of B.Sc Allied Sciences of Dr. KNR Health University.
- Mr. Srinivasulu also represented the Government to streamline the requisite qualifications for a Radiographer in Telangana and other states and succeeded.
- Mr. Srinivasulu has served as Working General Secretary for over 6 years and now the Chief Executive Officer of Society of Indian Radiographers.
- The President Mr. Vilas Badane and Secretary General Mr. Jagadish N Jagtap has appreciated and congratulated Mr. Siramdas.


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# Radiomics: A New Era in Medical Imaging

**Sanjeev Kumar,** Msc, Radiation and physics, Master Hospital Administration, PGDHQM, RSO Distt Hospital Bathinda

## Introduction

**Radiomics** is a field of medical imaging that uses machine learning to extract quantitative features from medical images. These features can be used to improve the diagnosis, prognosis, and treatment of diseases.

**Radiomics** is based on the principle that medical images contain a wealth of information that is not readily visible to the human eye. By using machine learning to extract this information, radiomics can provide insights that would be impossible to obtain with traditional methods.

**For example,** radiomics has been used to:

- Identify subtle changes in medical images that are not visible to the human eye, which can lead to earlier diagnosis and treatment of cancer.
- Predict how patients will respond to different treatments. This information can be used to personalize treatment plans and improve patient outcomes.
- Track the progression of disease over time. This information can be used to assess the effectiveness of treatment and make treatment decisions.
- Identify new biomarkers that can be used to develop new drugs.

Radiomics is a rapidly emerging field with the potential to revolutionize the way we diagnose, treat, and monitor diseases. However, there are a number of challenges that need to be addressed before radiomics can be widely adopted in clinical practice. Some of the challenges of radiomics include:

- **Data requirements:** Radiomics requires large datasets of medical images with associated clinical data. This data can be difficult and expensive to collect.
- **Feature selection:** The number of features that can be extracted from medical images is vast. It is important to select the most relevant features for a particular application.
- **Machine learning algorithms:** The choice of machine learning algorithm can have a significant impact on the performance of radiomics models.
- **Interpretability:** It is important to be able to interpret the results of radiomics models. This can be difficult, especially for complex models.

**Despite these challenges,** radiomics is a promising new field with the potential to make a significant impact on healthcare. With continued research and development, radiomics has the potential to become a standard tool for radiologists and other healthcare professionals.

Here are some specific examples of how radiomics is being used in radiology today:

- **Breast cancer:** Radiomics is being used to improve the detection and diagnosis of breast cancer. In one study, radiomics was able to identify subtle changes in breast tissue that were not visible to the human eye. This allowed for earlier diagnosis and treatment of breast cancer, which led to improved patient outcomes.
- **Prostate cancer:** Radiomics is being used to predict how patients will respond to different treatments for prostate cancer. In one study, radiomics was able to identify patients who were more likely to respond to hormone therapy. This information was used to personalize treatment plans and improve patient outcomes.
- **Lung cancer:** Radiomics is being used to track the progression of lung cancer over time. In one study, radiomics was able to identify patients who were more likely to experience a relapse of lung cancer. This information was used to monitor patients more closely and make treatment decisions.
- **Colorectal cancer:** Radiomics is being used to identify new biomarkers for colorectal cancer. In one study, radiomics was able to identify patients who were more likely to develop colorectal cancer. This information could be used to develop new screening tests for colorectal cancer.

These are just a few examples of how radiomics is being used in radiology today. As radiomics technology continues to develop, we can expect to see even more applications of this technology in the years to come.

History of Radiomics

The term "radiomics" was first coined in 2012 by Hamm et al. in a paper published in the journal Nature Medicine. In this paper, the authors proposed radiomics as a new approach to cancer research.

Since then, radiomics has been rapidly gaining momentum. There are now hundreds of research papers published on radiomics, and the field is rapidly expanding into new areas of application.

## Potential Applications of Radiomics

Radiomics has the potential to revolutionize the way we diagnose, treat, and monitor diseases. Some of the potential applications of radiomics include:

**Improved cancer diagnosis.** Radiomics can be used to identify subtle changes in medical images that are not visible to the human eye. This can lead to earlier diagnosis and treatment of cancer.

**Personalized cancer treatment.** Radiomics can be used to predict how patients will respond to different treatments. This information can be used to personalize treatment plans and improve patient outcomes.

**Monitoring disease progression.** Radiomics can be used to track the progression of disease over time. This information can be used to assess the effectiveness of treatment and make treatment decisions.
**Drug discovery.** Radiomics can be used to identify new biomarkers that can be used to develop new drugs.

**Challenges of Radiomics**

Radiomics is still a relatively new field, and there are a number of challenges that need to be addressed before it can be widely adopted in clinical practice. Some of the challenges of radiomics include:

**Data requirements.** Radiomics requires large datasets of medical images with associated clinical data. This data can be difficult and expensive to collect.
**Feature selection.** The number of features that can be extracted from medical images is vast. It is important to select the most relevant features for a particular application.
**Machine learning algorithms.** The choice of machine learning algorithm can have a significant impact on the performance of radiomics models.
**Interpretability.** It is important to be able to interpret the results of radiomics models. This can be difficult, especially for complex models.

**Conclusion**

Radiomics is a promising new field with the potential to revolutionize the way we diagnose, treat, and monitor diseases. However, there are a number of challenges that need to be addressed before radiomics can be widely adopted in clinical practice. With continued research and development, radiomics has the potential to make a significant impact on healthcare.



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## RRB 2019 Question Paper

**Likhit Singh,** Radiographer, Sanjay Gandhi Memorial Hospital, Mangolpuri, Delhi

**Q1. What is called the time required for the satellite to complete one rotation?**
(A) Period of force
(B) Period of momentum
(C) Period of motion
(D) Period of revolution

**Q2. Which is true of a placebo?**
(A) Is a substance that has no therapeutic effect
(B) Is a kind of animal experiment
(C) Should not be used to test new drugs
(D) Is unethical.

**Q3Which of the following develops a tough coat and is gradually converted into a seed in plants?**
(A) Pollen grains
(B) Ovule
(C) Embryo
(D) Zygote

**Q4The mutual electrostatic force between two point charges is defined by**
(A) Gauss's law
(B) Coulomb's law
(C) Newton's law
(D) Ohm's law

**Q5. How many layers of tissue surround each kidney?**
(A) Six
(B) Only one
(C) Two
(D) Three

**Q6. Regarding ultrasound transducers**
(A) 4D probes are not capable of real-time imaging
(B) High frequency probes have thin crystals
(C) The piezo-electric property is a very important property of ultrasound
(D) B mode is not possible with phased array probes.

**Q7. Radiation induced cataract is a**
(A) Stochastic effect
(B) Direct ionization effect
(C) Deterministic effect
(D) Non-threshold effect

**Q8. The gray matter on the surface of the brain is called**
(A) Myelin
(B) Tract
(C) Cortex
(D) Horns

**Q9. The real executive of the Indian government is _____?**
(A) The President
(B) The Prime Minister
(C) The Speaker
(D) The Vice President

**Q10. The minimum aluminium filter thickness required in general diagnostic X-ray tubes ABOVE 100kVp is**
(A) 2.5 mm
(B) 3.2 mm
(C) 1 mm
(D) 2 mm

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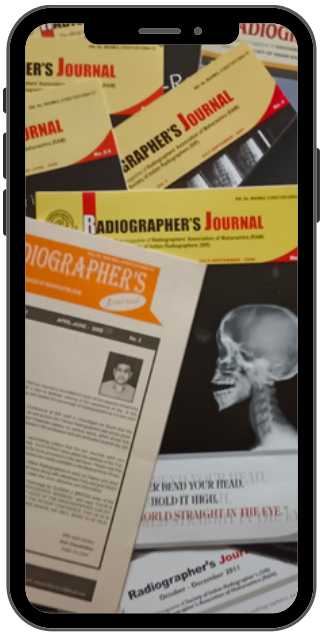

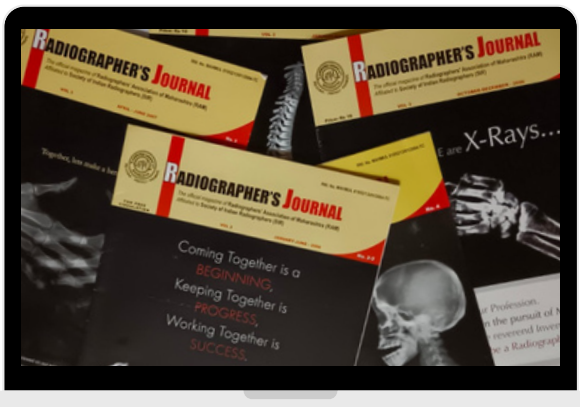


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- Personnel Radiation Monitoring Service (TLD Badge) is compulsory for Medical Diagnostic Installations as per Atomic Energy Regulatory Board (AERB) safety code no: #AERB/SC/MED-2 (Rev-1), dated: 05/10/2021
- Renentech Laboratories Pvt. Ltd., is accredited by Bhabha Atomic Research Centre (BARC) to provide PMS Services in states: Maharashtra, Gujarat, Rajasthan & Goa.

**Personnel Monitoring Service is required on Quarterly basis for the persons working in the facilities namely:**

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- Mammography Clinics
- CT Scan Centers
- Cath Labs
- Radiology and Radiotherapy Centers
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**Please Kindly Note:**

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- TLD Badges only monitors radiation dose received by a person and does not protect you from Radiation.

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- Quality Assurance of diagnostic X-Ray equipment means systematic actions Necessary to provide adequate confidence that diagnostic X-Ray equipment will perform satisfactorily in compliance with safety standards specified by **Atomic Energy Regulatory Board (AERB)**
- **Atomic Energy Regulatory Board (AERB)** authorized agency for Quality Assurance Services (QA) of Medical Diagnostic X-Ray Equipment.

**Why Quality Assurance of Diagnostic Machines is required?**

**It Helps:**

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- Accurate & Timely diagnosis
- Minimize radiation dose levels to patients, technicians & general public
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- Complies to regulatory requirements

**Compulsory Requirements as per:**

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# Assessment of Urolithiasis (Urinary Calculus) Composition utilizing Single-Source Dual-Energy CT (SSDECT) - A Case Study

**Dr. Murugesh.E,** BOT, M.Sc (Psy), DRDT, MRT, Radiographer/Imaging Technologist,
Govt. Omandurar Medical College, Chennai.

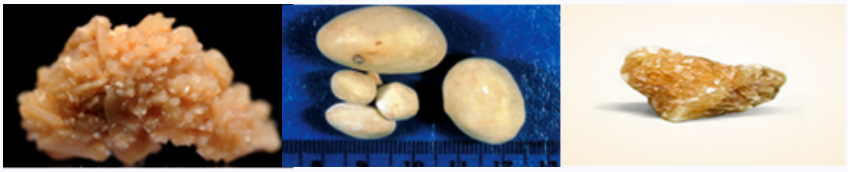
Urolithiasis are small deposits of mineral and acid salts on the inner surfaces of the Urinary system. Treatment of Urolithiasis depends upon chemical composition of the calculi.

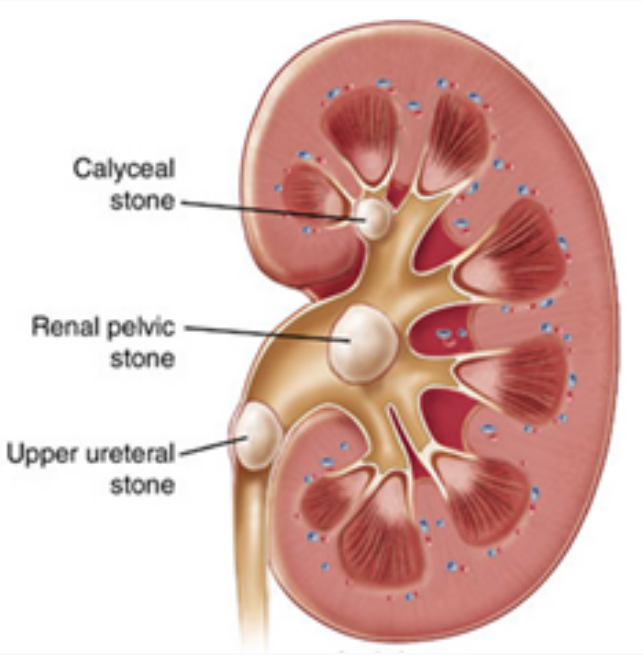
The superior sensitivity and specificity of Single-Source Dual-Energy CT (SSDECT) allows Urolithiasis to be diagnosed and classified definitely.

**Calculi Statistics:**

- More than 1 million cases reported annually in India with 1 in 272 or 3.6 per 1000 Indians develop Calculi annually.
- 80% of calculi under 2mm in size.90% of calculi pass through the urinary system spontaneously.
- Generally calculi smaller than 6mm are passable.

| Calculus Composition and its characteristics | | |
|---|---|---|
| **Calcium** | **Uric Acid** | **Cystine** |
| Very Hard | Hard to Smooth | Soft |
| Single or Multiple | Multiple | Multiple – Stag Horns |
| Ph values were between 4.6 and 6.0 | Ph value is at 5.3 – 5.4 | Ph value is at 6.5 - 7 |






**Aim of the study:** This study is aimed to assess the accuracy of Single source dual-energy computed tomography (SSDECT) in predicting the composition of urinary calculi.

**Objective:**

- To discriminate between Uric acid and Non uric acid calculi .
- To aid in selection of patients for invasive procedures like PCNL etc.

**Methodology:**

Total patients: 30
Duration:1 Month (1 case per day)
Age: 35 to 50 years

**Inclusion Criteria:**

- Patient referred for CT KUB with USG showing renal calculi above 3 mm.
- Patient who consented for SSDECT

**Exclusion Criteria:**

- Patient with associated parenchymal renal disease
- Multiple renal calculi on USG
- Patient who did not consent for procedure

**Principle of SSDECT:**

- Based on differential absorption of energies at various KV levels i.e. HU can change with changing KVp.
- Because x-ray absorption is energy dependent, changing KV results in material specific change of attenuation.

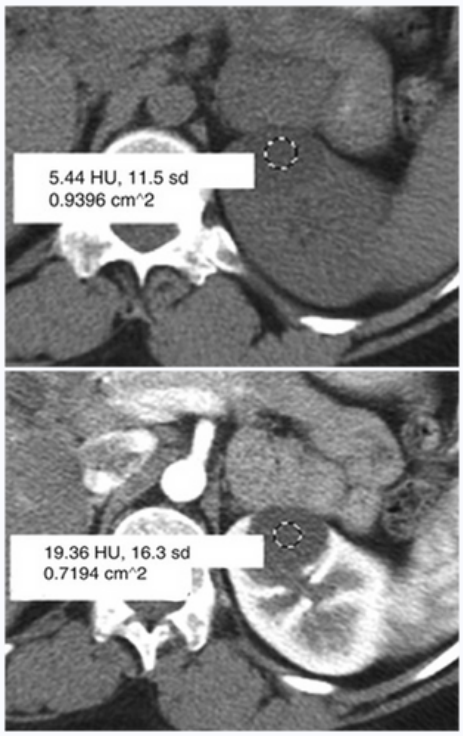
**Procedure:**

- After adequate patient preparation and consent, Plain CT KUB with SSDECT is done
- SSDECT involves acquiring

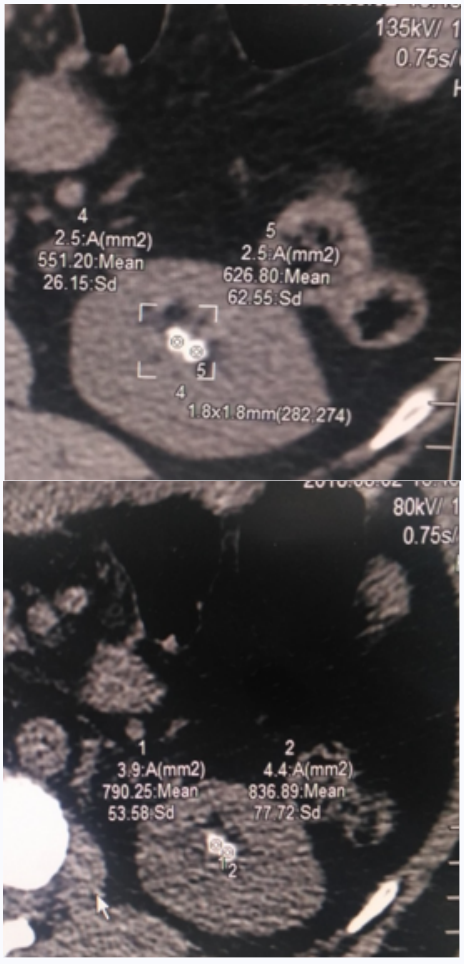
1. CT KUB (135 kvp) from Xiphisternum to Symphysis pubis.
2. CT of ROI (80 Kvp)

**Technical Parameters:**

| | |
|---|---|
| Low Kilovoltage | - 80 Kvp |
| High Kilovoltage | - 135 Kvp |
| Section Thickness | - 2 mm |
| Rotation Time | - 0.75 sec |
| mAS | - 180 mAS |

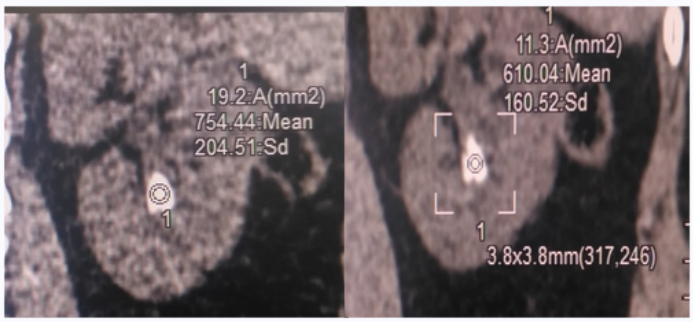



**Radiological analysis of calculi:** A region of interest was drawn on each stone, and the attenuation was measured on low and high energy images.

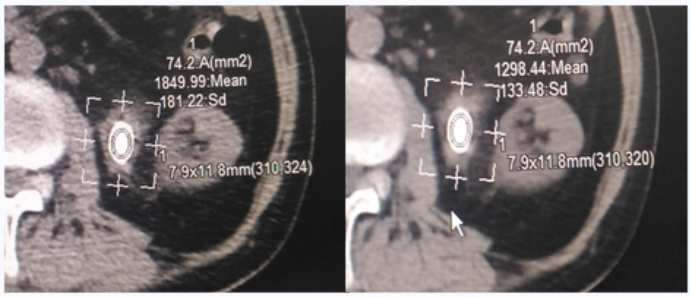



**Attenuation Ratio (DEHU Ratio) =**
Low energy / High energy
836.89 / 626.80
1.33

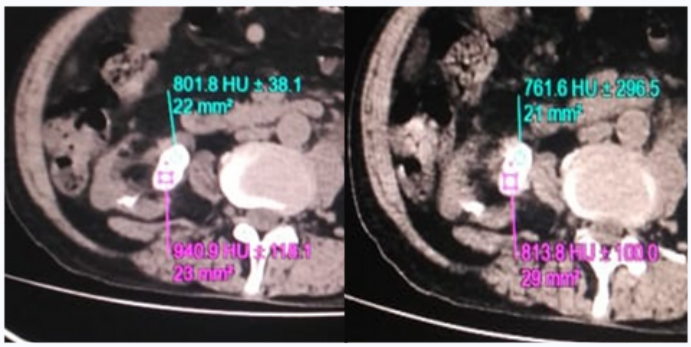
**Calculi Analysis Library :** Hidas et al, Stolzmann P , Scheffel H , Rentsch K , et al. Dual-energy computed tomography for the differentiation of uric acid stones and stone library creation . Urol Res 2011
**Uric Acid Stone -** Attenuation Ratio Less than 1.1
**Cystine Stone -** Attenuation Ration 1.2 to 1.24
**Calcium Stone -** Attenuation Greater than 1.24




**Case 1**
Attenuation Ratio
1.23 Calculi type
**cystine**




**Case 2**
Attenuation Ratio
1.4 Calculi type
**calcium**




**Case 3**
Attenuation Ratio
0.9 Calculi type
**uric acid**

**Result from Analysis:**

**Stones were Biochemically analysed and corelated**

- In our study, we were able to differentiate uric acid, cystine, and calcium stones.
- From the studied 30 patients we had 25 (83%) Positive and 5 (17%) Negative correlations.
- All of the 4 (100%) patients with uric acid stones.
- All of the 20 (100%) of the patients with calcium stones.
- The 1 (16%) out of 5 patient with a cystine stone.

**Advantages of SSDECT:**

- Patients with uric acid stones may be treated medically by means of urine alkalization.
- Cystine and calcium stones are less fragile and may be better treated with ESWL.

The success rate with shock wave lithotripsy depends upon the calculi characteristics and fragility.

**Disadvantages:**

- The CT DLP for the CT KUB was 980 mGy.cm and CT ROI DLP was 120 mGy.cm which is slightly higher
- Inability to distinguish struvite stones and the subtypes of calcium stones may have been due to differences in absorption among patients of different sizes, and the technologic limitations of current SSDECT systems.

**Conclusion:**

- In conclusion, uric acid, cystine, and calcium stone composition may be reliably predicted in vivo on the basis of SSDECT findings.
- In the future, a SSDECT examination may contribute to not only the identification but also the chemical characterization of stones in the urinary tract.
- Concerns about radiation exposure should not be a deterrent to ordering SSDECT to diagnose or manage urolithiasis.

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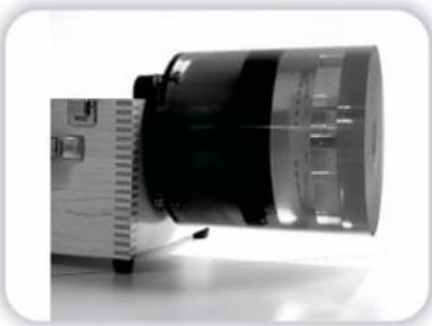
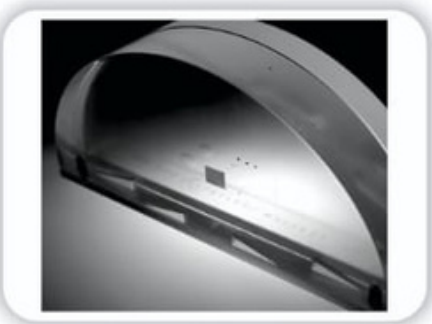


Catphan 500 Phantom for Spiral & Axial CT

CTDI Phantom



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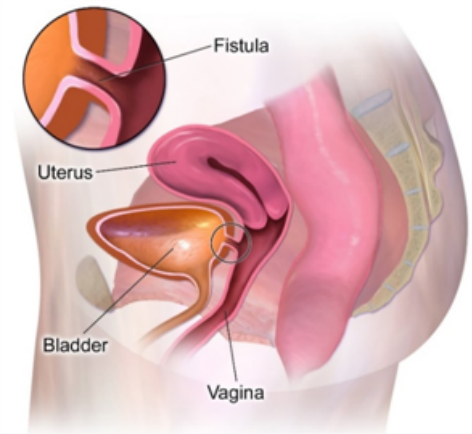
# The Uncommon but Distressing Disease in females
## **VVF:** Vesicovaginal fistula

**Gaurav Bhadane** (BPMT student), **Ravindra Gangurde** (Senior radiographer)
Dr. Vasantrao Pawar Medical College And Research Center, Adgaon,Nashik

**What is VVF (Vesicovaginal fistula)?**
VVF (Vesicovaginal fistula) is a condition where abnormal communication between vagina and urinary bladder. Urinary bladder gets filled but because of abnormal communication the urine from urinary bladder flows into vagina and the women will have constant leakage of urine. This leakage of urine from vagina has to be differentiating from other cause of urine which are much common. This can lead to significant physical discomfort, social stigma, and emotional distress for affected individuals.




**Vesicovaginal fistula**

The first documented case of VVF repair can be traced back to the 5th century BCE in India, where a surgeon named Sushruta described a surgical technique for repairing VVF using a curved needle and thread made from the intestines of animals. Throughout history, VVF was primarily associated with childbirth complications, particularly prolonged or obstructed labour. In the past, women who suffered from VVF often faced social ostracism and were considered outcasts due to the foul Odor and constant leakage of urine. This led to significant physical discomfort, emotional distress, and a decrease in their overall quality of life.

In the 19th century, advancements in surgical techniques allowed for more successful repairs of VVF. Surgeons like J. Marion Sims, known as the "father of modern gynaecology," developed new Sapproaches and instruments to repair VVF. In under developed nations, prolonged obstructed labour constitutes the most common ethology of VVF (>90%), especially in Sub-Saharan African countries. Poor socioeconomic status, early marriage, malnourishment, low literacy rate, and poor health-care system contribute to the higher prevalence of VVF in these countries.

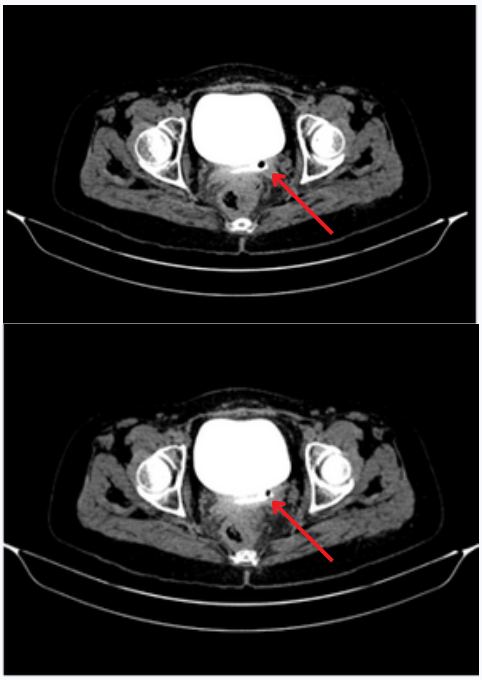
**The most common causes of VVF:**
**Obstetric complications:** Prolonged or obstructed labour is the leading cause of VVF in developing countries. When labour is prolonged, the pressure of the baby's head againstthe birth canal can cause tissue damage and create a hole between the bladder and vagina.
**Surgical trauma:** In some cases, VVF can occur as a result of surgical procedures involving the pelvic area, such as hysterectomy (removal of the uterus), caesarean section, or other gynaecological surgeries. Accidental injury to the bladder during surgery can lead to the formation of a VVF.
**Radiation therapy:** Radiation treatment for pelvic cancers, such as bladder cancer, can cause damage to the tissues in the pelvic area. This can result in the formation of VVF.
**Inflammatory conditions:** Certain inflammatory conditions, such as pelvic inflammatory disease (PID) or chronic urinary tract infections, can lead to the development of VVF. These conditions can cause inflammation and tissue damage in the bladder and surrounding structures, leading to the formation of a fistula.

**Common symptoms of VVF:**
**Continuous leakage of urine:** The primary symptom of VVF is the constant and involuntary leakage of urine into the vagina. This can result in persistent wetness, a foul Odor, and irritation of the vaginal tissues.
**Recurrent urinary tract infections (UTIs):** Due to the abnormal connection between the bladder and vagina, bacteria from the vagina can easily enter the bladder, leading to frequent UTIs. Symptoms of UTIs may include pain or burning during urination, frequent urination, cloudy or bloody urine, and lower abdominal pain.
**Irritation or inflammation of the vaginal tissues:** The constant exposure to urine can cause irritation and inflammation of the vaginal tissues, leading to discomfort, redness, itching, and pain.
**Vaginal discharge:** Some women with VVF may experience an abnormal vaginal discharge, which can be watery, foul-smelling, or blood-tinged.
**Psychological and social impact:** VVF can have significant psychological and social consequences for affected individuals. The constant leakage of urine can lead to embarrassment, social isolation, depression, and a decreased quality of life.

It is important to seek medical attention if you experience any of these symptoms, as early diagnosis and treatment can improve outcomes and prevent complications associated with VVF.

**Diagnostic tests:**
**Urine analysis:** A urine sample will be collected and analysed to check for the presence of infection or other abnormalities.
**Urine culture:** A urine sample may be sent to the laboratory for culture and sensitivity testing to identify the specific bacteria causing recurrent UTIs.
**Cystoscopy:** This procedure involves inserting a thin tube with a camera into the bladder through the urethra to visualize the bladder lining and identify any abnormal connections or openings.
The vesicovaginal fistula (VVF) can be detected with the help of various radiology technique such as...

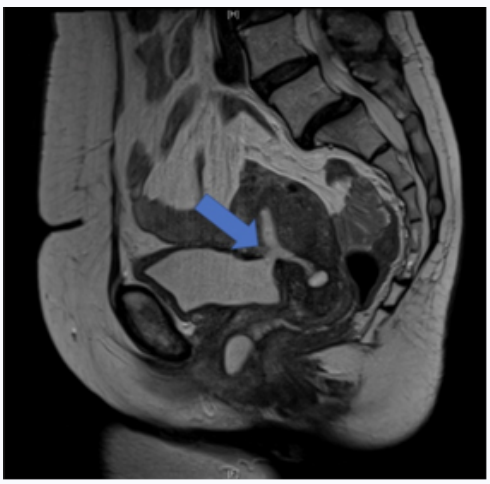
**CT-Intravenous Pyelogram (CT-IVP):** The diagnosis of vesicovaginal fistula (VVF) is done by CT-Scan. This imaging test involves injecting IV contrast into a veinto visualize the urinary tract, including the kidneys, ureters, and bladder. It can help to identify any abnormalities or obstructions that may contribute to VVF.



**Magnetic resonance imaging (MRI):** In some cases, an MRI may be ordered to provide more detailed images of the urinary tract and surrounding structures.

**Specialized tests:** In complex cases or when the fistula is not easily visualized, additional tests may be required, such as a fistulogram (using contrast dye to visualize the fistula) or a vaginal dye test (injecting dye into the vagina and monitoring for leakage into the bladder)

**MRI Fistulogram :**



**Diagnosis of VVF:**
The diagnosis of vesicovaginal fistula (VVF) typically involves a combination of medical history, physical examination, and diagnostic tests.

**Medical history:** The healthcare provider will ask about your symptoms, including the presence of continuous urine leakage, recurrent UTIs, vaginal discharge, and any previous surgeries or medical conditions that may contribute to the development of VVF.

**Physical examination:** A pelvic examination will be performed to assess the vaginal tissues for signs of inflammation, irritation, or fistula opening. The healthcare provider may also perform a digital rectal examination to check for any abnormalities in the rectovaginal septum.

**The treatment of vesicovaginal fistula (VVF):**
The treatment on vesicovaginal fistula (VVF) is surgical, there is no medical treatment for vesicovaginal fistula. The surgical treatment is laparoscopic vesicovaginal fistula repair. This surgery is done by the urologist surgeon. In this surgery the vagina and the urinary bladder is separated and stitched separately.

If patient underwent Lower Segment Caesarean Section such as hysterectomy (removal of the uterus), caesarean section, or other gynaecological surgeries and the fistula developed then Surgery should be postponed till 3–6 months to allow healing of any inflammation and edema.

Also, Surgery should be postponed if devitalized tissues, cystitis, or encrustation is present. Even a delay of 1–2 years is reasonable after radiation damage.

**Postoperative care:** Continuous bladder drainage via a urethral Foley catheter is essential. In patients with a fistula involving the bladder neck, the balloon should not be inflated, but the catheter should be sutured in place.

The bladder should remain catheterized for 2–3 weeks after repair

Cystography is undertaken before catheter removal if there is any doubt about the integrity of the repair.

Patients should avoid sexual intercourse for 3 months. Regardless of the surgical approach to VVFs, the key to postoperative management is the maintenance of a dry, uninfected suture line. For this reason, the use of antibiotics is recommended for a prolonged period after surgery, usually until all catheters are removed

VVF can be a distressing condition, but it is manageable and treatable. If you have a VVF, talk with a doctor. They'll be able to examine your fistula and work with you to create a treatment plan that's best for your situation.

### आप भी अपना पाठक धर्म निभाएँ

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

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

अग्रिम धन्यवाद.
**संपादक**

**Answers of RRB 2019**

1. D
2. A
3. B
4. B
5. D
6. B
7. C
8. C
9. A
10. A

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ULTRAVIST Abridged Prescribing Information: Composition: Ultravist 300, 370 - 1 ml contains 0.623 g (equivalent to 300 mg iodine), 0.769 g (equivalent to 370 mg iodine) iopromide in aqueous solution. For diagnostic use. **Indications: Ultravist:** This medicinal product is for diagnostic use only. To be used as a contrast medium for Uro-angiography, for intravascular use & use in body cavities for contrast enhancement in Computerized Tomography (CT), arteriography and venography, Intravenous/intraarterial digital subtraction angiography (DSA), intravenous urography, use for ERCP, arthrography and examination of other body cavities. **Dosage and method of administration:** For intravascular use. Dosage should be adapted to age, weight, clinical question and examination technique. Generally, doses of up to 1.5 g iodine per kg body weight are well tolerated, for use in body cavities: Arthrography: 5 - 15 ml Ultravist 300/370, ERCP: Dosage depends generally on clinical question and size of structure to be imaged. Other: Dosage depends generally on clinical question and size of structure to be imaged. **Contraindications:** There are no absolute contraindications to the use of Ultravist. **Undesirable effects:** Immune system disorders: (uncommon) - Hypersensitivity / anaphylactoid reactions such as: anaphylactoid shock, respiratory arrest, bronchospasm- laryngeal / pharyngeal, face edema, tongue edema, laryngeal / pharyngeal spasm, asthma , conjunctivitis, lacrimation, sneezing, cough, mucosal edema, rhinitis, hoarseness, throat irritation, urticaria, pruritus, angioedema; Endocrine disorders: (not known)- Thyrotoxic crisis, Thyroid disorder; Psychiatric disorders: (Rare)- Anxiety; Nervous system disorders: (Common)- Dizziness, Headache, Dysgeusia; (uncommon)- Vasovagal reactions, Confusional state, Restlessness, Paresthesia / hypoesthesia, Somnolence; (not known)- Coma, Cerebral ischemia / infarction, Stroke, Brain edema, Convulsion, Transient cortical blindness, loss of consciousness, Agitation, Amnesia, Tremor, Speech disorders, Paresis / paralysis; Eye disorders: (Common)- Blurred/ disturbed vision, Ear and labyrinth Disorders: (not known)- Hearing disorders; Cardiac disorders: (common)- Chest pain / discomfort; (uncommon)- Arrhythmia, (rare)- Cardiac arrest, Myocardial ischemia, Palpitations; (not known)- Myocardial infarction, Cardiac failure, Bradycardia, Tachycardia, Cyanosis; Vascular disorders: (common)- Hypertension, Vasodilatation; (uncommon)- Hypotension; (not known)- Shock, Thromboembolic events, Vasospasm; Respiratory, thoracic and mediastinal disorders: (uncommon)- Dyspnea; (not known)- Pulmonary edema, Respiratory insufficiency, Aspiration; Gastrointestinal disorders: (common)- Vomiting, Nausea, (uncommon)- Abdominal pain, (not known)- Dysphagia, Salivary gland enlargement, Diarrhea; Skin and subcutaneous tissue disorders: (Not known)- Severe cutaneous reactions: Toxic epidermal necrolysis (TEN)/Lyell syndrome, Stevens-Johnson syndrome (SJS), Drug reaction with eosinophilia and systemic symptoms (DRESS), Acute generalized exanthematous pustulosis (AGEP) Rash, Erythema, Hyperhidrosis; Musculoskeletal, connective tissue and bone disorders: (not known)- Compartment syndrome in case of extravasation; Renal and urinary disorders: (not known)- Renal impairment, Acute renal failure; General disorders and administration site conditions: (common)- Pain, Injection site reactions like pain, warmth, inflammation and soft tissue injury in case of extravasation), Feeling hot; (uncommon)- Edema; (not known)- Malaise, Chills, Pyrexia; Investigations: (not known)- Body temperature fluctuation. **Special warnings and special precautions:** Caution is advised in patients with hypersensitivity or a previous reaction, bronchial asthma, thyroid dysfunction, CNS disorders, hydration (Adequate hydration status must be assured in renally impaired patients), anxiety, renal impairment, cardiovascular disease, pheochromocytoma, myasthenia gravis, thromboembolic events. **Storage and Handling Instructions:** Ultravist should be warmed to body temperature prior to use. Protect from light and secondary X-rays. Store below 30°C. Keep out of reach of children. Contrast media should be visually inspected prior to use and must not be used, if discolored, nor in the presence of particulate matter (including crystals) or defective containers. For large volume containers: The multiple withdrawal of contrast medium must be done utilizing a device approved for multiple use. The rubber stopper of the bottle should never be pierced more than once to prevent large amounts of microparticles from the stopper getting into the solution. The contrast medium must be administered by means of an automatic injector, or by other approved procedures which ensure sterility of the contrast medium. The tube from the injector to the patient (patient's tube) must be replaced after every patient to avoid cross contamination. The connecting tubes and all disposable parts of the injector system must be discarded when the infusion bottle is empty or ten hours after first opening the container. Instructions of the device manufacturer must be followed. Please refer to full prescribing information before use. **Source:** PI Version No. UL_2021_02 dated 15 Dec 2021. Based on CCDS version 16 dated May 03, 2021. **Date of API update:** 10-02-2022.

GADOVIST® Abridged Prescribing Information **Composition:** Each ml contains 1.0 mmol Gadobutrol (equivalent to 604.72 mg Gadobutrol) as active ingredient. **Indications:** In adults, adolescence and children aged 2 years and older for: 1. Contrast enhancement in cranial and spinal magnetic resonance imaging (MRI). 2. Contrast enhancement MRI of other body regions. Liver, kidneys. 3. Contrast enhancement in Magnetic Resonance Angiography (MRA). 4. For MRI of the breast to assess the presence and extent of malignant breast disease. **Dosage and Method of Administration:** This medicinal product is for intravenous administration only. For Adults: a) For Contrast enhancement in cranial and spinal magnetic resonance imaging (MRI): Contrast enhancement MRI of other body regions: liver, kidneys & For MRI of the breast to assess the presence and extent of malignant breast disease: administration of 0.1 ml Gadovist per kg body weight is sufficient to answer the clinical question. b) Contrast enhancement in Magnetic Resonance Angiography (CE- MRA): 1) imaging of one field of view: 7.5 ml for body weight less than 75 kg, 10 ml for body weight of 75 kg or more; II) imaging of more than one field of view: 15 ml for body weight less than 75 kg, 20 ml for body weight of 75 kg or more. For children aged 2 years and older: recommended dose is 0.1 mmol Gadobutrol per kg body weight for all indications. **Contraindications:** None. **Undesirable effects:** Reported undesirable adverse events in clinical studies were: Hypersensitivity/ anaphylactoid reactions including anaphylactoid shock, circulatory collapse, respiratory arrest, pulmonary edema, bronchospasm, cyanosis, oropharyngeal swelling, laryngeal edema, hypotension, urticarial, angioedema, etc; Nervous system disorders including dizziness, dysgeusia, paresthesias, etc; Cardiac disorders like tachycardia, palpitations, cardiac arrest; Gastrointestinal disorders like nausea, vomiting, dry mouth; Skin and subcutaneous tissue disorders like erythema, pruritus, rash, Nephrogenic Systemic Fibrosis (NSF) (Not known); general disorders and administration site conditions like injection site reactions, feeling hot/ cold, malaise. **Special warnings and precautions for use:** Caution is advised in patients with - Hypersensitivity, previous reaction to contrast media, history of bronchial asthma, history of allergic disorders, cardiovascular disease, receiving haemodialysis, acute or chronic severe renal impairment, acute renal insufficiency, with a low threshold for seizures. **Instructions for use / handling:** Keep out of reach of children. Warning: To be sold by retail on prescription by Radiologist and Oncologist for diagnostic use only. This medicinal product should be visually inspected before use and should not be used in case of severe discoloration, the occurrence of particulate matter or a defective container. Please refer full prescribing information before use. **Source:** CCDS version 19 dated 13 May 2016, Revised 13 Oct 2015. **Date of revision of Text:** 19 Feb 2016

MAGNEVIST Abridged Prescribing Information **Composition:** Each ml contains 0.5 mmol (equivalent to 469.01 mg) gadopentetate dimeglumine solution for injection. **Indications:** 1. For Cranial and spinal magnetic resonance tomography. 2. For use in MRI in adults patients to facilitate visualization of lesions with abnormal vascularity in the body (excluding heart). **Dosage and method of administration:** For intravenous administration, only. For Cranial and spinal MRI in adults: 0.2 ml Magnevist per kg body weight (equivalent to 0.1 mmol gadopentetate dimeglumine per kg body weight), Maximum single dose: 0.6 ml Magnevist per kg body weight. For MRI to facilitate visualization of lesions with abnormal vascularity in the body (excluding Heart): 0.2 ml Magnevist per kg body weight, Maximum single dose: 0.6 ml Magnevist per kg body weight. Pediatric population. Maximum single dose: 0.4 ml Magnevist per kg body weight. **Contraindications:** None. Undesirable effects: Reported undesirable adverse events in clinical studies were: Hypersensitivity/anaphylactoid reactions including shock, hypotension, urticaria, pruritus, rash, bronchospasm, laryngospasm, etc, Nervous system disorder including dizziness, headache, convulsion, etc, Cardiac disorders like tachycardia, cardiac arrest, gastrointestinal disorders like vomiting, abdominal pain, Pain and injection site reactions. For a full listing of undesirable effects, please refer to the full prescribing information. **Special warnings and special precautions:** Caution is advised in patients with: Hypersensitivity, previous reaction to contrast media, history of bronchial asthma or allergic disorders, cardiovascular disease, receiving haemodialysis, acute or chronic severe renal impairment or insufficiency, seizure disorders or intracranial lesions. **Instructions for use / handling:** This medicinal product should be visually inspected before use. Please refer full prescribing information before use. Source: CCDS version 09, Mar 08 2011, Last Updated: 29-Dec-2011.

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# Contrast Induced Nephropathy (CIN)

**Priyanka Mishra,** Homi Bhabha Cancer Hospital / Mahamana Pandit Madan Mohan Malviya Cancer Centre,Varanasi
A Unit Of "Tata Memorial Hospital" ,Mumbai

## What Is Contrast Induced Nephropathy (CIN) ?

Nephropathy is a medical term used to denote disease or damage of the kidney , which can eventually result in kidney failure .the primary and most obvious functions of the kidney are to excrete any waste products and regulate water and acid-base balance of the body ;therefore ,loss of kidney function is a potentially fatal condition .

Nephropathy is considered a progressive illness ; in other words ,as kidneys become less & less effective over time with the progression of the disease.

Contrast media are solutions that are used to enhance the image quality of CT scans & X rays

CIN is a type of kidney damage caused by iodine- based contrast media .

## Risks

CIN is rare disorder & occurs when kidney problems are caused by use of certain contrast dyes. However , the risk of CIN can increase for people with advanced CKD( chronic kidney disease )

Symptoms are similar to those seen in kidney disease

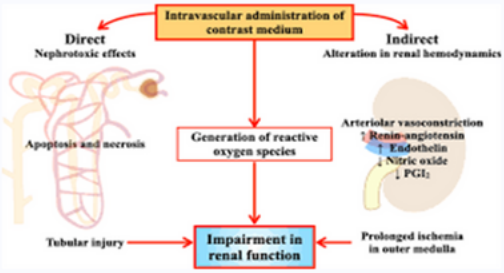
- Feeling more tired
- Poor appetite
- Swelling in the feet & ankles
- Puffiness around the eyes
- Dry/ichty skin

CIN is reversible & people can recover, but in some case ,it can lead to serious kidney problems.

## Mechanism

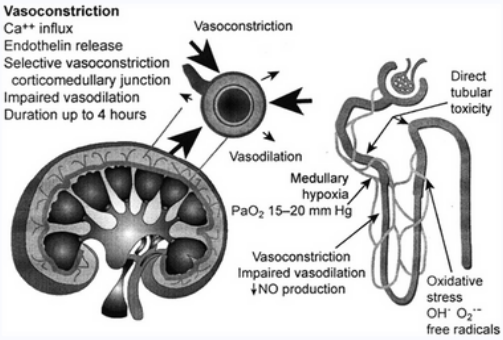
Contrast media leads to nephropathy via

1. Induction of medullary hypoxia
2. Generation of reactive oxygen species
3. Direct tubular toxicity




**The mechanism of CIN is not entirely understood, but is thought to include**

- Direct damage from reactive oxygen species .
- Contrast induced increase in urine output.
- Increased oxygen consumption.
- Changes in dilation & narrowing of blood vessels to the kidneys.
- Changes in urine viscosity.




## Treatment

There are no specific treatments for CIN, but prevention is the cornerstone of CIN management & hydration is the cornerstone of CIN prevention

Renal perfusion is decreased for upto 20 hours following contrast administration.

Intravascular volume expansions maintains renal blood flow,preserves nitric oxide production, prevents medullary hypoxemia & enhances contrast elimination

A number of other therapies for CIN have been investigated, including the following -

- Sodium bicarbonate
- N-acetylcysteine (nac)
- Statins
- Ascorbic acid
- The adenosine antagonists theophyline & aminophyline
- Vasodilators
- Forced diuresis
- Renal replacement therapy
- Prostaglandin e 1

A systemic review found that oral hydration produced similar a similar reduction in CIN compared with iv fluids.

## Prevention

- Avoiding contrast in at risk patients.
- Looking at alternate options for imaging ( USG, MRI without contrast, Non Contrast CT ).
- Using low osmolality /non-ionic contrast media.
- Ceasing nephrotoxins early.
- Avoiding repetitive dosing within one study.
- Prophylaxis is indicated for patients who have acute kidney injury ( AKI) or an EGFR less than 30 ml/min/1.73m^2.
- Reviewing the patient's medical history properly to identify possible risk factors , such as diabetes.

## Conclusions & Recommendations

Iodinated contrast media remains the sole agent for diagnostic & interventional vascular procedures, since there is no effective therapy available to treat established CIN,it is imperative to maintain adequate volume expansion in the periprocedure period , minimize the volume of cm used & to avoid the use of nephrotoxic medications whenever possible.

it has been also concluded that patients should be encouraged to drink fluids & salts prior to undergoing procedures requiring contrast media.

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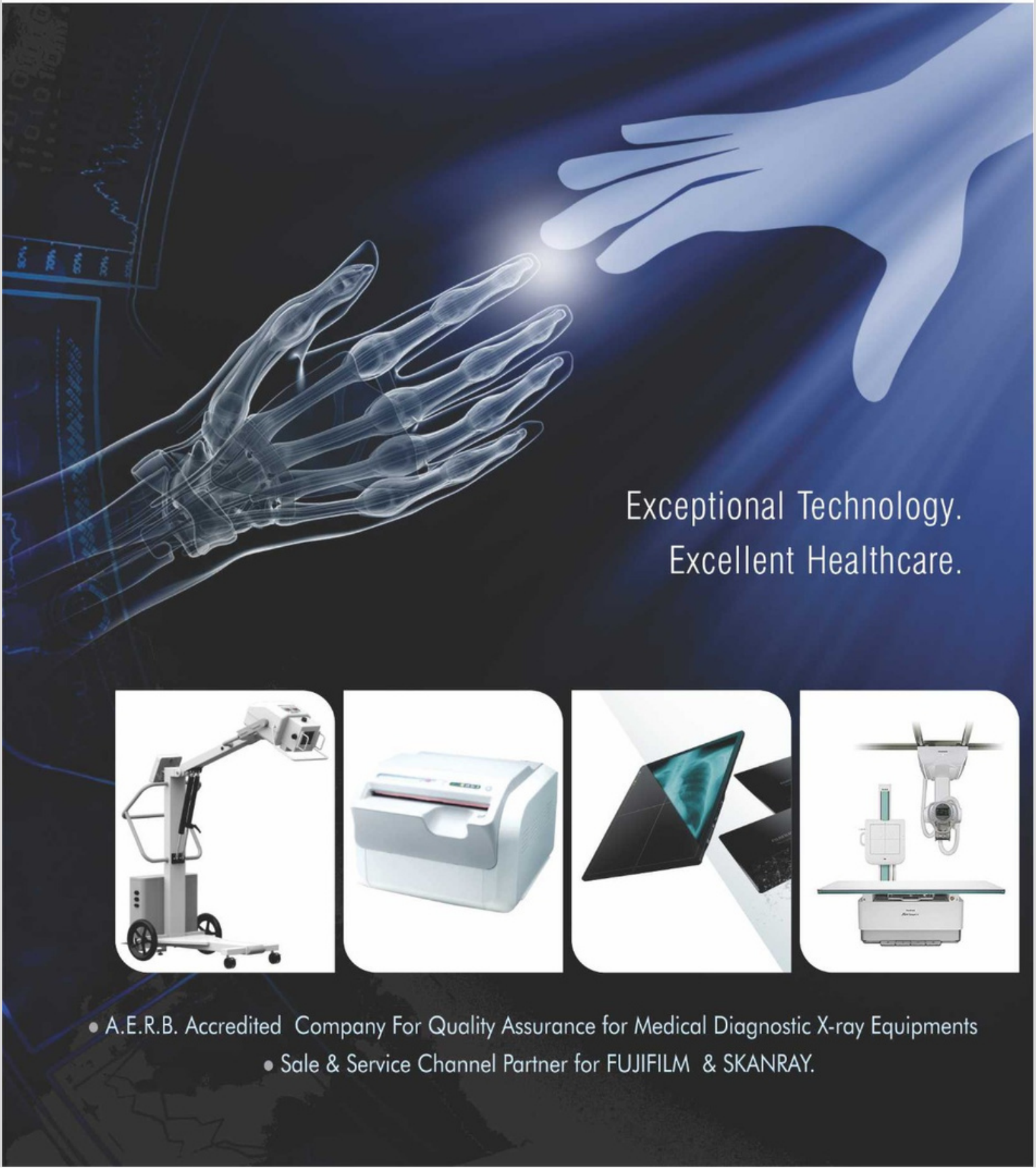
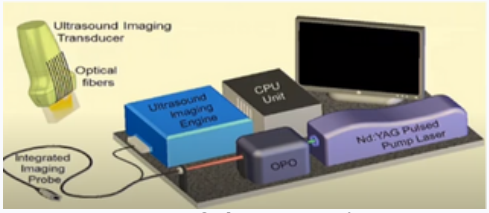


# Photoacoustic Tomography

**Wilson Hrangkhawl,** Lecturer, MIT, Sikkim Menial Institute of Med Sci & Central Referral Hospital, Gangtok, Sikkim.

Photoacoustic tomography (PAT), also known as Thermoacoustic Tomography, has exhibited its versatility in imaging with a consistent contrast mechanism, uniquely positioning it to bridge the microscopic and macroscopic domains in life sciences. PAT, alternatively referred to as optoacoustic Tomography, represents a burgeoning imaging modality with significant potential in both preclinical research and clinical applications. This hybrid technique employs acoustic signals to detect contrast in optical absorption through the photoacoustic effect. This process involves three key steps: (1) an object absorbs light, (2) the absorbed optical energy is transformed into heat, inducing a temperature increase, and (3) this leads to thermoelastic expansion, resulting in the release of acoustic waves. Common endogenous tissue chromophores (optical absorbers) encompass haemoglobin, melanin, and water.



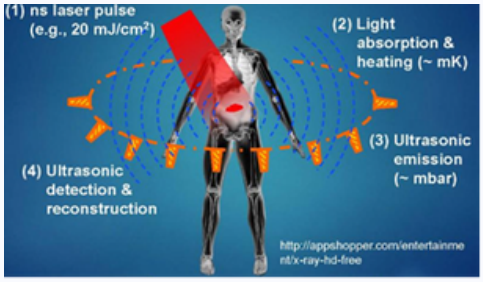

**Components of photoacoustic system integrated with USG system.**

## Image formation in Photoacoustic Tomography:

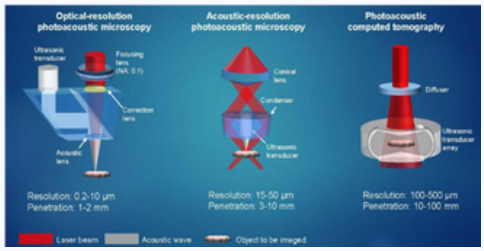
The first, direct image formation is based on mechanical scanning of a focused single-element ultrasonic transducer and is commonly used in photoacoustic microscopy (PAM). In PAM, the received photoacoustic or optoacoustic signal originates primarily from the volume laterally confined by the acoustic focus and can be simply converted into a one-dimensional image along the acoustic axis.

The second, reconstruction image formation, is based on mechanical/electronic scanning of a multi-element transducer array and is used in optoacoustic computed tomography (PACT). In PACT, each transducer element has a large acceptance angle within the field of view, and a photoacoustic image can only be reconstructed only by merging data from all transducer elements.

A variety of other reconstruction algorithms have also been developed other than universal back-projection (UBP) algorithm and time-reversal (TR) algorithm. Recently, based on the transducer characteristics, advanced image reconstruction algorithms have been developed to provide more accurate images than UBP or TR.

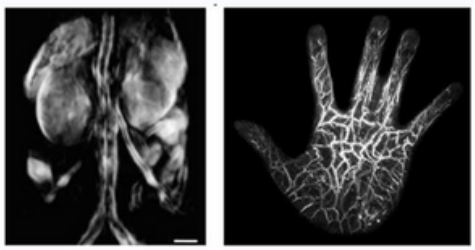



**Photoacoustic tomography principle**




**Implementation of Photoacoustic tomography**

**Photoacoustic imaging system integrated with USG system**



**Multiscale PAT:Invivo whole-body PACT image of a mouse, showing blood-rich internal organs (Left). In vivo PACT image of a human hand, showing its comprehensive vasculature (Right)**


**Different photoacoustic Imaging systems**

## Strengths of Photoacoustic Tomography:

### Super-resolution PAT:

Superresolution imaging has revolutionized fundamental biological research. With resolutions finer than the optical diffraction limit (approximately 250 nm laterally with high optical NA), super-resolution imaging has facilitated the observation of cellular and subcellular structures and processes.

**Multi-parameter PAT:** PA signals can yield a range of anatomical, functional, and metabolic parameters related to the tissue microenvironment. Given that a single parameter may not fully capture the true physiological and pathological conditions, multi-parameter OA imaging has the potential to offer more comprehensive information for the diagnosis, staging, and treatment of diseases.

**Molecular PAT:** While endogenous PA contrasts, such as haemoglobin in red blood cells, melanin in melanoma cells, DNA/RNA in cell nuclei, water in brain edema, and lipids in myelin, are abundant and non-toxic, they may lack the necessary specificity for disease diagnosis or tracking biological processes. Through the use of exogenous contrasts, molecular PAT enables the visualization of specific cellular functions and molecular processes.

## Limitation &Future Direction:

The limitation of PAT is the light attenuation limits the ultimate imaging depth. Currently, the maximum demonstrated PAT imaging depth is 8.4 cm in tissue. To address this limitation, novel light illumination schemes have been explored.

For instance, by illuminating the object from both sides, the imaging region can be doubled and potentially reach 16.4 cm. In terms of imaging speed, both PACT and PAM are currently limited by the pulse repetition rate of lasers. With advances in laser technology, we expect the PAT imaging speed to be improved accordingly.

**Conclusion:**

PAT technique has been evolving rapidly toward higher spatial resolution, higher frame rates, and higher detection sensitivity. The accelerating progress in PAT has also triggered growing contributions from biology, chemistry, and nanotechnology. The applications of PAT have also expanded greatly in fundamental life sciences, and many clinical applications have been proposed.

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# Rayat Bahra University ICME Event Report
## Theme: Emerging Technology and Techniques in Mammography Imaging
## Date: September 23, 2023

**Introduction**

With the approval of honourable chancellor sir Sd. Gurvinder Singh Bahra & guidance of worthy Vice Chancellor Prof. (Dr) Parvinder Singh the Department of Radiology & Imaging Technology, University School of Allied Health Sciences (USAHS), Rayat Bahra University organized an International Con on Medical Education (ICME) in collaboration with RAD-AID International (USA) and Association of Medical Radiology and Imaging Technologists, PGIMER, Chandigarh. ICME-2023 was a skill development and refresher course for the radiological technologists and students of MRIT on the theme of “Emerging Technology and Techniques in Mammography Imaging." The ICME-2023 that was held in the HYBRID mode (Online and Physical mode) on September 23, 2023, in the university's auditorium, Rayat Bahra University brought together experts, researchers, and practitioners in the field of mammography imaging.

Dr. Pankaj Kaul as Chairperson, Dr. Lalit Kumar Gupta served as the Organizing Chairperson, and Aditya Nagrath from PGIMER Chandigarh took on the role of Organizing Secretary The successful execution of this conference was made possible through the support and vision of Honourable Sardar Gurvinder Singh Bahra, the Chancellor and Chairman, Group of Bahra Universities and Hospital, and worthy Vice-Chancellor, Rayat Bahra University, Prof. (Dr.) Parvinder Singh. The Guest of Honor, Prof (Dr.) Ravinder Kaur from the Department of Radiodiagnosis at GMCH- 32 Chandigarh, and Dr. SS Gill, the Co-Patron, graced the occasion along with other distinguished guests present on the dais.

The program was streamed worldwide on the social platforms like Zoom and YouTube. Around 250 delegates physically attended and around 300 delegates joined online. The ICME event featured a series of Scientific Sessions, where experts and researchers presented their findings and insights on various aspects of mammography imaging. The scientific program was divided into 3 sessions with 2 speakers and 2 chairpersons in each session. Ms. Olive Peart, Program Manager, Mammography Technologists, RAD-AID (USA), Dr. Harnoor Singh, Faculty & Program Director RAD-AID, University of Texas (USA) Dr. Lalit Kumar Gupta, Associate Dean & HOD, Medical Radiology & Imaging Technology USAHS, Rayat Bahra University, and Miss Madhu Mammographer Technologists, PGIMER, Chandigarh were among the distinguished speakers who delivered scientific presentations based on their expertise in mammography imaging. These presentations enriched the knowledge-sharing atmosphere of the event and provided attendees with valuable insights to enhance their practices. These sessions covered a wide range of topics, including technological innovations, advanced imaging techniques, and best practices in mammography. The event commenced with Miss Varshdeep Kaur, Assistant Professor of Radiology and Imaging Technology, and Mr. Shivam Angiras, Assistant Professor of Radiology and Imaging Technology at USAHS, leading the way. The conference featured an Inaugural Session, Scientific Sessions with presentations by experts, and a Valedictory Function, followed by cultural performances, Nati and Bhangra dances, and a delightful high tea and dinner.

**Inaugural Session:** The ICME event on Emerging Technology and Techniques in Mammography Imaging began with the Inaugural Session, marked by a sense of enthusiasm and anticipation. Event started with lamp lighting followed by Saraswati Vandana by students of Radiology, Rayat Bahra University and Dr. Harpreet Singh, Assistant Professor, USE Department. Good luck saplings were presented to all the dignitaries on the dais by the students of Medical Radiology & Imaging Technology. Dr. Pankaj Kaul introduced the dignitaries sitting on the dais. Dr. Lalit Kumar Gupta, the Organizing Chairperson, extended a warm welcome cum Inaugural speech to the esteemed guests, speakers, and participants, setting the tone for the day's proceedings. Dr. SS Gill, Dean Medical Sciences, Rayat Bahra University and Ex-Vice Chancellor, Baba Farid University, gave a speech on the need for mammography and its importance in the rural and the urban areas. The Guest of Honor, Prof. (Dr) Ravinder Kaur, shared valuable insights into the evolving landscape of radiodiagnosis and mammography imaging, emphasizing the need for continuous learning and adaptation in healthcare. Dr. Parvinder Singh, the Vice-Chancellor of RBU, delivered an inspiring address highlighting the importance ofadvancements in mammography imaging specially in Ultrasound and the role of educational institutions in fostering innovation in the field.The dignitaries on the dais were presented momentos as a token of gratitude and regards. The session was concluded by Vote of Thanks by Organizing secretory, Aditya Nagrath and National Anthem followed by the High tea. The Inaugural Session not only set the stage for the conference but L-R Prof. (Dr) Lalit Gupta, Prof. (Dr) SS Gill, Prof(Dr) Ravinder Kaur, Honorable Sd. Gurvinder Singh Bahra ChairmanRBUI & Hospitals, Worthy VC Prof. (Dr) Parvinder Singh, Prof. Dr Pankaj Kaul & Mr. Aditya Nagrath also instilled a sense of purpose and excitement among the attendees.

Scientific Sessions: The ICME event featured a series of Scientific Sessions, where experts and researchers presented their findings and insights on various aspects of mammography imaging. These sessions covered a wide range of topics, including technological innovations, advanced imaging techniques, and best practices in mammography.

The scientific program was divided into 3 sessions with 2 speakers and 2 chairpersons in each session. Ms. Olive Peart, Dr. Harnoor Singh, Dr. Lalit Kumar Gupta, and Miss Madhu were among the distinguished speakers who delivered scientific presentations based on their expertise in mammography imaging. These presentations enriched the knowledge-sharing atmosphere of the event and provided attendees with valuable insights to enhance their practices.

**Valedictory Function:** The ICME event concluded with a grand Valedictory Function, which served as an occasion to celebrate the accomplishments and contributions of participants, organizers, and sponsors. Dr. Lalit Kumar Gupta expressed their gratitude to everyone who had played a role in making the conference a success.

Certificates of participation and awards were presented to outstanding contributors and researchers, acknowledging their valuable contributions to the field of mammography imaging. Additionally, faculty members from PGIMER Chandigarh and Chitkara University were recognized for their support and involvement.

Associations such as ISRT (Indian Society of Radiographers and Technologists), RAD-AID International, and the Association of Radiology Imaging Technologists were honoured with momentos in recognition of their efforts to advance medical imaging practices.

The associated companies in the field of drugs and chemicals were also awarded for their contributions to healthcare and research. The Valedictory Function marked the formal conclusion of the academic aspect of the event.

**Cultural Events and Dinner:** To provide a well-rounded experience, the ICME event included cultural performances, including traditional dances such as Nati and Bhangra. These performances showcased the rich cultural heritage of the region and provided a delightful interlude during the conference.The evening concluded with a sumptuous dinner, offering participants, speakers, and guests an opportunity for informal interactions and networking. This informal setting fostered further discussions and collaborations among attendees.

**Conclusion:** The International Conference on Medical Education (ICME) on "Emerging Technology and Techniques in Mammography Imaging" at Rayat Bahra University, was a tremendous success. Dr. Lalit Kumar Gupta, Aditya Nagrath, Honourable Chairman Sardar Gurvinder Singh Bahra, and worthy Vice-Chancellor Dr. Parvinder Singh orchestrated a memorable event that brought together experts, researchers, and enthusiasts in the field of mammography imaging. The event's impact extended beyond the academic realm, fostering cultural exchange and camaraderie. ICME 2023 will undoubtedly leave a lasting impression, contributing significantly to the advancement of mammography imaging and medical education. Very soon we will come forward with more successful events.


L-R Prof. (Dr) Lalit Gupta, Prof. (Dr) SS Gill, Prof(Dr) Ravinder Kaur, Honorable Sd. Gurvinder Singh Bahra ChairmanRBUI & Hospitals, Worthy VC Prof. (Dr) Parvinder Singh, Prof. Dr Pankaj Kaul & Mr. Aditya Nagrath



Honor to faculty, RTs & Students of PGIMER Chandigarh


Honor to faculty & students of Sant Baba Bhag Singh University


Honor to Faculty& students of Chitkara University

Prof. (Dr) Lalit Gupta sir presenting the memento to Dean Medical Dr S.S Gill


Faculty &Students of M.SC RIT,semester 3rd,USAHS, RBU


Prof. (Dr) Lalit Gupta sir honored on behalf of RAD-AID USA

Honor to Association of Medical Radiology and Imaging Technologist (AMRIT) of PGIMER Chandigarh by honorable chancellor sir


Faculty &Students of BMRIT semester 1st, USAHS, RBU

Saraswati pooja during inauguration



Faculty &Students of BMRIT semester 1st, USAHS, RBUAHS, RBU


Himachal Dance form 'Nati' by students of Department of Radiology and Imaging Technology, Rayat Bahra University


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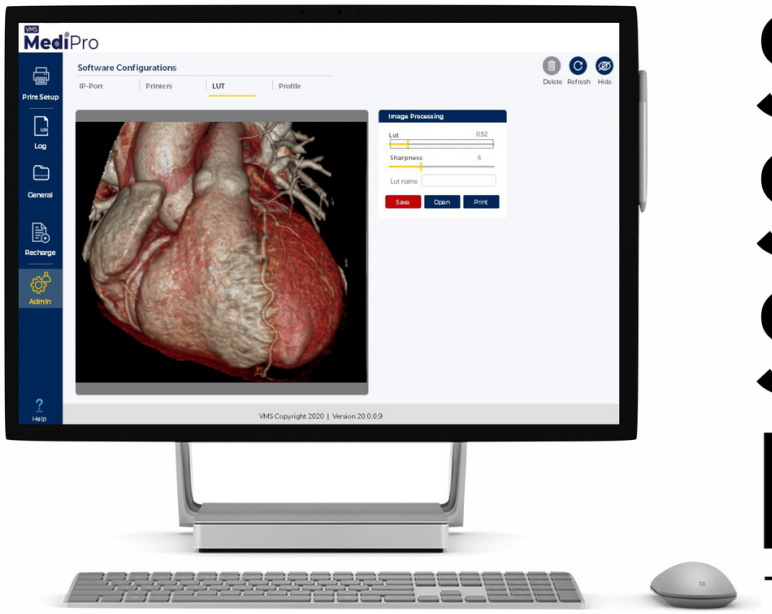


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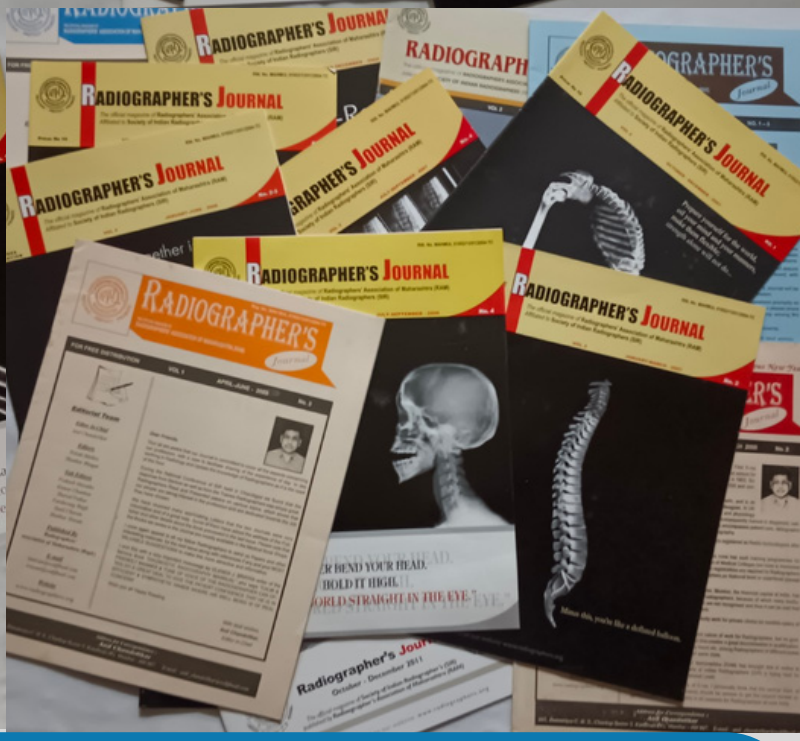


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