What the Heck Am I Looking At? – A Sonographer's Guide to Alternate Imaging Modalities

Katherine Peak, Ed.D., RT(R), RDMS, RVT

1

SPEAKER PRESENTATION DISCLAIMER

The content and views presented are made available for educational purposes only. The information presented are the opinions of the presenter and do not necessarily represent the views of the Society of Diagnostic Medical Sonography (SDMS) or its affiliated organizations, officers, Boards of Directors, or staff members.

The presenter is responsible for ensuring balance, independence, objectivity, scientific rigor, and avoiding commercial bias in their presentation. Before making the presentation, the presenter is required to disclose to the audience any relevant financial interests or relationships with manufacturers or providers of medical products, services, technologies, and programs.

The SDMS and its affiliated organizations, officers, Board of Directors, and staff members disclaim any and all liability for all claims that may arise out of the use of this educational activity.

2

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

RESEARCH DISCLAIMER

The information presented in this presentation is based on research conducted to the best of the presenters' abilities and knowledge. Research involves uncertainty and is subject to limitations. The findings and conclusions presented herein may be influenced by various factors including but not limited to data quality, methodology, assumptions, and interpretation.

Research outcomes may not always accurately predict real-world scenarios or future events. While the presenter may make efforts to ensure the accuracy and reliability of the information presented, completeness or absolute correctness is not guaranteed. This presentation is intended for informational purposes only and should not be construed as professional advice. Participants are encouraged to independently verify any information provided and consult relevant experts or professionals where appropriate.

The SDMS and its affiliated organizations, officers, Board of Directors, and staff members disclaim any and all liability for all claims that may arise out of the use of this educational activity.

3

GENERATIVE AI DISCLAIMER

The presenter utilized the use of large language models (LLMs) and generative artificial intelligence (AI) as a productivity tool to assist in drafting and refining content in this presentation.

While these tools can aid in structuring ideas, summarizing, paraphrasing, and language polishing, they have inherent limitations and cannot replace human creativity, critical thinking, or expert judgment. AI-generated content may contain errors, biases, or gaps in knowledge.

This presentation is intended for informational purposes only and should not be construed as definitive or authoritative guidance. Participants are encouraged to critically evaluate the information presented and consult relevant experts as needed. The SDMS and its affiliated organizations, officers, Board of Directors, and staff members disclaim any and all liability for claims that may arise from the use or interpretation of this educational material.

4

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

Objectives

- Discuss the other imaging modalities found in a diagnostic imaging department and their importance
- Understand the image production process of alternate imaging modalities
- Explain how other types of imaging correlate with sonographic examinations
- Review images from alternate imaging modalities

Unknown Author. [Photo]. Licensed under Creative Commons Attribution-NonCommercial 3.0 (CC BY-NC 3.0). Creative Commons. Accessed May 6, 2025. https://creativecommons.org/licenses/by-nc/3.0/

5

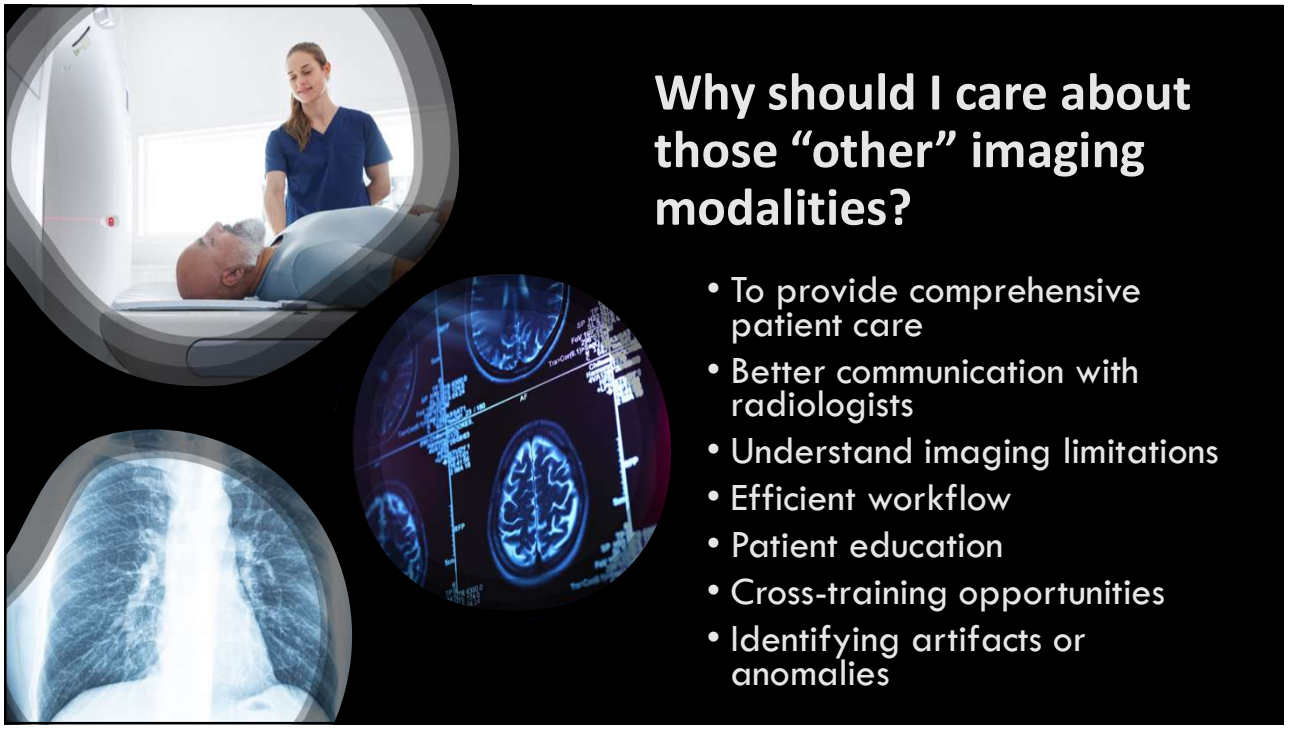
My Background

- Began my career as a radiologic technologist
- Opportunity to cross-train in sonography
- Sonographer for 29 years
  - Registered in abdomen, pediatrics, ob/gyn, and vascular technology

Cheryl's. Unicorn facts. Cheryls.com. Accessed May 6, 2025. https://www.cheryls.com/articles/holiday-occasions/unicorn-facts

6

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.



7

Diagnostic Radiography

- AKA: plain films
- Static images
- Produced with ionizing radiation (x-rays)
- Can image:
  - Chest
  - Abdomen
  - Extremities
  - Skull and facial bones
  - Spine
  - And lots more!

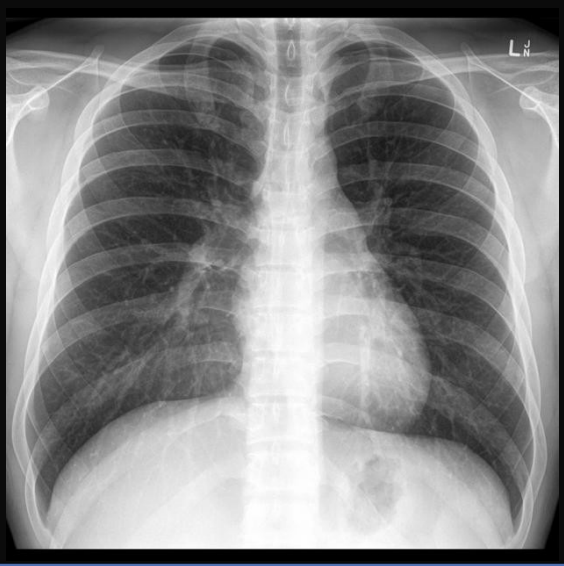
UCSF Health. X-ray (skeleton). UCSF Health. Accessed May 6, 2025. https://www.ucsfhealth.org/medical-tests/x-ray---skeleton

8

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

Normal Chest X-Ray

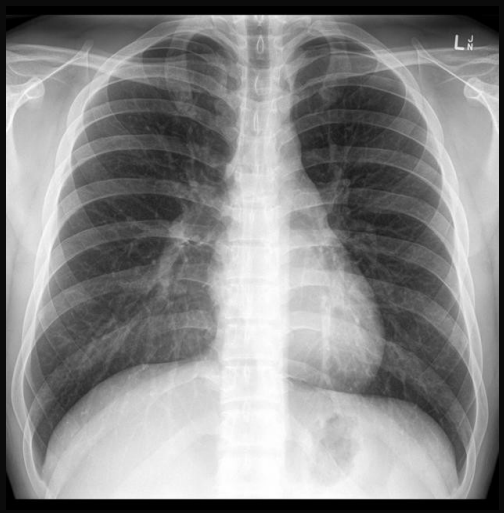
- Most common exam
- PA chest
- Evaluation of:
  - Lungs
  - Heart
  - Airways
  - Bones



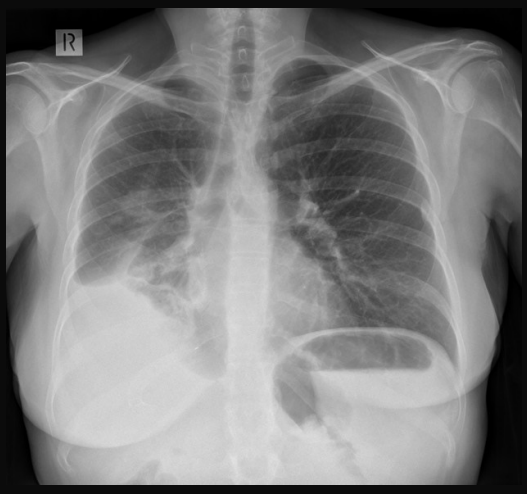
[1]Gaillard F, Normal frontal chest x-ray. Case study, Radiopaedia.org (Accessed on 11 Mar 2025) doi:10.53347/rID-8090

9

Pleural Effusion



[1]Gaillard F, Normal frontal chest x-ray. Case study, Radiopaedia.org (Accessed on 11 Mar 2025) doi:10.53347/rID-8090

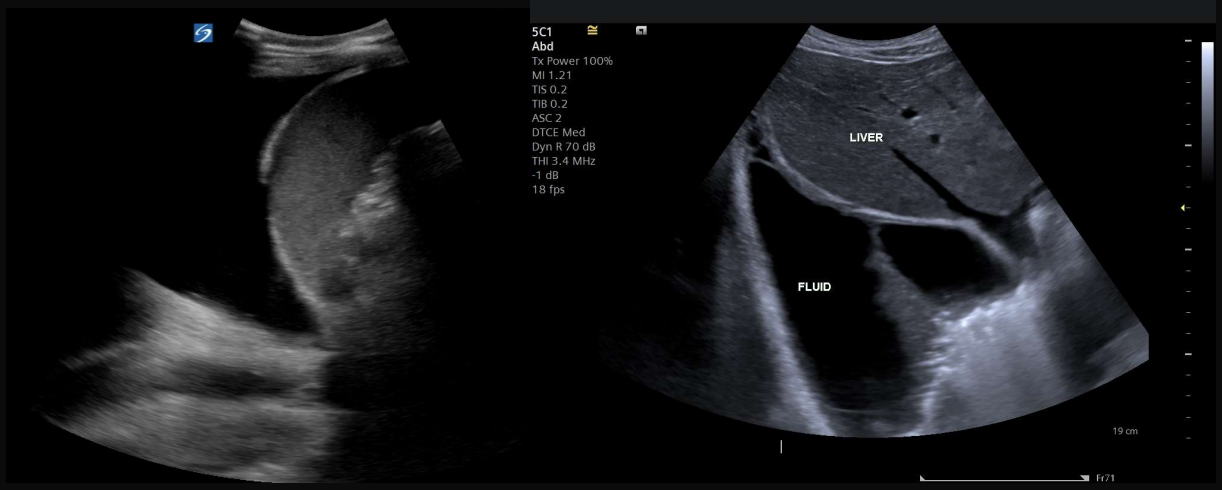


[2]Hacking C, Right pleural effusion and TIPS. Case study, Radiopaedia.org (Accessed on 26 Mar 2025) doi:10.53347/rID-39372

10

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

Pleural Effusion



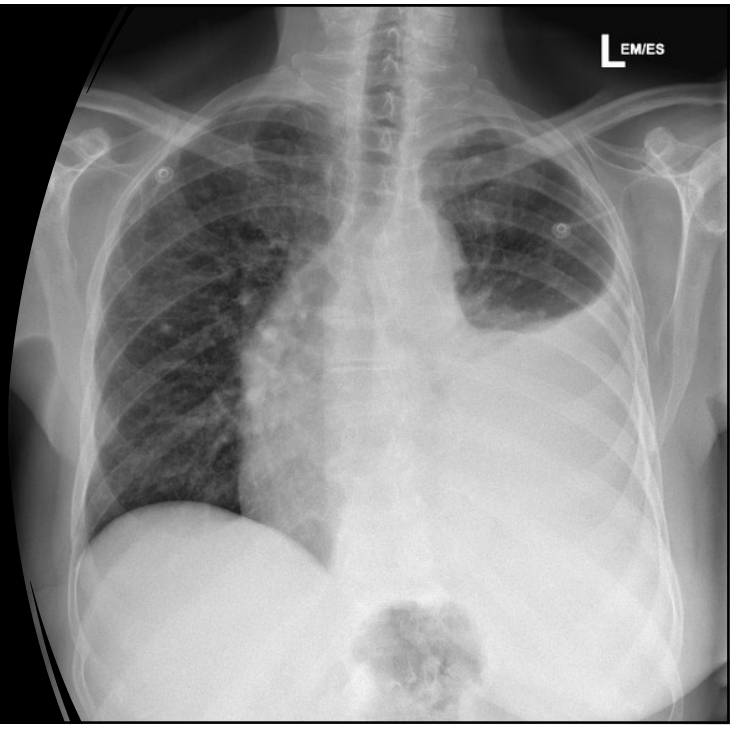
[3]Lim Z, Pleural effusion on point-of-care ultrasound (POCUS). Case study, Radiopaedia.org (Accessed on 19 May 2025) doi:10.53347/rID-94919

[4]Yonso M, Pleural effusion. Case study, Radiopaedia.org (Accessed on 19 May 2025) doi:10.53347/rID-177820

11

Pleural Effusion

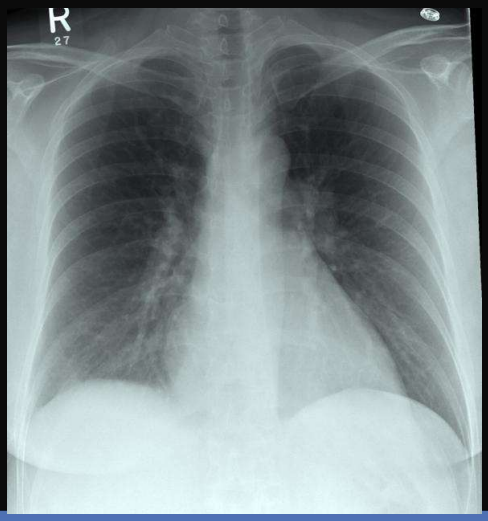
[5]Hacking C, Malignant pleural effusion. Case study, Radiopaedia.org (Accessed on 26 Mar 2025) doi:10.53347/rID-80388



12

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

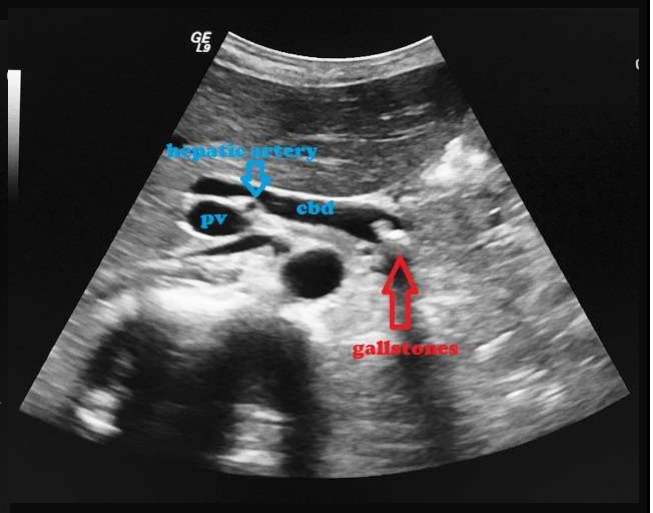
Pleural Effusion



[6]Al Salam H, Pleural effusion. Case study, Radiopaedia.org (Accessed on 26 Mar 2025) doi:10.53347/rID-13266

13

Choledocholithiasis

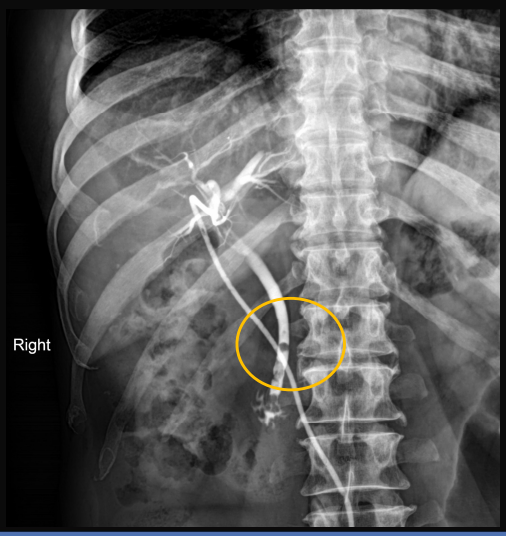


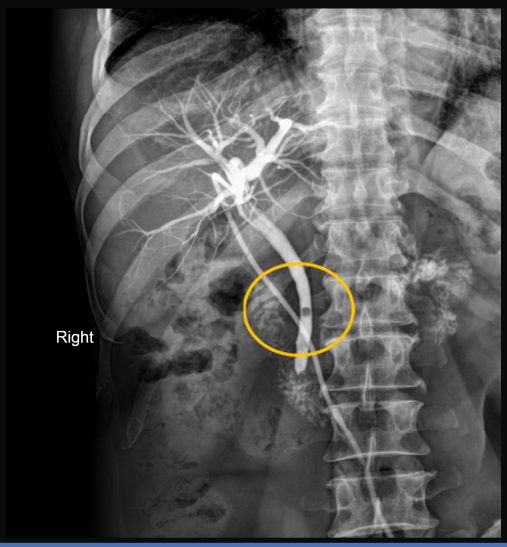
[7]Bickle I, Choledocholithiasis. Case study, Radiopaedia.org (Accessed on 19 May 2025) doi:10.53347/rID-52826

14

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

Cholangiogram - Choledocholithiasis



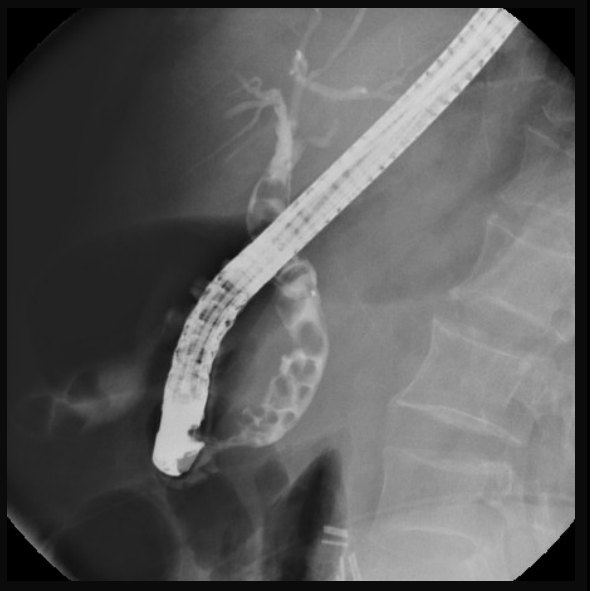


[8]Niknejad M, Choledocholithiasis (T tube cholangiography). Case study, Radiopaedia.org (Accessed on 19 May 2025) doi.:10.53347/rID-96610

15

Endoscopic Retrograde Cholangiopancreatogram (ERCP) –

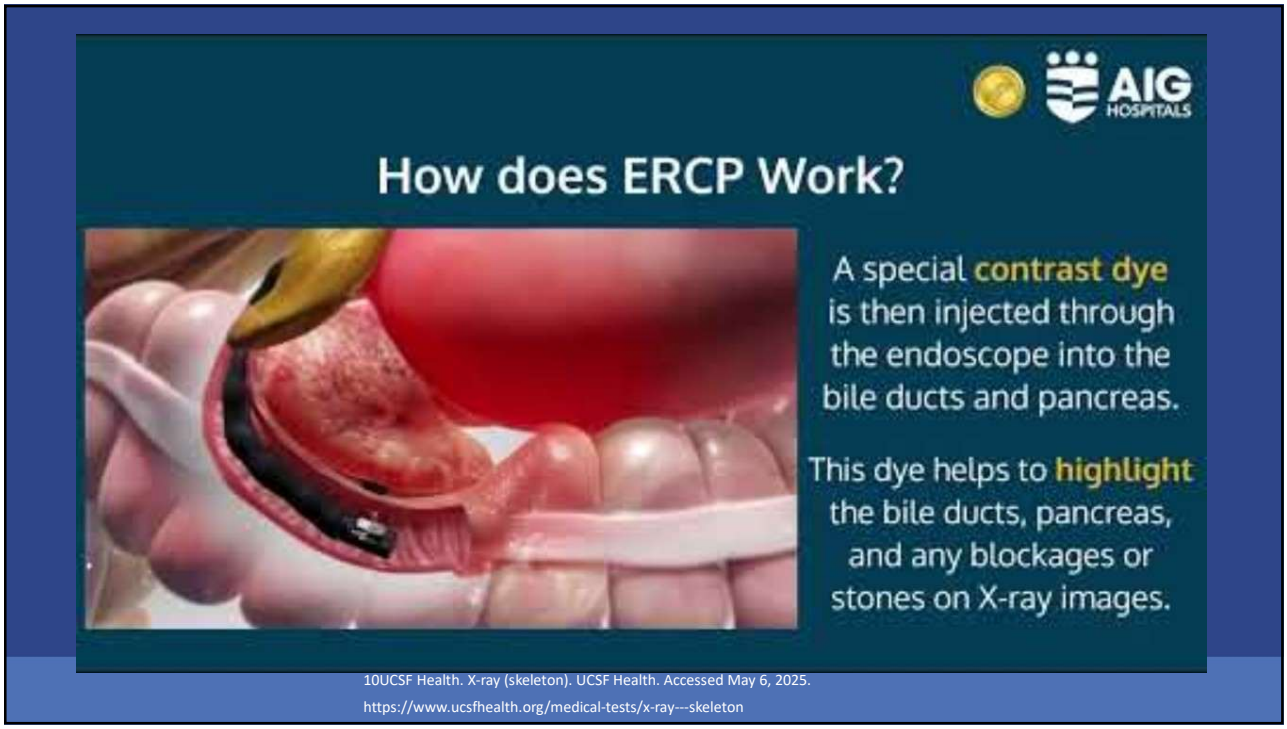
Choledocholithiasis



[9]Al Salam H, Cholelithiasis and choledocholithiasis. Case study, Radiopaedia.org (Accessed on 19 May 2025) doi:10.53347/rID-10308

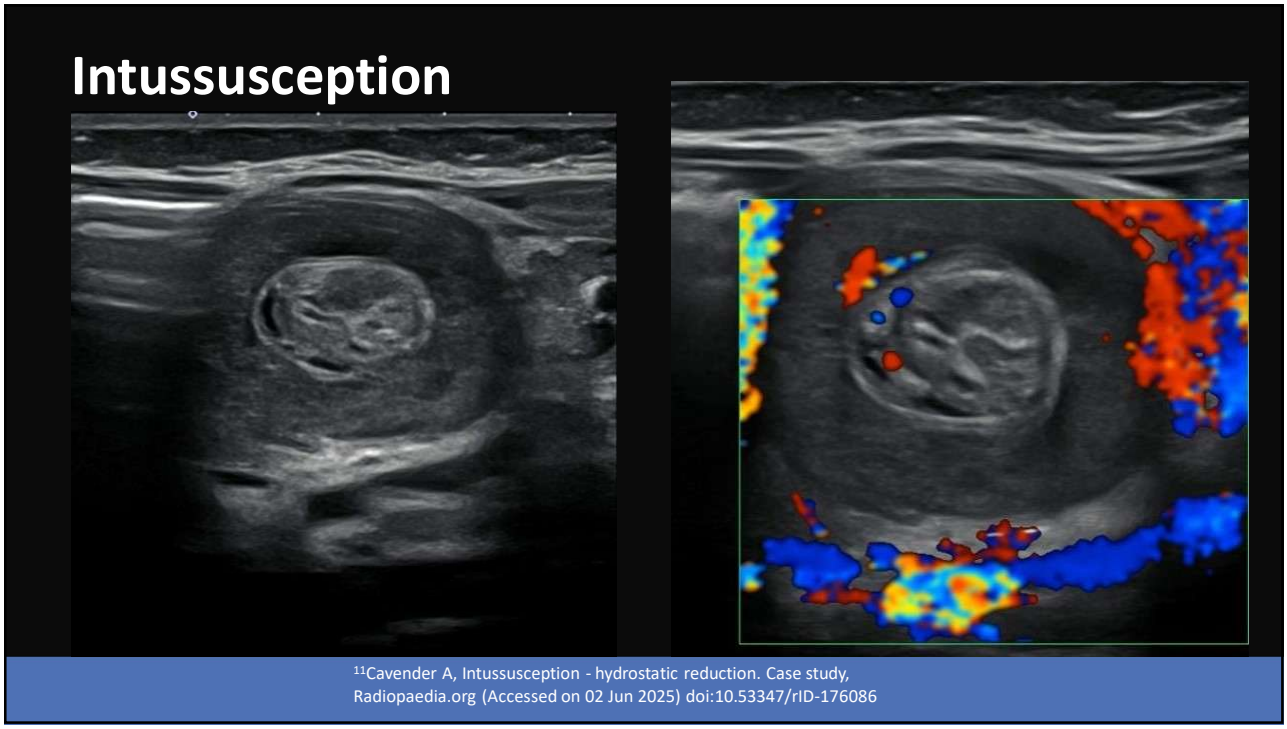
16

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.



[10]UCSF Health. X-ray (skeleton). UCSF Health. Accessed May 6, 2025. https://www.ucsfhealth.org/medical-tests/x-ray---skeleton

17

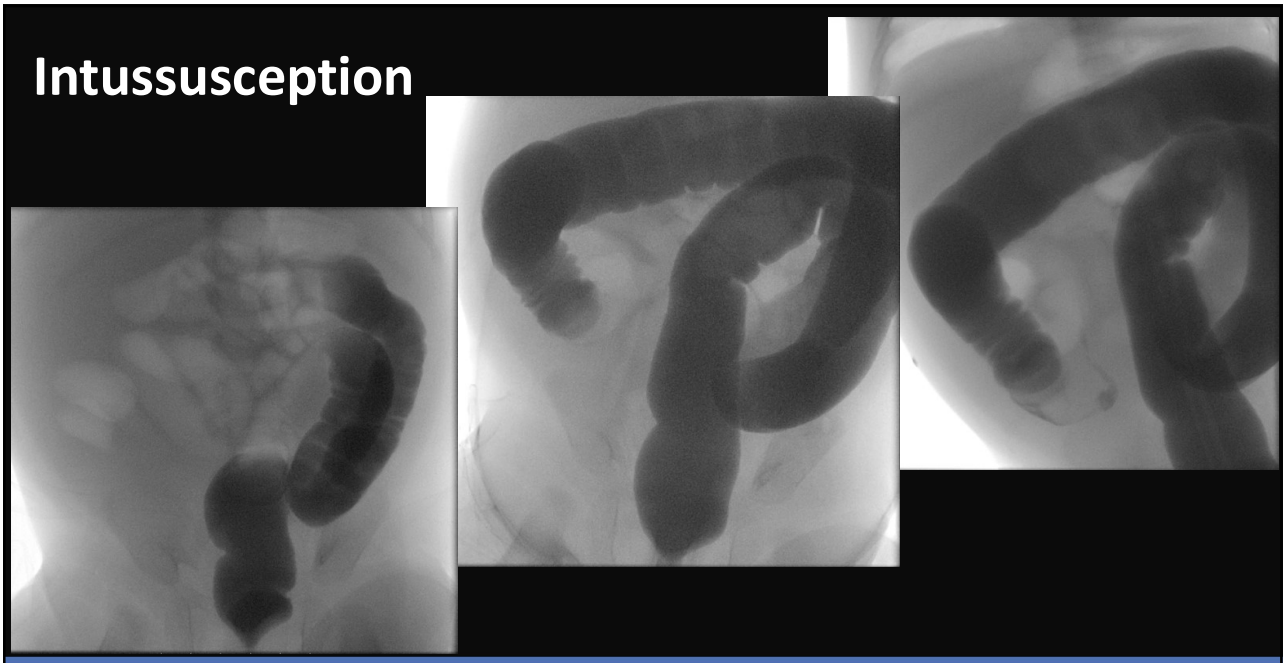


[11]Cavender A, Intussusception - hydrostatic reduction. Case study, Radiopaedia.org (Accessed on 02 Jun 2025) doi:10.53347/rID-176086

18

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

Intussusception

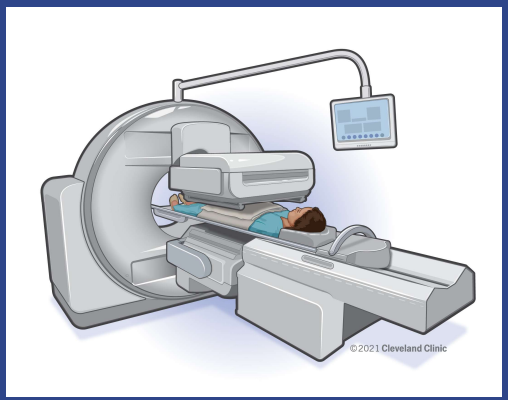


[11]Cavender A, Intussusception - hydrostatic reduction. Case study, Radiopaedia.org (Accessed on 02 Jun 2025) doi:10.53347/rID-176086

19

Nuclear Medicine

- Radioisotopes
  - Gamma rays
  - Injected, swallowed or inhaled
- Radiation detected by gamma cameras
- Physiologic data
  - Organ/tissue function, not anatomy

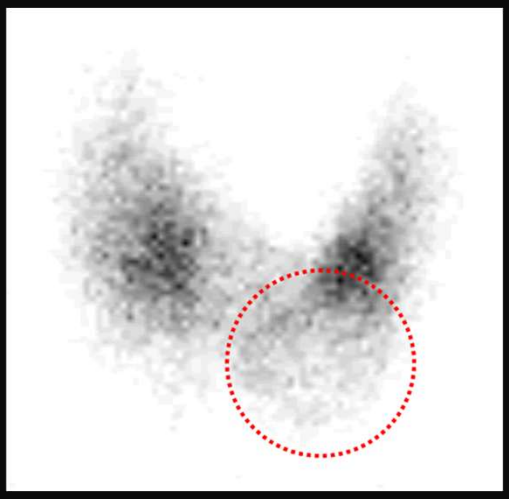


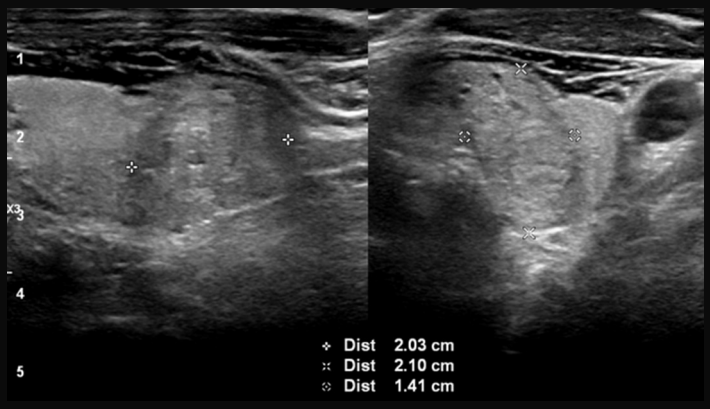
Cleveland Clinic. Nuclear medicine imaging. Cleveland Clinic. Accessed May 6, 2025. https://my.clevelandclinic.org/health/diagnostics/4902-nuclear-medicine-imaging

20

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

Thyroid Nodules

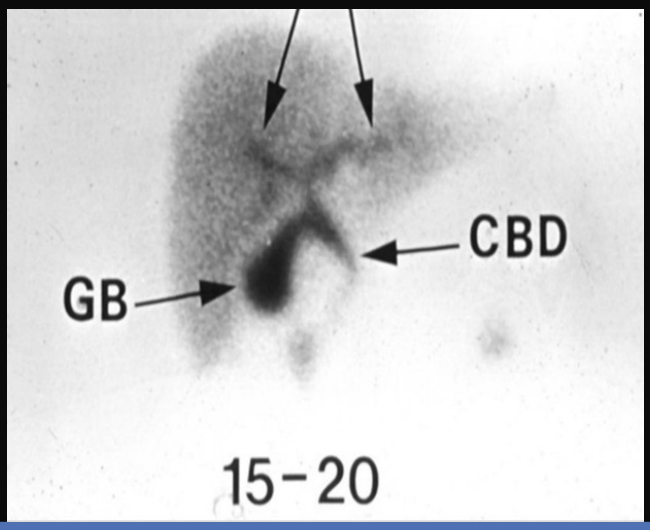


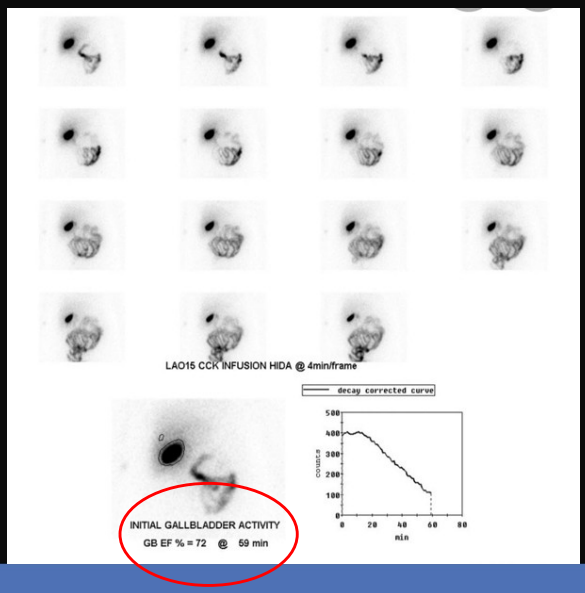


[12]Banks K, Cold nodule on thyroid scintigraphy. Case study, Radiopaedia.org (Accessed on 01 Apr 2025) doi:10.53347/rID-169092

21

HIDA Scan (GB)[13]



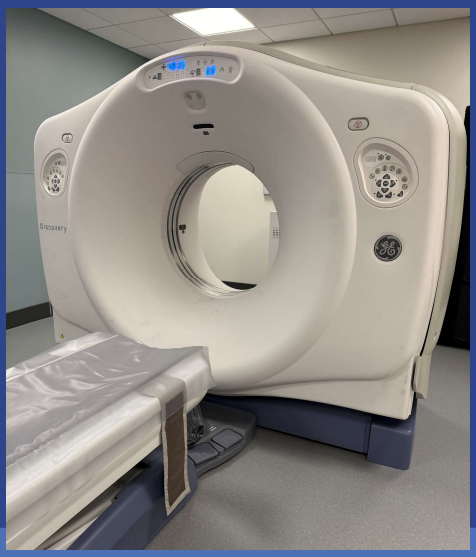


From personal files of Peak K (on file with author)

22

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

Computed Tomography (CT)[14]

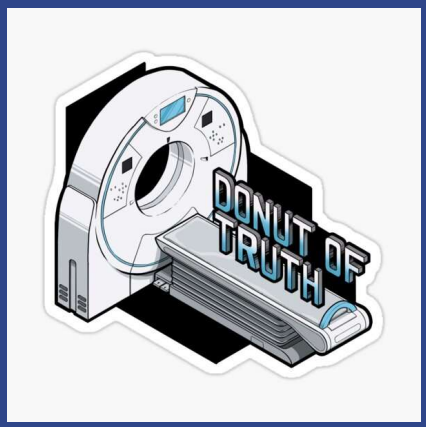


From personal files of Peak K (on file with author)

- A diagnostic imaging procedure that uses a combination of X-rays and computer technology to produce images of the body
- The x-ray tube/beam moves in a circle around the body
- The X-ray information is sent to a computer that interprets the X-ray data and displays it in two-dimensional form
- Computer software makes three-dimensional images possible

23

Computed Tomography (CT)[14,15]

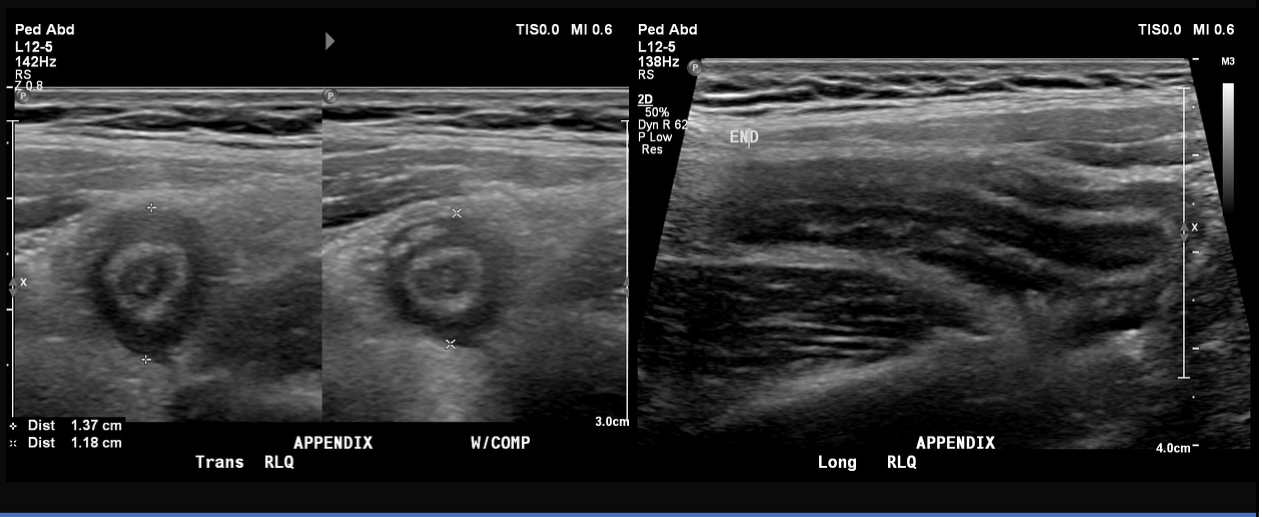


- Since 2007, the number of annual CT exams has surged by 30% in the U.S.
- 93 million CT scans carried out on 62 million people in 2023
- Due to:
  - Increased patient demands
  - Technological advancement
  - Aging population
  - Shift in emergency department imaging
  - Expanded medical applications

24

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

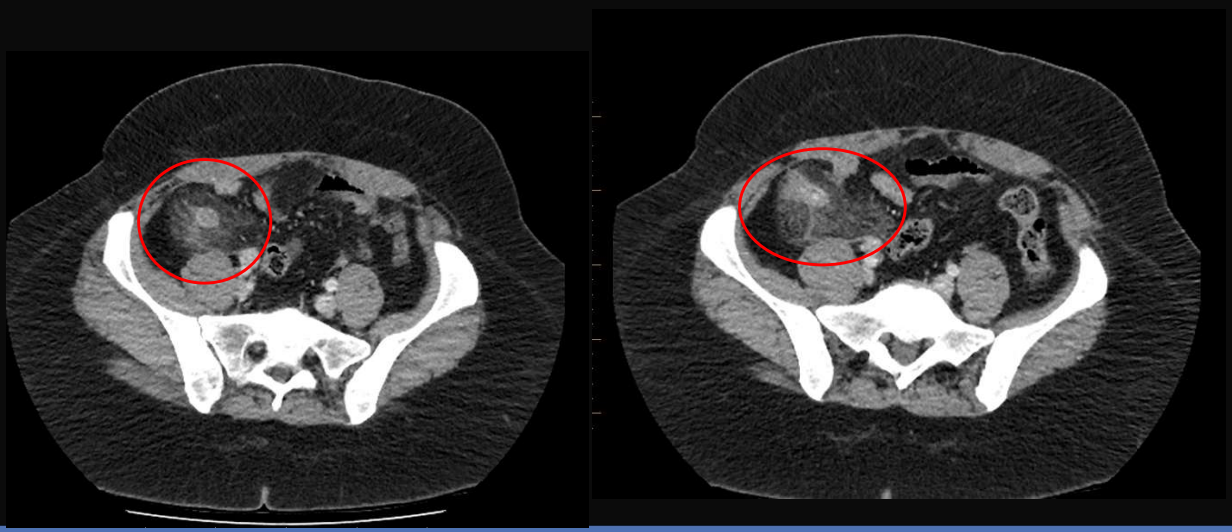
Appendicitis



[16]Thibodeau R, Appendicitis. Case study, Radiopaedia.org (Accessed on 07 May 2025) doi:10.53347/rID-174425

25

Appendicitis



[17]Kansan Naider D, Appendicitis. Case study, Radiopaedia.org (Accessed on 08 May 2025) doi:10.53347/rID-146814

26

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

Appendicitis

- Kansan Naider D, Appendicitis. Case study, Radiopaedia.org (Accessed on 08 May 2025) doi:10.53347/rID-146814

27

Magnetic Resonance Imaging (MRI)[18]

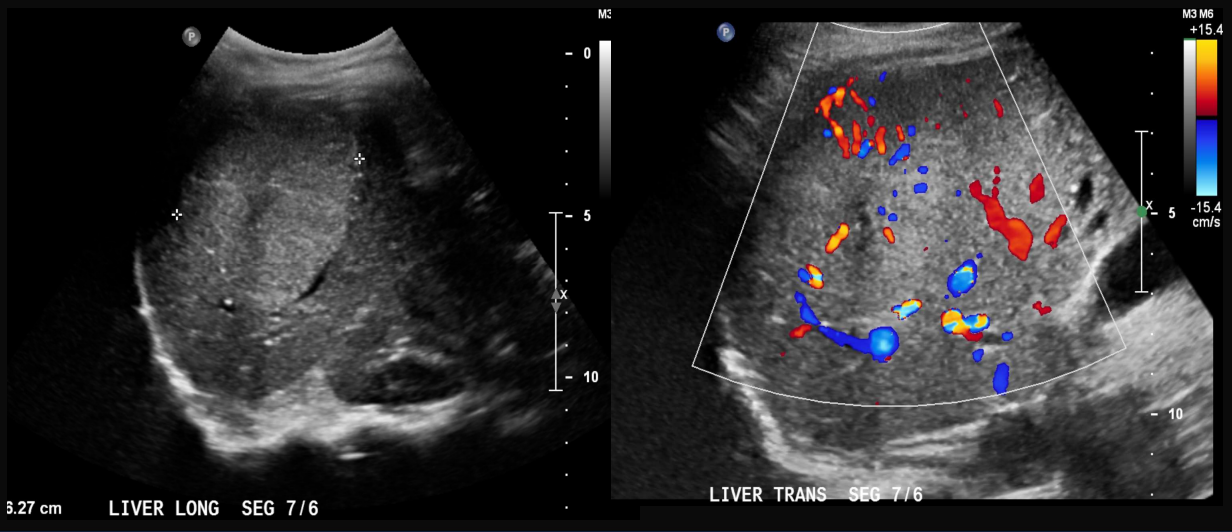
- Utilizes strong magnetic fields and radiofrequency waves for imaging
- No ionizing radiation like CT
- Brain, spinal cord and nerves, muscles, ligaments, and tendons are seen much more clearly with MRI than with regular x-rays and CT
  - MRI is often used to image knee and shoulder injuries
- Issues with noise, implants, claustrophobia

From personal files of Peak K (on file with author)

28

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

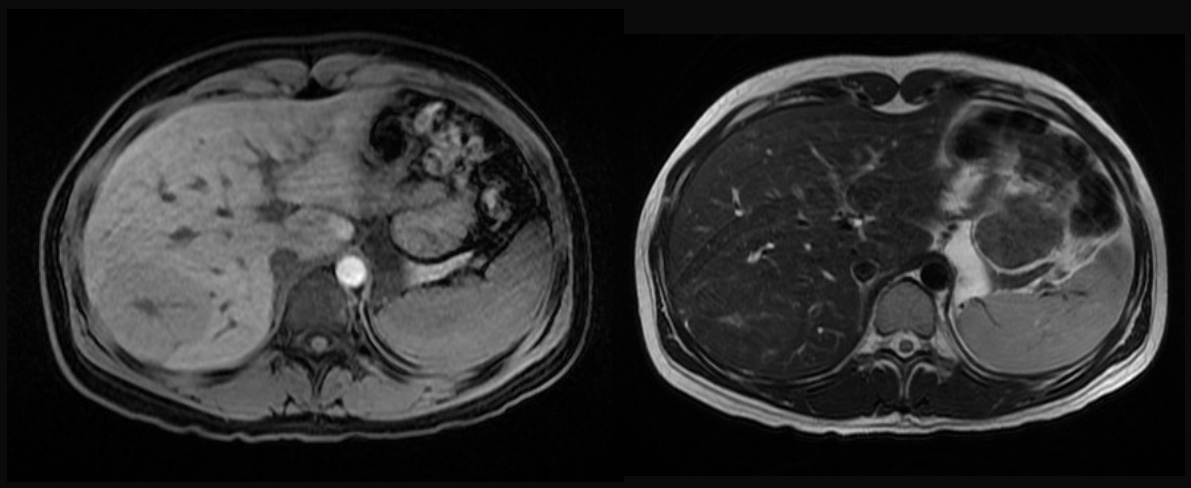
Incidental Liver Mass



[19]Di Muzio B, Focal nodular hyperplasia. Case study, Radiopaedia.org (Accessed on 13 May 2025) doi:10.53347/rID-68936

29

MRI – Focal Nodular Hyperplasia



[19]Di Muzio B, Focal nodular hyperplasia. Case study, Radiopaedia.org (Accessed on 13 May 2025) doi:10.53347/rID-68936

30

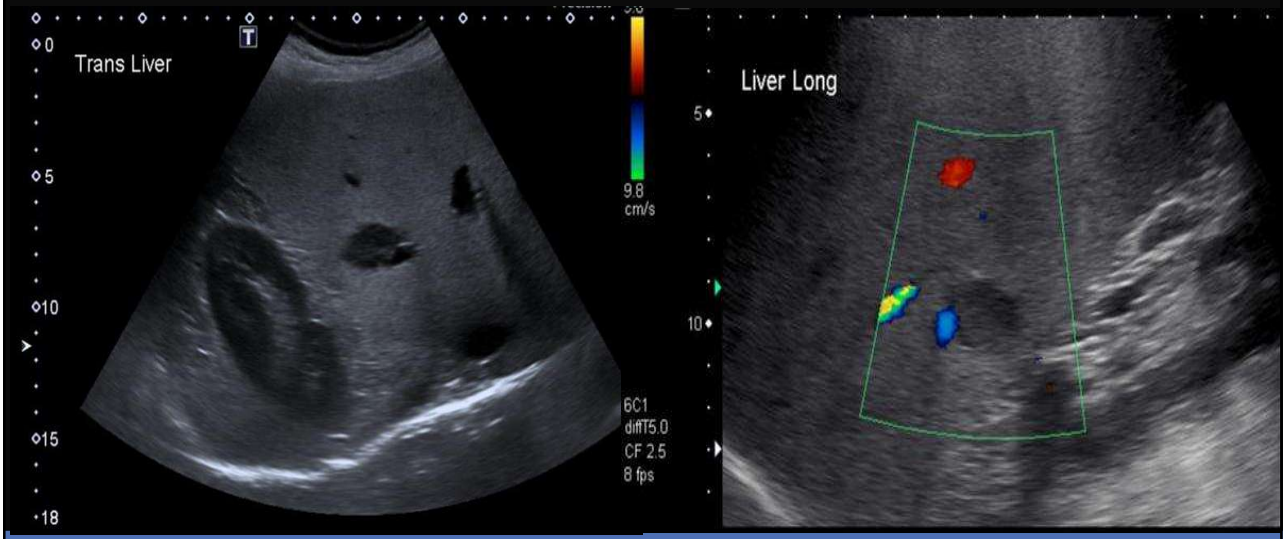
© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

MRI – Focal Nodular Hyperplasia

[19]Di Muzio B, Focal nodular hyperplasia. Case study, Radiopaedia.org (Accessed on 13 May 2025) doi:10.53347/rID-68936

31

Incidental Liver Mass - US

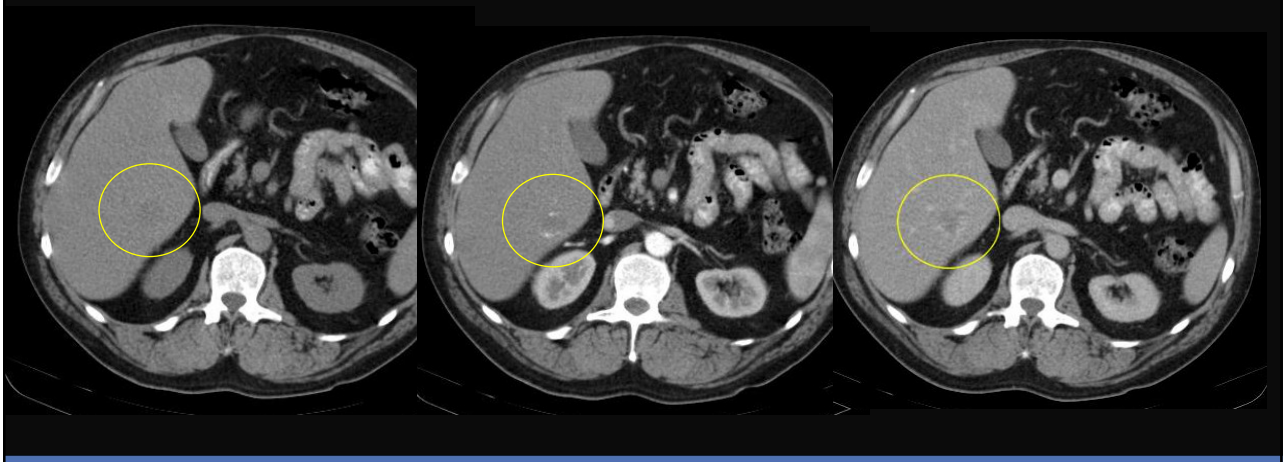


[20]Gerstenmaier J, Hepatic hemangioma - atypical due to hepatic steatosis (ultrasound). Case study, Radiopaedia.org (Accessed on 15 May 2025) doi:10.53347/rID-31275

32

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

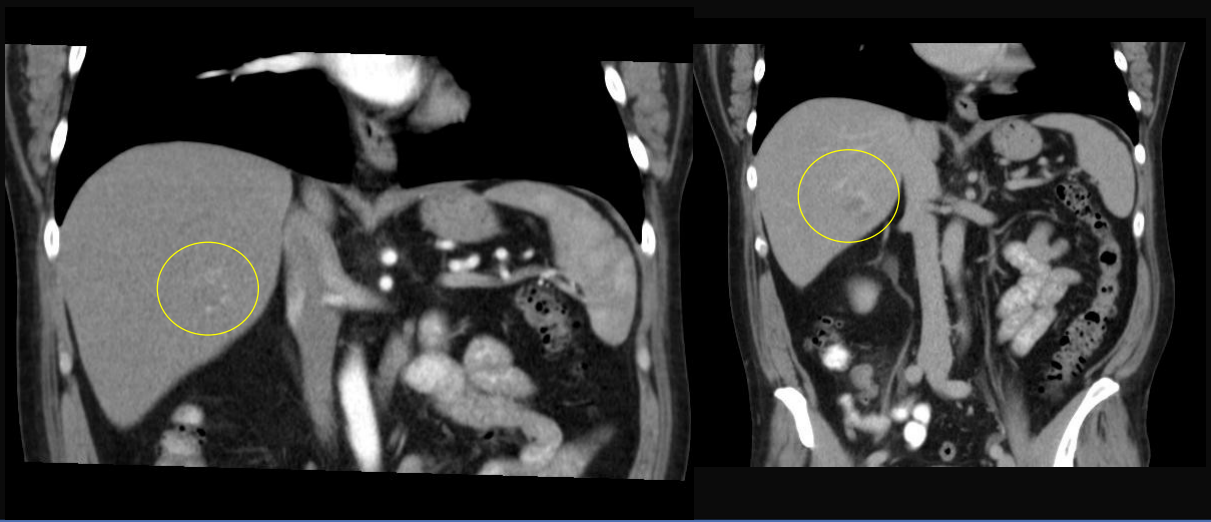
Three Phase CT scan – Cavernous Hemangioma



[20]Gerstenmaier J, Hepatic hemangioma - atypical due to hepatic steatosis (ultrasound). Case study, Radiopaedia.org (Accessed on 15 May 2025) doi:10.53347/rID-31275

33

Three Phase CT scan – Cavernous Hemangioma

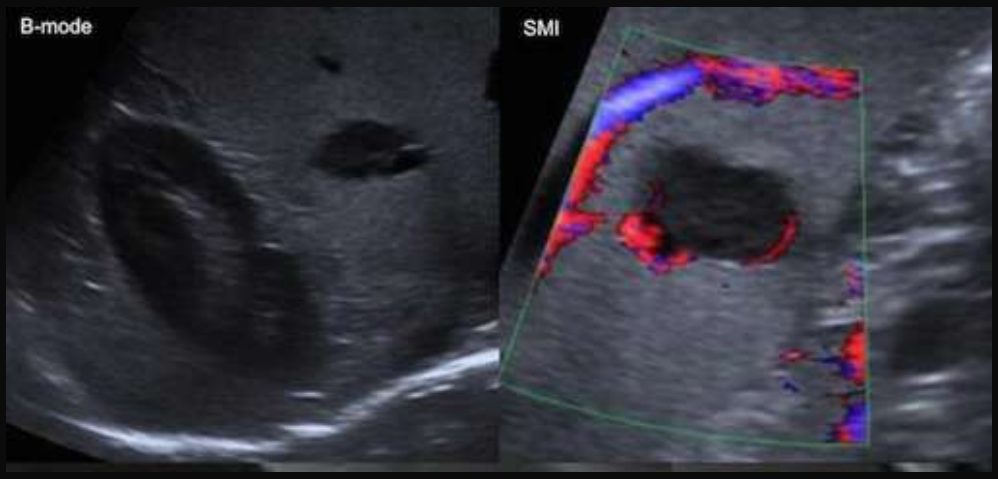


[20]Gerstenmaier J, Hepatic hemangioma - atypical due to hepatic steatosis (ultrasound). Case study, Radiopaedia.org (Accessed on 15 May 2025) doi:10.53347/rID-31275

34

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

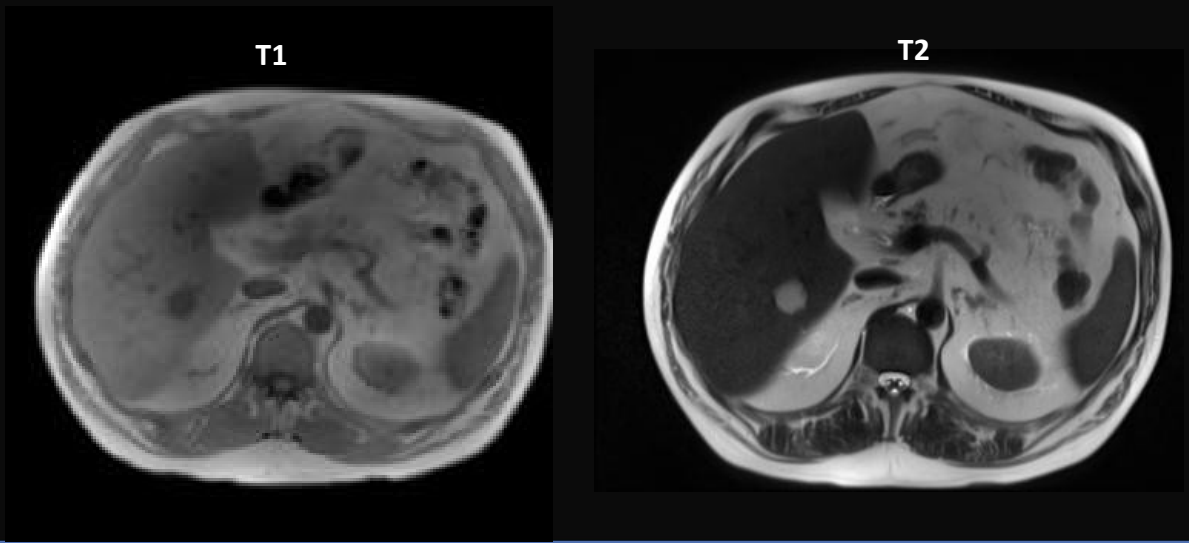
Incidental Liver Mass - US



[20]Gerstenmaier J, Hepatic hemangioma - atypical due to hepatic steatosis (ultrasound). Case study, Radiopaedia.org (Accessed on 15 May 2025) doi:10.53347/rID-31275

35

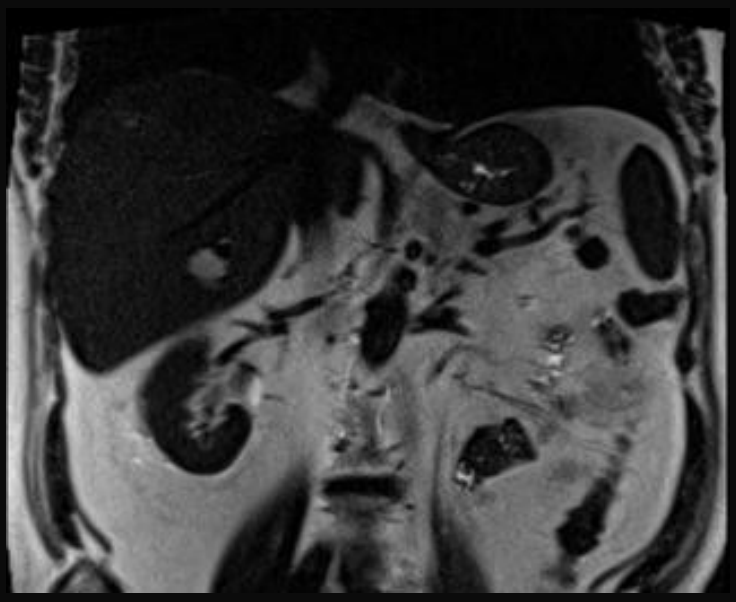
MRCP – Cavernous hemagioma



[20]Gerstenmaier J, Hepatic hemangioma - atypical due to hepatic steatosis (ultrasound). Case study, Radiopaedia.org (Accessed on 15 May 2025) doi:10.53347/rID-31275

36

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

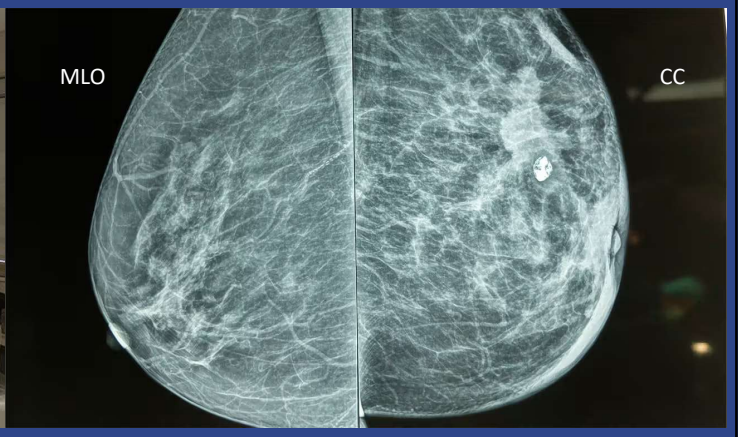


MRCP – Cavernous hemagioma

[20]Gerstenmaier J, Hepatic hemangioma - atypical due to hepatic steatosis (ultrasound). Case study, Radiopaedia.org (Accessed on 15 May 2025) doi:10.53347/rID-31275

37

Mammography



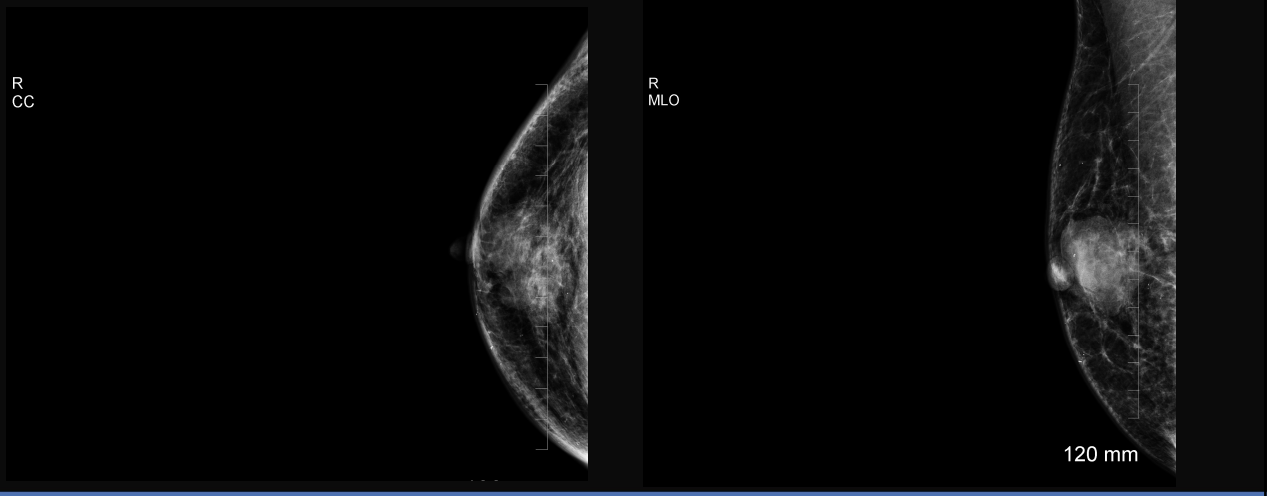
HSHS St. Vincent Hospital. Mammograms: critical to breast cancer prevention and survival. HSHS Health. Accessed May 6, 2025. https://www.hshs.org/st-vincent/news/mammograms-critical-to-breast-cancer-prevention-and-survival

Healthline Editorial Team. Mammogram images of breast cancer. Healthline. Accessed May 6, 2025. https://www.healthline.com/health/breast-cancer/mammogram-images-breast-cancer

38

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

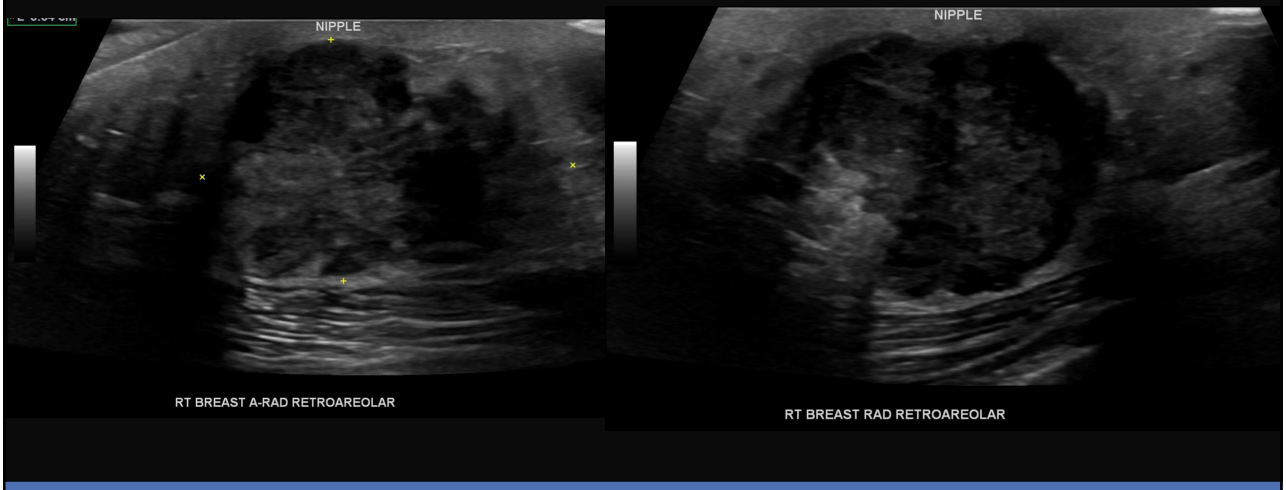
Mammogram



[21]Banks K, Male breast cancer (FDG PET-CT). Case study, Radiopaedia.org (Accessed on 04 Jun 2025) doi:10.53347/rID-203010

39

Breast Ultrasound

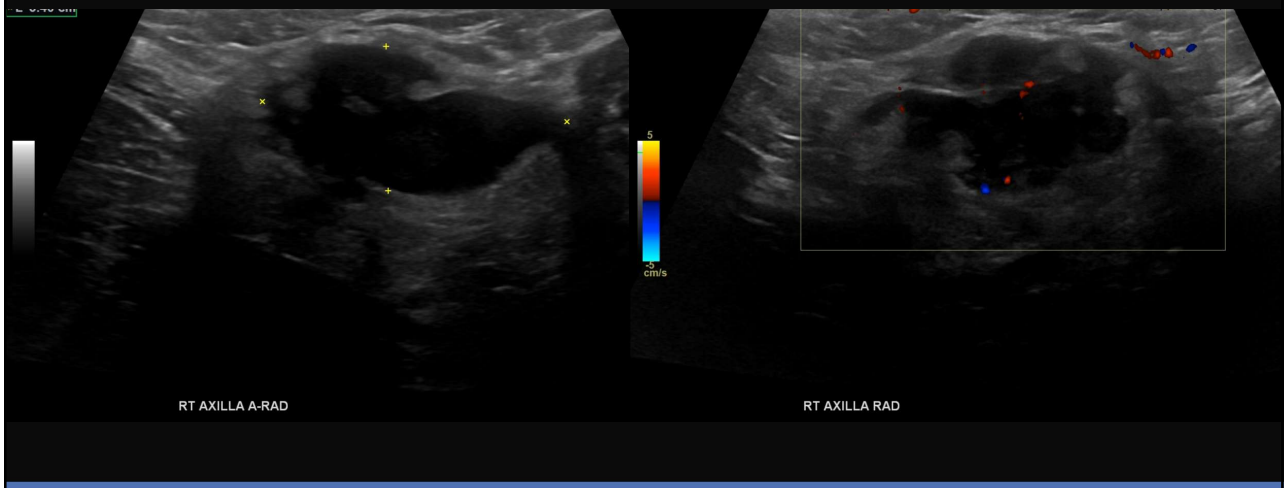


[21]Banks K, Male breast cancer (FDG PET-CT). Case study, Radiopaedia.org (Accessed on 04 Jun 2025) doi:10.53347/rID-203010

40

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

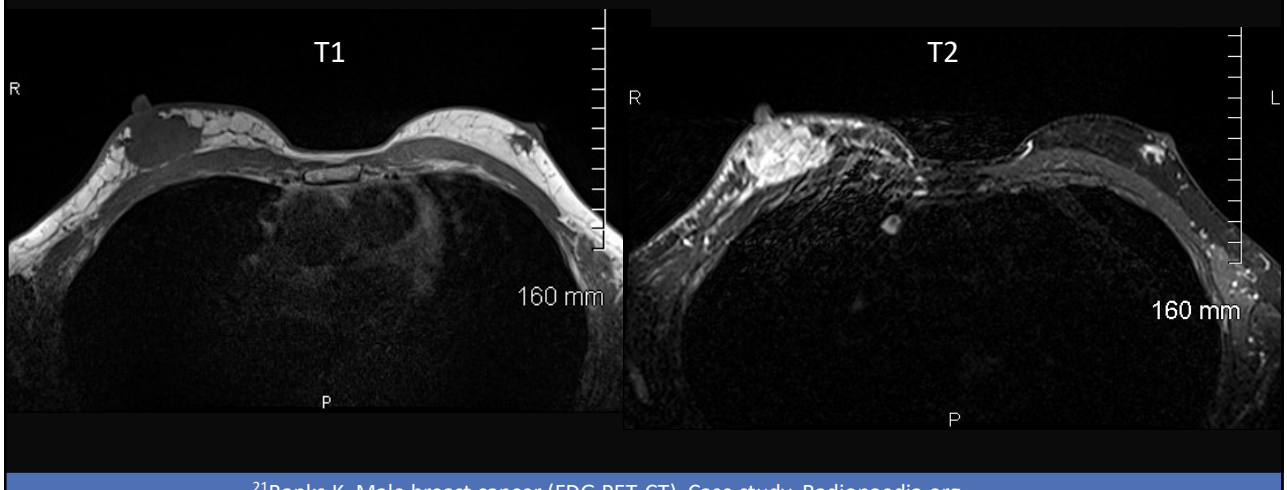
Axillary Ultrasound



[21]Banks K, Male breast cancer (FDG PET-CT). Case study, Radiopaedia.org (Accessed on 04 Jun 2025) doi:10.53347/rID-203010

41

Breast MRI

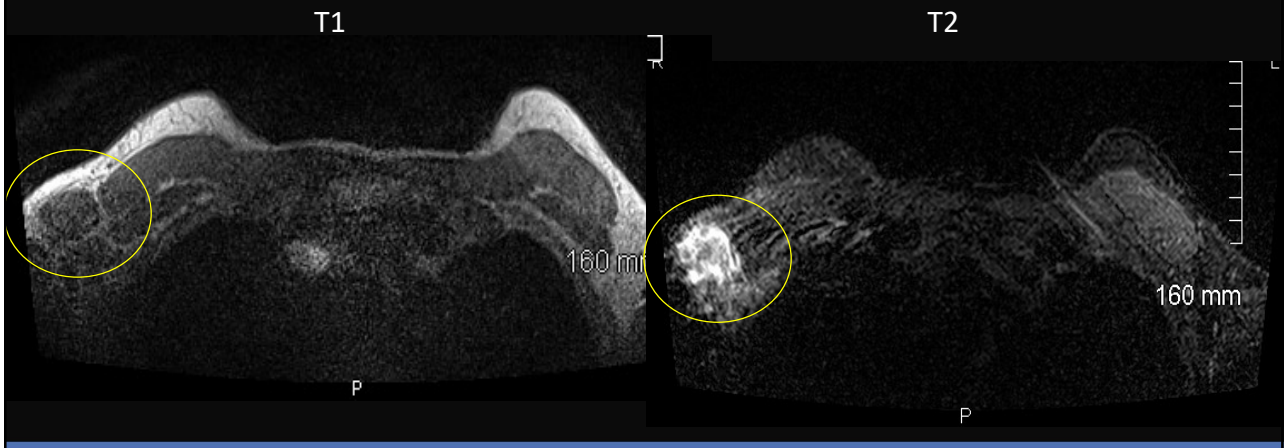


[21]Banks K, Male breast cancer (FDG PET-CT). Case study, Radiopaedia.org (Accessed on 04 Jun 2025) doi:10.53347/rID-203010

42

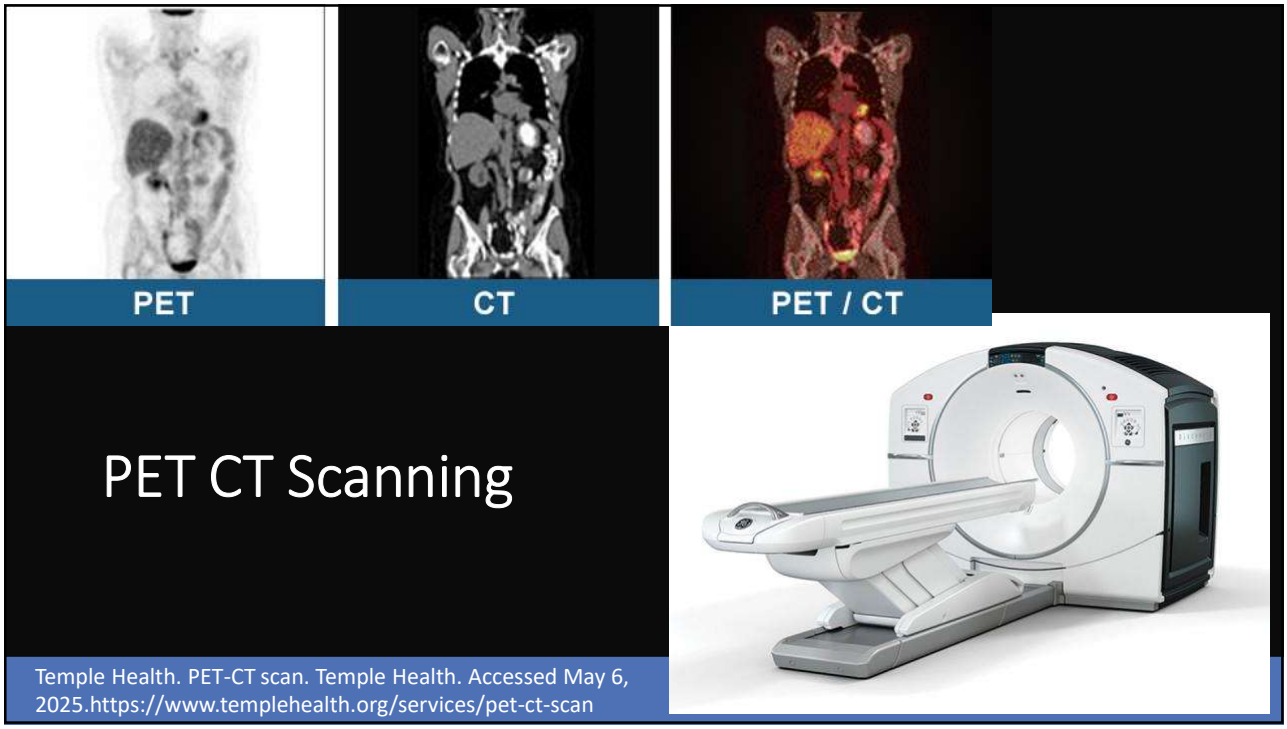
© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

Breast MRI



[21]Banks K, Male breast cancer (FDG PET-CT). Case study, Radiopaedia.org (Accessed on 04 Jun 2025) doi:10.53347/rID-203010

43



PET CT Scanning

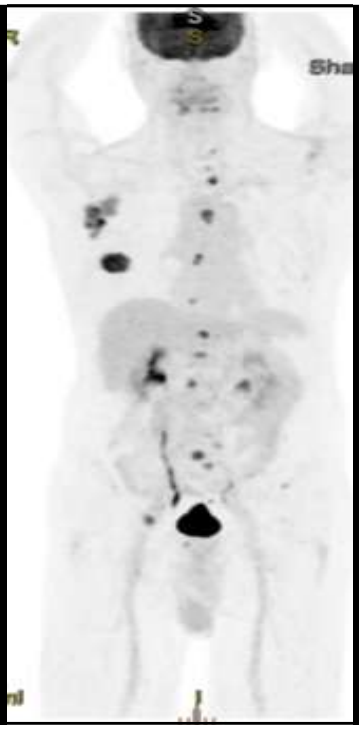
Temple Health. PET-CT scan. Temple Health. Accessed May 6, 2025.https://www.templehealth.org/services/pet-ct-scan

44

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

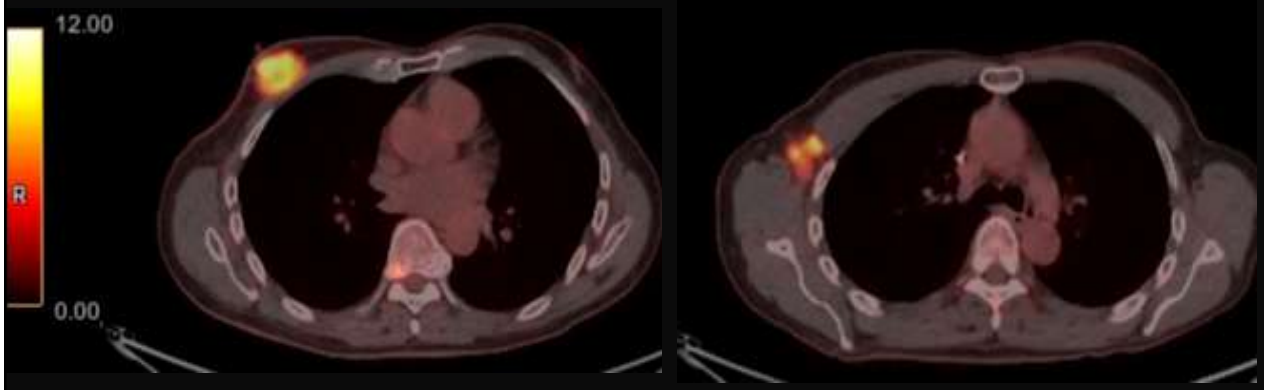
PET CT Scanning

[21]Banks K, Male breast cancer (FDG PET-CT). Case study, Radiopaedia.org (Accessed on 04 Jun 2025) doi:10.53347/rID-203010



45

PET CT Scanning

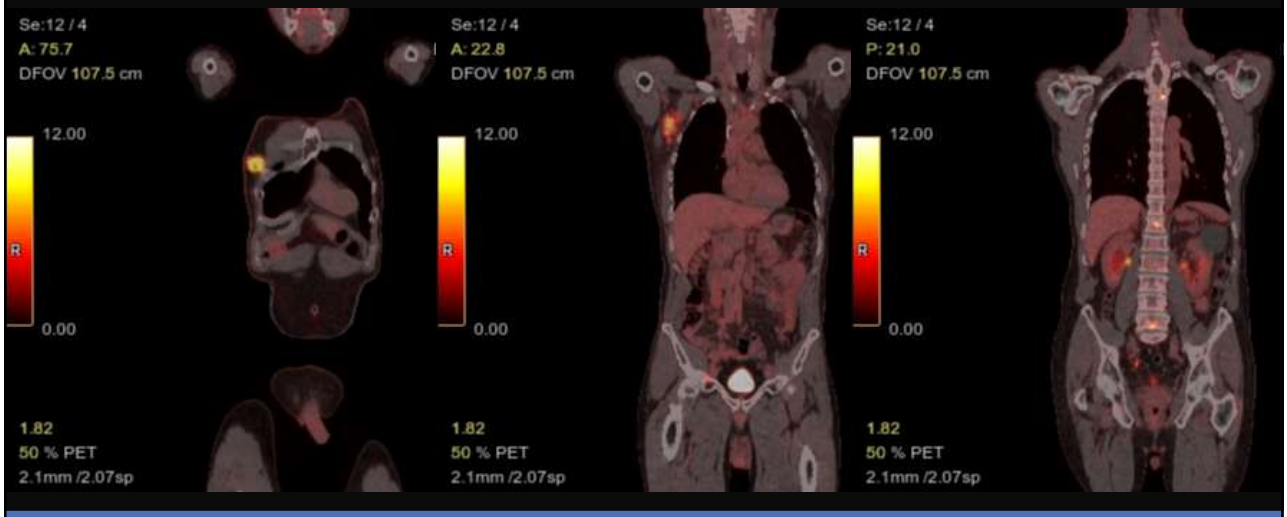


[21]Banks K, Male breast cancer (FDG PET-CT). Case study, Radiopaedia.org (Accessed on 04 Jun 2025) doi:10.53347/rID-203010

46

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

PET CT Scanning



[21]Banks K, Male breast cancer (FDG PET-CT). Case study, Radiopaedia.org (Accessed on 04 Jun 2025) doi:10.53347/rID-203010

47

krpeak@usi.edu

48

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

References

1. Gaillard F, Normal frontal chest x-ray. Case study, Radiopaedia.org (Accessed on 11 Mar 2025) doi:10.53347/rID-8090
2. Hacking C, Right pleural effusion and TIPS. Case study, Radiopaedia.org (Accessed on 26 Mar 2025) doi:10.53347/rID-39372
3. Lim Z, Pleural effusion on point-of-care ultrasound (POCUS). Case study, Radiopaedia.org (Accessed on 19 May 2025) doi:10.53347/rID-94919
4. Yonso M, Pleural effusion. Case study, Radiopaedia.org (Accessed on 19 May 2025) doi:10.53347/rID-177820
5. Hacking C, Malignant pleural effusion. Case study, Radiopaedia.org (Accessed on 26 Mar 2025) doi:10.53347/rID-80388
6. Al Salam H, Pleural effusion. Case study, Radiopaedia.org (Accessed on 26 Mar 2025) doi:10.53347/rID-13266

References

7. Bickle I, Choledocholithiasis. Case study, Radiopaedia.org (Accessed on 19 May 2025) doi:10.53347/rID-52826
8. Niknejad M, Choledocholithiasis (T tube cholangiography). Case study, Radiopaedia.org (Accessed on 19 May 2025) doi:10.53347/rID-96610
9. Al Salam H, Cholelithiasis and choledocholithiasis. Case study, Radiopaedia.org (Accessed on 19 May 2025) doi:10.53347/rID-10308
10. AIG Hospitals. ERCP (Endoscopic Retrograde Cholangiopancreatography). YouTube. February 7, 2025. Accessed 17 May 2025. https://youtu.be/BsB3mtSCK9s?si=Gyk7zozWgIe3PBgb
11. Cavender A, Intussusception - hydrostatic reduction. Case study, Radiopaedia.org (Accessed on 02 Jun 2025) doi:10.53347/rID-176086
12. Banks K, Cold nodule on thyroid scintigraphy. Case study, Radiopaedia.org (Accessed on 01 Apr 2025) doi:10.53347/rID-169092

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.

References

13. Snyder E, Kashyap S, Lopez PP. Hepatobiliary Iminodiacetic Acid Scan. [Updated 2023 Jul24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK539781/

14. Computed Tomography (CT) Scan. Johns Hopkins Medicine. Accessed 06 May 2025. https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/computed- tomography-ct-scan#:~:text=Computed%20tomography%20is%20commonly%20referred,fat%2C%20organs%20and%20blood%20vessels

15. Fernandez E. Popular CT Scans Could Account for 5% of All Cancer Cases A Year. University of California San Francisco. 14 Apr 2025. Accessed 06 May 2025. https://www.ucsf.edu/news/2025/04/429791/popular-ct-scans-could-account-5-all-cancer-cases-year

16. Thibodeau R, Appendicitis. Case study, Radiopaedia.org (Accessed on 07 May 2025) doi:10.53347/rID-174425

51

References

17. Kansan Naider D, Appendicitis. Case study, Radiopaedia.org (Accessed on 08 May 2025) doi:10.53347/rID-146814

18. Magnetic Resonance Imaging (MRI). National Institute of Biomedical Imaging and Bioengineering. Accessed 22 May 2025. https://www.nibib.nih.gov/science-education/science-topics/magnetic-resonance-imaging-mri

19. Di Muzio B, Focal nodular hyperplasia. Case study, Radiopaedia.org (Accessed on 13 May 2025) doi:10.53347/rID-68936

20. Gerstenmaier J, Hepatic hemangioma - atypical due to hepatic steatosis (ultrasound). Case study, Radiopaedia.org (Accessed on 15 May 2025) doi:10.53347/rID-31275

21. Banks K, Male breast cancer (FDG PET-CT). Case study, Radiopaedia.org (Accessed on 04 Jun 2025) doi:10.53347/rID-203010

52

© Copyright. Society of Diagnostic Medical Sonography. All Rights Reserved.