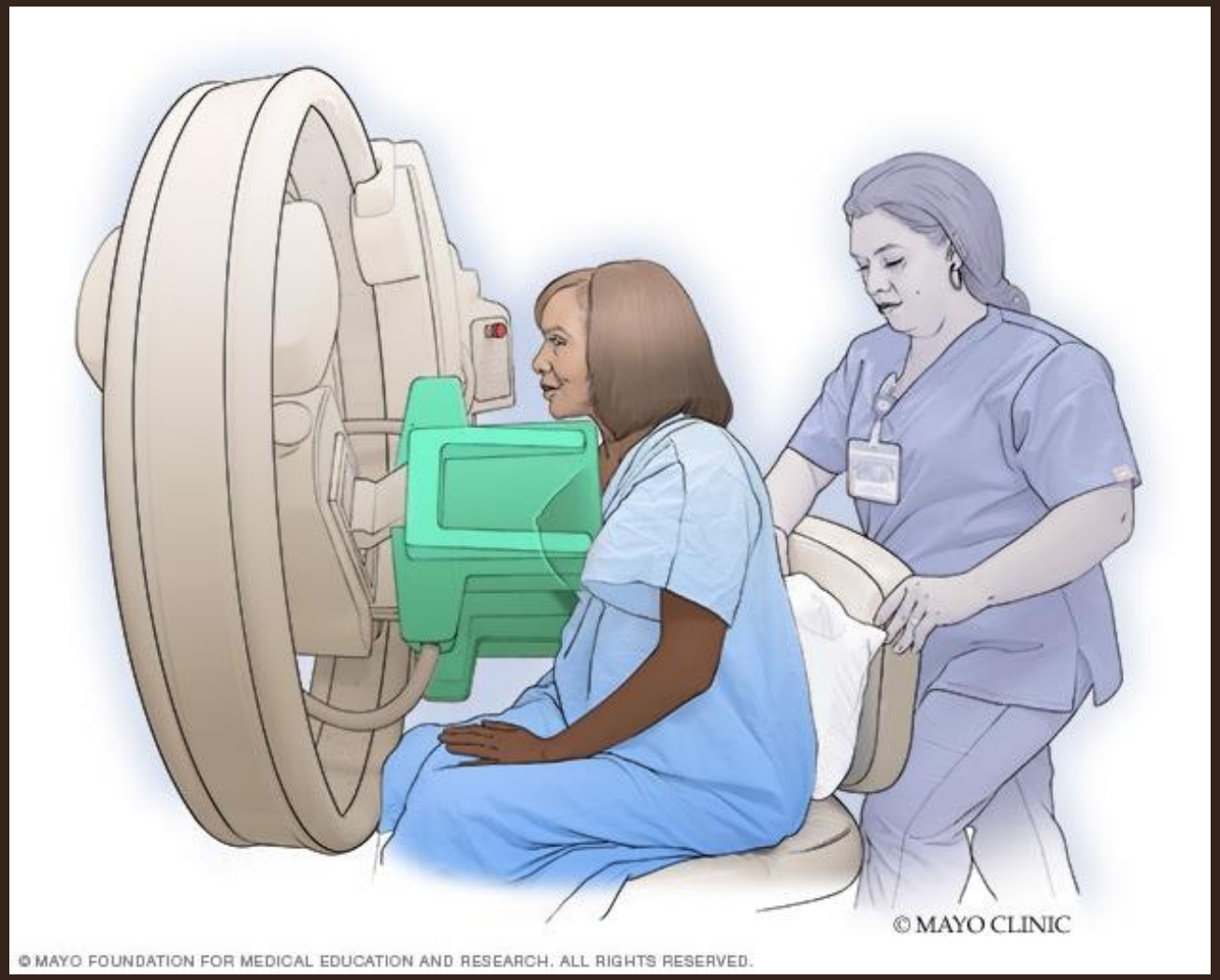
MOLECULAR BREAST IMAGING

OBJECTIVES

1. Description of Molecular Breast Imaging and how it works
    1. Radioactive tracer TC-99m sestamibi function
    2. Gamma Camera
2. MBI Outlook
3. Advantages vs Disadvantages
4. MBI comparisons to other breast imaging modalities

WHAT IS MBI?

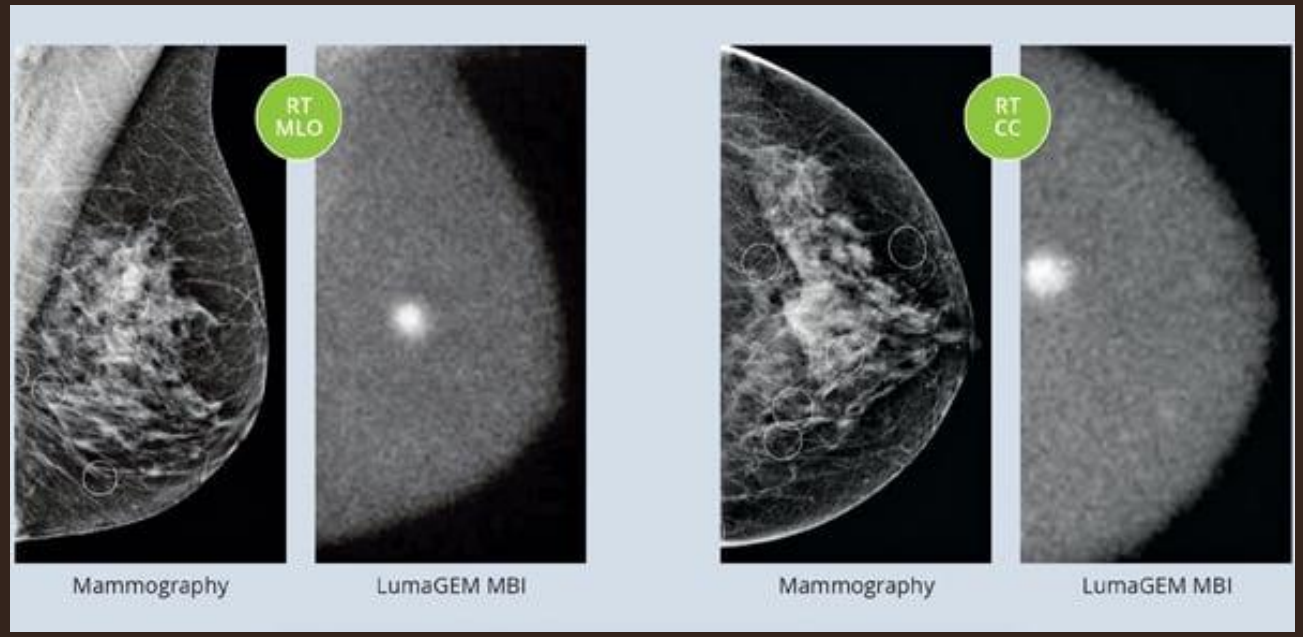
- Molecular breast imaging is a type of imaging that utilizes a radioactive tracer to aid in the visualization of breast tissue.
- Utilizes a gamma camera with light compression.
- Radioactive tracer called Tc-99m sestamibi



https://www.mayoclinic.org/-/media/kcms/gbs/patient-consumer/images/2022/06/03/15/59/molecular-breast-imaging-8col-225650-001.jpg

WHAT IS MBI?

- The radioactive tracer is injected intravenously.
- Carried through the blood stream into the breast tissue.



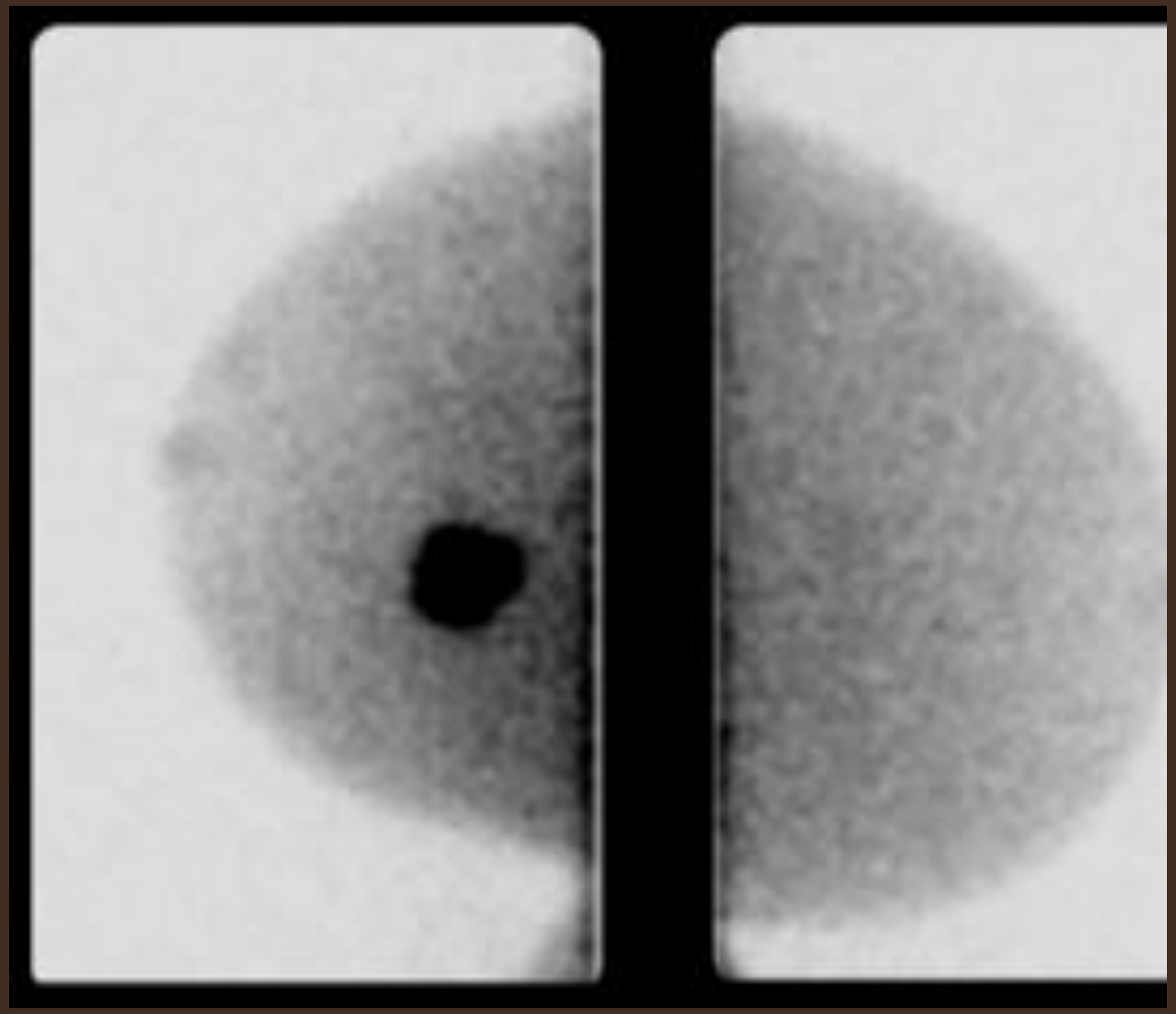
https://www.itnonline.com/sites/default/files/field/image/Mammo-and-MBI-copy.jpg

Demonstrates the ability to visualize suspicious lesions better on dense breasts

TC-99M SESTAMIBI

- Radioactive tracer utilized in molecular breast imaging.
- 6-hour half-life.
- Emits 140 keV, ideal for clinical radiography.
- Emits gamma photons which are picked up by the gamma camera.
- This radiopharmaceutical is used in practice commonly for breast, cardiac, and parathyroid issues.

KeV= kilo electron volts (energy)



https://nebula.wsimg.com/c30bc0fac7a3f26ab3d2d6ef91746ac7?AccessKeyId=3710FDDD87CDBD1A5BB9&disposition=0&alloworigin=1

HOW DOES THIS WORK?

- Cancerous cells grow rapidly and absorb the tracer much faster than surrounding tissues.
- Normal breast tissue will slowly absorb the tracer and stay a fuzzy gray or white color.
- Suspicious or cancer cells will appear bright white or black.
- Clears rapidly from the blood stream

GAMMA CAMERA

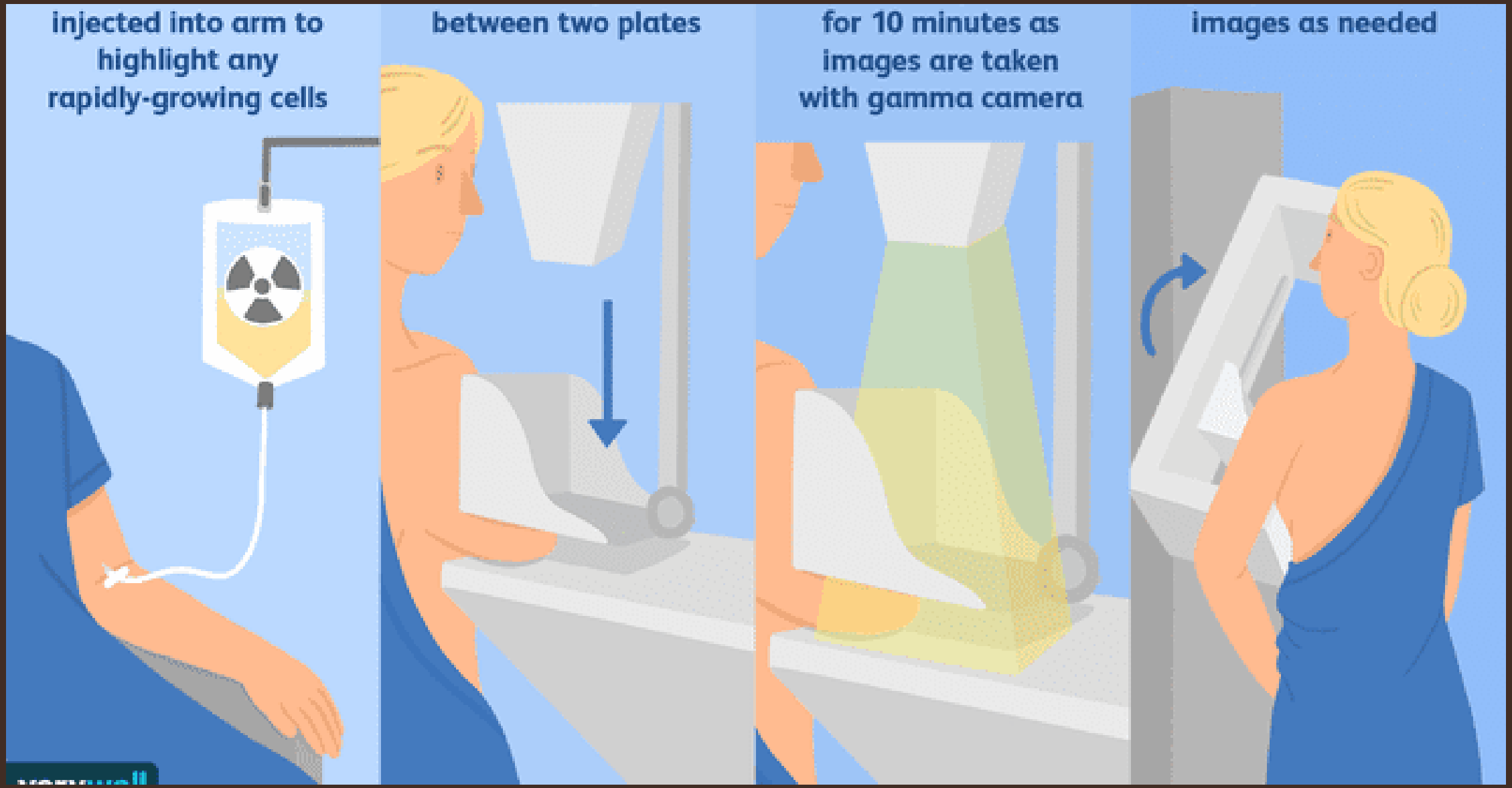
- Different types- LumaGem & Eve Clear Scan
- Converts gamma photons into electrons.
- Visualizes the interactions made in the breast from the radioactive tracer.
- Performs CC & MLOs.
- Slight Compression to immobilize the breast.

https://images.dotmed.com/images/news/stories/32247.jpg

https://www.professionalsuk.co.uk/uploads/assets/1706878732_65bce70ccd90a.jpg

https://www.foxchase.org/sites/default/files/assets/MBI1.jpg

DIFFERENT GAMMA CAMERAS



https://www.google.com/url?sa=i&url=https%3A%2F%2Fautos.yahoo.com%2Fmolecular-breast-imaging-145239392.html&psig=AOvVaw39-3i6t3Gg75lbrCn2_5TE&ust=1701123731623000&source=images&cd=vfe&opi=89978449&ved=0CBIQjRxqFwoTCJDPqO7Z4oIDFQAAAAAdAAAAABAJ

OUTLOOK FOR MBI

- In congruence with yearly mammograms, it can be extremely helpful for patients with dense breasts.
- Next step in the process if MRI or ultrasound are inconclusive.
- Helpful for patients who already have a cancer dx and are looking to see if more places in the breasts are affected.
- Less expensive than MRI
- High specificity & sensitivity for small lesions
- Continuously advancing.

ADVANTAGES OF MBI

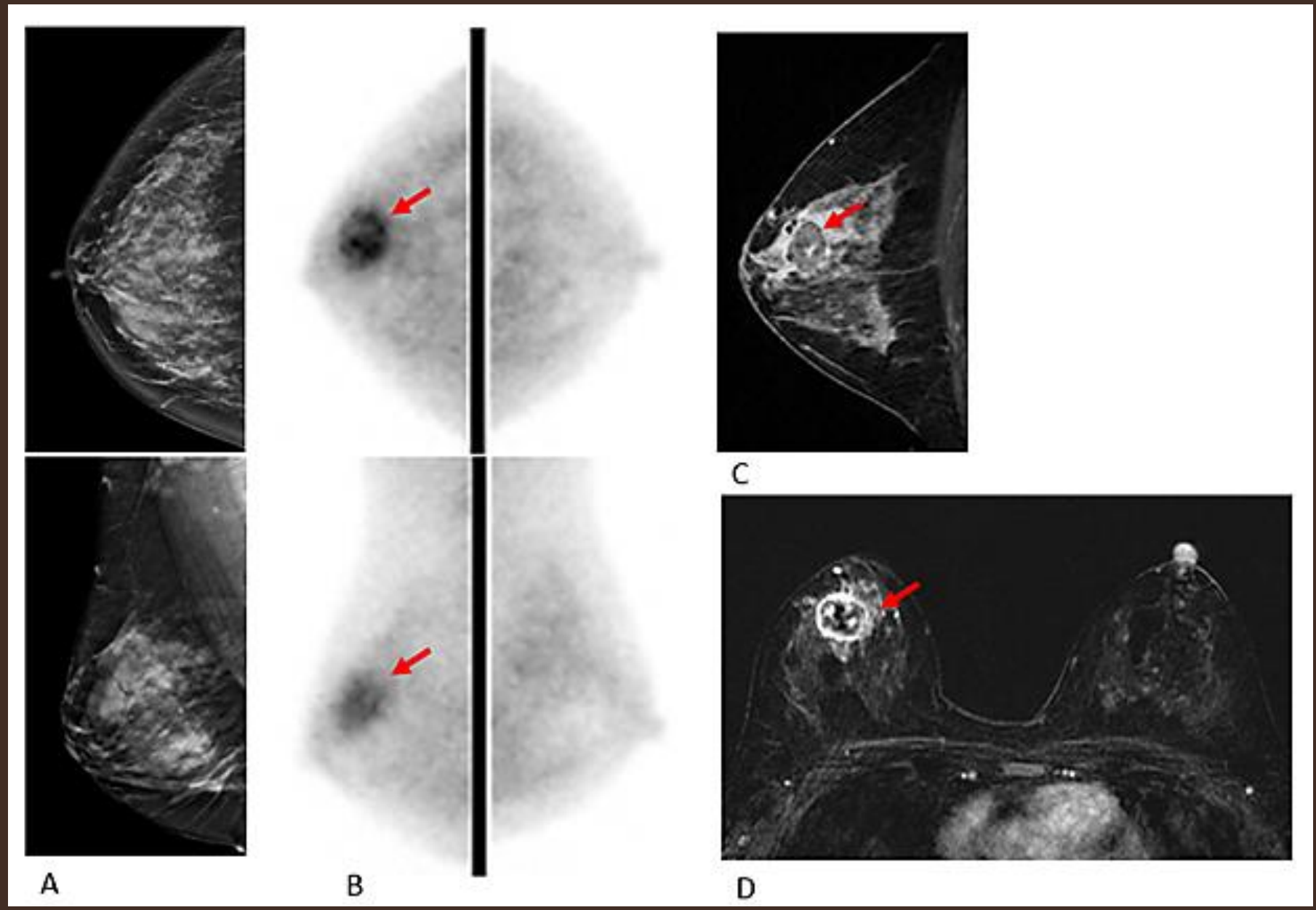
- Very good at visualizing masses in dense breasts.
- Can identify cancers that are not seen in mammography or ultrasound.
- Provides useful information for staging.
- Can be used for biopsy.
- Helpful with neoadjuvant chemotherapy.
- Not many contraindications for using Tc-99m sestamibi (pregnancy being the main)

DISADVANTAGES OF MBI

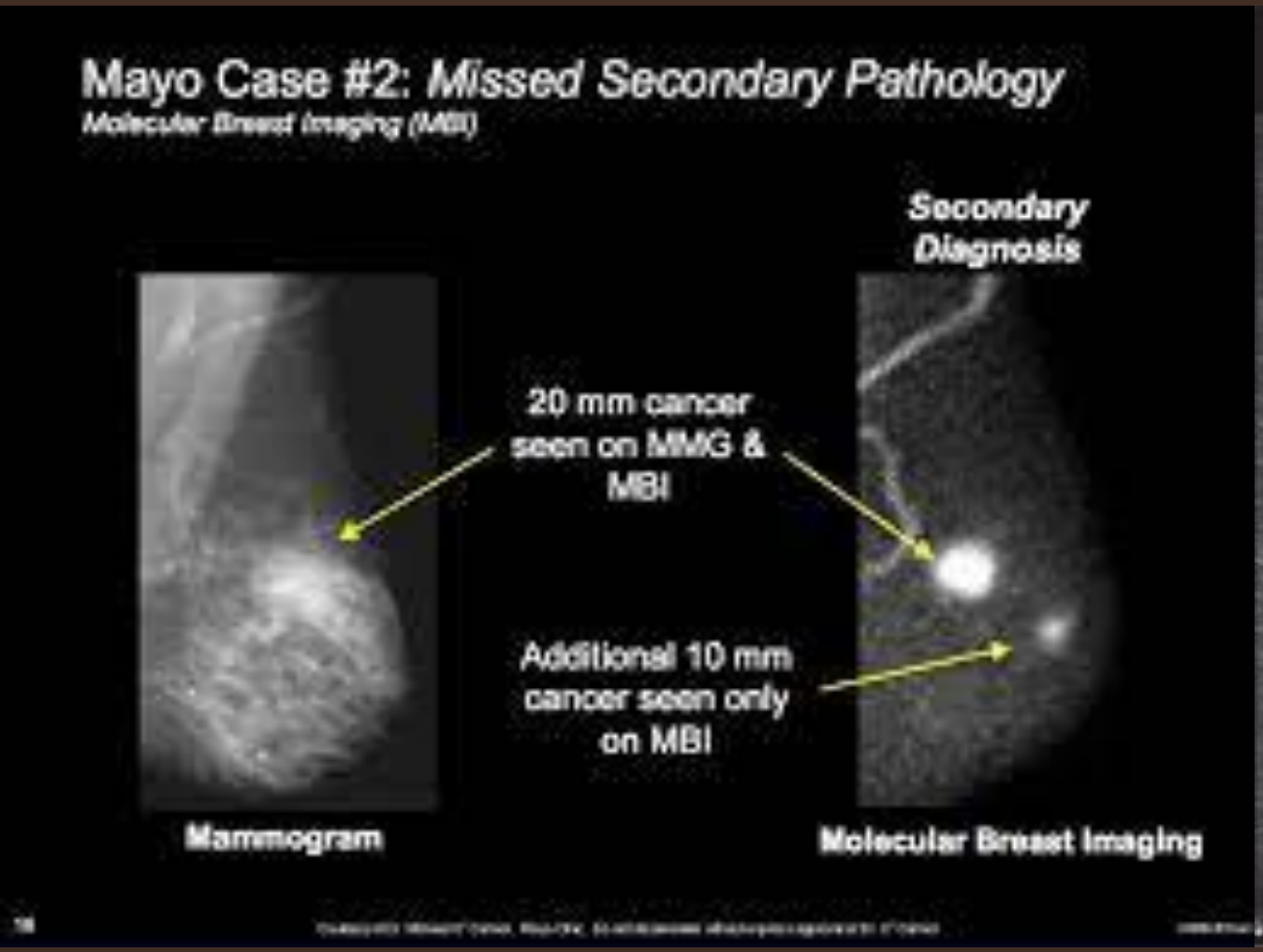
- Procedure times are longer.
- Radiation is always a risk factor, 2.1-2.6 mSv for whole body dose
- The usage in the United States for MBI is low.
- Limited for axillary and chest wall visualization.
- Cannot see everything every time.
- Still a lot to learn!!!

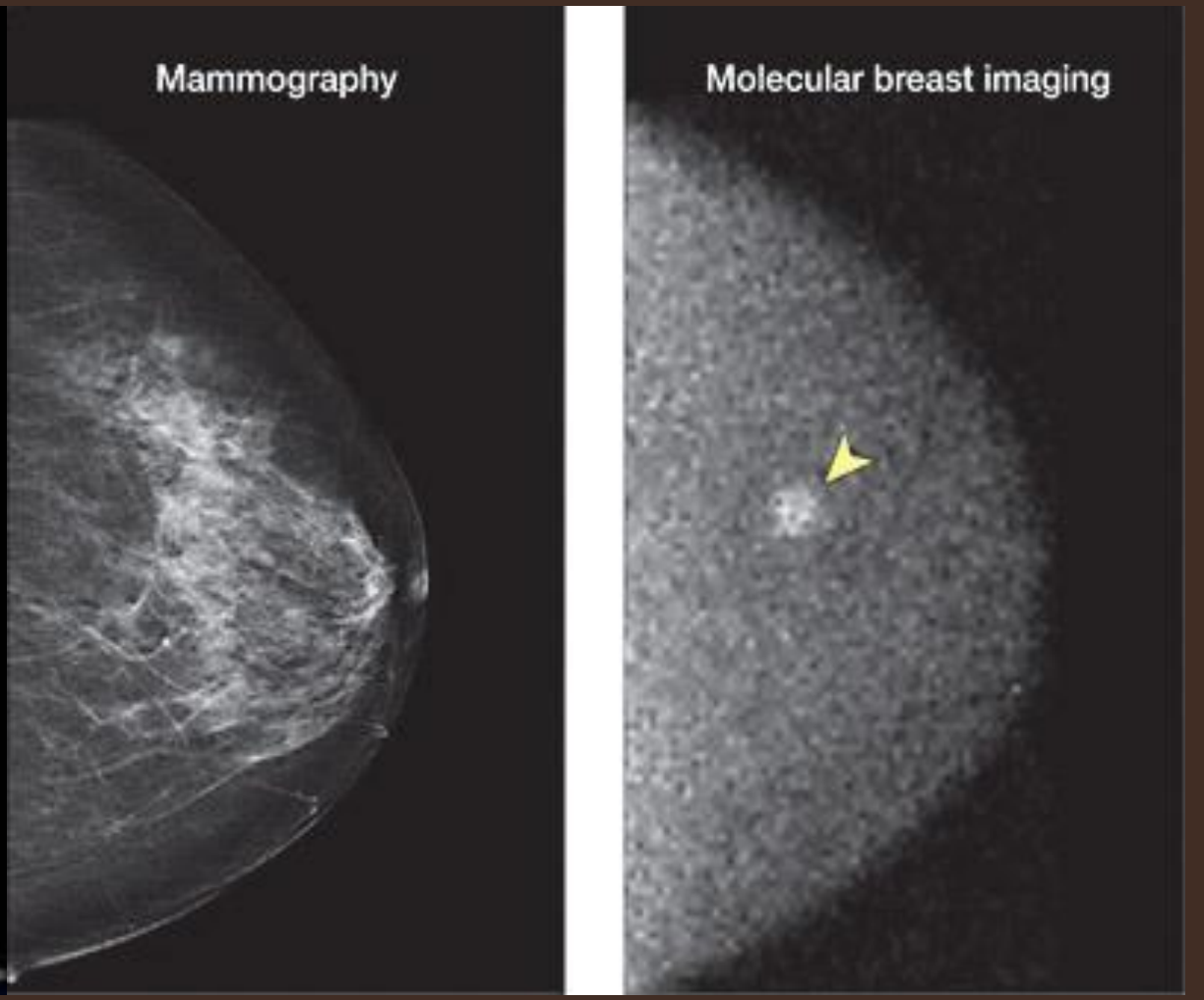
COMPARISONS

- MBI can detect 3x more cancers than mammography alone.
- MBI does better at analyzing dense breast tissue compared to mammography alone.
- MRI has more false positive rates than MBI.



https://s3.amazonaws.com/rdcms-snmmi/files/production/public/images/mbi__physicians_figure1.jpg





https://images.dotmed.com/images/news/stories/15923.jpg

CONCLUSION

- Molecular Breast Imaging is an advancing product with high specificity and sensitivity to breast cancer.
- MBI utilizes a radioactive tracer injected intravenously.
- The gamma camera is designed to detect the interactions made from the radioactive tracer and breast tissue.
- MBI can be utilized in congruence with yearly mammograms especially those at high risk for cancer.

SOURCES

- Covington, M. F., Parent, E. E., Dibble, E. H., Rauch, G. M., & Fowler, A. M. (2021). Advances and Future Directions in Molecular Breast Imaging. *Journal of Nuclear Medicine*, *63*(1), 17–21. https://doi.org/10.2967/jnumed.121.261988
- *Molecular breast imaging - Mayo Clinic*. (n.d.). Www.mayoclinic.org. https://www.mayoclinic.org/tests-procedures/molecular-breast-imaging/about/pac-20394710#:~:text=Molecular%20breast%20imaging%20is%20a
- *Molecular breast imaging facts*. (n.d.). Mayo Clinic Health System. https://www.mayoclinichealthsystem.org/locations/la-crosse/services-and-treatments/breast-cancer-care/imaging-and-mammography/mbi-facts#:~:text=The%20two%20tests%20are%20complementary
- *Molecular Breast Imaging - SNMMI*. (n.d.). Www.snmmi.org. https://www.snmmi.org/AboutSNMMI/Content.aspx?ItemNumber=36606
- *Molecular Breast Imaging*. (n.d.). Www.breastcancer.org. https://www.breastcancer.org/screening-testing/molecular-breast-imaging
- O'Connor, M., Rhodes, D., & Hruska, C. (2009). Molecular breast imaging. *Expert Review of Anticancer Therapy*, *9*(8), 1073–1080. https://doi.org/10.1586/era.09.75