PET CT INDICATION AND PATIENT JOURNEY

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RADIOLOGIST

INTERVENTIONAL RADIOLOGIST

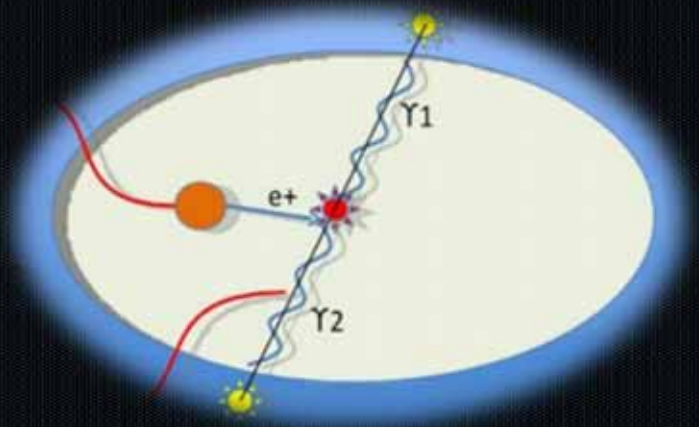
Positron Emission Tomography - nuclear imaging technique.

Gives data about biological and chemical activities.

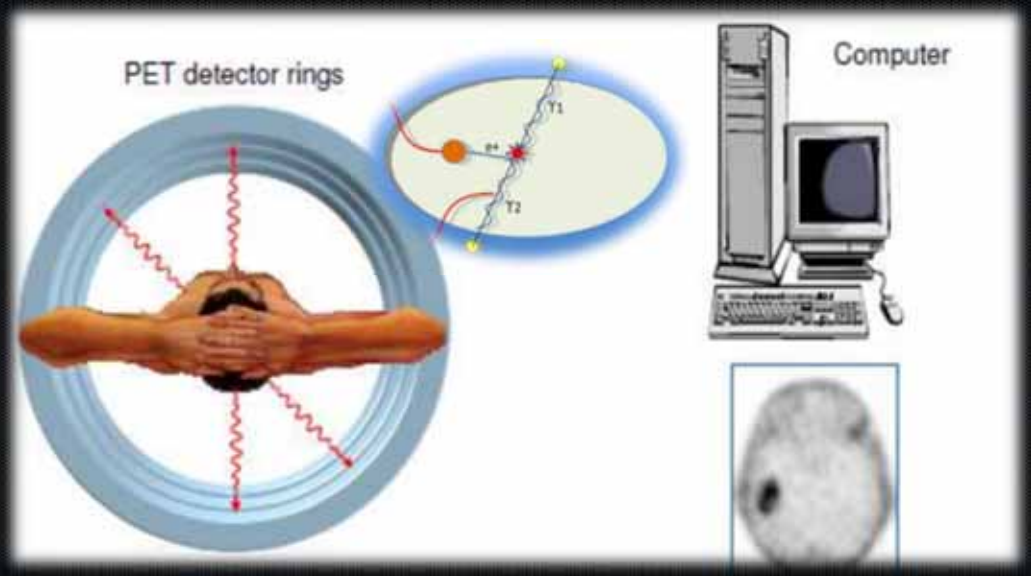
- Inject Short lived Radioactive Isotope in body - most commonly used is FDG (fluoro-2-deoxyglucose).
- Wait till tracer gets accumulated in tissues of interests.
- Patient is placed in the imaging scanner
- Tissue concentration is recorded with time.

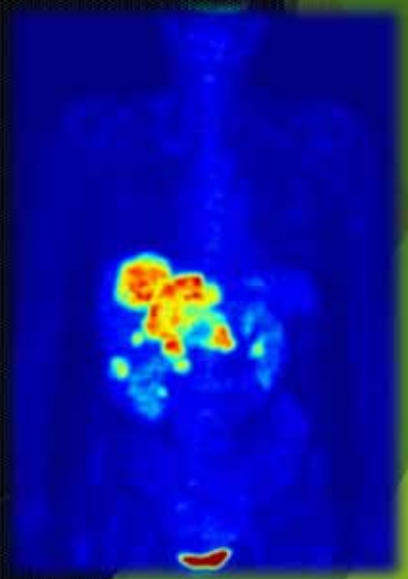
How do we see it?

- As isotope decays in body, it releases a positron in body that interacts with an electron, and produces a pair of photons.



- The system detects pairs of gamma rays emitted indirectly by positron emitting radionuclide (tracer), which was previously injected in body on a biologically active molecule.
- PET scanner detect these photons and with the help of a computer creates pictures offering details on both the structure and function of organs and tissues in body.
- • Images of tracer concentration within the body are then constructed by computer analysis.





PET tracer:

1. Fluorodeoxyglucose is a glucose analogue – 2-fluoro-2-deoxy-D-glucose - FDG.

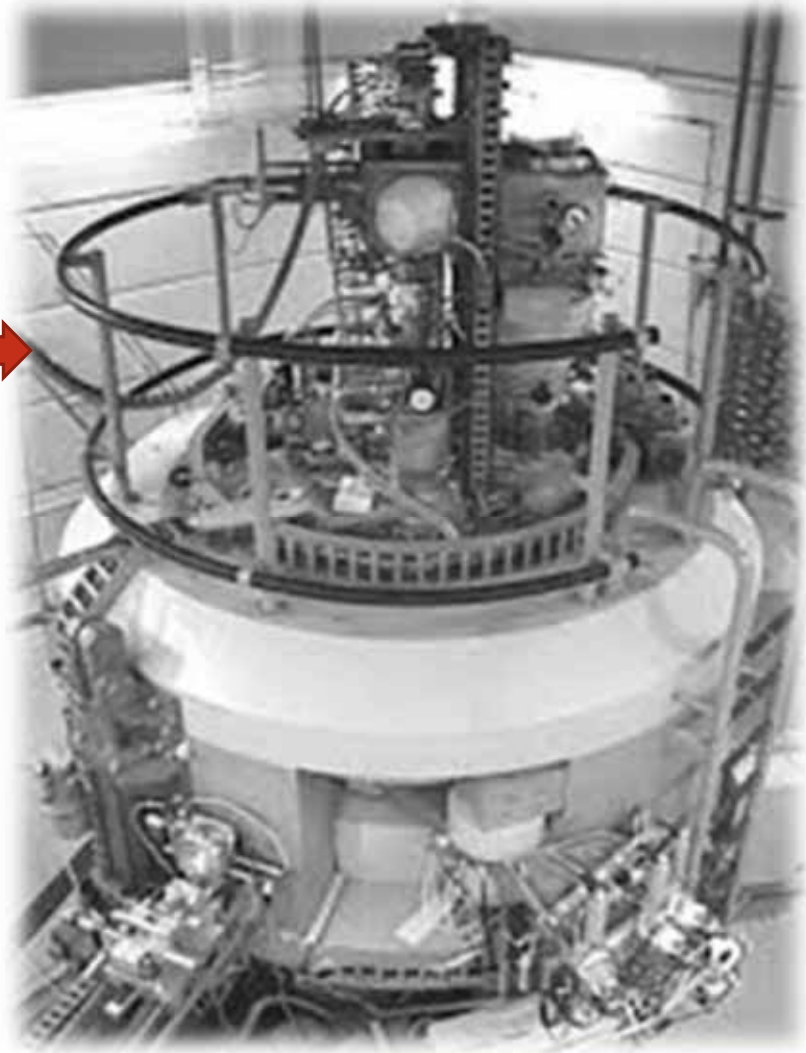
• Radioactive fluoride atom produced in a **cyclotron** is attached to a molecule of glucose.

• The FDG molecule is absorbed by various tissues just as normal glucose would be.

IN- HOUSE PRODUCTION of radioisotopes and radiopharmaceuticals/ radiotracers:

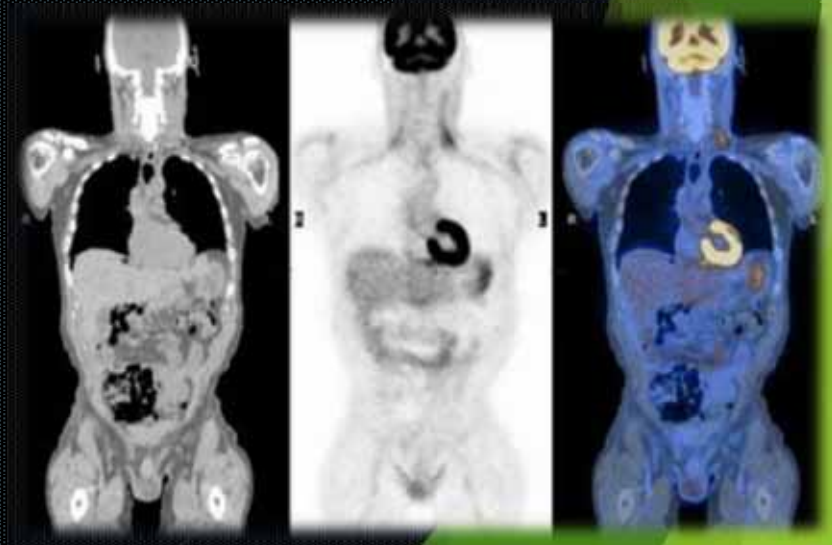
1.FDG

2.PSMA

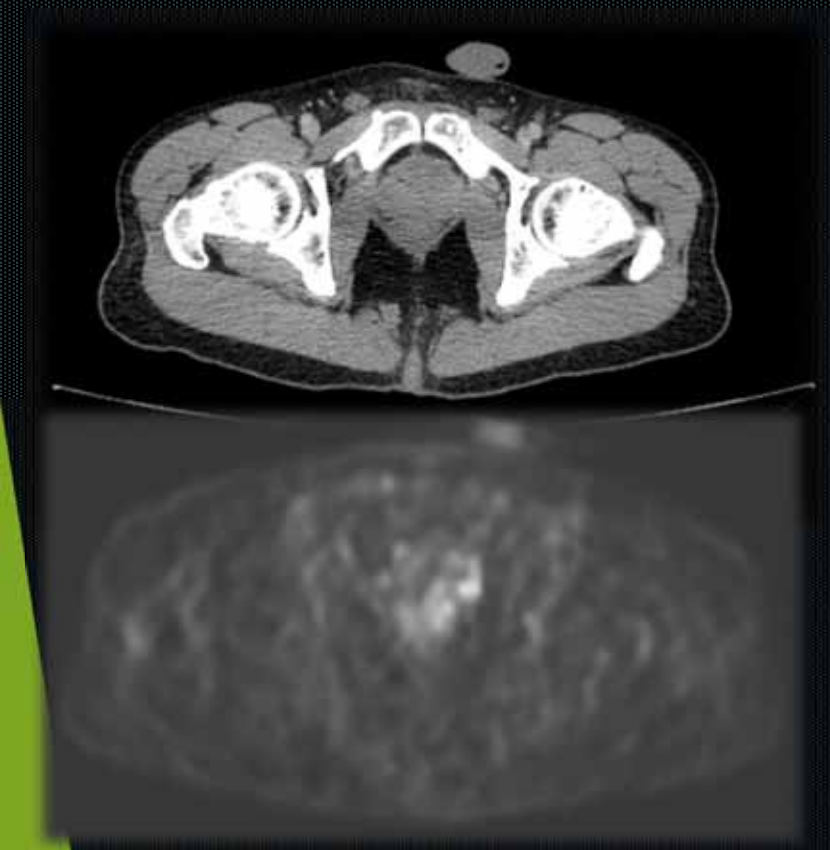


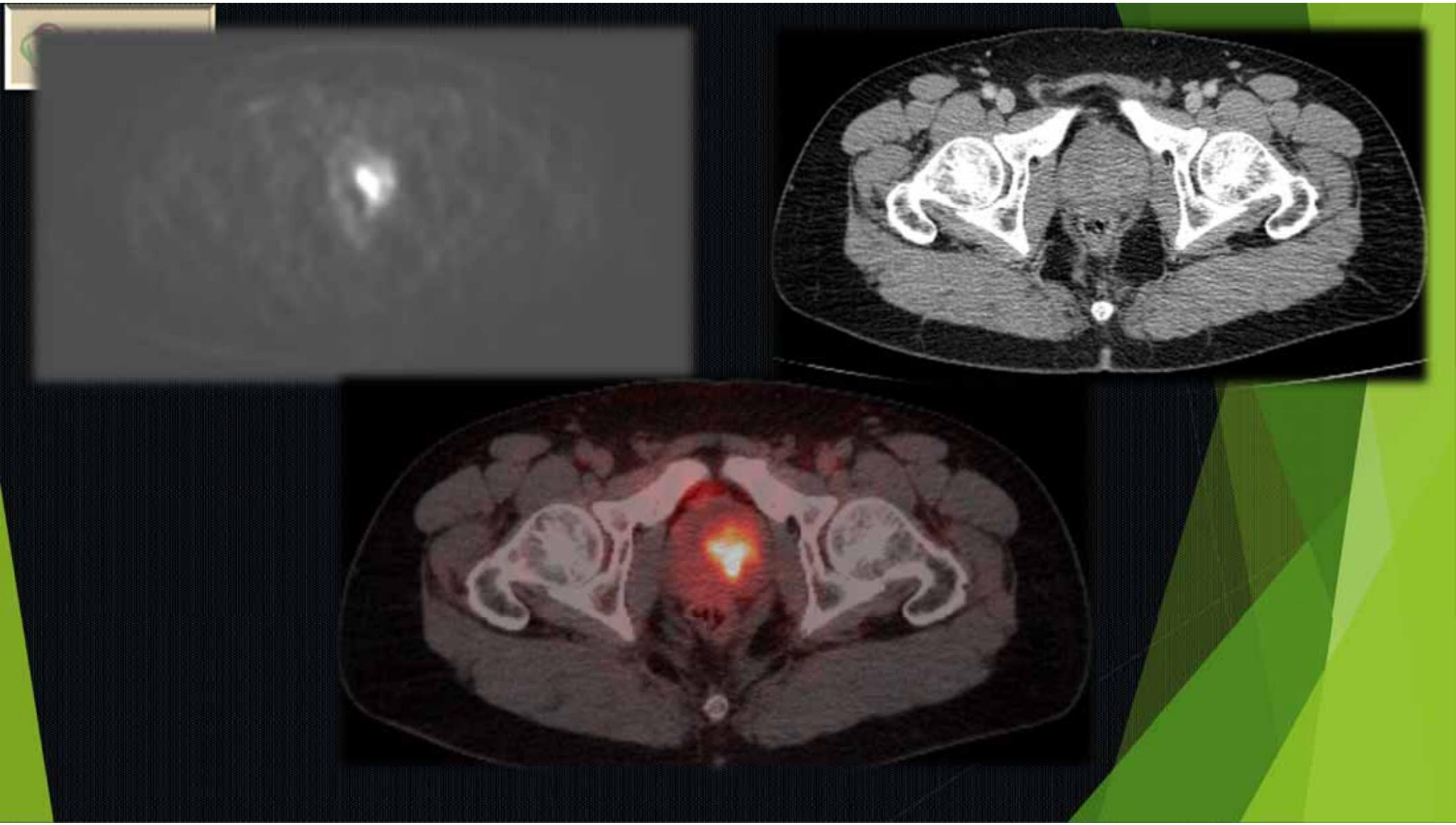
2. Prostate Specific Membrane Antigen (PSMA) 68Ga-PSMA-11.

- Half-life : 110 mins
- FDG is not cancer specific and will accumulate in any areas of high rates of metabolism and glycolysis.
- Therefore, increased uptake can be expected in all sites of hyperactivity at the time of FDG administration (e.g., muscles and nervous system tissues); at sites of active inflammation or infection.
- Physiologic uptake of FDG is normally seen in brain, heart, liver, spleen, GI tract, bone marrow, urinary collecting system including bladder.



- **Radioactive tracer drug (68Ga-PSMA-11) is injected and attaches to PSMA proteins (prostate cancer tumours overexpress this protein).**
- **PSMA PET is more effective and precise for localizing mestatic prostate cancer.**





PET provides images of quantitative uptake of the radionuclide injected that can give the concentration of radiotracer activity in kilobecquerels per milliliter .

Methods for assessment of radiotracer uptake:

- visual inspection
- **standardized uptake value (SUV)**
- glucose metabolic rate

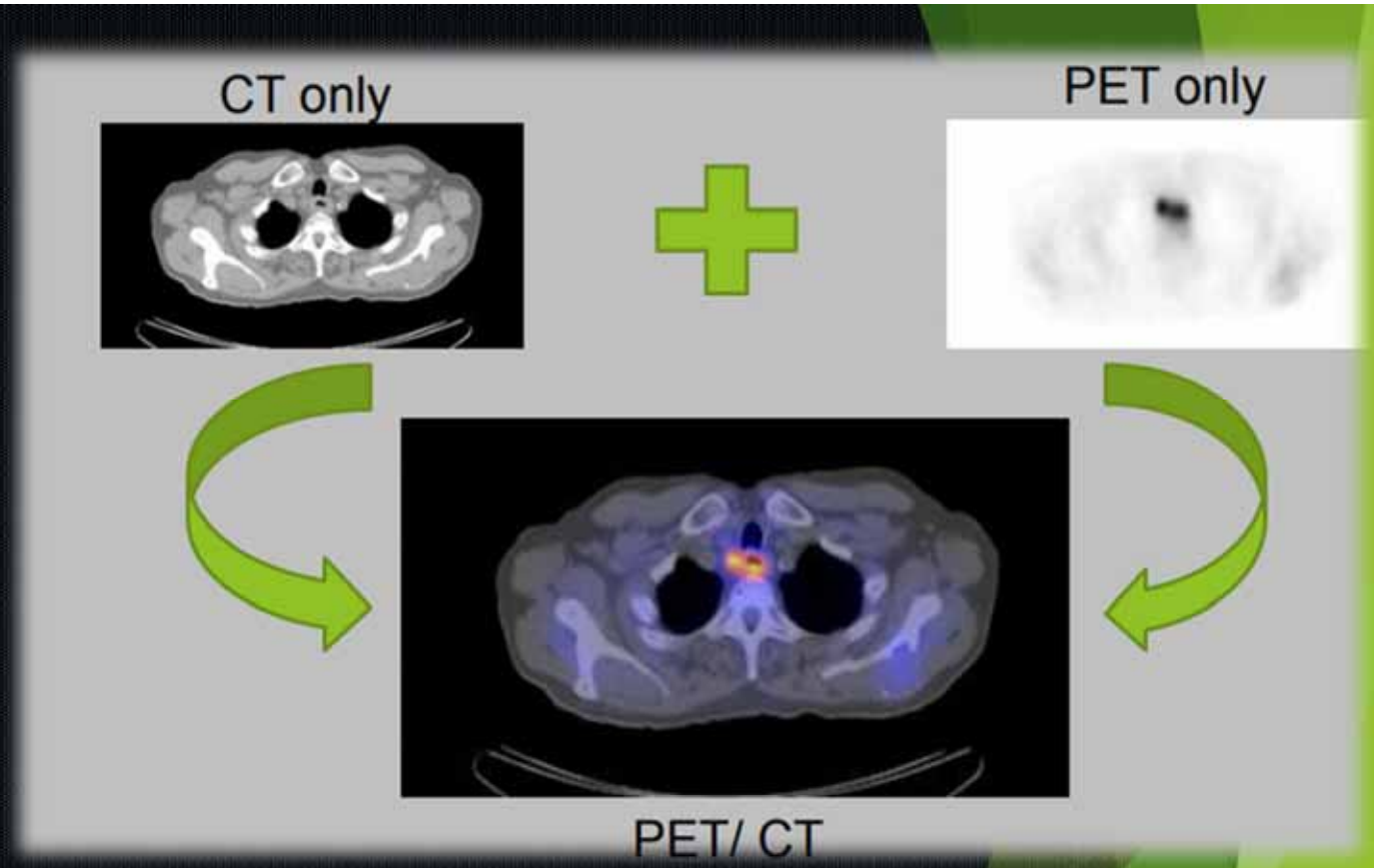
SUV

- Semiquantitative assessment of the radiotracer uptake from a static (single point in time) PET image.
- Malignant tumours have an SUV of greater than 2.5–3.0, whereas normal tissues such as the liver, lung, and marrow have SUVs ranging from 0.5 to 2.5.
- The SUV of a given tissue is calculated with the following formula:

$$SUV = \frac{Tumor\ activity\ concentration\ (MBq/ml)}{Injected\ dose\ (MBq)} \times body\ weight\ (g)$$

PET + CT → More information

- PET - Functional imaging
- CT-Scanner - Anatomical details
- Medical Imaging Technique
- Both systems in one Gantry
- Acquired image combined into a coregistered image



- One-Stop-Shop for Anatomical and Functional information.
- Greater Patient Comfort
  - One trip to the doctors office
  - Better treatment planning
  - More satisfied Patient experience

Applications of PET

- Neuroimaging
- Clinical oncology (medical imaging of tumours).
- Musculo-skeletal imaging
- Cardiology
- Pharmacology
- Neuropsychology

ONCOLOGY:

- Diagnose malignant tumours .
- Select and monitor therapy.
- Detect recurrent tumours before they can be seen on CT or other imaging modalities.
- Find out if the tumour has metastasized (spread).
- Therapy F/U

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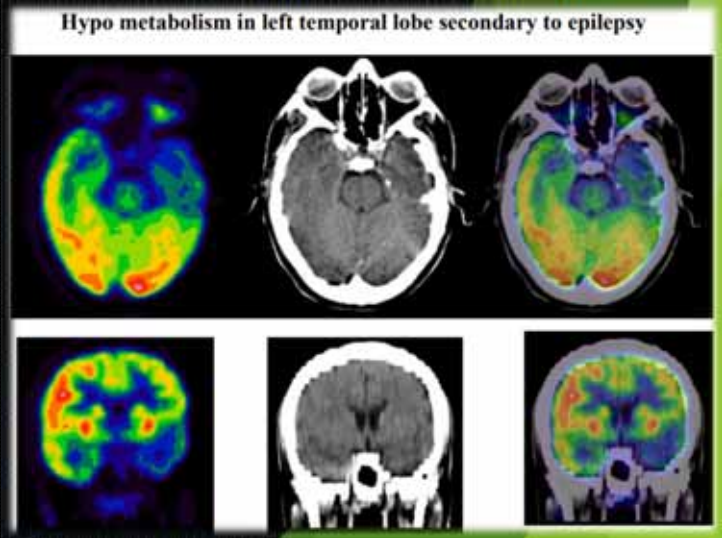
NEUROLOGY:

- Localize seizure focus in patients with seizure disorders/ pre-surgery planning.
- Alzheimer’s disease
- Evaluate extent of stroke and recovery following therapy.



CARDIOLOGY:

- Detect presence of coronary artery disease- myocardial viability/myocardial perfusion.
- Assess the extent of damage from heart disease (is the patient a bypass candidate?)
- Determine which patients will benefit from cardiac transplantation.

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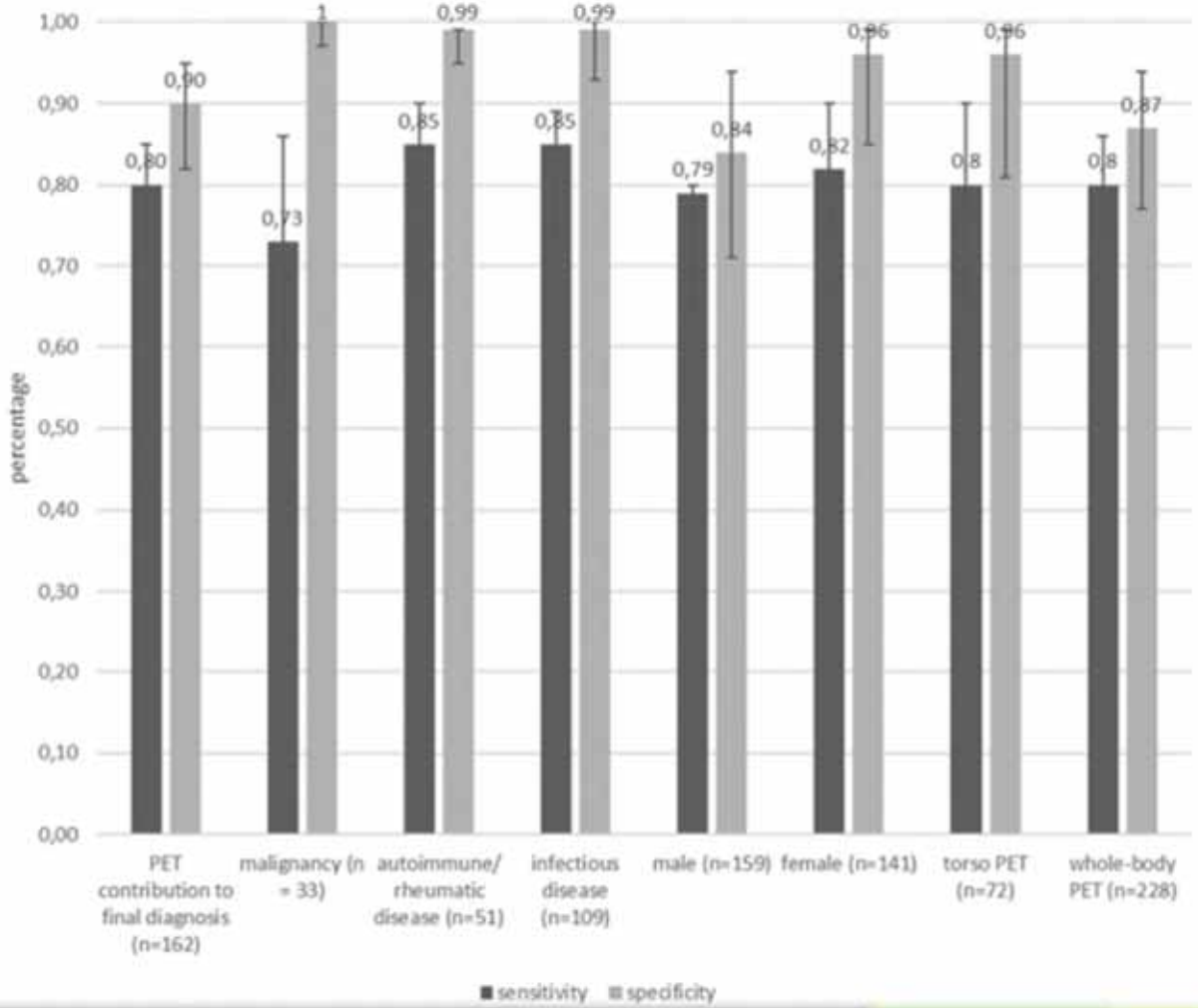
www.nature.com/scientificreports/



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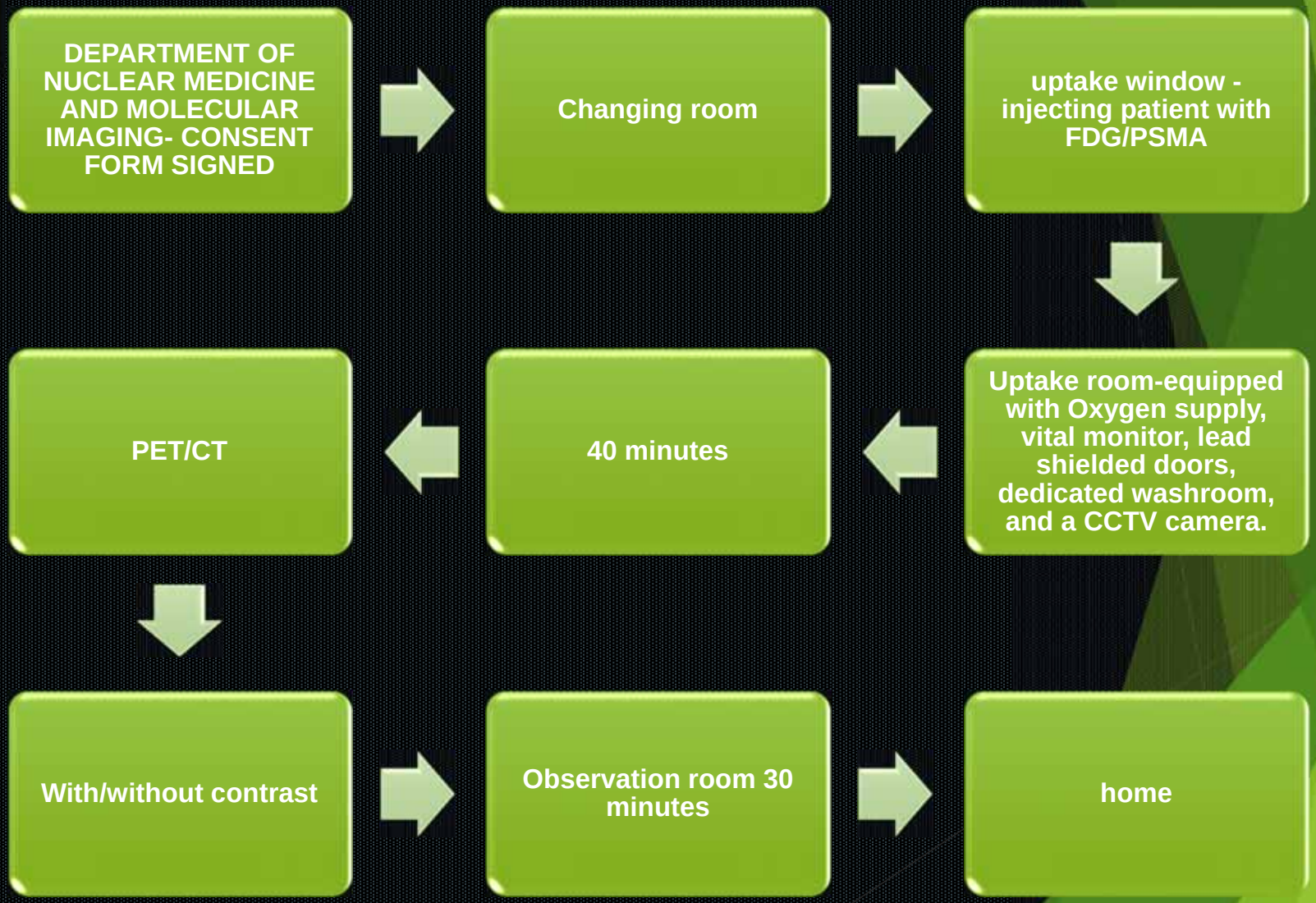

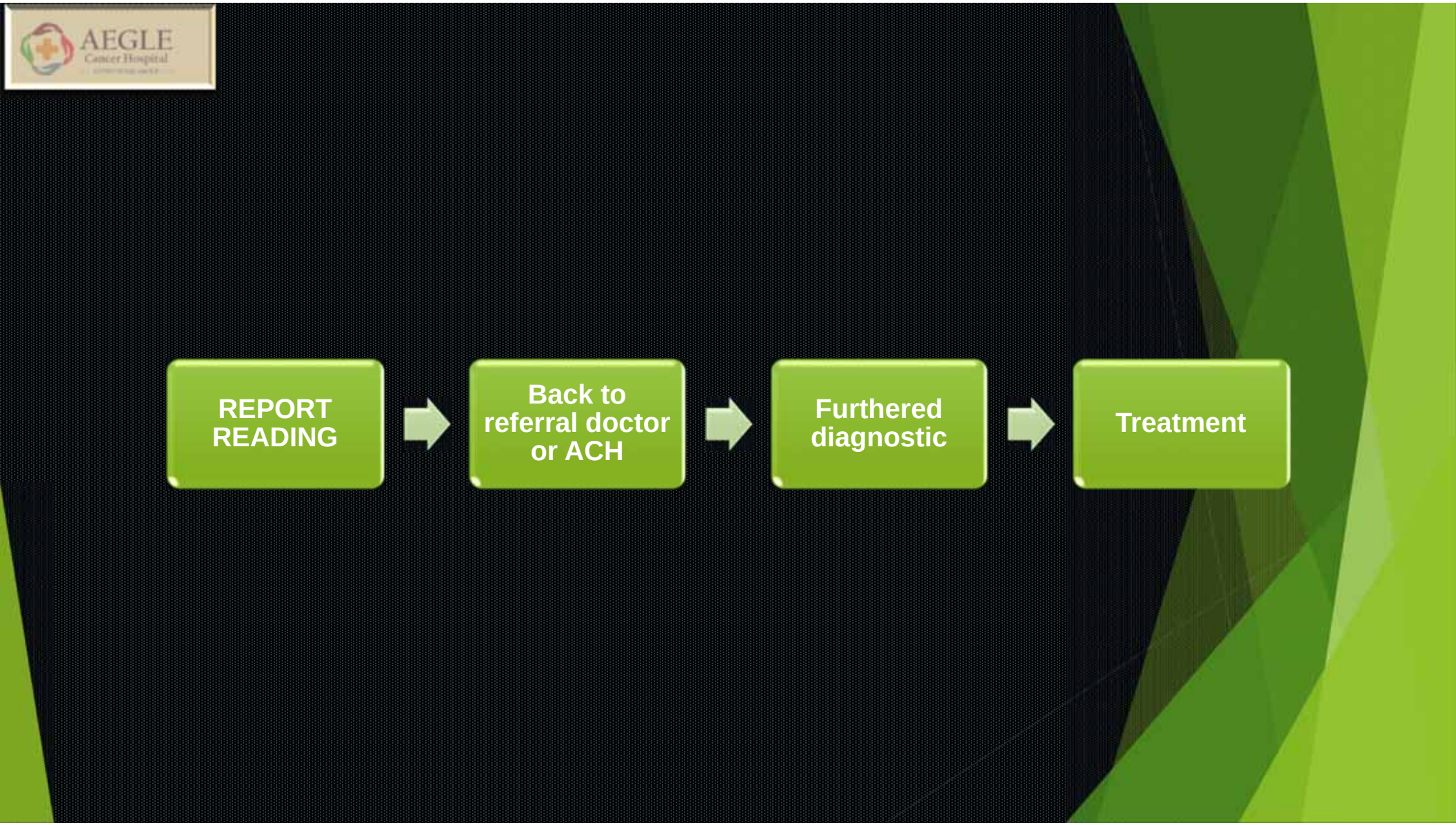
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REPORT READING
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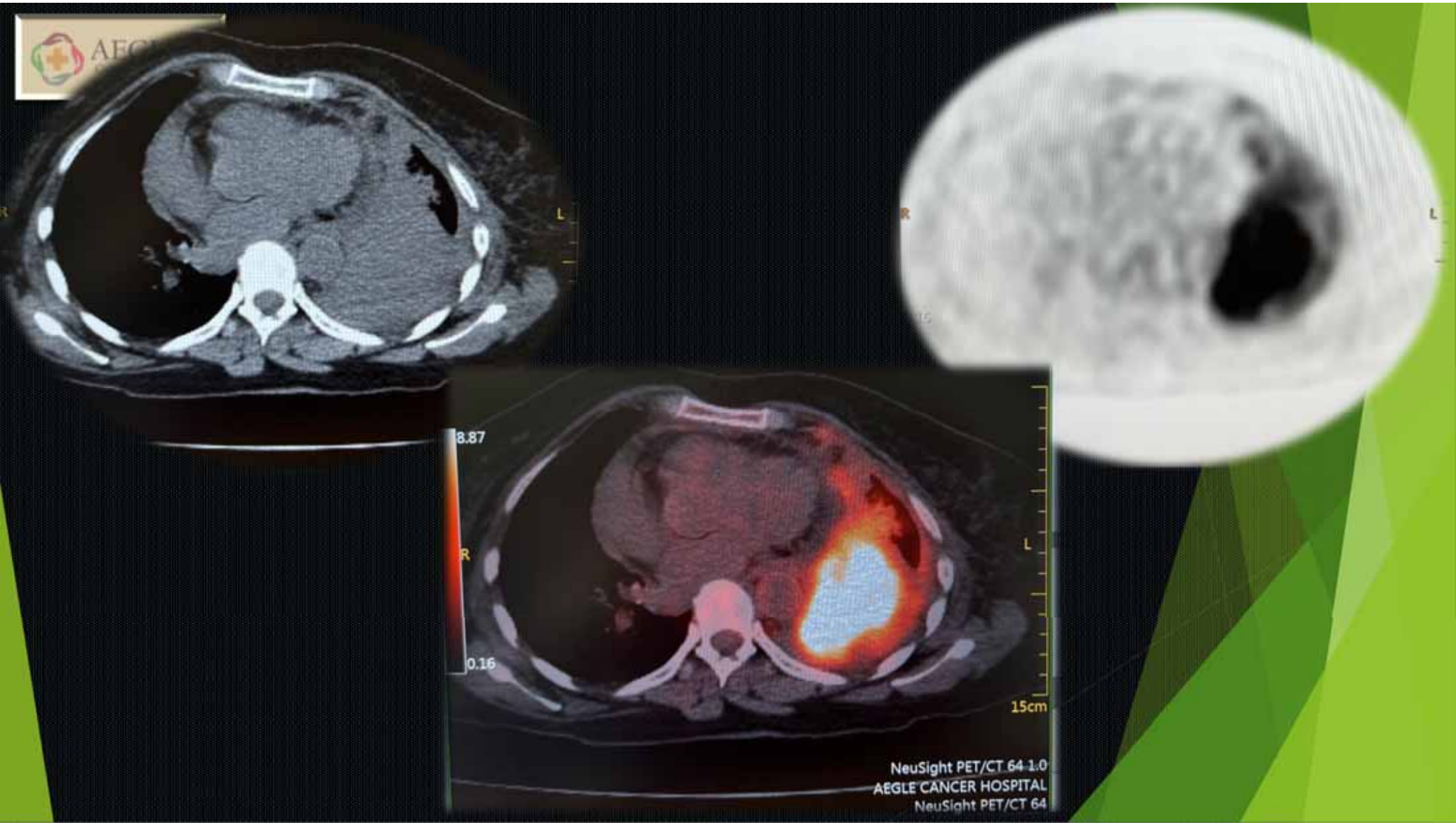
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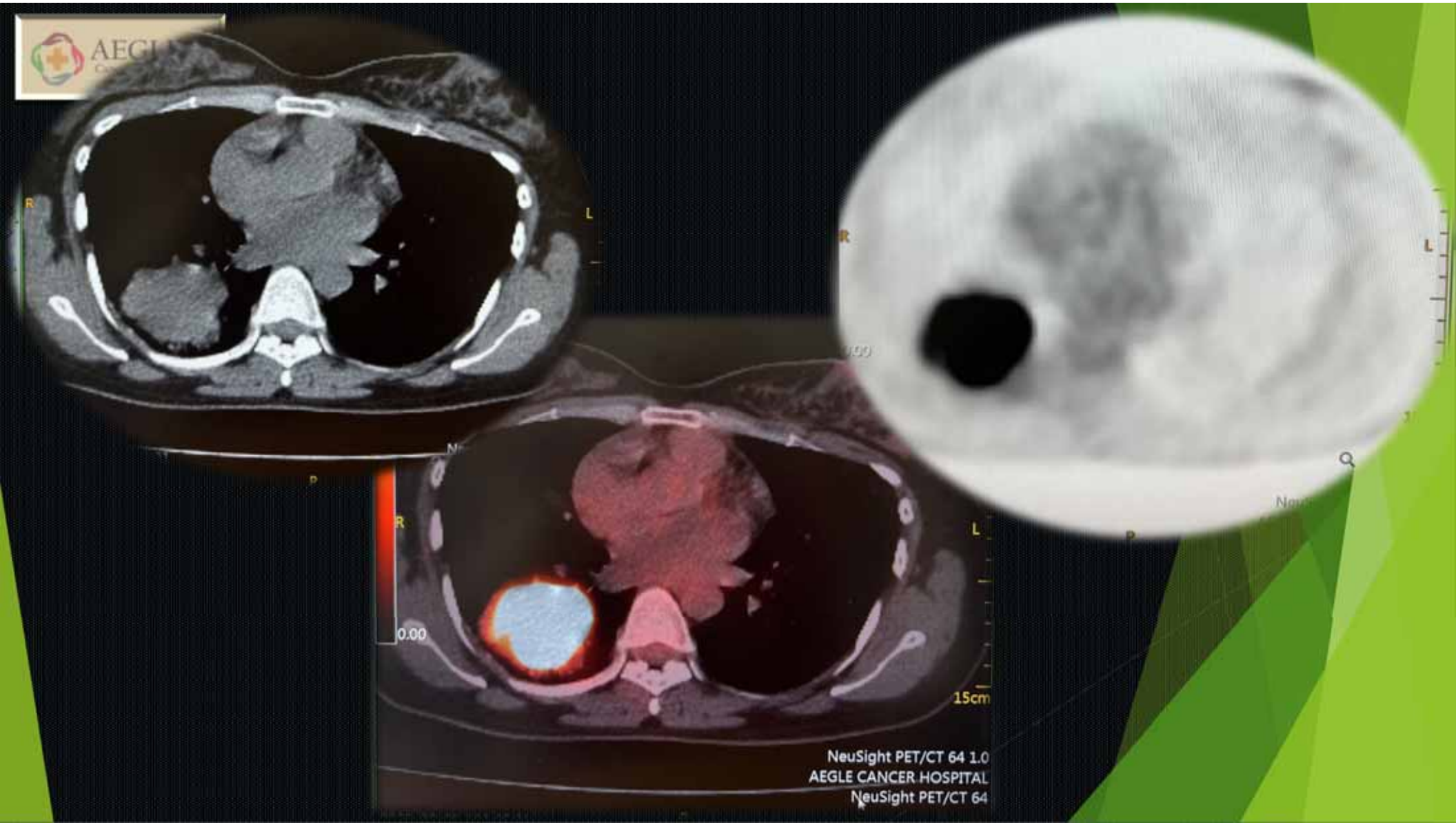
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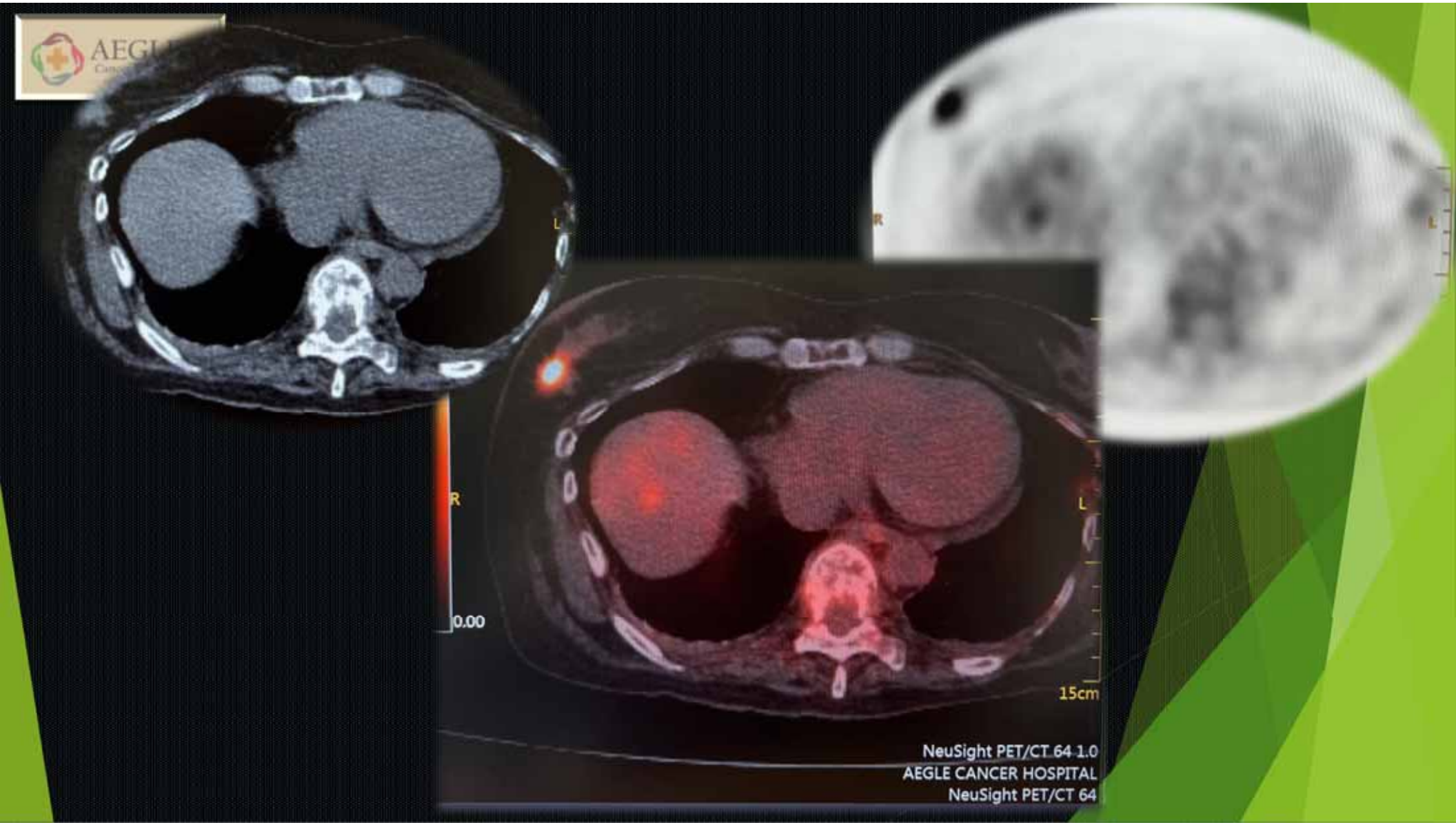
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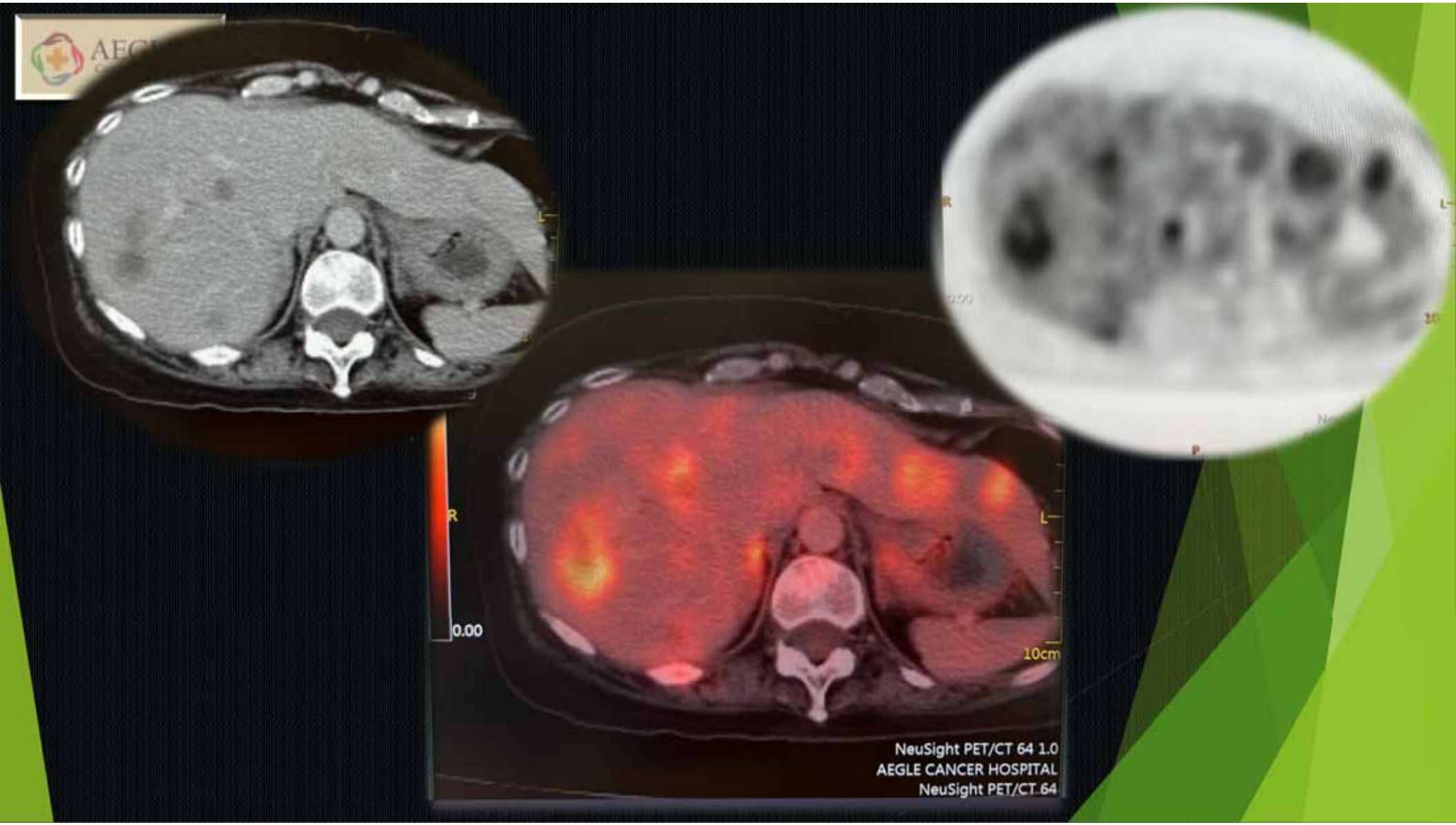
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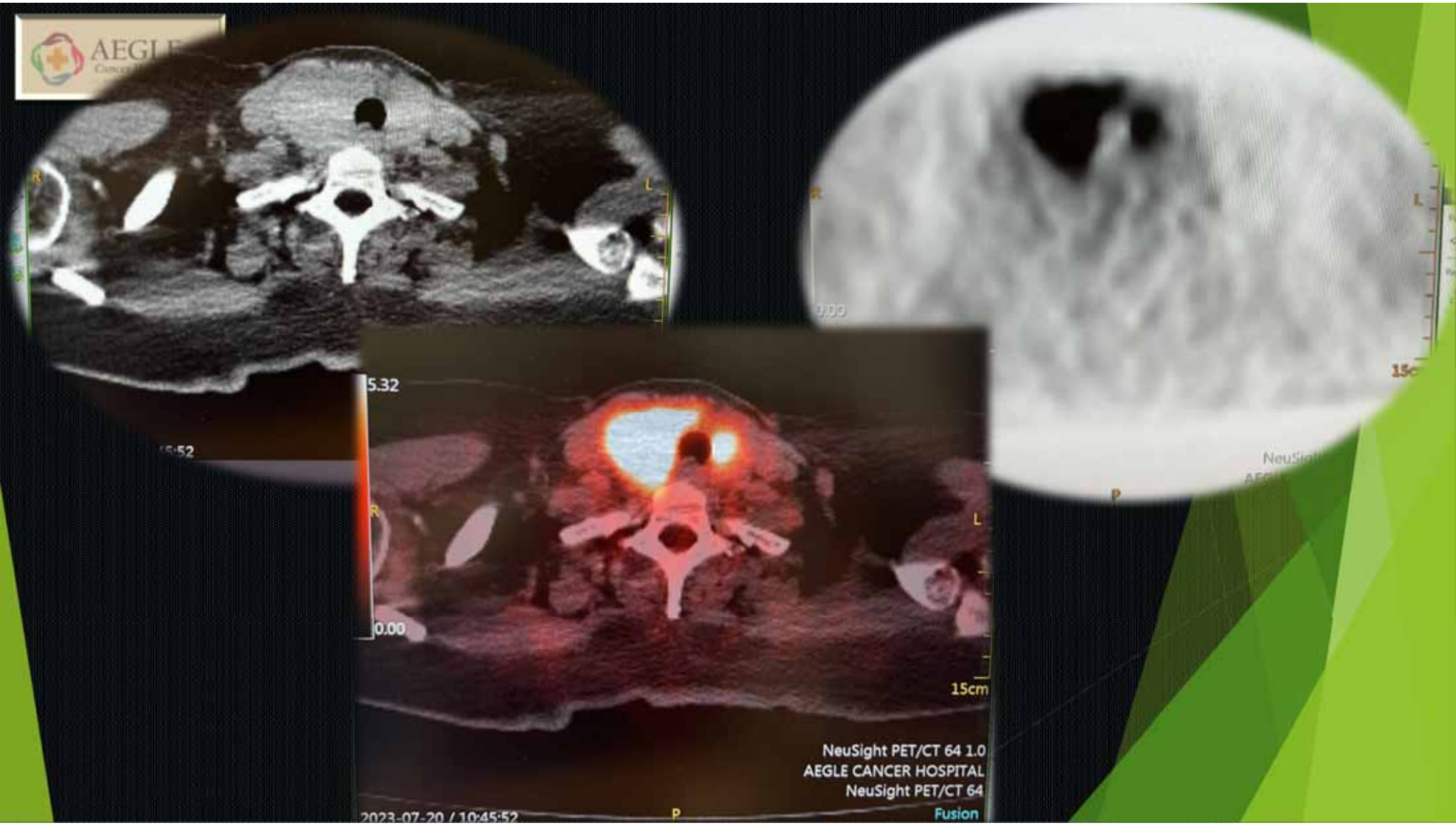
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