CT Scanning

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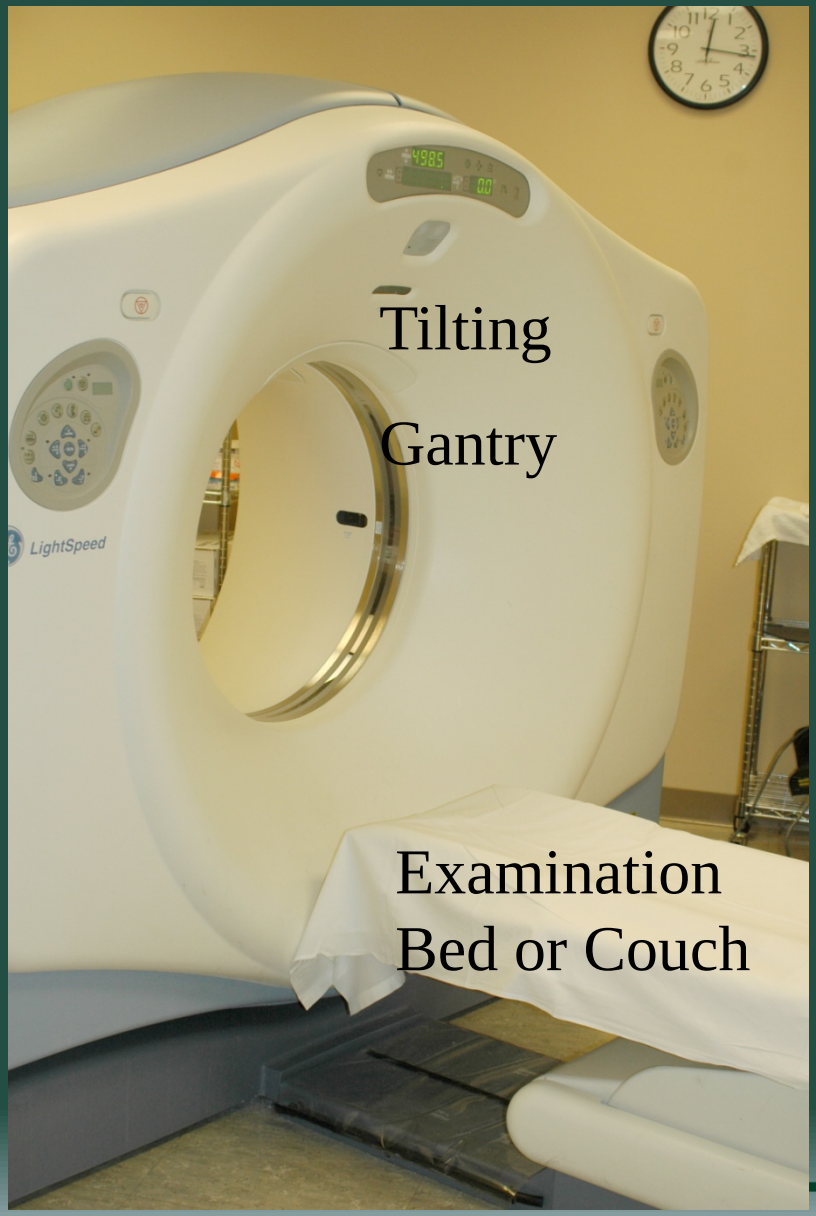
Computed Tomography (CT)

- Donut Shaped machine
- Uses x-ray energy and computer generation of images
- Advantages
  - Sensitive to slight density difference
  - Cross sectional anatomy
- Attenuation: reductions in intensity of x-ray beam as it traverses matter either by absorption or deflection
- **Special terms used on CT reports**
  - **High attenuation, Low attenuation**

CT Terms

- High attenuation
  - Absorption of x-ray photon
  - Presented as white on image
- Low attenuation
  - Free passage of photon
  - Presented as black on image

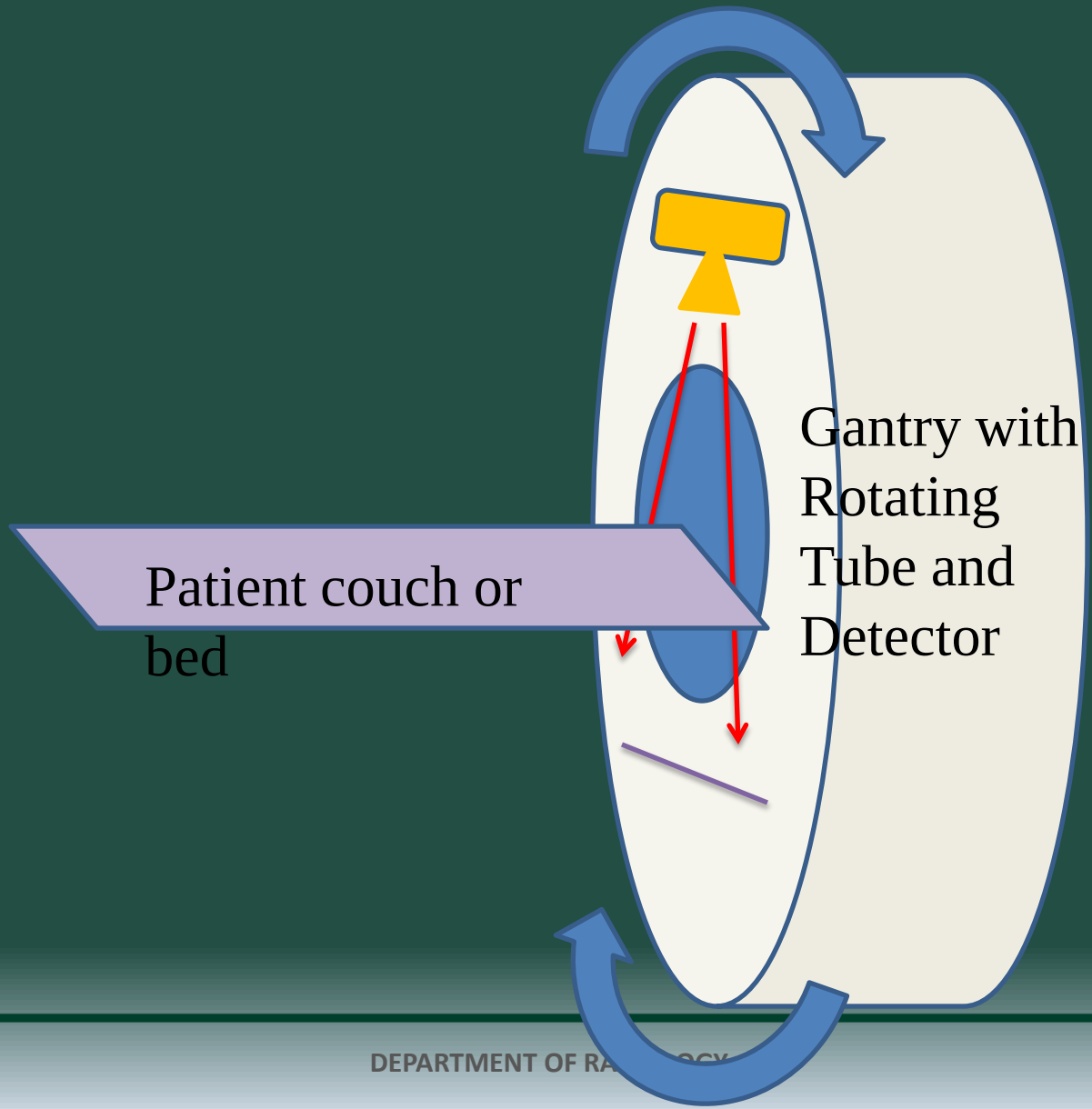


CT Scanner

64+ Slice CT

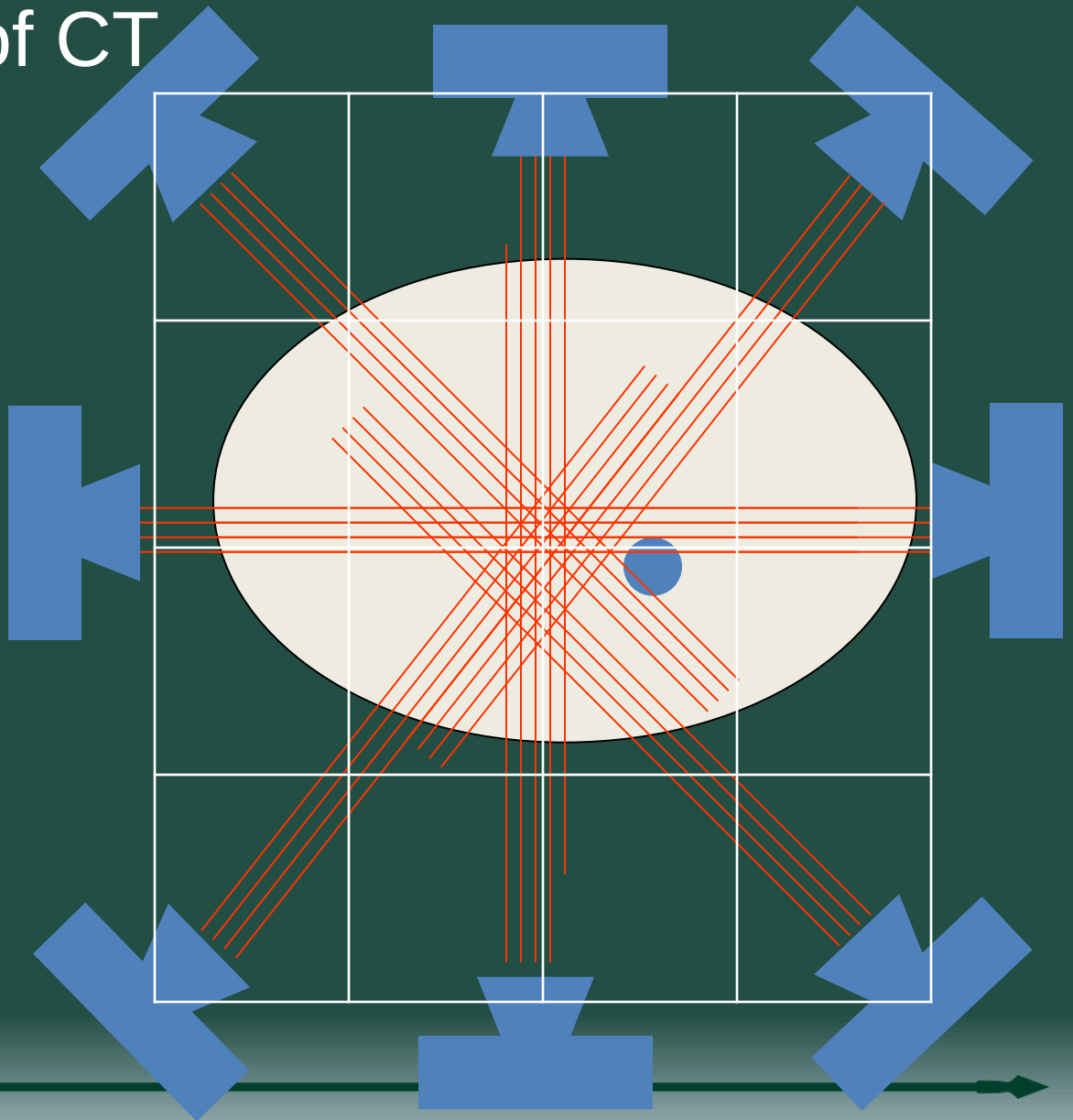
- Faster scan times
- Reduced patient motion
- Increased resolution 0.35mm resolution
- 3-D reconstructions
- Improved diagnostic accura
- Reduced need for 'high ris more invasive examinations

CT Scanner


Gantry with Rotating Tube and Detector
Patient couch or bed

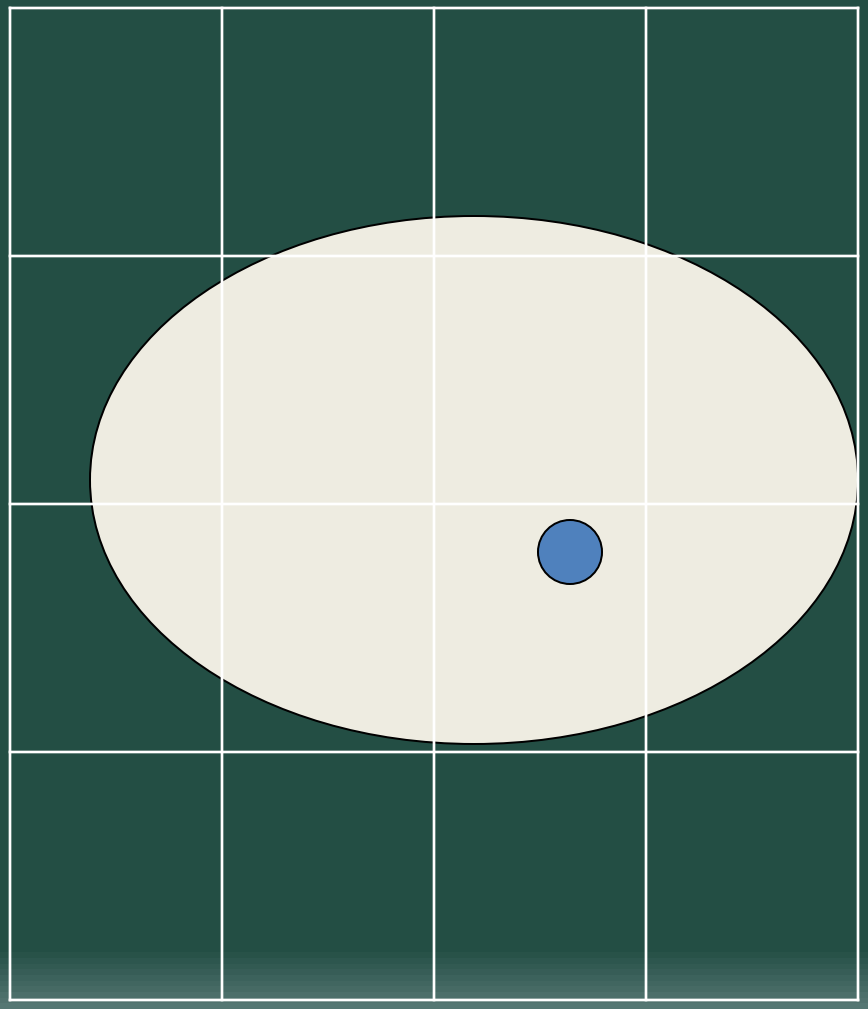
Basic Principles of CT

- CT imaging system moves around the body part at a fixed location
- Attenuation information obtained in multiple planes
- Reconstruct of this attenuation information into a simple grid



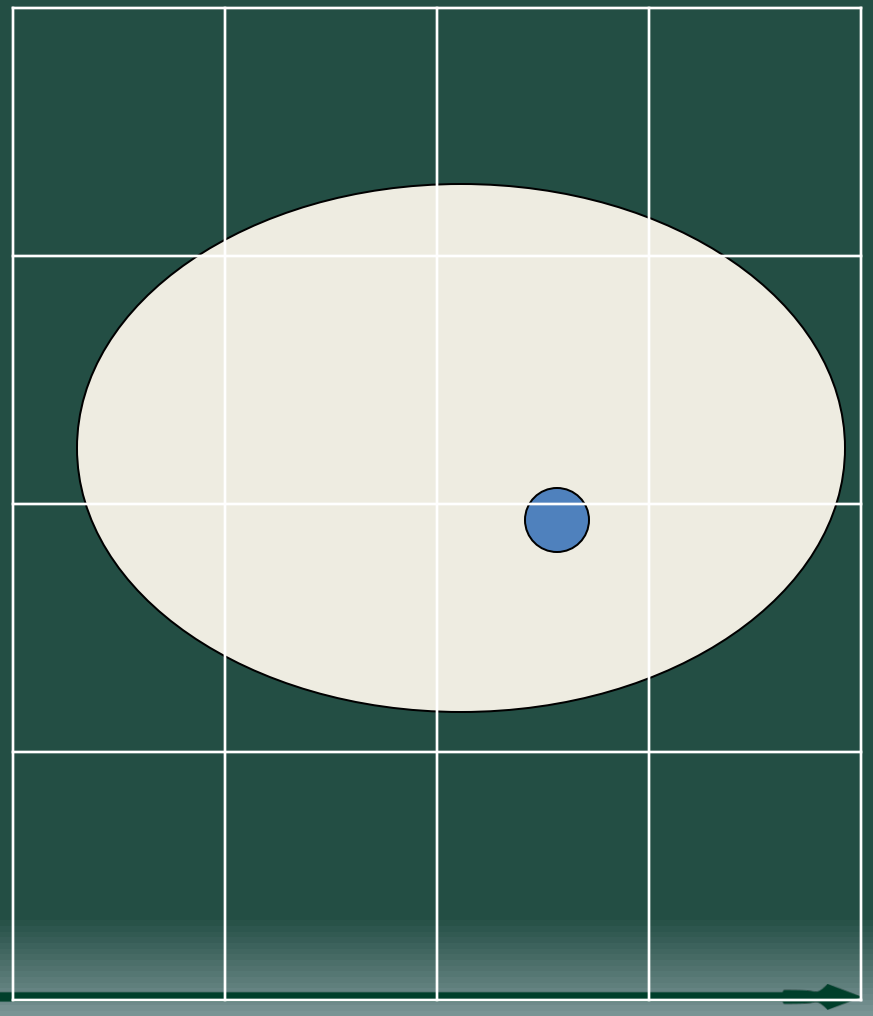
Basic Principles of CT

- Each body section divided into 3 dimensional boxes - voxel
- 2 dimension grid of pixels
- Calculate attenuation in each direction
- Add up all attenuations in each pixel
- Normalize to a common scale



Basic Principles of CT

- Density of each pixel varies resulting in a pictorial representation of the density of structures within that section
- Repeat for each subsequent slice
- The smaller the pixel, the higher



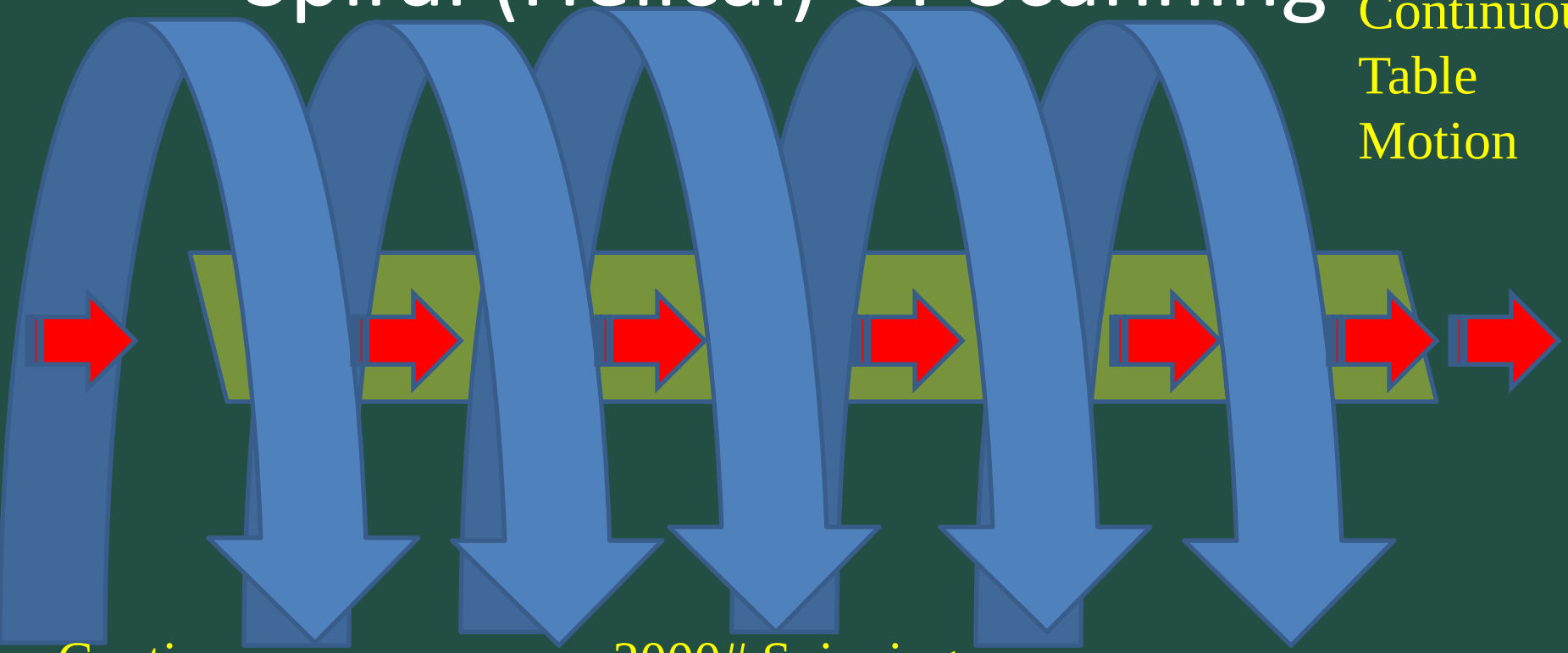
Spiral (Helical) CT:

- Table moves at **constant speed**
- X-ray tube and detectors **continuously rotating**
- Multiple views are acquired which are not in-plane (helical data set-volumetric data)
- Computer reconstructs views to form a slice (similar principle to that presented earlier)

Spiral (Helical) CT:

- Faster image acquisition than conventional CT (less motion artifact)
- Allows high resolution 2-D and 3-D reformations
- Isotropic Voxels
- Can also obtain conventional axial image at a single location (i.e. head CT, high resolution lung CT)

Spiral (Helical) CT Scanning



Continuous Table Motion

Continuous Tube Rotation

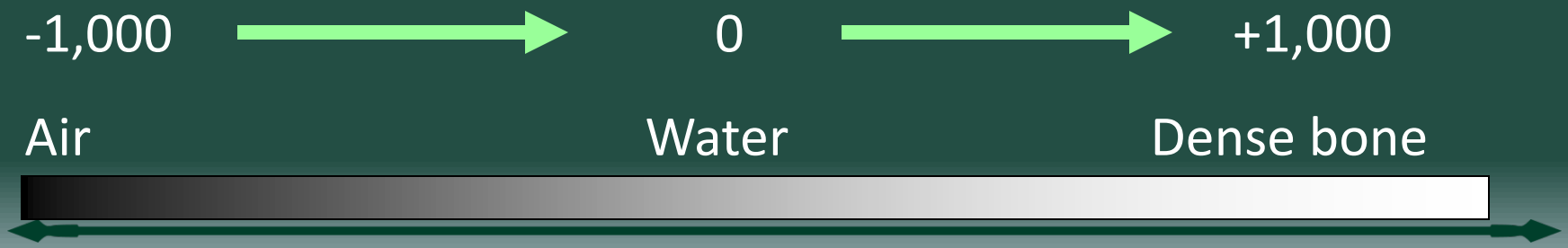
2000# Spinning Instrument Package - <1rps

Hounsfield Units

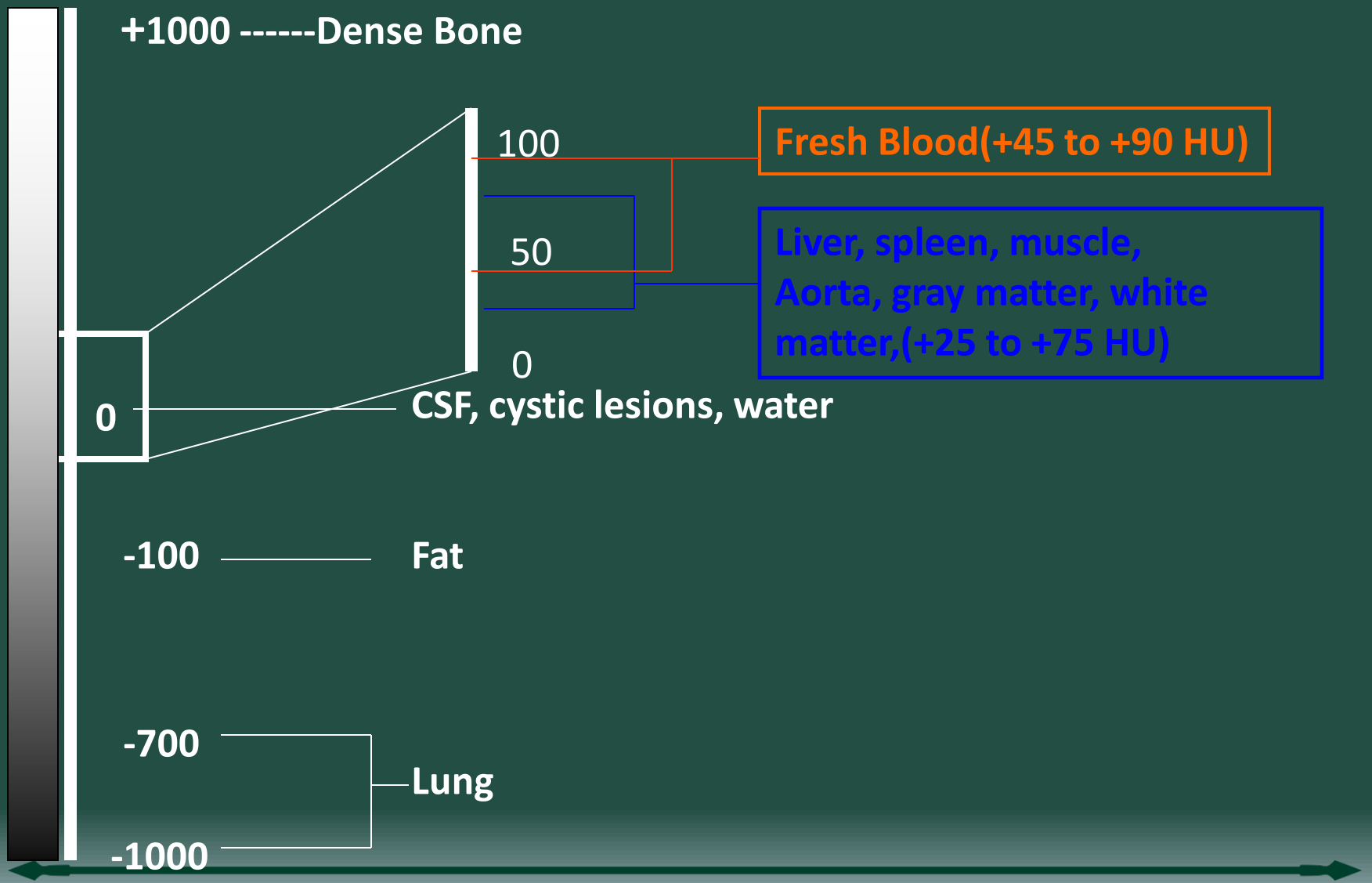
Hounsfield units (HU) = CT Numbers =
Arbitrary scale based on attenuation with water assigned a CT number of 0

One CT number (HU) = 1/1000 of water attenuation value

= 0.1% change in attenuation relative to water



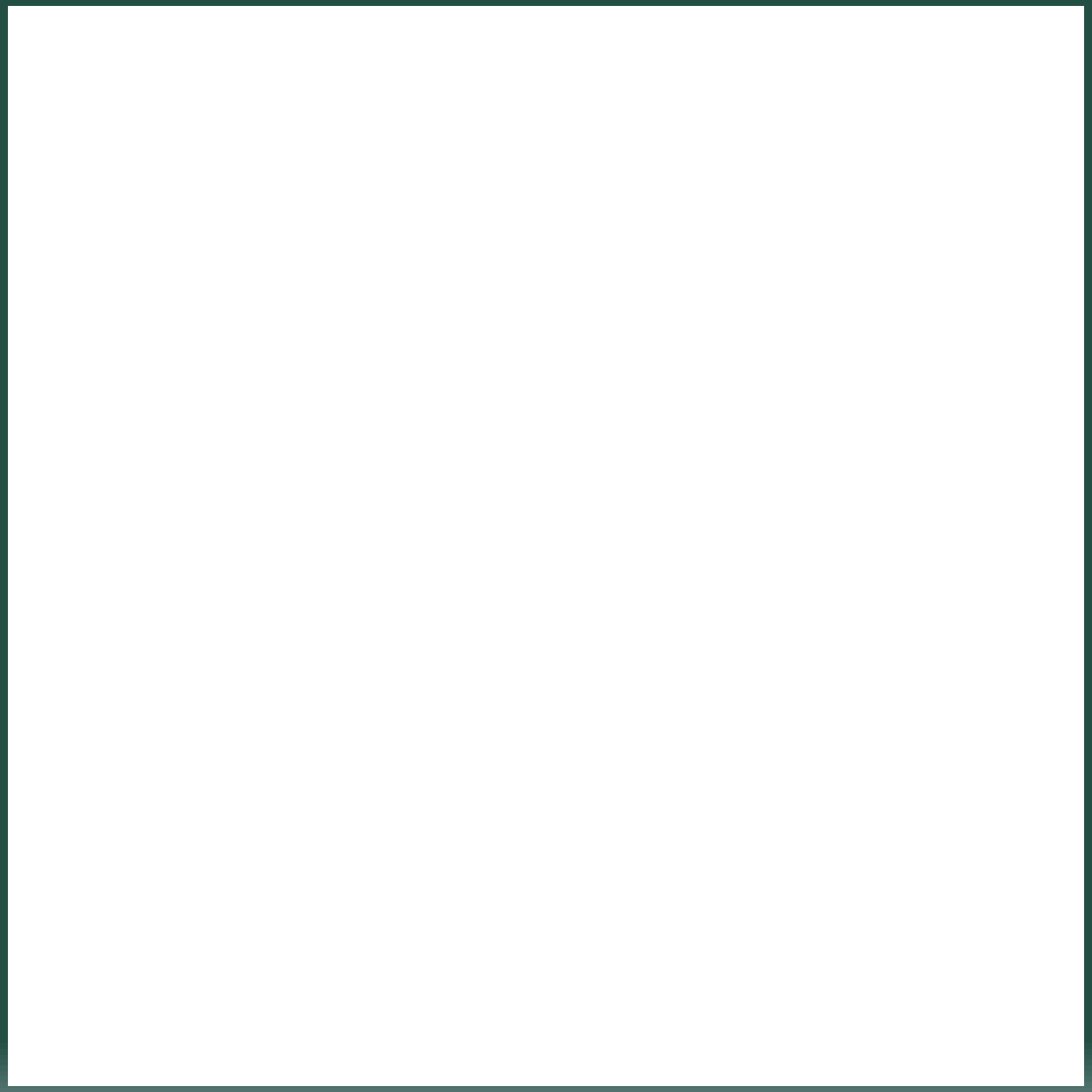
Typical CT Numbers (HU)

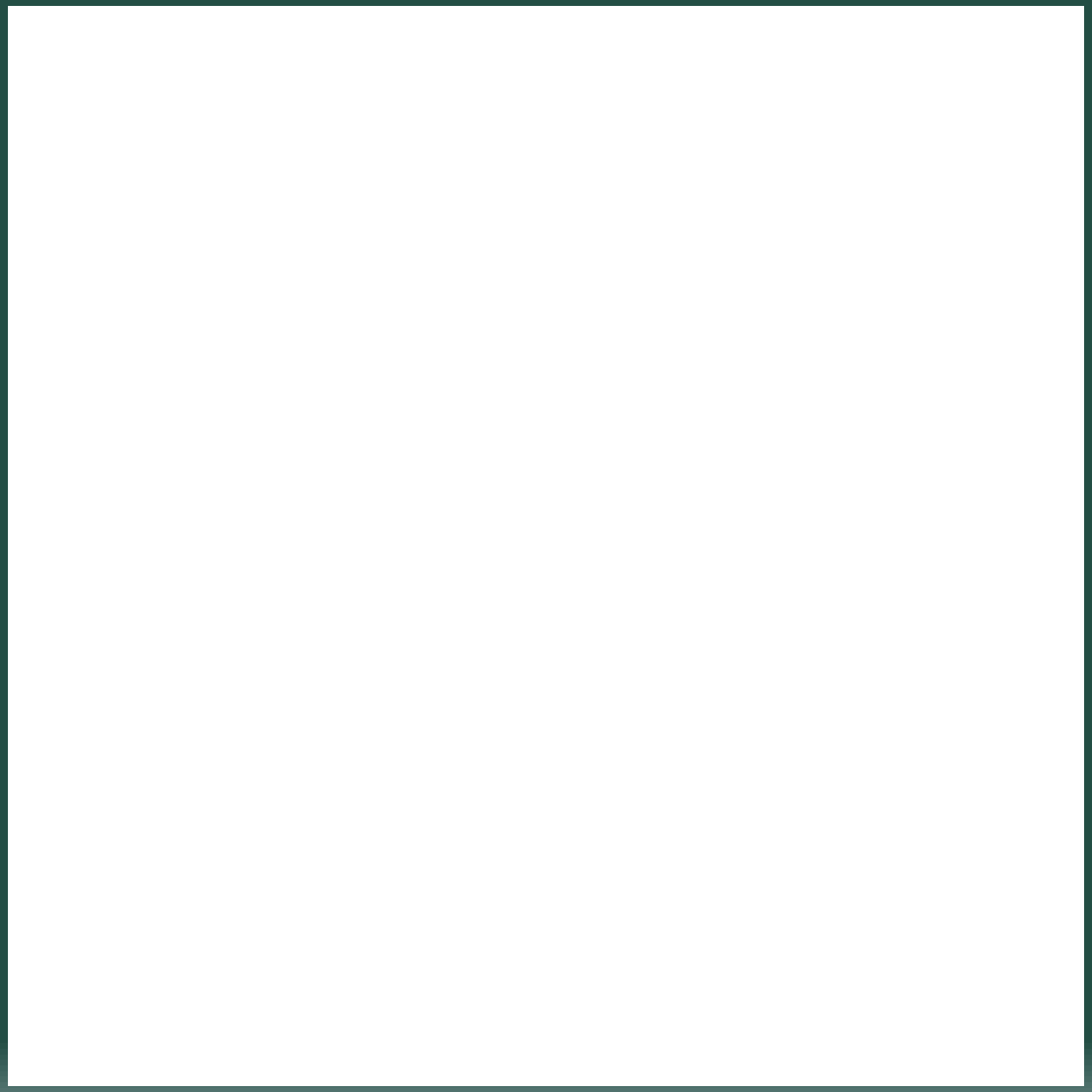


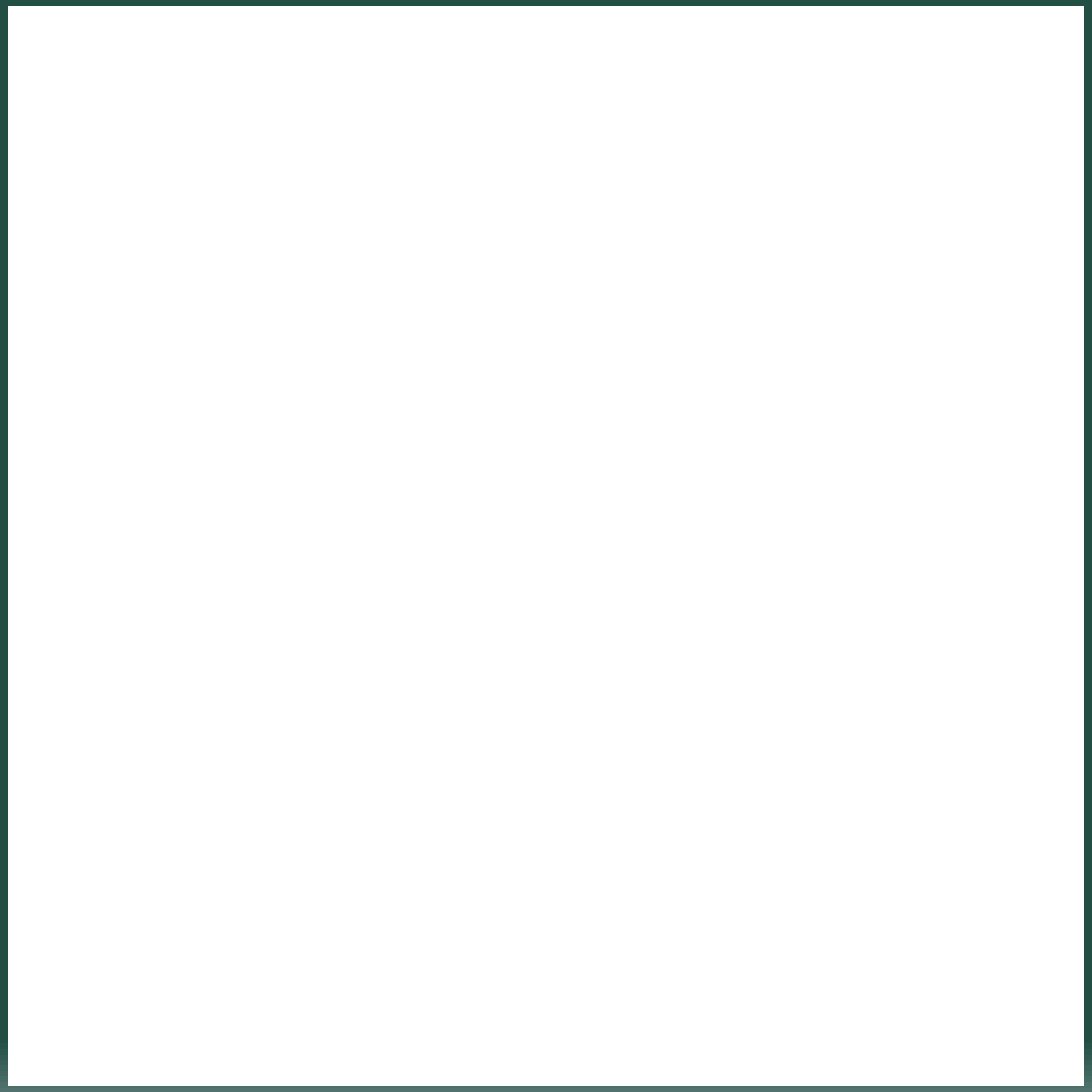
Scanogram or Scout View

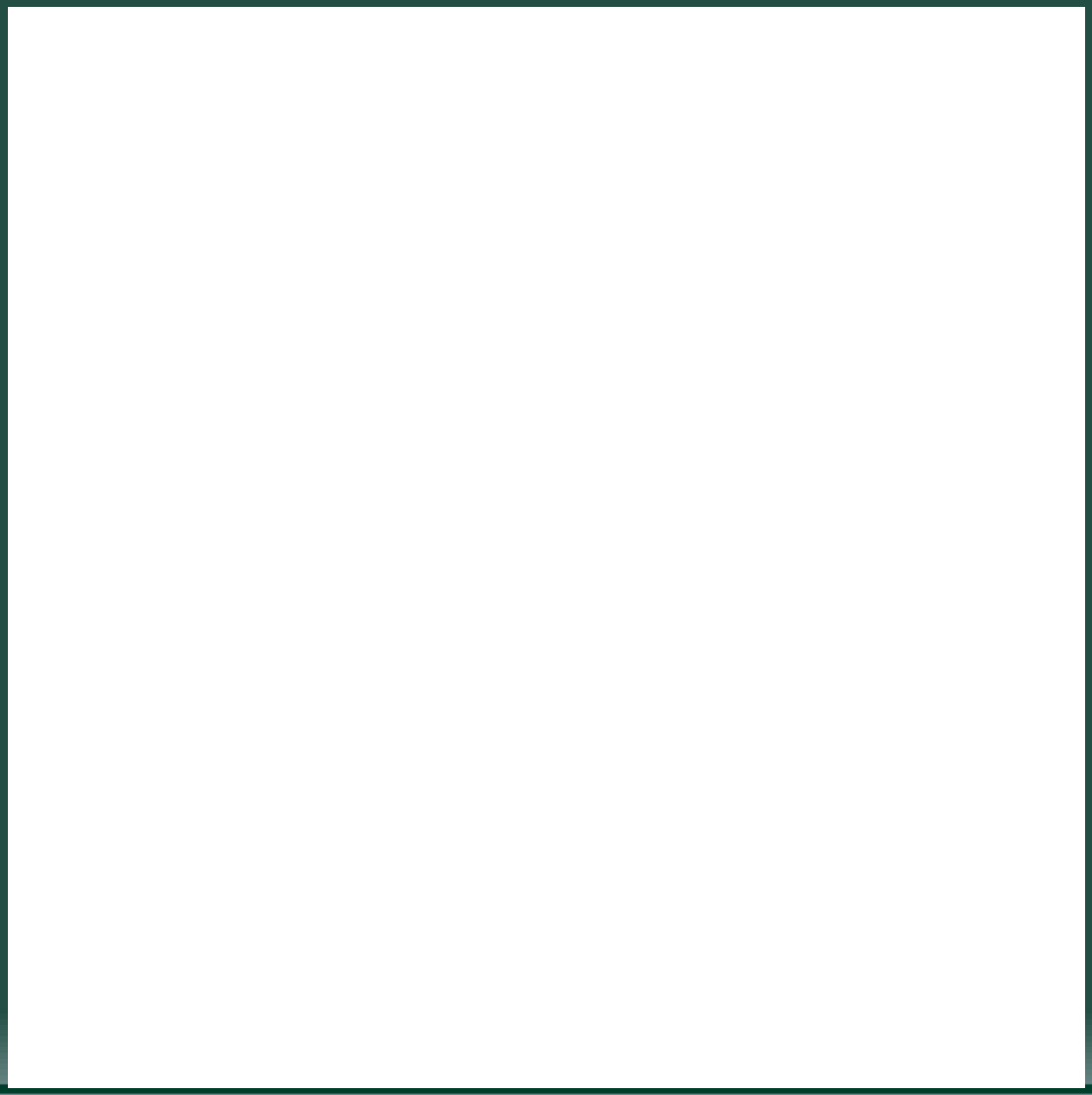
Brain CT

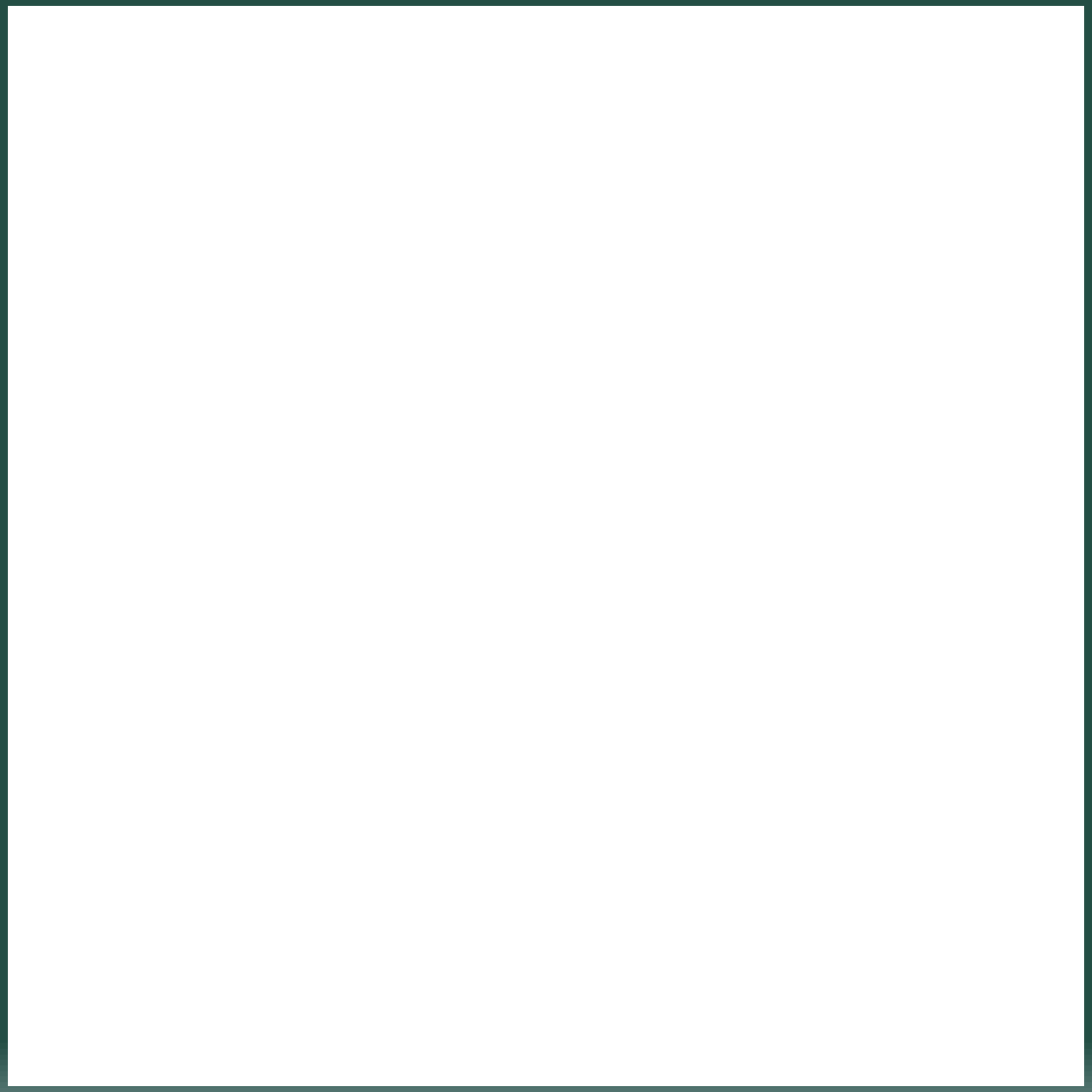
Scalp
Hematoma

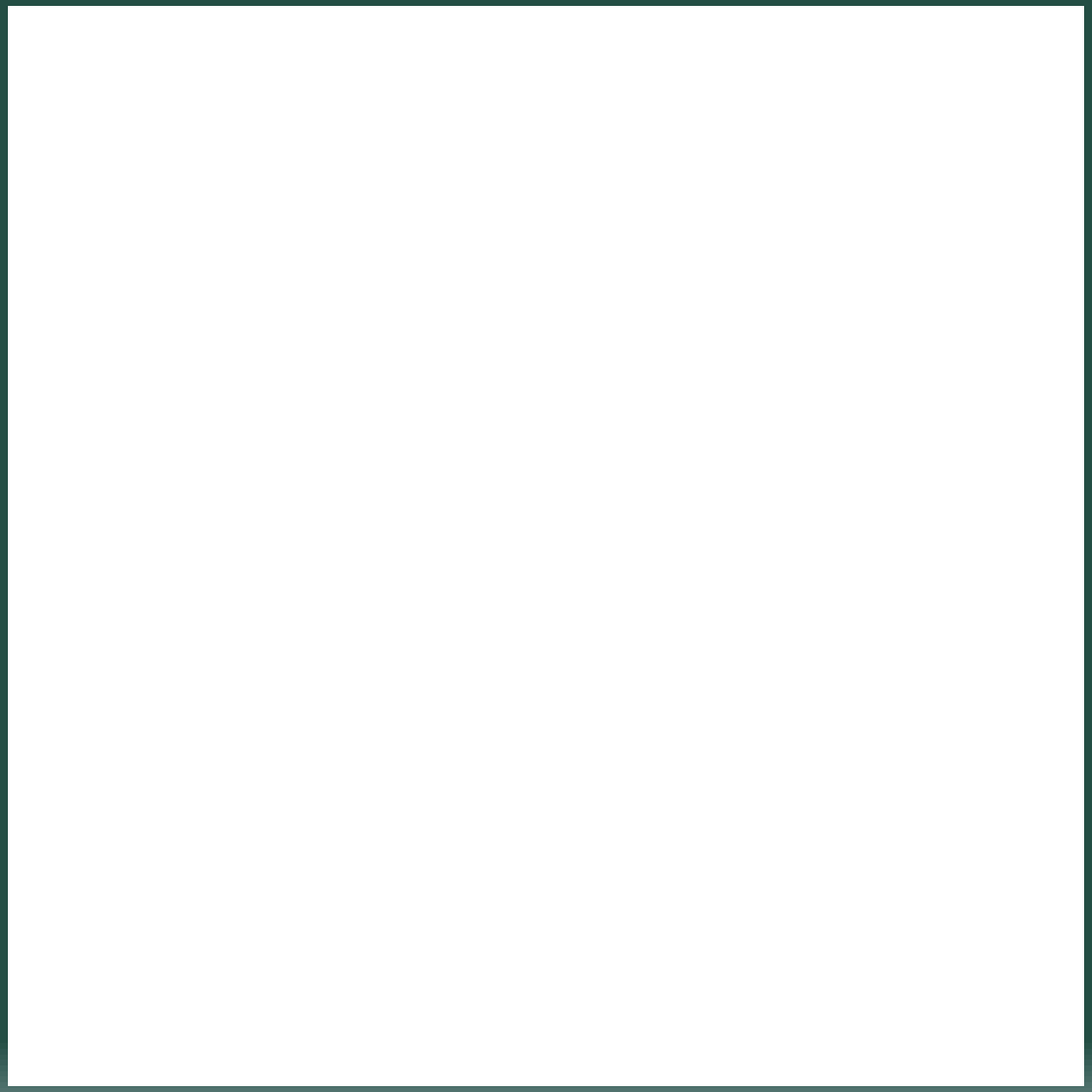


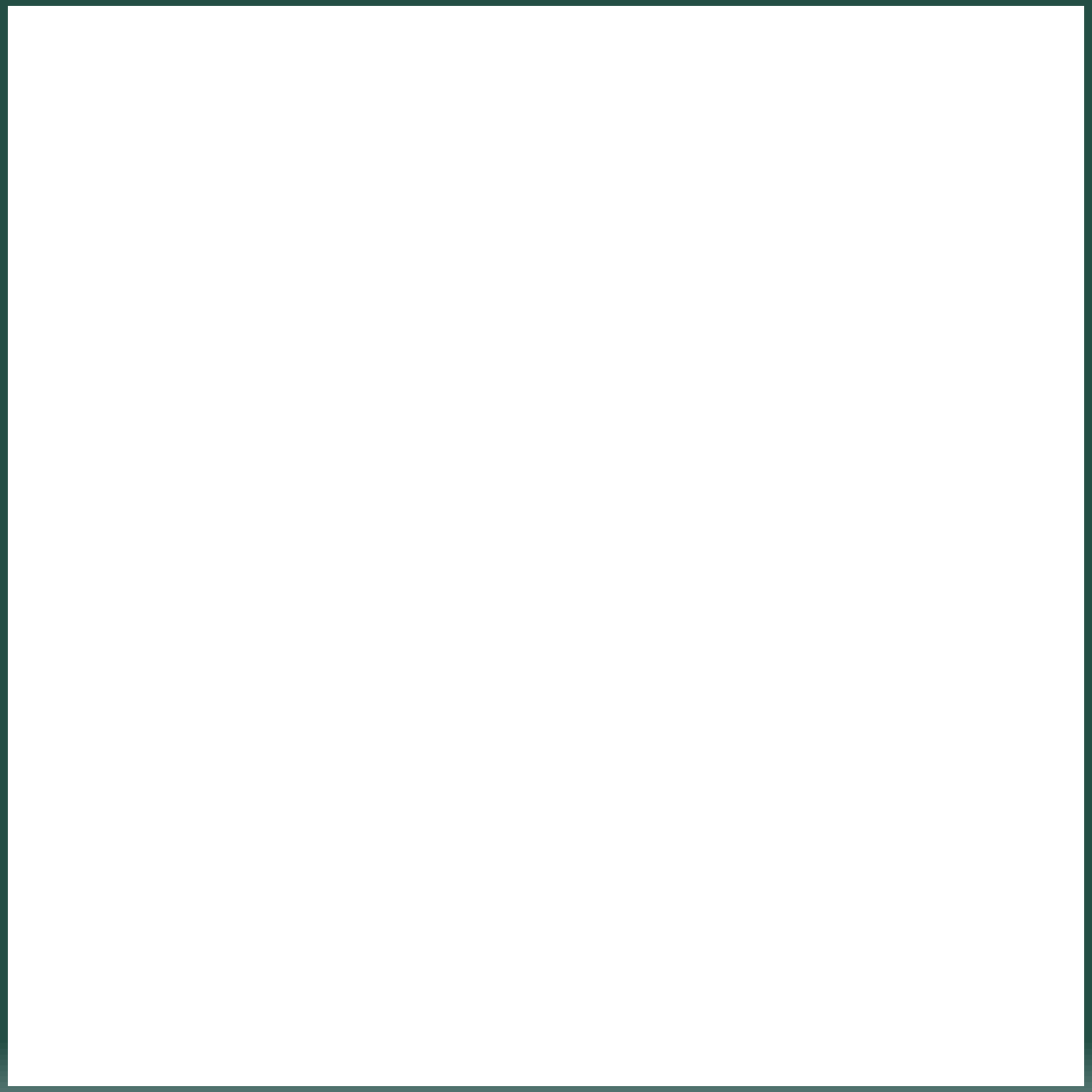












Courtesy Dr. Jim Potchen

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