

THE TUFFEST STUFF CT REGISTRY REVIEW

Live Lecture Seminar

SATURDAY CURRICULUM

1. The CT Imaging Chain-10 major components & their functions
 - a. The x-ray tube
 - b. Generator
 - c. Filter
 - d. Pre-patient collimator
 - e. Pre-detector collimator
 - f. Detector system
 - g. Analog to digital converter
 - h. The CT Computer or Array Processor
 - i. Digital to analog converter
 - j. The monitor
2. The visual CT imaging chain
 - a. Operational components
 - b. Component functions
3. CT Fundamental Principles
 - a. Defining CT
 - b. Scale of Contrast
 - i. Contrast resolution
 - c. Attenuation factors
 - d. CT contraindications
 - i. Radiation exposure dose
 - ii. Sensitivity to contrast media
 - iii. Pheochromocytoma
 - iv.
4. Radiation Physics
 - a. Radiation types:
 - i. Electromagnetic
 - ii. Particulate
 - iii. Relative Biological Effectiveness, Quality Factor
 - b. Radiation Interaction
 - i. Tube
 1. Bremsstrahlung
 2. Characteristic
5. Acquisition geometries by MODE
 - a. Axial
 - b. Helical
 - c. Dynamic
 - d. Topogram/Scanogram
6. Acquisition geometries by GENERATION
 - a. First generation
 - i. Rotate-translate, pencil beam
 - b. Second generation
 - i. Rotate-translate, fan beam

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- c. Third generation
 - i. Rotate-rotate, fan beam
 - d. Fourth generation
 - i. Rotate only, fan beam
 - ii. Nutating
 - e. Fifth generation- no moving parts
 - i. Electron beam CT
 - ii. Dynamic spatial reconstructor
 - f. Sixth generation
 - i. Dual source CT
 - g. Seventh generation
 - i. Flat panel design
7. Beam geometries:
- a. Pencil
 - b. Fan
 - c. Cone
 - d. Area
8. CT Instrumentation
- a. X-RAY tube major components:
 - i. Anode
 - ii. Cathode
 - iii. Envelope
 - iv. vacuum
 - v. Tube port
 - vi. Rotor/Stator
 - b. X-RAY production
 - i. Manipulating technical factors- milliamperage, kVp
 - ii. CT Warm up procedure
 - 1. Manual
 - 2. Systemic
9. The Data Acquisition System
- a. Primary components
 - i. Detector systems
 - 1. Xenon gas
 - 2. Scintillation photodiode
 - ii. Analog to digital converter
10. Digital signal processing
- a. The CT computer
11. Image processing and display
- a. Types of data
 - i. Scan/measurement
 - ii. Raw
 - iii. Convolved

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- iv. filter back projected
- v. image
- b. Image processing
 - i. Reconstruction algorithms
 - ii. Interpolation, extrapolation
 - iii. Prospective vs. Retrospective reconstruction
 - iv. Interval
 - v. The resolutions:
 - 1. Spatial
 - 2. Contrast
 - 3. temporal
 - vi. 3D image processing
 - vii. 3D rendering
- c. Image display
 - i. Matrix
 - ii. Pixel
 - iii. voxel
 - iv. Window width
 - v. window level or center
- d. Image quality
 - i. Comprehensive scanning parameters
 - 1. mA
 - 2. kVp
 - 3. Slice thickness
 - 4. Algorithm
 - 5. PITCH
 - 6. Contrast volume
 - 7. Contrast flow rate
 - 8. Injection vs. image delay
 - ii. Influencing factors
 - iii. Linearity
 - iv. uniformity
 - v. Noise defined, factors
- e. Three types of resolution and their influencing factors
 - i. Spatial
 - ii. Contrast
 - iii. Temporal
- f. Artifacts defined, causes, resolutions, image review
 - i. Partial volume averaging
 - ii. Misregistration
 - iii. Ring
 - iv. Windmill
 - v. Out-of-field

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- vi. Metal
- vii. Beam hardening, cupping
- viii. Spiral & cone beam effects

12. Data acquisition Components

- a. Gantry components and functions
 - i. Slip rings
 - ii. Generator
 - iii. Cooling system
 - iv. X-ray source
 - v. Filtration
 - vi. Collimation
 - vii. Detectors
- b. Table characteristics and functions
 - i. Couch
 - ii. Incrementation
 - iii. Referencing
 - iv. Restrictions
 - 1. Patient weight impact
- c. The CT x-ray tube: major and minor components
 - i. Calculating heat units
 - ii. Pre-patient and Pre-detector collimation functions
 - 1. Slice thickness in MDCT
 - 2. Slice thickness in SDCT

13. Introduction to reconstruction

- a. Terminology
- b. Components
- c. Algorithms
- d. SFOV
- e. DFOV
- f. Detector systems:
 - i. gas ionization
 - ii. scintillation photodiode
- g. Matrix
- h. pixel
- i. voxel
- j. Interpolation
- k. extrapolation
- l. Partial volume effect

14. Quality assurance

- a. Concepts
- b. Responsibility
- c. Reports
- d. Accuracy

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- i. Slice thickness
 - ii. Laser light
 - iii. Noise
 - iv. Uniformity
 - v. linearity
- 15. Patient care and safety
 - a. Patient assessment and preparation
 - i. Preparing the patient
 - ii. Systems to review
 - iii. Patient review
 - iv. Questions prior to the administration of intravenous contrast media by system
 - 1. Cardiovascular
 - 2. Respiratory
 - 3. Gastrointestinal
 - 4. Genitourinary
 - 5. Central nervous system
 - 6. Cranial nerves
 - 7. Endocrine
 - 8. Musculoskeletal
 - 9. skin
 - b. The patient chart
 - i. Facility ownership
 - ii. Documentation
 - iii. Functions
 - 1. Patient & insurance billing
 - 2. Auditing and research
 - 3. Epidemiology
 - 4. Readmission information
 - 5. Legal affairs
 - c. Imaging technologist responsibilities
 - d. HIPAA and the CT Technologist
 - e. Patient scheduling and screening
 - i. patient education
 - f. Informed consent guidelines
 - i. Personal injury
 - 1. Intentional misconduct
 - 2. Negligence and malpractice
- 16. Patient vital signs
 - a. Blood pressure
 - b. heart rate
 - c. pulse rate
 - d. oximetry
 - i. Adult and child

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- e. Heart rhythms:
 - i. Tachycardia
 - ii. Bradycardia
 - f. Relative laboratory values for CT patients
 - i. BUN
 - ii. Se-Creatinine
 - iii. Prothrombin time
 - iv. Partial thromboplastin time
 - v. D-dimer and Pulmonary Embolism
17. Contrast agents
- a. Defining positive and negative contrast media
 - b. Contrast media classifications
 - i. Parenteral, enteral
 - ii. Ionic, non-ionic
 - iii. Osmolality
 - c. Tri-iodinated benzoic acid
 - d. IV contrast clinical efficacy
 - e. Important IV contrast terminology
 - i. Osmolality
 - ii. Osmolarity
 - iii. Osmosis
 - iv. Viscosity
 - v. Ionicity
 - vi. Clearance
 - f. Calculating iodine dose
 - g. Types of IV contrast
 - i. High osmolality ionic
 - ii. Low osmolality ionic
 - iii. Low osmolality non-ionic
 - iv. Iso-osmolar
 - h. Physiological impact of IV contrast media
 - i. The blood brain barrier
 - ii. Kidney opacification stages and distribution
 - iii. Premedication protocols
 - iv. Calculating pediatric IV contrast dose
 - v. Three types of adverse reactions
 - 1. Chemotoxic
 - 2. Idiosyncratic
 - 3. Preventive measures
 - vi. Contrast induced nephropathy
 - 1. Effects on systems
 - a. Thyroid
 - b. Pulmonary

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c. CNS

- i. Barium facts and considerations
 - i. Volume
 - ii. Perforation