

THE TUFFEST STUFF CT REGISTRY REVIEW

Live Lecture Seminar SUNDAY CURRICULUM

A. INJECTION TECHNIQUES

- a. Drug administration routes
 - i. Oral
 - ii. Buccal
 - iii. Topical
 - iv. Rectal
 - v. Parenteral
- b. Injection techniques
 - i. Hand
 - ii. Mechanical injector
- c. Injection parameters
 - i. Catheters
 - 1. Angiocath
 - 2. Butterfly
 - ii. Central venous access devices
 - 1. PICC- peripherally inserted central catheter
 - 2. Tunneled, non-tunneled
- d. Documenting contrast media administration
 - i. Infiltration = extravasation
 - 1. Remedy
 - ii. Phlebitis
- e. Phases of contrast enhancement
 - i. Bolus
 - ii. Non-equilibrium
 - iii. Equilibrium
- f. Routes of contrast media delivery
 - i. Drip infusion
 - ii. Bolus
 - 1. Hand injection
 - 2. Mechanical injector
 - iii. Understanding contrast media arrival times
 - 1. Routine brain is the exception
- g. Factors impacting contrast enhancement
 - i. Pharmacokinetic factors
 - ii. Patient/equipment factors
- h. Injection factors
 - i. Contrast media volume
 - ii. Contrast media flow rate
 - iii. Contrast media flow duration
 - iv. Bolus triggering
- i. Time density curves
 - i. Influencing factors
 - 1. Cardiac output

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2. Patient weight
 3. Contrast media flow rate
- B. PATIENT CARE, plus
- a. Patient preparation, patient education
 - i. Scan instructions
 - ii. Scan room temperature
 - iii. Rolling veins
 - b. CT drugs
 - i. Steroids, analgesics, sedatives, anti-convulsants
 - ii. Benadryl
 - iii. Anti-coagulants
 - c. IV procedures
 - i. Existing lines
 - ii. Equipment
 - iii. Pressure injectors
 - iv. IV site preparation
 1. Aseptic technique
 - v. Nine steps to venipuncture
- C. NEUROLOGIC IMAGING
- a. Fundamentals
 - b. Clinical indications
 - c. Neurologic windows
 - d. Stroke facts
 - e. Meningeal layers
 - f. Pathology and hemorrhage
 - i. Intracerebral hemorrhage
 - ii. Subarachnoid hemorrhage
 - iii. Epidural hemorrhage
 - iv. Subdural hematoma
 - v. Arteriovenous malformation
 - vi. Hypotensive
 - g. Brain perfusion studies
 - h. Ventricular system
 - i. Temporal bone
 - j. Paranasal sinuses
 - k. Facial bones/orbits
- D. NEUROANATOMY
- a. Vascular structures
 - i. Top of arch vascular anatomy
 - ii. Circle of Willis
 - iii. Artery and vein comparison
 - b. Resolving hemostasis
 - c. Bony and soft tissue structures

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- d. CT neurological anatomy described and visualized
- E. OSTEOLYTIC LESIONS AND PATHOLOGIES
 - a. Patient age
- F. THORACIC IMAGING PROCEDURES
 - a. Scanning keys
 - b. Methodologies
 - c. High resolution CT
 - d. Pulmonary embolism
 - e. Coronary circulation
- G. CARDIAC ANATOMY & CIRCULATION
 - a. CT calcium scoring
 - b. Aortic aneurysm
 - c. Cardiac pharmacology
 - d. Cardiac CT
 - i. Gating
 - 1. Prospective
 - 2. Retrospective
- H. THORACIC ANATOMY
 - a. Systemic circulation components
 - b. Pulmonary circulation components
 - c. Blood flow through the heart
- I. MEDIASTINAL LANDMARKS
 - a. Vertebral column levels & structures
 - i. Cervical
 - ii. Thoracic
 - iii. Lumbar
 - iv. Sacral
 - v. Coccygeal
- J. CORONARY ANGIOGRAPHY
 - a. Sublingual nitroglycerin
 - b. Gating
 - c. The electrocardiogram
 - d. Pathology review
- K. MUSCULOSKELETAL CT
 - a. General imaging fundamentals
 - b. MSK windows
 - c. Upper and lower extremity CT
 - i. Annotating
 - ii. Wrist, hand, elbow, shoulder
 - iii. Foot, ankle, knee, hip
 - d. Vertebral column
 - i. Cervical
 - ii. Thoracic

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- iii. Lumbar
 - iv. Sacral
 - v. Coccygeal
 - e. Abdomen & pelvis
 - i. Vascular anatomy review
 - ii. Abdomen anatomy review
 - 1. The pain connection
 - a. Appendicitis
 - b. Diverticulitis
 - 2. Renal colic
 - iii. Abdomen CT scanning fundamentals
 - 1. Pathology review
 - 2. Metastatic lesions
 - iv. Pancreas CT essentials
 - 1. Hepato-biliary Pancreatic anatomy
 - v. Multiphasic imaging
 - f. CT essentials kidneys and ureters
 - i. Urinary tract anatomy
 - ii. Urinary vascular enhancement phases
 - iii. Evaluating renal mass
 - iv. CT urography
 - 1. Calculi
 - 2. Renal colic vs. peritoneal irritation
- L. ADRENAL GLAND CT
- M. CT OF THE ACUTE APPENDIX
- N. DIVERTICULOSIS, DIVERTICULITIS
- O. ABDOMEN CT ESSENTIALS
- a. Anatomy review
 - i. Cross-sectional
 - ii. Vascular
 - 1. Abdominal aortic branches
 - 2. Upper abdominal arteries
 - 3. Azygos system
 - 4. Hemi-azygos system
 - 5. Hepatic portal system
- P. ABDOMINOPELVIC CT
- a. Pelvic cross-sectional anatomy
 - i. Male
 - ii. female
 - b. Pelvic vasculature
 - i. Iliac vein thrombosis and DVT
 - ii. Iliac artery
 - 1. Internal branches and perfusion

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2. External branches

Q. CARDIAC FUNDAMENTALS

- a. Introduction to cardiac anatomy and physiology
 - i. Pulmonary circulation
 - ii. Systemic circulation
 - iii. The Great Vessels
 - iv. Circulation through the heart
 - v. The cardiac cycle
 1. Lub, dub
 - vi. The ECG
 1. Defining diastole
 2. Defining systole
 - vii. Blood Pressure measurements at rest
 1. Normal sinus rhythm
 2. Tachycardia
 3. Bradycardia
- b. Cardiac anatomy
 - i. Walls and chambers
 - ii. Vascular anatomy
 - iii. Base, apex
 - iv. Pericardial sac
 - v. Epicardial fat
 - vi. Heart valves
 1. Semi-lunar
 2. Atrioventricular
 3. Regurgitation
 - vii. Coronary circulation
 1. Cardiac CTA
 2. Right coronary artery
 3. Left coronary artery
 4. Ramus intermedius
 5. Great cardiac vein
 - viii. Cardiac conduction system
 1. Four steps
 - ix. Cardiac physiology
 1. Cardiac output
 2. Ejection fraction
 3. Stroke volume
 4. CT calcium scoring
 5. Cardiomegaly
 - x. Cardiac gating
 1. Retrospective
 2. Prospective

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- R. CT RECONSTRUCTION FUNDAMENTALS
 - a. The Visual CT Imaging Chain
 - b. Image Reconstruction
 - i. Filtered Back Projection
 - ii. Convolution kernels
 - iii. Reconstruction terminology
 - 1. Convolved data
 - 2. Interpolation, extrapolation
 - iv. Ray-View-Projection
 - v. Attenuation profile
 - vi. Reconstruction and back projection
 - vii. SFOV
 - viii. DFOV
 - ix. CT Reconstruction Algorithms
- S. PITCH in CT
 - a. Definition
 - b. Why PITCH occurs
 - c. Slice pitch
 - d. Controlling factors
 - i. Expanding the helix
 - ii. Contracting the helix
 - e. Defining beam width
 - f. PITCH mathematics
 - i. SDCT/SSCT Systems
 - ii. Multiple Detector Systems
 - g. Impacts of PITCH
 - i. Dose
 - ii. Quality
 - iii. Anatomy covered
 - iv. Slice PITCH
- T. RADIATION PROTECTION IN CT
 - a. Radiation defined
 - b. Radiation sources
 - c. Atomic bomb survivor data
 - d. Magnitude of radiology use in the USA
 - e. Defining ionization
 - f. Ten factors impacting dose
 - g. AEC = Automatic Tube Current Modulation
 - i. Angular
 - ii. Longitudinal
 - iii. ECG based
 - iv. Organ based
 - h. Automatic tube potential

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- i. Mean photon energies
 - i. Application to photoelectric effect
- j. Dose display
 - i. CTDI Volume
 - ii. Dose Length Projection
 - iii. Post-data study display
- k. Dose notification levels
- l. Dose alert levels
- U. PITCH & DOSE
- V. EXPOSURE FACTORS
 - a. Tube current times product
 - b. Effective tube current times product
- W. PERCEPTION OF RISK
 - a. PEDIATRIC CT
 - i. General principles
 - 1. Dose factors
 - 2. Special considerations
 - b. Radiation dose to the fetus
 - i. Fetal age and radiation risks
 - ii. Fetal radiation effects
 - c. Dose reduction steps
 - d. Dose uniformity
 - i. SFOV
 - ii. Patient thickness
 - e. The ideal slice profile
 - i. Scatter radiation tails
- X. GENERAL RADIATION EXPOSURE DOSE MEASURES
 - a. Absorbed dose: the Gray
 - b. Effective dose: the Seivert
- Y. CT SPECIFIC DOSE MEASURES
 - a. CTDI-vol
 - b. DLP
 - c. Estimating effective dose in mSv
- Z. RADIATION BIOEFFECTS
 - a. Controlling factors
 - i. Age
 - ii. Dose rate
 - iii. Tissue sensitivity
 - iv. Area/volume of tissue irradiated
 - v. Dose uniformity
 - 1. SFOV
 - 2. Patient thickness
- AA. CTDI-vol IS NOT PATIENT DOSE

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- a. Size Specific Dose Estimate
- b. Relating CTDI-vol to patient dose
- BB. FACTORS IMPACTING PATIENT DOSE
 - a. Patient centering in the gantry
 - b. Overranging/overscanning
 - c. Exposure factors
 - d. Collimation
 - e. PITCH
 - f. Number of detectors
- CC. IMAGE QUALITY AND DOSE
 - a. Dose and noise
 - b. Dose and slice thickness
 - c. Dose and mA
 - d. Dose and kVp
- DD. ITERATIVE RECONSTRUCTION
- EE. TWO MAIN BIOLOGICAL EFFECTS
 - a. Deterministic
 - b. Stochastic
- FF. BASIC PILLARS OF DOSE REDUCTION
 - a. Appropriate utilization tenets
 - b. Optimizing CT protocols
 - c. Dose reduction methodologies
 - d. Conventional shielding
 - e. Automated shielding
 - f. Dose realities
- GG. RADIATION SAFETY
 - a. Acquisition parameter settings
 - b. Scan mode
 - c. Detector configuration
 - d. PITCH
 - e. Tube potential
 - f. Exposure time per tube rotation
 - g. Tube current time product
 - h. Field of measurement
 - i. Beam shaping filter
- HH. INTERACTIONS INSIDE THE TUBE
 - a. Bremsstrahlung
 - b. Characteristic
- II. INTERACTIONS INSIDE THE PATIENT
 - a. Compton scatter
 - b. Photoelectric effect
- JJ. FETAL RADIATION RISKS
 - a. Radiation effects

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- b. Fetal dose when Mom is exposed

KK. DOSE REDUCTION TECHNIQUES

- a. Filtration
- b. Shielding
 - i. Lead apron issues

LL. THE CARDINAL PRINCIPLES OF RADIATION PROTECTION

- a. Time
- b. Distance
- c. Shielding