

THE TUFFEST STUFF CT REGISTRY REVIEW SEMINAR
& "BABY BOARDS" CT EXAM EXPERIENCE
STUDY PAGES FOR REVIEW
"THE CT ANTHOLOGY of INCREASE/DECREASE RELATIONSHIPS"

.THE MANNER IS WHICH THIS MATERIAL IS PRESENTED PROVIDES AN OPPORTUNITY FOR YOU TO STUDY AND LEARN. ALONGSIDE OR BENEATH EACH INFORMATIVE OFFERING IS A LINE FOR YOU TO COMPLETE THE VICE-VERSA (v/v) OR OPPOSITE RELATIONSHIP. IT IS AN EFFECTIVE STUDY TECHNIQUE THAT HELPS TO TEACH DISCIPLINE AND PATIENCE. DO IT.

THE RESOLUTIONS

CONTRAST RESOLUTION (CR):The ability to differentiate soft tissue structures based on their individual shade of gray; aka, System Sensitivity, Low contrast Detectability (LCD); testing for System Uniformity is testing for CR

1. As mAs increases, CR increases; v/v, As mAs decreases, CR decreases
2. As dose increases, CR increases; v/v, As dose decreases, CR decreases
3. As Pixel Size decreases, CR decreases; v/v, As pixel size increases, CR increases
4. As Slice Thickness decreases, CR decreases; v/v, As Slice Thickness increases, CR increases
5. As Patient Size increases, CR decreases; v/v, As Patient Size decreases, CR increases
6. As Object Size increases, CR decreases; v/v, As Object Size decreases, CR increases
7. Inherent Contrast: relevant to the attenuation factors
 - a. Part thickness, As Part Thickness increases, CR decreases

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- i. v/v , As Part Thickness decreases, CR increases
- b. Part density, As Part Density increases, CR decreases
 - i. v/v , As Part Density decreases, CR increases
- c. Part Atomic Number (Z), As Z increases, CR decreases
 - i. v/v , As Z decreases, CR increases
- d. kVp, As kVp increases, CR decreases
 - i. v/v , As kVp decreases, CR increases

SPATIAL RESOLUTION(SR): Describes the ability of the scanner to resolve or differentiate closely placed objects that are significantly different from their background; aka, high contrast resolution; The Sharpness of the CT image as defined in line pairs per cm.

1. As Matrix Size increases, SR increases; v/v , As Matrix Size decreases, SR decreases
2. As Pixel Size increases, SR decreases; v/v , As Pixel Size decreases, SR increases
3. As Slice Thickness decreases, SR increases; v/v , As Slice Thickness increases, SR decreases
4. As Focal Spot Size decreases, SR Increases; v/v , As Focal Spot Size increases, SR decreases

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5. As PITCH increases, SR decreases; v/v, As PITCH decreases, SR increases
6. As Patient Motion increases, SR decreases; v/v, As Patient Motion decreases, SR increases
7. As SFOV increases, SR decreases; v/v, As SFOV decreases, SR increases
8. As DFOV decreases, SR increases; v/v, As DFOV increases, SR decreases
9. As Sampling Frequency increases, SR increases; v/v, As Sampling Frequency decreases, SR decreases
10. As Projections increase, SR increases; v/v, As Projections decrease, SR decreases
11. As Scanner Geometry increases, SR increases; v/v, As Scanner Geometry decreases, SR decreases
12. As Filtered Back Projection decreases; SR decreases; v/v, As FBJ increases, SR increases
13. Inherent Contrast: relevant to the attenuation factors
 - a. Part thickness, As Part Thickness increases, SR decreases
 - i. v/v, As Part Thickness decreases, SR increases
 - b. Part density, As Part Density increases, SR decreases

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- i. v/v , As Part Density decreases, SR increases
- c. Part Atomic Number (Z), As Z increases, SR decreases
 - i. v/v , As Z decreases, SR increases
- d. kVp, As kVp increases, SR decreases
 - i. v/v , As kVp decreases, SR increases

TEMPORAL RESOLUTION (TR): Indication of the ability of a CT system to perform in freezing the motion of a scanned part or object.

1. As Gantry Speed increases, TR increases; v/v , As GS decreases, TR decreases
2. As PITCH increases, TR increases; v/v , As P decreases, TR decreases
3. Inherent Contrast: relevant to the attenuation factors
 - a. Part thickness, As Part Thickness increases, TR decreases
 - i. v/v , As Part Thickness decreases, TR increases
 - b. Part density, As Part Density increases, TR decreases
 - i. v/v , As Part Density decreases, TR increases
 - c. Part Atomic Number (Z), As Z increases, TR decreases
 - i. v/v , As Z decreases, TR increases
 - d. kVp, As kVp increases, TR INcreases
 - i. v/v , As kVp decreases, TR decreases

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PITCH (P)

Described as the manner in which the impacting factors cause the helix that envelops the patient to either contract or expand. Here are the factors that impact PITCH:

1. How fast the tube rotates within the gantry;
 - a. As Tube Rotation Speed increases, P decreases
 - b. v/v , As Tube Rotation Speed decreases, P increases
2. How fast the patient increments through the gantry;
 - a. As Patient Speed increases, P decreases
 - b. v/v , As Patient Speed decreases, P increases
3. Beam Width (BW), in general:
 - a. As Beam Width increases, P increases (depending on overlap)
 - b. $BW = \text{Slice thickness} \times \text{Number of Detectors used}$
 - c. v/v , As Beam Width decreases, P decreases
4. More specifically regarding BW
 - a. As Slice Thickness decreases, P decreases
 - b. v/v , As Slice Thickness increases, P increases
 - c. As Detector No. increases, P increases

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- d. v/v , As Detector No. decreases, P decreases

PITCH is also an impacting factor for each of the following:

1. Dose
 - a. As PITCH increases, dose decreases
 - b. v/v , As PITCH decreases, dose increases
2. Quality
 - a. As PITCH decreases, Spatial Resolution increases
 - b. v/v , As PITCH increases, Spatial Resolution decreases
3. Anatomy covered per tube rotation
 - a. As PITCH increases, Anatomy covered per tube rotation increases
 - b. v/v , As PITCH decreases, Anatomy covered per tube rotation decreases
4. Relative to Interpolation
 - a. As PITCH increases, the amount of interpolation increases
 - b. v/v , As PITCH decreases, the amount of interpolation decreases
5. Relative to Slice PITCH
 - a. As PITCH increases, Slice PITCH increases

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- b. v/v , As PITCH decreases, Slice Pitch decreases

THE SCATTER RADIATION PRODUCTION FACTORS

Fog from scatter radiation covers up image details and makes image contrast gray. This makes it difficult to see the difference between different soft tissue structures that are included within the same field of view. The more readily the visibility of structures like the liver, kidney and psoas muscle are compared to one another the higher the scale of contrast. As the different soft structures become more readily visible we say that contrast improves. It does so because the scale of contrast has become shorter. Contrast resolution is a measure of how well we can see individual shades of gray that represent soft tissue structures.

- A. Defining & describing the scatter production factors
 - a. Field size- the dimension of the x-ray beam that exposes the part
 - i. In diagnostic that would be a 14 x 17 inch rectangular field
 - ii. In CT, the field size is the dimension of the slice width
 - b. Part Thickness- what dimension of anatomy must the beam traverse to interact with the image receptor
 - c. kVp- controls the penetrating capability of the beam
- B. Impact of scatter production factors
 - a. Field size
 - i. As Field Size increases, scatter production increases
 - ii. As Field Size decreases, scatter production decreases
 - b. Part thickness
 - i. As part thickness increases, scatter production increases
 - ii. As part thickness decreases, scatter production decreases
 - c. kVp
 - i. As kVp increases, scatter production increases
 - ii. As kVp decreases, scatter production decreases
- C. RELATIONSHIPS
 - a. As scatter production increases, contrast resolution decreases
 - b. As scatter production decreases, contrast resolution increases

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- c. As scatter production increases, patient dose increases
- d. As scatter production decreases, patient dose decreases

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