Radiology: Cardiothoracic Imaging

SPECIAL REPORT

Standardized Medical Terminology for Cardiac Computed Tomography 2023 Update An Expert Consensus Document of the Society of Cardiovascular Computed Tomography (SCCT), American Association of Physicists in Medicine (AAPM), American College of Radiology (ACR), North American Society for Cardiovascular Imaging (NASCI), and Radiological Society of North America (RSNA) with endorsement by the Asian Society of Cardiovascular Imaging (ASCI), the European Association of Cardiovascular Imaging (EACI), and the European Society of Cardiovascular Radiology (ESCR)

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Conflicts of interest are listed at the end of this article.

See commentary by Roberts and Hanneman in this issue.

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Since the emergence of cardiac computed tomography (Cardiac CT) at the turn of the 21st century, there has been an exponential growth in research and clinical development of the technique, with contributions from investigators and clinicians from varied backgrounds: physics and engineering, informatics, cardiology, and radiology. However, terminology for the field is not unified. As a consequence, there are multiple abbreviations for some terms, multiple terms for some concepts, and some concepts that lack clear definitions and/or usage. In an effort to aid the work of all those who seek to contribute to the literature, clinical practice, and investigation of the field, the Society of Cardiovascular Computed Tomography updates a standard set of medical terms commonly used in clinical and research activities related to cardiac CT.

Supplemental material is available for this article.

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Introduction

Cardiac computed tomography (Cardiac CT) continues to expand with increasing applications and evolving technology. The terminology used in the field was previously unified by consensus agreement of cardiologists, medical physicists and radiologists in 2006 (1). A representative writing group with key stakeholders was reconvened to provide an update to the nomenclature of terms commonly used in clinical and research applications of cardiac CT. The purpose of this work is to consolidate multiple terms and to provide clear definitions for terms applicable to cardiac CT.

The writing group focused on terms most relevant to cardiac CT. Not included within the scope of this document were more general terms related to vascular imaging interpretation and analysis such as *cross-sectional area* or *percent diameter stenosis*. These were thought to be well understood or have been clearly defined in the literature of their respective fields. The one

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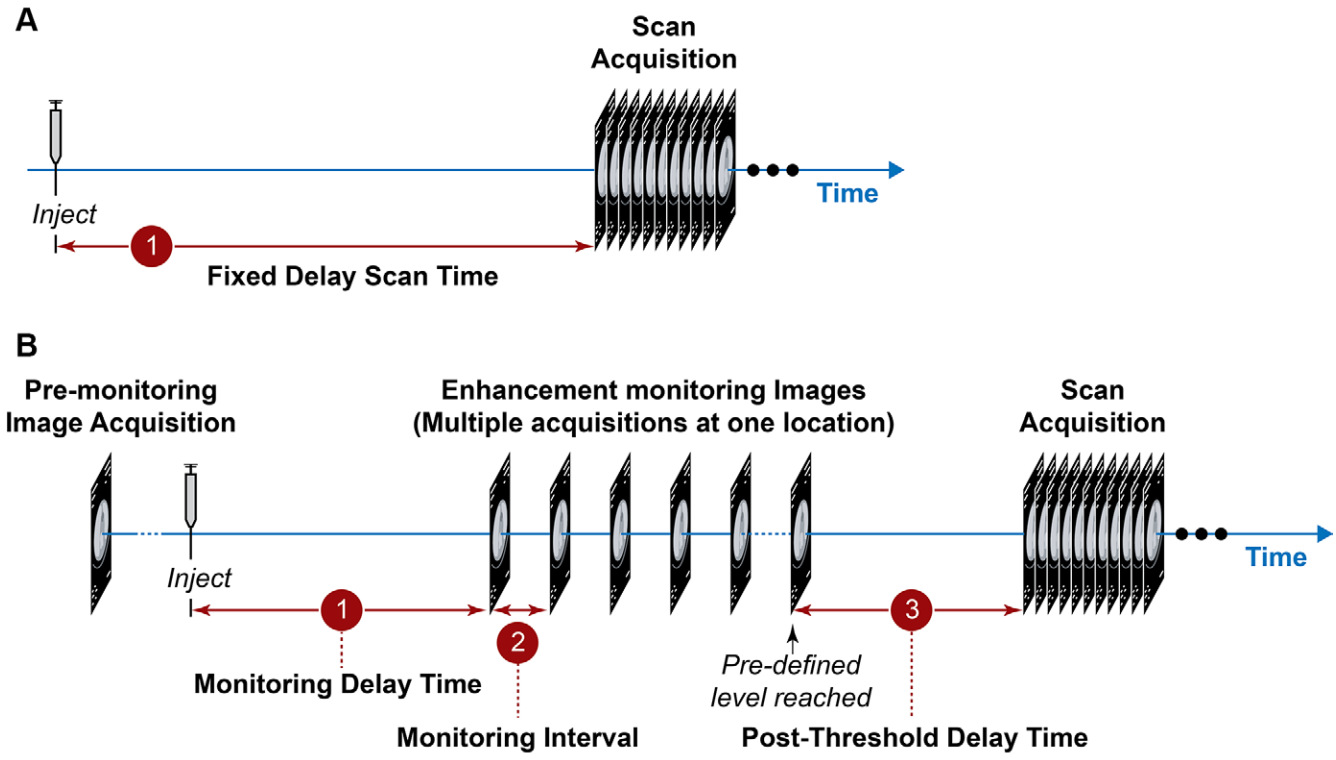
set of exceptions was terms used to describe plaque composition. New inclusions for version 2.0 include addition of expanding CT technology and radiology lexicon standard terminology. Radlex® (which is short for radiology lexicon) is developed and maintained by the Radiological Society of North America (RSNA) to provide common terminology for radiology exams and reports including the LOINC/RSNA Radiology Playbook, RadElement Common Data Elements and RadReport radiology reporting templates. The website *www.radlex.org* provides a search engine to support adoption of preferred terminology, with preferred name, RadLex ID and preferred user radiology lexicon (PURL) defined for each term (2).

The document underwent organization review by the SCCT Board of Directors and American Association of Physicists in Medicine's Board, the American College of Radiology's Board, North American Society for Cardiovascular Imaging's Board and by the Radiological Society of North America's Board and external peer review. Disclosures of potential conflicts of interest for the writing group and external peer reviewers may be found in Appendix 1. Affiliations of the external peer reviewers may be found in Appendix 2.

Explanation of Tables

This document provides tables of standardized medical terminology for cardiac CT applying to *Equipment and Examination Procedures* (Table 1), *Contrast Injection and Data Acquisition* (Table 2), *Image Reconstruction, Processing, and Analysis* (Table 3), *Image Interpretation, Analysis, Artifacts, and Radiation* (Table 4) and *Multienergy Technology* (Table 5) (3–7). In each table, the recommended terms are listed in the first column, with any recommended abbreviations in parentheses. Definitions and any comments regarding the terms or their usage, including occasional cases of other acceptable terms, are listed in the next column. Previous terms and abbreviations that are not recommended and hence to be avoided are in the third column. The RADLEX name and ID are given in the fourth column. Decisions about terms were made by consensus (majority opinion).

Disclosures of conflicts of interest: All Conflicts of interest are noted per SCCT guidelines committee reporting. See Appendix 1 and 2.



Contrast administration **(A)** fixed scan delay, **(B)** monitoring delay time, monitoring interval, post threshold delay time. Used with permission of Mayo Foundation for Medical Education and Research, all rights reserved.

Table 1: Equipment and Examination Procedures

Recommended term (and abbreviation, if applicable)	Definition and comments	Previous terms and abbreviations (not recommended)	RADLEX Name RADLEX ID (RID)
Electron beam CT (EBCT)	General description of CT systems that generate x-rays by striking a stationary target surrounding the patient with a magnetically deflected electron beam. The electron beam CT system is no longer in clinical use or manufactured.	Electron beam tomography, EBT, Ultrafast CT, UFCT	Scanning electron beam RID10605
CT source	The source of x-rays can be from single, dual or multiple sources		Single source RID12321 Dual source RID12322 Multi-source RID12323
Multi-detector row CT (MDCT)	General description of computed tomography systems that generate x-rays with one or more x-ray tubes and detect them with one or more 2-dimensional array of detectors	Multislice CT, MSCT, multidetector CT	CT detector configuration RID10588
Detector row	Row of physical detectors in a 2-dimensional array oriented perpendicular to the z-axis (direction of patient translation)		Multi-detector row configuration RID10589
n-row CT	Specific description of an MDCT scanner based on the number (n) of detector rows		
Slice	A portion of the image volume specifically oriented perpendicular to the z-axis		Slice thickness RID28669
n-slice CT	Specific description of an MDCT scanner based on the maximum number (n) of simultaneously acquired projections-		
Imaging modality	DICOM has two letter abbreviations for modalities that include: CT, MR, XR, US		Imaging Modality RID10311
Cardiovascular computed tomography, Cardiovascular CT	General description for CT imaging of the heart or vasculature; may or may not use ECG-gating or ECG-triggering; may be specified as "noncontrast" or "contrast-enhanced"	CVCT	
Cardiac computed tomography or Cardiac CT or CCT[1]	Computed tomographic imaging of the heart usually using ECG-gating or ECG-triggering; may be specified as "noncontrast cardiac CT" or "contrast-enhanced cardiac CT"	Cardiac CTA	Cardiac gating RID11248 Cardiac triggering RID11245
Coronary artery calcium CT or CAC CT	Images of the coronary arteries obtained by noncontrast cardiac CT and used to detect and quantify coronary artery calcium	Heart scan or calcium score, or CACS	Calcium score RID28808
Coronary CT angiography, Coronary CTA or CCTA[2]	CT imaging of the coronary arteries using ECG-gating or ECG-triggering after injection of contrast medium	EBCTA, MDCTA	
Cardiac CT function	A cardiac acquisition covering one or more cardiac cycles that provides CINE imaging typically in the 3 dimensions and includes multiple phases through cardiac cycle	CT Cardiac Fluoroscopy 4DCT, Cine CT 4DCT ventriculogram	
CT fractional flow reserve, CT-FFR	Calculated estimation of intravascular flow or pressure based on CT derived anatomy	FFRCT and FFR-CT	Vascular flow measurement mode RID29014
Myocardial CT perfusion, or Myocardial CTP	Evaluation of myocardial blood flow or enhancement pattern by computed tomography with the injection of contrast medium; can be modified with the term "first pass" to indicate image acquisition coincident with the initial passage of the contrast material through the heart	MCTP, CT Myocardial perfusion imaging (CT MPI)	Perfusion imaging RID10376
Myocardial CT late enhancement, Myocardial-CT-LE	Delayed imaging after the injection of contrast medium to evaluate for delayed enhancement of myocardium	Delayed enhancement scan, DHE scan, scar imaging	Enhancement pattern RID6058

[1]Cardiac computed tomography: This term refers to the use of any form of computed tomographic imaging of the heart that usually uses the ECG signal for data acquisition and image reconstruction. It may be specified as noncontrast cardiac CT, such as for aortic valve calcium quantification, or contrast-enhanced cardiac CT, such as for evaluation of the cardiac chambers or valves, or of a suspected intracardiac mass. An evaluation of the coronary arteries in particular using contrast-enhanced cardiac CT has a special designation, coronary CT angiography.
[2]Coronary CT angiography: This term refers to the use of contrast-enhanced cardiac CT specifically for imaging the wall and lumen of the coronary arteries. The examination procedure and its resultant data are referred to as a coronary CT angiogram, or a coronary CTA

Table 2: Contrast Injection and Data Acquisition

Recommended term (and abbreviation, if applicable)	Definition	Previous terms and abbreviations (not recommended)	Radex Name Radlex ID (RID)
Contrast transit time	Time required for contrast medium to flow from the injection site to the region of interest Expressed in seconds	Circulation time, vein to artery travel time, contrast delay	
Bolus tracking	Process of monitoring the attenuation in a cross-sectional region of interest after contrast injection to determine when the desired attenuation is attained, thereby triggering the start of the scan	Bolus monitoring	Automatic bolus tracking RID10562
Fixed delay scan	Scan data are acquired at a predetermined time after initiation of contrast injection.	Fixed delay time scan	Fixed delay scan RID10560
Fixed delay scan time	Predetermined fixed delay time from start of contrast injection to initiation of scan (Time 1 in Figure 1) Expressed in seconds	Fixed delay time, Contrast Delay Time, scan delay time, Contrast to Scan Delay Time, empiric delay time	
Timing bolus or test bolus	Small bolus of contrast medium used to determine the contrast transit time	Test injection, timing scan	Test bolus technique RID10568
Variable delay scan	Scan data are acquired after initiation of contrast injection based on bolus tracking data for an individual patient. The time delay between contrast injection and scan varies from patient to patient.		
Variable delay scan time	Delay time from start of contrast injection to initiation of scan using a bolus tracking method. Expressed in seconds		
Monitoring delay time	Time from injection to the start of monitoring scans (Time 1 in Figure 1B) Expressed in seconds		Monitoring Delay RID10564
Monitoring interval	Time between consecutive monitoring scans (Time 2 in Figure 1B) Expressed in seconds		
Post threshold delay time	During a bolus tracking acquisition, the time from reaching the threshold value in the tracked region to the scan initiation (Time 3 in Figure 1B) Expressed in seconds		
Threshold enhancement for trigger or Trigger threshold	In bolus tracking, the prescribed amount of enhancement within the region of interest, to trigger the preprogrammed scanning sequence		Threshold enhancement for trigger RID10566
Scan delay time	Time from start of contrast injection to initiation of scan acquisition (may be based on calculation using timing bolus acquisition data, or it may be fixed or variable). Expressed in seconds	Contrast Delay Time, delay time, Contrast to Scan Delay Time	
Breath-hold delay	Time from initiation of breath hold instruction to scan initiation		
Data acquisition or scan	The process of measuring the x-ray attenuation of an object	Image acquisition	
Projection data	The x-ray attenuation data measured by a CT system that are used for image reconstruction	X-ray data, attenuation data, scan data, Raw data, sinogram	
Data acquisition window	Duration of data acquisition (x-ray tube 'on time' or 'exposure') within the cardiac cycle. The location of the window (phase) is usually described by its position relative to the initial QRS peak in a cardiac cycle (given in % of the R-R interval or milliseconds, depending on the scanner manufacturer). The location of the window may be described relative to the start of the data acquisition window or the center of the data acquisition window	Phase	
Widened data acquisition window	Acquisition of additional scan data beyond the minimum needed for image reconstruction so as to allow reconstruction of series using different phases	Padding, phase tolerance	Acquisition duration RID12356

(Table 2 continues)

Table 2: Contrast Injection and Data Acquisition (*continued*)

Recommended term (and abbreviation, if applicable)	Definition	Previous terms and abbreviations (not recommended)	Radex Name Radlex ID (RID)
Detector coverage	Total z-axis dimension of exposed detector rows expressed in mm. This represents the width of the section of anatomy imaged per gantry rotation at isocenter (e.g., 320-row CT scanner with 0.5-mm rows = 160 mm detector coverage at the center of the gantry)		
Detector row width	Active width of 1 detector row in the z-axis direction measured at iso-center. Expressed in millimeters along the z-axis (e.g., 0.6 mm)	Slice width, slice collimation, detector slice collimation, channel width	
Detector configuration	Description of the number and width of active data channels. Expressed in millimeters relative to the center of the scan plane	Beam collimation, detector collimation	CT detector configuration RID10588
Total nominal beam width	The nominal width of the x-ray beam expressed in mm relative to the center of the scan plane	Beam collimation	Beam Collimation RID12372
Rotation time	Time required for one 360-degree rotation of the CT gantry		
Pitch	For helical scanning, the ratio of the table travel per gantry rotation to the detector coverage		Beam Pitch RID12382
Tube potential	The electric potential applied across an x-ray tube to accelerate electrons towards a target material. Expressed in units of kilovolts (kV)[1]	Tube Voltage	Tube potential RID12244
Tube current	Number of electrons accelerated across an x-ray tube per unit time. Expressed in units of milliampere (mA)		Fixed tube current RID12351
Tube current-time product	The product of average tube current and rotation time, expressed in units of milliampere × seconds (mAs).		Tube Current-time product RID12344
Effective tube current-time product	In helical scan mode, this is equal to average tube current x rotation time / pitch. Expressed in units of milliampere × seconds (mAs)		Effective mAs RID12370
Exposure time	Duration of time during which the x-ray beam is on. In axial scan mode, this varies with scan angle, and is calculated as (scan angle / 360) × rotation time. In helical scanning, this varies with pitch, detector coverage, and the extent of anatomy to be imaged in the z axis. It reflects the cumulative duration of the entire helical scan		
Tube current modulation	Automatic adjustment of the tube current during data acquisition		CT exposure control method RID10582
Attenuation-based tube current modulation	Adjustment of tube current in the x, y and z planes based on the attenuation profile		Angular longitudinal tube current modulation RID10586
ECG-based tube current modulation	Adjustment of the tube current according to prescribed intervals within the cardiac cycle	ECG pulsing, dose modulation, tube modulation	

(Table 2 continues)

Table 2: Contrast Injection and Data Acquisition (*continued*)

Recommended term (and abbreviation, if applicable)	Definition	Previous terms and abbreviations (not recommended)	Radex Name Radlex ID (RID)
Automatic exposure control	Individualized modulation or adjustment of tube current and tube potential to achieve a pre-specified image quality level based on patient attenuation profile on CT localizer radiograph. The definition of image quality used depends on the manufacturer.		Automatic exposure control method RID12352
Automatic tube potential selection	Individualized selection of tube potential based on a pre-specified desired image quality level and the patient attenuation profile on the CT localizer radiograph		
Acquisition field of view	Diameter or width of the region within the scan plane that is exposed to x-ray. Expressed in units of millimeters or centimeters	Scan field of view	CT scan field of view RID12330
Scan length	Distance between start and end of data acquisition along the z-axis. Expressed in millimeters or centimeters	Scan range	
Scan time	Total time required to acquire projection data over the entire scan length. In axial scan mode, this includes the time required to increment the table between successive x-ray exposures. Expressed in seconds	Acquisition time	
Axial scan	Data acquisition while the patient table remains stationary; the table position may be sequentially incremented between x-ray exposures to collect data over a longer z-axis range	Step and shoot scan	Axial scan mode RID10615
Helical scan or spiral scan	Data acquisition while the patient table is moving along the z-axis		Helical Scan mode RID10613
Prospectively ECG-triggered	Method for initiating data acquisition at a prespecified acquisition window in the cardiac cycle using the ECG signal to synchronize data acquisition.	Triggered cardiac CT step and shoot scan Prospective gating, prospectively ECG gated	Cardiac Triggering RID11245
Retrospectively ECG-gated	Method for data acquisition with acquisition window extending throughout the entire cardiac cycle using ECG signal to synchronize image reconstruction.		EKG gating RID11250
High pitch helical scan or High pitch spiral scan	Helical or spiral scan that uses a table advancement of greater than 2 times the detector coverage per gantry rotation, requiring a dual source system		Beam pitch RID12382
Volumetric scan	Wide detector axial acquisition covering the entire heart at a fixed table position	Whole-heart scan, volume scan, one-rotation scan	
Single beat acquisition	Volumetric scan or helical or spiral scan covering the entire heart during one cardiac cycle		

[1]All modern CT systems use generators with near constant voltage levels. Peak kilovoltage (kVp), which represented the peak value of a widely varying voltage levels, is no longer relevant for modern CT systems.

Table 3: Image Reconstruction, Processing and Analysis

Recommended term (and abbreviation, if applicable)	Definition and comments	Previous terms and abbreviations (not recommended)	Radlex Name RADLEX ID (RID)
Pixel	Picture element, the smallest "picture element" in a two-dimension matrix that composes an image.		
Voxel	Volume element, the smallest three-dimensional element determined by the pixel size (X and Y) and slice thickness (Z)		Voxel geometry RID12645
Isotropic voxel	Voxels that are the same size in the X, Y and Z dimension.		Isotropic Voxel RID12645
Image matrix	The number of rows and columns of pixels. Typical CT matrix is 512 rows by 512 columns, but higher values maybe available		RID45732
Kernel	The parameter used to represent the sharpness and other features of the reconstructed image.		Kernel RID28903
Reconstruction	The mathematical process of generating images from the acquired projection data.		Reconstruction RID28665
Filtered back projection	Analytic reconstruction algorithm using simultaneous equations of X-ray sums from different angles to compute attenuation coefficients within a cross section		Filtered-back projection RID12680
Iterative reconstruction[1]	Reconstruction algorithm starting with an image assumption followed by numerous comparisons and adjustments to achieve agreement with real measured values.		Iterative reconstruction RID10624
Series	A set of images resulting from a specific CT scan acquisition and reconstruction. Using the same projection data but different reconstruction parameters; multiple series may be reconstructed from a single CT scan	Axial data, axial slices, slices, reconstruction	
Exam	The collection of projection data and the resulting images from a single patient visit; the entire exam may consist of multiple scans and multiple image series	Image set, study	
Image reconstruction window	Duration of time within a single cardiac cycle over which projection data are used for image reconstruction, expressed in milliseconds. The value must be equal to or less than that of the data acquisition window		
Reconstruction Phase	The time point within the acquisition window that defines the time during which the projections for a given image are reconstructed. This is relative to the R-R interval and often is expressed in units of milliseconds before or after the R-peak (+ms or -ms) or % of a cardiac cycle (%). This is usually illustrated as a box on the ECG waveform.		
Reconstructed Field of View[2]	Diameter or width of the region over which projection data are reconstructed, typically less than or equal to the acquisition field of view; some systems extrapolate data from within the acquisition field of view to reconstruct a field of view wider than the diameter of the x-ray beam; expressed in mm (some systems report the value in mm or cm)	Display field of view	
Reconstructed slice thickness	The nominal thickness of the reconstructed image perpendicular to the reconstruction plane; expressed in mm (e.g., for axial images, this is the nominal thickness along the z-axis of the anatomy contained in the reconstructed image); the thickness is relative to the center of the image plane		
Increment	The nominal distance between the centers of consecutively reconstructed slices expressed in mm		

(Table 3 continues)

Table 3: Image Reconstruction, Processing and Analysis (*continued*)

Recommended term (and abbreviation, if applicable)	Definition and comments	Previous terms and abbreviations (not recommended)	Radlex Name RADLEX ID (RID)
CT number	The numerical value assigned to each pixel in an image; this value represents the average x-ray attenuation of all tissue included in the voxel of anatomy associated with a given pixel relative to water, expressed in Hounsfield units (HU)	CT density, CT attenuation, CT value, attenuation	
Hounsfield Unit (HU)	The unit of measurement for CT numbers, named in honor of the co-inventor of CT, Sir Godfrey Hounsfield. By definition, the CT number of water is 0 HU, and the CT number of air is –1000 HU		Hounsfield Unit RID39161
Multi-cycle reconstruction	Type of image reconstruction that uses projection data from the same phase of 2 or more consecutive cardiac cycles for generation of each image so as to effectively improve temporal resolution at consistent heart rates	Multisector reconstruction, multisegment reconstruction	
Multi-phase reconstruction	The creation of 2 or more series per cardiac cycle to evaluate different time points within the cardiac cycle		
Image processing	Mathematical modification of reconstructed images	Image reconstruction, reformats, post processing	
Image plane	A digital representation of a section of anatomy reconstructed from the projection data. The image plane should be specified (axial, coronal, sagittal, or oblique)		Imaging plane RID10569
Routine Imaging Planes	Axial, coronal, sagittal and oblique		Axial RID10579 Sagittal RID10574 Coronal RID10570
Cardiac Imaging planes	Double oblique views to visualize cardiac structures		Oblique plane RID10573
Multiplanar reformat (MPR)	Two-dimensional grayscale image displaying all the pixels in any imaging plane through the imaged volume; typically created from original axial plane images		Multiplanar reformat RID12759
Curved multiplanar reformat (cMPR)	Two-dimensional grayscale image displaying all the pixels in a curved plane through the imaged volume; typically created from original axial plane images by tracing a path through the center of the anatomical structures of interest	Curved multiplanar reconstruction	Curved planar reformat RID12772
Maximum intensity projection (MIP)	Two-dimensional projection through a defined section of the complete image volume, displaying only the pixel having the highest CT number along a path orthogonal to the specified section		Maximum intensity projection RID12762
Minimum intensity projection (MinIP)	Two-dimensional projection through a defined section of the complete image volume, displaying only the pixel having the lowest CT number along a path orthogonal to the specified section		Minimum intensity projection RID12764
Volume-rendering technique (VRT)	A visualization process to evaluate a 3-dimensional structure		Volume rendering RID12769
Straightened multiplanar reformat (sMPR)	360° visualization of a vessel around an axis of rotation defined by the centerline of the vessel; vessel appears straight and can be displayed in multiple formats (e.g., MIP, VRT)	Rotisserie view, longitudinal view, long view	

[1]There are several generations of iterative reconstruction which reduce image noise. Some iterative reconstruction techniques are applied in image space to decrease noise on the reconstructed CT image. Others utilize the projection data and incorporate both noise models and the specific geometric characteristics of the scanner. In some cases, a combination of techniques is used.
[2]Reconstructed field of view can be narrow to focus on the heart which may improve in-plane spatial resolution, or widen to include the lungs and chest wall for evaluation of non-cardiac structures

Table 4: Image Interpretation, Analysis, Artifact, and Radiation

Recommended term (and abbreviation, if applicable)	Definition and comments	Previous terms and abbreviations (not recommended)	Radlex Name RadLex ID (RID)
Calcified plaque[1]	Atherosclerotic plaque in which the attenuation of the entire plaque is consistent with that of calcium		Calcified RID5747
Partially calcified plaque[1]	Atherosclerotic plaque in which there are 2 visible plaque components, one of which appears calcified and the other noncalcified. Classification of partially calcified plaque is described by its degree of calcification: predominantly calcified (75% or greater component of plaque calcified), partially calcified, and predominantly non-calcified (75% or greater of plaque non-calcified).	Mixed plaque	
Non-calcified plaque	Atherosclerotic plaque in which the attenuation of the entire plaque is consistent with soft tissues and not calcium		Noncalcified RID39226
High risk plaque (HRP) features	Plaque features associated with higher vulnerability of the plaque such as: low attenuation plaque (LAP), positive remodeling (PR), napkin-ring sign (NRS), spotty calcification (SC)	Vulnerable plaque features Adverse plaque features	
Agatston score	Value used to quantify calcium identified from CT images; based on the maximum attenuation and area of image pixels with CT numbers greater than 130 HU	Calcium score CAC score	Calcium score RID28808
Calcium volume	Value used to quantify calcium identified from CT images; based on the number and size of voxels with CT numbers greater than a threshold value		
Calcium mass	Value used to quantify the milligrams of calcium from CT images that is equal to volume × density, where calcium density is determined using calibration phantoms or multi-energy CT techniques		
Beam-hardening artifact	Dark bands or streaks typically originating from a highly attenuating imaged object as a result of changes in the spectral distribution of polychromatic x-rays during transmission through matter.	Streak artifact	Beam hardening artifact RID11327
Partial volume averaging	A phenomenon that arises when multiple different materials are present in a voxel and are nonlinearly averaged and represented by a single CT number.	Calcium blooming	Partial volume averaging RID11481
Banding	Contrast gradient along the imaged volume resulting from the acquisition of image stacks during slightly different contrast phases; not really an artifact, but a manifestation of changes in contrast concentration over time relative to the time of image acquisition	Slab artifact	Banding artifact RID11487
Helical interpolation artifact	Artifact caused by mismatch of heart rate and table motion during helical data acquisition characterized by smearing of data in the z-direction and loss of image quality		Helical interpolation artifact RID11333
Motion artifact	Blurring of anatomy owing to cardiac, respiratory, or gross patient motion; typically characterized by blurring or streaking in the axial image plane		Motion related artifact RID11423
Misalignment artifact	Improper alignment of adjacent slabs, as visualized along the z-axis due to respiratory, gross body, or cardiac motion owing to arrhythmia or variations in heart rate	Step artifact misregistration artifact, registration artifact	Misregistration artifact RID39413 Arrhythmia artifact RID11309
Volume CT dose index ($CTDI_{vol}$)	A measure of a CT scanner's radiation output that depends on scanning parameters. This standardized metric is universally defined and allows comparison of the amount of radiation being used in a scan. Expressed in units of milligray (mGy)[2]		Volume CT dose index RID12357

(Table 4 continues)

Table 4: Image Interpretation, Analysis, Artifact, and Radiation (*continued*)

Recommended term (and abbreviation, if applicable)	Definition and comments	Previous terms and abbreviations (not recommended)	Radlex Name RadLex ID (RID)
Dose length product (DLP)	A quantity derived by multiplying the volume CTDI with the scan length to represent the cumulative amount of radiation delivered by a scan. Expressed in milligray-centimeters (mGy -cm).		CT dose length product RID12359
Size-specific dose estimate (SSDE)	An estimate of the absorbed dose to the center of an irradiated volume of a specific size, expressed in units of milligray (mGy).[3]		Radiation dose estimate RID10553
Effective dose	An estimate of radiation detriment from a nonuniform radiation exposure expressed in terms of a uniform whole-body exposure that takes into account the dose to specific organs and the radiation sensitivity of these organs. The SI unit for effective dose is the millisievert (mSv).[4]		Radiation dose estimate RID10553

[1]Calcified plaque vs noncalcified plaque: In the strictest sense, CT can reliably distinguish two types of plaques: calcified plaques, and noncalcified plaques. It is recognized that not all plaques are entirely calcified or noncalcified; hence, a calcified plaque can be further described as partially calcified, or by its degree of calcification as minimally calcified (specks of less than a quarter of the plaque calcium), moderately calcified (approximately half of the plaque calcified), predominantly calcified (most greater than 3/4 of the plaque calcified but still with some visible noncalcified elements), or completely calcified. The term mixed plaque should be avoided.
[2]$CTDI_{vol}$ is measured in a cylindrical acrylic phantom of standard size. Volume CTDI does not correspond to absorbed dose to the patient, which varies depending on patient size and the amount of anatomy scanned.
[3]SSDE is calculated using the CTDIvol and a unitless conversion factor that is chosen based on the patient size. Patient size is determined based on the patient attenuation, not physical dimensions, in terms of the diameter of a water-filled cylinder having equivalent x-ray attenuation (known as the water equivalent diameter).
[4] Effective dose is calculated using values that are averaged across both genders and all ages and is not representative of the radiation risk to any given patient. Rather, effective dose can be used to compare the averaged radiation detriment between imaging procedures and other types of irradiations, such as from naturally occurring radiation exposures (e.g., background radiation levels).

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Table 5: Multi-Energy Technology

Recommended term (and abbreviation, if applicable)	Definition and comments	Previous terms and abbreviations (not recommended)	RadLex Name RadLex ID (RID)
Ultra-high resolution CT (UHR-CT)	CT with detector elements at or smaller than 0.25 mm along the z-axis		
Energy integrating detector (EID)	Scintillating detector measuring total energy deposited by all photons without specific information about an individual photon or its energy. X-rays are first converted into light and then the light is converted into electrons.	Conventional, single energy CT	
Energy integrating detector CT (EID-CT)	CT with energy integrating detectors		
Multi-Energy CT	Technology using more than one energy at either the detector or source	Dual Energy CT	
Detector based multi-energy CT	Technology where the x-ray beam transmitted through the patient has only one energy spectrum and photon energy discrimination occurs at the detector level.		
Photon counting detector (PCD)	Semiconductor detector that counts individual x-rays and retains specific information about an individual photon's energy. X-rays are converted directly into electrons.		
Photon counting detector CT (PCD-CT)	CT with photon counting detectors	PCCT PCT	
Multilayer detector (MLD)	Two or potentially more physical detector layers that simultaneously absorb different parts of the x-ray spectrum	spectral detector, sandwich detector	
Multilayer detector CT (MLD-CT)	CT with multilayer detectors	Spectral detector CT (SDCT)	
Source based multi-energy CT	Technology where the x-ray beam transmitted through the patient has more than one energy spectrum		
Split beam filter (SBF)	An x-ray filter composed of two different materials is used to split the x-ray beam into higher and lower effective energies at a single tube potential setting	TwinBeam, split filter	
Split beam filter CT (SBF-CT)	CT with a split beam filter		
Kilovolt (kV) switching	Switching tube potentials on a single source CT system between projections or rotations	Rapid kV switching, Fast kV switching	
Kilovolt (kV) switching CT (KVS-CT)	CT performed with kV switching		
Low- and high energy images	For source-based acquisitions, images from originally measured low- and high-energy spectra		
Mixed image	Weighted average of low- and high-energy images		
Spectral-derived Images	Images postprocessed or derived from multi-energy CT		
Threshold image	Image using only photons above a specific energy up to the tube potential derived from a photon counting acquisition		
Bin image	Image using only photons within a range of energies which are specified and derived from a photon counting detector CT acquisition		
Virtual mono-energetic Image (VMI)	Spectral-derived image from a multi-energy acquisition that provides standardized x-ray attenuation information (CT numbers) at a discrete x-ray energy	Virtual mono energetic reconstruction, monochromatic energy equivalent, VME	
Iodine specific image	Image that quantifies iodine equivalent signal derived from a multi-energy acquisition		
Calcium specific image	Image that quantifies calcium equivalent signal derived from a multi-energy acquisition		
Virtual non-contrast image (VNC)	Image in which iodine equivalent signal has been removed derived from a multi-energy acquisition		
Virtual non-calcium Image (VNCa)	Image in which calcium equivalent signal has been removed derived from a multi-energy acquisition		