
Appendix

MDCT Protocols

From: *Kalra MK, Saini S, Chapter 1.1, page 5*

Table 1. Important scanning parameters and contrast considerations that must be addressed during development of scanning protocols for a given diagnostic indication

CT scanning parameters	Contrast consideration
Scan area of interest	Contrast versus noncontrast
Scan direction	Route
Localizer radiograph	Concentration
Scan duration	Volume
Gantry revolution time	Rate of injection
Table speed, beam pitch, beam collimation	Trigger-fixed, automatic tracking, or test bolus
Reconstructed section thickness	
Extent of overlap	
Reconstruction algorithms	
Tube potential	
Tube current and automatic exposure control	
Radiation dose	

Fom: Kalra MK, Saini S, Chapter I.1, page 5

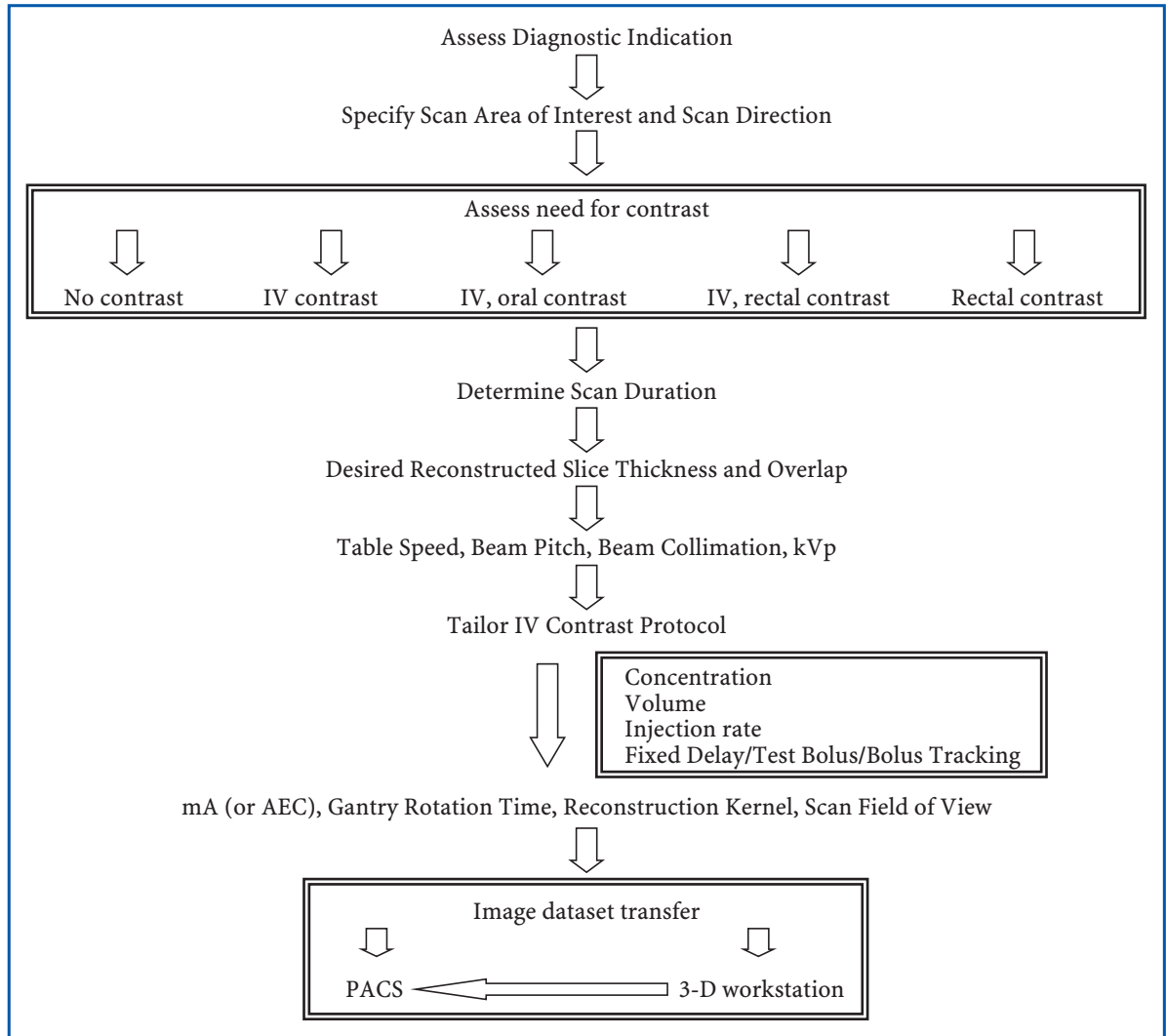


Fig. 1. Building blocks for scanning protocols

From: *Bae KT, Chapter 1.2, page 18*

Table 1. Contrast enhancement times and proposed scan delays in different applications

	Pulmonary CTA	Coronary thoracic aorta CTA	Abdominal aorta/peripheral runoff	Hepatic parenchyma/portal vein
Contrast arrival time (s) ^a	$Tarr = 7-10$	$Tarr = 12-15$	$Tarr = 15-18$	30-40 ($Tarr = 15-18$)
Peak time (s) ^a	From 15 to ID (peak reaches a plateau rapidly)	ID + (0 to 5) ^b	ID + (5 to 10) ^b	ID + (25 to 40) ^b
Fixed scan delay (s)	15 (20 for slow injection)	20	30 (20-25 for slow scan)	60-70
Variable scan delay (s)	15 (20 for slow injection)	ID + 5 - SD/2	ID + 5 - SD/2	ID + 35 - SD/2
Circulation-adjusted delay	$Tarr + 5$	ID + ($Tarr - 10$) - SD/2	ID + ($Tarr - 10$) - SD/2	ID + ($Tarr \times 2 + 5$) - SD/2

CTA computed tomography angiography, $Tarr$ contrast arrival time, ID injection duration (s), SD scan duration (s)

For CTA, ID = "15 s + 1/2 SD" (with saline flush) or "20 s + 1/2 SD" (without saline flush) is suggested with the injection rate of 4 ml/s

For the liver, ID is determined by considering the total iodine load of 0.5 gI/kg

Peak time increases by 3-5 s with the use of saline flush

$Tarr$: a for pulmonary CTA, 100 HU threshold over the pulmonary artery with the first scan at 10 s after the start of the injection; b for aorta and hepatic phases, 50 HU threshold over the aorta with the first scan at 10 s after the start of the injection

^aAssuming normal cardiac circulation, body weight of 60-80 kg, and the injection rate of 3-5 ml/s via the antecubital vein

^bA larger number is used for a shorter injection duration

From: *Solomon R, Chapter 1.3, page 25*

Estimated GFR/1.73 m² = 186 x Serum [creatinine]^{-1.154} x Age^{-0.203}

x 0.74 if female x 1.21 if African American

Formula was empirically determined in a cohort of individuals (1628) (mostly white) with chronic kidney disease (determined by iothalamate clearance <55 ml/min/1.73m²).

Evidence from other studies suggests that it underestimates GFR by 25-30% in subjects with "normal" renal function.

Fig. 1. MDRD or Levey Formula

Fom: *Solomon R,Chapter I.3,page 26*

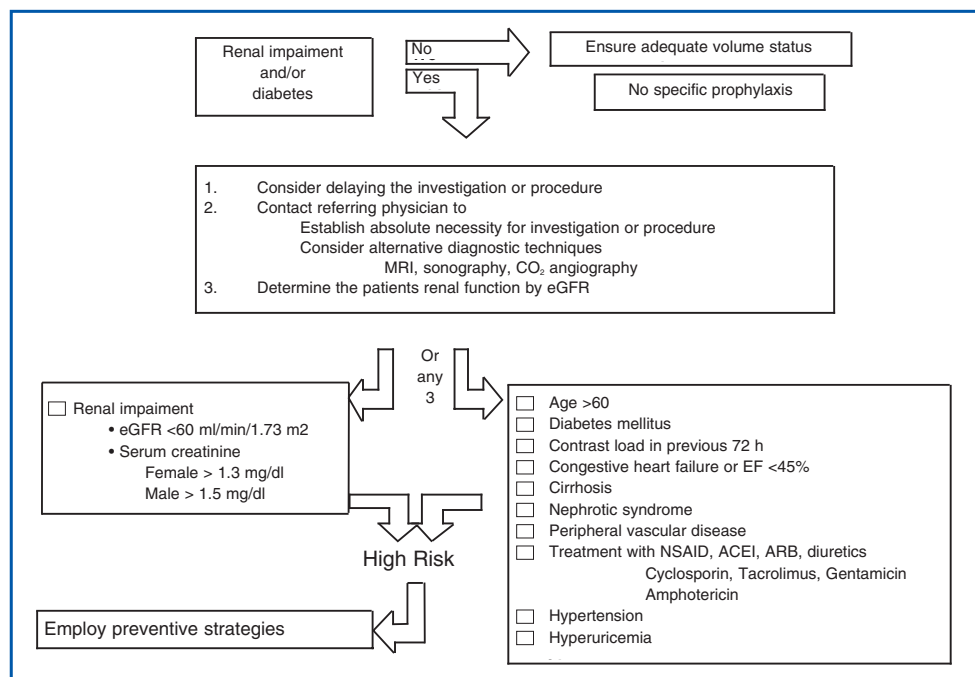


Fig. 2. Protocol (modified from [3])

Fom: *Sahani DV, Singh AH,Chapter II.1,page 43*

Table 2. Multidetector computed tomography (MDCT) liver protocols on different computed tomography (CT) scanners

Parameters	4 channel	16 channel	64 channel
DC (mm)	4×1.25	16×0.625	64×0.6
TS (mm/s)	15	18.75	38
Pitch	1.0–2.0	0.938	0.984
Slice thickness (mm)			
Arterial phase (CTA)	1.25	1.0	1.0
Arterial phase (liver)	2.5–5.0	2.5	2.5
Venous phase (CTA)	2.5	2.0	2.0
Venous phase (liver)	5.0	5.0	5.0
Arterial Delay (s)		Bolus tracking/automated trigger Empirical delay:25–30 s	
Venous Delay (s)	65–70 s	60 s	50–60 s

DC detector collimation, TS table speed, CTA computed tomographic arteriography

Fom: *Schindera ST, Nelson RC, Chapter II.2, page 50*

Table 1. Scan parameter for PVP and HAP using 4-, 16-, and 64- slice MDCT (developed for GE scanners)

	4-slice MDCT		16-slice MDCT		64-slice MDCT	
	HAP	PVP	HAP	PVP	HAP	PVP
Detector configuration(mm)	4×3.75	4×2.5	16×1.25	16×0.625	64×0.625	64×0.625
Pitch	1.5	1.5	1.38	1.75	1.38	1.38
Table speed (mm/rotation)	22.5	15	27.5	17.5	55.0	55.0
Rotation time (s)	0.8	0.8	0.6	0.5	0.5	0.5
kV	140	140	140	140	140	140
mA	220	220	300	380	450	450
Slice thickness (mm)	5.0	5.0	5.0	5.0	5.0	5.0
Axial slice thickness for MPR and 3D-reconstruction (mm)	2.5	2.5	1.25	0.625	1.25	0.625

Fom: *Sahani DV, Shah ZK, Chapter II.3, page 68*

Table 1. Multidetector computed tomography (MDCT) parameters for the pancreas: Protocols for GE Scanners at our institute

Parameters	4 channel	16 channel	64 channel
DC (mm)	1.25	0.625	0.6
TS (mm/s)	15	18.75	38
	Beam Pitch 1.0–2.0		
Slice thickness (mm)			
Arterial (CTA)	1.25	1.0	1.0
Arterial (liver)	2.5–5.0	2.5	2.5
Venous (CTA)	2.5	2.0	2.0
Venous (liver)	5.0	5.0	5.0
	Delay arterial bolus tracking empirical delay 25–30 s		
Venous Delay (s)	65–70	65–70	65–70

DC detector collimation, TS table speed, CTA computed tomographic arteriography

Fom: *Kavangh JJ et al, Chapter III.3, page 130*

Table 1. Computed tomography (CT) protocols: CT pulmonary angiography

Scanner type	4 slice	16 slice	64 slice
Collimation		16 × 0.75	64 × 0.6
Reconstruction (mm)	1.25	1.00	0.75
Rotation time (s)	0.8	0.5	0.33
Contrast volume (370 mgI/mL)	100 ml	100 ml	75–100 ml
Saline flush		50 ml	50 ml

From: *Shetty SK, Lev MH, Chapter 12, page 168*

Table 1. Sample acute stroke computed tomography (CT) protocol employed at the authors' institution, incorporating CT angiography (CTA) and CT perfusion (CTP). The protocol is designed to answer the four basic questions necessary for stroke triage described. Note the alteration in the kilovolt peak (kVp) for perfusion acquisition. Parameters are presented for illustrative purposes and have been optimized for the scanner currently employed (General Electric Healthcare Lightspeed 16) in our emergency department. Parameters should be optimized for each scanner

Scan series	Unenhanced	CTA head	CTA neck	Cine perfusion ×2
Contrast		Biphasic contrast injection: 2.5 cc/s for 50 cc, then 1.0 cc/s for 20 cc		7 cc/sec for 40 cc for each CTP acquisition
Scan delay		Delay: 25 s (35 s if poor cardiac output, including atrial fibrillation)		Delay: 5 s (each series is a 60-s cine acquisition)
Range	C1 to vertex	C1 to vertex	Arch to C1	Two CTP slabs
Slice thickness	5 mm	2.5 mm	2.5 mm	5 mm
Image spacing	5mm	2.5 mm	2.5 mm	N/A
Table feed	5.62 mm	5.62 mm	5.62 mm	N/A
Detectors configuration (mm)	16×0.625	16×0.625	16×0.625	16×1.25
Pitch	0.562:1	0.562:1	0.562:1	N/A
Mode	Helical	Helical	Helical	Cine 4i
kVp	140	140	140	80
mA	220	200	250	200
Rotation time	0.5 s	0.5 s	0.5 s	1 s
Scan FOV	Head	Head	Large	Head
Retrospective slice thickness/interval	None	1.25/0.625 mm	1.25/1.0 mm	None

Standard reconstruction algorithm is used for all image reconstruction

CTA computed tomography angiography, CTP computed tomography perfusion, kVp kilovolt peak, mA milliampere, FOV field of view

From: *Sebastian S, Salamipour H, Chapter 12, page 197*

Table 2. Scanning protocol for extremity trauma with AutomA technique on a 16-slice MDCT scanner (GE Healthcare)

Noise index	15–20
Tube current range	75–440
Gantry rotation time	0.5 s
Voltage	120 kVp
Beam pitch	0.938:1
Table speed	18.75 mm/rotation
Detector configuration	16×1.25 mm
Reconstructed slice thickness	1.25–2.5 mm (soft tissue & bone algorithm)