Brain - general

Preparatory steps

Indication	Traumatic lesions of the brain. Suspected or known focal or diffuse structural disease when MRI is contra-indicated or not available.
Advisable preliminary or alternative investigations	Clinical neurological examination. MRI is an alternative examination without exposure to ionising radiation.
Patient preparation	Appropriate consent. Exclude radiodense items, whenever possible.
Scan projection radiograph	Lateral: skull base to vertex.

Acquisition objectives

Target volume	Entire brain. Where possible, gantry angulation and appropriate head positioning should be applied to minimise exposure to the eye lenses.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small - medium (< 1 mm; 1 - 2.5 mm)
Pitch	Low (< 0.9)
CTDI volume	< 60 mGy; high (head phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Viewing slice thickness defines exposure parameters. MPR is not obligatory, but may facilitate evaluation of lesions; this requires thin collimation and thin primary sections.

Primary reconstruction section thickness	Adapted to beam collimation (in case of MPR).
Overlap of primary reconstruction	0-50%
Reconstruction algorithm	Soft tissue smooth
Field of view	Corresponding to head
Viewing slice thickness	Medium.
Overlap of viewing slices	None required.

Brain - general

Image quality criteria, visualization	1. Entire cerebrum. 2. Entire cerebellum and brain stem
Image quality criteria, critical reproduction	1. Reproduction of the border between white and grey matter. 2. Reproduction of the basal ganglia. 3. Sharp reproduction of the ventricular system. 4. Sharp reproduction of major vessels after intravenous contrast (enhanced slices).
Contrast media	Enhancement may be valuable for delineating lesions.
Dose and concentration	50-100 ml, 300 mgI/ml.
Flow rate	Not critical.
Delay and timing	60-120s depending on suspected pathology.
Modification to technique	Additional slices may be reconstructed with an appropriate algorithm to evaluate osseous structures. The target volume may be extended to include the cervical spine and/or face in trauma patients with suspected pathology. On some systems only non-helical scanning (incremental acquisition) provides adequate image quality

Brain - petrous temporal bone

Preparatory steps

Indication	Chronic otitis media; conductive hearing loss; congenital malformations and neoplasms of the ear; facial nerve pathology and petrous bone trauma.
Advisable preliminary or alternative investigations	MRI may provide a preferable investigation in selected cases of neoplasm, including pulsatile tinnitus
Patient preparation	Appropriate consent. Exclude radiodense items whenever possible
Scan projection radiograph	Lateral: vertex of skull to angle of mandible.

Acquisition objectives

Target volume	Entire petrous temporal bone.
Image weighting	Spatial resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice small (< 1 mm); 16 slice small (< 1 mm)
Pitch	Low (< 0.9)
CTDI volume	< 60 mGy; high (head phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Image reconstruction	Viewing slice thickness defines exposure parameters. MPR is recommended
Primary reconstruction section thickness	Small
Overlap of primary reconstruction	0-50%
Reconstruction algorithm	Ultra high
Field of view	Smallest to include individual petrous bones, to improve spatial resolution
Viewing slice thickness	Small
Overlap of viewing slices	0 – 50%

Brain - petrous temporal bone

Image quality criteria, visualization	1. Entire petrous bones.
Image quality criteria, critical reproduction	1. Sharp reproduction of margins of mastoid air cells 2. Sharp reproduction of the auditory ossicles (if present). 3. Sharp reproduction of facial canal, labyrinth and aqueduct
Contrast media	Not usually required
Modification to technique	Contrast media may be required in evaluating inflammatory masses, neoplasms and pulsatile tinnitus. Examination should be extended to include the upper neck in cases of tinnitus.

Face - sinuses

Preparatory steps

Indication	Assessment of extent of inflammatory disease and neoplasms (facial trauma is considered elsewhere).
Advisable preliminary or alternative investigations	None required. MRI offers an alternative examination without exposure to ionising radiation in the staging of tumours and in selected cases of inflammatory disease.
Patient preparation	Appropriate consent. Exclude radiodense items whenever possible. Ephidrine nose drops may be given, unless clinically contraindicated.
Scan projection radiograph	Lateral: vertex of skull to angle of mandible

Acquisition objectives

Target volume	Sinuses from superior limit of frontal sinuses to the hard palate (axial acquisition).
Image weighting	Spatial resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice small (< 1 mm); 16 slice small (< 1 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	< 20 mGy; low (head phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Viewing slice thickness defines radiation exposure parameters. Coronal MPR is mandatory

Primary reconstruction section thickness	Small
Overlap of primary reconstruction	0-50%
Reconstruction algorithm	High resolution
Field of view	To include all sinuses
Viewing slice thickness	Medium
Overlap of viewing slices	0 – 50%

Face - sinuses

Image quality criteria, visualization	1. Sinuses 2. Nasal cavity
Image quality criteria, critical reproduction	1. Sharp reproduction of normal cortical bone 2. Sharp reproduction of the osteomeatal complex. 3. Sharp reproduction of the lamina papyracea 4. Reproduction of the cribriform plate 5. Sharp reproduction of the air-mucosa interface
Contrast media	Not usually required.
Modification to technique	Delineation of neoplasms may require standard soft tissue algorithm and use of contrast enhancement, and the examination should be extended to include cervical nodes Direct coronal examination is recommended where sharp reproduction of the cribriform plate is essential to the indication.

Face - trauma

Preparatory steps

Indication	Facial trauma, facial deformity
Advisable preliminary or alternative investigations	Radiography.
Patient preparation	Appropriate consent. Exclude radiodense items wherever possible
Scan projection radiograph	Lateral: skull vertex to mid neck

Acquisition objectives

Target volume	Entire facial and mandibular skeleton.
Image weighting	Spatial resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice small (< 1 mm); 16 slice small (< 1 mm)
Pitch	Low (< 0.9)
CTDI volume	< 20 mGy; low (head phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Viewing slice thickness defines exposure parameters. MPR and 3D reconstructions are valuable

Primary reconstruction section thickness	Small
Overlap of primary reconstruction	0-30%
Reconstruction algorithm	High resolution
Field of view	Corresponding to all facial and mandibular structures
Viewing slice thickness	Small
Overlap of viewing slices	

Face - trauma

Image quality criteria, visualization	1. Entire face 2. Entire mandible 3. All sinuses 4. Temporomandibular joint.
Image quality criteria, critical reproduction	1. Sharp reproduction of normal cortical bone. 2. Sharp reproduction of trabecular bone 3. Sharp reproduction of the of lamina papyracea 4. Reproduction of the cribriform plate 5. Sharp reproduction of the nasolacrimal duct 6. Sharp reproduction of the optical canal
Contrast media	None.
Modification to technique	The target volume may be limited in clinically limited fractures, for example blow-out fractures of the orbit. The target volume should be extended to include the calvarium and brain in suspected cerebral trauma, using reconstruction parameters appropriate to both areas. The target volume may be extended to include the cervical spine in suspected cervical trauma. A similar protocol may be used for dental implant scanning, limiting the target volume to the upper or lower teeth and alveoli. Target volume should include the calvarium in examinations prior to surgical correction of craniofacial deformity.

Face - masses & cervical nodes

Preparatory steps

Indication	Diagnosis of masses arising from face and neck; demonstration of cervical lymphadenopathy including staging of cervicofacial neoplasms.
Advisable preliminary or alternative investigations	Ultrasonography and MRI are alternative examination without exposure to ionising radiation
Patient preparation	Appropriate consent. Radiodense items should be excluded wherever possible
Scan projection radiograph	Lateral: vertex of skull to manubrium sterni.

Acquisition objectives

Target volume	Facial and cervical contents as appropriate to indication.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients. The thyroid or eye lens should be excluded from the target volume wherever permitted by the clinical indication.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	< 40 mGy; medium (head phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Image reconstruction	Viewing slice thickness defines radiation parameters. MPR is not obligatory but may facilitate evaluation of lesions; this requires small primary reconstruction section thickness.
Primary reconstruction section thickness	Medium (small for MPR)
Overlap of primary reconstruction	0-50%
Reconstruction algorithm	Soft tissue standard
Field of view	Corresponding to entire cross-section of face and neck
Viewing slice thickness	Medium
Overlap of viewing slices	0-30%

Face - masses & cervical nodes

Image quality criteria, visualization	1. All soft tissues and related skeleton appropriate to the indication
Image quality criteria, critical reproduction	1. Sharp reproduction of major vessels of the face and/or neck. 2. Sharp reproduction of the air–tissue interface 3. Sharp reproduction of fat-muscle interface
Contrast media	Enhancement is mandatory.
Dose and concentration	50 – 100ml, 300 mgI/ml contrast media.
Flow rate	Not critical
Delay and timing	60 – 120s
Modification to technique	Examination with an open mouth may be used to avoid artefact from dental fillings in the area of interest Exposure with an open mouth or with oral Valsalva manœvre may be used to separate nasopharyngeal folds

Chest - pulmonary metastases

Preparatory steps	
Indication	M staging of neoplasms metastasising to chest
Advisable preliminary or alternative investigations	Examination may not be required if preliminary chest radiograph demonstrates metastases.
Patient preparation	Appropriate consent. Radiodense items should be excluded wherever possible.
Scan projection radiograph	Frontal: lower neck to upper abdomen.
Acquisition objectives	
Target volume	Entire lungs from pulmonary apex to posterior costo-phrenic recesses.
Image weighting	Spatial resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 Slice medium (1 - 2.5 mm)
Pitch	Medium - high (0.9 - 1.3; >1.3)
CTDI volume	< 10 mGy; low (trunk phantom)
Tube voltage	Medium (110 – 130 kV)
Image reconstruction	Viewing slice thickness defines exposure parameters. MPR be valuable in equivocal findings
Primary reconstruction section thickness	Medium
Overlap of primary reconstruction	0-50%
Reconstruction algorithm	Soft tissue standard
Field of view	To include all cross-section of lung
Viewing slice thickness	Medium
Overlap of viewing slices	0 – 50%

Chest - pulmonary metastases

Image quality criteria, visualization	1. Entire field of lung parenchyma 2. Entire pleura.
Image quality criteria, critical reproduction	1. Sharp reproduction of trachea and central bronchial wall 2. Sharp reproduction of pleural margins 3. Reproduction of small vessels within 1cm from the pleural surface 4. Reproduction of pulmonary fissures
Contrast media	None
Modification to technique	If examination of mediastinal content is also required, enhancement is indicated and the appropriate protocol should be selected. Target volume may be extended, with appropriate enhancement and parameters, to include other areas of suspected metastases

Chest - mediastinum or survey

Preparatory steps

Indication	Diagnosis, staging and monitoring of mediastinal and pleural masses, lymph node disease, infection or traumatic lesions, including evaluation of pulmonary hila (examination of great vessels is included under CTPA).
Advisable preliminary or alternative investigations	Chest radiography. MRI is an alternative examination, especially in children and young adults. PET is valuable in selected clinical problems
Patient preparation	Appropriate consent. Exclude radiodense items whenever possible
Scan projection radiograph	Frontal; lower neck to mid abdomen

Acquisition objectives

Target volume	Entire chest contents.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice medium (1 - 2.5 mm)
Pitch	Medium - high (0.9 – 1.3; >1.3)
CTDI volume	< 10 mGy; low (trunk phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Viewing slice thickness defines exposure parameters. MPR is not obligatory but may facilitate evaluation of lesions, especially hila

Primary reconstruction section thickness	Adapted to beam collimation
Overlap of primary reconstruction	0-30%
Reconstruction algorithm	Soft tissue standard
Field of view	Adapted to include whole cross-section of chest
Viewing slice thickness	Medium.
Overlap of viewing slices	0-30%

Chest - mediastinum or survey

Image quality criteria, visualization	1. Entire chest from apex to posterior costophrenic recesses 2. Entire chest wall including adjacent muscles
Image quality criteria, critical reproduction	1. Sharp reproduction of major mediastinal vessels 2. Sharp reproduction of pleuromediastinal margin 3. Sharp reproduction of endotracheal and endobronchial margins 4. Reproduction of intrathoracic oesophagus 5. Sharp reproduction of major mediastinal vessels 6. Sharp reproduction of pleuromediastinal margin 7. Sharp reproduction of endotracheal and endobronchial margins
Contrast media	Enhancement is mandatory. Unenhanced images are valuable also for characterising lesions
Dose and concentration	80-150 ml, 300 mg I/ml.
Flow rate	2-3m/s (critical only when examining major vessels).
Delay and timing	15-25s
Modification to technique	Target volume may be limited in selected cases, according to clinical indication

Chest - parenchyma (HRCT)

Preparatory steps	
Indication	Detection and characterisation of diffuse parenchymal lung disease, including emphysema and bronchiectasis.
Advisable preliminary or alternative investigations	Chest radiography and respiratory function tests
Patient preparation	Appropriate consent. Exclude radiodense items whenever possible
Scan projection radiograph	Frontal: lower neck to upper abdomen.
Acquisition objectives	
Target volume	From 2 – 3cm below pulmonary apex to half way between the dome of diaphragm and the posterior costophrenic angle.
Image weighting	Spatial resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice small (< 1 mm); 16 slice small (< 1 mm)
Pitch	Not applicable: incremental exposure
CTDI volume	< 10 mGy; low (trunk phantom)
Tube voltage	Medium (110 – 130 kV)
Image reconstruction	Collimation defines slice thickness and spatial resolution
Primary reconstruction section thickness	Small
Overlap of primary reconstruction	Overlap does not apply: sections are acquired at 10-15mm intervals
Reconstruction algorithm	High resolution
Field of view	Maximum diameter of lungs
Viewing slice thickness	Primary reconstruction is used for viewing
Overlap of viewing slices	Not applicable

Chest - parenchyma (HRCT)

Image quality criteria, visualization	1. Entire cross-section of lung parenchyma
Image quality criteria, critical reproduction	1. Sharp reproduction of pulmonary fissures 2. Sharp reproduction of small pulmonary vessels within 1cm off the pleura 3. Sharp reproduction of bronchial walls within 3cm from the chest wall.
Contrast media	None
Modification to technique	Examination may be repeated in expiration at 2 – 3cm intervals, to assess air trapping Examination may be repeated prone at 2 – 3cm intervals, to assess gravity-dependent disease. Examination may be additionally performed at 2 – 3cm intervals in expiration and lateral decubitus in cases of severe/unusual air-trapping Images may be reconstructed of individual lungs to improve spatial resolution

Abdomen and pelvis - general

Preparatory steps

Indication	Diagnosis of intra-abdominal pathology, abdominal staging and monitoring of malignant disease, trauma
Advisable preliminary or alternative investigations	Ultrasonography or MRI may be alternative examinations
Patient preparation	Appropriate patient consent. Exclude radiodense items, whenever possible. Barium residue from previous gastrointestinal studies may preclude CT. Oral contrast media or water may be used for gastro- intestinal demarcation. Rectal contrast media may be applied selectively
Scan projection radiograph	Frontal: mid chest to upper thigh

Acquisition objectives

Target volume	From diaphragm to inferior border of the pubic symphysis.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size.
Beam collimation	4 slice medium - large (1 - 2.5 mm; > 2.5 mm); 16 slice small - medium (< 1 mm; 1 - 2.5 mm)
Pitch	Medium - high (0.9 - 1.3; >1.3)
CTDI volume	< 15 mGy; medium (trunk phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Viewing slice thickness defines exposure parameters. MPR is not obligatory but may facilitate evaluation of lesions

Primary reconstruction section thickness	Adapted to beam collimation
Overlap of primary reconstruction	0-50%
Reconstruction algorithm	Soft tissue standard
Field of view	Corresponding to the abdominal region
Viewing slice thickness	Medium - large
Overlap of viewing slices	0 – 30%

Abdomen and pelvis - general

Image quality criteria, visualization	1. Entire abdominal contents 2. Entire diaphragms 3. Entire bladder 4. Abdominal wall muscles
Image quality criteria, critical reproduction	1. Sharp reproduction of the gall bladder wall and major intrahepatic ducts (enhanced slices). 2. Sharp reproduction of the intrapancreatic part of the common bile duct (enhanced slices). 3. Sharp reproduction of major branches of the abdominal aorta (enhanced slices). 4. Sharp reproduction of renal pelvis and perirenal fascia 5. Sharp reproduction of urinary bladder wall (enhanced slices) 6. Reproduction of vessels in the liver (unenhanced slices: veins)
Contrast media	Enhancement may increase sensitivity and specificity.
Dose and concentration	80-120ml, 300mg I/ml
Flow rate	2-3ml/s, preferably by power injector
Delay and timing	60 - 80s (“portal phase”)
Modification to technique	In suspected abdominal hemorrhage, unenhanced imaging is recommended Target volume of interest may be limited in selected cases according to clinical indication In cases of trauma the entire osseous pelvis may be included In cases of osseous pathology (esp. in trauma cases), additional bone algorithm reconstructions may be applied

Abdomen - kidneys

Preparatory steps

Indication	Diagnosis, staging and monitoring of focal renal and perirenal lesions. Rarely indicated in paediatric patients
Advisable preliminary or alternative investigations	Ultrasonography. MRI is an alternative examination, especially in paediatric and young adult patients.
Patient preparation	Appropriate patient consent. Exclude radiodense items, wherever possible
Scan projection radiograph	Frontal: lower chest to hip joints

Acquisition objectives

Target volume	Entire kidneys including adrenals.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	< 15 mGy; medium (trunk phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Image reconstruction	Viewing slice thickness defines exposure parameters. MPR is not obligatory but may facilitate evaluation of lesions
Primary reconstruction section thickness	Adapted to beam collimation
Overlap of primary reconstruction	0-50%
Reconstruction algorithm	Soft tissue standard
Field of view	Both kidneys and perirenal spaces
Viewing slice thickness	Medium
Overlap of viewing slices	0 – 30%.

Abdomen - kidneys

Image quality criteria, visualization	1. Both perirenal spaces 2. Visualisation of both kidneys and adrenals
Image quality criteria, critical reproduction	1. Sharp reproduction of the renal pelvis and the proximal ureters 2. Sharp reproduction of the adrenal glands 3. Sharp reproduction of the perirenal fascia 4. Sharp reproduction of the renal vessels up to the hilum (enhanced slices) 5. Sharp reproduction of the renal cortex (arterial phase enhanced slices) 6. Sharp reproduction of the internal surface of the renal pelvis (late excretory phase enhanced slices)
Contrast media	Unenhanced and enhanced examination is recommended for characterization of disease. Depending on indication arterial, nephrographic or excretory phases may be recommended
Dose and concentration	40-80ml, 300mg I/ml.
Flow rate	2-5ml/s, preferably by power injector
Delay and timing	15 – 25s (arterial phase); 80 – 120s (for nephrographic phase); > 240 s (excretory phase).
Modification to technique	In follow-up examinations of known lesions, only enhanced CT sections may be applied. In appropriate indications, the entire urether and bladder should be included in the target volume at appropriate state of enhancement of the urine. For staging and monitoring of malignant disease, the target volume of the late phase may be extended according to the “abdomen-pelvis survey” protocol

Abdomen – urolithiasis

Preparatory steps

Indication	Detection, localisation, exclusion and monitoring of urolithiasis with calcified or non-calcified urinary stones
Advisable preliminary or alternative investigations	Ultrasonography and / or plain film of the abdomen in cases of known calcified stones
Patient preparation	Appropriate patient consent. Exclude radiodense items, wherever possible. Water as negative oral contrast media may be helpful in patients with reduced abdominal fat
Scan projection radiograph	Frontal: from xyphoid to upper thigh

Acquisition objectives

Target volume	From upper pole of the kidneys to floor of urinary bladder.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small - medium (< 1 mm; 1 - 2.5 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	< 15 mGy; medium (trunk phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Image reconstruction	Viewing slice thickness defines exposure parameters. MPR is not obligatory but may help to discriminate between calculus and phlebolith
Primary reconstruction section thickness	Adapted to beam collimation
Overlap of primary reconstruction	30-50%
Reconstruction algorithm	Soft tissue standard
Field of view	Both kidneys
Viewing slice thickness	Medium
Overlap of viewing slices	0 - 30%

Abdomen – urolithiasis

Image quality criteria, visualization	1. Entire renal parenchyma of both kidneys 2. Both perirenal spaces 3. Entire length of both ureters 4. Entire urinary bladder
Image quality criteria, critical reproduction	1. Sharp reproduction of the renal pelvis 2. Reproduction of both ureters 3. Reproduction of the urinary bladder wall
Contrast media	None
Modification to technique	Following detection of focal pathologies other than urolithiasis, enhanced CT protocols of the suspected area may be applied (see protocols “abdomen-pelvis survey” or “kidneys”).

Abdomen - pancreas

Preparatory steps

Indication	Diagnosis, staging and monitoring of pancreatic tumours.
Advisable preliminary or alternative investigations	Ultrasonography. MRI is an alternative examination without exposure to ionising radiation.
Patient preparation	Appropriate consent. Exclude radiodense items, whenever possible. Oral contrast media or preferably water for gastro-intestinal demarcation.
Scan projection radiograph	Frontal: lower chest to iliac crest.

Acquisition objectives

Target volume	Entire pancreas and liver.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	< 25 mGy; high (trunk phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Viewing slice thickness defines exposure parameters. MPR is recommended for assessment of vascular invasion. This requires thin collimation and thin primary reconstruction section thickness.

Primary reconstruction section thickness	Adapted to beam collimation
Overlap of primary reconstruction	0-50%
Reconstruction algorithm	Soft tissue standard
Field of view	Corresponding to abdominal region. Additional target reconstruction of the pancreas may be performed
Viewing slice thickness	Medium
Overlap of viewing slices	0-50 %

Abdomen - pancreas

Image quality criteria, visualization

1. Entire pancreas
2. Entire liver
3. Entire duodenum

Image quality criteria, critical reproduction

1. Sharp reproduction of the gallbladder wall and major intrahepatic biliary ducts.
2. Sharp reproduction of the peripancreatic vessels.
3. Sharp reproduction of the normal adrenal glands.
4. Sharp reproduction of the intrapancreatic part of the common bile duct.
5. Sharp reproduction of the pancreatic duct.

Contrast media

Intravenous contrast media are mandatory for adequate detection and staging of pancreatic tumours. A low dose unenhanced scan to localize the extent of the pancreas may be performed prior to the administration of contrast media.

Dose and concentration	120-150 ml 300 mg I/ml
Flow rate	3-5 ml/s by power injector
Delay and timing	The optimal phase in case of adenocarcinoma is the pancreatic parenchyma phase (delay 40-50 s). In cases of islet cell tumours, the optimal phase is the early arterial phase (delay 20-30 s). A portal venous phase may be added to better delineation of venous structures in relation to the pancreas and to search for liver metastases (delay 60-80 s).

Modification to technique

To screen the whole abdomen and pelvis for metastases, the volume may be extended to include the rest of the abdomen and pelvis.
For pancreatitis or pancreatic trauma, see: Abdomen & pelvis - survey.

Abdomen - adrenal glands

Preparatory steps

Indication	Characterisation of adrenal masses or assessment of the adrenal glands in patients with impairment of adrenal function.
Advisable preliminary or alternative investigations	MRI is an alternative examination without exposure to ionising radiation and is preferred in cases of pheochromocytoma.
Patient preparation	Appropriate consent. Exclude radiodense items, whenever possible. Oral contrast media or water for gastro-intestinal demarcation.
Scan projection radiograph	Frontal: mid chest to iliac crest.

Acquisition objectives

Target volume	Both adrenal glands.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	< 25 mGy; high (trunk phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Image reconstruction	Viewing slice thickness defines radiation parameters. MPR may facilitate evaluation of lesions; this requires thin collimation and thin primary section thickness.
Primary reconstruction section thickness	Adapted to beam collimation
Overlap of primary reconstruction	0-50 %
Reconstruction algorithm	Soft tissue standard
Field of view	Corresponding to abdominal region. Additional target reconstruction of the adrenal glands may be performed
Viewing slice thickness	Medium
Overlap of viewing slices	0-50 %

Abdomen - adrenal glands

Image quality criteria, visualization	1. Both adrenal glands entirely
Image quality criteria, critical reproduction	1. Sharp reproduction of the adrenal glands (unenhanced and enhanced scan) 2. Sharp reproduction of the major branches of the abdominal aorta (unenhanced and enhanced scan) 3. Sharp reproduction of the intrapancreatic part of the common bile duct (enhanced scan) 4. Sharp reproduction of the pancreatic duct (enhanced scan) 5. Sharp reproduction of gallbladder wall (enhanced scan) 6. Reproduction of hepatic veins (unenhanced scan)
Contrast media	Contrast media are not necessary in most cases of endocrine dysfunction. In cases of incidental masses, discovered on other imaging studies, an unenhanced scan allows differentiation between lipid-rich adenomas (<3 cm, oval shape, sharply delineated, <10 HU) and the rest. Contrast media may be helpful to differentiate between lipid-poor adenomas and malignant lesions: the degree of washout of intravenously administered contrast media is reliable in most cases.
Dose and concentration	80-100 ml 300 mg I/ml
Flow rate	2-4 ml/s
Delay and timing	Both a parenchymal phase (50-70 s delay) and a washout phase (10-15 min)
Modification to technique	In patients with pheochromocytoma, the volume may be extended to include the rest of the abdomen and pelvis.

Abdomen - liver & spleen

Preparatory steps

Indication	Suspected or known focal liver lesions.
Advisable preliminary or alternative investigations	Ultrasonography. MRI is an alternative examination without exposure to ionising radiation.
Patient preparation	Appropriate consent. Exclude radiodense items, whenever possible.
Scan projection radiograph	Frontal: mid chest to iliac crest.

Acquisition objectives

Target volume	Entire liver and spleen.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	< 25 mGy; high (trunk phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction	Viewing slice thickness defines exposure parameters. MPR is not obligatory, but may facilitate evaluation of lesions.
Primary reconstruction section thickness	Adapted to beam collimation (in case of MPR)
Overlap of primary reconstruction	0-50 %
Reconstruction algorithm	Soft tissue standard
Field of view	Corresponding to the abdominal region
Viewing slice thickness	Medium
Overlap of viewing slices	0-50 %

Image quality criteria, visualization

1. Entire liver
2. Entire spleen

Image quality criteria, critical reproduction

1. Sharp reproduction of the major branches of the abdominal aorta (unenhanced and enhanced scan)
2. Sharp reproduction of the adrenal glands (unenhanced scan)

Abdomen - liver & spleen

Image quality criteria, critical reproduction	3. Sharp reproduction of the intrapancreatic part of the common bile duct (enhanced scan) 4. Sharp reproduction of the gallbladder wall (enhanced scan) 5. Sharp reproduction of the pancreatic duct (enhanced scan) 6. Reproduction of the hepatic veins (unenhanced scan)
Contrast media	Intravenous contrast media increase the diagnostic accuracy (sensitivity, specificity and confidence level) in patients with focal liver lesions, when scanned properly. Unenhanced scans of the liver are helpful in patients with cirrhosis, and may be the only series acquired in patients with large masses in whom invasive therapy is not considered. Intravenous contrast media are mandatory in patients in whom information of the exact number, location and extension of lesions is essential for choice of therapy. In monitoring patients with known liver lesions, it is important to choose the identical protocol as the previous study for comparison, or at least the contrast enhancement phase that optimally showed the lesions on the previous study. The portal venous phase (delay 60-80 s) is optimal in detecting hypovascular metastases. The combination of late arterial phase (delay 30-35 s) and portal venous phase is optimal in patients with cirrhosis or hypervascular primary and secondary liver lesions.
Dose and concentration	120-150 ml 300 mg I/ml
Flow rate	3-5 ml/s
Delay and timing	See above
Modification to technique	To screen the whole abdomen and pelvis for metastases, the volume may be extended to include the rest of the abdomen and pelvis.

Vascular - chest - CTPA

Preparatory steps

Indication	Diagnosis of pulmonary embolism; evaluation of suspected or known major vessel aneurysm, dissection or congenital anomaly
Advisable preliminary or alternative investigations	Chest radiography including lateral projection. MRI or transoesophageal ultrasonography may be alternative examinations for major vessels.
Patient preparation	Appropriate consent. Exclude radiodense items whenever possible
Scan projection radiograph	Frontal, lower neck to upper abdomen

Acquisition objectives

Target volume	All chest from apex to costophrenic recess.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Medium - high (0.9 – 1.3; >1.3)
CTDI volume	< 10 mGy; low (trunk phantom)
Tube voltage	Low - medium (< 110 kV; 110 – 130 kV)

Image reconstruction

Viewing slice thickness defines exposure parameters. MPR, 3D or MIP may facilitate evaluation and are recommended for visualization of major vessels.

Primary reconstruction section thickness	Medium
Overlap of primary reconstruction	0-30%
Reconstruction algorithm	Soft tissue standard
Field of view	Adapted to include whole cross-section of chest
Viewing slice thickness	Medium
Overlap of viewing slices	0-30%

Vascular - chest - CTPA

Image quality criteria, visualization	1. Entire thoracic aorta and origin of the supra-aortic vessels 2. Entire heart
Image quality criteria, critical reproduction	1. Reproduction of thoracic aorta 2. Reproduction of small vessels within 1cm from the pleural surface 3. Sharp reproduction of large and medium sized vessels 4. Sharp reproduction of pleura and mediastinal margin. 5. Sharp reproduction of endobronchial and endotracheal wall
Contrast media	Mandatory. Appropriately timed bolus enhancement is essential
Dose and concentration	80 – 100ml, 370mgI/ml
Flow rate	4-5ml/s, preferably by power injector.
Delay and timing	15 – 25s
Modification to technique	When examining disease of major vessels FOV may be limited to include these and the hilar. Unenhanced acquisition of the aorta is warranted to rule out intramural haematoma in aortic dissection Automatic timing is valuable to avoid untimely acquisition due to variations in cardiac output. In cases of aortic dissection target volume may be extended to include abdominal and pelvic arteries

Vascular - abdomen

Preparatory steps

Indication	Aortic aneurysm or dissection, mesenteric ischaemia.
Advisable preliminary or alternative investigations	Ultrasonography or MRI provide alternative examinations
Patient preparation	Appropriate consent. Exclude radiodense items, whenever possible.
Scan projection radiograph	Frontal: lower chest to pelvic symphysis

Acquisition objectives

Target volume	Entire abdominal and pelvic contents.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Medium - high (0.9 - 1.3; >1.3)
CTDI volume	< 15 mGy; medium (trunk phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Viewing slice thickness defined exposure parameters. MPR, 3D or MIP are usually applied and define beam collimation

Primary reconstruction section thickness	Medium
Overlap of primary reconstruction	0-30%
Reconstruction algorithm	Soft tissue standard
Field of view	Corresponding to entire abdominal region
Viewing slice thickness	Medium
Overlap of viewing slices	Not essential

Vascular - abdomen

Image quality criteria, visualization	1. Entire abdominal aorta from diaphragmatic hiatus to bifurcation 2. Iliac and femoral arteries to level of groin 3. Entire abdominal contents
Image quality criteria, critical reproduction	1. Sharp reproduction of superior mesenteric artery to level of iliocolic artery 2. Sharp reproduction of abdominal aorta and birfurcation 3. Sharp reproduction of renal arteries to hilum 4. Sharp reproduction of iliac bifurcation and splenic artery to splenic hilum. 5. Sharp reproduction of celiac trunk
Contrast media	Mandatory. Appropriately timed bolus enhancement is essential
Dose and concentration	80 – 100ml, 370mg I/ml
Flow rate	4ml/s, preferably by power injector
Delay and timing	15-25s
Modification to technique	In cases of suspected mesenteric ischaemia thinner sections may be obtained, with overlap Target volume may be limited in selected cases, according to clinical indication Automatic timing is valuable to avoid untimely acquisition due to variations in cardiac output.

Vascular - peripheral

Preparatory steps

Indication	Peripheral vascular disease
Advisable preliminary or alternative investigations	Duplex sonography or MR angiography are alternatives without exposure to ionising radiation
Patient preparation	Appropriate consent. Exclude radiodense items whenever possible.
Scan projection radiograph	Frontal: lower abdomen to ankles

Acquisition objectives

Target volume	Entire pelvis and legs.
Image weighting	Contrast resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Medium - high (0.9 - 1.3; >1.3)
CTDI volume	< 15 mGy; medium (trunk phantom)
Tube voltage	Low - medium (< 110 kV; 110 – 130 kV)

Image reconstruction

Image reconstruction	MPR, 3D or MIP are usually essential and defines beam collimation
Primary reconstruction section thickness	Small – medium
Overlap of primary reconstruction	0-50%
Reconstruction algorithm	Soft tissue standard
Field of view	Corresponding to pelvis
Viewing slice thickness	Small
Overlap of viewing slices	Not essential

Vascular - peripheral

Image quality criteria, visualization	1. Inferior lumbar aorta and aortic bifurcation 2. Major arteries of pelvis. 3. Major arteries of upper and lower leg
Image quality criteria, critical reproduction	1. Sharp reproduction of arteries at ankle (if patent). 2. Sharp reproduction of arteries of bifurcation 3. Sharp reproduction of femoral arteries
Contrast media	Mandatory. Appropriately timed bolus enhancement is essential
Dose and concentration	100ml, 370mgI/ml
Flow rate	4ml/s, preferably by power injector
Delay and timing	20 – 30s
Modification to technique	Automatic timing is valuable to avoid untimely acquisition due to variations in cardiac output

Cervical vertebrae - trauma

Preparatory steps

Indication	Main indication are traumatic disorders. Similar technique can be used for bone tumours, degenerative, infectious, arthritic and osteonecrotic alterations.
Advisable preliminary or alternative investigations	Conventional radiography; MRI or US are alternative examinations, especially in non-traumatic disorders.
Patient preparation	Appropriate consent. Exclude radiodense items, whenever possible.
Scan projection radiograph	Lateral: forehead to manubrium sterni.

Acquisition objectives

Target volume	Entire cervical spine.
Image weighting	Spatial resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Low - medium (< 0.9; 0.9 - 1.3)
CTDI volume	< 40 mGy; medium (head phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Image reconstruction	Viewing slice thickness defines exposure parameters. Surface reconstruction and MPR may facilitate evaluation of lesions and are recommended. This requires thin primary reconstruction section thickness.
Primary reconstruction section thickness	Adapted to beam collimation.
Overlap of primary reconstruction	0-50%.
Reconstruction algorithm	High resolution
Field of view	Corresponding to all cross section of the spine including adjacent muscles
Viewing slice thickness	Medium – small.
Overlap of viewing slices	0 – 25%.

Cervical vertebrae - trauma

Image quality criteria, visualization	1. The entire cervical spine.
Image quality criteria, critical reproduction	1. Sharp reproduction of cortical bone. 2. Sharp reproduction of trabecular bone. 3. Sharp reproduction of the intervertebral joints. 4. Sharp reproduction of the intervertebral radicular canals. 5. Sharp reproduction of the intervertebral disk profiles.
Contrast media	Usually not indicated, but enhancement may be useful for delineating soft tissue lesions in selected patients.
Dose and concentration	60-100 ml, 300 mgI/ml.
Flow rate	2-4 ml/s, preferably by power injector.
Delay and timing	40-80s depending on suspected pathology.
Modification to technique	Additional slices may be reconstructed with an appropriate FOV and algorithm to evaluate soft tissues. The target volume may be limited or extended according to clinical indication.

Lumbar and thoracic spine - trauma

Preparatory steps

Indication	Main indication are traumatic disorders. Similar technique can be used for bone tumours, degenerative, infectious, arthritic and osteonecrotic changes.
Advisable preliminary or alternative investigations	Conventional radiography; MRI or US are alternative examinations, especially in non-traumatic disorders.
Patient preparation	Appropriate consent. Exclude radiodense items, whenever possible.
Scan projection radiograph	Lumbar spine: lateral – mid chest to hip joints.Thoracic spine: frontal – thyroid cartilage to mid lumbar spine.

Acquisition objectives

Target volume	Area of lumbar or thoracic spine suspect of pathology.
Image weighting	Spatial resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	< 15 mGy; medium (trunk phantom)
Tube voltage	Medium - high (110 – 130 kV; > 130 kV)

Image reconstruction

Viewing slice thickness defines exposure parameters. Surface reconstruction and MPR may facilitate evaluation of lesions and are recommended. This requires thin primary reconstruction section thickness.

Primary reconstruction section thickness	Adapted to beam collimation.
Overlap of primary reconstruction	0-50%.
Reconstruction algorithm	High resolution
Field of view	Corresponding to all cross section of the spine including adjacent muscles
Viewing slice thickness	Medium.
Overlap of viewing slices	0 – 25%.

Lumbar and thoracic spine - trauma

Image quality criteria, visualization	1. The areas of lumbar or thoracic spine which are suspect of pathology.
Image quality criteria, critical reproduction	1. Sharp reproduction of cortical bone. 2. Sharp reproduction of trabecular bone. 3. Sharp reproduction of the intervertebral joints. 4. Sharp reproduction of the intervertebral radicular canals. 5. Sharp reproduction of the intervertebral disk profiles.
Contrast media	Usually not indicated, but enhancement may be useful for delineating soft tissue lesions in selected patients.
Dose and concentration	60-100 ml, 300 mgI/ml.
Flow rate	2-4 ml/s, preferably by power injector.
Delay and timing	40-80s depending on suspected pathology.
Modification to technique	Additional slices may be reconstructed with an appropriate FOV and algorithm to evaluate soft tissues. The target volume may be extended according to clinical indication.

Pelvis - bone

Preparatory steps

Indication	Main indication is traumatic disorders. Similar technique can be used for bone tumours, degenerative, infectious, arthritic and osteonecrotic changes.
Advisable preliminary or alternative investigations	Conventional radiography; MRI or US are alternative examinations, especially in non-traumatic disorders.
Patient preparation	Appropriate consent. Exclude radiodense items, whenever possible.
Scan projection radiograph	Frontal: mid abdomen to upper thigh.

Acquisition objectives

Target volume	Entire pelvic ring.
Image weighting	Spatial resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	< 15 mGy; medium (trunk phantom)
Tube voltage	Medium - high (110 – 130 kV; > 130 kV)

Image reconstruction

	Viewing slice thickness defines exposure parameters. Surface reconstruction and MPR may facilitate evaluation of lesions and are recommended. This requires thin primary reconstruction section thickness.
Primary reconstruction section thickness	Adapted to beam collimation.
Overlap of primary reconstruction	0-50%.
Reconstruction algorithm	High resolution
Field of view	Corresponding to all cross section of the pelvic bones
Viewing slice thickness	Medium.
Overlap of viewing slices	0 – 25%.

Pelvis - bone

Image quality criteria, visualization	1. Whole osseous pelvic ring. 2. Iliac crests. 3. Hips, including trochanter region.
Image quality criteria, critical reproduction	1. Sharp reproduction of cortical bone. 2. Sharp reproduction of trabecular bone. 3. Sharp reproduction of the sacroiliac joint spaces 4. Sharp reproduction of the symphysis. 5. Sharp reproduction of the hip jont spaces.
Contrast media	Usually not indicated, but enhancement may be useful for delineating soft tissue lesions in selected patients.
Dose and concentration	60-100 ml, 300 mgI/ml.
Flow rate	2-4 ml/s, preferably by power injector.
Delay and timing	60-80s depending on suspected pathology.
Modification to technique	Additional slices may be reconstructed with an appropriate FOV and algorithm to evaluate soft tissues or small osseous lesions. The target volume may be limited according to clinical indication. If the area of interest is only posteriorly (e.g. sacroiliac joints) or anteriorly located gantry tilt to avoid unnessearay exposure of female gonads is important. Intra-articular contrast for outlining intra-articular structures.

Shoulder - bone

Preparatory steps

Indication	Main indication is traumatic disorders. Similar technique can be used for bone tumours, degenerative, infectious, arthritic and osteonecrotic changes.
Advisable preliminary or alternative investigations	Conventional radiography; MRI or US are alternative examinations, especially in non-traumatic disorders
Patient preparation	Appropriate consent. Exclude radiodense items, whenever possible.
Scan projection radiograph	Frontal: above acromion extending 12-25 cm caudally, depending on suspected pathology

Acquisition objectives

Target volume	Entire shoulder region.
Image weighting	Spatial resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice medium (1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	< 15 mGy; medium (trunk phantom)
Tube voltage	Medium - high (110 – 130 kV; > 130 kV)

Image reconstruction

Viewing slice thickness defines exposure parameters. Surface reconstruction and MPR may facilitate evaluation of lesions and are recommended. This requires thin primary reconstruction section thickness

Primary reconstruction section thickness	Adapted to beam collimation
Overlap of primary reconstruction	0-50%.
Reconstruction algorithm	High resolution
Field of view	Corresponding to all cross section of the shoulder region including scapula when suspect of pathology
Viewing slice thickness	Medium.
Overlap of viewing slices	0 – 25%.

Shoulder - bone

Image quality criteria, visualization	1. All skeleton appropriate to the indication.
Image quality criteria, critical reproduction	1. Sharp reproduction of the cortical bone 2. Sharp reproduction of trabecular bone 3. Sharp reproduction of the humeroscapular joint space. 4. Sharp reproduction of the acromioclavicular joint space
Contrast media	Usually not indicated, but enhancement may be useful for delineating soft tissue lesions in selected patients.
Dose and concentration	60-100 ml, 300 mgI/ml.
Flow rate	2-4 ml/s, preferably by power injector.
Delay and timing	60-80s depending on suspected pathology.
Modification to technique	Additional slices may be reconstructed with an appropriate FOV and algorithm to evaluate soft tissues or small osseous lesions. The target volume may be limited or extended according to clinical indication. Intra-articular contrast for outlining intra-articular structures.

Limb trauma - bone

Preparatory steps

Indication	Main indication is traumatic disorders. Similar technique can be used for bone tumours, infectious and osteonecrotic changes.
Advisable preliminary or alternative investigations	Conventional radiography; MRI or US are alternative examinations, especially in non-traumatic disorders.
Patient preparation	Appropriate consent. Exclude radiodense items, whenever possible.
Scan projection radiograph	Frontal or lateral: extent depend on suspected pathology, but at least one joint should be included.

Acquisition objectives

Target volume	Area with suspected pathology.
Image weighting	Spatial resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice small - medium (< 1 mm; 1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Low - medium (< 0.9; 0.9 - 1.3)
CTDI volume	< 20 mGy; low (head phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Image reconstruction	Viewing slice thickness defines exposure parameters. MPR and surface reconstruction may facilitate evaluation of lesions. This requires thin primary reconstruction section thickness.
Primary reconstruction section thickness	Adapted to beam collimation.
Overlap of primary reconstruction	0-50%.
Reconstruction algorithm	High resolution
Field of view	Corresponding to cross section of the bone(s) and adjacent muscles
Viewing slice thickness	Medium.
Overlap of viewing slices	0 – 25%.

Limb trauma - bone

Image quality criteria, visualization	1. All skeleton appropriate to the indication.
Image quality criteria, critical reproduction	1. Sharp reproduction of the cortical bone. 2. Sharp reproduction of trabecular bone. 3. Sharp reproduction of the visualised joint space.
Contrast media	Usually not indicated, but enhancement may be useful for delineating soft tissue lesions in selected patients.
Dose and concentration	60-100 ml, 300 mgI/ml.
Flow rate	2-4 ml/s, preferably by power injector.
Delay and timing	60-80s depending on suspected pathology.
Modification to technique	Additional slices may be reconstructed with an appropriate FOV and algorithm to evaluate soft tissues or small osseous lesions. The target volume may be limited or extended according to clinical indication.

Peripheral joints

Preparatory steps

Indication	Main indication is traumatic disorders and loose bodies. Similar technique can be used for degenerative, infectious, arthritic and osteonecrotic changes.
Advisable preliminary or alternative investigations	Conventional radiography; MRI or US are alternative examinations, especially in non-traumatic disorders.
Patient preparation	Appropriate consent. Exclude radiodense items, whenever possible.
Scan projection radiograph	Frontal or lateral: entire joint region.

Acquisition objectives

Target volume	Entire joint region suspect of pathology.
Image weighting	Spatial resolution
Exposure	Exposure parameters should be adjusted to patient size, especially in paediatric patients.
Beam collimation	4 slice small - medium (< 1 mm; 1 - 2.5 mm); 16 slice small (< 1 mm)
Pitch	Low - medium (< 0.9; 0.9 - 1.3)
CTDI volume	< 20 mGy; low (head phantom)
Tube voltage	Medium (110 – 130 kV)

Image reconstruction

Image reconstruction	Viewing slice thickness defines exposure parameters. MPR and surface reconstruction may facilitate evaluation of lesions. This requires thin primary reconstruction section thickness.
Primary reconstruction section thickness	Adapted to beam collimation.
Overlap of primary reconstruction	0-50%.
Reconstruction algorithm	High resolution
Field of view	Corresponding to cross section of the joint(s) and adjacent muscles/tendons
Viewing slice thickness	Medium.
Overlap of viewing slices	0 – 25%.

Peripheral joints

Image quality criteria, visualization	1. All skeleton and joint structures appropriate to the indication.
Image quality criteria, critical reproduction	1. Sharp reproduction of the cortical bone. 2. Sharp reproduction of trabecular bone. 3. Sharp reproduction of the joint facets. 4. Sharp reproduction of the joint space.
Contrast media	Usually not indicated, but enhancement may be useful for delineating soft tissue lesions in selected patients.
Dose and concentration	60-100 ml, 300 mgI/ml.
Flow rate	2-4 ml/s, preferably by power injector.
Delay and timing	60-80s depending on suspected pathology.
Modification to technique	Additional slices may be reconstructed with an appropriate FOV and algorithm to evaluate soft tissues or minor osseous lesions. The target volume may be limited or extended according to clinical indication. Intra-articular contrast for outlining intra-articular structures.

Paediatric - craniofacial malformations

Preparatory steps

Indication	Severe malformation of the head and face
Advisable preliminary or alternative investigations	Skull radiographs; AP and lateral
Patient preparation	Appropriate patient consent. Radiodense items (tubes) should be excluded wherever possible. Correct positioning of the head of the patient must be pursued. Sedation or general anaesthesia may be required.
Scan projection radiograph	Lateral: head including the whole mandible

Acquisition objectives

Target volume	Whole head and cervical spine.
Image weighting	Spatial resolution is dominant
Exposure	Should be adjusted to head size; keep low in infants.
Beam collimation	4 slice small - medium (< 1 mm; 1 - 2.5 mm); 16 slice small - medium (< 1 mm; 1 - 2.5 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	According to patient size (low to medium)
Tube voltage	Low - medium (according to patient size) (< 110 kV; 110 – 130 kV)

Image reconstruction

Viewing slice thickness defines radiation parameters. MPR and 3D volume rendering is mandatory

Primary reconstruction section thickness	Adapted to beam collimation
Overlap of primary reconstruction	30%
Reconstruction algorithm	Soft tissue standard & high resolution
Field of view	Corresponding to the head and face
Viewing slice thickness	Medium
Overlap of viewing slices	0-30%

Paediatric - craniofacial malformations

Image quality criteria, visualization	1. Entire head 2. Entire face 3. Entire mandible 4. Brain
Image quality criteria, critical reproduction	1. Sharp reproduction of all cranial sutures 2. Sharp reproduction of skull bones 3. Sharp reproduction of ethmoid and mastoid air cells
Contrast media	None
Modification to technique	Additional slices may be reconstructed to evaluate osseous structures of the petrous bones and to evaluate the brain with appropriate algorithm

Paediatric - chest general

Preparatory steps

Indication	Mediastinal masses, trauma, suspected tracheobronchial anomalies; severe inflammatory bronchopulmonary and pleural disease
Advisable preliminary or alternative investigations	Chest radiographs; ultrasonography in selected cases MRI is an alternative method.
Patient preparation	Appropriate patient consent. Radiodense items should be excluded wherever possible. Correct positioning of the patient must be pursued. Sedation or general anaesthesia may be required (especially for breath-holding)
Scan projection radiograph	Frontal: from tip of the mandible to upper abdomen

Acquisition objectives

Target volume	From the lung apices to the posterior costo-phrenic recesses.
Image weighting	Contrast resolution and spatial resolution
Exposure	Low - Medium. Should be adjusted to patient size.
Beam collimation	4 slice small - medium (< 1 mm; 1 - 2.5 mm); 16 slice small - medium (< 1 mm; 1 - 2.5 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	According to patient size (low to medium)
Tube voltage	Low - medium (according to patient size) (< 110 kV; 110 – 130 kV)

Image reconstruction

Image reconstruction	Viewing slice thickness defines radiation parameters. MPR is recommended; for tracheobraonchial and vascular anomalies 3D viewing is recommended
Primary reconstruction section thickness	Adapted to beam collimation
Overlap of primary reconstruction	0-50%
Reconstruction algorithm	Soft tissue standard & high resolution
Field of view	Corresponding to the chest
Viewing slice thickness	Medium (soft tissue) & small (lung)
Overlap of viewing slices	0-30%

Paediatric - chest general

Image quality criteria, visualization	1. Entire chest content 2. Entire chest wall
Image quality criteria, critical reproduction	1. Sharp reproduction of air-soft tissue interface of the trachea and major bronchi 2. Sharp reproduction of mediastinal and hilar vessels 3. Sharp reproduction of the lower lobe vessels of the lungs 4. Sharp reproduction the heart cavities
Contrast media	Mandatory for most indications
Dose and concentration	Dependent on age and weight (see chapter 5); non ionic contrast media
Flow rate	1.5 – 3 ml/ s; preferably by power injector
Delay and timing	Dependent on age and indication
Modification to technique	Target area of interest may belimited in selected cases according to the clinical indication. In selected cases target volume may be extendedto include other areas of suspected disease (especially the neck)

Paediatric - abdomen survey

Preparatory steps

Indication	Trauma, suspected intra-/retroperitoneal abscess. Diagnosis of masses, staging and monitoring of neoplasms
Advisable preliminary or alternative investigations	Ultrasonography; MRT is the preferred method in most patients
Patient preparation	Appropriate patient consent. Radiodense items should be excluded wherever possible. Appropriate bowel opacification is recommended. Correct positioning of the patient must be pursued. Sedation or general anaesthesia may be required.
Scan projection radiograph	Frontal: mid chest to upper thigh

Acquisition objectives

Target volume	From diaphragm to the symphysis
Image weighting	Contrast resolution is dominant
Exposure	Should be adjusted to patient size.
Beam collimation	4 slice medium - large (1 - 2.5 mm; > 2.5 mm); 16 slice medium (1 - 2.5 mm)
Pitch	Medium (0.9 - 1.3)
CTDI volume	According to patient size (low to medium)
Tube voltage	Low - medium (according to patient size) (< 110 kV; 110 – 130 kV)

Image reconstruction

	Viewing slice thickness defines radiation parameters. MPR is recommended.
Primary reconstruction section thickness	Adapted to beam collimation
Overlap of primary reconstruction	0-50%
Reconstruction algorithm	Soft tissue standard
Field of view	Corresponding to the abdominal region
Viewing slice thickness	Medium
Overlap of viewing slices	0-30%

Paediatric - abdomen survey

Image quality criteria, visualization	1. Entire abdominal contents 2. Both entire diaphragms 3. Entire bladder 4. Abdominal wall
Image quality criteria, critical reproduction	1. Sharp reproduction of major branches of the abdominal aorta 2. Sharp reproduction of renal pelvis and part of the ureters (enhanced scans) 3. Reproduction of the gall bladder wall (enhanced scans) 4. Reproduction of the intrapancreatic part of the common bile duct (enhancd scans) 5. Reproduction of urinary bladder wall (enhanced scans) 6. Reproduction of intrahepatic vessels (enhanced scans)
Contrast media	Mandatory
Dose and concentration	Dependent on age and weight (see chapter 5); non ionic contrast media
Flow rate	1.5 – 3 ml/ s; preferably by power injector
Delay and timing	Dependent on age and indication
Modification to technique	In suspected abdominal hemorrhage, oral contrast media must be avoided. Target area of interest may be limited in selected cases according to clinical indication.