



PITTWATER  
RADIOLOGY



# Diagnostic **Imaging** Guidelines

# ABDOMEN

## ABDOMEN

Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
Abdominal pain or mass	Mass or inflammation	1. CT 2. U/S (esp female pelvic mass)	Both abdominal Xray & ultrasound have limited sensitivity and specificity compared to global screening ability of CT
Weight loss	Occult primary cancer	1. CT	CT best global screen for malignancy in chest, abdomen & pelvis
Right lower quadrant pain	Appendicitis	1. CT 2. U/S	<ul style="list-style-type: none"> <li>• CT has highest sensitivity, specificity and ability to make alternate diagnosis.</li> <li>• U/S less sensitive and specific; preferred for children and young women as ionizing radiation is a concern</li> </ul>
Acute Abdomen	Perforation, Diverticulitis, colitis, Bowel obstruction, IBD, renal colic	1. AXR 2. CT	Plain abdominal films are less sensitive. CT is more sensitive and specific for many of these diagnoses.
<b>Specific Indications Adrenal</b>			
Cushing's or Conn's Syndrome	Hyperplasia, adenoma, cancer	1. CT	Thin section multiphasic CT for mass vs hyperplasia
Adrenal Mass	Cyst, adenoma myelolipoma, haemorrhage, met, lymphoma	1. CT 2. MRI	CT best for mass characterisation. Detection of fat is good sign for benign adenoma. If equivocal, chemical shift MRI may be useful.
Hypertension, flushing, rash	Pheochromocytoma	1. CT 2. MIBG - nuclear med scan 3. MRI	<ul style="list-style-type: none"> <li>• Non-contrast CT best for screening adrenals, retroperitoneum and pelvis after urine is positive for catecholamines.</li> <li>• MRI or MIBG used to locate ectopic tumours.</li> </ul>
<b>Specific Indications - Aorta</b>			
Pulsatile abdominal mass	Aortic Aneurysm: 1. Screening or F/U 2. Pre-Op planning 3. Post-Op F/U	1. U/S 2. CT/MSCT +/-Angio 3. CTA	<ul style="list-style-type: none"> <li>• U/S good for screening, but limited for aneurysm complications</li> <li>• CT procedure of choice for leak or mural haemophages</li> </ul>

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Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
<b>Specific indications - Biliary</b>			
Abnormal LFTs, painless jaundice	Mass or obstruction, CBD stones, choledochal cyst	1. U/S 2. CT 3. MR cholangiogram pancreatogram (MRCP)*	<ul style="list-style-type: none"> <li>• U/S is useful screen for liver size, mass or biliary dilatation, gallstones.</li> <li>• CT is more sensitive for mass in liver or pancreas.</li> <li>• MRCP useful to diagnose bile duct stone and show anatomy of obstructed biliary tree.</li> </ul>
Acute RUQ pain	Acute cholecystitis	1. U/S 2. CT	<ul style="list-style-type: none"> <li>• U/S to diagnose gallstones, assess wall/size and pericholecystic fluid.</li> <li>• CT for non-diagnostic U/S</li> </ul>
<b>Specific Indications - Kidney</b>			
Renal colic, haematuria	Ureteral stone	1. Spiral CT KUB	CT has higher sensitivity than KUB or IVP for stones and may make alternative diagnosis for cause of pain.
Pyuria, fever, flank pain	Pyelonephritis	1. CT 2. U/S	CT for renal infection not responsive to antibiotics after 48 hours, with possible complications. Assess for stone, abscess or perinephric fluid.
Flank mass, haematuria	Renal cancer, complex cyst	1. CT 2. U/S 3. MRI*	CT excellent for nodes and other spread.
Hypertension	Renal artery stenosis-screening	1. U/S Doppler 2. CT angiography	<p>U/S of renal vessels often difficult and relies on indirect signs. CT angiograms provide excellent anatomical view of renal arteries.</p> <p>CT angiography is modality of choice.</p> <p>If there is renal impairment then renal Doppler is an alternative.</p>

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Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
<b>Specific Indications - Liver</b>			
Abnormal LFTs, steatosis	Fatty infiltration, biliary tree dilatation	1. U/S 2. CT	Multiphasic post contrast CT Study for liver/spleen density and enhancement
Mass < 2cm on U/S	Cyst, metastasis, haemangioma	1. Spiral CT 2. MRI*	Dynamic CT or MRI with contrast are both useful to characterise small masses 8 - 20mm.
Mass > 2cm on U/S	Haemangioma, metastasis, FNH, adenoma	1. Spiral CT 2. MRI* 3. Nuclear Medicine	CT best screening test to characterise mass and survey abdomen. MRI for problem-solving. Hepatic scintigraphy may confirm haemangioma or FNH.
Jaundice	Hepatitis, cholangiocarcinoma	1. CT	CT procedure of choice
Hepatocellular cancer	Cirrhosis, hepatitis	1. MRI* 2. Spiral CT 3. U/S	MRI procedure of choice to detect small HCC and characterise dysplastic nodules in high risk patients. U/S is the least useful of these modalities in the detection of HCC.
<b>Specific Indications - Pancreas</b>			
Elevated amylase-lipase	Acute pancreatitis	1. CT 2. U/S	CT is procedure of choice, especially for necrosis, abscess and haemorrhage. U/S to assess for gallstones.
Pain, steatorrhea	Chronic pancreatitis	1. CT 2. MRCP* 3. ERCP	CT for gland size, calcifications and dilated pancreatic duct. MRCP role evolving. ERCP best for minimal disease with side duct dilatation, small stones or strictures.
Weight loss, back pain	Pancreatic cancer	1. Spiral CT 2. MRI/MRCP*	Multiphasic CT or dynamic MRI equivalent for diagnosis.
Recurrent pancreatitis	Pancreas divisum	1. MRCP* vs ERCP	MRCP non-invasive screen for congenital pancreatic duct anomaly.
Endocrine abnormality	Islet cell tumour pancreas	1. Spiral CT 2. MRI*	Multiphasic CT or dynamic MRI equivalent for diagnosis of insulinoma, VIPoma, etc.

\* No MBS rebate currently available for this indication

# SOFT TISSUE MUSCULOSKELETAL

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Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
Tendon tears & tendinosis	Grading injury	1. Xray 2. U/S 3. MRI	Xray required to assess for calcific deposits, avulsion injuries and joint pathology. In good hands ultrasound is relatively accurate for detection of full thickness tears. MRI more accurate than U/S and good for assessment of partial thickness tears.
Trauma - muscle strain	Grade injury, exclude haematoma	1. MRI 2. U/S	MRI is more sensitive to the detection of low-grade strains and can detect early oedema. MRI also more accurate for correct grading of injury.
Lumps & Bumps	Nature of lesion and extent - benign or malignant	1. U/S 2. MRI 3. CT	Ultrasound useful in assessing anatomical site and whether the lesion is solid or cystic. MRI is superior in tissue characterisation and extent in soft tissue to determine which compartment. CT good for fat containing lesions, and assessing for calcium and bone involvement.

# BONE & JOINT MUSCULOSKELETAL

## BONE & JOINT MUSCULOSKELETAL

Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
Trauma	Fracture	<ol style="list-style-type: none"> <li>1. Xray</li> <li>2. CT</li> <li>3. Nuclear Medicine</li> <li>4. MRI</li> </ol>	Xray detects most fractures. However many bone fractures are occult and MRI or bone scan can detect these. MRI more specific than nuclear med and provides superior anatomical information. CT useful for subtle cortical fractures and for assessment of fragment position.
Trauma	Sprain ligament	<ol style="list-style-type: none"> <li>1. Xray</li> <li>2. CT</li> <li>3. Nuclear medicine</li> <li>4. MRI</li> </ol>	Xray to assess for avulsion fragment. MRI or CT usually with intra-articular contrast most sensitive way to assess for tear. For some ligaments U/S can be accurate.
Joint pain	Arthritis, internal derangement	<ol style="list-style-type: none"> <li>1. Xray</li> <li>2. CT</li> <li>3. Nuclear medicine</li> <li>4. MRI</li> </ol>	Xray (weight bearing) for cartilage loss. MRI and nuclear medicine bone scan useful for early changes. Both sensitive to synovitis. MRI procedure of choice for cartilage tears including meniscal and labral injuries.
Suspected bone tumour	Benign vs malignant	<ol style="list-style-type: none"> <li>1. Xray</li> <li>2. CT</li> <li>3. Nuclear medicine</li> <li>4. MRI</li> </ol>	Plain Xray most useful in assessing metastases, aggressiveness and for differential diagnosis. MRI and CT have complimentary roles in further assessment: CT to assess for matrix calcification and cortical breakthrough and MRI for extent of marrow spread and soft tissue involvement. Bone scan plays major role in assessing for lesions in other bones.

Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
SOB, Dyspnoea	Pulmonary Embolus	CT Angiogram	CT pulmonary angiogram now modality of choice
Non-Cardiac Chest Pain	Aortic Dissection	1. Spiral CT 2. Trans-oesophageal echo*	Comparable methods with use based on availability, acuteness of disease, presence of aortic insufficiency etc.
Abnormal CXR - Nodules	Lung Cancer, Metastasis Granuloma	1. CT 2. Image guided biopsy	CT sections may show distinguishing characteristics
Abnormal CXR - hilar or mediastinal	Lung cancer, metastasis, lymphoma, sarcoid, thymus	1. CT 2. Image guided biopsy	Imaging is not tissue specific but disease pattern and distribution may suggest one disease over another
Abnormal CXR - interstitial lung disease	Interstitial pulmonary fibrosis, sarcoid, dust related diseases	1. CT with high resolution thin sections	Imaging is not tissue specific but disease pattern, distribution and ancillary findings may help narrow the differential diagnosis
Abnormal CXR - posterior mediastinal mass	Neurogenic tumour, enteric cyst, dilated oesophagus, aortic dilation	1. CT 2. MRI*	Relationship to posterior structures determined including vertebral column
Lung cancer	Staging	1. CT - Chest/Abd +/- Brain 2. Bone scan	To assess for nodal disease, distant spread to adrenals, liver, brain & bone
Dysphagia	Oesophageal cancer, benign strictures	1. Barium swallow 2. Endoscopy 3. CT	CT for staging primary tumour and screening for abdominal metastases
CIP	Possible Coronary Artery Disease	Coronary CT Angiogram	CT for anatomical information on disease severity & extent
Sobre		Myocardial Perfusion	MPI provides important functional cardiac data & prognostic information

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Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
Family History	Cerebral aneurysm	1. CT angiogram	CT method of choice for screening eg. family history
Hypertension	Renal artery stenosis	1. CT angiogram 2. Renal Doppler U/S	CT method of choice. Doppler useful when impaired renal function
TIA/Stroke	Carotid disease	1. Doppler U/S 2. CT angiogram 3. MRI	Doppler U/S method of choice for plaque assessment and grading of stenosis. Evolving role for CT/MRI.
Leg/Arm swelling pain	Suspected deep venous thrombosis	1. Doppler U/S	Methods of choice for both upper and lower limb
Chest pain, shortness of breath	Suspected pulmonary embolus	1. CT angiogram 2. V/Q scan	CT modality of choice. Role for V/Q scan in those unable to have CT



Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
Back pain/radicular pain	Disc protusion, either cause for pain	1. Xray 2. CT 3. MRI	Xray to exclude fracture and assess alignment of vertebrae. CT or MRI for disc protusion. MRI advantage in detection of disc degeneration and annular tears: better assessment of cord.
Back Injury	Fracture/subluxation	1. Xray 2. CT 3. MRI	Xray screening test. If in doubt CT detects almost all fractures. MRI for assessing disc, cord injury and soft tissues.
Posterior buttock/leg pain	Lumbosacral disease	1. MRI 2. Spiral CT	MRI modality of choice. CT alternative when MRI not available.



Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
Ischaemic attack/stroke	TIA, infarct or haemorrhage	<ol style="list-style-type: none"> <li>1. CT</li> <li>2. MRI</li> <li>3. Carotid doppler</li> </ol>	<ul style="list-style-type: none"> <li>• CT useful to detect stroke after several hours. Most accurate for acute haemorrhage</li> <li>• MRI positive for ischaemia earlier especially if combine diffusion imaging.</li> <li>• Doppler evaluation to assess for carotid stenosis and ulcerative plaque.</li> </ul>
Suspected intracranial lesion	Mass, aneurysm	<ol style="list-style-type: none"> <li>1. CT</li> <li>2. MRI</li> <li>3. MRA or angiogram</li> </ol>	MRI more accurate for extent of lesion. Also more clearly delineates posterior fossa and skull base masses such as acoustic neuroma and pituitary tumours.
Head injury	Fracture, intracerebral bleed	1. CT	CT modality of choice in trauma. More accurate than plain films in the detection of skull and facial bone fractures.
Neurological symptoms varying with time and involving different regions.	Demyelination, MS	1. MRI	MRI imaging modality of choice for demyelination in brain or spine.



Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
	Adnexal mass	1. TV U/S 2. CT 3. MRI*	Transabdominal/transvaginal U/S screening is procedure of choice. If U/S equivocal, CT or MRI next test to differentiate pedunculated leiomyoma from ovarian mass. MRI usually diagnostic for leiomyoma, endometrioma, dermoid, hydrosalpinx
Abdominopelvic mass	Ovarian neoplasm	1. CT 2. MRI*	<ul style="list-style-type: none"> <li>• CT is an excellent technique to characterise large benign vs malignant ovarian tumours.</li> <li>• MRI is an alternative technique.</li> </ul>
Pelvic pain, pregnancy	Ectopic pregnancy	1. U/S	+ Beta HCG.
Pelvic pain, menorrhagia	Leiomyoma vs Adenomyosis	1. MRI*	MRI diagnostic for both diseases.
Pelvic pain, fever, leucocytosis	Tubo-ovarian abscess	1. U/S 2. CT	U/S can be used for screening but CT is definitive test to show disease extent, guide percutaneous drainage and differentiate diverticulitis.
Post menopausal bleeding	Hyperplasia, polyp, cancer	1. U/S 2. MRI*	<ul style="list-style-type: none"> <li>• U/S for endometrial thickness, sonohysterography for polyp/mass.</li> <li>• MRI for selected cases when tissue sampling unsuccessful.</li> </ul>

Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
Lump/mass	Cyst, fibroadenoma cancer	1. Mammography 2. U/S	Usually need both modalities to characterise lesion. Biopsy under image guidance may be required for definitive diagnosis.
Nipple discharge	Papilloma, cancer	1. Mammography	Ductogram sometimes needed to confirm a papilloma.

## BREAST

\* No MBS rebate currently available for this indication.

Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
Posterior buttock/ leg pain	Lumbosacral plexopathy	1. MRI 2. Spiral CT	MRI preferred to delineate L4-5 and S1-3 nerve roots in coronal plane with fat saturation.
Pain, fever	Pelvic-perineal abscess	1. Spiral CT 2. MRI*	<ul style="list-style-type: none"> <li>• CT most efficient choice to detect fluid, gas and guide drainage route.</li> <li>• MRI has a role in the delineation of anal fistula</li> </ul>
Mass, leg swelling	Lymphoma	1. Spiral CT	
Cancer Staging			
	Bladder and cervical cancer	1. CT 2. MRI*	CT more readily available but MRI has benefits in being multiplanar and having better contrast resolution.
	Endometrial cancer	1. U/S 2. CT 3. MRI*	U/S used for endometrial thickness. Since 90% of endometrial cancers are Stage I-II, the role of imaging is limited. MRI staging is preferred because it is superior for detecting myometrial invasion. CT staging excellent for advanced disease (Stages III-IV) and for poorly differentiated carcinoma, uterine carcinoma or large tumours.
Elevated BETA HCG	Gestational trophoblastic disease	1. U/S 2. CT 3. MRI*	U/S screening for uterine tumour, CT screening for brain, chest & liver metastases from choriocarcinoma and detecting uterine tumour.
Mass, ascites, CA 125 Antigen	Ovarian cancer	1. U/S 2. CT 3. MRI*	U/S will detect mass but CT is most effective screen for metastases or detecting other primary tumour metastatic to ovaries.
Bleeding, mass	colon cancer	1. CT	CT for staging advanced trans-serosal disease and adenopathy.
Bleeding	Vagina or vulva cancer	1. CT	CT only for selected cases for surgical planning.

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Clinical Signs & Symptoms or Other Findings	Clinical Diagnosis	Imaging Modality	Comments
Salivary gland mass	Calculus, benign or malignant neoplasm	1. Xray 2. U/S 3. CT	CT is best modality to detect stones with decreasing role for sialography. U/S and CT can usually characterise masses.
Thyroid enlargement/mass	Cyst, MNG or cancer	1. U/S 2. Nuclear Medicine 3. CT	U/S detects nodules and cysts, assesses if multinodular. Nuclear Medicine for large dominant nodules. FNA under U/S definitive test. CT for retro-sternal extension or to assess for trachea displacement/compression.
Hyperthyroid	Thyrotoxicosis	1. Nuclear medicine 2. U/S	Assess for diffuse enlargement or 'hot' nodule
Hypercalcaemia	Hyperparathyroid	1. U/S 2. Nuclear medicine 3. CT 4. MRI*	Often find parathyroid adenoma with U/S. If not, nuclear medicine may locate it with follow-up CT or MRI.
Neck Mass	Cancer, lymphoma abscess, cyst	1. U/S 2. CT 3. MRI*	U/S if superficial often sorts it out. CT or MRI for deeper lesions to assess site and tissue character. Also modalities of choice to assess for lymph node involvement.

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## Index of Common Nuclear Medicine Scans

### 1. MYOCARDIAL PERFUSION SCANS

- Diagnosis of coronary artery disease (CAD) when difficult to assess clinically or with an abnormal resting ECG.
- Asymptomatic patients with abnormal stress ECGs or patients with atypical chest pain.
- Diagnosis of CAD in patients unable to exercise, using pharmacological stress (Persantin or Dobutamine).
- Assess residual ischaemia and myocardial viability after myocardial infarction.
- Assess haemodynamic significance of known stenoses.
- Assess regional wall movement and Ejection Fraction
- Evaluate therapy - recurrence of symptoms after angioplasty or bypass.
- Pre-op risk assessment in high risk patients undergoing surgery.

### 2. BONE SCANS

- Tumours primary and secondary - earliest detection of metastases.
- Trauma - fracture not detectable on x-ray especially scaphoid, ribs, neck of femur - sports injuries, stress fractures, periostitis = "shin splints" enthesopathies.
- Arthritis - inflammatory or degenerative arthritis, extent/activity of polyarthritis, detection of active facet joint arthritis.
- Infection - sensitive detection of septic arthritis and osteomyelitis.
- To assess x-ray lesions for degree of osteoblastic activity.
- Paget's disease extent and activity.
- Loosening of prosthesis.
- Unexplained bone pain.
- Avascular necrosis or bone infarct e.g. Perthes disease or Keinbock's.
- Plantar fasciitis.
- Reflex sympathetic dystrophy.
- Trochanteric bursitis.
- Heterotopic calcification.

## Index of Common Nuclear Medicine Scans continued

### 3. GATED HEART POOL STUDY

- Assess degree of myocardial damage post infarction.
- Assess degree of cardiomyopathy.
- Progress of cardiac function in cardiac failure and response to treatment.
- Investigation of dyspnoea - whether cardiac or pulmonary in origin.

### 4. LUNG SCAN

- Ventilation and perfusion scans to diagnose pulmonary embolic disease.

### 5. THYROID SCAN

- Assess palpable nodules - hot or cold? solitary or part of multinodular goitre.
- Assess size of goitre and degree of retrosternal extension.
- Confirm thyroiditis.
- Assess thyrotoxicosis - Graves' disease, toxic multinodular goitre or toxic stage of thyroiditis.
- Thyroglossal cyst - is normal thyroid present?

### 6. RENAL SCANS

- DTPA scan to assess renal function and detection of functionally significant renal artery stenosis.
- Investigation of obstructive uropathy - with Lasix washout.
- DMSA scan to visualise renal cortex, presence of renal scarring or acute stage of pyelonephritis.

## Index of Common Nuclear Medicine Scans continued

### 7. GASTROENTEROLOGY

- Labelled red cell study to detect hepatic haemangiomas.
- Labelled red cell scan to detect site of G.I. bleeding.
- Oesophageal transit study to assess motility disorder in patients with dysphagia.
- Gastric emptying study.
- Colonic transit study to confirm and quantify delayed transit in clinical constipation.
- Meckel's diverticulum study - to detect ectopic gastric mucosa.
- Colloid liver scan to determine size, shape and position and to assess diffuse liver disease.

### 8. HEPATOBILIARY

- To detect acute cholecystitis.
- To detect chronic or acalculus cholecystitis.
- To assess gall bladder function and contraction (E.F) with cholecystokinin infusion.
- To determine patency of common bile duct and presence of biliary stenosis, dyskinesia or bile leak detection of biliary reflux.

### 9. LABELLED WHITE CELL STUDIES

- To diagnose and localise site of infection, abscess formation. • Assess extent of inflammatory bowel disease.

### 10. GALLIUM STUDY

- To detect infection. • Degree extent of Lymphoma and monitor treatment and recurrence.

### 11. LYMPHOSCINTIGRAPHY

- Sentinel Node (Breast Cancer & Melanoma) • Lymphoedema

### 12. PARATHYROID IMAGING

- Parathyroid adenoma



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