Cross Sectional Imaging in Pancreatic Cancer

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Background

- 3% cancers in UK
- Ductal adenocarcinoma commonest
  - Predilection for head and neck
  - Obstructive jaundice
- Surgery primary treatment
- 5 year survival following resection only 10%
- NETs and cystic tumours less common but better prognosis

How is Suspected Pancreatic Cancer Investigated?

- Tumour markers
- Ultrasound
- Computed tomography (CT)
- Magnetic resonance imaging (MRI incl. MRCP)
- Endoscopic ultrasound (EUS)
- Endoscopic retrograde cholangiopancreatography (ERCP)
- Positron emission tomography tomography (PET-CT)
- Other nuclear medicine eg. octreotide scan, nanocolloid
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What is the Role of Imaging?

- **Preoperative**
  - Is it cancer?
    - Localise tumour
  - Is it resectable?
    - Local extent
    - Distant disease
  - Anatomic variants
    - Vascular/biliary tree

- **Post-operative**
  - Identify complications
  - Recurrence
What is the Role of Imaging?

• Palliative
  • Size of tumour if chemorad considered (<5cm)
  • Response to palliative treatment
CT vs MRI

• If we know it’s cancer then it doesn’t matter which!
  • Similar capability to assess local tumour extent
    • NB. both can underestimate disease

Takakura et al. Abdom Imaging 2011;36:457-62
Motosugi et al, Radiology 2011;260:446-453
Verbeke et al, Pancreatology 2010;10:300
Spatial Resolution (Clarity)

- CT better than MRI
  - Wide anatomical coverage
  - Comprehensive local and distant disease assessment
  - Rapid
    - Eliminates artefact
    - Multi-planar reconstruction
Contrast Resolution (Intensity)

- MRI better than CT
  - MRI parameters can be altered to improve resolution
  - Better for lesion characterisation/detection
  - Long examination time
Liver lesion characterisation in pancreatic cancer

? Metastasis
**MRI**

- **Indications**
  - Equivocal CT findings
  - Characterising lesions (primary tumour, liver lesion)
  - Defining anatomy of biliary tree and PD
  - Patient factors
    - Renal impairment precluding CECT
    - Iodine contrast allergy

- **Contraindications**
  - Pacemaker
  - Aneurysm clips
  - Metal FB eye
  - Claustrophobia
  - Inability to breath hold
56 year old male
Abdominal pain, drinks half litre vodka per day
56 year old male
Drinks half litre vodka per day
**Staging CT**

- **Contrast**
  - Timing crucial

- **Pancreas protocol**
  - **Triple phase CAP**
    - Non contrast (calcification)
    - Late arterial phase 35 sec (pancreatic phase = primary tumour & vessels)
    - Portal venous phase 70 sec (metastases)
86 year old female
#NOF, acutely deranged LFTS
Pancreatic Cancer Diagnosis

- Pancreatic adenocarcinoma
  - Hypovascular
    - Compared to adjacent enhancing pancreas
  - 10% isoattenuating
    - Secondary signs helpful
    - Double duct sign
    - Atrophic distal pancreas
    - Interrupted duct
    - Vascular occlusion

- Biliary stents / pancreatitis can be problematic
62 year old male
Early satiety and epigastric pain, normal OGD, borderline abnormal LFTs
54 year old female
6 week history central abdo pain radiating to back, dilated PD on US
**EUS**

- Indeterminate findings on CT/MRI
- FNA possible
  - Cytological assessment
- Operator dependent
- Limited availability
Pancreatic Cancer Staging

- T staging (90% focal mass)
  - TX
    - Primary tumor cannot be assessed
  - T0
    - No evidence of primary tumor
  - Tis
    - Carcinoma in situ
  - T1
    - ≤ 2 cm in diameter and confined to the pancreas
  - T2
    - > 2 cm in diameter and confined to the pancreas
  - T3
    - Extension beyond pancreas but not involving coeliac axis or SMA
  - T4
    - Involvement of coeliac axis, SMA, stomach, bowel (unresectable)
    - Lymphatic channels along coeliac axis or SMV
Pancreatic Cancer Staging

• N staging
  • NX
    • Regional lymph nodes not assessed
  • N0
    • No involvement of regional lymph nodes
  • N1
    • Involvement of regional lymph nodes

• Prognosis directly related to nodal involvement

• CT not accurate for nodal involvement

Roche et al, AJR 2003; 180:475–480
Pancreatic Cancer Staging

- CT limited in detection of small liver and peritoneal metastases
- Lung metastases not usually found if no other contraindication to surgery

Vascular Resectability

- Venous invasion
  - PV
  - Splenic vein
  - SMV
    - Gastrocolic trunk
    - First jejunal branch

- Arterial invasion
  - Coeliac trunk
  - Hepatic artery
  - SMA
Vascular Invasion

- Loss of fat plane between tumour and vessel
- Flattening / slight irregularity of one side (ie. <180°)
  - Questionable involvement
- Tumour extending around at least two sides (ie. 180°)
  - Definite involvement, en bloc venous resection may still be possible
- Circumferential narrowing or occlusion
  - Mostly unresectable
  - Short-segment focal venous occlusion may allow local resection
72 year old male
Abdo pain, hypotension, PR bleeding
72 year old male
Abdo pain, hypotension, PR bleeding
72 year old male
Abdo pain, hypotension, PR bleeding
65 year old female
Abdominal pain and distension, ascites on US
58 year old female
Upper abdo pain, dilated CBD on US
72 year old male
Abdo and back pain with weight loss, normal OGD
Follow-up

• No role for routine imaging post surgery
  • Only if symptomatic
  • Only if recurrence suspected clinically
• Assess response to chemotherapy in palliative cases
Take Home Points

• CT usually provides required information (pancreatic CT for staging)

• Other tests available for problem solving

• Consider suitability of test in clinical context