Pancreatic solid neoplasms. A tomographic-pathological correlation

Poster No.: C-0854
Congress: ECR 2014
Type: Educational Exhibit
Authors: M. C. Prieto Falcón¹, S. Serena², R. M. Nuevo Pérez², G. Coronado Vilca², A. GARCIA DE LA OLIVA², S. Recio Gallardo²; ¹Seville/ES, ²Sevilla/ES
Keywords: Abdomen, CT, Biopsy, Cancer
DOI: 10.1594/ecr2014/C-0854

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR’s endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.
As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.
You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys’ fees, arising from or related to your use of these pages.
Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.
www.myESR.org
Learning objectives

1. Explain in a didactic way the general and specific characteristics of solid pancreatic neoplasms in multiple detection computed tomography (MDCT).
2. Illustrate the tomographic appearance of the various pancreatic solid neoplasms and show their pathologic correlation.
Background

Multiple detection Computed tomography (MDCT) is the technique of choice for the study of pancreatic cancer, it allows us to diagnose it, stage it and to define which pancreatic tumors are potentially resectable by surgery.

The technique used in our study is based on the protocol performed for CT pancreatic tumors:

- Biphasic dynamic study:
  - Pancreatographic phase at 45 seconds to identify the tumor and stage it locally.
  - Portal phase at 70 seconds to evaluate distant metastases and the permeability of the porto-mesenteric venous system

The solid tumors of the pancreas are: adenocarcinoma, pancreatic neuroendocrine tumour (PNET), solid pseudopapillary tumour, pancreatoblastoma, pancreatic lymphoma and pancreatic metastases.

In our study we depict the general and specific characteristics of these tumors when they are evaluated by tomography with intravenous contrast, which will let us propose a correct diagnosis.

1. PANCREATIC ADENOCARCINOMA. (Fig.1)

Represent the 85 % -95 % of malignant pancreatic tumors, they are more common in men from 60 to 80 years old.

Most frequently located in the pancreatic head (80%).

Clinic manifestations: abdominal pain, weight loss and jaundice. This makes it difficult to achieve an early diagnosis, being usually late, observing up to 85% of liver and peritoneal metastases when these tumors are diagnosed.

Contrast MDCT findings: A tumor is usually hypovascular in the pancreatic head, often causes proximal dilatation with distal abrupt narrowing of the choledochus and dilatation of the intrahepatic bile duct.

2. PANCREATIC NEUROENDOCRINE TUMOUR (PNET).

It Represents less than 5% of the pancreatic tumors. Most of the patients are young.
These tumors tend to be sporadic and solitary. When multiple, they are associated with hereditary syndromes (MEN 1, tuberous sclerosis, neurofibromatosis or von Hippel-Lindau).

There are 2 types:

- **NON-FUNCTIONING** (Fig. 2): Hormonally active but with no clinic manifestations. The most common location is the pancreatic head. Clinic: Asymptomatic, this causes a late diagnosis, finding large tumors (> 5 cm). Symptoms are produced by compression of adjacent structures or metastases. Malignancy in 90%. MDCT with IV contrast findings: Because of the large size they can achieve, they frequently have cystic or necrotic changes.

  - TYPICAL (70%): Hypervascular and heterogeneous tumour with calcifications.
  - ATYPICAL (30%): Hypovascular tumour (differential diagnosis has to be done with adenocarcinoma).

- **FUNCTIONING** (Fig. 3 and 4). These tumors produce hormones which lead to a clinical syndrome. When diagnosed they are usually small (<3cm).

**3. SOLID PSEUDOPAPILLARY TUMOUR.** (Fig. 5)

Represents the 1% - 2% of pancreatic tumors. They are more common in African and Asian young women, with low malignant potential.

Clinic manifestations: pain and abdominal mass.

MDCT with IV contrast findings: large mass (9 cm) with hypo / isodense cap and cystic internal bleeding degeneration.

**4. PANCREATOBLASTOMA.**

It represents the 0.2 % of the pancreatic tumors and it is more common in Asian children (1-8 years).

It is characterized by an elevated serum # - fetoprotein (25 % -33 %), growing slowly and usually manifesting as a large asymptomatic mass (10cm).

Clinic is given by compression (abdominal pain, early satiety, vomiting and constipation).
Radiological diagnosis is very difficult because of its real size that makes it difficult to know from which body does it originate. Differential diagnosis should be made with neuroblastoma, Wilms tumor and hepatoblastoma.

The definitive diagnosis is given by the pathologic study.

There are 2 types:

- Package without calcifications that has a good prognosis.
- Infiltrative calcifications with poor prognosis, generating liver metastases.

MDCT with IV contrast findings: multilocular heterogeneous mass with septae, located in the pancreatic head. They may have clustered calcifications. Rarely cause biliary dilatation because of its gelatinous texture.

5. PANCREATIC LYMPHOMA. (Fig. 6)

There are 2 types:

a. Primary: It is rare, more common in immunosuppressed patients.

b. Secondary: Caused by direct extension of peripancreatic lymphadenopathies.

Clinic: It is nonspecific:

a. Abdominal pain, abdominal mass and weight loss.

b. Obstructive jaundice and acute pancreatitis.

c. Classic symptoms of non-Hodgkin lymphoma (fever, chills and night sweats) present in only 2% of cases.

MDCT with IV contrast findings:

- Focal: Large, hypodense and hypovascular mass inside the head of the pancreas.
- Diffuse: ill-defined mass that simulates the appearance of acute pancreatitis. Shortly contrast enhancement.

Vascular invasion, calcifications and necrosis intratumoral are rare.

6. PANCREATIC METASTASES. (Fig. 7)
They represent the 2-5% of the pancreatic malignancies. The diagnostic key is the clinic history (a primary malignancy in other location, for example: kidney, lung, breast, colorectal carcinoma and melanoma).

Clinic: Nonspecific and in most cases asymptomatic.

There are 3 morphological patterns: Solitaire (50% -70%), multifocal (5% -10%), and diffuse (15% -44%).

MDCT with IV contrast findings:

a. Well-defined hypervascular mass with necrotic center hypocaptivating when it is metastatic from a renal carcinoma. The differential diagnosis is with PNET.

b. Hypovascular masses when metastases are from the lung, breast and colon. The differential diagnosis is with pancreatic adenocarcinoma.

Definitive diagnosis is given by biopsy.

**KEY POINTS.**

1. Adenocarcinoma (Fig. 8): Elderly man with hypovascular tumour in the pancreatic head and dilatation of the bile duct.
2. PNET (Fig. 8): Heterogeneous hypervascular tumour. 2 type: non-functioning and functioning.
3. Solid pseudopapillary tumour: Young woman with large encapsulated tumour and internal hemorrhagic degeneration.
4. Pancreatoblastoma: Child with a large heterogeneous tumour with multilocular septa in the pancreatic head. Clustered calcifications. It rarely causes biliary dilatation (gelatinous texture).
5. Pancreatic lymphoma: Hypovascular tumour in immunocompromised patients.

- Well-defined hypervascular masses with necrotic center hypocaptivating when they are metastases from kidney carcinoma. Differential diagnosis with PNET.
- Hypovascular masses when they are metastatic of lung, breast and colon carcinoma. There should be made a differential diagnosis with pancreatic adenocarcinoma.
Fig. 1: A 65 years old men with constitutional syndrome. MDCT with IV contrast: hypovascular mass in the pancreatic head generated dilatation proximal with distal abrupt narrowing of the choledochal (a and b). Pathological findings: MODERATELY DIFFERENTIATED DUCTAL ADENOCARCINOMA. Perineural involvement by tumor and adjacent normal pancreatic parenchyma. HE20x (C).

© Departments of Radiology and Pathological anatomy, Virgen Macarena Hospital, Sevilla/ES 2013
Fig. 2: MDCT with IV contrast: hypervascular tumour in the pancreatic head (a). In MDCT made 2 months later the tumor had necrosis and calcifications (b). The result of the biopsy was PANCREATIC NEUROENDOCRINE TUMOUR NON-FUNCTIONING (not shown).

© Departments of Radiology and Pathological anatomy, Virgen Macarena Hospital, Sevilla/ES 2013

<table>
<thead>
<tr>
<th>TUMOUR</th>
<th>SIZE</th>
<th>LOCATION</th>
<th>CLINIC</th>
<th>MALIGNANCY</th>
<th>RADIOLOGICAL APPEARANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSULINOMA + FREQUENT</td>
<td>90%</td>
<td>90% intra-pancreatic</td>
<td>Triada whipple</td>
<td>10%</td>
<td>Hypervascular</td>
</tr>
<tr>
<td>GASTRINOMA</td>
<td>&lt;1cm</td>
<td>Extrapancreatic</td>
<td>Sde, Zollinger-Ellison</td>
<td>60%</td>
<td>Hypervascular</td>
</tr>
<tr>
<td>GLUCAGONOMA</td>
<td>&gt;5 cm</td>
<td>90% pancreatic head and body</td>
<td>Diarrhea Dermatosis Diabetes PVT</td>
<td>70%</td>
<td>Frequent areas of necrosis</td>
</tr>
<tr>
<td>VIPOMA</td>
<td>&gt;3 cm</td>
<td>75% pancreatic tail</td>
<td>Werner-Morrison</td>
<td>90%</td>
<td>Cystic areas and necrosis</td>
</tr>
<tr>
<td>SOMATOTASTINOMA</td>
<td>&gt;5 cm</td>
<td>50% pancreatic head</td>
<td>Diarrhea Steatorrhea Cholelithiasis Achlorhydia</td>
<td>50%</td>
<td>Hypervascular</td>
</tr>
</tbody>
</table>

Fig. 3: Functioning pancreatic neuroendocrine tumor features.

© Departments of Radiology and Pathological anatomy, Virgen Macarena Hospital, Sevilla/ES 2013
Fig. 4: A 35 year old man with weakness and occasional loss of consciousness. MDCT with IV contrast: heterogeneous solid mass in the head of the pancreas with large uptake of contrast in the arterial phase. Peripancreatic lymphadenopathy (yellow arrow) (a and b). Pathological findings: PANCREATIC INSULINOMA. A well circumscribed nodular tumor with solid and trabecular patterns of growth. (HE-10x) (c). Positive immunostaining for chromogranin for neoplastic cells (d).

© Departments of Radiology and Pathological anatomy, Virgen Macarena Hospital, Sevilla/ES 2013
Fig. 5: An Asian 25 year old woman with abdominal pain. MDCT with IV contrast: heterogeneous mass in the pancreatic tail that enhances the contrast and has a capsule that delimits it (a). Pathological findings: SOLID PSEUDOPAPILLARY TUMOUR: monomorphic proliferation of small cells with pseudopapillary pattern. HE 40x (b).

© Departments of Radiology and Pathological anatomy, Virgen Macarena Hospital, Sevilla/ES 2013

Fig. 6: A 60 year old woman immunosuppressed with fever and night sweats. MDCT with IV contrast: Hypovascular mass in pancreatic body (a and b) with large peripancreatic lymphadenopathies (c). Pathological findings: NON-HODGKIN LYMPHOMA. Atypical lymphoid proliferation in relation to lymphoma. Giemsa 10X. The neoplastic cells express CD20 positive immunostaining (d).

© Departments of Radiology and Pathological anatomy, Virgen Macarena Hospital, Sevilla/ES 2013
Fig. 7: Patient with choroidal melanoma. MDCT with IV contrast: hypovascular mass in the head-body of the pancreas (a and b). Pathological findings: PANCREATIC METASTASES OF MELANOMA: atypical cells with polygonal morphology are isolated. We can see the characteristic nuclear pseudoinclusion melanoma. Giemsa - 40X (c).

© Departments of Radiology and Pathological anatomy, Virgen Macarena Hospital, Sevilla/ES 2013
**ADENOCARCINOMA / PNET**

<table>
<thead>
<tr>
<th></th>
<th>ADENOCARCINOMA</th>
<th>PNET</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RADIOLOGICAL APPEARANCE</strong></td>
<td>Hypovascular</td>
<td>Hypervascular</td>
</tr>
<tr>
<td><strong>CALCIFICATIONS</strong></td>
<td>2%</td>
<td>20%</td>
</tr>
<tr>
<td><strong>BILIARY OBSTRUCTION</strong></td>
<td>Frequent</td>
<td>Infrequent</td>
</tr>
<tr>
<td><strong>CENTRAL NECROSIS CYSTIC DEGENERATION</strong></td>
<td>Infrequent</td>
<td>Frequent</td>
</tr>
</tbody>
</table>

**Fig. 8:** Differential diagnosis between pancreatic adenocarcinoma and pancreatic neuroendocrine tumour (PNET).

© Departments of Radiology and Pathological anatomy, Virgen Macarena Hospital, Sevilla/ES 2013
Findings and procedure details

- We review our file cases of pancreatic solid neoplasms, presenting and illustrating the tomographic findings.
- In collaboration with the Pathological Anatomy Unit of our Hospital, we describe and correlate them with their histological findings.
Conclusion

- Abdominal MDCT with intravenous contrast let us diagnose and stage the pancreatic neoplasms.
- Knowing their general and specific characteristics will let us make a correct diagnostic approach.
- Finally, the pathologic study will give us the final diagnosis.
References