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Pancreatic Head Mass: What Can Be Done ? Diagnosis: Laparoscopy

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The idea of using laparoscopy for diagnosing abdominal masses is as old as the use of laparoscopy itself. The first report of laparoscopy in America was published in 1911 by Bertram M. Bernheim of Johns Hopkins University. Using a rigid cytoscope and light reflected from a head lamp, the abdomen was explored for metastatic disease. The first use of laparoscopy for pancreatic cancer was presented by Cushieri in 1978. Laparoscopy was used to diagnose and stage pancreatic cancer, thus avoiding a significant number of laparotomies in cases in which surgical palliation was not necessary [1].

Imaging Modalities

In the case of panceatic head mass, imaging modalities precede any surgical procedure. The possibilities are: transabdominal ultrasound (US), endoscopic retrograde cholangio-pancreatography (ERCP), contrast-enhanced computer tomography (CT), magnetic resonance imaging (MRI), selective angiography, magnetic resonance cholangio-pancreatography (MRCP), three-dimensional magnetic resonance angiography (MRA), positron emission tomography (PET), endoscopic ultrasound (EUS), intravenous ultrasound (IVUS) and intraductal high frequency ultrasound (IDUS).

For any mass in the head of the pancreas the first line of investigation is transabdominal ultrasonography (US). US can confirm the presence of dilated bile ducts, calcification in the mass and liver metastases larger than 1.5 cm in diameter in the case of malignancy, but it is unable to provide precise information on the nature of the pancreatic head mass.

CT is more effective in detailing the size and site of a tumor. But both US and CT have a tendency to overstage local tumor status, particularly with regard to peripancreatic fat invasion and portal vein invasion [2]. The accuracy of CT may be improved by using spiral CT [3]. However it is inadequate for differentiating and determining if resectability is necessary.

MRI does not provide any additional advantage.

Selective angiography is used for the diagnosis of certain anatomic details, particularly in the case of large tumors.

PET can differentiate pancreatic cancer from chronic pancreatitis with a sensitivity of 85% to 98% and a specificity of 53% to 93% [4].

EUS has proved extremely useful for the detection of small tumors, nodes and venous invasion. In the series of Palazzo *et al.*, in the detection of primary tumors, the sensitivity of EUS was 91%, in the detection of pathological lymph nodes, 62%, and in the detection of vascular invasion ,100% [5]. EUS may miss small peritoneal and hepatic metastases and it can not differentiate between malignant tumors and chronic pancreatitis.

For the diagnosis of portal vein invasion - in the case of malignancy - the sensitivity of IVUS

was 99%, the specificity was 92% and the overall accuracy was 94% in the series of Nakao [6]. Information about portal vein invasion is important when determining the operation preferred for pancreatic cancer.
Intraductal high frequency ultrasound (IDUS) might be useful in the diagnosis of localized stenosis of the main pancreatic duct and in differentiating between malignancy and focal inflammation [7].
Modern imaging procedures have improved the ability to recognize pancreatic masses. The sensitivity and specificity of these imaging modalities are elevated but their ability to differentiate cancers from chronic pancreatitis is effectively unsatisfactory. Although a positive study can prevent an unnecessary exploration, each of these modalities has a known incidence of false negative results [8]. Because of the uncertainty of these methods in discriminating between benign and malignant diseases, cytologic or histologic verification is mandatory.

Laparoscopy

Laparoscopy has its role in diagnosis, in histologic confirmation, in staging, and, in certain situations, in therapy.
Laparoscopy enables us to examine the serosal surfaces of the anterior abdominal wall, diaphragm, falciform ligament, omentum, pelvic viscera, bowels and their mesenteries. We can insufflate and enter the lesser sac and mobilize the head of the pancreas. Particular attention is directed toward the pelvis, as it is often the site of the earliest metastatic disease due its gravitational dependence. Anatomic survey of the liver, biliary tree, pancreas and peripancreatic structures is mandatory. However, by itself, it does not address the dilemma of differentiating between a benign and a malignant disease. For final diagnosis ,histologic or cytologic confirmation is needed. A benign result never excludes the possibility of a malignancy.
Peritoneal cytologic analysis can be obtained with the installation of normal saline solution into the abdominal cavity. With the use of intraoperative fine-needle aspiration cytology (FNA), tissue biopsy (TB) and peritoneal washings cytology (PWC) we can histologically evaluate the abnormalities. The sensitivity of FNA and TB is about 90% and their specificity is about 100% [9].
Staging laparoscopy is highly sensitive for detecting occult intraabdominal metastases in patients with pancreatic or periampullary cancer [10]. A positive biopsy from the peritoneal surfaces or from the liver indicates non-resectability. Staging laparoscopy has been shown to be able to identify previously unsuspected, small-volume intraabdominal metastases, typically in the liver and on the surfaces of the peritoneum. This justifies its mandatory use before laparotomy in patients, with potentially resectable lesions.
Other evidence for local non-resectability is tumor extension into adjacent soft tissue planes (such as the mesenteric root, the hepatoduodenal ligament and the retroperitoneum) or regional lymph node enlargement with histologic confirmation. The sensitivity of laparoscopy for peritoneal metastases is about 89%, the specificity for carcinomatosis is about 100% [5].
However, metastatic lesions below the capsule of the liver and tumor invasion of the retroperitoneum and of the portal vein are the main considerations when determining local non-resectability of a pancreatic cancer; these are usually missed by laparoscopic inspection. Laparoscopic ultrasonography (LUS) has been said to detect these metastatic lesions. LUS has the ability to scan target organs under direct vision and direct contact. Laparoscopy supported by LUS, combines the benefits of staging laparoscopy with the benefits of intraoperative ultrasound. It is possible to simultaneously view, on a monitor, the

laparoscopic view of the abdominal cavity and the sonographic image with a "picture-in-picture" video mixing system [2].
LUS enables the detection of previously unsuspected metastases. LUS has all the advantages of EUS and in addition can identify nodal, hepatic and extrahepatic - peritoneal - metastatic spread. The use of intraoperative biopsy should assist in identifying nodal disease. The sensitivity of LUS for demonstrating pathologic changes is 96% [2].
Laparoscopy with LUS is more specific and accurate in predicting tumor resectability than laparoscopy alone (88% and 89% vs. 50% and 65%), while laparoscopy supported by LUS is able to predict nonresectability in 80% [7].
In the role of staging, the combination of laparoscopy with LUS is more specific for assessing non-resectability (T stage) compared with US (100% vs. 64%; $P<0.05$) and CT (100% vs. 47%; $P<0.005$) [2].
No imaging investigation is able to assess the N stage accurately. Nodal enlargement is frequently the result of reactive hyperplasia and smaller nodes may harbour micrometastasis. Nodal malignancy requires biopsy confirmation.
In M stage, laparoscopy with LUS is significantly more sensitive than US (94% vs. 29%; $P<0.001$) and CT (94% vs. 33%; $P<0.005$) [2].
Because laparoscopy with LUS is the most reliable method for verifying metastatic changes, it reliably predicts tumor non-resectability.
For benign lesions - such as pancreatic insulinoma - LUS is one of the most sensitive tools available. Its detection rate is 83-100% [11].
All non-resectable patients could be found with the combination of EUS plus laparoscopy plus LUS [12].
Laparoscopy with LUS should be considered to be the first step in any potentially curative surgical procedure. There are two principal disadvantages. The procedure is invasive and it necessitates general anaesthesia.
The role of laparoscopy in the resection of the pancreatic head mass is controversial especially if we consider the oncologic aspect.
The main options for palliation are endoscopic or percutaneous biliary stent insertion, or surgery involving biliary and/or duodenal bypass. Most periampullary lesions develop biliary obstruction and these patients require long-term biliary decompression. Those who benefit the most from laparoscopic palliation are the good operative candidates having a good physiologic condition and who are expected to survive more than 6 months [1]. But the technical demands of laparoscopic choledochojejunostomy will limit its widespread application.
Gastric outlet obstruction tends to occur late in the course of the disease in patients surviving more than 6 months. These symptoms are due in part to gastroparesis induced by the retroperitoneal tumor mass, so actual duodenal obstruction may be overestimated [13].
Although endoscopic and percutaneous interventions have a low mortality rate, numerous complications associated with recurrent stent obstruction may occur [14].
When there is a mass in the head of the pancreas and there is a firm diagnosis made on the basis of clinical presentation and imaging procedures, laparoscopy combined with LUS is an alternative to open exploration [15]. With the aid of accurate histologic sampling, laparoscopy is a valuable way of establishing the diagnosis and assessing the severity of disease.

Key words Diagnosis; Histology; Laparoscopy; Neoplasm Staging; Palliative Care

Abbreviations CT: computed tomography; MR: magnetic resonance imaging; ERCP: endoscopic retrograde cholangio-pancreatography; EUS: endoscopic ultrasound;

FNA: fine-needle aspiration; IDUS: intraductal high frequency ultrasound; IVUS: intravenous ultrasound; LUS: laparoscopic ultrasonography; MRA: magnetic resonance angiography; MRCP: magnetic resonance cholangio-pancreatography; PET: positron emission tomography, PWC: peritoneal washings cytology; TB: tissue biopsy; US: ultrasound

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