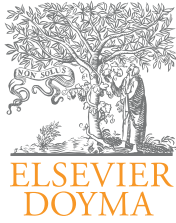

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Review article

Is Arterial Infiltration Still a Criterion for Unresectability in Pancreatic Adenocarcinoma?☆

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A B S T R A C T

As surgical resection remains the only hope for cure in pancreatic cancer (PC), more aggressive surgical approaches have been advocated to increase resection rates. Venous resection demonstrated to be a feasible technique in experienced centres, increasing survival. In contrast, arterial resection is still an issue of debate, continuing to be considered a general contraindication to resection. In the past few years there have been significant advances in surgical techniques and postoperative management which have dramatically reduced mortality and morbidity of major pancreatic resections. Furthermore, advances in multimodal neo-adjuvant and adjuvant treatments, as well as the better understanding of tumour biology and new diagnostic options have increased overall survival.

In this article we highlight some of the important points that a modern pancreatic surgeon should take into account in the management of PC with arterial involvement in light of the recent advances.

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¿Sigue representando la infiltración arterial un criterio de irresecabilidad en el carcinoma de páncreas?

Palabras clave:
Cancer de páncreas
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Pancreatectomía ampliada

R E S U M E N

La resección quirúrgica representa en la actualidad la única posibilidad terapéutica para pacientes afectos de carcinoma de páncreas (CP). Procedimientos quirúrgicos agresivos han sido descritos en un intento de incrementar la resecabilidad. La resección venosa representa en la actualidad una técnica quirúrgica aceptada en centros con importante experiencia en cirugía pancreática. Por el contrario, la resección arterial en enfermos afectos de CP sigue siendo una técnica muy controvertida. La infiltración arterial en estos pacientes suele ser considerada un criterio de irresecabilidad. En los últimos años, importantes avances en la

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técnica quirúrgica y en el tratamiento postoperatorio de estos pacientes han permitido reducir la morbimortalidad de las resecciones pancreáticas. Por otra parte, notables mejoras en el tratamiento neoadyuvante y adyuvante así como un mayor conocimiento en la biología del tumor además de nuevas opciones diagnósticas han permitido mejorar la supervivencia.

En el presente artículo, destacamos importantes puntos que un cirujano moderno debe de considerar para tratar a afectados de CP con infiltración arterial.

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Introduction

In Western countries, pancreatic cancer (PC) is the fourth and fifth cause of cancer-related death in men and women respectively, with more than 100 000 deaths every year in Europe and the U.S.A.[1,2] Approximately 80%–90% of PC are locally advanced lesions or have systemic spread at the time of diagnosis. For patients susceptible to surgical treatment, as long as free margins are achieved, surgery is the only treatment which can offer prolonged survival.[3]

Vascular resection in pancreatectomy for PC is a controversial area. Venous involvement, as long as venous reconstruction is possible, is a technically complex factor, but as a concept it should not determine unresectability. Arterial involvement has long been a contraindication for surgical resection, due to a high morbimortality rate and limited oncological benefit. Recently, a small number of groups have been changing this criterion.[4–7] The factors which have contributed towards this change are the standardisation of surgical procedures, the participation of general surgeons with broad experience in vascular surgery and the centralisation of pancreatic surgery in reference hospitals.

The anatomical location of the pancreas and its proximity to the large abdominal blood vessels influence arterial involvement in tumour formation processes. The common hepatic artery (CHA), the coeliac trunk (CT) and the superior mesenteric artery (SMA) are the vessels most frequently affected by the tumour process. In certain cases, either because of tumour spread itself or because of the presence of vascular anatomical variants, other arteries such as the right hepatic artery (RHA) are affected.[4]

Diagnosis

Preoperative staging is a particularly important step in patients with PC. Its purpose is to establish lesions which are considered borderline resectable (BRPC), those which require neoadjuvant treatment and cases where the tumour is inoperable or unresectable.

Portal/mesenteric venous or arterial involvement was the established criterion for defining BRPC in the first definition made of this concept.[8] Different classifications have been subsequently described.[9–11] In all of them, BRPC or unresectable lesions are defined by arterial involvement.

Computerised axial tomography (CT), PET/CT and endoscopic ultrasound-guided (EU) fine needle biopsy have been demonstrated as suitable methods for diagnosing and staging PC.[11] CT and EU are also considered necessary tests to provide information on arterial involvement in PC patients.[12]

The inclusion of arteries in the tumour mass or the combination of a greater than 50% involvement of the arterial circumference with irregularity or stenosis of the blood vessel wall is radiological criteria for arterial involvement. However, tomography assessment of the condition of the arteries in some PC patients is difficult.[13] Very often CT does not manage to identify arterial or venous involvement[14] which is in fact relatively frequent (21%–64%).[15,16]

Sugiyama et al. have reported that EU is more precise in identifying portal vascular involvement than CT, ultrasound and angiography.[17] Other groups have reported similar conclusions.[18,19] However there is no unanimity on this criterion. Vascular involvement is far more difficult to assess using EU,[19,20] which has a reported sensitivity of 50%–100%[20–23] and a specificity of 58%–100%.[20,23]

The diagnostic precision of magnetic resonance for vascular involvement is very similar to that of CT.[24,25] Therefore this diagnostic technique is reserved for patients where CT is contraindicated; iodine allergy, renal failure or pregnancy.

Surgical Management of Vascular Involvement

Superior Mesenteric Artery

Final confirmation of vascular infiltration is determined by surgical exploration. In standard cephalic duodenopancreatectomy, arterial involvement is usually seen on transecting the neck of the pancreas.

The ''artery first'' approach is a technical modification which enables early identification of arterial involvement in CP patients.[26] The SMA is dissected first. The neck of the pancreas and the stomach are divided in the final part of the resection. Plenty of different techniques have been described under this term.[27–35]

In groups which consider arterial involvement an absolute contraindication for surgical resection, this artery-first approach is necessary in an attempt to avoid the late detection of arterial spread. When this occurs, the surgeon has two options: (1) to consider the cancerous lesion unresectable, or (2) to resect the lesion, leaving the tumour adhered to the affected vessel. A macroscopically positive resection margin (R2) is always associated with poorer survival.[36]

In groups where arterial involvement is not a criterion for unresectability, the artery-first approach is not as important. However, if it is used, vascular control of the SMA and the SMV

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