Usefulness of multi-detector row Computed Tomography for accurate preoperative assessment of pancreatic adenocarcinoma: report of a case

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Summary

A 74-year-old female underwent surgical treatment for adenocarcinoma of the pancreatic head. Preoperative multi-detector row computed tomography (MD-CT) demonstrated tumor invasion into the accessory right colic vein and the branch of the middle colic artery (MCA), which was not detected by digital subtraction angiography. MD-CT showed anatomical variants in the left hepatic artery arising from the left gastric artery, and the right posterior hepatic artery arising from the superior mesenteric artery. Three-dimensional reconstruction CT generated a clear picture of the anatomy of the region concerned, which is essential for a safe operation. The MD-CT findings were highly consistent with the intra-operative findings. We have demonstrated that MD-CT is an important and highly accurate modality for pancreatic surgery.

Key-words: *Preoperative assessment, Multi-detector row Computed tomography (MD-CT), Pancreatic carcinoma, Tumor invasion.*

Résumé

Un sujet du sexe féminin âgée de 74 ans avait subi un traitement chirurgical pour adénocarcinome et la tête pancréatique la tomographie par ordinateur et rangée multi-détecteur Préopératoire (TO-MD) a indiqué invasion de la tumeur dans la veine du coli accessoire de la droite et la branche du colique artère du centre (CAC) qui n'était pas détecté par l'angiographie subtraction digitale. Le TO-MD avait indiqué une variante anatomique dans l'artère hépatique du gauche résulté d'artère gastrique du gauche et l'artère hépatique postérieur de la droite résulté de l'artère mesentérique supérieure. Une reconstruction d'une trio dimension TO a provoqué une image claire de l'atomie de la région concernée, ce qui est essentiel pour une opération sans danger. Les résultats TO-MD étaient surtout constants avec des résultats intraopératoire. Nous avons montré que le TO-MD est une modalité très correcte et importante pour la chirurgie pancréatique.

Introduction

Pancreatic cancer is one of the most aggressive malignancies with an overall five-year survival rate of less than 5% in North America[1]. Even after tumor resection and postoperative adjuvant therapy, the median patient survival time is very short, ranging from 19 to 29 months[2-4]. The only hope for long term survival is curable resection.

However, only a minority of patients are eligible for surgical treatment. In most cases, tumors are already in advanced stages when symptoms become apparent. For patients who undergo surgery, whether curative or not, there is a degree of morbidity associated with the surgical procedure[5]. Therefore early diagnosis, accurate preoperative staging and scrupulous surgical planning are essential. In this report, we describe a case of successful surgical treatment of pancreatic head adenocarcinoma in which preoperative multi-detector row computed tomography (MD-CT) and three-dimensional-CT (3D-CT) gave a clear picture of the blood vessels and anatomy of the region concerned.

Case

A 74-year-old female was admitted to our hospital with a two-week history of epigastralgia after eating and skin pruritus. On physical examination, no abnormal findings other than icteric conjunctiva were revealed. Blood tests showed elevated biliary enzymes and tumor markers: gamma glutamyl transpeptidase, 453 U/L (normal range, 5-70 U/L); aspartate transaminase, 303 U/L (normal range, 10-35 U/L); alanine aminotransferase, 330 U/L (normal range, 5-40 U/L); and total serum bilirubin, 2.3 mg/dL (normal range, 0.3-1.1 mg/dL). Carcinoembryonic antigen and carbohydrate antigen were 35.7 ng/mL (normal range, less than 2.2 ng/mL) and 1981 U/L (normal range, less than 37 U/mL), respectively.

Abdominal ultrasound examination revealed the dilatation of the intra- and extra-hepatic ducts, and abdominal CT demonstrated a low density mass in the pancreatic head. Endoscopic retrograde cholangio-pancreatogram successfully showed stenosis of the common bile duct and main pancreatic duct. A nasal drainage tube was endoscopically inserted via the papilla of Vater into the common hepatic duct. Cytology of bile from endoscopic nasal biliary drainage (ENBD) revealed adenocarcinoma.

MD-CT demonstrated an iso density mass lesion that measured 2.5 cm in the lower part of the pancreatic head (Figure 1). The tumor is surrounding greater than 280 degrees of the accessory right colic vein (ARCV). Reconstruction 3D-CT showed a caliber change in the ARCV and MCA, suggesting tumor invasion (Fig. 2). Otherwise digital subtraction angiography (DSA) failed to show the encasement of the regional vessels (Fig. 3a and 3b). Prior to the surgery, MD-CT also visualized the abberant hepatic arteries (Fig. 2), and no sign of para-aortic lymph node or distant metastasis was detected. Taken together

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the findings by using the accurate preoperative imaging technique of MD-CT, resectable pancreatic cancer was diagnosed.

Following laparoscopic observation reconfirming absence of peritoneal dissemination, we carried out a pancreatico-duodednectomy with a D2 lymphadenectomy. Consistent with the preoperative imaging by MD-CT, pancreatic carcinoma invaded around the ARCV and MCA. The pathological examination revealed adenocarcinoma in the pancreatic head but no lymph node metastasis. The postoperative course was uneventful and the patient was discharged without complication 28 days after surgery.

Discussion

Recently, several diagnostic modalities, such as ultrasonography, magnetic resonance imaging, and computed tomography, are available for the assessment of the primary cancer and recurrent pancreatic cancer[6,7]. Accurate preoperative detection and staging of pancreatic cancer is essential as it may allow the identification of patients with locoregional disease that is amenable to surgical treatment.

In the present case, MD-CT and reconstruction 3D-CT contributed significantly to the evaluation of local extension, lymph node metastasis, and distant metastasis. For the assessment of vascular invasion, the grading system advocated by Lu et al was applied[8]. According to their study, each major blood vessel is given a grade of 0-4 based on tumor contiguity to its circumference: grade 0, no contiguity of tumor to vessels; grade 1, tumor contiguity less than one-quarter of its circumference; grade 2, tumor contiguous to between one-quarter and one-half of its circumference; grade 3, tumor contiguous to between one-quarter and three-quarters of its circumference; grade 4, greater than three-quarters circumferential involvement or constriction of any vessel. In this case, the contiguity

of the tumor to the ARCV and MCA was greater than three-quarters of the tumor circumference and caliber change was apparent. Therefore the vein was staged at grade 4. Since the positive predictive value of CT for major vascular invasion is high, 85-96%, we diagnosed invasion of the ARCV and MCA[8-10]. On intraoperative findings, pancreatic carcinoma involved to the ARCV and MCA. Our case was suggesting that the grading system by Lu et al could be indicated to assess the branch of the major vessels. In addition, reconstruction 3D-CT displays permitted easy comprehension of the pertinent anatomy.

In previous studies comparing diagnostic value of CT with that of DSA, DSA was thought to be complementary or superior to CT in detecting vascular involvement[11,12]. Recently, however, advanced techniques have improved the accuracy of CT in diagnosing vascular invasion whereas the usefulness of DSA in this area is still low[13-15]. In our case, tumor invasion into the ARCV could not be demonstrated by DSA; however, the encasement of the ARCV was clearly shown by MD-CT. Currently, DSA had been performed on all candidates for curable resection of the pancreatic cancer in our institution, since about the 30% of the patients have vascular variation, and a precise understanding of the relevant anatomy is essential for a safe operation[11]. As seen in this case, more recently, 3D-CT can accurately detect vascular anomalies. Considering that DSA is a technique with significant cost and complication, it seems unnecessary in pre-operative evaluation when 3D-CT is available.

In conclusion, we successfully treated a patient with pancreatic cancer which had invaded minor vessels. The concrete surgical plan was based predominantly on the MD-CT results, and the correlation with the surgical result was excellent. Our case suggests that reconstruction 3D-CT has the potential to eliminate the role of DSA in strati
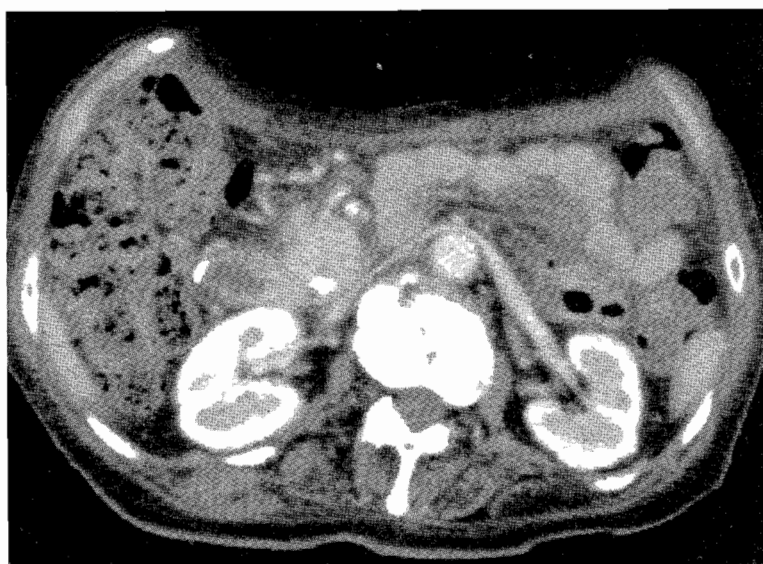
Figure 1 *The evaluation of resectability is difficult in this case. The pancreatic tumor, which is difficult to delineate, is shown as an iso-attenuating mass. Just below the bifurcation of SMV trunk and ARCV, greater than 280 degrees of the ARCV is surrounded by the tumor. The caliber change is obvious.*

Figure 2 *The caliber change of the accessory right colic vein (left side arrow) and the branch of the middle colic artery (right side arrow) is obvious. Replaced right hepatic artery from the supreior mesenteric artery and replaced left hepatic artery from the left gastric artery (LGA) are shown. The LGA directly bifurcates from the aortic trunk.*
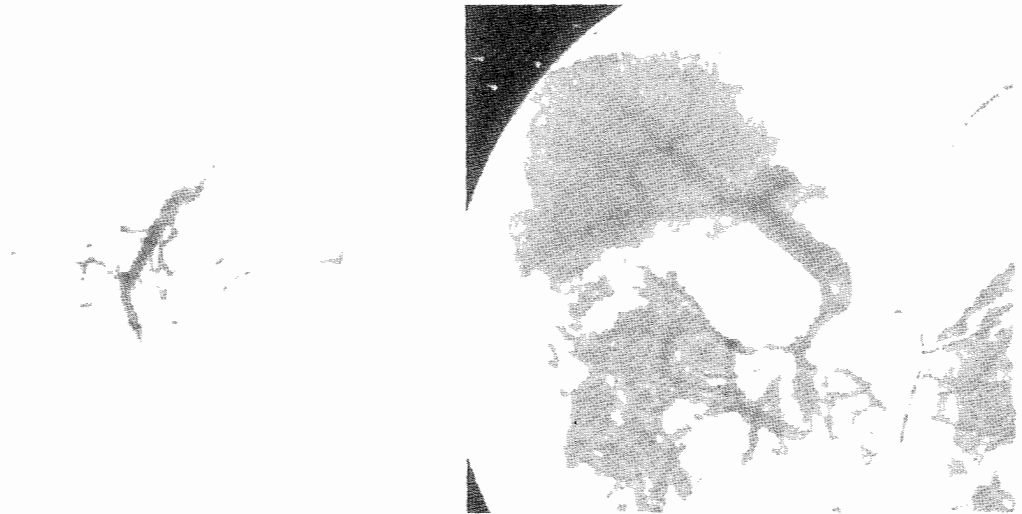

Figure 3a and 3b *Digital subtraction angiography (DSA) failed to show the encasement of the regional vessels.*

fying the treatment of pancreatic cancer.

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