

CT
1
2

CT
CT
30
17
가
가
CT
(single - level dynamic)
2
CT
CT
17
13 (76%)
가
가
2.76 cm,
2.32 cm
2.48 cm
CT
87%
10
3
CT
CT
(3)
(4)
11
7
CT
가
가
CT

ERCP,
(CT) 가
가
22%
(1).
5%
5
3%
(4 - 10).
(1 - 3).
(arterial phase)
(portal phase)
가
가
(4 - 5).
CT
CT

1

2

23:7 30 40 69 61 . 13
 , 17
 17
 , 13 8
 , 3 , 2
 10
 CT (Hi-Speed Advantage system; GE Medical Systems, Milwaukee, WI, U.S.A.)
 10mm
 CT
 (iopamidol, Iopamiro 300; Bracco, Milan, Italy) 100 - 120 ml (Medrad, Pittsburgh, Pa, U.S.A.) 3 ml
 25 - 30
 20

Table 1. Results of Helical CT in Predicting Resectability of Pancreas Cancer

		CT Findings		
		Resectable	Unresectable	Total
Op*findings	Resectable	13	0	13
	Unresectable	4	13	17
	Total	17	13	30

*Op = operation

5 mm 5 mm
 60 - 65 10 mm
 5 mm
 CT
 5 mm , 2 4F Yashiro
 (Terumo, Tokyo, Japan)
 (digital subtraction angiography)
 CT . 5 mm
 10 ml 1 1 ml
 slip - ring

Table 2. Reasons for Irresectability in 17 Patients with Pancreatic Cancer

Reasons for Irresectability	Found at CT	Found at Surgery
Hepatic Metastasis	4	0
Lymph node involvement	3	0
Extrapancreatic invasion	7	3
Vascular invasion	3	0
Peritoneal carcinomatosis	0	1
Total	13	4

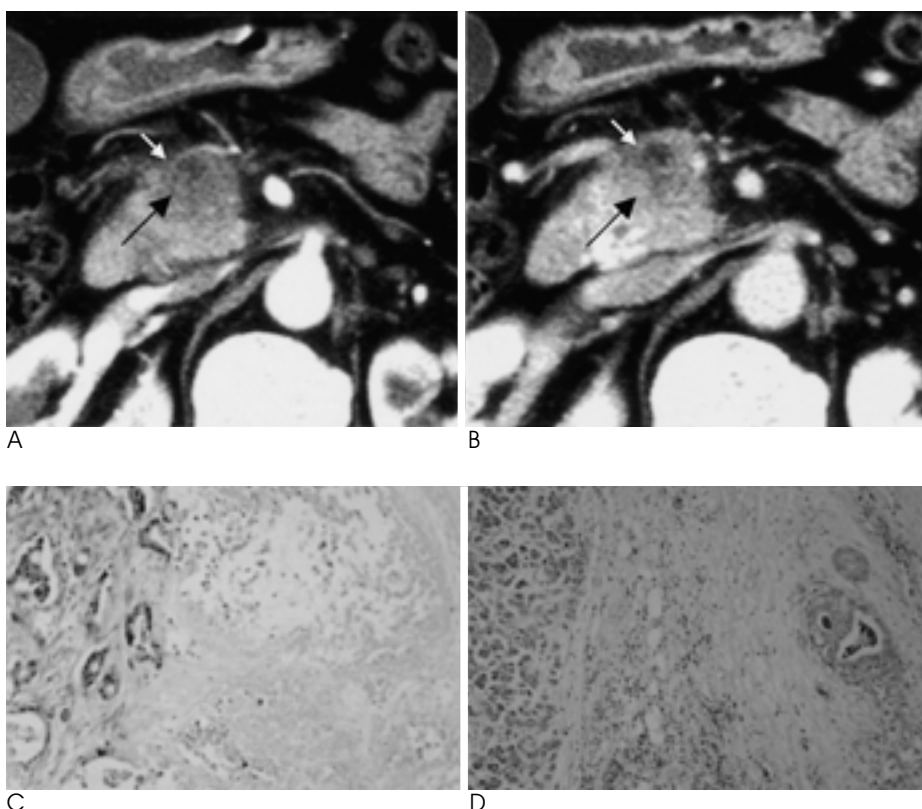


Fig. 1. CT scans show a pancreatic head mass with central hypoattenuating (arrows) and peripheral enhancing area (long arrows) at arterial (A) and portal (B) phases. Microscopic photographs show an area of central necrosis (C) and peritumoral fibrosis (D).

	CT Findings	
	Central hypodense area (No.)	Peripheral enhancing area (No.)
Pathologic findings	Tumoral cells (13)	Peritumoral fibrosis (13)
	Central necrosis (3)	Peritumoral inflammation (13)
	Mucin (4)	
	Abscess (3)	
	Neointima proliferation (7)	

CT
(100%), 30 17
(57%) 가 , 13 (43%) 가
. CT 가 17
13 (76%) 가 , 87%,
76% (Table 1). CT

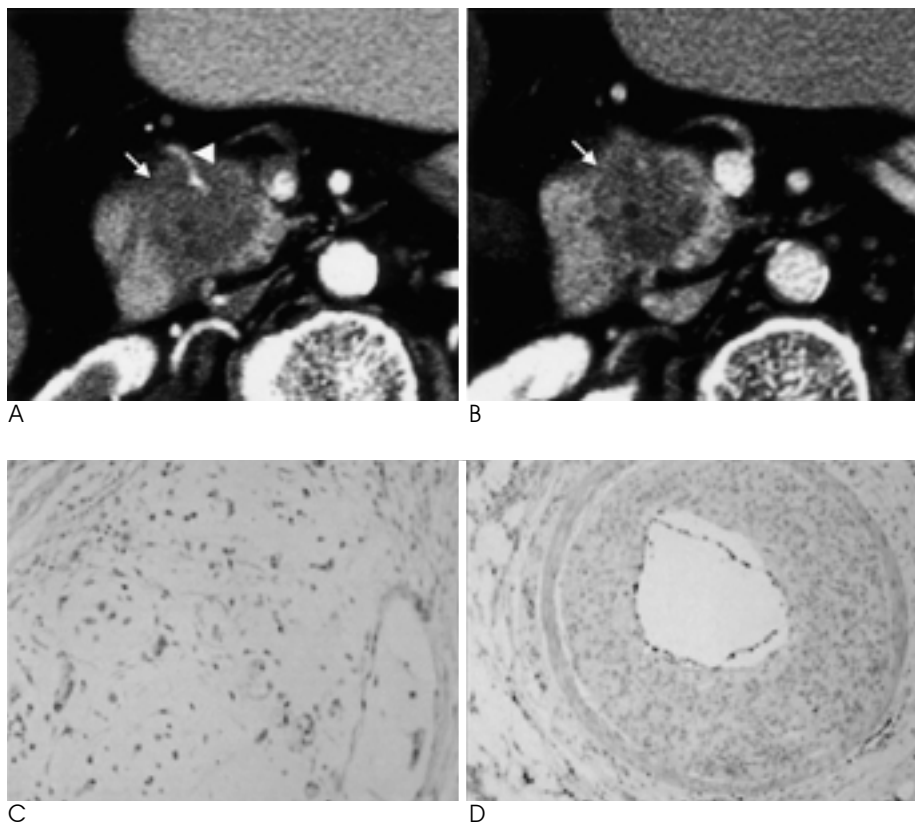


Fig. 2. CT scans show a pancreatic head mass (arrows) with central and peripheral hypoattenuating area at arterial (A) and portal (B) phases. Note pancreatic vessel invasion by tumor (arrowhead). Microscopic photographs show an area of intratumoral mucin (C) and neointimal proliferation of a peripancreatic vessel (D).

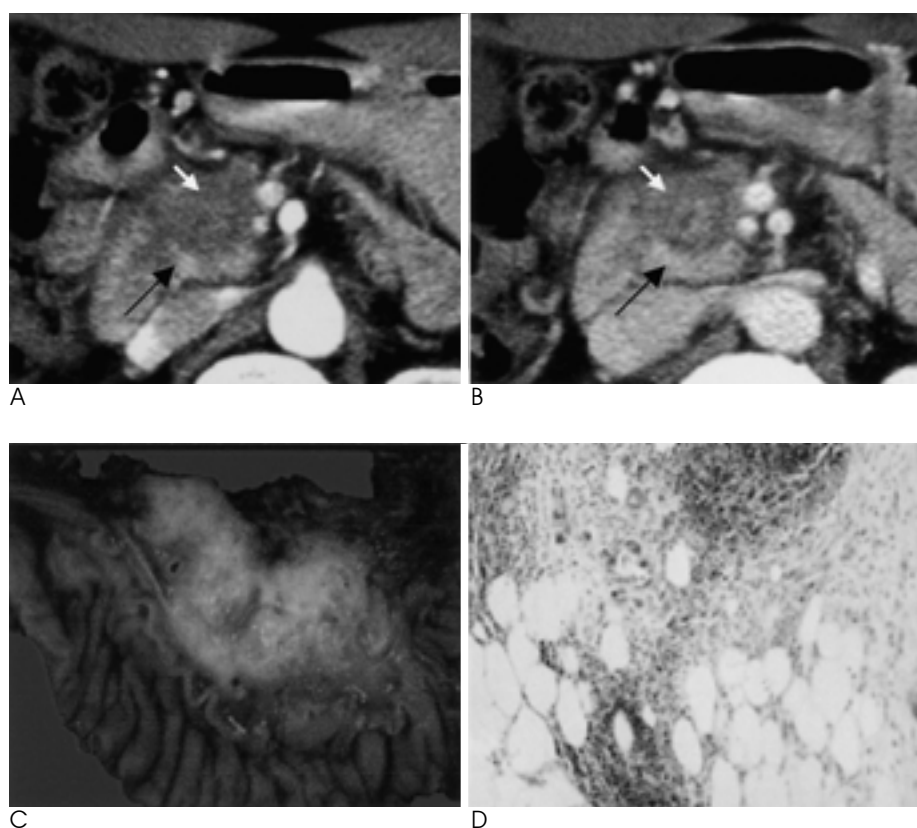


Fig. 3. CT scans show a pancreatic head mass with central hypoattenuating area (arrows) and peritumoral parenchymal enhancement (long arrows) on arterial (A) and portal (B) phase images. Peripancreatic infiltration was not detected on CT. Gross specimen photograph shows a yellowish mass (C). Microscopic photograph shows peripancreatic fat infiltration of pancreatic cancer (D).

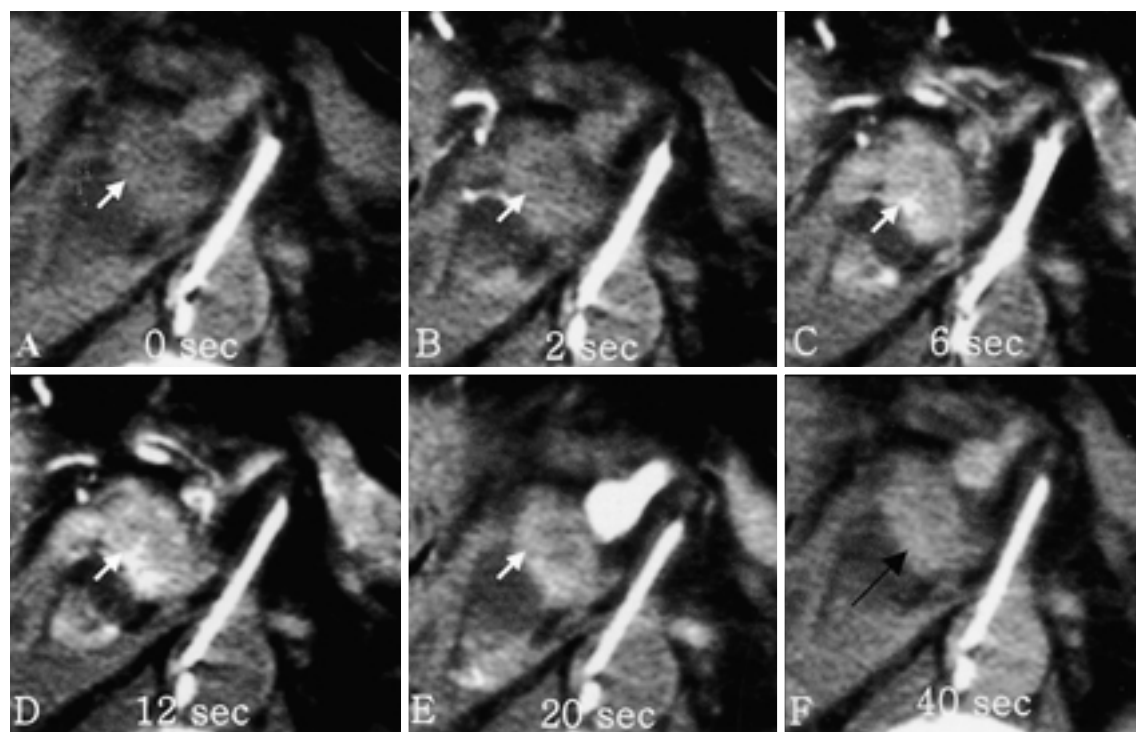


Fig. 4. Single-level dynamic CT scans obtained before (A) and 2 seconds (B), 6 seconds (C), 12 seconds (D), and 20 seconds (E) after contrast infusion through celiac axis and superior mesenteric artery show persistent hypoattenuating central portion of the mass and progressive enhancing periphery (arrows), but 40 second scan (F) shows decreased enhancement of the peripheral portion of the tumor (long arrow).

가 4 (24%) 100% (6, 9, 10). CT (8),
 가 , 3
 ,
 (Table 2).
 13 가
 . 가 CT 가
 ,
 ,
 ,
 3 , 7 , 3 가 가 13 CT
 (Fig. 1 - 3). (Table 3), CT
 2.76 cm (1.5 - 4.5 cm),
 2.30 cm (1.4 - 4.2 cm), 2.48 cm (
 1.4 - 4.2 cm) . (neointima proliferation),
 CT Freeny
 ,
 (6) Megibow (14)
 , Bluemke (8)
 CT (Fig. 4).
 ,
 3 , 4 (Fig. 1, (8, 12) (15)
 2). CT .
 ,
 (Table 3). 13
 11 (85%)
 , 7 (54%)
 (Fig. 2, 3). ic) CT
 ,
 CT
 가 ring 1 - 3 mm CT slip -
 (1 - 3), CT 1
 가 (11). , (focal nodular hyperplasia)
 , Ischikawa (12) , (16 - 18),
 cm
 ,
 (13). 가 ,
 가 . CT CT CT
 가 ,
 , CT
 , CT (14).
 CT 가 가 가 CT
 가 , 30 (100%), (6 - 9)
 가 가
 87% , 76%, 100%, CT

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Pancreatic Adenocarcinoma: Dual-Phase Helical CT with Surgical and Histopathologic Correlation¹

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Purpose: To determine the accuracy of dual-phase helical CT in assessing the resectability of pancreatic ductal adenocarcinoma, and to correlate the CT findings with the surgical and histopathologic findings.

Materials and Methods: Thirty patients with pathologically proven cancer of the pancreas underwent arterial- and portal- phase helical CT scanning, and in two of these, single-level dynamic CT was performed during celiac and superior mesenteric arteriography. In 17 patients who underwent surgery for potentially resectable cancer of the pancreatic head, tumor resectability was assessed. The CT findings were analyzed and correlated with these of surgery and histopathology.

Results: In 13 (76%) of the 17 patients who underwent surgery, tumors were resectable. Their average size was 2.76 cm (arterial phase), 2.30 cm (portal phase), and 2.48 cm (pathologically determined) and the overall accuracy of helical CT for assessing resectability was 87%. In all patients, the central portion of the tumors exhibited hypoattenuation at both phases; the peripheral portion showed hypoattenuation at the arterial phase and iso- ($n=10$) or hyperattenuation ($n=3$) at the portal phase. Single-level dynamic CT depicted a persistently hypoattenuating central portion and progressive and prolonged enhancement of the periphery. CT-histopathologic correlation showed that central hypoattenuation indicated the presence of tumor cells, necrosis ($n=3$) and mucin ($n=4$), while the peripheral iso- or hyperattenuated areas seen at the portal phase represented fibrosis and inflammatory infiltration. Histopathologic examination revealed tumoral infiltration of peripancreatic fat tissue ($n=11$) and microvascular invasion of major peripancreatic vessels ($n=7$).

Conclusion: The dual-phase helical CT is useful in the determination of resectability in pancreas cancer and CT findings represent well the histopathologic features of pancreas cancer.

Index words : Pancreas, cancer
Pancreas, CT
Pancreas, neoplasms

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