Intraoperative Fine Needle Aspiration Cytology in Pancreatic Lesions

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The notes of 129 patients investigated by intraoperative fine needle aspiration biopsy between 1973 and 1977 have been reviewed. Eighty-four of the patients were operated on and punctured at the Department of Surgery, Lund, and 45 at different county hospitals belonging to the region. All aspirates were stained and evaluated at the Department of Cytodiagnostics, Lund. Sixty-four of the 75 patients with pancreatic cancer were correctly diagnosed and in another three patients the cytological diagnosis was "suspicion of cancer." Including these latter cases the sensitivity of the method was 91% in pancreatic cancer. In four out of five patients with endocrine tumors the cytological report was correct *i.e.*, "endocrine tumor." In none of 22 patients with chronic pancreatitis or pancreatic cysts the diagnosis was falsely positive. Twenty-seven patients who during the operation were suspected of having a pancreatic lesion were at follow-up (mean 2.8 years) found not to have any significant pancreatic disease. Among these patients no falsely positive reports were given. In nine of the 129 patients (7%) the aspirates even at re-checking were found to be nonrepresentative or the aspiration unsuccessful. Six of these were performed at county hospitals. In 24 patients with pancreatic cancer total pancreatectomy was performed. In the remaining 105 patients no complications which could be related to the puncture were detected.

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IN SPITE OF the development of a variety of diagnostic tools such as angiography, percutaneous transhepatic cholangiography (PTC), endoscopic retrograde cholangiopancreaticography (ERCP), CT scanning and ultrasound the diagnosis of pancreatic diseases still possesses well-known difficulties. Even at laparotomy the true nature of a palpable pancreatic mass may be difficult to determine. Nowadays, it is not justifiable to perform radical pancreatic surgery without an exact diagnosis. Biopsy of the pancreas, either by the thick Vim-Silverman needle or wedge section, is associated with a substantial risk of hemorrhage, pancreatitis, fistulas and abscess formation.[9,14] Furthermore, this method according to different authors is impaired by diagnostic errors varying from five to 57%.[13]

In recent years aspiration cytology has been used especially as a preoperative procedure using percutaneous puncture guided by for instance angiography, PTC[4] or ultrasound.[8] The purpose of the present retrospective study was to evaluate our experiences of intraoperative fine needle aspiration biopsies for cytodiagnosis in pancreatic lesions.

Patients

The notes of 129 patients investigated by intraoperative fine needle aspiration biopsy between 1973 and 1977 have been reviewed. Eighty-four of the patients were operated on and punctured at the University Hospital of Lund and 45 at different hospitals belonging to the region. All aspirates were stained and evaluated at the Department of Cytodiagnostics, Lund.

As shown in Table 1 the final diagnoses were pancreatic cancer in 75 patients, endocrine pancreatic tumors in five patients, chronic pancreatitis in 18 and pancreatic cyst in four. In 51 of the patients with pancreatic cancer histological verification was available and in the remaining 24 the diagnosis was clinical with clearcut distant metastases observed during the operation in 20 and a clinical course consistent with the diagnosis in all 24. Fourteen of the 18 cases with chronic pancreatitis were verified histologically, while in the remaining four the diagnosis was clinically based on typical findings at ERCP, pancreatic function test and clinical course. Twenty-seven patients who during the operation—mostly cholecystectomy, choledocholithectomy and gastric operations—were suspected of having a pancreatic lesion were subsequently found not to have any significant pancreatic disease based on clinical course until the follow-up after a time period averaging 2.8 years (Table 1).

Technique

The instrument used for the aspiration biopsy was a 10 ml disposable plastic syringe fitted in an adapter permitting single handed manipulation. The needle, attached to the syringe, had an outer diameter of

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TABLE 1. *Patients Grouped According to Final Diagnoses*

Diagnosis	Number of Patients
Pancreatic cancer	75
Endocrine pancreatic tumor	5
Chronic pancreatitis	18
Pancreatic cyst	4
No pancreatic disease	27
	129

0.6–0.8 mm and a length varying from 50 to 120 mm. In patients with a palpable mass in the pancreas the mass was fixed with the left hand and the puncture performed by keeping the instrument in the right hand. In general three punctures were performed. When diffuse lesions were at hand serial aspirations were made from the caput, corpus and cauda. During maximum aspiration the needle was moved quickly back and forth in the lesion for a few seconds. Usually a volume of aspirate not more than that which fills the lumen of the needle was adequate. Care was taken that the aspiration was discontinued before the needle was withdrawn from the parenchyma; otherwise the aspirate was dispersed on to the walls of the syringe and difficult to expel.

The aspirate was applied to one or two glass slides and carefully smeared out. The glass slides were immediately placed in 95% ethanol for fixation during two to three minutes. The smears were stained in Harris haematoxylin for two minutes, rinsed in water for 90 seconds, differentiated in HCl–alcohol and rinsed again in water for 90 seconds. Afterwards they were stained for 30 seconds in Erythrocin and mounted with Eukitt®. The entire staining procedure takes about five minutes. Thus a preliminary report was possible to give about 10–15 minutes after aspirations performed at the Department of Surgery in Lund.

Results

As shown in Table 2 the cytologist in 65 of the 75 patients with pancreatic cancer gave a correct answer. In another three patients the cytological diagnosis was "suspicion of cancer." Including these latter patients the sensitivity of the method was 91% in pancreatic cancer. In seven subjects the cytological report was incorrect. Also at rechecking the aspirates from these patients were found only to contain benign pancreatic or ductal cells (6 patients) or blood (1 patient) indicating that the tumors were not hit at aspiration. Five patients suffered from endocrine tumors. In four of these the cytological report was correct and in one it was falsely negative. For specific diagnoses of endocrine tumors special staining and histochemistry is necessary. In this material two patients suffered from insulinoma, two from glucagonoma and one from gastrinoma.

TABLE 2. *Results of Intraoperative Fine Needle Aspiration Biopsies in 102 Patients with Different Pancreatic Diseases*

Cytological Report	Pancreatic Cancer	Endocrine Pancreatic Tumors	Chronic Pancreatitis	Pancreatic cyst
Cancer	65	—	—	—
Suspicion of cancer	3	—	—	—
No cancer	3	1	5	3
Endocrine tumors	—	4	—	—
Inflammation	—	—	12	1
Not representative	3	—	1	—
Unsuccessful aspiration	1	—	—	—
	75	5	18	4

In 12 of the 18 patients with chronic pancreatitis the cytologist's report was "inflammation," in five "no cancer" and in one "not representative." In one of the patients with pancreatic cysts the cytological report was "inflammation" and in the remaining three "no cancer." No falsely positive results were at hand (Table 2).

Among the 27 patients without signs of pancreatic disease at follow-up after almost three years the cytologist reported "no cancer" in 20, "not representative" in four and "inflammation" in three. No falsely positive reports were given.

In nine of the 129 patients (7%) the aspirate was not representative or the aspiration unsuccessful. As shown in Table 3 the results were falsely negative or the aspiration unsuccessful in seven out of the 75 cancers. It is worth noting that six of these were performed at county hospitals where the surgeons were less accustomed to the method and the personnel less accustomed to the management of the aspirates.

In 24 of the 75 patients with pancreatic cancer total pancreatectomy was performed. Thus, these patients are excluded when judging complications to the aspiration. However, in none of the 105 remaining patients were any complications detected which could be placed in association with the fine needle aspirations.

TABLE 3. *Intraoperative Fine Needle Aspiration Biopsies in 75 Patients with Pancreatic Cancer**

Investigator	Cancer	Suspicion of Cancer	Falsely Neg.	Unsuccessful Aspiration
Cytologist (Lund)	16	—	—	—
Surgeon (Lund)	19	—	1	—
Surgeon (county hospital)	28	3	5	1

* The results are related to the different type of investigators performing the puncture.

TABLE 4. *Accuracy of Intraoperative Fine Needle Aspiration Cytology in Different Series*

Series	Total No. of Patients	Pancreatic Cancer	Positive (%)	False Negative (%)	Benign Lesions
Christoffersen et al.[3]	28	5	5 (100)	—	23
Arnesjö et al.[2]	25	18	16 (89)	2 (22)	7
Koivuniemi et al.[11]	59	21	20 (95)	1 (2.6)	38
Forsgren et al.[5]	40	29	28 (97)	1 (8.3)	11
Akashi et al.[1]	122	44	42 (95)	2 (2.5)	76
Kline et al.[10]	28	18	16 (89)	2 (17)	10
Shorey[14]	21	18	18 (100)	—	3
Present series	129	75	68 (91)	7 (11)	54
	452	228	213 (93)	15 (6)	222

Discussion

The present paper reviews five years experience with intraoperative fine needle aspiration biopsy for cytodiagnosis in pancreatic lesions. The sensitivity of the method in patients with pancreatic cancer was 91%. In no subject was a falsely positive diagnosis made and no complications were found which could be assigned to the aspiration biopsy.

Intraoperative biopsy of the pancreas remains controversial, with disagreement among surgeons as to the value and dangers of different methods of biopsy.[13] Biopsy by means of Vim-Silverman needle or wedge biopsy has been used for many years. The diagnostic accuracy, however, is varying and often rather low.[13] This method is furthermore associated with complications such as bleeding, pancreatitis, cyst formation and fistulas. The fear of complications may lead the surgeon to take too superficial biopsies resulting in falsely negative reports as pancreatic cancer often is surrounded by a large area of pancreatitis.[6] With the fine needle the surgeon needs not hesitate to perform several deep as well as superficial punctures as the risk of complications is negligible. If the surgeon nevertheless wants to use a thick needle this procedure should be saved for lesions in the pancreatic head available via a transduodenal puncture. For this purpose the Tru-Cut needle (Travenol Laboratories Inc.) may be used.

Few reports on intraoperative fine needle aspiration biopsy for cytological interpretation have appeared. All have shown a high degree of accuracy (Table 4). This is in accordance with the findings of the present study. However, we also found that aspirations performed at hospitals without cytologists had a higher degree of unsuccessful aspirations and nonrepresentative aspirates. This means that the method in order to be optimal should be routinely used to increase the experience of the staff with the puncture technique and fixation procedures.

Percutaneous (*preoperative*) fine needle aspiration biopsy has for many years been used extensively in palpable tumors, *e.g.* in the breast, lymph nodes, salivary glands and prostate. In 1972 Oscarson[12] et al. described selective angiography as a guide to percutaneous fine needle aspiration cytodiagnosis of gastric and pancreatic tumors in a small series of patients. Since then, several reports have appeared of pancreatic biopsy with guidance of PTC, ultrasound and CT scanning using essentially the same technique.[4,7,8] The results of the present study clearly indicate that fine needle aspiration biopsy is of great value also when performed during operation. The preoperative as well as the intraoperative fine needle aspiration biopsies seem to be free from complications. The possibility of disseminating cancer cells at the puncture must also be taken into account using either technique. Our overall experience of fine needle aspiration biopsies of the pancreas together with reports by other authors[1,2,3,5,10,11,15] suggest that the risk of disseminating cancer cells by using this method is minimal. In summary, intraoperative fine needle aspiration biopsy of pancreatic lesions seems to be a highly reliable method without complications and without any risk of falsely positive reports.

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