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New sonographic imaging observations in focal pancreatitis

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Abstract. The imaging findings that ultrasonographically differentiate focal acute pancreatitis (FAP) from a malignant lesion of the pancreas are described. Focal acute pancreatitis is ultrasonographically (US) characterized as a hypoechoic, homogeneous, localized, subsegmental, non-expansive and diffusely demarcated lesion located mostly in the head of the pancreas. It could not be visualized using CT. Endoscopic retrograde cholangiopancreatography (ERCP) performed in 13 of the 32 patients, showed chronic pancreatitis. Focal acute pancreatitis disappeared in 1–6 months at US follow-up. The clinical diagnoses were acute pancreatitis in 11 patients, chronic pancreatitis in 12 patients, biliary disease in 5 patients, hepatopathia in 1 patient while the diagnosis was unknown in 2 patients. No patient developed any pancreatic cancer during a median of 85 months of follow-up. In conclusion, the present data indicate that patients with FAP at US, without any focal lesion seen on either CT or ERCP, have a benign pancreatic lesion, which resolves in 1–6 months; thus, such patients probably do not need any further investigation or follow-up at all.

Key words: Pancreatitis – Ultrasound – Pancreatic tumour

Introduction

A localized, hypoechoic lesion in the pancreas is seen sonographically in several diseases or conditions, such as carcinoma, pancreatitis, pancreas divisum, focal lipomatosis, multifocal idiopathic fibrosclerosis, duodenal diverticulum and ventral anlage. Although both acute and chronic pancreatitis, as well as benign and malignant pancreatic tumours, are clinically, morphologically and radiologically described entities [1, 2], it is difficult to determine whether a hypoechoic lesion is benign or malignant in the individual patient.

During transabdominal US of the pancreas we occasionally noticed a non-expansive, hypoechoic homogeneous, localized lesion with diffuse demarcation in the head of the pancreas. Most importantly, it disappeared within 1–6 months and the clinical follow-up proved it to be benign. We call this imaging finding focal acute pancreatitis (FAP).

A prospective study of 32 patients with these US findings was performed. The aim of this paper is to present FAP, its US and clinical findings and to separate it from pancreatic carcinoma and its impact on the clinical management of focal pancreatic lesions. The prevalence of FAP, or the sensitivity or specificity of US to diagnose the lesion were, however, not assessed.

Materials and methods

During US of the pancreas due to suspected hepatopancreatico-biliary disease an occasional lesion in the pancreas with the following characteristics was detected:

1. Hypoechoic
2. Homogeneous
3. Localized
4. Diffuse demarcation
5. Subsegmental, i.e. not engaging a whole pancreatic segment (head, body, tail)
6. Non-expansive, i.e. preserving the shape, size and contour of the pancreas and usually surrounded by normal parenchyma. No or minimal influence on the common biliary or pancreatic ducts or surrounding vessels.

Our attention was drawn to this lesion, as it disappeared within some months and the clinical follow-up showed it to be a benign lesion. We performed a prospective study and registered all patients with this specific sonographi-

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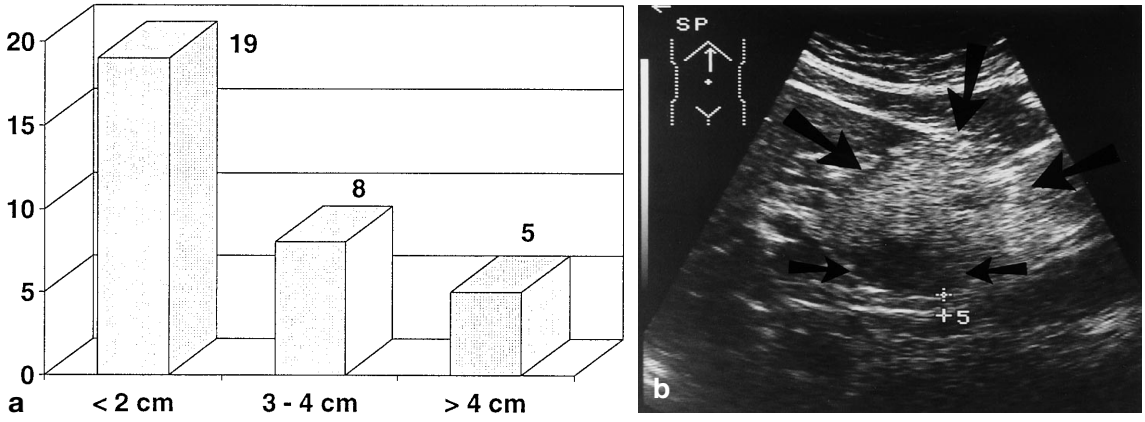

Fig. 1. **a** Number of patients with varying sizes of the focal acute pancreatitis (FAP) lesion. **b** FAP in the female patient (see Fig. 3) demonstrated *(small arrows)* as non-expansive and with preserved surrounding tissue of the pancreatic head *(large arrows)*

cal appearance. Ultrasound was performed because of abdominal pain and abnormal amylase (17 patients) or pathological liver enzyme studies (19 patients) indicating hepato-pancreato-biliary disease. Patients with suspected FAP were radiologically evaluated with US, CT (13 patients), endoscopic retrograde cholangiopancreaticography (ERCP; 13 patients) and Magnetic Resonance Imaging (MRI; 3 patients).

Ultrasound was performed using real-time equipment (Hitachi EUB, Hitachi, Tokyo, Japan; or Acuson XP10, Acuson, Mountainview, Calif.). The CT examination was performed using a Siemens Sonotron DRG or Sonotron 2 (Siemens, Erlangen, Germany). Prior to the investigation 500 ml of 2.3% Gastrografin was given perorally. Intravenous injection of iohexol (Omnipaque; Nycored Nyegaard and Co., Oslo, Norway) at a dose of 1 ml/kg body weight and a concentration of 300 mg I/ml was used, and continuous 8- or 4-mm slices were imaged. The ERCP technique was performed according to the procedure described previously [3] in 13 cases. MRI was performed (3 patients) using a Fonar B 3000 0.3-T machine, T1-weighted axial spin-echo (SE) images (TR/TE: 800/30 ms; 5-mm-thick slices) and T2-weighted SE images (TR/TE: 2000/85 ms; 7-mm-thick slices) with and without IV contrast enhancement; Gadodiamid (Omniscan, Nyegaard and Co., Oslo, Norway) at a dose of 0.5 mmol/ml gadolinium, 0.2 ml/kg IV. Percutaneous fine-needle aspiration cytology (FNAC) was performed as previously described [4] in 7 cases. Four patients were biopsied on two different occasions.

Clinical data, together with blood test analyses, were retrospectively reviewed from patient records by two surgeons experienced in pancreatic diseases. The diagnosis of pancreatitis (23 patients) required severe abdominal pain combined with a raised serum amylase level. Acute pancreatitis was defined as the first or second attack of pancreatitis [5]. Chronic pancreatitis was evident from patient history of previous recurrent pancreatitis attacks, radiological examinations, FNAC and/or surgical findings [6]. The median follow-up time was 80 months (range 7–147 months) in the total patient sample and median 85 months (range 44–147 months) in living patients.

Results

Focal acute pancreatitis was found in 32 patients (16 females and 16 males; mean age 58 years, range 25–87 years) during a period of 8 years (1985–1993).

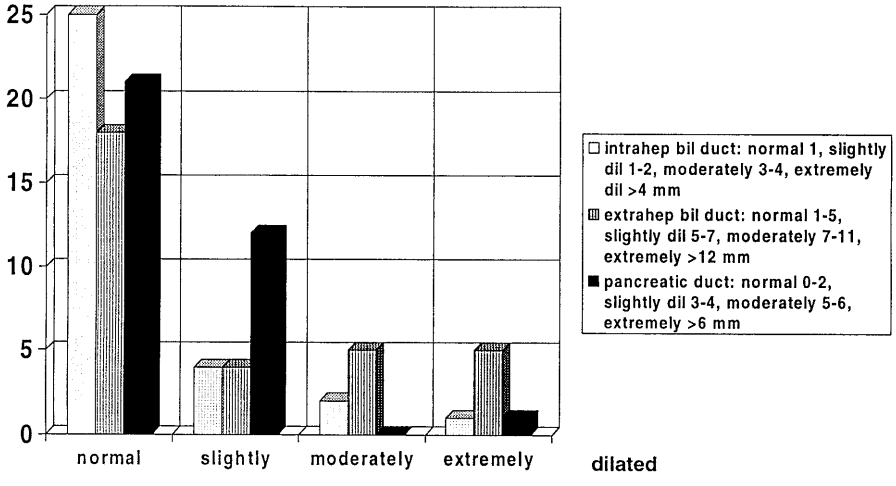

Fig. 2. Number of patients with varying diameters of the intrahepatic and extrahepatic biliary ducts and the pancreatic duct

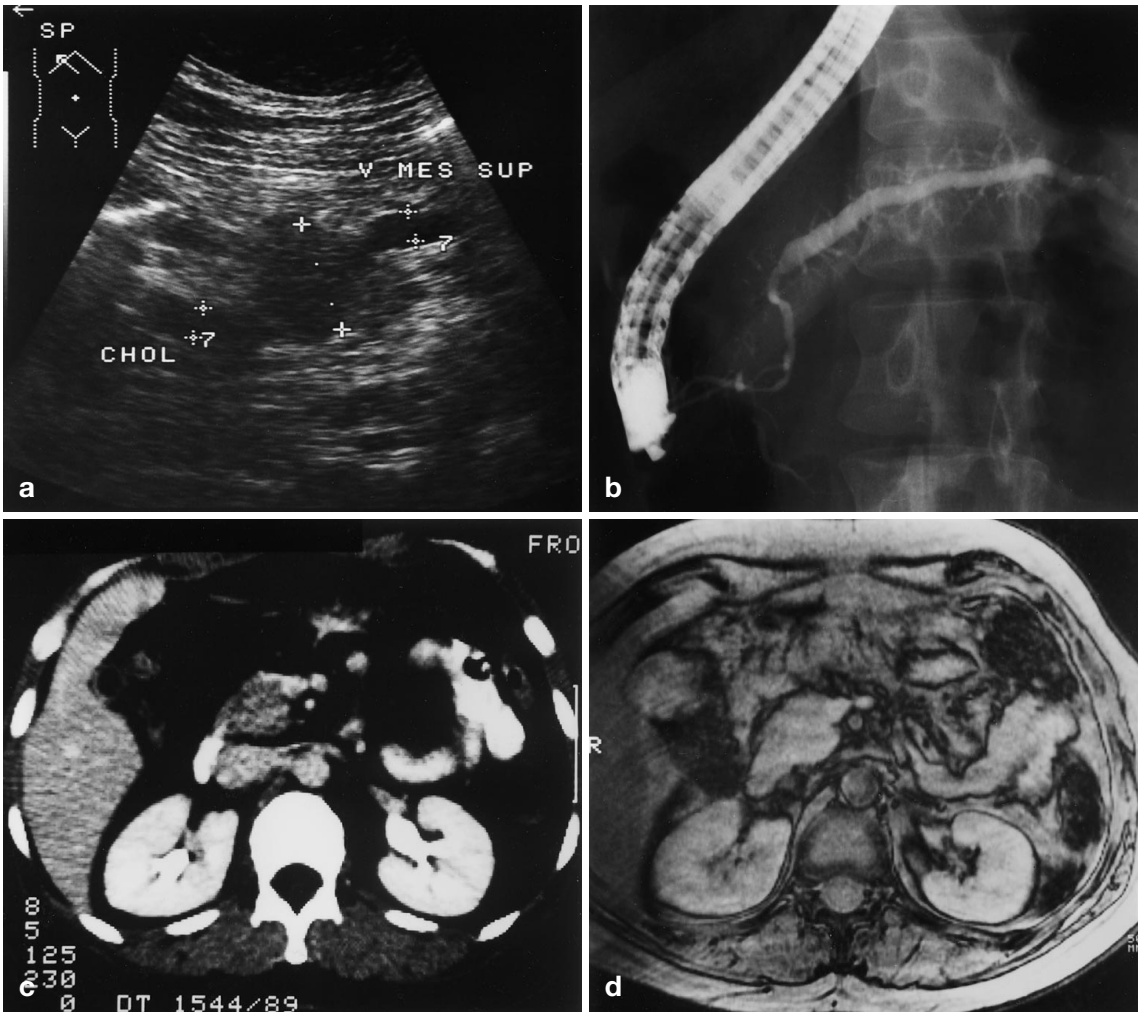

Fig. 3 a–d. A 36-year-old female operated on (duodeno-pancreatectomy) due to increased clinical symptoms in combination with a persistent FAP lesion. **a** Focal Acute Pancreatitis as demonstrated by ultrasonography. **b** Endoscopic retrograde cholangiopancreaticography of the corresponding area with slight changes in accordance with chronic pancreatitis. **c** Computed tomography. **d** Magnetic resonance imaging of the corresponding area

Initial radiological evaluation

Ultrasound showed the FAP lesion to be localized in the head and/or the uncinate process of the pancreas in 28 cases, in the body in 1 case and in the tail in 3 cases. The size of the FAP lesion varied between 1.5 and 5 cm with a median size of 3 cm (Fig. 1 a). The remaining part of the pancreatic gland was normal (Fig. 1 b). The common biliary and pancreatic ducts showed normal size in most of the cases (Fig. 2). Concomitant findings were gallstones in dilated extrahepatic bile ducts and in the gallbladder in 4 patients, while another 11 patients had gallstones in the gallbladder only. Five patients had a sonographical picture suggesting cholecystitis.

Computed tomography in 13 cases (15 investigations) could not demonstrate the FAP lesion at all (Figs. 3, 4). The ERCP technique was normal in 3 cases. Three cases showed a slight compression of the pancreatic duct in the area of the FAP lesion in the head of pancreas. Four cases showed changes in accordance with chronic pancreatitis, where the most pronounced changes were seen in the area of the FAP lesion. Three cases were inconclusive. None of the cases showed any signs of malignancy. All cytology specimens after FNAC revealed chronic inflammatory reaction, without any signs of malignancy.

Radiological follow-up

Twenty-four patients were radiologically controlled, 7 with US, 5 with CT and 12 with both US and CT. In 2 patients cysts were detected in the area of the FAP lesion 1 and 13 months after the initial examination, respectively. In the 19 patients who were controlled with US, the FAP lesion disappeared over a period of 1–6 months.

Clinical evaluation, follow-up and surgery

The initial clinical diagnosis was acute pancreatitis in 11 patients, of biliary (4 patients), alcoholic (2 patients), idiopathic (4 patients) or circulatory (1 patient) origin (Table 1). Twelve patients had recurrent attacks of

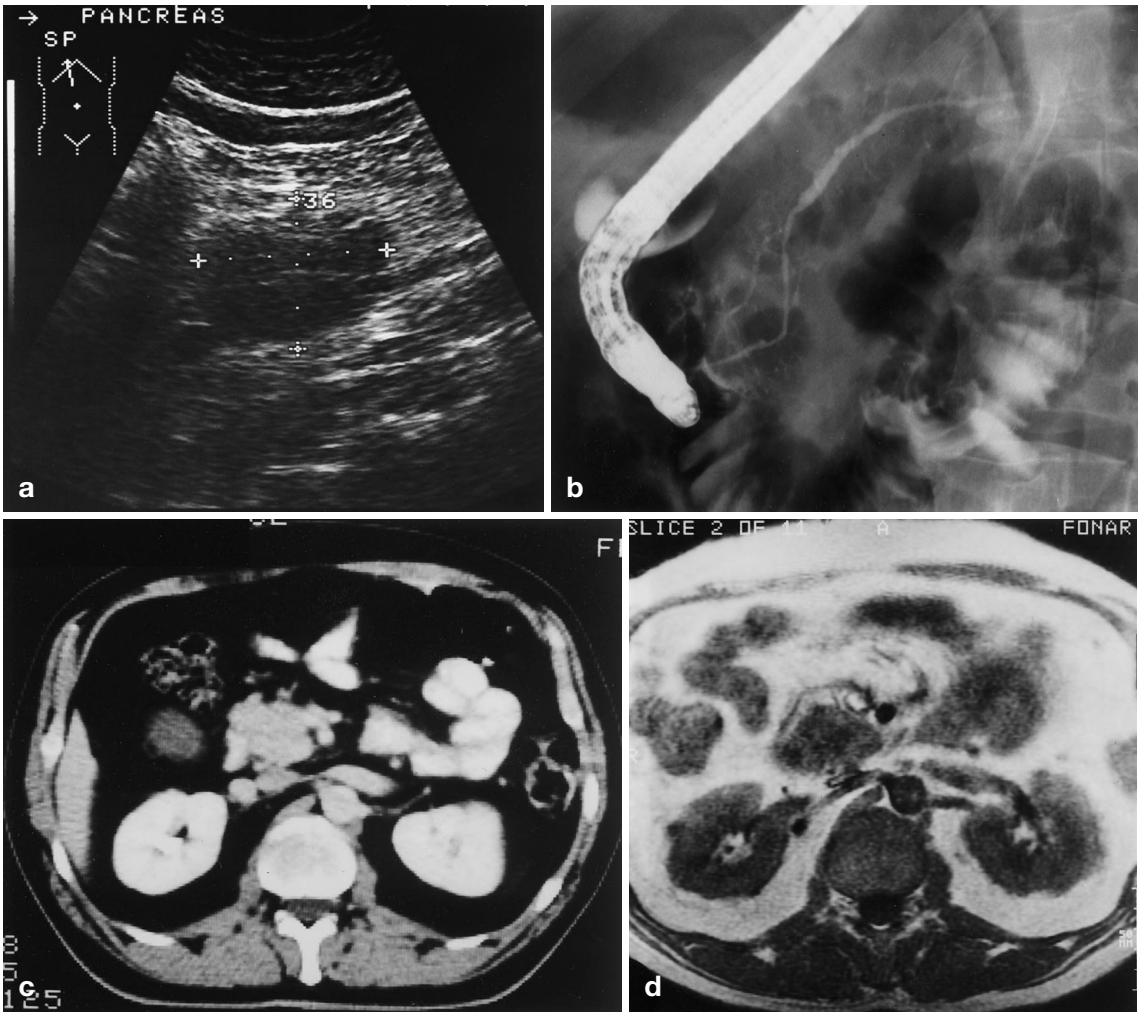

Fig. 4 a–d. Same as Fig. 3, but in a 45-year-old male. Percutaneous ultrasound-guided biopsy was performed in both patients, and cytology revealed inflammatory reaction

chronic pancreatitis (11 alcohol induced, 1 biliary), where the present episode was the fourth to fifteenth. Five patients had biliary stone diseases, 2 with jaundice and cholangitis, 1 with acute cholecystitis and 2 with dilated extrahepatic ducts without any visible stone. One patient had hepatopathia of unknown origin and 3 patients had diseases outside the hepato-pancreato-biliary system; seventeen of 32 patients had increased serum amylase levels, and 19 of 32 had pathological liver enzyme studies, 8 of them with jaundice (Table 1).

Eight patients were operated on within 2 days to 4 months, 3 of them to rule out malignancy, and 5 patients because of biliary disease. One patient was treated using ERCP and papillotomy to clear extrahepatic biliary stones. Multiple perioperative fine-needle aspiration biopsies and/or microscopic analyses of the surgical specimens were done in all surgically treated cases and showed chronic inflammatory changes without any malignancy.

Clinical follow-up (patient records)

At follow-up 9 of the 11 patients who had an acute pancreatitis attack had had no further symptoms. Seven of the 12 patients who had chronic pancreatitis had continuing abdominal pain; several of them were hospitalized again with these symptoms. All patients with gallstone-related disease were free of symptoms. No patient developed symptoms or signs of pancreatic cancer during the median follow-up time of 85 months (range 44–147 months) in living patients.

Seven patients died (three autopsies were performed) during follow-up within 7–44 months after the initial US examination. The causes of death were thrombosis of the superior mesenteric artery causing total intestinal gangrene, generalized malignant histiocytoma originating from the left thigh, cerebrovascular disease, hepatic insufficiency, chronic pancreatitis causing malnutrition and cachexia and advanced age (2 patients). None of the dead patients had any pancreatic malignancy.

Discussion

Focal acute pancreatitis might be a new sonographic imaging finding in the head and/or uncinate process of the

Table 1. Patient characteristics in 32 patients with focal acute pancreatitis grouped according to final clinical diagnoses

	Pancreatitis		Biliary disease	Miscellaneous	Normal range
	Acute	Chronic			
Number	11	12	5	4	
Male/female	5/6	6/6	2/3	3/1	
Age (years, mean)	60	53	70	50	
Time symptoms–US (days)	13.6	13.6	4.9	145	
Amylase (mean)	28.2	11.0	7.9	4.4	< 5 μkat/l
Liver enzymes (mean)					
Bilirubin	46	48	90.5		< 20 U/l
ALAT	2.8	1.0	3.4	1.5	< 0.7 μkat/l
Alkaline phosphatase	6.8	7.6	8.8	5.5	< 4.6 μkat/l
Hospital stay (days)	13.2	9.3	8.3	0.3	
Surgery/papillotomy	2/0	2/0	0/4		
Cytology/Histology	1/2	4/2	0/4		
Complications (pancreatic pseudocysts)	2				

pancreas, found to be benign at long-term clinical follow-up. It is usually seen in diseases engaging pancreas and/or the biliary system. Alternatively, FAP might merely represent part of an acute or chronic pancreatitis not previously recognized at US. Most importantly, FAP is benign and has distinct US imaging findings that differentiate it from malignant tumours of the pancreas. Thus, it is non-expansive, i.e. preserving the shape, size and contour of the pancreas, and has only a minimal influence on the biliary and pancreatic ducts. It has a diffuse demarcation not engaging the whole pancreatic head, i.e. it is subsegmental. On the other hand, FAP also has similarities at US with malignant pancreatic tumours, as well as with other localized hypoechoic lesions in the pancreas, e.g. focal pancreatitis, segmental pancreatitis, focal mass, local pancreatic mass, pseudotumours, etc. [7–16]. In fact, the terminology concerning morphological changes in the pancreas is manifold and often confusing, and the difficulties to differentiate malignant from inflammatory lesions in the head of the pancreas has been extensively described and reviewed [7–16]. Furthermore, a focal pancreatic scar, multifocal idiopathic fibrosclerosis [7] or a duodenal diverticulum [17, 18] are other differential diagnoses. Whereas CT is usually considered superior to US in detecting pathological changes in and around the pancreas [16], US has been shown to be more sensitive in detecting, for example, small endocrine pancreatic tumours [19]. The role of MRI in detecting pancreatic changes is still under evaluation [20].

Surprisingly, CT failed to detect the FAP lesion. This might be a crucial finding, exclusively separating FAP from malignancy in the clinical/roentgenological workup. Since, however, only 13 of 32 patients were investigated using CT, the finding warrants further investigation. Perhaps the same holds true for MRI, since MRI also failed to detect the lesion in 3 of 32 patients examined using MRI. Theoretically, the FAP lesion probably consists of oedema, or increased or decreased blood circulation, explaining why it is usually seen in diseases engaging pancreas and/or the biliary system, or in diseases surrounding the pancreatico-biliary system. Due to its small size, it could be difficult to demonstrate using CT, whereas MRI should reveal it [20, 21]. Maybe a high-field MRI machine (1–1.5 T) would have visualized the lesion. Although ERCP is highly accurate in differentiating between malignant and inflammatory pancreatic lesions [3], and is often considered the gold standard, FAP was not seen in the 13 patients examined. Fine-needle aspiration cytology is usually used to differentiate between malignant and benign pancreatic lesions [4]. Recent data show a low risk of needle tract seeding of cancer cells [22, 23]. Since none of our 32 patients developed any cancer during the long follow-up, we think that FNAC is without any danger and indeed important in these patients.

Clinically, FAP was seen mainly in patients with acute (11 of 32) and chronic (12 of 32) pancreatitis, but also in patients with gallstone disease (5 of 32), predominately those having stones in the extrahepatic bile ducts (4 of 32). Thus, FAP is directly correlated to diseases engaging the pancreas or surrounding structures. The reason for the location of FAP almost only in the head of pancreas and in the vicinity of the pancreatic and common bile ducts is unknown. This localization, however, probably explains why 19 of our 32 patients had one or more pathological liver enzyme levels in blood. Although FAP is probably caused by a local inflammatory reaction, it was seen during a long period of time in some patients. Some patients had had only 1 or 2 days of symptoms, whereas others had had symptoms for several months. Follow-up studies also showed FAP to remain for up to 6 months. We call this lesion acute as it is transient and disappears within a few months, i.e. in agreement with previous follow-up studies using CT after acute pancreatitis, where the CT changes may be present for 3–5 months after the clinical signs of pancreatitis have totally subsided [8, 24]. These long-lasting US and CT changes perhaps also explain why there was no difference at US between cases of acute or chronic pancreatitis, although there are clear-cut differences in the clinical course between these two groups of patients.

Most importantly, from the clinical point of view, none of the 32 patients developed any pancreatic malignancy during the 80 months of follow-up, clearly indicating that FAP is not a malignant or pre-malignant

pancreatic lesion. Although the risk that some of these patients really have a pancreatic cancer still may exist, it should be negligible, since pancreatic cancer runs a fast course [25] and the cancer should consequently have been evident during our long follow-up period.

In summary, we propose that focal acute pancreatitis might be a new imaging finding in ultrasonography, and in the clinical setting of the pancreas. Characteristic US criteria separate it from other benign lesions and from malignant tumours.

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