

ORIGINAL ARTICLE

Endoscopic Ultrasound Reliably Identifies Chronic Pancreatitis when Other Imaging Modalities Have Been Non-Diagnostic

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ABSTRACT

Context There are classical radiological features for the diagnosis of chronic pancreatitis when utilising endoscopic retrograde cholangiopancreatography (ERCP), magnetic resonance cholangiopancreatography (MRCP) or computed tomography (CT), however, not all patients exhibit these features despite convincing clinical histories, which may result in diagnostic delay. Objective The aim of this study was to assess the use of endoscopic ultrasound (EUS) in the diagnosis of chronic pancreatitis when other imaging modalities had not yielded a diagnosis. **Methods** All patients undergoing pancreatic EUS between January 1996 and December 2004 were identified from the radiology computerised database. Sixteen patients with a clinical diagnosis of chronic pancreatitis (10 males, 6 females; mean age 53±4 years) underwent EUS after normal conventional imaging. Patients were then followed clinically until December 2007. **Results** Thirteen patients exhibited features of chronic pancreatitis not identified by other modalities, which included duct dilatation (n=8), calcification (n=7); parenchymal change (n=6), irregular undilated ducts (n=2), pancreatic ductal calculi (n=1), and fine calcification (n=1). Of the remaining 3 patients, a diagnosis of autoimmune pancreatitis was made in one, in another there was a pancreatic duct stricture of uncertain origin that was stented, and in only one case was no diagnosis established. All 13 patients with an EUS diagnosis of chronic pancreatitis subsequently underwent a repeat CT scan for surveillance of their disease and in all cases, the CT scans subsequently demonstrated evidence of chronic pancreatitis indicating radiological progression. No new pancreaticobiliary diagnoses were established during this period. **Conclusions** EUS is a useful diagnostic tool confirming the diagnosis of chronic pancreatitis in 13 of 16 cases where histories were suspicious of chronic pancreatitis, and providing an alternative diagnosis in another two cases. EUS should be considered an important tool for diagnosis of chronic pancreatitis and should be used when cross-sectional imaging is non-diagnostic.

INTRODUCTION

Chronic pancreatitis is defined as a progressive, destructive inflammatory process that ends in total destruction of the pancreas and results in malabsorption of dietary nutrients, diabetes mellitus, and severe, unrelenting pain [1]. As the histological confirmation of chronic pancreatitis is rarely possible, the diagnosis has traditionally been based on computed tomography (CT) or endoscopic retrograde cholangiopancreatography (ERCP) findings [2]. More recently, magnetic resonance cholangiopancreatography (MRCP) [3] has proven to be a non-invasive alternative to ERCP. However, despite the use of these imaging

modalities, we have noted a number of patients who have a reliable history, often with evidence of exocrine insufficiency but in whom imaging studies are negative.

The development of endoscopic ultrasound (EUS) has provided an alternate means of assessing these patients. Numerous studies have compared EUS with other modalities, mainly ERCP, and found it to be at least as good, and often superior [4, 5, 6, 7, 8, 9, 10, 11, 12].

There are a number of specific features that may be identified using EUS [13] many of which represent early changes of chronic pancreatitis not detectable using other modalities and thus there is the potential for EUS to replace all other modalities.

Several studies over recent years have assessed the role of EUS in the diagnosis of chronic pancreatitis. However, EUS is currently not widely available outside of major centres as it demands a high level of expertise to perform and interpret the images obtained. In this setting, non-discriminatory use of EUS in patients with upper abdominal and possible chronic pancreatitis, prior to cross-sectional imaging, may represent a waste of this precious resource.

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Figure 1. EUS confirming the presence of calcification within the wall of the dilated main pancreatic duct. Parenchymal echogenic foci are also noted. Image obtained on a linear endoscope (PEF-703FA, Toshiba, Crawley, United Kingdom).

The aim of this study was to assess the role of EUS in patients with histories suggestive of EUS in whom CT and ERCP or MRCP had proved non-diagnostic to determine whether targeted use of EUS is optimal usage of this currently limited resource.

PATIENTS AND METHODS

All patients undergoing EUS for pancreaticobiliary disease between January 1996 and December 2004 were identified from the computerised radiology database at the University Hospital Wales. Patients referred for EUS from the Royal Gwent Hospital, Newport and the University Hospital Wales, Cardiff had the procedure performed and reported by a single radiologist based at the University Hospital of Wales. Patients undergoing EUS for a suspected diagnosis of chronic pancreatitis were identified and only those with negative conventional imaging by means of CT and ERCP/MRCP were included in this study.

EUS was carried out following conscious sedation using either radial (Olympus UM-20 or UM-2000, KeyMed, Southend, United Kingdom) or linear (PEF-703FA, Toshiba, Crawley, United Kingdom) scopes with a Powervision 6000 processor (Toshiba, Crawley, United Kingdom).

At the level of the papilla, in the long position, gentle withdrawal of the endoscope was commenced. Inflation of a water filled balloon around the ultrasound transducer, and aspiration of luminal gas enabled ultrasound imaging of the gallbladder, biliary tract, and pancreatic head. The remainder of the pancreas, and coeliac axis region was visualised from the stomach.

The features of chronic pancreatitis that may be identified on EUS and which were specifically observed include: hyperechoic foci; hyperechoic strands; parenchymal lobularity, irregular pancreatic duct margins; hyperechoic pancreatic duct margins; visible side branches; pancreatic duct dilatation; shadowing calcifications and cysts.

Patient notes were retrieved from the medical records departments of both hospitals and data sourced included the indication for EUS and the reports of pre-

EUS imaging including CT, MRCP and ERCP. The EUS reports were then extracted for those patients undergoing EUS for confirmed or suspected pancreatic masses. The reports from the EUS examination were then compared to the other modalities. In cases in which a resection was performed, the EUS findings were compared to the operative findings.

ETHICS

Approval was obtained from the Research and Development Department of the Hospital prior to commencing the work. Informed consent was obtained from all patients prior to performance of endoscopic ultrasound and all aspects of the study were conducted in accordance with the Declaration of Helsinki.

STATISTICS

Descriptive statistics were reported: mean, standard deviation (SD), and frequencies.

RESULTS

Of 219 procedures performed, sixteen patients (7.3%) underwent EUS on the basis of a clinical suspicion of chronic pancreatitis based upon a history of chronic upper abdominal pancreatic-type pain but normal conventional imaging. There were 10 males and 6 females and the age was 53 ± 4 years (mean \pm SD).

The examination provided useful diagnostic information in 15 of 16 patients. In thirteen cases (81.3%), EUS identified features of chronic pancreatitis that had not been seen by other modalities which included: duct dilatation (n=8); calcification (n=7) (Figure 1); parenchymal change (n=6), irregular undilated ducts (n=2), pancreatic ductal calculi (n=1) and fine calcification (n=1) (Figures 2 and 3).

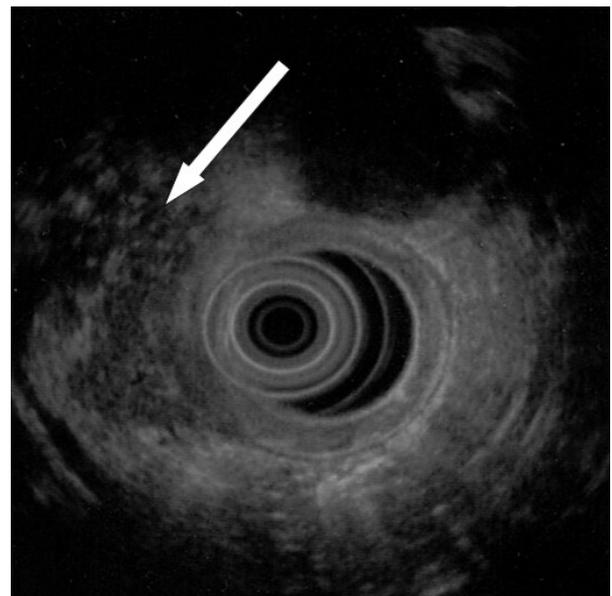


Figure 2. EUS demonstrating parenchymal changes with fine calcification and undilated, tortuous ducts (arrowed) typical of early chronic pancreatitis. Image obtained on a radial endoscope (Olympus UM-2000, KeyMed, Southend, United Kingdom).

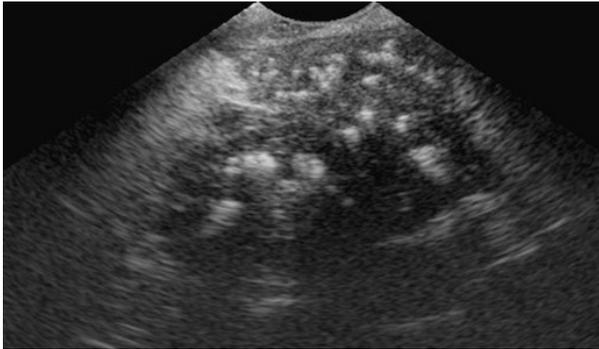


Figure 3. EUS demonstrating a microcalcification (arrowed) not visualised on other imaging modalities. Image obtained on a linear endoscope (Toshiba PEF-703FA, Toshiba, Crawley, United Kingdom).

Of the remaining 3 patients (18.8%), a diagnosis of sclerosing pancreatitis was made in one, and in another, there was a pancreatic duct stricture of uncertain origin that was stented leading to symptomatic improvement. In only one case was no diagnosis established.

Each of the patients with EUS diagnosed chronic pancreatitis were followed up in a specialist chronic pancreatitis clinic and subsequently underwent protocol cross-sectional imaging as part of the surveillance of their disease. In all cases, CT scans subsequently, demonstrated evidence of chronic pancreatitis indicating radiological progression. During this period of observation, no new pancreaticobiliary diagnoses were established in these patients.

DISCUSSION

Overall, EUS provided additional diagnostic information in 94% of patients in this series, including the identification of 13 cases of chronic pancreatitis and 2 cases of other benign pathologies (pancreatic duct stricture and autoimmune pancreatitis). In all cases, at the time of performance of the EUS, patients had histories of multiple admissions and extensive investigation using conventional imaging modalities such as CT, ERCP and MRCP.

Numerous studies have now confirmed the sensitivity and specificity of EUS in relation to the old 'gold standard' of ERCP in chronic pancreatitis [4, 5, 6, 7, 8, 9, 10, 11, 12]. Importantly, it has been shown that patients with normal EUS also have normal ERCP [4, 5, 7] and that there is a good inter-observer agreement in the interpretation of findings [14]. Several authors have taken the comparison a step further and attempted to relate the severity of disease to EUS appearances. Both Sahai *et al.* and Wiersema *et al.* have demonstrated that EUS is accurate in establishing the severity of chronic pancreatitis [5, 8]. Irisawa *et al.*, using computer analysis of images to determine the size of the hyperechoic areas within the pancreas, found that the size of the hyperechoic area could be related directly to the severity of the disease [15].

The current study did not attempt to mimic the previous studies and relate disease severity to EUS features as it was only considering patients in which other imaging modalities, which are usually reliable in the identification of chronic pancreatitis, were non-diagnostic. However, we have no reason to believe that EUS would not have provided a diagnosis in cases in which cross-sectional imaging or ERCP had succeeded. Kahl *et al.* reported follow-up on a series of 38 patients out of a cohort of 130 with known or suspected chronic pancreatitis in whom ERCP was normal [16]. EUS performed in these patients revealed features of chronic pancreatitis in 84.2% (32/38) of cases. With a mean follow-up of 18 months, 22 patients had repeat ERCP on clinical grounds and classical ERCP features were subsequently identified in all patients, of whom 10 had grade II chronic pancreatitis and 12 had grade I chronic pancreatitis. The remaining 16 patients had not undergone repeat imaging and remained in a clinical follow-up program. The study therefore confirmed the sensitivity of EUS compared to ERCP and also showed that EUS detected parenchymal changes at an earlier stage in the disease process.

In many cases the EUS changes identified in this series were subtle indicating early chronic pancreatitis. From the patient point of view, this is particularly important as it provides a diagnosis, where previously patients were left unlabelled experiencing repeated hospital admissions for abdominal pain up until a point where damage to the pancreas was severe and changes were then evident on conventional imaging. The second important issue is that as many cases of chronic pancreatitis are related to alcohol intoxication, if changes are detected early, it may be possible that through abstinence form the stimulus that some patients may not progress to debilitating advanced chronic pancreatitis with associated endocrine and exocrine failure.

One further advantage of EUS over other diagnostic tests is that through the use of a linear scope, it is possible to perform targeted biopsies of the pancreas. Although the evidence for this role in diagnosing chronic pancreatitis is at present uncertain [17, 18] this utility was put to good use in order to confirm the diagnosis of sclerosing pancreatitis, as had been documented in previous series [19].

CONCLUSIONS

This study has demonstrated that EUS is a useful aid to the diagnosis of chronic pancreatitis and identifies features not present on CT/MRCP/ERCP. As it is less invasive than ERCP, there is good evidence that EUS should now be regarded as the new 'gold standard' for the diagnosis of chronic pancreatitis. As the availability of EUS is currently limited, we would suggest that it be used primarily in cases in which there is diagnostic uncertainty but as expertise develop, it is

likely to replace other modalities as a one-stop test in many cases.

Conflict of interest The authors have no potential conflicts of interest

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