

# The Use of Endoscopic Ultrasound and Intravenous Secretin as an Investigative Tool to Aid Diagnosis in Pancreatic Sphincter Hypertension

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## Summary

Pancreatic sphincter hypertension (PSH) is one of the causes of recurrent pancreatitis. The diagnosis can be established by direct measurement of pancreatic sphincter pressures at pancreatic sphincter manometry. This procedure is not without risks, and in cases with PSH, it certainly carries a higher risk of post procedure pancreatitis. The treatment of this disorder is pancreatic sphincterotomy, which on its own carries risk of acute pancreatitis. Therefore it is important to establish the diagnosis reliably before undertaking this procedure. In order to overcome the false positive readings that are possible in sphincter manometry, we proposed to use secretin stimulated endoscopic ultrasound (SSEUS) to measure pancreatic ductal response as an adjunctive method to aid and supplement the diagnosis. Here we describe 3 cases in which this was carried out to optimal effect.

**Key Words:** Pancreatic sphincter hypertension, Recurrent pancreatitis, Secretin stimulated endoscopic ultrasound

## Introduction

A hundred years ago, *Rugero Oddi* described a sphincter that bears his name. In that time, investigators have determined its precise anatomy and have demonstrated its independence from the duodenal muscle wall. Modern manometric technique have also confirmed it functions independently from the duodenal muscle wall. These techniques have defined the motor activity of the sphincter and its abnormal motility in patients presenting with

either recurrent biliary-type pain or idiopathic recurrent pancreatitis. The term sphincter of Oddi dysfunction is used to describe these motility disorders of the sphincter.

There are two major groups of sphincter of Oddi dysfunction based on manometric findings, irrespective of whether the symptoms are biliary or pancreatic. They are sphincter of oddi stenosis and dyskinesia<sup>1</sup>. Sphincter of Oddi stenosis refers to basal sphincter pressures that are more than 40mmHg. Sphincter of Oddi dyskinesia refers to contractions with a frequency of more than 7 per minute,

intermittent rise in basal pressure, retrograde contractions of more than 50% and paradoxical cholecystokinin-octapeptide response.

The sonographic secretin test has been used as a screening test to evaluate the different diagnostic questions in pancreatic disease.

Conventional extracorporeal ultrasound with secretin stimulation has been used as a non-invasive study to detect obstruction and predict outcome of therapy but it has its drawbacks. Inconsistent results have been obtained because of the inherent limitations of standard ultrasonography in detecting small changes in pancreatic duct diameter. The main limitations are that of lack of sensitivity.

Endoscopic ultrasound is, on the other hand, a far more sensitive modality in detecting small changes of this nature.

Secretin is a hormone that is naturally found in the human digestive system and causes increased pancreatic secretion and also transient dilatation of the pancreatic ductal system as a result.

In the setting of pancreatic sphincter hypertension, Catalano *et al*<sup>2</sup>, has shown that using endoscopic ultrasound, one can actually visualize the changes in the pancreatic duct diameter after the patient is given a bolus of intravenous secretin.

A persistent dilatation response to secretin is abnormal and can be due to obstructive disorders of the pancreas such as strictures, stones, sphincter of Oddi dysfunction and pancreatic divisum<sup>2</sup>. In the setting of pancreatic insufficiency, the converse occurs, i.e. there will be a blunted response to secretin as pancreatic secretions are diminished and due to fibrotic changes within the pancreas this limits itself and ductal dilatation.

The study concludes that, patients with pancreatic sphincter hypertension show an exaggerated and sustained dilatation response to secretin

compared to normal controls. This method appears to be a useful diagnostic modality in the evaluation of patients with suspected obstructive disorders of the pancreas and it can predict which patients may respond to endoscopic therapy.

A positive SSEUS was taken to be persistent dilatation of 1mm or greater of the main pancreatic duct for 15 minutes<sup>2</sup>. Secretin was administered as an intravenous bolus at a dose of 1 IU/kg clinical units.

In the past other studies have also demonstrated the efficacy of the secretin stimulation tests in aiding diagnosis of pancreatic diseases<sup>3</sup>. Secretin also helps improve the visualization of the pancreatic ducts in those with severe chronic pancreatitis and helps in clinching the diagnosis using magnetic resonance cholangio-pancreatography (MRCP) when other methods such as conventional extracorporeal ultrasonography and computed tomography of the abdomen have failed<sup>4</sup>.

Three cases that presented with recurrent pancreatitis and all other causes having been excluded were subjected to pancreatic sphincter manometry and then to a secretin stimulated endoscopic ultrasound (SSEUS) in order to aid in diagnosis and therefore help define therapeutic options.

This is the first series of its nature where SSEUS has been shown to be able to guide therapy in pancreatic sphincter hypertension.

### Case 1

A 26-year old woman presented with recurrent epigastric pain and was diagnosed to have recurrent acute pancreatitis. This had been going on over a period of 2 years. Elevated levels of serum amylase and corresponding ultrasonography appearances of swollen head of pancreas and peripancreatic oedema established the diagnosis. However the ultrasound failed to reveal any clues as to the underlying aetiology.

## CASE REPORT

She was screened for causes of pancreatitis and the fasting serum lipids, serum calcium, drug history were negative. She was then subjected to a pancreatic sphincter manometry. Sphincter pressures were 42.5mmHg (normal less than 40mmHg). However as this was a borderline reading and there was no tachyoddia present (defined as sphincter contractions of more than 6 per minute), she was then subjected to a SSEUS to further aid in diagnosis. At SSEUS, the main pancreatic duct showed physiological dilatation to secretin. The response started at 2 minutes and waned off at 5 minutes and the duct diameter increased by 1mm from 2mm to 3mm. This was interpreted as a negative test. A further search for an aetiology resulted in an abdominal computed tomography being performed. This revealed a small solitary gallstone and cholecystectomy was performed for her resulting in sustained improvement and no further attacks of acute pancreatitis.

### Case 2

A young man of 18 had several attacks of acute pancreatitis from the age of 16. He had extensive investigations including metabolic screen, computed tomography and endoscopic retrograde cholangio-pancreatography (ERCP). Finally, he was subjected to pancreatic sphincter manometry.

Pancreatic sphincter pressures were elevated at 83mmHg and there was borderline tachyoddia at 6/min. This was a positive test. He developed post manometry pancreatitis, which was self limiting, and is a feature well described in patients with pancreatic sphincter hypertension.

He was then subjected to SSEUS. The pancreatic duct baseline diameter was 2mm and with secretin stimulation, it showed a brisk response by dilating to 3mm and this was sustained for 15 minutes. This was a positive test and he was then subjected to a pancreatic sphincterotomy, which was performed endoscopically.

A 5Fr *Geenen* stent was first positioned in the main pancreatic duct and a precut sphincterotomy was performed over the stent. There were no post procedure complications and he has since been free of attacks of acute pancreatitis.

### Case 3

A 35-year old lady presented with several episodes of acute pancreatitis for which an aetiology was not readily apparent. She was also subjected to transabdominal ultrasound, which failed to reveal any apparent abnormality. A pancreatic sphincter manometry was performed, which revealed a pressure reading of 55mmHg. An SSEUS was then performed. The baseline diameter of the pancreatic duct was 1mm and this remained unchanged throughout the procedure. The pancreas also appeared rather heterogeneous in appearance, suggesting parenchymal disease.

She was not subjected to a pancreatic sphincterotomy in view of the absence of correlation between the pressure readings and SSEUS findings.

### Discussion

Endoscopic ultrasound is extremely useful in detecting small changes in ductal diameter due to its superior resolution. It also is very sensitive in identifying changes in pancreatic parenchymal abnormalities.

In the first case, as the pressure readings were borderline, the SSEUS has helped to define the management of the case and helped to avoid unnecessary sphincterotomy of the pancreatic sphincter which carries a high risk of complications like acute pancreatitis, bowel perforation and haemorrhage. She eventually was discovered to have cholelithiasis and was treated appropriately with a good outcome. The initial inability to detect the gallstone by ultrasound is well described. The presence of

ileus and overlying gas filled bowel loops reduces the sensitivity of transabdominal ultrasound to 60 - 70%. The second case has pancreatic sphincter hypertension and showed a definite response to secretin stimulation. The resting intraductal pressure was higher in this patient compared to the other two cases, suggesting the possibility of higher intraductal pressures as a result of obstruction at the level of the hypertonic sphincter.

In the third case, there was complete absence of ductal response to secretin, which suggests pancreatic exocrine insufficiency. This also correlated with the abnormal pancreatic parenchymal appearance. She was diagnosed to have chronic pancreatitis with recurrent acute episodes of pancreatitis. The SSEUS and the superior resolution obtained with endoscopic ultrasound helped in arriving at a concrete diagnosis.

SSEUS appears to be a useful diagnostic modality in the evaluation of patients with suspected obstructive disorders of the pancreas and it can help predict which patients may respond to endoscopic therapy. The use of pancreatic sphincter manometry in evaluating patients with 'idiopathic pancreatitis' has helped in elucidating the aetiology in up to 50% of cases<sup>6</sup>. This has important therapeutic implications, as treatment in this abnormality is division of the sphincter at endoscopy.

In conclusion the use of SSEUS as an adjunct to establish the diagnosis of pancreatic sphincter hypertension appears to be promising based on this series of cases.

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