



Research Article

STUDY ON ASSOCIATION BETWEEN GALLSTONE SIZE AND PANCREATITIS

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ABSTRACT

Acute Pancreatitis is the most common pancreatic disease. Various factors are believed to be involved in causing acute pancreatitis in patients of cholelithiasis like multiple gallstones, small gallstones, biliary sludge, wide cystic duct, choledocholithiasis and presence of a common channel. Small gallstones might migrate into the common bile duct more easily than larger stones. The present study was done to find out any association between small sized gallstones and developing acute pancreatitis. This study included 70 patients between 1st June 2016 to 31st May 2017, who presented with acute pancreatitis in the emergency department or surgical outpatient department with presence of gallstones on ultrasound of abdomen. Ultrasonography of all patients was done to detect gallstones. Number, size of the largest and the smallest gallstone, thickness of gall bladder wall, presence of pericholecystic fluid, condition of pancreas and its size, echogenicity, peripancreatic collection, presence or absence of ascites, condition of Common Bile Duct (CBD), its diameter, presence or absence of CBD stones were noted in all cases. The patients were divided into 5 mm categories according to smallest stone size. Maximum number of patients, i.e. 46 (65.7%), were observed in ≤ 5 mm category. In this study we found that multiple small gallstones were associated with acute gallstone induced pancreatitis. Therefore patients with multiple small size gallstones require early surgery to reduce incidence of gallstone induced pancreatitis and its complications.

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INTRODUCTION

Acute Pancreatitis is the most common pancreatic disease in the world¹. It is defined as an acute condition presenting with abdominal pain and is usually associated with raised pancreatic enzyme levels in the blood or urine as a result of pancreatic inflammation². It is a common disease with mild to severe clinical presentation, and, considerable morbidity and mortality. Gallstones are the most common cause of acute pancreatitis². It occurs in 3 to 8% of patients of gallstone disease³. Various factors are believed to be involved in causing acute pancreatitis in patients of cholelithiasis like multiple gallstones, small gallstones, biliary sludge, wide cystic duct, choledocholithiasis and presence of a common channel. We cannot predict precisely which gallstone patients are at higher risk of developing acute pancreatitis. Gallstones are often detected incidentally on ultrasound during routine examinations and over 70% of gallstones are asymptomatic⁴. Ultrasound is a highly sensitive investigation for gallstones and can detect size of gallstones as well as presence of microlithiasis or biliary sludge. 10% of patients with asymptomatic gallstones will experience a gallstones related biliary event like biliary colic, acute cholecystitis, acute cholangitis or acute pancreatitis within five years of diagnosis,

and 20% will experience such events within 20 years of diagnosis⁴⁻⁵. Expectant management is usually followed in patients with incidentally discovered small gall bladder stones. However keeping in mind the above mentioned statistics this is a matter of debate. The present study was done to find out any association between small sized gallstones and developing acute pancreatitis.

MATERIALS AND METHODS

This study included 70 patients who presented with acute pancreatitis in the emergency department or surgical outpatient department with presence of gallstones on ultrasound abdomen between 1st June 2016 to 31st May 2017. These patients were admitted, evaluated and investigated. Patients with history of trauma and patients of gallstone induced pancreatitis with pregnancy were excluded from this study. Detailed history of all the patients was taken; thorough clinical examination and relevant laboratory investigations were done. Ultrasonography of all patients was done to detect gallstones. Number, size of largest and smallest gallstone, thickness of gall bladder wall, presence of pericholecystic fluid, condition of pancreas and its size, echogenicity, peripancreatic collection, presence or absence of ascites, condition of common bile duct (CBD), its diameter, presence or absence of CBD stones were noted. CECT abdomen was also done in all patients 72 hours after onset of pain. The modified CT severity Index was recorded.

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RESULTS

The study comprised 70 patients of Gallstone induced acute pancreatitis. The age of patients ranged from 21 to 86 years with mean age of 53.16 ± 15.72 years. The maximum number of patients i.e. 16 (22.8%) were found in the age group of 51-60 years. 52 (74.3%) patients were female and 18 (25.7%) patients were male with M:F ratio of 1:2.9.

Smallest gallstone size in various cases, ranged from 0.5 to 20.8 mm with average of 5.27 ± 4 mm. Patients were divided into 5mm categories. Maximum number of patients, 46 (65.7%) were observed in ≤ 5 mm category followed by 19 (27.1%) in 5.1 to 10mm category. 65 patients (92.8%) were in ≤ 10 mm category (Table 1).

Largest gallstone size, in various cases, ranged from 1 to 23 mm with average of 9.35 ± 5.34 mm. Patients were again divided into 5mm categories. Maximum patients 25 (35.7%) were in the 5.1 to 10 mm category. Only 2 patients (2.8%) were in the >20 mm category.

62 patients (88.6%) had multiple gallstones. 7 patients (10%) had single gallstone and 1 patient (1.4%) had two gallstones. Multiple small stones with at least one stone ≤ 5 mm were present in 61 patients (87.1%).

On assessment of the CBD, stones were found in 4 patients (5.7%) on ultrasound. It was dilated in 15 patients (21.4%). All these patients had multiple gall bladder stones. 21 patients (30%) had modified CT severity index 4. Severe pancreatitis (MCTSI of 8 or 10) was seen in 13 (18.5%) patients.

Average Alkaline Phosphatase of patients with gallstone size ≤ 5 mm was 215.87 ± 172.86 U/L. In patients with gallstone size 5.1-10mm it was 158.21 ± 78.79 U/L, and in >10 mm category it was 132.4 ± 55.75 U/L (Figure 1).

Average total bilirubin in patients with gallstone size ≤ 5 mm was 2.35 ± 2.47 mg/dL. In patients with gallstone size 5.1-10mm it was 1.56 ± 1.43 mg/dL and in >10 mm category it was 0.98 ± 0.54 mg/dL (Figure 2).

DISCUSSION

An association between biliary tract disease and pancreatitis was first recorded in 1901⁶. Gallstones passage into the intestinal tract coinciding with initial symptoms of pancreatitis as first observed by Acosta and coworkers⁷, kick started the research in this field. Since then many strides have been made to find out various factors responsible for gallstone induced pancreatitis.

70 patients included in our study were divided into 5 mm categories according to smallest stone size. Maximum number of patients, i.e. 46 (65.7%), were observed in ≤ 5 mm category followed by 19 (27.1%) in 5.1 to 10mm category. In total, 65 patients (92.8%) were in ≤ 10 mm category. In the study conducted by Niels G. Venneman *et al* in 2005, they measured the sizes of gallstones obtained after cholecystectomy. The mean smallest gallstone size in patients with acute pancreatitis (21 patients) was 2 mm⁸. In the present study also maximum patients were seen in ≤ 5 mm category. In another study by Andrew K Diehl *et al* in 1997, 84% of patients with pancreatitis had at least one stone smaller than 5 mm. Patients with at least one stone smaller than 5 mm had 4 fold greater risk of presenting with pancreatitis rather than uncomplicated biliary pain⁹. These results are in accordance to the present

study. Grace H Elta in 2008 reported that microlithiasis was a potential cause of acute pancreatitis. He defined microlithiasis as tiny stones of size 1-2mm¹⁰. Mc Mahon and Shefta in 1980 said that small, irregular or mulberry shaped stones were the dominant stone type in 78% of the pancreatitis group¹¹. Houssin *et al.* in 1983 also found an inverse relation between the diameter of the smallest stone and the presentation as acute pancreatitis¹². In the study published by T R Kelly in 1984 stone size of 5 mm or less was present in 51 of 75 patients (70%) with acute pancreatitis¹³. All these studies are in agreement with the present study as 65.7 % of the patients have stone size ≤ 5 mm. If we compare the percentage of patients in all stone size categories, the number of patients in ≤ 5 mm category is twice the number of patients in all other categories put together. Most of the patients (92.8%) had smallest stone size less than 10 mm. So, small stones were present in most of the patients. The gradual increase in number of patients of acute pancreatitis with decrease in size of gallstone indicates increasing risk of pancreatitis with decrease in smallest stone size.

The exact mechanism that triggers pancreatic injury has not been completely understood.³ The common channel theory suggests that an impacted stone in the distal bile duct might create behind it a common channel allowing the reflux of bile into the pancreatic duct triggering acute pancreatitis.¹⁴ In many patients, however the union of main bile duct and main pancreatic duct is too short to allow the formation of such common channel. Another theory known as the duodenal reflux theory suggests that stones may pass through the sphincter of Oddi and stretch the muscles making it incompetent, as a result duodenal juices containing activated pancreatic digestive enzymes could reflux through the incompetent sphincter into the pancreatic duct causing acute pancreatitis.¹⁵ The most widely accepted theory is based on the concept of the pancreatic duct obstruction. This theory suggests that the impaction of triggering gallstones or alternatively the edema and inflammation resulting from the passage of such gallstones could obstruct the pancreatic duct. Continuing secretion into the obstructed duct causes ductal hypertension resulting in the extravasation of pancreatic juice in the pancreatic parenchyma triggering pancreatic injury.¹⁶ So, smaller the gallstone size more chances of passage of the stone down the biliary tree and hence more chances of pancreatitis.

Largest gallstone size ranged from 1 to 23 mm with average of 9.35 ± 5.34 mm. As per Niels G. Venneman *et al*⁸ in 2005, the mean largest stone size in patients with pancreatitis was 7 mm which is comparable to the present study. Andrew K. Diehl *et al* in 1997 have also reported the mean diameter of the largest gallstone in those with pancreatitis to be 9.6 mm. He commented that patients with acute pancreatitis showed a distribution towards smaller stones.⁹

In the present study 62 patients (88.6%) had multiple gallstones. Andrew K Diehl *et al* in 1997 found that patients with 20 or more gallstones had significantly higher risk of acute pancreatitis⁹. Niels G. Venneman *et al* in 2005 have also found higher number of gallstones in patients with pancreatitis⁸. The present study is in accordance with these studies. Therefore the patients with multiple gallstones are at an increased risk of acute pancreatitis. More the number of gallstones more chances of passage of stone down the biliary tree. Common Bile Duct (CBD) Stones were found in 4

patients (5.7%) on ultrasound. All these patients had multiple gall bladder stones. In a study by Alejandro Oría *et al* published in 1991 in 51 patients with confirmed pancreatic inflammation at surgery only 5 patients (9.8%) had stones in the bile duct, suggesting that choledocholithiasis may not be sole triggering factor of acute gallstone pancreatitis¹⁷. In another study published in 2011 by H.C. van Santvoort *et al*, out of 167 patients, 15 (9%) had CBD stones on ultrasonography and/or CT¹⁸. The results in the present study are in agreement to above mentioned studies.

Alkaline phosphatase and bilirubin were higher in patients with smaller gallstones. Hence, this parameter is showing increase with decrease in gallstone size. This further supports the concept of smaller gallstones passing down the CBD more easily, thus raising alkaline phosphatase and bilirubin.

Keeping in view the abovementioned findings it is advisable that patients with multiple small gallbladder stones require early cholecystectomy to prevent the high chances of developing the severe complication of acute pancreatitis.

CONCLUSION

In spite of better understanding of the etiopathogenesis, better diagnostic facilities and treatment, gallstone induced pancreatitis still has considerable morbidity and mortality. So early diagnosis and early treatment are essential. If we know which gallstones can cause acute pancreatitis, we can treat those cases early and prevent complications. The present study was aimed to find association between size of gallstones and acute gallstone induced pancreatitis. In our study we found that multiple small gallstones are associated with causing acute gallstone induced pancreatitis. Therefore patients with multiple small size gallstones require early surgery to reduce incidence of gallstone induced pancreatitis.

Table 1 Number of patients in smallest gallstone size categories

Smallest Gallstone Size	Number of patients	Percentage
≤5 mm	46	65.7
5.1-10mm	19	27.1
10.1-15mm	2	2.9
15.1-20mm	2	2.9
20.1-25mm	1	1.4

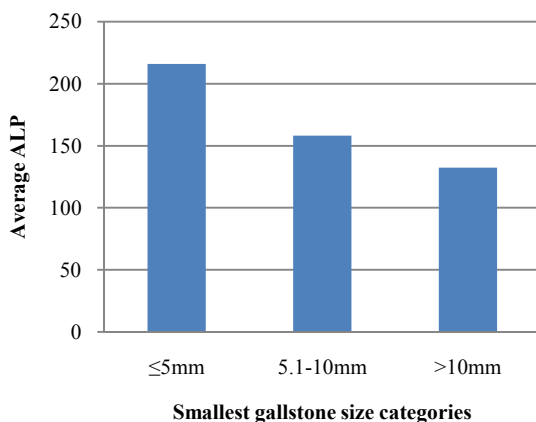


Figure 1 Average Alkaline phosphatase (ALP) in smallest gallstone size categories

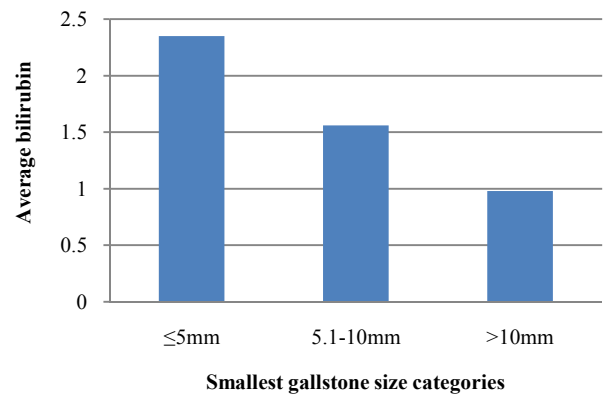


Figure 2 Average bilirubin in smallest gallstone size categories

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