

# Relationship between Fatty Liver and Pancreatitis

Jing Jia<sup>1\*</sup>, Qingming Wu<sup>1</sup>, Jiguang Kou<sup>2</sup>, Ming Yang<sup>3</sup>

<sup>1</sup>Faculty of Medicine, Wuhan University of Science and Technology, Wuhan, China

<sup>2</sup>Department of Digestive Medicine, Xiaogan Central Hospital, Xiaogan, China

<sup>3</sup>Department of Radiology, Xiaogan Central Hospital, Xiaogan, China

Email: \*787023924@qq.com

**How to cite this paper:** Jia, J., Wu, Q.M., Kou, J.G. and Yang, M. (2018) Relationship between Fatty Liver and Pancreatitis. *International Journal of Clinical Medicine*, 9, 243-248.

<https://doi.org/10.4236/ijcm.2018.94021>

**Received:** March 17, 2018

**Accepted:** April 16, 2018

**Published:** April 19, 2018

Copyright © 2018 by authors and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

## Abstract

**Objective:** We aim to explore the relationship between fatty liver and the severity of acute pancreatitis. **Methods:** The data of 128 patients with acute pancreatitis in the Xiaogan Central Hospital of Hubei from October 2016 to October 2017 were retrospectively analyzed. Clinical data of patients with fatty liver and non-fatty liver were statistically analyzed, the CT value of the liver and spleen was measure, and fatty liver was defined as mean L/SCT value < 1. **Results:** Among 128 patients, fatty liver was found in 56 (43.8%) and nonfatty liver in 72 (56.2%). Compared with patients with non fatty liver disease, the severity of pancreatitis, blood triglyceride and C reactive protein levels were higher in fatty liver patients, higher proportion of patients with local complications and persistent organ failure. **Conclusion:** Fatty liver has a greater impact on the severity of acute pancreatitis. It is possible to be an indicator of the severity of acute pancreatitis.

## Keywords

Acute Pancreatitis, Fatty Liver, CT Values

## 1. Introduction

Acute pancreatitis is a kind of inflammatory injury caused by pancreatic tissue self-digestion, such as pancreatic edema, hemorrhage and necrosis, most of which are mild lesions with good prognosis, but 20% is severe acute pancreatitis, the mortality rate is 15% - 20%, which requires strict monitoring [1]. Therefore, it is of great clinical significance to predict and classify the condition of patients with acute pancreatitis, and to carry out early intensive care and nutritional support for critical patients.

Fatty liver is associated with a variety of gastrointestinal diseases, including AP. Low density liver changes are often found on plain abdominal CT scans in patients with AP [2]. However, there is no systematic study of fatty liver on the development and prognosis of AP. The purpose of this study was to investigate the effect of fatty liver on the development and prognosis of AP.

## 2. Materials and Methods

### 1) General Information

From October 2016 to October 2017, 128 patients with acute pancreatitis were collected from Xiaogan Central Hospital, including 76 males and 52 females, with an average age of  $52.7 \pm 14.9$  years. Inclusion criterion: 1) accord with the diagnostic criteria of acute pancreatitis [3]: Two of the following three features need to be satisfied: a) Abdominal pain accords with the characteristics of acute pancreatitis (acute onset of persistent severe upper abdominal pain, It can often be released to the back); b) serum lipase or amylase is at least three times higher than the normal upper limit; c) imaging examination with characteristic changes in acute pancreatitis. 2) Abdominal CT plain scan is performed within 24 hours after onset of the disease. Exclusion standard: a) no abdominal CT scan was performed within 24 hours; b) incomplete clinical data; c) Splenectomy patients.

2) According to the consensus of diagnosis and treatment of acute pancreatitis in 2015 in China [4], acute pancreatitis is divided into three categories: mild, moderate severe and severe. Mild acute pancreatitis with no organ failure, no local or systemic complications; Moderate severe acute pancreatitis is associated with local or systemic complications, with transient organ failure and recovery within 24 hours, with no persistent organ failure. Temporary organ failure can be recovered within 24 hours, and no persistent organ failure can be achieved within 24 hours; severe acute pancreatitis with persistent organ failure for more than 48 hours. Persistent organ failure is defined as organ failure lasting more than 48 hours. Early local complications include acute peripancreatic fluid accumulation and acute necrotic accumulation.

### 3) Image analysis, measurement and calculation

The CT values of liver and spleen were measured on two consecutive levels by two radiologists in abdominal group. The left lateral lobe of liver, left inner lobe of liver and right lobe of liver were selected as three regions of interest. The ROI of spleen ranged from 200 to 400 mm<sup>2</sup> in the same plane. The CT value of normal liver was higher than that of spleen, and the CT value of liver decreased after hepatic steatosis [5]. The average value of fatty liver was defined as liver/spleen CT value < 1.

### 4) Statistical treatment

Statistical software SPSS20.0 was used for statistical analysis. Continuous data are presented as median (interquartile range), and categorical data are presented as quantities and proportions. The counting data were expressed as the number of cases or percentage, and the difference between groups was statistically signif-

icant by using  $X^2$  test ( $P < 0.05$ ).

### 3. Results

#### 1) General information analysis

The study included 128 patients, of whom 76 (59.4%) were male and 52 (40.6%) were female, as shown in **Table 1**. The mean age was  $52.7 \pm 14.9$  years. According to the consensus classification of multidisciplinary diagnosis and treatment in 2015 in China, 56 (44.8%) cases were classified as mild, 58 (45.3%) cases as moderately severe, and 14 (10.9%) cases as severe. The incidence of early local complications was acute peripancreatic fluid accumulation in 38 (29.7%) cases, acute necrotic accumulation in 20 (15.6%) cases, and persistent organ failure in 14 (10.9%) cases.

#### 2) Disease characteristics of patients with fatty liver and non-fatty liver

The study included 128 patients, including 56 (43.8%) patients with fatty liver. **Table 2** shows the comparison of parameters and severity of acute pancreatitis between patients with fatty liver and those with non-fatty liver. Mean age was not significantly different between fatty liver and nonfatty liver groups ( $49.9 \pm 11.1$  versus  $54.9 \pm 17.2$ ,  $p = 0.161$ ). Fatty liver was more prevalent in male patients (78.6% versus 44.4%,  $p < 0.001$ ). The average BMI of fatty liver group was significantly higher than that of non-fatty liver group ( $26.2 \pm 2.9$  versus  $22.5 \pm 3.2$ ,  $p < 0.001$ ). The level of random blood glucose in fatty liver group was also higher than that in non-fatty liver group ( $9.01 \pm 3.7$  versus  $6.90 \pm 2.8$ ,  $p = 0.016$ ). Analysis of median serum triglyceride, initial and Maximum serum CRP levels [median (interquartile range)] of the fatty liver group were significantly higher than those of the nonfatty group [4.3 (1.9 - 10.6) versus 1.0 (0.8 - 1.5),  $p < 0.001$ ; 8.6 (1.6 - 30.9) versus 2.7 (0.5 - 7.5),  $p < 0.001$  and 196.3 (64.4 - 284.0) versus 63.1 (19.7 - 113.6),  $p < 0.001$ ].

**Table 1.** Statistical tables of clinical features of patients with acute pancreatitis (n = 128).

Patient Characteristic	Age, mean $\pm$ SD (range), years	Sex		Acute pancreatitis classification			Complications and organ failure		
		Male (%)	Female (%)	Mild	Moderate severe	Severe	Peripancreatic fluid collection	Necrotic accumulation	Persistent organ failure
	$52.7 \pm 14.9$	76 (59.4%)	52 (40.6%)	56 (44.8%)	58 (45.3%)	14 (10.9%)	38 (29.7%)	20 (15.6%)	14 (10.9%)

**Table 2.** Comparison of characteristics and severity parameters between AP patients with and without fatty liver.

Patient Characteristic	Age, mean $\pm$ SD, years	Sex		BMI	Random blood glucose, mmol/L	Serum triglyceride, mmol/L	Serum CRP (random blood Glucose) g/L	
		Male (%)	Female (%)				initial	Maximum
Fatty liver	$49.9 \pm 11.1$	44 (78.6%)	12 (21.4%)	$26.2 \pm 2.9$	$9.01 \pm 3.7$	4.3 (1.9 - 10.6)	8.6 (1.6 - 30.9)	196.3 (64.4 - 284.0)
Nonfatty liver	$54.9 \pm 17.2$	32 (44.4%)	40 (55.6%)	$22.5 \pm 3.2$	$6.90 \pm 2.8$	1.0 (0.8 - 1.5)	2.7 (0.5 - 7.5)	63.1 (19.7 - 113.6)
P	0.161	<0.001		<0.001	0.016	<0.001	<0.001	<0.001

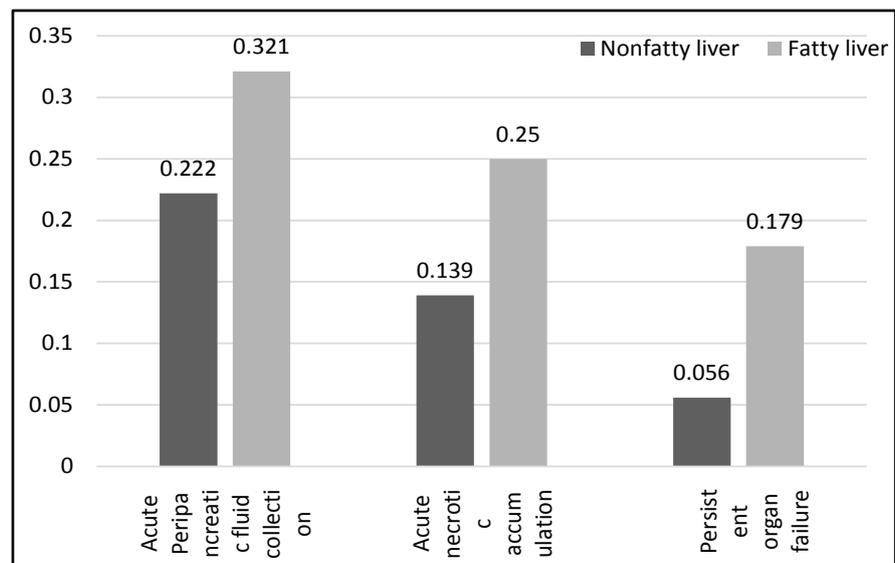
3) According to the severity of AP divided into mild, moderate and severe, the proportion of patients with fatty liver and non-fatty liver were counted respectively. As shown in **Table 3**, there were 14 (25.0%) cases of fatty liver and 42 (75.0%) cases of non-fatty liver in patients with mild acute pancreatitis, 32 (54.2%) cases of fatty liver and 26 (44.8%) cases of non-fatty liver in patients with moderately severe acute pancreatitis, 10 (71.4%) cases of fatty liver and 4 (28.6%) cases of severe non-fatty liver in patients with severe acute pancreatitis. The proportion of patients with mild acute pancreatitis in fatty liver group was lower than that in non-fatty liver group, but the proportion in moderate severe acute pancreatitis patients was significantly higher than that in non-fatty liver group.

4) Comparison of the incidence of complications and persistent organ failure in the fatty liver group and the non fatty liver group

As shown in **Figure 1**, the fatty liver group has a higher proportion of complications and persistent organ failure than the non-fatty liver group. Patients with fatty liver showed higher percentages of Acute Peripancreatic fluid collection (32.1% versus 22.2%,  $p = 0.833$ ) and Acute necrotic accumulation (25.0% versus 13.9%,  $p = 0.048$ ) than those without fatty liver. Patients with fatty liver also had higher rates of Persistent organ failure (17.9% versus 5.6%,  $p = 0.009$ ).

**Table 3.** Proportion of fatty liver in patients with different degrees of pancreatitis.

	Mild (n = 56)	Moderate severe (n = 58)	Severe (n = 14)
Fatty liver	14 (25.0%)	32 (54.2%)	10 (71.4%)
Nonfatty liver	42 (75.0%)	26 (44.8%)	4 (28.6%)



**Figure 1.** Comparison of complications between fatty liver group and non-fatty liver group.

## 4. Discussion

In this study, we explored the effects of fatty liver on the severity and prognosis of patients with AP. The results showed that the fatty liver group had more severe clinical features than the non-fatty liver group in AP patients. Patients with fatty liver had higher incidence of local complications and were more prone to persistent organ failure.

It was found that the proportion of fatty liver patients in mild acute pancreatitis patients was lower than that in non-fatty liver patients, but the proportion of fatty liver patients in moderate severe and severe acute pancreatitis patients was significantly higher than that in non-fatty liver patients. Especially in patients with severe acute pancreatitis, the proportion of non-fatty liver patients is as high as 71.4%. This is consistent with the conclusion that the patients with fatty liver have higher incidence of local complications and are more prone to persistent organ failure.

In patients with acute pancreatitis associated with fatty liver, shared disease factors such as obesity, alcoholism and hyperlipidemia are commonly found. We found that patients with fatty liver had higher levels of serum glucose, triglyceride and BIM. And the proportion of men with fatty liver is as high as 78.6%, which may be due to the fact that in modern society, men tend to work under pressure, have more social activities, live faster, and eat irregularly; often eat high fat content of food and alcohol and so on.

In patients with AP, the presence of fatty liver can lead to a more severe clinical manifestation, and high serum c-reactive protein levels in the fatty liver group may be a viable explanation [6].  $\alpha - 1$  antitrypsin is a glycoprotein that is mainly synthesized by the liver. It can play a significant anti-inflammatory effect by affecting a wide range of inflammatory cells. A recent study has shown that liver steatosis significantly inhibits  $\alpha - 1$  antitrypsin levels in mice and human models of acute pancreatitis. This reduces the level of serum  $\alpha - 1$  antitrypsin and leads to excessive activation of inflammation [7], a mechanism that can effectively explain our results. The median of initial serum CRP was 8.6 and 2.7, respectively, and the median of Maximum serum CRP was 196.3 and 63.1, respectively. Serum CRP was the most widely used biomarker. However, the delayed expression of its Maximum level is not good for the early diagnosis of the severity of the disease. In the early stage of AP, fatty liver can be diagnosed by CT scan, thus predicting the delayed peak of serum CRP. The development and prognosis of the disease can be judged accurately in the initial stage of the disease. The incidence of severe pancreatitis through early intervention is reduced.

In 2015, the consensus of diagnosis and treatment of Consensus on Multidisciplinary diagnosis and treatment of acute pancreatitis in China emphasized that pancreatic CT scan was the preferred imaging method for diagnosing AP and judging the severity of AP. It was suggested that CT plain scan should be completed within 12 hours after emergency treatment to evaluate the extent of exudation of pancreatitis. At the same time, other acute abdomen can also be dis-

tinguished [1]. By morphological features, the range of peripancreatic fluid accumulation and pancreatic necrosis can be effectively distinguished. So it is important to evaluate the development state of fatty liver and acute pancreatitis with CT plain scan.

In short, fatty liver can be diagnosed by CT scan, and it is closely related to the severity of AP. AP patients with fatty liver can lead to a higher incidence of local complications, increasing the risk of persistent organ failure or even death in patients with AP. Fatty liver plays an important role in predicting the severity and prognosis of AP.

## References

- [1] Yoon, S.B., Lee, I.S., Choi, M.H., Lee, K., Ham, H., Oh, H.J., Park, S.H., Lim, C.-H. and Choi, M.-G. (2017) Impact of Fatty Liver on Acute Pancreatitis Severity. *Gastroenterology Research and Practice*, **2017**, Article ID: 4532320. <https://doi.org/10.1155/2017/4532320>
- [2] Yadav, A.K., Sharma, R., Kandasamy, D., Bhalla, A.S., Gamanagatti, S., Srivastava, D.N., *et al.* (2015) Perfusion CT: Can It Predict the Development of Pancreatic Necrosis in Early Stage of Severe Acute Pancreatitis? *Abdominal Imaging*, **40**, 488-499. <https://doi.org/10.1007/s00261-014-0226-6>
- [3] Wu, Q.M., Peng T.L. and Wang, X.H. (2001) Relationship between CT Index and Prognosis of Severe Pancreatitis. *Chinese Medical Imaging Technology*, **17**, 1195-1196.
- [4] Professional Committee of Pancreatology of the Chinese Medical Association (2015) Consensus on Multidisciplinary Diagnosis and treatment of Acute Pancreatitis in China (Draft). *Chinese Journal of Pancreatic Diseases*, **15**, 217-224.
- [5] Song, Y.F. (2013) Ct Diagnosis and Differential Diagnosis of Fatty Liver. *Chinese Modern Drug Application*, **7**, 25-26.
- [6] Oruc, N., Ozutemiz, O., Yuce, G., *et al.* (2009) Serum Procalcitonin and CRP Levels in Non-Alcoholic Fatty Liver Disease: A Case Control Study. *BMC Gastroenterology*, **9**, 16. <https://doi.org/10.1186/1471-230X-9-16>
- [7] Wang, Q., Du, J., Yu, P., *et al.* (2015) Hepatic Steatosis Depresses Alpha-1-antitrypsin Levels in Human and Rat Acute Pancreatitis. *Scientific Reports*, **5**, Article No.: 17833. <https://doi.org/10.1038/srep17833>