World Journal of Gastroenterology

Online Submissions: http://www.wjgnet.com/esps/
wjg@wjgnet.com
doi:10.3748/wjg.v19.i4.569

World J Gastroenterol 2013 January 28; 19(4): 569-574
ISSN 1007-9327 (print) ISSN 2219-2840 (online)

BRIEF ARTICLE

Retrospective study of steroid therapy for patients with autoimmune pancreatitis in a Chinese population

Bin Liu, Jing Li, Lu-Nan Yan, Hao-Ran Sun, Tong Liu, Zhi-Xiang Zhang

Bin Liu, Tong Liu, Zhi-Xiang Zhang, Department of General Surgery, General Hospital of Tianjin Medical University, Tianjin 300052, China
Jing Li, Department of Anesthesiology, General Hospital of Tianjin Medical University, Tianjin 300052, China
Lu-Nan Yan, Department of General Surgery, West China Hospital, Sichuan University, Chengdu 610041, Sichuan Province, China
Hao-Ran Sun, Department of Radiology, General Hospital of Tianjin Medical University, Tianjin 300052, China
Author contributions: Liu B and Li J performed the majority of experiments; Liu T and Zhang ZX revised the manuscript; Yan LN and Sun HR coordinated and provided financial support for this work, and collected clinical materials; Liu B, Li J and Yan LN designed the study and wrote the manuscript.
Supported by National Natural Science Foundation of China, No. 81170453
Correspondence to: Bin Liu, MD, Department of General Surgery, General Hospital of Tianjin Medical University, Tianjin 300052, China. liubin78@163.com
Telephone: +86-22-60363951 Fax: +86-22-60363951
Received: September 13, 2012 Revised: December 19, 2012
Accepted: December 25, 2012
Published online: January 28, 2013

Abstract

AIM: To explore the optimal steroid therapeutic strategy for autoimmune pancreatitis (AIP).

METHODS: This study was conducted retrospectively in two large institutions in China. Patients with clinically, radiologically and biochemically diagnosed AIP were enrolled. The performed radiological investigations and biochemical tests, the regimen of the given steroid treatment, remission and relapse whether with and without steroid therapy were analyzed.

RESULTS: Twenty-eight patients with AIP received steroid treatment, while 40 patients were treated surgically by pancreatoduodenectomy, distal pancreatectomy and choledochojejunostomy, radiofrequency ablation for the enlarged pancreatic head, percutaneous transhepatic biliary drainage and endoscopic biliary drainage. The starting oral prednisolone dose was 30 mg/d in 18 (64.3%) patients and 40 mg/d in 10 (35.7%) patients administered for 3 wk. The remission rate of AIP patients with steroid treatment (96.4%) was significantly higher than in those without steroid treatment (75%). Maintenance therapy (oral prednisolone dose 5 mg/d) was performed after remission for at least 6-12 mo to complete the treatment course. Similarly, the relapse rate was significantly lower in AIP patients with steroid treatment (28.6%) than in those without steroid treatment (42.5%). Steroid re-treatment was effective in all relapsed patients with or without steroid therapy.

CONCLUSION: Steroid therapy should be considered in all patients with active inflammatory phase of AIP. However, the optimal regimen still should be trailed in larger numbers of patients with AIP.

Key words: Autoimmune pancreatitis; Chinese population; Steroid therapy; Remission; Relapse

Liu B, Li J, Yan LN, Sun HR, Liu T, Zhang ZX. Retrospective study of steroid therapy for patients with autoimmune pancreatitis in a Chinese population. *World J Gastroenterol* 2013; 19(4): 569-574 Available from: URL: http://www.wjgnet.com/1007-9327/full/v19/i4/569.htm DOI: http://dx.doi.org/10.3748/wjg.v19.i4.569

INTRODUCTION

Autoimmune pancreatitis (AIP) has recently been described as a type of chronic pancreatitis characterized by an autoimmune inflammatory process with prominent lymphocyte infiltration[1]. Since the concept of autoimmune pancreatitis was firstly introduced by Yoshida *et al*[2]

in 1995, the number of AIP reports has been recently increased in the medical literature.

AIP is characterized by diffuse or focal enlargement of the pancreas, irregular narrowing of the main pancreatic duct, elevated serum immunoglobulin G4 (IgG4) and presence of autoantibodies, and/or IgG4-positive plasma cells and/or dense lymphocyte infiltration with fibrosis[3]. Before the availability of the diagnostic criteria of AIP proposed by the Japan Pancreas Society[4], AIP was frequently misdiagnosed as pancreatic cancer, which consequently imposed the patients a superfluous pancreatic resection[5].

Since the fibroinflammatory process of AIP has a favorable response to steroids, steroid therapy has been accepted as a standard treatment for AIP[6]. Treatment protocols for AIP are still evolving. Although the initial and maintenance dose of oral steroids are clearly recommend by the Japanese literature[7], there is little consensus worldwide on a steroid treatment regimen for patients with AIP[8]. Hence, to explore the optimal steroid therapeutic strategy for AIP, we conducted a retrospective study on AIP treatment in two large institutions in China.

MATERIALS AND METHODS

Subjects

This retrospective study was done to evaluate steroid therapeutic strategy for patients with AIP. The study was conducted in the General Hospital of Tianjin Medical University and West China Hospital of Sichuan University. A total of 68 patients with clinically, radiologically and biochemically diagnosed AIP were enrolled.

Diagnostic criteria

AIP was diagnosed according to the Asian diagnostic criteria for AIP[9]. Consequently, the diagnosis was based on the following clinicopathological findings: (1) the imaging criteria including diffuse/segmental/focal enlargement of the pancreas and diffuse/segmental/focal pancreatic ductal narrowing, often with the stenosis of the bile duct; (2) the serological criteria including elevated serum IgG or IgG4 levels, or detection of autoantibodies; and (3) and/or the histopathological criteria including lymphoplasmacytic infiltration and fibrosis, with abundant IgG4-positive cell infiltration. Thus, AIP was diagnosed when the imaging criteria and one of the other two criteria, the serological and histopathological, were satisfied. Optionally, AIP can also be diagnosed with fulfillment of both the imaging criteria and a good response to steroid treatment.

Assessment of the investigations and therapeutic strategy

We assessed the performed radiological investigations and biochemical tests for all AIP patients. We analyzed remission and relapse whether with or without steroid treatment as well as the given steroid treatment regimen in the patients who received steroid treatment. Remission was defined as the disappearance of clinical symptoms and resolution of the pancreatic and/or extrapancreatic manifestations on radiological investigations[10-12]. All the patients underwent periodic laboratory tests and imaging studies every 3 mo in the first year after remission resulting from steroid treatment. Relapse was defined as reappearance of symptoms with the development of pancreatic and/or extrapancreatic abnormalities on imaging studies and/or marked elevation of serum IgG or IgG4 levels[11,12]. Relapse also included re-elevation of serological levels alone exclusive of clinical symptoms or abnormal imaging[7].

Statistical analysis

Statistical analysis was performed using Fisher's exact test and Mann-Whitney's *U* test (with commercially available software SPSS version 13.0; SPSS, Inc, Chicago, IL). Data were expressed as mean ± SD or median (range). The period from the start of steroid treatment to relapse was evaluated using the Kaplan-Meier method. Differences with P values < 0.05 were considered significant.

RESULTS

Patient profile

Sixty-eight patients with AIP fulfilling the Asian diagnostic criteria for AIP were included in this study. There were 50 men and 18 women with an average age of 62.5 years [patients with steroid 62 (43-78) years, patients without steroid 64 (47-72) years]. Forty patients underwent various surgical procedures (30 males, 10 females), while the remaining 28 patients received steroid treatment (20 males, 8 females). The surgical procedures included pancreatoduodenectomy, distal pancreatectomy and choledochojejunostomy, radiofrequency ablation for the enlarged pancreatic head, percutaneous transhepatic biliary drainage and endoscopic biliary drainage. The numbers of patients undergoing various surgical procedures are as follow: (1) thirteen underwent pancreatoduodenectomy; (2) nineteen underwent distal pancreatectomy and choledochojejunostomy; (3) three underwent radiofrequency ablation for the enlarged pancreatic head; (4) three underwent percutaneous transhepatic biliary drainage; and (5) two underwent endoscopic biliary drainage. In the current study, no patient received any other immunosuppressive treatments such as azathioprine or ursodeoxycholic acid or mycophenolate mofetil.

Given steroid therapy

Steroid therapy was administered in 28 of the 68 AIP patients who were initially presented with obstructive jaundice, abdominal pain, rapid weight loss (> 5 kg in the past 3 mo), diffuse enlargement of the pancreas, associated extrapancreatic abnormalities such as cholangitis and retroperitoneal fibrosis. The clinical presentations in the 28 patients are shown in Table 1.

Table 1 Clinical presentation of patients with steroid treatment *n* (%)

Clinical presentation	Patients (*n* = 28)
Obstructive jaundice	17 (60.7)
Abdominal pain	9 (32.1)
Rapid weight loss	6 (21.4)
Diffuse enlargement of the pancreas	17 (60.7)
Associated extrapancreatic abnormalities	
Cholangitis	18 (64.3)
Retroperitoneal fibrosis	3 (10.7)

Before steroid therapy, blood glucose levels were controlled using insulin in 6 (21.4%) patients and oral hypoglycemics in AIP patients with diabetes mellitus. Alternatively, for patients showing hyperbilirubinemia > 3 mg/dL, percutaneous transhepatic biliary drainage and endoscopic biliary drainage were performed in 4 and 3 patients, respectively.

Regimens of steroid therapy

Among the 28 AIP patients who received steroid therapy, 18 (64.3%) patients started on oral prednisolone at 30 mg/d, while 10 (35.7%) patients began oral prednisolone at 40 mg/d. The therapy monitoring 3 wk after starting steroid treatment was achieved based on the patient's clinical presentation as well as the biochemical results and the imaging findings. When steroid treatment was effective, the dose was tapered by 5 mg every 1-2 wk until the dose reached a maintenance dose of 5 mg/d. Then, maintenance steroids for at least 6-12 mo were given to complete the treatment course. The maintenance steroid treatment was withdrawn whenever complete radiological and serological improvement was obtained.

Remission rate with and without steroid therapy

Steroid therapy used in this study was very effective in alleviating the clinical presentation of AIP (such as obstructive jaundice and abdominal pain) and induced remission more quickly than other treatments without steroids. Likewise, clinical and radiological responses to steroid therapy were seen in 2-3 wk in this study. We also found that response to steroid therapy was typically rapid with significant radiological improvement at 2-3 wk.

The remission rate of AIP patients with steroid treatment (27/28 patients, 96.4%) was significantly higher ($P < 0.001$) than in those without steroid treatment (30/40 patients, 75%). Furthermore, the period to yield a remission in the patients treated with an initial prednisolone dose of 30 mg/d was not significantly different ($P = 0.273$) from the period in those treated with an initial prednisolone dose of 40 mg/d (6.4 ± 5.72 mo and 6.1 ± 6.05 mo, respectively). At remission, the enlarged pancreas returned to near-normal size in 22 (78.6%) patients. Pancreatic atrophy occurred in 6 (21.4%) patients and persistent focal enlargement was found in 1 (3.6%) patient. Irregularity of the pancreatic ducts and/or some degree of bile duct stenosis remained in 15 (53.6%) patients. Although the elevated serum IgG level declined in all patients after the start of steroid treatment, it failed to normalize (< 751 mg/dL) in 17 (60.7%) patients. Likewise, 15 (53.6%) patients with persistently elevated serum IgG levels showed irregular pancreatic ducts and/or some degree of bile duct stenosis.

Relapse rate with and without steroid therapy

The relapse rate was significantly lower ($P = 0.004$) in AIP patients with steroid treatment than in those without steroid treatment (8/28 patients, 28.6% and 17/40 patients, 42.5%, respectively). The relapse period after starting steroid treatment differed in the 8 patients: within 6 mo in 1 (12.5%) patient, within 1 year in 4 (50%) patients, within 2 years in 6 (75%) patients and within 3 years in all 8 (100%) patients. Multivariate analysis showed that there was no correlation ($P = 0.573$) between the relapse rate and the initial prednisolone dose (20% with prednisolone dose of 40 mg/d and 22.2% with prednisolone dose of 30 mg/d). Furthermore, the relapse occurred in 2 of the 10 patients who received prednisolone at 40 mg/d and in 4 of the 18 patients who received prednisolone at 30 mg/d. The relapse rate of AIP was significantly higher ($P = 0.003$) in patients with persistently elevated serum IgG levels (6/17 patients, 35.3%) than in those with normalized serum IgG levels (1/7 patients, 10%). Relapse occurred in 3 of the 8 (37.5%) patients during the maintenance treatment, whereas it occurred in the rest of the 5 (62.5%) patients when the maintenance treatment was stopped. Steroid re-treatment was effective in all relapsed patients with or without steroid therapy.

Maintenance dose of oral steroids after remission

The maintenance steroid therapy was administered after remission in all 28 AIP patients treated with steroids. After remission, the starting oral prednisolone dose was gradually tapered by 5 mg every 1-2 wk to reach a maintenance dose of 5 mg/d. The maintenance steroids were continued for at least 6-12 mo to complete the treatment course. The maintenance dose of steroid was withdrawn in 7 (25%) patients in whom complete radiological and serological improvement was obtained.

Complications of steroid treatment

There was no death attributable to steroid treatment related complications. As AIP patients were typically elder patients, they were at a high risk of developing steroid related complications. Steroid treatment related complications occurred in 7 of the 28 patients, including pneumonia in 3 patients, avascular necrosis of the femoral head in 1 patient, lumbar vertebral fracture in 1 patient and diabetes mellitus in 2 patients. In these patients, the steroid medication dose was reduced or completely ceased. In addition, the 3 patients with pneumonia were treated with antibiotics.

DISCUSSION

It has been reported that the overall prevalence of AIP was 0.82/100 000 in Japan. Moreover, on the basis of clinical presentation, biochemical results or histological findings, AIP constitutes 5%-11% of all patients with chronic pancreatitis[13,14]. Likewise, Song *et al*[15] stated that AIP patients accounted for 5% of chronic pancreatitis population in China.

In this study, AIP was found predominantly in elderly males. This coincides with the feature that although AIP occurs in both sexes, it is at least twice as common in men as in women. In addition, in spite that AIP varies widely in age, most AIP patients are older than 50 years[16]. The clinical presentation of AIP in the current study was in agreement with the studies by Kim *et al*[12] and Nishimori *et al*[17]. AIP was presented with obstructive jaundice in 49 (72.1%) patients, abdominal pain in 30 (44.1%) patients and rapid body weight loss in 21 (30.9%) patients. Alternatively, diabetes mellitus was present in 40 (58.8%) patients.

Moreover, AIP has frequently been diagnosed or suspected as pancreaticobiliary malignancy, which consequently imposed the patients an unnecessary pancreatic resection[18,19]. This study also showed that 40 (58.8%) patients with AIP underwent unnecessary surgical procedures.

Alternatively, Refaat *et al*[20] showed in their case report of AIP that although the imaging findings were suggestive of AIP, pancreatic biopsy was necessary to differentiate AIP from pancreatic cancer as the management differs significantly. Consequently, clinicians should be conversant with the clinical, radiographic, serologic and histologic evidence of AIP to improve the diagnostic accuracy for AIP.

Although steroid therapy is generally considered to be very effective in the initial inflammatory phase of AIP, its facile use for patients whose diagnosis of AIP is questionable should be prohibited[21]. In this study, steroid therapy was very effective in improving patient's clinical presentation such as obstructive jaundice and abdominal pain. Additionally, it induced remission more quickly than surgical treatments as the clinical presentation, the imaging findings and the laboratory results were improved in all cases in four week after steroid treatment. This result concurs with Hirano *et al*[22]. Therefore, we think that steroid therapy should be considered in all patients with AIP with active disease. This is in agreement with the study by Pannala *et al*[8].

There has been no consensus to date on steroid regimen and duration of treatment in AIP. Mayo Clinic recommended the initial oral prednisolone dose of 40 mg/d for 4 wk. Afterward, laboratory tests and radiological investigation should be performed 4-6 wk after initiating treatment. If there are biochemical and radiological responses, the dose is gradually tapered by 5 mg every week to complete the treatment course of 11 wk[10]. Considering that many complications are related to steroid treatment, maintenance low-dose oral prednisolone treatment was not routinely performed for patients with AIP[8]. In a Japanese consensus statement, Kamisawa *et al*[7] suggested that initiating treatment with prednisolone at 0.6 mg/kg daily should be tapered gradually to reach a maintenance dose of 5 mg/d over 3-6 mo. Finally, maintenance steroids are continued for at least 6 mo and possibly up to 3 years. Although the remission can be achieved in most AIP patients after steroid treatment[9], relapses still occur in 24%-40% of the patients and the starting doses of steroid (typically given for 3-4 wk) are often continued for varying periods of time[8].

In our practice, the starting oral prednisolone dose was 30-40 mg/d for 3 wk. Then, we monitored the patient's clinical presentation, the biochemical and serological results as well as the imaging findings in 3 wk after starting steroid treatment. Consequently, when steroid treatment was effective, we tapered the dose by 5 mg every 1-2 wk to reach a maintenance dose of 5 mg/d. Lastly, maintenance steroids were continued for at least 6-12 mo to complete the given treatment course. The maintenance steroid treatment was withdrawn once complete radiological and serological improvement was achieved. In this study, the response was typically rapid through significant radiological improvement at 2-3 wk in 96.4% of the patients. This coincides with Kamisawa *et al*[23].

Future studies should help to establish an optimal steroid therapy regimen to effectively alleviate the clinical presentation of AIP patients and reduce the risk of steroid-induced complications.

Similar to the previous studies[6,7], we also found that AIP patients were typically elder patients and are at a high risk of developing steroid related complications (diabetes, pneumonia and so forth). Instead of using long-term low-dose steroids, azathioprine, mycophenolate mofetil and other immunosuppresive drugs are used for maintenance of remission in AIP patients who relapse after steroid withdrawal[10]. But, similar to steroids, azathioprine or mycophenolate mofetil also have significant side effects such as increased risk of infection, headache, peripheral edema, hypertension, leucopoenia and lymphoma[8,24]. Thus, the option of long-term treatment for maintenance of AIP remission needs prospective and controlled trials in larger numbers of patients to assess the risk to benefit ratio of each approach.

In conclusion, steroid therapy, usually in a dose range of 30-40 mg/d, is effective in AIP patients and should be considered for all AIP patients in the acute inflammatory phase. The optimal regimen of steroid therapy remains to be determined.

ACKNOWLEDGMENTS

The authors are grateful to the staff of Department of General Surgery, General Hospital of Tianjin Medical University and the staff of Department of General Surgery, West China Hospital, Sichuan University for collecting the clinical materials, and to the staff of De-

partment of Endocrine, General Hospital of Tianjin Medical University for their skillful technical assistance. Special thanks are extended to the staff of Department of Radiology, General Hospital of Tianjin Medical University for collecting the imaging materials and the staff of Department of Clinical Laboratory of General Hospital of Tianjin Medical University for processing the blood samples.

COMMENTS

Background

There is no consensus so far on steroid regimen for patients with autoimmune pancreatitis (AIP).

Research frontiers

Steroid therapy has been accepted as a standard treatment for AIP. But, there is little consensus worldwide on a steroid treatment regimen for patients with AIP.

Innovations and breakthroughs

This is a retrospective study exploring the optimal steroid therapeutic strategy for AIP. The performed radiological investigations and biochemical tests, the regimen of the given steroid treatment, remission and relapse whether with and without steroid therapy were analyzed.

Applications

The study results suggest that steroid therapy should be considered in all patients with active inflammatory phase of AIP.

Terminology

Remission: the disappearance of clinical symptoms and resolution of the pancreatic and/or extrapancreatic manifestations on radiological investigations. Relapse: reappearance of symptoms with the development of pancreatic and/or extrapancreatic abnormalities on imaging studies and/or marked elevation of serum immunoglobulin G (IgG) or IgG4 levels

Peer review

This is a good retrospective study in which authors analyzed the optimal steroid therapeutic strategy for AIP. The results are interesting and suggest that steroid therapy should be considered in all patients with active inflammatory phase of AIP.

REFERENCES

1 **Finkelberg DL**, Sahani D, Deshpande V, Brugge WR. Autoimmune pancreatitis. *N Engl J Med* 2006; **355**: 2670-2676 [PMID: 17182992 DOI: 10.1056/NEJMra061200]
2 **Yoshida K**, Toki F, Takeuchi T, Watanabe S, Shiratori K, Hayashi N. Chronic pancreatitis caused by an autoimmune abnormality. Proposal of the concept of autoimmune pancreatitis. *Dig Dis Sci* 1995; **40**: 1561-1568 [PMID: 7628283]
3 **Giday SA**, Khashab MA, Buscaglia JM, Krishnamurty DM, Chen T, Kalloo AN, Canto MI, Okolo PI, Hruban RH, Jagannath SB. Autoimmune pancreatitis: current diagnostic criteria are suboptimal. *J Gastroenterol Hepatol* 2011; **26**: 970-973 [PMID: 21299615 DOI: 10.1111/j.1440-1746.2011.06683.x]
4 **Kanno A**, Ishida K, Hamada S, Fujishima F, Unno J, Kume K, Kikuta K, Hirota M, Masamune A, Satoh K, Notohara K, Shimosegawa T. Diagnosis of autoimmune pancreatitis by EUS-FNA by using a 22-gauge needle based on the International Consensus Diagnostic Criteria. *Gastrointest Endosc* 2012; **76**: 594-602 [PMID: 22898417 DOI: 10.1016/j.gie.2012.05.014]
5 **Imazu H**, Kanazawa K, Mori N, Ikeda K, Kakutani H, Sumiyama K, Hino S, Ang TL, Omar S, Tajiri H. Novel quantitative perfusion analysis with contrast-enhanced harmonic EUS for differentiation of autoimmune pancreatitis from pancreatic carcinoma. *Scand J Gastroenterol* 2012; **47**: 853-860 [PMID: 22507131 DOI: 10.3109/00365521.2012.679686]
6 **Hirano K**, Tada M, Isayama H, Yagioka H, Sasaki T, Kogure H, Nakai Y, Sasahira N, Tsujino T, Yoshida H, Kawabe T, Omata M. Long-term prognosis of autoimmune pancreatitis with and without corticosteroid treatment. *Gut* 2007; **56**: 1719-1724 [PMID: 17525092 DOI: 10.1136/gut.2006.115246]
7 **Kamisawa T**, Shimosegawa T, Okazaki K, Nishino T, Watanabe H, Kanno A, Okumura F, Nishikawa T, Kobayashi K, Ichiya T, Takatori H, Yamakita K, Kubota K, Hamano H, Okamura K, Hirano K, Ito T, Ko SB, Omata M. Standard steroid treatment for autoimmune pancreatitis. *Gut* 2009; **58**: 1504-1507 [PMID: 19398440 DOI: 10.1136/gut.2008.172908]
8 **Pannala R**, Chari ST. Corticosteroid treatment for autoimmune pancreatitis. *Gut* 2009; **58**: 1438-1439 [PMID: 19834112 DOI: 10.1136/gut.2009.183293]
9 **Park SW**, Chung JB, Otsuki M, Kim MH, Lim JH, Kawa S, Ito T, Nishimori I, Ryu JK, Okazaki K, Lee K, Kamisawa T. Conference report: Korea-Japan symposium on autoimmune pancreatitis. *Gut Liver* 2008; **2**: 81-87 [PMID: 20485615 DOI: 10.5009/gnl.2008.2.2.81]
10 **Agrawal S**, Daruwala C, Khurana J. Distinguishing autoimmune pancreatitis from pancreaticobiliary cancers: current strategy. *Ann Surg* 2012; **255**: 248-258 [PMID: 21997803]
11 **Ghazale A**, Chari ST. Optimising corticosteroid treatment for autoimmune pancreatitis. *Gut* 2007; **56**: 1650-1652 [PMID: 17998320 DOI: 10.1136/gut.2007.129833]
12 **Kim HM**, Chung MJ, Chung JB. Remission and relapse of autoimmune pancreatitis: focusing on corticosteroid treatment. *Pancreas* 2010; **39**: 555-560 [PMID: 20182397 DOI: 10.1097/MPA.0b013e3181c8b4a5]
13 **Nishimori I**, Tamakoshi A, Otsuki M. Prevalence of autoimmune pancreatitis in Japan from a nationwide survey in 2002. *J Gastroenterol* 2007; **42** Suppl 18: 6-8 [PMID: 17520216 DOI: 10.1007/s00535-007-2043-y]
14 **Kim KP**, Kim MH, Song MH, Lee SS, Seo DW, Lee SK. Autoimmune chronic pancreatitis. *Am J Gastroenterol* 2004; **99**: 1605-1616 [PMID: 15307882 DOI: 10.1111/j.1572-0241.2004.30336.x]
15 **Song Y**, Liu QD, Zhou NX, Zhang WZ, Wang DJ. Diagnosis and management of autoimmune pancreatitis: experience from China. *World J Gastroenterol* 2008; **14**: 601-606 [PMID: 18203294 DOI: 10.3748/wjg.14.601]
16 **Okazaki K**, Uchida K, Ohana M, Nakase H, Uose S, Inai M, Matsushima Y, Katamura K, Ohmori K, Chiba T. Autoimmune-related pancreatitis is associated with autoantibodies and a Th1/Th2-type cellular immune response. *Gastroenterology* 2000; **118**: 573-581 [PMID: 10702209]
17 **Nishimori I**, Tamakoshi A, Kawa S, Tanaka S, Takeuchi K, Kamisawa T, Saisho H, Hirano K, Okamura K, Yanagawa N, Otsuki M. Influence of steroid therapy on the course of diabetes mellitus in patients with autoimmune pancreatitis: findings from a nationwide survey in Japan. *Pancreas* 2006; **32**: 244-248 [PMID: 16628078 DOI: 10.1097/01.mpa.0000202950.02988.07]
18 **Hardacre JM**, Iacobuzio-Donahue CA, Sohn TA, Abraham SC, Yeo CJ, Lillemoe KD, Choti MA, Campbell KA, Schulick RD, Hruban RH, Cameron JL, Leach SD. Results of pancreaticoduodenectomy for lymphoplasmacytic sclerosing pancreatitis. *Ann Surg* 2003; **237**: 853-858; discussion 858-859 [PMID: 12796582 DOI: 10.1097/01.SLA.0000071516.54864.C1]
19 **Nakazawa T**, Ohara H, Sano H, Ando T, Imai H, Takada H, Hayashi K, Kitajima Y, Joh T. Difficulty in diagnosing autoimmune pancreatitis by imaging findings. *Gastrointest Endosc* 2007; **65**: 99-108 [PMID: 17185087]
20 **Refaat R**, Harth M, Proschek P, Lindemayr S, Vogl TJ. Autoimmune pancreatitis in an 11-year-old boy. *Pediatr Radiol* 2009; **39**: 389-392 [PMID: 19190899 DOI: 10.1007/s00247-008-1132-2]
21 **Chari ST**. Diagnosis of autoimmune pancreatitis using its five cardinal features: introducing the Mayo Clinic's HI-

SORt criteria. *J Gastroenterol* 2007; **42 Suppl 18**: 39-41 [PMID: 17520222 DOI: 10.1007/s00535-007-2046-8]
22 **Hirano K**, Shiratori Y, Komatsu Y, Yamamoto N, Sasahira N, Toda N, Isayama H, Tada M, Tsujino T, Nakata R, Kawase T, Katamoto T, Kawabe T, Omata M. Involvement of the biliary system in autoimmune pancreatitis: a follow-up study. *Clin Gastroenterol Hepatol* 2003; **1**: 453-464 [PMID: 15017645]
23 **Kamisawa T**, Egawa N, Nakajima H, Tsuruta K, Okamoto A. Morphological changes after steroid therapy in autoimmune pancreatitis. *Scand J Gastroenterol* 2004; **39**: 1154-1158 [PMID: 15545176 DOI: 10.1080/00365520410008033]
24 **Sodikoff JB**, Keilin SA, Cai Q, Bharmal SJ, Lewis MM, Raju GS, Willingham FF. Mycophenolate mofetil for maintenance of remission in steroid-dependent autoimmune pancreatitis. *World J Gastroenterol* 2012; **18**: 2287-2290 [PMID: 22611324 DOI: 10.3748/wjg.v18.i18.2287]

P- Reviewer Refaat R **S- Editor** Wen LL
L- Editor A **E- Editor** Xiong L