Autoimmune Pancreatitis and IgG4-Related Disease

Outline

- Case presentation
- Background of IgG4
- Autoimmune pancreatitis (AIP)
- Relevance of IgG4-positive cells in GI biopsies
- IgG4-related disease, other organ examples

Case History

- 58 year old man who presented with painless jaundice
  - CT scan: intra- and extra-hepatic duct dilatation, no pancreatic mass but fullness of uncinate
  - ERCP: distal, lower 1/3, common bile duct stricture

Case History

- 58 year old man who presented with painless jaundice
  - CT scan: intra- and extra-hepatic duct dilatation, no pancreatic mass but fullness of uncinate
  - ERCP: distal, lower 1/3, common bile duct stricture
  - Had a Whipple procedure and cholecystectomy
    - Intraoperative: diffusely firm pancreas and no stones in gallbladder
No discrete mass lesion

Cellular stroma
Storiform fibrosis

Obliterative phlebitis

Perineural inflammation
Periductal inflammation

Lymphocytes, plasma cells, eosinophils

Numerous IgG4-positive plasma cells

>50 IgG4+ plasma cells/HPF
IgG4+/IgG+ plasma cells = >40%

Common bile duct inflammation

Transmural inflammation of gallbladder

Lymphoplasmacytic inflammation
My diagnosis
IgG4-related disease
Autoimmune pancreatitis type 1 (IgG4-related pancreatitis)
IgG4-related cholecystitis
Chronic pancreatitis

Immunoglobulin G (IgG)

- Most abundant immunoglobulin (75-80%)
- Four subclasses
  - IgG4 accounts for 3-6% of total serum IgG

Serum IgG4 concentration

- Upper limit of normal is variable
  - 86 mg/dL at UCSF
  - 121 mg/dL in another lab
- Elevated serum IgG4
  - >135 mg/dL
    - Sensitivity of 97%; specificity of 79.6% in diagnosing IgG4-related disease
    - Patients with allergic disorders, receiving allergen immunotherapy, parasitic disease, pemphigus, variety of pulmonary disorders, and reported in rheumatoid arthritis

Started with...and where we are now
IgG4-related disease (IgG4-RD)

- Diffuse or mass forming fibro-inflammatory condition rich in IgG4-positive plasma cells
  - Diagnosis based on combination of
    - Clinical, imaging, serology, histopathology and immunohistochemistry
- Multiorgan disease can be synchronous or evolve metachronously over months to years

IgG4-RD major organ manifestations

- Pancreas (prototype)
- Biliary tree
- Gallbladder
- Liver
- Orbit/periorbital
- Sinus/nose
- Salivary gland
- Lymph nodes
- Thyroid
- Mediastinum
- Aorta
- Pericardium
- Lung
- Retroperitoneum
- Kidney
- Pituitary
- Meninges
- Peripheral nerve
- Skin
- Breast
- Prostate
- *Stomach
- *Bowel
- *Mesentery
- *Spleen
- * Suspected, not confirmed

How to count IgG4-positive plasma cells

1. Characteristic histologic appearance
   a. Dense lymphoplasmacytic infiltrate
   b. Fibrosis, least focally in a storiform pattern
   c. Obliterative phlebitis

2. Elevated number of IgG4-positive plasma cells in tissue

Two main features of IgG4-RD

- At x40 objective lens (HPF)
  - Use printed photographs of the same microscopic field
  - Direct counting under microscope, but
  - NOT by “eyeballing”

- Find “hot spots” (most intense IgG4+ foci)
- Count three HPF then calculate average
- Use same fields on IgG stain to calculate IgG4+/IgG+ ratio

Pitfalls

- Diagnosing IgG4-RD because of excessive emphasis on elevated serum IgG4 level
  - 10% of pancreatic adenocarcinoma
  - 20% of cholangiocarcinoma
- Overreliance on IgG4+ plasma cells in tissue

Non-IgG4-RD cases with increased IgG4+ cells

- **Inflammatory conditions**
  (Abundant plasma cells, so high numbers of IgG4+ plasma cells)
  - Primary sclerosing cholangitis (23%)
  - Inflammatory bowel disease
  - Autoimmune atrophic gastritis, oral inflammatory diseases, anti-neutrophilic cytoplasmic antibody-associated vasculitis, rheumatoid arthritis, Rosai-Dorfman disease, Hashimoto’s thyroiditis, Castleman’s disease, pulmonary abscess, splenic sclerosing angiomatoid nodular transformation, perforating collagenosis, inflammatory myofibroblastic tumor, and Rhinosinusitis
- **Malignancy**
  - Pancreatobiliary cancer
  - Lymphoma

IgG4-to-IgG ratio

- Powerful tool
  - >40% comprehensive cutoff value in any organ
    - Sensitivity 94.4%, specificity of 85.7%
  - Useful particularly when abundance of plasma cells

Threshold does not equate to IgG4-RD

Ratio is also a must

For histology alone, use the term...
Balance histologic criteria and diagnosis of IgG4-related disease

- Stringent criteria provides high specificity
  - In appropriate clinical context
  - Elevated serum IgG
  - Other organ manifestation of disease
  - Diagnosis can be made with lower IgG4+/IgG+ ratio
- But clinical features must be correlated with histopathologic criteria

Autoimmune pancreatitis (AIP)

<table>
<thead>
<tr>
<th></th>
<th>AIP type 1</th>
<th>AIP type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infiltrate</td>
<td>Dense predominantly lymphoplasmacytic infiltrate</td>
<td>Dense predominantly lymphoplasmacytic infiltrate with neutrophilic infiltration</td>
</tr>
<tr>
<td>Pancreatic ducts</td>
<td>Without epithelial damage and patent lumen</td>
<td>With destruction of duct epithelium by neutrophilic granulocytes (granulocytic epithelial lesion)</td>
</tr>
<tr>
<td>Lobules</td>
<td>Involving and replacing acinar tissue</td>
<td>Patchy involvement commonly admixed with neutrophils</td>
</tr>
<tr>
<td>Fibrosis</td>
<td>Storiform fibrosis, most prominent in peripancreatic fat</td>
<td>Less prominent, limited to pancreas</td>
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<tr>
<td>Vein</td>
<td>Obliterative phlebitis</td>
<td>Obliterative phlebitis rarely seen</td>
</tr>
<tr>
<td>IgG4 stain</td>
<td>Abundant positive plasma cells</td>
<td>Scant to no positive plasma cells</td>
</tr>
</tbody>
</table>

Modified Honolulu consensus

Why? Management

- AIP type 1 is responsive to corticosteroid
  - Remission in 3 months (87-98%)
- AIP type 2
  - Has been observed to improve with corticosteroids
  - Spontaneous resolution

Reason to subtype

- Recurrence risk
  - AIP type 1
    - High 3-year relapse rate (6-59%)
    - Predictor of relapse
      - Presence of IgG4-related cholangitis/proximal duct involvement
    - Whipple procedure
      - Decrease risk of relapse (2.7-28%)
      - Does not eliminate risk of relapse
  - AIP type 2 does not relapse
Clinical profile of autoimmune pancreatitis

<table>
<thead>
<tr>
<th></th>
<th>AIP type 1</th>
<th>AIP type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>~62 years old</td>
<td>~48 years old</td>
</tr>
<tr>
<td>Male</td>
<td>61-91%</td>
<td>44-74%</td>
</tr>
<tr>
<td>Elevated serum IgG4 level (&gt;135 mg/dL)</td>
<td>41-76%</td>
<td>0-17%</td>
</tr>
<tr>
<td>Other organ involvement</td>
<td>Biliary, salivary, retroperitoneal, kidney</td>
<td></td>
</tr>
<tr>
<td>Prevalence of IBD</td>
<td>Absent; 2-6%</td>
<td>Present; 16-30%</td>
</tr>
</tbody>
</table>

Classical imaging findings of pancreas

- Computed tomography (CT) scan
  - Diffuse enlargement and effacement of the usual lobular appearance
- Endoscopic retrograde cholangiopancreatography
  - Diffuse or long segments of irregular narrowing of the main pancreatic duct

Tumefactive mass

Clinical presentation and radiographic appearance mimics pancreatic carcinoma and leads to pancreatic resection.

In a surgical series of resections for “chronic pancreatitis”

- AIP represented about 20% of Whipple resections
- Only 33% had a discrete mass on CT scan

Serum IgG4 in pancreatic disease

Elevated serum IgG4 in 7% of non-AIP patients

9.6% of patients with pancreatic cancer (13/135, 9.6%)

Figure taken from Am J Gastroenterol 2007;102:1646-1653.
Autoimmune pancreatitis type 1

<table>
<thead>
<tr>
<th>Histologic features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infiltrate</td>
</tr>
<tr>
<td>Pancreatic ducts</td>
</tr>
<tr>
<td>Lobules</td>
</tr>
<tr>
<td>Fibrosis</td>
</tr>
<tr>
<td>Vein</td>
</tr>
<tr>
<td>IgG4 stain</td>
</tr>
</tbody>
</table>

Inflammatory infiltrate

- Lymphocytes
  - Diffuse T-cells; CD3-, CD4-, CD8-positive
  - Germinal center B-cells
- Plasma cells

Inflammatory infiltrate

Can also include mild to moderate eosinophils, scattered macrophages, and rare neutrophils
Variable lobular involvement

Storiform fibrosis

Venulitis

Obliterative phlebitis
Lymphoid aggregate?

EVG stain facilitates

Pitfalls of obliterative phlebitis

- Can be observed in chronic pancreatitis and pancreatic adenocarcinoma
- Lymphoid aggregate adjacent to artery mistaken for obliterative phlebitis
Abundant IgG4-positive plasma cells

Immunohistochemical stains

- IgG4-positive plasma cells cutoff points
  - >10/HPF (for biopsy)
  - >30/HPF (acceptable specificity)
  - >50/HPF (high specificity)
- Ratio of IgG4-positive plasma cells to IgG-positive plasma cells is at least >40%

Autoimmune pancreatitis type 2

<table>
<thead>
<tr>
<th>Histologic features</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infiltrate</td>
<td>Dense predominantly lymphoplasmacytic with neutrophilic infiltration</td>
</tr>
<tr>
<td>Pancreatic ducts</td>
<td>With destruction of duct epithelium by neutrophilic granulocytes (granulocytic epithelial lesion)</td>
</tr>
<tr>
<td>Lobules</td>
<td>Patchy involvement admixed with neutrophils</td>
</tr>
<tr>
<td>Fibrosis</td>
<td>Less prominent, limited to pancreas</td>
</tr>
<tr>
<td>Vein</td>
<td>Obliterative phlebitis rarely seen</td>
</tr>
<tr>
<td>IgG4 stain</td>
<td>Scant to no positive plasma cells</td>
</tr>
</tbody>
</table>

Periductal inflammation
Granulocytic epithelial lesion of smaller ducts

Epithelial duct destruction

Negative IgG4 stain

IgG

IgG4
Case History

58 year old man painless jaundice fullness of uncinate distal CBD stricture

Histologic features supportive of autoimmune pancreatitis type 1 (IgG4-related pancreatitis)

Honolulu consensus

<table>
<thead>
<tr>
<th></th>
<th>AIP type 1</th>
<th>AIP type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Fibroinflammatory process of pancreatic ducts, lobules, veins, and common bile duct; easily recognized on low-power microscopy</td>
<td>Fibroinflammatory process of mainly pancreatic ducts and intrapancreatic common bile duct, but less marked in lobules and veins</td>
</tr>
<tr>
<td>Infiltrate</td>
<td>Predominantly lymphoplasmacytic infiltration often with eosinophils and rare neutrophils</td>
<td>Predominantly lymphoplasmacytic infiltration. Neutrophilic infiltration of medium-sized and small ducts and often acini</td>
</tr>
<tr>
<td>Pancreatic ducts</td>
<td>Dense periductal inflammation without epithelial damage and lumen of the ducts is patent</td>
<td>Dense periductal inflammation associated with destruction of duct epithelium by neutrophilic granulocytes (granulocytic epithelial lesion)</td>
</tr>
<tr>
<td>Lobules</td>
<td>Lymphoplasmacytic infiltration involving and replacing acinar tissue</td>
<td>Lymphoplasmacytic infiltration involving and replacing acinar tissue</td>
</tr>
<tr>
<td>Peripancreatic fat</td>
<td>Fibroinflammatory process may extend to peripancreatic region</td>
<td>Inflammation usually limited to the pancreas</td>
</tr>
<tr>
<td>Fibrosis</td>
<td>Dense periductal inflammation associated with destruction of duct epithelium by neutrophilic granulocytes (granulocytic epithelial lesion)</td>
<td>Swirling fibrosis centered around ducts and veins (storiform fibrosis) but most prominent in peripancreatic fat</td>
</tr>
<tr>
<td>Vein</td>
<td>Obliterative phlebitis (organized obstruction of veins in association with dense lymphoplasmacytic infiltration)</td>
<td>Obliterative phlebitis rarely seen</td>
</tr>
<tr>
<td>Artery</td>
<td>Intense arterial involvement rarely seen</td>
<td>Arterial involvement usually absent</td>
</tr>
<tr>
<td>IgG4 stain</td>
<td>Abundant positive plasma cells</td>
<td>Scant to no positive plasma cells</td>
</tr>
</tbody>
</table>

Modified from Table 1. Pancreas. 2010;39:549-554.

Gallbladder findings

Supportive of IgG4-related cholecystitis

Gallbladder Differential diagnosis

- Involved by
  - Primary sclerosing cholangitis
  - Secondary sclerosing cholangiopathy
    - Choledocholithiasis
    - Malignancy-associated obstructive jaundice
  - IgG4-related cholecystitis
  - Uncomplicated cholelithiasis
**Gallbladder**

**Histologic differences**

- **Involved by**
  - Primary sclerosing cholangitis
  - Secondary sclerosing cholangiopathy
  - IgG4-related cholecystitis

- **Diffuse, lymphoplasmacytic inflammation**
  - Sparse mucosal inflammation
  - Frequent Rokitansky-Aschoff sinuses, fibrosis and muscular hypertrophy

- **Lymphoid nodules**

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**Unique to IgG4-related cholecystitis**

<table>
<thead>
<tr>
<th>Pathologic feature</th>
<th>PSC</th>
<th>Malignancy-associated</th>
<th>IgG4-RC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mucosal inflammation</td>
<td>46-50%</td>
<td>100%</td>
<td>25-55%</td>
</tr>
<tr>
<td>Transmural inflammation</td>
<td>10-38%</td>
<td>52%</td>
<td>35-50%</td>
</tr>
<tr>
<td>Phlebitis</td>
<td>0</td>
<td>22%</td>
<td>41%</td>
</tr>
<tr>
<td>Epithelial metaplasia</td>
<td>69-85%</td>
<td>17%</td>
<td>18-25%</td>
</tr>
<tr>
<td>&gt;10 IgG4+ PC/HPF</td>
<td>0</td>
<td>15%</td>
<td>40%</td>
</tr>
<tr>
<td>IgG4/IgG ratio of &gt;0.5</td>
<td>0</td>
<td>0</td>
<td>+++</td>
</tr>
</tbody>
</table>

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**Gastroenterologist requests**

- IgG4 stain on gastrointestinal biopsy
  - Ampulla
  - Duodenum
  - Colon
- Pathologist finds >10 IgG4+ plasma cells/HPF
- What is the diagnosis? Is this finding predictive of AIP?

**Unique to IgG4-related cholecystitis**

- Mucosal inflammation
- Transmural inflammation
- Phlebitis
- Epithelial metaplasia
- >10 IgG4+ PC/HPF
- IgG4/IgG ratio of >0.5

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**IgG4+ plasma cells in GI mucosal biopsy not specific for AIP diagnosis**

- **Ampullary biopsy**
  - Autoimmune pancreatitis
  - Chronic pancreatitis
  - Pancreatic carcinoma
- **Duodenal biopsy**
  - Serologically confirmed celiac disease
  - Chronic pancreatitis
  - Pancreatic carcinoma
  - Duodenitis
  - Gastric heterotopia
- **Colonic biopsy**
  - Idiopathic inflammatory bowel disease

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Clin Gastroenterol Hepatol 2012;10:91-96
### IgG4-RD major organ manifestations

<table>
<thead>
<tr>
<th>Organ</th>
<th>Manifestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pancreas</td>
<td>Biliary tree</td>
</tr>
<tr>
<td>Liver</td>
<td>Orbit/peri orbital</td>
</tr>
<tr>
<td>Salivary gland</td>
<td>Lymph nodes</td>
</tr>
<tr>
<td>Mediastinum</td>
<td>Aorta</td>
</tr>
<tr>
<td>Lung</td>
<td>Retropitoneum</td>
</tr>
<tr>
<td>Pituitary</td>
<td>Meninges</td>
</tr>
<tr>
<td>Skin</td>
<td>Breast</td>
</tr>
<tr>
<td>*Stomach</td>
<td>*Bowel</td>
</tr>
<tr>
<td>*Spleen</td>
<td>* Suspected, not confirmed</td>
</tr>
<tr>
<td>Gallbladder</td>
<td>Sinus/nose</td>
</tr>
<tr>
<td></td>
<td>Thyroid</td>
</tr>
<tr>
<td></td>
<td>Pericardium</td>
</tr>
<tr>
<td></td>
<td>Kidney</td>
</tr>
<tr>
<td></td>
<td>Peripheral nerve</td>
</tr>
<tr>
<td></td>
<td>Prostate</td>
</tr>
<tr>
<td>*Stomach</td>
<td>*Mesentery</td>
</tr>
<tr>
<td>Lung</td>
<td>Solid nodular</td>
</tr>
<tr>
<td></td>
<td>Bronchovascular</td>
</tr>
<tr>
<td></td>
<td>Alveolar interstitial</td>
</tr>
</tbody>
</table>

### Multifocal irregular pulmonary nodules and nodular consolidations

- Radiographic diagnostic considerations
  - Sarcoidosis
  - Multifocal pulmonary amyloidosis
  - Low-grade lymphoproliferative disorder (marginal zone lymphoma)

- Had left thoractomy

### High resolution CT scan

- Slow growing bilateral irregular nodules, predominantly peribronchovascular and supleural

### Firm, irregular white areas

- Patterns of pulmonary involvement
  - Solid nodular
  - Bronchovascular
  - Alveolar interstitial
IgG4-related lung disease

Cellular stroma

Arteritis

84 IgG4+ plasma cells/HPF

IgG4+/IgG > 40%
Pitfalls in histologic appearance

<table>
<thead>
<tr>
<th></th>
<th>Inflammation</th>
<th>Fibrosis</th>
<th>Phlebitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung</td>
<td>Small aggregates of neutrophils in airspace or infiltrates</td>
<td>Lacks storiform fibrosis in non-solid lesions (interstitial pneumonia)</td>
<td>Often has arteritis in solid lesions</td>
</tr>
</tbody>
</table>

- Arteritis, but **no necrotizing arteritis**
- Scattered macrophages and rare giant cells, but **no epithelioid granulomas**
- Neutrophils present, but **no prominent microabscesses**
  (exception upper aerodigestive tract erosion/ulcer)
- **No necrosis**

IgG4-related disease

- Autoimmune pancreatitis
- IgG4-related cholecystitis
- IgG4-related lung disease
- IgG4-related sialadenitis

Lobular accentuation & geographic germinal centers

Hypercellular interlobular stroma*

Enlarged left submandibular gland
Lymphoplasmacytic inflammation

No atypical cells or lymphoepithelial lesion

>100 IgG4+ plasma cells/HPF

IgG4-related sialadenitis

<table>
<thead>
<tr>
<th></th>
<th>IgG4-related sialadenitis</th>
<th>Sjogren syndrome</th>
<th>MALT lymphoma</th>
<th>Chronic sialadenitis, NOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salivary glands involved</td>
<td>Unilateral or bilateral, submandibular</td>
<td>Transiently, parotid predilection</td>
<td>1, 2, multiple glands; parotid predilection</td>
<td>Usually unilateral, may be bilateral submandibular</td>
</tr>
<tr>
<td>Inflammation</td>
<td>Marked lympho-plasmacytic</td>
<td>Mild, no plasma cells in sheet</td>
<td>Diffuse proliferation of atypical cells</td>
<td>Mild</td>
</tr>
<tr>
<td>IgG4+ plasma cells</td>
<td>&gt;100/HPF</td>
<td>&lt;50/HPF</td>
<td>&lt;50/HPF</td>
<td></td>
</tr>
<tr>
<td>Lymphoepithelial lesion</td>
<td>Not prominent</td>
<td>Prominent</td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>Interlobular fibrosis</td>
<td>Prominent, cellular</td>
<td>Absent</td>
<td>Acellular hyalinized</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>25% other sites of IgG4-RD</td>
<td>Xerophthalmia</td>
<td>Abnormal flow cytometry</td>
<td>50% sialoliths</td>
</tr>
</tbody>
</table>

Pitfalls in histologic appearance

<table>
<thead>
<tr>
<th>Inflammation</th>
<th>Fibrosis</th>
<th>Phlebitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salivary</td>
<td>Large irregular lymphoid follicle formation with expanded germinal centers</td>
<td>Storiform fibrosis rare in parotid and minor salivary gland</td>
</tr>
</tbody>
</table>

Granulomatosis with polyangitis (Wegener granulomatosis)
- Can fulfill strict histologic criteria, but not histology!
  - No necrotizing arteritis
  - Scattered macrophages and rare giant cells, but no epithelioid granulomas
  - Neutrophils typically absent, and no prominent microabscesses
  - No necrosis

Summary of IgG4-related disease

1. Responses to steroid therapy
   - Case presentation and examples of IgG4-RD
     - Classical histologic features
     - Salient organ specific histologic features
     - Differential diagnosis

2. Diagnosis requires histologic and clinical correlation
   - Mere staining of IgG4+ plasma cells
     - Neither diagnostic nor predictive of IgG4-RD

Mod Pathol. 2012; 25, 1181-1192.
>10 IgG4+ plasma cells/HPF in liver

- Primary sclerosing cholangitis
  - In periductal hilar region
  - But not parenchyma or on liver biopsy
- Autoimmune hepatitis
  - On liver biopsy (7/26)
- Patients with autoimmune pancreatitis
  - On liver biopsy in minority (3/17)
- IgG4-related cholangitis
- IgG4-associated autoimmune hepatitis

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PSC vs IgG4-related cholangitis liver pathology

<table>
<thead>
<tr>
<th></th>
<th>Periductal fibrosis</th>
<th>Lympho-plasmacytic infiltrate</th>
<th>Storiform fibrosis or obliterative phlebitis</th>
<th>&gt;10 IgG4-positive plasma cells/HPF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary sclerosing cholangitis</td>
<td>Present (35%)</td>
<td>49% hilus (explant)</td>
<td>None</td>
<td>23% at hilus (explant) None in parenchyma (explant and liver bx)</td>
</tr>
<tr>
<td>IgG4-related cholangitis</td>
<td>Present (40%)</td>
<td>Present</td>
<td>Present, but not on biopsy</td>
<td>60% of liver bx* 88% of bile duct bx</td>
</tr>
</tbody>
</table>

*Typically nonspecific liver biopsy findings; more portal/lobular inflammation than PSC (perivenular accentuation, spares ducts, has inflammatory nodules)

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IgG4+/IgG+ plasma cells in GI mucosal biopsy not specific for AIP diagnosis

- Examined 41 pancreatic resections
  - 11 AIP, 30 PDAC, 29 CP
- Ampullary biopsy
  - Cut-off 0.10 had sensitivity of 86% and specificity of 95%
    - One case of PDAC had an IgG4+/IgG+ ratio of 0.16
    - 4 cases of AIP had a ratio <0.20
- Duodenal biopsy
  - Cut-off 0.10 had sensitivity of 62% and specificity of 96%

---

PSC vs IgG4-related cholangitis clinical/imaging

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Cholangiogram</th>
<th>Serum IgG4</th>
<th>IBD</th>
<th>Other organ involved</th>
<th>Steroid therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary sclerosing cholangitis</td>
<td>Younger 40’s</td>
<td>Band-like or beaded, &quot;pruned-tree&quot; appearance</td>
<td>9-22% patients</td>
<td>70-80%</td>
<td>Not effective</td>
<td></td>
</tr>
<tr>
<td>IgG4-related cholangitis</td>
<td>Older, 60’s obstructive jaundice</td>
<td>Longer strictures, segmental and in distal 1/3 of common bile duct</td>
<td>74-100% patients</td>
<td>6%</td>
<td>50-92% had AIP</td>
<td>Effective</td>
</tr>
</tbody>
</table>

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Mimics cholangiocarcinoma, PSC, pancreatic cancer

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Histopathol 2011;58:414-422.
Am J Gastroentrol 2006;101:2070-2075.