Function disorders in the sphincter of Oddi

Dr. Turumin JL, MD, PhD, DMSci.

Model of functional disorders in the sphincter of Oddi in patients with biliary diseases and pancreatic diseases

**Sphincter of Oddi hypomotility and duodenogastric reflux**

Fig. 1. Passage of hepatic bile and pancreatic juice into the duodenum lumen in patients with biliary diseases, sphincter of Oddi hypomotility (hypomotility of the sphincter of common bile duct, sphincter of pancreatic duct and sphincter of hepatopancreatic ampulla) and duodenogastric reflux (duodenal juice) or duodenogastroesophageal reflux (duodenal juice and gastric juice).


**Biliary type III of sphincter of Oddi dysfunction**

Fig. 2. Passage of hepatic bile and pancreatic juice into the duodenum lumen in patients with biliary diseases and hypertonus (spasm) of the sphincter of common bile duct (biliary type III of sphincter of Oddi dysfunction). The increase of COX-2 activity in the smooth muscle cells of the sphincter of common bile duct may be accompanied by hypertonus (spasm) formation.

**Associated diseases**: Chronic (spastic aseptic) cholecystitis. Cholesterol gallstone disease. Chronic calculous cholecystitis. Metaplasia.

**Pancreatic type III of sphincter of Oddi dysfunction**

Fig. 3. Passage of hepatic bile and pancreatic juice into the duodenum lumen in patients with biliary diseases and hypertonus (spasm) of the sphincter of pancreatic duct (pancreatic type III of sphincter of Oddi dysfunction). The increase of COX-2 activity in the smooth muscle cells of the sphincter of pancreatic duct may be accompanied by hypertonus (spasm) formation.

**Associated diseases**: Chronic (spastic aseptic) pancreatitis.

Web-site: [http://www.drturumin.com](http://www.drturumin.com)
E-mail: drjacobturumin@yahoo.com
Functional disorders in the sphincter of Oddi

Dr. Turumin JL, MD, PhD, DMSci.

Hypertonus or spasm

Hepatopancreatic ampulla (HPA)

Pressure in CBD – (+++)

Sphincter of CBD

Common bile duct (CBD)

Duodenum

Hypotonus of the sphincter of PD

Pressure in CBD – (+)

Hepatopancreatic ampulla (HPA)

Pressure in HPA – (+++)

Sphincter of PD

Passage of hepatic bile and pancreatic juice into the duodenum lumen in patients with biliary diseases and in hypertonus (spasm) of the sphincter of hepatopancreatic ampulla (mixed type of sphincter of Oddi dysfunction). The increase of COX-2 activity in the smooth muscle cells of the sphincter of hepatopancreatic ampulla may be accompanied by hypertonus (spasm) formation.


Biliopancreatic reflux (lithogenic bile)

Fig. 5. Passage of hepatic bile and pancreatic juice into the duodenum lumen in patients with biliary diseases, hypertonus (spasm) of the sphincter of hepatopancreatic ampulla, hypotonus of the sphincter of pancreatic duct and biliopancreatic reflux of hepatic bile into the pancreatic duct. The increase of COX-2 activity in the smooth muscle cells of the sphincter of hepatopancreatic ampulla may be accompanied by hypertonus (spasm) formation.


Pancreaticobiliary reflux (pancreatic juice)

Fig. 6. Passage of hepatic bile and pancreatic juice into the duodenum lumen in patients with biliary diseases, hypertonus (spasm) of the sphincter of hepatopancreatic ampulla, hypotonus of the sphincter of common bile duct and pancreaticobiliary reflux of pancreatic juice into the common bile duct. The increase of COX-2 activity in the smooth muscle cells of the sphincter of hepatopancreatic ampulla may be accompanied by hypertonus (spasm) formation.


Web-site: http://www.drturumin.com
E-mail: drjacobturumin@yahoo.com
Syndrome of excessive bacterial growth in duodenum (duodenal hypertension)

**Fig. 7.** Passage of hepatic bile and pancreatic juice into the duodenum lumen in patients with biliary diseases and **duodenal hypertension** (the increase of intraluminal pressure in the duodenum – syndrome of excessive bacterial growth in duodenum).

**Associated diseases:** Gallstone disease. Chronic calculous cholecystitis. Chronic pancreatitis.

Duodenal-pancreatic reflux (duodenal juice)

**Fig. 8.** Passage of hepatic bile and pancreatic juice into the duodenum lumen in patients with biliary diseases, hypotonus of the sphincter of hepatopancreatic ampulla, hypotonus of the sphincter of pancreatic duct, hypertonus (spasm) of the sphincter of common bile duct, **duodenal hypertension** (the increase of intraluminal pressure in the duodenum – bacterial overgrowth) and duodenal-pancreatic reflux of duodenal juice into the pancreatic duct.


Duodenal-biliary reflux (duodenal juice)

**Fig. 9.** Passage of hepatic bile and pancreatic juice into the duodenum lumen in patients with biliary diseases, hypotonus of the sphincter of hepatopancreatic ampulla, hypotonus of the sphincter of common bile duct, hypertonus (spasm) of the sphincter of pancreatic duct, **duodenal hypertension** (the increase of intraluminal pressure in the duodenum – bacterial overgrowth) and duodenal-biliary reflux of duodenal juice into the common bile duct.

**Associated diseases:** Chronic (infectious) cholecystitis. Mixed or Pigment (brown) gallstone disease. Chronic calculous cholecystitis. Gastric metaplasia.

Web-site: [http://www.drturumin.com](http://www.drturumin.com)
E-mail: drjacobturumin@yahoo.com
## Functional disorders in the sphincter of Oddi and possibly reflux associated diseases in the hepato-biliary-cholecysto-pancreatico-duodeno-gastro-esophageal region

<table>
<thead>
<tr>
<th>Functional disorders in the sphincter of Oddi</th>
<th>Possibly reflux associated diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of reflux or dysfunction</strong></td>
<td><strong>Target organ – Gallbladder</strong></td>
</tr>
<tr>
<td>Pancreaticobiliary reflux (pancreatic juice)</td>
<td>Chronic (enzymatic) cholecystitis.</td>
</tr>
<tr>
<td>Biliary type III of sphincter of Oddi dysfunction (spasm of sphincter of common bile duct)</td>
<td>Chronic (spastic aseptic) cholecystitis.</td>
</tr>
<tr>
<td>Duodenal-biliary reflux (duodenal juice)</td>
<td>Chronic (spastic aseptic) pancreatitis.</td>
</tr>
<tr>
<td>Duodenal-biliary (acidic) reflux (duodenal juice and gastric juice)</td>
<td>Chronic (alcoholic infectious) pancreatitis.</td>
</tr>
<tr>
<td>Duodenal-pancreatic alcohol reflux (duodenal juice and gastric juice and alcohol)</td>
<td>Chronic (infectious) pancreatitis.</td>
</tr>
<tr>
<td>Duodenal-pancreatic reflux (duodenal juice)</td>
<td>Chronic (infectious) pancreatitis.</td>
</tr>
<tr>
<td>Duodenal-pancreatic (acidic) reflux (duodenal juice and gastric juice)</td>
<td>Chronic (infectious) pancreatitis.</td>
</tr>
<tr>
<td>Duodenogastric reflux (duodenal juice)</td>
<td>Bile reflux gastritis.</td>
</tr>
<tr>
<td>Duodenogastroesophageal reflux (duodenal juice and gastric juice)</td>
<td>Bile reflux gastritis.</td>
</tr>
<tr>
<td>Small intestinal bacterial overgrowth syndrome (duodenum)</td>
<td>Gallstone disease.</td>
</tr>
<tr>
<td>Small intestinal bacterial overgrowth syndrome (duodenal hypertension)</td>
<td>Gallstone disease.</td>
</tr>
</tbody>
</table>

**Absorption function of a gallbladder, a functional status of the sphincter of Oddi, an anatomic configuration of hepatopancreatic ampulla of the sphincter of Oddi (Y-type, V-type or U-type) define development and prevalence of the certain type of pathology in each concrete patient with biliary diseases and pancreatic diseases.**

- Inactivation of chronic aseptic inflammation – Selective or nonselective COX-2 inhibitors.
- Inactivation of spasm – Selective or nonselective spasmylytics.
- Inactivation of *Helicobacter pylori* – Antibacterial drugs (Eradication).
- Inactivation of *Salmonella enterica* serovar Typhi – Antibacterial drugs (Eradication).
- Inactivation of lithogenic bile and toxic secondary hydrophobic bile acids – Ursodeoxycholic acid.
- Inactivation of pancreatic juice – Pancreatic enzymes (?) and/or Ursodeoxycholic acid (?).
- Inactivation of gastric juice (HCl) – Proton pump inhibitor (PPI) agents. Selective prokinetics.

**Web-site:** [http://www.drturumin.com](http://www.drturumin.com)

**E-mail:** drjacobturumin@yahoo.com
1. **Selective COX-2 inhibitors** (celecoxib, nimesulide, etc.): celecoxib – 100 mg or 200 mg * 2 times per day during 5-7 days;

2. **Nonselective COX-2 inhibitors** (ibuprofen, diclofenac sodium, indomethacin, naproxen sodium, ketoprofen, flurbiprofen, etc.): ibuprofen – 200 mg or 300 mg or 400 mg * 3 times per day during 5-7 days;

3. **Selective spasmolytics** (pinaverium bromide, mebeverine hydrochloride, hyoscine butylbromide, etc.): hyoscine butylbromide – 200 mg or 400 mg or 600 mg * 3 times per day during 5-7 days;

4. **Nonselective spasmolytics** (drotaverine hydrochloride, papaverine hydrochloride, fentanyl, etc.): drotaverine hydrochloride – 40 mg or 60 mg or 80 mg * 3 times per day during 5-7 days;

5. **Antibacterial drugs** (ciprofloxacin, clarithromycin, amoxicillin, metronidazole, erythromycin, doxycycline, co-trimoxazole, etc.): ciprofloxacin – 500 mg * 2 times per day during 5 days;

6. **Ursodeoxycholic acid**: ursodeoxycholic acid – 750 mg * 1 time before going to bed – 14-30-45 days.

7. **Pancreatic enzymes** (mezym forte, panzyNorm forte, panzyflor, festal, kreon, etc.): kreon 10000 – 1 capsule or 2 capsules * 2-4 times per day during meal during 7-14-30 days;

8. **Proton pump inhibitor (PPI) agents** (esomeprazole, lansoprazole, omeprazole, pantoprazole, rabeprazole, dexlansoprazole): rabeprazole – 20 mg * once daily – during 4-8 weeks.

9. **Selective prokinetics** (domperidone, cisapride, metoclopramide, etc.): domperidone – 10 mg * 3-4 times per day before meal and at bedtime during 14 days.

The universal algorithm of the pathogenetic treatment of symptomatic (with biliary pain) biliary diseases with concomitant functional disorders in the sphincter of Oddi:

1) **Selective COX-2 inhibitors** (celecoxib or nimesulide, etc.):
   - celecoxib – 100 mg or 200 mg * 2 times per day during 5-7 days,

   + 2) **Selective spasmolytics** (hyoscine butylbromide or hyoscine butylbromide or pinaverium bromide, etc.):
   - hyoscine butylbromide – 200 mg or 400 mg or 600 mg * 3 times per day during 5-7 days;

   + 3) **Antibacterial drugs** (ciprofloxacin [for eradication of *Salmonella enterica ser. Typhi*] or clarithromycin + amoxicillin or metronidazole [for eradication of *Helicobacter pylori*, etc.]):
   - ciprofloxacin – 500 mg * 2 times per day during 5 days;

4) **after 5 days of treatment** (1+2+3):
   - ursodeoxycholic acid – 750 mg 1 time before going to bed – 30-45 days.

Absorption function of a gallbladder, a functional status of the sphincter of Oddi, an anatomic configuration of hepatopancreatic ampulla of the sphincter of Oddi (Y-type, V-type or U-type) define development and prevalence of the certain type of pathology in each concrete patient with biliary diseases and pancreatic diseases.

Therefore, depending on dysfunction (hyper tonus) or relaxation (hypo tonus) of the human sphincter of Oddi, depending on anatomic configurations of the human sphincter of Oddi (Y-type, V-type or U-type) and length of common channel (>5 mm, 2-5 mm or <2 mm) of the human sphincter of Oddi, different pathology will form in patients with biliary diseases after cholecystectomy in hepato-biliary-pancreatico-duodenal-gastric zone.

The presented data and this algorithm of pathogenetic treatment of biliary diseases with concomitant functional disorders in sphincter of Oddi may help diminish the duration of disease period and the quantity of patients with biliary diseases by 30-40%. Also, the remission period will be increased up to 18-24 months.

The pathogenetic correction of metabolic and morpho-functional disturbances in the gallbladder and liver:
- in patients with gallbladder dysfunction helps decrease the risk of appearance of the chronic acalculous cholecystitis without biliary sludge;
- in patients with chronic acalculous cholecystitis without biliary sludge helps decrease the risk of appearance of the chronic acalculous cholecystitis with biliary sludge;
- in patients with chronic acalculous cholecystitis with biliary sludge helps decrease the risk of appearance of the chronic calculous cholecystitis;
- in patients with chronic calculous cholecystitis helps decrease the risk of appearance of the acute calculous cholecystitis.

Web-site: [http://www.drturumin.com](http://www.drturumin.com)
E-mail: drjacobturumin@yahoo.com
• in patients after cholecystectomy helps decrease the risk of appearance of the choledocholithiasis.
• in patients with pancreaticobiliary reflux of pancreatic juice into common bile duct and the gallbladder (hypomotility of the sphincter of pancreatic duct and sphincter of common bile duct) helps decrease the risk of appearance of the chronic acalculous (enzymatic) cholecystitis and chronic calculous cholecystitis.
• in patients with spasm of the sphincter of common bile duct helps decrease the risk of appearance of the biliary type III of sphincter of Oddi dysfunction, the chronic acalculous (aseptic spastic) cholecystitis and chronic calculous cholecystitis.
• in patients with duodenal hypertension (the increase of intraluminal pressure in the duodenum – the small intestinal bacterial overgrowth syndrome) and duodenal-biliary reflux of duodenal juice into the common bile duct (hypomotility of the sphincter of hepatopancreatic ampulla and sphincter of common bile duct) and into the gallbladder helps decrease the risk of appearance of the chronic cholangitis, chronic acalculous (infectious) cholecystitis and chronic calculous cholecystitis, mixed gallstone disease or pigment (brown) gallstone disease,
• in patients with biliopancreatic reflux of lithogenic bile into the pancreatic duct (hypomotility of the sphincter of common bile duct and sphincter of pancreatic duct) helps decrease the risk of appearance of the chronic biliary (bile) pancreatitis and pancreatic cancer,
• in patients with duodenal hypertension (hypomotility of the sphincter of hepatopancreatic ampulla and sphincter of pancreatic duct) helps decrease the risk of appearance of the chronic (aseptic) pancreatitis.
• in patients with duodenogastric bile reflux (hypomotility of the sphincter of common bile duct and sphincter of hepatopancreatic ampulla) helps decrease the risk of appearance of the atrophic antral gastritis (bile reflux gastritis),
• in patients with duodenogastroesophageal bile reflux (hypomotility of the sphincter of common bile duct and sphincter of hepatopancreatic ampulla, and hypomotility of the lower esophageal sphincter) helps decrease the risk of appearance of the chronic alcoholic (infectious) pancreatitis, chronic (chymous infectious) pancreatitis, chronic (acidic) pancreatitis.

This algorithm of pathogenetic treatment of biliary diseases with concomitant functional disorders in sphincter of Oddi may help:
1. Effectively to stop the biliary pain and dyspeptic syndrome within 1-3 days;
2. To block the intensity of chronic aseptic inflammation in the gallbladder wall within 7-10 days, i.e. to decrease the thickness of gallbladder wall from 4-5 mm up to 2 mm;
3. Complete disorganization and elimination of biliary sludge within 10-14 days;
4. To restore the accumulation function of liver and the excretion function of liver within 10-14 days;
5. To restore the absorption function and the concentrating function and the evacuation function of gallbladder within 10-14 days;
6. To increase the duration of complete clinical remission period up to 2-4 years.

These data will help diminish the quantity of patients with biliary diseases (the gallbladder dysfunction, the chronic acalculous cholecystitis (aseptic spastic) without biliary sludge, the chronic acalculous (enzymatic) cholecystitis, the chronic acalculous (infectious) cholecystitis, the chronic acalculous cholecystitis with biliary sludge, the chronic calculous cholecystitis, the acute calculous cholecystitis, the choledocholithiasis) and the quantity of patients with pancreatic diseases (the chronic biliary pancreatitis, the chronic (aseptic) pancreatitis, the chronic alcoholic (infectious) pancreatitis, the chronic (chymous infectious) pancreatitis, the chronic (acidic) pancreatitis and the quantity of patients with gastro-esophageal-reflux-disease, and, also, the quantity of patients after cholecystectomy by 30-40% after 18-24 months in different countries of the North America, Central America and South America, Europe and Asia Pacific, Africa and Middle East.

Web-site: http://www.drturumin.com
E-mail: drjacobturumin@yahoo.com
Pancreatobiliary reflux – Biliopancreatic reflux – Choledocho-pancreatic reflux – Duodenal-biliary reflux – Duodenal-pancreatic reflux


Web-site: http://www.drturumin.com
E-mail: drjacobturumin@yahoo.com
Duodenogastric reflux – Duodenogastroesophageal reflux – Cholecystectomy


Duodenogastric reflux – Duodenogastroesophageal reflux

Ursodeoxycholic acid treatment of bile reflux gastritis


Ursodeoxycholic acid treatment of pancreatitis


Web-site: http://www.drturumin.com
E-mail: drjacobturumin@yahoo.com
**Pancreatobiliary reflux – Intestinal metaplasia in gallbladder.** Gallbladder cancer.

**Biliopancreatic reflux – Pancreatic cancer (papillary, tubular or cystic adenocarcinoma).**

Intraductal papillary carcinoma, Intraductal tubular carcinoma.


Hilicobacter pylori – Salmonella enterica serovar Typhi – Gallbladder cancer – Pancreatic cancer


Web-site: [http://www.drturumin.com](http://www.drturumin.com)
E-mail: drjacobturumin@yahoo.com


Pandey M. Helicobacter species are associated with possible increase in risk of biliary lithiasis and benign biliary diseases. World J Surg Oncol. 2007; 5(94): 1-5.


Silva CP, Pereira-Lima JC, Oliveira AG, Guerra JR, Marques DL, Sarmanho L, Cabral MM, Queiroz DM. Association of the presence of Helicobacter in gallbladder tissue with cholelithiasis and cholecys-

Web-site: http://www.drturumin.com
E-mail: djacobturumin@yahoo.com
Functional disorders in the sphincter of Oddi

Dr. Turumin JL, MD, PhD, DMSci.

Functional disorders in the sphincter of Oddi

Dr. Turumin JL, MD, PhD, DMSci.


