Dynamic changes in the gallbladder wall, in the gallbladder bile and in the liver in patients with symptomatic (with biliary pain) biliary diseases

Early detection and the treatment of symptomatic (with biliary pain) biliary diseases have the important clinical importance because of transformation of functional disturbances biliary system into the organic pathology – **gallbladder dysfunction → chronic acalculous cholecystitis without biliary sludge → chronic acalculous cholecystitis with biliary sludge → chronic calculous cholecystitis** (table 4).

It is a result of disturbance of colloidal stability of the gallbladder bile, of precipitation of the cholesterol monohydrate crystals and calcium bilirubinate granules, and the addition of chronic aseptic inflammation in the gallbladder wall (table 5).

Laparoscopic cholecystectomy is a "gold" standard of the treatment of chronic calculous cholecystitis.

The absence of gallbladder promotes the appearance of the functional biliary hypertension and the dilation of the common hepatic duct and common bile duct. In some patients it is accompanied with progressive deterioration of the chronic pancreatitis, with appearance of dysfunction of Oddi's sphincter, of duodeno-gastral reflux and/or of reactive hepatitis (table 6).

Possibly, the symptomatic (with biliary pain) biliary diseases are the "COX-2" associated biliary diseases. The main cause of these diseases is the excessive COX-2 expression in the smooth muscle cells and in the epithelial cells of the gallbladder and of the common hepatic duct and common bile duct.

Probably, the symptomatic (with biliary pain) biliary diseases are the diseases of the smooth muscle cells of the gallbladder wall or of the smooth muscle cells of cystic duct, of the common bile duct sphincter or of the pancreatic duct sphincter or of the sphincter of ampulla (the excessive COX-2 expression).

Table 4

Symptomatic (with biliary pain) biliary diseases (Gallbladder)

		Control	Gallbladder hypomotility	Chronic acalculous cholecystitis	Chronic acalculous cholecystitis with biliary sludge	Chronic calculous cholecystitis	Acute calculous cholecystitis	State after cholecyst-ectomy
	Gallbladder							
1	COX-2 expression in smooth muscle cells	–	+	++	+++	+++	++++	
2	PGE2 in smooth muscle cells	–	↑	↑↑	↑↑↑	↑↑↑	↑↑↑↑	
3	6-keto-PGF-1alpha in smooth muscle cells	–	↑	↑↑	↑↑↑	↑↑↑	↑↑↑↑	
4	Hypertrophy smooth muscle cells	–	+	++	+++	+++	?	
5	CCK receptors	normal	↓	↓↓	↓↓↓↓	↓↓	↓	
6	Fibrosis of muscular layer	–	нет	+	++	++	+++	
7	COX-2 expression in epithelial cells	–	±	+	++++	+++	++++	
8	PGE2 in epithelial cells	–	–	↑	↑↑↑	↑↑↑	↑↑↑↑	
9	6-keto-PGF-1alpha in epithelial cells	–	–	↑	↑↑↑	↑↑↑	↑↑↑↑	
10	Hyperplasic and hyper-trophy epithelial cells	–	+	++	+++	+++	?	
11	Atrophy of mucosal layer	–	–	+	++	+++	++++	
11	Gallbladder motility	> 70%	< 40%	< 50%	< 50%	< 50%	< 5%	
12	Absorption of water	normal	↓	↓↓	↓↓↓↓	↓↓	0	
13	Absorption of biliary cholesterol	normal	↓	↓↓	↓↓↓↓	↓↓	0	
14	Secretion of biliary mucin	–	±	↑↑	↑↑↑↑	↑↑↑	↑↑↑↑	
15	Thickness of gallbladder wall	2 mm	2 мм	3-4 мм	3-6 мм	3-4 мм	5-10 мм	
16	Biliary pain	–	+	++	+++	+++	++++	
17	Degree of inflammation	–	±	+	+++	+++	++++	
18	“Active” passage of he-patic bile	> 70%	< 40%	< 50%	< 50%	< 50%	< 0%	
19	“Passive” passage of hepatic bile	> 70%	< 40%	< 50%	< 30%	< 50%	< 0%	

Table 5.

Symptomatic (with biliary pain) biliary diseases (Gallbladder bile)

		Control	Gallbladder hypomotility	Chronic acalculous cholecystitis	Chronic acalculous cholecystitis with biliary sludge	Chronic calculous cholecystitis	Acute calculous cholecystitis	State after cholecyst-ectomy
	Gallbladder bile							
1	CSI	<1.0	≥ 1.0	≥ 1.25	≥ 1.50	≥ 1.25	≥ 1.25	
2	Calcium bilirubinate granules	–	±	++	++++	+++	++++	
3	Cholesterol monohydrate crystals	–	±	++	++++	+++	++++	
4	Biliary mucin	–	± soluble	++ soluble	++++ polymerization	+++ polymerization	++++ polymerization	
5	Biliary sludge	–	±	±	+++	++	++++	
6	Concentration of choles-terol in gallbladder bile	normal	↑	↑↑	↑↑↑	↑↑↑	↑↑↑↑	
7	Concentration of bile salts in gallbladder bile	normal	↓	↓↓	↓↓↓↓	↓↓	↓↓	
8	Gallbladder storage ca-pacity of bile acid pool size	> 70%	< 40%	< 50%	< 50%	< 50%	?	

Table 6

Symptomatic (with biliary pain) biliary diseases (Liver)

		Control	Gallbladder hypomotility	Chronic acalculous cholecystitis	Chronic acalculous cholecystitis with biliary sludge	Chronic calculous cholecystitis	Acute calculous cholecystitis	State after cholecyst-ectomy
	Liver							
1	Biliary cholesterol secre-tion	normal	±	++	++++	+++	?	+++
2	Hepatic bile volume	normal	↓	↓↓	↓↓↓	↓↓↓	?	↓↓↓↓
3	Bile acids concentration in liver tissue	normal	±	++	++++	+++	?	++++
4	Degree of chronic “bland” intrahepatic cho-lestasis	–	±	++	++++	+++	?	++++
5	Enterohepatic circulation of bile acids	–	↑	↑↑	↑↑↑	↑↑↑	?	↑↑↑↑
6	Gallbladder-independent enterohepatic circulation of bile acids	–	↑	↑↑	↑↑↑	↑↑↑	?	↑↑↑↑
7	Total pool size of bile acids	normal	↓	↓↓	↓↓↓↓	↓↓↓	?	↓↓↓↓
8	Absorption of bile salts in ileum	normal	↓	↓↓	↓↓↓↓	↓↓↓	?	↓↓↓↓
9	Bile acids concentration in portal vein	normal	±	++	++++	++++	?	++++
10	Gallbladder-independent enterohepatic circulation of biliary cholesterol	normal	↑	↑↑	↑↑↑	↑↑↑	?	↑↑↑↑
11	Absorption of biliary cholesterol in ileum	normal	↑	↑↑	↑↑↑	↑↑↑	?	↑↑↑↑
12	Gallbladder-independent enterohepatic circulation of biliary bilirubin	normal	↑	↑↑	↑↑↑	↑↑↑	?	↑↑↑↑