Functional disorders and chronic diseases of the biliary tract

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Abstract. The incidence of cholelithiasis in the Russian Federation is quite high, and there is a tendency to a progressive increase in the number of patients with cholelithiasis. VS Mayat et al. (1978) call cholelithiasis the second problem in gastroenterology (after peptic ulcer). However, it can be assumed that if the incidence of gallstone disease continues to increase at the same rate as at present, then cholelithiasis will soon become the number one problem. According to clinical observations, in the post-war period, the incidence of gallstone disease for every 10 years increased by almost 2 times. According to the materials of pathoanatomical studies, over 25 years it has increased by an average of 2.8 times. According to the forecast of A. V. Shaposhnikov and Ya. D. Abusara (1976), cholelithiasis in 1982 can occur in every third person.

1 Introduction

The pancreas is located in the upper part of the retroperitoneal space. It has an arcuate shape. The pancreas has three sections:

1) head;
2) body;
3) tail.

The head of the pancreas is located in the flexure of the duodenum. The head is separated from the body of the gland by a groove in which the portal vein passes. Features of the relationship of the head of the pancreas with the common bile duct (according to: Maksimenkov A.N. Surgical anatomy of the abdomen. L .: Medicine 1972; 664): A - the parenchyma of the gland surrounds the common bile duct; B - the parenchyma of the gland is only adjacent to the common bile duct (Fig. 1) [1].

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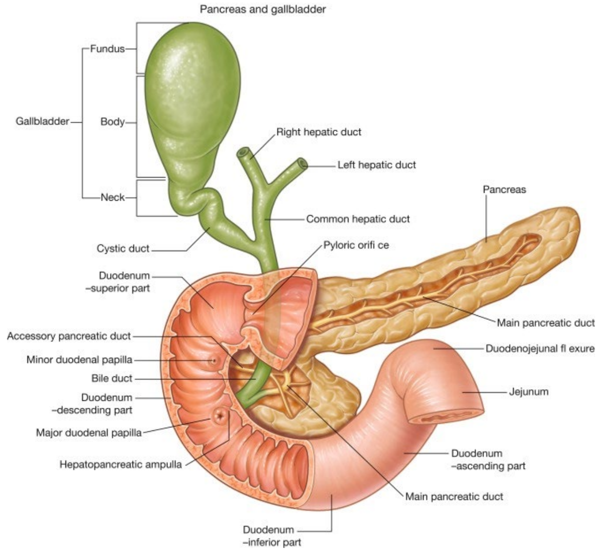

Fig. 1. Scheme of connection of the common bile and pancreatic ducts with the formation of a common hepatic-pancreatic ampulla

Variants of the structure of the pancreas The body of the pancreas has an upper, lower and anterior margins. The tail is cone-shaped or pear-shaped (Fig. 2) [1]. The pancreatic duct (wirsungia) collects secretions from most of the organ. In the head of the pancreas, it is closer to the posterior surface of the organ; in the body of the pancreas, the duct is usually located closer to its anterior surface; in the tail of the pancreas, the duct passes centrally or moves anteriorly. The duct opens on the longitudinal fold of the mucous membrane of the descending part of the duodenum on its own or together with the common bile duct. In the final section of the duct there is a sphincter of the pancreatic duct. The accessory pancreatic duct runs in the upper anterior section of the pancreatic head and opens with a minor papilla 3-4 mm away from the major duodenal papilla.

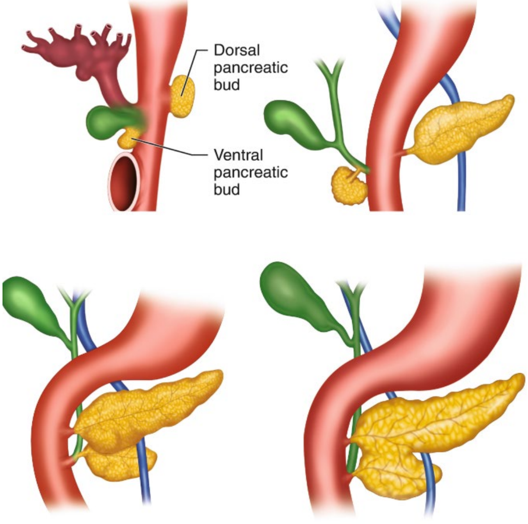

Fig. 2 Structural variants of the pancreas

Prerequisites for the formation of stones are also created by stagnation of bile in the gallbladder, as it contributes to a greater concentration of it and an increase in the concentration of cholesterol and bilirubin in it (10-12 times), and the gradual absorption of bile acids leads to a decrease in their content in bile [1]. Significant factors leading to stagnation of bile are violations of the neurohumoral regulation of the contractile function of the gallbladder and ducts (dyskinesia), anatomical changes in the bile ducts (kinks, adhesions, scars) [2], as well as various causes that disrupt the emptying of the gallbladder: increased intra-abdominal pressure (in during pregnancy, etc.), prolapse of internal organs, persistent constipation, a sedentary lifestyle, rare meals, etc. The genetic factor also plays a certain role.

2 Research methodology

In cholelithiasis, pathoanatomical changes are diverse: in the gallbladder, changes in the form of acute catarrhal inflammation, subsiding and again aggravating and turning into phlegmonous-ulcerative and gangrenous cholecystitis with shrinkage of the gallbladder. When the cystic duct is blocked by a stone, empyema or dropsy of the gallbladder may develop. Inflammatory changes occurring in the gallbladder can cause an inflammatory response in nearby organs: the duodenum, the transverse colon, and the greater omentum. Inflammatory infiltrate from the serous cover of the gallbladder passes to the listed organs and can lead to the formation of a massive paravesical inflammatory “tumor” (pericholecystitis). The development of a perivesical inflammatory infiltrate may result in the formation of adhesions of the gallbladder with neighboring organs, the infiltrate may fester. Gallbladder and bile duct stones can cause pressure ulcers in the bladder wall or duct and in the adjacent duodenum, stomach, or transverse colon. Under such conditions, “internal biliary fistulas” are formed, in which there is communication between the gallbladder or bile ducts and the stomach or intestines [3-4]. Large stones entering the intestine can cause obstructive (mechanical) intestinal obstruction. With ulcerative phlegmonous or gangrenous cholecystitis, perforation of the gallbladder wall and the outflow of its contents into the free abdominal cavity may occur, which will cause the development of peritonitis. The exit of stones from the gallbladder into the common bile duct may be accompanied by blockage of the duct, obstructive jaundice and inflammation of the bile ducts - cholangitis. The main site for the formation of stones is the gallbladder, but they can form in all other parts of the biliary system [4]. Gallstones come in various sizes: from a grain of sand to a chicken egg. Single large stones can be from 20 to 50 g. The shape of the stones is varied: single gallbladder stones are ovoid, and if there are two large stones in the gallbladder, they take the form of a half-egg. Often in the gallbladder there are stones faceted or in the form of small peas. Branched stones are found in the bile ducts; in the common bile duct oblong in the form of a cigar. The number of stones is also varied, it ranges from one to 20,000 (S.P. Fedorov). Pathological changes in the bile ducts are generally similar to those described in the gallbladder: catarrhal changes, purulent cholangitis, often leading to the development of multiple small abscesses along the ducts in the liver, are also described here.

3 Results and Discussions

In cholelithiasis, pathoanatomical changes are diverse: in the gallbladder, changes in the form of acute catarrhal inflammation, subsiding and again aggravating and turning into phlegmonous-ulcerative and gangrenous cholecystitis with shrinkage of the gallbladder. When the cystic duct is blocked by a stone, empyema or dropsy of the gallbladder may develop [5]. Inflammatory changes occurring in the gallbladder can cause an inflammatory response in nearby organs: the duodenum, the transverse colon, and the greater omentum. Inflammatory infiltrate from the serous cover of the gallbladder passes to the listed organs and can lead to the formation of a massive paravesical inflammatory “tumor” (pericholecystitis) [6]. The development of a perivesical inflammatory infiltrate may result in the formation of adhesions of the gallbladder with neighboring organs, the infiltrate may fester. Gallbladder and bile duct stones can cause pressure ulcers in the bladder wall or duct and in the adjacent duodenum, stomach, or transverse colon. Under such conditions, “internal biliary fistulas” are formed, in which there is communication between the gallbladder or bile ducts and the stomach or intestines [5]. Large stones entering the intestine can cause obstructive (mechanical) intestinal obstruction. With ulcerative phlegmonous or gangrenous cholecystitis, perforation of the gallbladder wall and the outflow of its contents into the free abdominal cavity may occur, which will cause the development of peritonitis. The exit of stones from the gallbladder into the common bile duct may be accompanied by blockage of the duct, obstructive jaundice and inflammation of the bile ducts - cholangitis. The main site for the formation of stones is the gallbladder, but they can form in all other parts of the biliary system.

Gallstones come in various sizes: from a grain of sand to a chicken egg. Single large stones can be from 20 to 50 g [7]. The shape of the stones is varied: single gallbladder stones are ovoid, and if there are two large stones in the gallbladder, they take the form of a half-egg. Often in the gallbladder there are stones faceted or in the form of small peas. Branched stones are found in the bile ducts; in the common bile duct oblong in the form of a cigar. The number of stones is also varied, it ranges from one to 20,000 (S.P. Fedorov). Pathological changes in the bile ducts are generally similar to those described in the gallbladder: catarrhal changes, purulent cholangitis, often leading to the development of multiple small abscesses along the ducts in the liver, are also described here.The International Civil Aviation Organization, in order to minimize the adverse impact of civil aviation on the climate, formulates policies, develops and updates Standards and Recommended Practices (SARPs) regarding GHG emissions from international air travel. The following ICAO targets were approved in 2010 (reaffirmed in 2019): Achieve an average annual improvement in fuel efficiency of 2% by 2020, with a target of 2% per year in 2021-2050; it is desirable to keep the net CO2 emissions of international aviation from 2020 at the same level through CO2 neutrality. One way to achieve these goals is through a market-based mechanism, the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), approved by ICAO in 2016 [8]. The system provides for a baseline monitoring phase in 2019-2020, a voluntary pilot (experimental) phase in 2021-2023 and a first voluntary phase in 2024-2026, from 2027 CORSIA will be mandatory for most countries (except for the least developed countries, small island developing countries and inland developing countries) [9]. This mechanism provides for additional costs (emission charges) for airlines when carbon emissions exceed the 2019 baseline. However, as an alternative to a fee, aircraft operators can use low-carbon aviation fuel or green fuel that meets the CORSIA sustainability criteria [10]. As of November 30, 2020, 88 countries (accounting for 77% of international air travel) have joined the CORSIA pilot phase. Russia does not participate in this stage and, together with a number of other countries (China, India), criticizes it. According to the Russian side, the system provides for the acquisition of emission units by airlines on open carbon markets outside the international civil aviation sector, which in fact is a mechanism for returning investments in projects in other industrial sectors and does not contribute to the development of technologies in the aviation industry. At the same time, regardless of participation in the pilot phase, all ICAO member states, starting from 2019, should put in place a system for monitoring, informing ICAO and auditing information on carbon dioxide emissions of air transport operators registered in these states in relation to international flights. It should be emphasized once again that within CORSIA, you need to pay for carbon dioxide emissions only if they exceed the base year, which restrains the increase in the volume of this type of international transportation, but is not a direct factor in their rise in price [11]. At the same time, since 2012, all air carriers flying to airports in the EU countries have been required to report on carbon dioxide emissions and, if the established limits are exceeded, purchase special certificates on the market (this measure for flights from third countries after its introduction was suspended until 2017 of the year).

In 2019, an expert estimate of the potential annual fee for carbon dioxide emissions by Russian companies engaged in international air transportation (if such a fee, following the example of the EU, is introduced for flights to all foreign countries), was 0.4-1 billion dollars, depending on the price of CO2 on the international market ($25–75 per ton). The International Maritime Organization is adopting important guidelines to support the implementation of mandatory measures to improve energy efficiency and reduce GHG emissions from international shipping [12]. In 2018, the Initial Strategy for the Reduction of GHG Emissions from Ships was adopted, which set the following goals: to reach the peak of GHG emissions from international shipping as soon as possible, to reduce them by at least 50% by 2050 (relative to 2008) and to to a trajectory consistent with the objectives of the Paris Agreement; reduce specific carbon dioxide emissions from maritime transport by at least 40% by 2030 and by 70% by 2050 (relative to 2008); extend the use of Energy Efficiency Design Factors for New Vessels – sets the acceptable level of carbon dioxide emissions (grams of CO2 per ton-mile) for various types of ships and is valid until 2025. Since 2019, ships with a gross tonnage of 5000 reg. tons and more must begin collecting data on marine fuel consumption in accordance with mandatory fuel collection and reporting requirements that came into force in March 2018. In addition to IMO regulation on data collection, all maritime carriers are also subject to mandatory EU requirements on the evaluation of monitoring plans and verification of reports on carbon dioxide emissions from ships, introduced in 2015 [13]. The requirements apply to ships with a capacity of more than 5000 reg. t that make flights to or from a European Economic Area (EEA) port, including flights between EEA ports. The initial IMO Strategy sets out the overall vision for decarbonization and outlines the way forward for the adoption of the Refined Strategy to reduce GHG emissions from ships in 2023 [15].

The Russian delegation, supporting the proposed draft amendments, noted the importance of promptly conducting a comprehensive assessment of the consequences of the measure before its adoption and the development of all necessary guidelines.

4 Conclusions

The introduction of mandatory carbon pricing systems is one of the most fundamental measures in terms of achieving GHG emission reduction targets. At the level of the Paris Agreement, the introduction of carbon pricing systems is not mandatory. Countries or associations independently make such a decision to achieve their climate goals. Nevertheless, in 2020, the EU has plans to introduce cross-border carbon regulation, which brings the issue of carbon pricing to the international level and creates risks for Russian exporters supplying products to the EU. In world practice, there are three main carbon pricing schemes: carbon tax, GHG emissions trading system and mixed schemes. GHG emission trading systems can be either mandatory or voluntary. According to the World Bank, as of November 2020, there were 64 carbon pricing initiatives in the world, of which 33 can be attributed to carbon taxes and 31 to TPCs. Such initiatives cover 46 countries (including EU countries) and 35 subnational jurisdictions (individual US states, provinces in Canada, regions in China, etc.). The current or planned to be introduced carbon pricing initiatives in the world cover about 12 billion tons of CO2-eq. (about 22% of global GHG emissions).

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