

## Hyperlipidemia and liver diseases

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**H**yperlipidemia means the quantity of cholesterol and/or triglyceride in plasma higher than the upper limit of normality. The level of lipid in plasma may be interfered by diseases, diets, environment and life style. The morbidity rate of fatty liver, atherosclerosis, myocardial infarction will decrease if hyperlipidemia can be diagnosed and treated timely.

Fat in the diet will be absorbed after digestion in the small intestine, forming chylomicrons in blood, and fatty acids as well as glyceride releases from them under the action of lipoproteinase. Fatty acids may enter fat cells or muscular cells, and they may be stored as triglyceride after esterification or undergo oxidation. Cholesterol in plasma is necessary for forming cellular membranes, and for synthesis of corticosteroids. In the liver which is essential to regulating blood lipids, cholesterol may change into bile acids or enter the bile without being metabolized to carry out functions of digestion, bacteriostasis, and bowel movement. A high level of triglyceride can be formed at this time in the liver when diet contains more carbohydrate.<sup>[1]</sup>

Blood lipids such as cholesterol, triglyceride are combined with proteins to form lipoproteins, which can be defined of very low density, low density, moderate density, and high density according to their size and physical-chemical characteristics.<sup>[2]</sup>

Normally, synthesis and metabolism of cholesterol and triglyceride are in a state of dynamic balance. Hyperlipidemia will occur if they are overly synthesized or less metabolized. Human body can automatically regulate the synthesis and metabolism of blood lipids according to energy requirement when the liver function is normal. Therefore, the liver plays an important role in metabolic balance of blood cholesterol and triglyceride. In China the normal serum level of total cholesterol in

adults is 2.86–5.96 mmol/L (110–230 mg/dl), and the normal serum level of triglyceride is 0.22–1.20 mmol/L (20–110 mg/dl).<sup>[3]</sup>

Hyperlipidemia can be sorted out primary hyperlipidemia from secondary hyperlipidemia. Primary hyperlipidemia may be seen in patients with hereditary lipoproteinase deficiency, hereditary lipoproteinase imbalance, hereditary hypercholesterolemia, hereditary hyper-alpha-lipoproteinemia and others. Secondary hyperlipidemia may happen in patients with diabetes mellitus, viral hepatitis, hypothyroidism, extremity hypertrophy, uremia, renal failure syndrome, biliary cirrhosis, drunkenness, administration of contraceptives, systemic lupus erythematosus, pregnancy and alimentary obesity.

The liver is an important organ maintaining dynamic balance of the metabolism of cholesterol and triglyceride. Acute or chronic malfunction of the liver because of viral hepatitis, toxipathic hepatitis, liver cirrhosis, and other diseases may induce hyperlipidemia. The most common cause for hyperlipidemia in patients with liver diseases in China is viral hepatitis; but the incidence of hyperlipidemia associated with non-insulin dependent diabetes mellitus is increasing following the improvement of living quality of people.

Hyperlipidemia in patients with viral hepatitis has something to do with the following factors: decreased metabolism or consumption of cholesterol and triglyceride in the liver; overly nutrition supplied diet; less physical exercises for energy consumption; decreased metabolism due to lower activity of lipoproteinase; intemely treatment of liver dysfunction.<sup>[4]</sup>

In China, hyperlipidemia is commonly seen in patients with chronic hepatitis B or C, obese or thin. Fatty degeneration of the liver and fatty liver will occur if hyperlipidemia lasts for a long time, and liver function will be worsened. Hyperlipidemia may also occur during or shortly after convalescence of patients with acute viral hepatitis. Too much nutrition in food, large amount of diet and limited physical activities are important factors for the development of hyperlipidemia.

Some patients with liver diseases associated with hyperlipidemia may have such symptoms as dizziness, headache, fatigue, discomfort or slight pain in the hepatic region and increased body weight. Physical examination could find hepatomegaly of soft or moderate quality

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without tenderness. Ultrasonographically, hepatomegaly may be found to have different degree of fatty changes. Computed tomography and magnetic resonance imaging are helpful in the diagnosis of fatty liver. Routine blood test may also show elevated levels of cholesterol, triglyceride, alanine transaminase (ALT), aspartate transaminase (AST), gamma-glutamyl transpeptidase ( $\gamma$ -GT), bile acid and globulin, apart from the decreased level of albumin. If necessary, liver biopsy should be performed. The possibility of hyperlipidemia should be considered in the majority of obese people and in those whose ALT level is hard to return to normal despite treatment.

Tackling hyperlipidemia includes active treatment of viral hepatitis, regulation of diets and physical activities, and administration of lipoclastics if necessary. It is recommended that the total calorie of daily diet be limited appropriately, especially the amount of fat less than 25%. Meanwhile, the ratio of saturated fatty acid and non-saturated fatty acid should be better fitted for 1:1 to 1:2, and cholesterol in daily diet should not exceed 300 mg. Body weight should lower down in obese patients. Fish, fresh water fish in particular is rich in non-saturated fatty acid which is able to inhibit agglutination of thrombocytes in blood vessels and prevent thrombosis.<sup>[5]</sup>

Lipoclastics are feasible in some patients if causative factors of hyperlipidemia fail to be treated. A lot of lipoclastics are available, but none is effective to control lipid imbalance, let alone side-effects despite they could lower the levels to some extent of cholesterol and triglyceride. The commonly used lipoclastics include clofibrate, fenofibrate, gemfibrozil, nicotinic acid, lovastatin, simvastatin, probucol, lipanthyl, pantethine, cholestyramine, and cholestipol, but most of them inevitably induce dysfunction of the liver with elevated levels of

ALT and AST. This is why lipoclastics are not given to the patients with liver diseases.

Other treatments including replacement of plasma, artificial liver support system, portacaval anastomosis and liver transplantation should be cautious because of possible side-effects, high cost, and transient results.

The last but not the least, preventive measures for the occurrence of hyperlipidemia should concentrate on eradication of causative factors, readjustment of diet, control of body weight, and engagement of physical exercises.

### Competing interest

The author or authors do not choose to response to the statements listed in Instructions for Authors.

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*Received October 22, 2001*

*Accepted after revision December 12, 2003*