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Question 1: why do we have the portal vein or the liver receiving more blood from the vein than it receives from the artery?

In the hepatic portal system, the liver receives a dual blood supply from the hepatic portal vein and hepatic arteries. The hepatic portal vein carries venous blood drained from the spleen, gastrointestinal tract and its associated organs; it supplies approximately 75% of the liver's blood. The hepatic arteries supply arterial blood to the liver and account for the remainder of its blood flow. The hepatic artery accounts for 25% of the liver's blood supply and delivers oxygenated blood as an arterial branch of the celiac axis. In fact, 75% of the liver's oxygen supply comes from the hepatic artery. The biliary system and connective tissue is supplied by the hepatic artery alone whereas the rest of the liver receives the dual supply. The hepatic artery also has both alpha- and beta-adrenergic receptors; therefore, flow through the artery is controlled, in part, by the splanchnic nerves of the autonomic nervous system.

Oxygen is provided from both sources; approximately half of the liver's oxygen demand is met by the hepatic portal vein, and half is met by the hepatic arteries. Blood flows through the liver tissue and empties into the central vein of each lobule. The central veins coalesce into hepatic veins that collect the blood leaving the liver and bring it to the heart. A portal system is a venous structure that enables blood from one set of capillary beds to drain into another set of capillary beds, without first returning this blood to the heart. The majority of capillaries in the body drain directly into the heart, so portal systems are unusual.

The hepatic portal system connects the capillaries of the gastrointestinal tract with the capillaries in the liver. Nutrient-rich blood leaves the gastrointestinal tract and is first brought to the liver for processing before being sent to the heart. Here, carbohydrates

and amino acids can be stored or used to make new proteins and carbohydrates. The liver also removes vitamins and cofactors from the blood for storage, as well as filters any toxins that may have been absorbed along with the food. When any of these stored substances are needed, the liver releases them back into circulation through the hepatic veins.

Question 2: discuss five disease conditions of the liver

1. **Hepatitis A**

   Hepatitis A is a liver disease caused by the hepatitis A virus (HAV). HAV causes the liver to swell and prevents it from working well. HAV usually goes away on its own in almost all cases with no serious complications. However, HAV may cause some patients to suffer liver failure. Those at risk of serious long term effects from HAV include people with other liver diseases and people over 60. Hepatitis A occurs sporadically and in epidemics worldwide, with a tendency for cyclic recurrences. The hepatitis A virus is one of the most frequent causes of foodborne infection. Epidemics related to contaminated food or water can erupt explosively. They can be also prolonged, affecting communities for months through person-to-person transmission. Hepatitis A viruses persist in the environment and can withstand food-production processes routinely used to inactivate and/or control bacterial pathogens. The disease can lead to significant economic and social consequences in communities. It can take weeks or months for people recovering from the illness to return to work, school, or daily life. The impact on food establishments identified with the virus, and local productivity in general, can be substantial.

   The hepatitis A virus is transmitted primarily by the faecal-oral route; that is when an uninfected person ingests food or water that has been contaminated with the faeces of an infected person. In families, this may happen though dirty hands when an infected person prepares food for family members. Waterborne outbreaks, though infrequent, are usually associated with sewage-contaminated or inadequately treated water. The virus can also be transmitted through close physical contact (such as oral-anal sex) with an infectious person, although casual contact among people does not spread the virus.

2. Hepatitis B

Hepatitis B is a high preventable liver disease caused by the hepatitis B virus (HBV). HBV causes the liver to swell and prevents it from working well. About 95% of adults who are exposed to HBV fully recover within 6 months (acute HBV) without medication. About 5% have HBV all their lives (chronic HBV) unless they are successfully treated with medications. Infants born to mothers infected with HBV are at high risk of developing chronic HBV. Chronic HBV can lead to cirrhosis (scarring) of the liver, liver cancer, and liver failure.

In highly endemic areas, hepatitis B is most commonly spread from mother to child at birth (perinatal transmission), or through horizontal transmission (exposure to infected blood), especially from an infected child to an uninfected child during the first 5 years of life. The development of chronic infection is very common in infants infected from their mothers or before the age of 5 years. Hepatitis B is also spread by needle stick injury, tattooing, piercing and exposure to infected blood and body fluids, such as saliva and, menstrual, vaginal, and seminal fluids. Sexual transmission of hepatitis B may occur, particularly in unvaccinated men who have sex with men and heterosexual persons with multiple sex partners or contact with sex workers.

Infection in adulthood leads to chronic hepatitis in less than 5% of cases, whereas infection in infancy and early childhood leads to chronic hepatitis in about 95% of cases. Transmission of the virus may also occur through the reuse of needles and syringes either in health-care settings or among persons who inject drugs. In addition, infection can occur during medical, surgical and dental procedures, through tattooing, or through the use of razors and similar objects that are contaminated with infected blood. The hepatitis B virus can survive outside the body for at least 7 days. During this time, the virus can still cause infection if it enters the body of a person who is not protected by the vaccine. The incubation period of the hepatitis B virus is 75 days on average, but can vary from 30 to 180 days. The virus may be detected within 30 to 60 days after infection and can persist and develop into chronic hepatitis B.

3. Hepatitis C

Hepatitis C is a disease caused by a virus that infects the liver. The virus, called the Hepatitis C virus or HCV for short, is just one of the hepatitis viruses. The other common hepatitis viruses are A and B, which differ somewhat from HCV in the way they are spread and treated.

The hepatitis C virus is a blood borne virus. It is most commonly transmitted through: injecting drug use through the sharing of injection equipment; the reuse or inadequate sterilization of medical equipment, especially syringes and needles in healthcare settings; the transfusion of unscreened blood and blood products; sexual practices that lead to exposure to blood (for example, among men who have sex with men, particularly those with HIV infection or those taking pre-exposure prophylaxis against HIV infection).

HCV can also be transmitted sexually and can be passed from an infected mother to her baby; however, these modes of transmission are less common. Hepatitis C is not spread through breast milk, food, water or casual contact such as hugging, kissing and sharing food or drinks with an infected person.

4. **Gilbert Syndrome**

Gilbert Syndrome is a mild genetic disorder in which the liver does not properly process a substance called bilirubin. Bilirubin is made by the breakdown of red blood cells. Gilbert Syndrome is more common in men than women. Gilbert's syndrome is due to a mutation in the UGT1A1 gene which results in decreased activity of the bilirubin uridine diphosphate glucuronosyltransferase enzyme. It is typically inherited in an autosomal recessive pattern and occasionally in an autosomal dominant pattern depending on the type of mutation. Episodes of jaundice may be triggered by stress such as exercise, menstruation, or not eating. Diagnosis is based on higher levels of unconjugated bilirubin in the blood without either signs of other liver problems or red blood cell breakdown.

Typically no treatment is needed. If jaundice is significant phenobarbital may be used. Gilbert's syndrome affects about 5% of people in the United States. Males are more often diagnosed than females. It is often not noticed until late childhood to early

adulthood.

5. Liver Cancer

Liver cancer is the growth and spread of unhealthy cells in the liver. Cancer that starts in the liver is called primary liver cancer. Cancer that spreads to the liver from another organ is called metastatic liver cancer. Hepatocellular carcinoma (HCC) is the most common type of primary liver cancer. Primary liver cancer is one of the cancers on the rise in the United States. Primary liver cancer is about twice as common in men than in women.

The liver can be affected by primary liver cancer, which arises in the liver, or by cancer which forms in other parts of the body and then spreads to the liver. Most liver cancer is secondary or metastatic, meaning it started elsewhere in the body. Primary liver cancer, which starts in the liver, accounts for about 2% of cancers in the U.S., but up to half of all cancers in some undeveloped countries. This is mainly due to the prevalence of hepatitis, caused by contagious viruses, that predisposes a person to liver cancer. Because the liver is made up of several different types of cells, several types of tumors can form there. Some of these are benign (noncancerous), and some are cancerous and can spread to other parts of the body (metastasize). These tumors have different causes and are treated differently.