Forms of liver disease: a case study

The liver being the largest visceral organ in the body has been known to have a wide range of functions in the body ranging from the metabolism of hormones and drugs to the conversion of fatty acid to ketones. When the liver is diseased, there is an inability of the liver to perform its function properly due to either an acute or a chronic damage. Liver disease is usually caused by exposure to toxic compounds or drugs, genetic defect such as haemochromatosis, infections and injury. The type of liver disease can also be classified by the effect it has on the liver. Hepatitis is the inflammation of the liver. Hepatitis can occur in two major forms which are acute hepatitis (lasting < 6 months) or chronic hepatitis (lasting > 6 months). It most commonly arises due to viral infections. The commonly known hepatitis viruses are hepatitis A virus (HAV), hepatitis B virus (HBV), hepatitis C virus (HCV) , hepatitis D virus (HDV) and hepatitis E virus (HEV). Cirrhosis involves the scarring of the liver due to menacing onset of continuous liver tissue damage. It is usually associated with inflammation and is marked by cell death. It is usually irreversible.

Gallstones are characterized by the precipitation of cholesterol and bile pigments, leading to the formation of stones. These stones could be symptomatic or asymptomatic depending on the area which they are found as well as their size. Obstruction in the liver could result due to several conditions, such as tumors, inflammation and gall stones. An obstruction in the liver leads to the accumulation of waste products such as bile in the blood as well as the skin and eyes therefore leading to conditions such as jaundice.

Fatty liver results in the enlargement and tenderness of the liver as well as abnormal liver function. This is commonly known to arise from excessive consumption of alcohol. When diseases such as cirrhosis and hepatitis progress in some cases, they can lead to liver cancer. However, it is more common for cancer to spread to the liver from other parts of the body.

Although liver diseases vary in description, they share common symptoms such as jaundice (yellowing of the skin and eyes), light stools, loss of appetite, diarrhoea, vomiting, nausea, dark urine, ascites, (which is the swelling of the abdomen due to the accumulation of fluid) abdominal pain and in some cases pruritus they may not be present until the disease has reached an advanced stage. However, the severity and also the type of disease can be distinguished following a range of test fuch as liver function tests. The diagrams below show the summary of hepatic failure including the features, complications and investigations as well as the coomon causes, investigations and managements for acute liver disease.

CASE SUMMARY

A 39 year old male sailor who recently completed a 4 month tour of south east asia, went to his clinic with complaints of flu – like symptoms as well as mild pyrexia, nausea, vomiting, pain in his upper right quadrant and darkened urine. After reviewing his medical history, it was discovered that he had contracted several common sexually transmitted diseasease after living promiscuously but they were cured with antibiotic administration. On further examination, a mild scleral icterus was noted, indicating jaundice. A chest examination showed no abnormalities and the tenderness of the upper right quadrant was linked to the observed hepatomegaly through palpation.

However, he showed no signs of splenomegaly or lymphadenopathy. The examination also revealed several tattoos and some of which were obtained during his tour of duty.

LABORATORY INVESTIGATIONS AND DIAGNOSIS

Some biochemical tests were carried out on the patient's blood and urine and the results obtained are shown below in table 2 with reference values followed by a figure 2, a chart on his urine output alongside the level of some biomarkers.

C- Reactive Protein (CRP) and Erythrocyte Sedimentation Rate (ESR): Erythrocyte sedimentation rate (ESR) is a test used in determining the presence of infections, tumors and inflammation as well as autoimmune diseases. This test is based on the analysis of acute-phase response which normally starts within days or hours of the beginning inflammation. This is because the increase in acute phase proteins is often accompanied by the increase of ESR. This occurs because the acute phase proteins lead to a clustering of red blood cells. ESR however cannot be used as an indication of the area where the inflammation is occurring. This patient has an elevated ESR of 120mm/hr which about 9 times more than the reference As ESR cannot be used as a single indicator, it is used alongside other tests such as C- reactive protein. C-reactive protein is an acute phase protein and in high levels it is used in the indication of infection and inflammation. As its levels fall in relation to the presence of inflammation, it is a better marker at monitoring inflammation. This patient shows a highly elevated CRP level (230 mg/LT) which is about 100 times the reference range (<3 mg/LT),

therefore further suggesting that the patient is having an inflammatory response, probably due to an infection.

Alkaline Phosphatase: Alkaline phosphatase (ALP) is found mostly in the bile ducts therefore increased levels in the blood usually indicates an biliary obstruction, therefore hampering the transportation and delivery of bile. It is also used as a test in detecting liver and bone disease as elevated levels usually indicate liver damage or a problem with the bone cells. Therefore when used alongside other liver test such as aspartate aminotransferase (AST), bilirubin or alanine aminotransfere (ALT) a definite diagnosis of liver disease can be made. In this patient, the ALP test shows a result of 350 IU/L which is highly elevated when compared to the reference range of 20 â€” 70 IU/L. This therefore suggests obstruction of the bile ducts which could have resulted from an inflammation of the bile duct. This is because it may lead to the narrowing of the bile duct. The most common causes of inflammation are viral and bacterial infections.

Alanine transaminase: Alanine aminotransferase (ALT) is a test used in detecting liver injury. Alongside AST, a diagnosis of liver disease can be made with ALT as they are believed to be essential in the detection of liver injury. As ALT is found in cells of liver, during hepatocellular damage, it seeps out, into the blood. In this patient, there was a notable increase of ALT of about twice the normal expected range. Although a higher range is expected in diseases such as acute hepatitis, liver cell damage is still indicated.

Bilirubin: It is a pigment of bile formed from the breakdown of heme in red blood cells. An increase in bilirubin levels can have various causes such as

hepatocellular damage and biliary obstruction. In this patient, there is an increase in the total bilirubin as well as conjugated bilirubin. The elevation of the total bilirubin shows reduced liver function as some of the symptoms experienced by the patient can be attributed to this increase, such as the yellowing of the sclera. Total bilirubin, is used as a test in used in diagnosing jaundice and in this patient, a highly elevated level of 30mg/dL compared to the reference range of 0. 2-1. 3 mg/dL indicates an onset of jaundice. There is also a noticeably high amount of bilirubin in the urine (conjugated hyperbilirubinemia) resulting in the darkened colour observed by the patient. This could occur due to various reasons such as infections affecting the liver. There are several infections which could lead to hyperbilirubinemia and they include include viral Epstein Barr virus, cytomegalovirus (CMV) and viral hepatitis.

PATHOPHYSIOLOGY

The symptoms experienced by this patient although they are mostly flu symptoms are accompanied with other symptoms such as scleral icterus, pain in the right upper quadrant and darkened urine. The yellowing of the patient´s sclera is believed to be pointer to the onset of jaundice. This could have been due to the inability of the body to excrete bilirubin properly or due to a high level of hepatocellular damage. This theory is further supported by the levels of bilirubin (total bilirubin of 30mg/dL) observed in the laboratory tests carried out. The colour of his urine is also attributed to hyperbilirubinemia as increased amounts of conjugated bilirubin are excreted in the urine due to poor hepatic funtion

The hepatomegaly which was observed during palpation of the liver is believed to be due to inflammation. The pain which this patient experiences in the upper right quadrant usually indicates defects with the gall bladder and the liver as it could be caused due to an obstruction of the bile duct, or diseases such as non-alcholic fatty liver disease. hepatitis (inflammation of the liver), cholecystitis (inflammation of the gallbladder resulting from cholelithiasis) and cancer. Other diseases which affect the right upper quadrant that are unrelated to the liver and the hepatobiliary system include pneumonia affecting the lung. In cholecystitis, the inflammation of bile duct leads to an irritatiuon of structures in the abdominal cavity and therefore leads to pain in the right upper quadrant. The nausea and vomitting experienced by this patient although it could be wrongly attributed to a condition such as food poisoning, due to the fact that the patient is a sailor and must have come in contact with some raw food especially in the region where he just briefly returned from (sdouth east asia which is highluy endemic of salmonellosis). However food posioning resulting from infections such as salmonellosis, are known to show symptoms within 2 days of incubation. Threfore food poisoning is ruled out. However, conditions which could cause symptoms of nausea and vomiting include infectious and inflammtory conditions. Therefore, infections such as appendictis, cholecystitis (a gall baldder infection) and viral hepatitis are suspected. The assumption of inflammation is supported by the CRP and ESR test carried out on the patient as an elevation of the tests indicate inflammation which was further confirmed during the palpation of the liver. The increased amount of the white blood cells (lymphocytes) in the complete blood count, indicates the presence of an infection as infetcion as they are present in high numbers

during infections. The presence of tatoos observed during physical examination of this patient further suggests a high susceptibility to infections, such as forms viral hepatitis (especially those known to be endemic in South East Asia) and HIV. The promiscuous life which was ascertained from his previous medical history also suggests that the patient could have contracted an infection during his travel, leading to the noticed symptoms.

These symptoms which the patient show are generally similar to a clinical stage of viral hepatitis known as the the prodromal stage . They are also common symsptoms of cholecystitis.

Further Laboratory Tests

As the laboratory tests which were carried out were not enough to ascertain the exact ailment of the patient. Further Laboratory tests and clinical investigations which can be done include:

- Viral serologic testing
- Enzyme-linked immunosorbent assay (ELISA).
- Strip immunoassay (SIA)

Reverse transcriptase polymerase chain reaction (RT/PCR). RT/PCR is a test with high sensitivity and specificity (> 98%) for diagnosing HCV infection. RT/PCR identifies genetic material of the HCV. (Centers for Disease Control and Prevention (2002) Centers for Disease Control and Prevention (2002) National Institutes of Health Consensus Development Conference Statement: Management of Hepatitis C. Retrieved June 10-12, 2002, from http://consensus. nih. gov/cons/116/Hepc091202. pdf. CDC, 2002)

Liver biopsy

Computed axial tomography (CAT), etc

The image below shows the progression from symptoms to diagnosing in a patient suspected of having viral hepatitis and also suffering from jaundice.

Treatment and Management

Based on the symptoms and clinical findings, two of the suspected diseases that this patient might be suffering from are viral hepatitis and cholecytitis. The treatment for cholecstitis include

- Antibiotic administration
- Daily stimulation of gallbladder contraction with intravenous CCK
- Elective lapatoscopic cholecystectomy
- Some treatments for viral hepatitis, depending on the type include:
- Allopathic treatment
- Administration of nutritional supplements such as vitamin C