

HEPATITIS A, B, AND C

Abstract

Hepatitis, inflammation of the liver, is caused by a viral infection. Depending on the type of hepatitis, prevention and cures are available, but hepatitis is still a disease with potentially serious consequences. Hepatitis A is spread from person to person, while hepatitis types B and C can be transmitted by contact with blood. People infected with hepatitis C can have the virus in their blood and liver for many years and during that time liver damage will be slowly occurring, but they will have no signs or symptoms of the infection. Infection with hepatitis C can cause cirrhosis and liver cancer, as can hepatitis B. Certified nursing assistants are exposed to blood and body fluids and are potentially exposed to the viruses that cause hepatitis. By following standard precautions and safe injection practice guidelines, a CNA can effectively eliminate the risk of developing an infection.

Learning Objectives

1. Identify the primary routes of transmission of hepatitis A, B, and C.
2. Discuss the signs and symptoms of hepatitis A, B, and C.
3. Discuss the available treatments for hepatitis A, B, and C infections.
4. Discuss Standard Precautions and Safe Injection Practices to prevent workplace infections with hepatitis A, B, or C.

Introduction

Infections from hepatitis types A, B, and C are a worldwide health problem. Hepatitis A is spread from person to person, while hepatitis types B and C can be transmitted by contact with blood. Caring for a patient who has hepatitis, in most cases, requires basic care and symptomatic, supportive therapy. The key issue when working with a hepatitis patient is to remember that the patient is contagious, but transmission of the virus from one person to another can be prevented by strict adherence to infection control practices and by conscientiously using standard precautions and safe injection practices.

Hepatitis Virus: Overview

Hepatitis is a medical term that means infection and inflammation of the liver, and hepatitis is caused by infection with a virus. The hepatitis viruses are called *pathogens* because they are capable of causing a disease. Depending on the type of hepatitis, prevention and cures are available, but hepatitis is still a disease with potentially serious consequences.

There are seven types of hepatitis, each of which is caused by a different virus. The seven types are hepatitis type A, B, C, D, E, F, and G. Types A, B, and C are by far the most common, and will be discussed separately in the following sections.

Hepatitis A

When compared to hepatitis B and C, hepatitis A could reasonably be considered the most benign of the three viruses. It causes abdominal

pain, jaundice, nausea, and vomiting that can occasionally last for months. The great majority of people who develop an infection with hepatitis A will recover. Those infected will not develop a chronic infection. The disease can be effectively treated with simple medical care, and there is a vaccine that can prevent infection with hepatitis A.

Disease Transmission

Hepatitis A is spread from person to person and the route of transmission is oral; the virus enters the body through the mouth. This happens most often when someone eats food or drinks liquids that are contaminated with feces that contain the hepatitis A virus. This is referred to as fecal-oral transmission. For this reason hepatitis A infections and outbreaks are often associated with the food service or food preparation industry and restaurants.

The idea of consuming food or liquids contaminated with feces is unpleasant. However, the contamination of the food or liquid does not have to be obvious for fecal-oral transmission to occur, and in the vast majority of cases the contamination is not obvious and would never be suspected. The only requirements for fecal-oral transmission to occur are that a person is infected with hepatitis A, does not practice good handwashing and has hands contaminated with stool that contains the hepatitis A virus, and the person touches food or utensils with contaminated hands.

Because hepatitis is caused by infection with a microorganism, the contamination of the skin does not have to be obvious. All it takes for fecal-oral transmission to occur is poor, inefficient handwashing. Hepatitis A can also be transmitted through contact with infected blood

or by certain types of sexual contact, but these routes of transmission are much less common than the fecal-oral route.

Exposure to hepatitis A is common. One in three persons has the anti-hepatitis A antibody in the blood. Antibodies are proteins formed by the immune system that are designed to eliminate a specific bacteria or virus. An antibody that is detected in the blood is evidence that someone has been exposed to a particular bacteria or virus.

People most at risk for being infected with hepatitis A are people who live in conditions of poor hygiene, people who live in close contact with large groups of people (such as those who are incarcerated, military personnel), and people who have traveled overseas. Hepatitis A is more common outside the United States.

Exposure to hepatitis A is common and the virus is easily transmitted, but active, symptomatic cases of hepatitis A are uncommon in the United States. In recent years the average number of cases per year that have been reported has decreased more than 90%, and it is estimated that each year there are fewer than 6 cases per 100,000 people.

Signs and Symptoms

After the hepatitis A virus enters the body it infects and inflames the liver. The signs and symptoms of a hepatitis A infection begin to appear in two to six weeks after exposure, and include abdominal pain, diarrhea, fatigue, fever, jaundice, loss of appetite, and nausea.

Jaundice is defined as a yellow tinge to the skin. In cases of hepatitis A it can be very pronounced. Jaundice happens because an infection with hepatitis A disrupts the ability of the liver to break down and eliminate bilirubin. Bilirubin is formed when red blood cells are recycled in the liver, and if bilirubin is not eliminated by the liver, it accumulates in the skin and imparts a yellow color.

The signs and symptoms typically last for about two months, but some people, approximately 10-15% who are infected will have a course of the illness that can last for up to six months.

Not everyone who is infected with hepatitis A will have signs and symptoms. Some people have a low level of the virus that is not cleared, and they do not have signs or symptoms. Others develop mild symptoms that resolve as the immune system clears the virus. In many of these cases, an infection with hepatitis A is never diagnosed. Hepatitis A can be easily transmitted because an infected person is contagious before the signs and symptoms of an infection appear or the infected person may never develop symptoms.

Diagnosis and Treatment

Hepatitis A is diagnosed by using a blood test that detects the presence of the hepatitis A antibody in the blood. Blood tests that measure how well the liver is functioning will also be done and, depending on the circumstances, the patient may be tested for the presence of hepatitis B and C, and human immunodeficiency virus (HIV) infection.

Hepatitis A is treated with measures that are commonly called *symptomatic and supportive care*. This means that there are no specific medications or therapies that can eradicate the hepatitis A virus. Most people who have an infection with hepatitis A and are symptomatic respond well to fluids and medications such as ondansetron (Zofran®) that will stop nausea and vomiting. With good symptomatic, supportive care and with enough time, the patient's immune system will eliminate the virus.

Prognosis

The outlook or prognosis for most people who have a hepatitis A infection is very good. The disease runs its course, the virus is cleared, and antibodies are formed that provide lifelong immunity. After a person has had an infection with hepatitis A, the risk of being infected again is extremely low. There are no long-term effects and the liver heals completely.

Someone who is elderly or has pre-existing liver disease and who becomes infected with hepatitis A are considered at high risk of poor outcomes, and these patients need close monitoring. Approximately 100 people in the United States die each year from hepatitis A.

Prevention

Hepatitis A can be prevented by good personal hygiene and strict adherence to handwashing protocol. If someone has been exposed to a person who is known to be infected with hepatitis A, a medication called immune globulin that has antibodies against the hepatitis A virus is available. This medication may be helpful in preventing an uninfected person from developing an infection.

It is important to remember that there is a difference between exposure to a virus and infection with a virus. Being exposed simply means that the virus may have gained entry into the person's body. Being infected means that the person's immune system was not able to eliminate the virus before it became stable and began to multiply.

There is a vaccine that can prevent infection with hepatitis A. The vaccine, distributed under the trade names Havrix® and VAQTA®, is safe, effective, and provides protection against hepatitis A for at least 20 years. As with all vaccines it can prevent an infection, but it is not helpful for treating an infection. Unlike hepatitis B, routine vaccination against hepatitis A is not recommended for everyone. However, if a person works in an environment where exposure to hepatitis A occurs, then that person should be vaccinated.

Children between their first and second birthdays, men who have sex with men, people who have chronic liver disease, and people who use street drugs should be vaccinated against hepatitis A.

Hepatitis B

Hepatitis B is a more serious disease than hepatitis A. The symptoms of a hepatitis B infection are more prolonged and more intense than those of a hepatitis A infection.

Some people who develop an infection with hepatitis B will never clear the virus and they become chronically infected. People who are chronically infected with hepatitis B are at risk for developing liver

damage and as mentioned before, liver cancer. Chronic hepatitis B is the cause of approximately 50% of all cases of liver cancer.

Disease Transmission

The primary way that hepatitis B is transmitted is through contact with infected blood. This can happen in a healthcare facility if someone is stuck with a needle or cut with a medical sharp instrument such as a scalpel blade, and these types of accidents are the most common mode of transmission. Infected blood can also be absorbed if it splashes on a mucous membrane such as the lining of the mouth or nose, or if the infected blood contacts an area of the skin that is abraded or chapped. Hepatitis B can also be transmitted by splash contact in the eye.

Transmission of hepatitis B is also a common consequence of IV drug use. Hepatitis B can be transmitted sexually, as well. It has been estimated that the transmission rate of hepatitis B during unprotected sex is 50-100 times that of HIV. Men and women who have multiple sex partners and men who have sex with men are especially at risk for sexual transmission of hepatitis B.

The hepatitis B virus has been found in other body fluids such as bile, saliva, semen, and spinal fluid, but the risk of infection after contact with one of these contaminated fluids is very low. Hepatitis B can also be transmitted by an infected mother to a new born child.

Hepatitis B is not transmitted by casual contact. A person cannot be infected with hepatitis B by hugging or touching someone, by a cough or a sneeze, or by sharing eating utensils.

Case Example:

A CNA is helping an RN with bedside care and is stuck with a needle that was used to obtain a blood sample from a patient who is infected with hepatitis B. What are the chances the CNA will develop a hepatitis B infection? There are a lot of variables that determine whether or not the virus is transmitted and infection develops but the risk of developing an infection with hepatitis B from a needlestick has been estimated to between 6 to 31%.

Signs and Symptoms

After someone has been infected with hepatitis B there is an incubation period of 60-150 days. During this time, the infected person has no signs or symptoms. After the incubation period, someone infected with hepatitis B is likely to develop abdominal pain, dark colored urine, fever, fatigue, jaundice, loss of appetite, and vomiting. These typically last for several weeks but they can last for up to six months.

Some people who are infected with hepatitis B do not become symptomatic. Most people - approximately 95% - who have a normal immune system will clear the virus. The other 5% will develop a chronic infection.

Diagnosis and Treatment

Hepatitis B is diagnosed by using tests that measure the amount of viral DNA, the number of anti-hepatitis B antibodies, and specific parts of the virus (antigens) that are in the blood. Blood tests that measure liver damage will be done, and tests for the presence of hepatitis C

and HIV may be performed, if there is a specific need to do so. If the infection is chronic, a liver biopsy and a computed tomography (CT) scan of the liver may be done.

There are no medications available that can be used to treat an acute hepatitis B infection, but most people with an acute hepatitis B infection will clear the virus and there will be no long-term harm. Patients are treated with symptomatic and supportive care. Chronic infection with hepatitis B is treated with antiviral drugs. These drugs do not cure the disease, but they can prevent the patient from developing cirrhosis and liver cancer. Drugs used to treat a chronic hepatitis B infection require long-term treatment that have significant side effects.

Prognosis

A chronic infection with hepatitis B can be very serious. Chronic hepatitis B causes about 2000 to 4000 deaths in the United States each year. The infection can cause cirrhosis (scarring) of the liver and it is a major cause of liver cancer. People who have a chronic hepatitis B infection are 200 times more likely to develop liver cancer than someone who is not infected with hepatitis B.

Prevention

Infection with hepatitis B can be prevented by strict adherence to standard precautions, safe injection practices, and by practicing safe sex. There is a vaccine that can prevent infection with hepatitis B, and it is effective.

Vaccination against hepatitis B has greatly reduced the number of infections in the United States. It has been estimated that the number of healthcare occupational-associated infections with hepatitis B has been reduced by 95% because of the availability and effectiveness of the hepatitis B vaccine. The hepatitis B vaccine should be given to the following groups.

- Healthcare workers who may be exposed to blood or body fluids
- All children 19 years and younger, especially children who are born to mothers who are infected with hepatitis B
- People who live in large groups and in close contact, such as military personnel, and people who are incarcerated
- People who have blood clotting disorders
- People who have liver disease or are infected with hepatitis C
- IV drug users
- Men who have sex with men
- Patients who require hemodialysis on a routine basis
- People who are infected with HIV
- Anyone who has, or has had a sexually transmitted disease
- Anyone living with someone who has a chronic hepatitis B infection

If someone is exposed to hepatitis B through a needlestick or a blood splash, that person should be given the hepatitis B vaccine series and hepatitis B immune globulin. If these treatments are promptly administered, there is an 80-90% chance that the exposed person will not become infected. The vaccine is safe, and severe reactions are extremely rare.

A CNA who may be exposed to blood or body fluids in the workplace should receive the hepatitis B vaccine. The vaccine is typically offered

free of charge by employers, and employers are often required to provide the vaccine to any employee who has had an exposure to blood or body fluids while at work.

The risk of developing an infection with hepatitis B after a needlestick is 6-30%. However, not all exposures to blood are as obvious as a needlestick. Approximately two-thirds of people infected with hepatitis B cannot recall a specific incident in which they were stuck by a needle or a sharp or were splashed with blood. Exposures to pathogens can be subtle.

Hepatitis C

Hepatitis C is the most common blood-borne disease in the United States. There are approximately 5.2 million cases of hepatitis C infection in the United States. Hepatitis C infection is the most common cause of liver cancer in most Western countries, and approximately 40% of all liver transplantations are performed because of complications associated with hepatitis C infection.

Infection with hepatitis C can cause cirrhosis and liver cancer, as can hepatitis B, but there is a significant difference between these two infections that complicates the clinical picture of hepatitis C. People infected with hepatitis C can have the virus in their blood and liver for many years and during that time liver damage will be slowly occurring, but they will have no signs or symptoms. Hepatitis C infections can be treated, but treatment is much more effective if it is started soon after the infection is contracted, and earlier treatment helps prevent liver damage, as well.

For many years hepatitis C infections were treated with a two-drug protocol that was not highly effective. However, in the past several years, new medications have been developed that have almost doubled the success rate of therapy, and newer drugs that are even more effective and easier to tolerate will soon be available.

Disease Transmission

Hepatitis C is primarily transmitted by contact with infected blood. In the United States, the most common way that hepatitis C is transmitted is by IV drug use and the sharing of needles. Infection may occur in a healthcare facility by a needlestick or puncture injury or splash contact to a mucous membrane or splash contact to non-intact skin. The risk of becoming infected with hepatitis C after a needlestick injury or a puncture injury is approximately 1.8%, with a range of 0-7%.

Transmission of the virus after a mucous membrane exposure is rare, and no transmission through intact or non-intact skin has been documented. Hepatitis C virus has been found in ascites, menstrual fluid, saliva, semen, spinal fluid, and urine. Transmission of the hepatitis C virus from these fluids has not been reported. However, if someone suffered a parenteral exposure to one of these fluids, for example if spinal fluid infected with hepatitis C splashed onto a laceration, or if someone was exposed to a large amount of one of these fluids, transmission could possibly occur. Hepatitis C can be transmitted from an infected mother to a newborn child.

Transmission of hepatitis C by sexual activity is a relatively complicated issue. Transmission of hepatitis C during sexual activity

appears to be possible but the chances of this happening are very low. A recent study estimated that the risk of becoming infected with hepatitis C from sexual activity is 1 in every 190,000 sexual encounters. People who have multiple sex partners have an increased risk of sexual transmission of the virus. Sexual practices that involve exposure to blood increase the risk of transmission of hepatitis C, and if someone has genital ulcers or a sexually transmitted disease the risk of sexual transmission is increased. An infection with HIV increases the risk of sexual transmission of hepatitis C by increasing the amount of hepatitis C virus in the blood or semen and by compromising the immune system.

Hepatitis C is not transmitted by casual contact. A person cannot be infected by hepatitis B by hugging or touching someone, by a cough or a sneeze, or by sharing eating utensils.

Signs and Symptoms

Some people who are newly infected with hepatitis C may have mild signs and symptoms. These could easily be mistaken for infection with influenza or another relatively harmless illness, and if these signs and symptoms do occur they usually resolve in a week or two. Most people who are newly infected are asymptomatic.

The hepatitis viruses A, B, and C infect and inflame the liver. However, the hepatitis C virus can also cause diabetes, kidney disease, non-Hodgkin's lymphoma, and skin and blood disorders.

Healthcare Employee Protection from Exposure

Certified nursing assistants are exposed to blood and body fluids and so potentially exposed to hepatitis A, B, and C. However, by following standard precautions and safe injection practice guidelines, a CNA can effectively eliminate the risk of developing an infection with one of these viruses. The following sections will cover only the basics of standard precautions and safe injection practices.

Hepatitis B and C are transmitted through exposure to infected blood. This may cause some people to be concerned about receiving a transfusion, but the risk of developing an infection with one of these viruses from a blood transfusion is extremely low. Approximately 1 in 350,000 transfusions for hepatitis B and approximately 1 in 2 million transfusions for hepatitis C are known to occur.

Standard Precautions and Safe Injection Practices

Standard precautions are steps and practices that are used to prevent the transmission of infectious microorganisms. Safe injection practices do so also, but their focus is on the safe use of needles, syringes and medical sharps (scalpel blades). Standard precautions and safe injection practices are used to protect the caregiver and the patient. The following are the key points of each safety protocol that a CNA needs to know to be protected against infection with hepatitis.

- Consider *all* blood as potentially infectious.
- Consider *all* body fluids, except sweat, as potentially infectious even if they are not visibly contaminated with blood.
- Follow handwashing protocols. Studies have clearly shown that handwashing is the most effective way of preventing the transmission of infections. Wash hands before and after performing patient care, and wash hands after removing PPE. Alcohol-based

hand rubs are acceptable unless the person's hands are visibly soiled and if that is the case, the person must use soap and water.

- Use personal protective equipment (PPE) when indicated, and use it properly. PPE includes face masks or face shields, gloves, gowns, hair covers, masks, and shoe covers. PPE can protect a CNA but only if it is used properly. Shortcuts should be avoided.
- Understand and use respiratory hygiene and cough etiquette.
- Maintain a safe and clean environment to reduce the risk of contamination and transmission of pathogens. Hepatitis B can survive outside the body on environmental surfaces for approximately seven days. Hepatitis C can survive outside the body on environmental surfaces for approximately 16 hours.
- Understand and follow safe injection practices. The three most important rules of safe injection practices are: 1) *never* re-cap a needle, 2) syringes, needles, *etc.*, that have been used for one patient should *never* be re-used, and 3) *always* place used needles and sharps in a sharps container. Never place them in an ordinary trash can.
- If a CNA is stuck with a needle or a sharp, or if a CNA is exposed to blood or body fluid while not using PPE, a supervisor should be informed immediately.

To learn more about Standard Precautions, Safe Injection Practices, and handwashing, the following World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) links are helpful.

- http://www.who.int/csr/resources/publications/EPR_AM2_E7.pdf.
- <http://www.cdc.gov/injectionsafety/>.

Protocol Steps for Hepatitis Virus Exposure

An exposure to a blood-borne pathogen is defined as: 1) a needlestick or a puncture wound from a sharp object, 2) contact of a mucous membrane or non-intact skin with blood or a body fluid, or 3) any direct contact with blood or body that is known to be infected, such as in cases where PPE was not used.

These definitions describe most exposure situations, and these situations are very obvious for those who are involved. However, if a person has any doubt as to whether exposure has occurred, a supervisor should be notified. The person who was potentially exposed to a blood-borne pathogen should not make the decision alone. As mentioned previously, approximately two-thirds of people infected with hepatitis B cannot recall a specific incident in which they were stuck by a needle or a sharp or were splashed with blood. Infections with blood-borne pathogens can be prevented, but only if the proper treatment is started very soon after the exposure.

As mentioned above, the risks of developing an infection with hepatitis B from a needlestick or puncture wound is approximately 6-31%, and the risk of developing an infection with hepatitis C from a needlestick or puncture is 1.8% with a range of 0-7%. These ranges reflect the fact that not all needlesticks and puncture wounds are the same. The risk of developing an infection depends on the nature of the virus but also depends on the following factors/

- The wound depth
- Whether the needle was in an artery or a vein
- The type of needle; large, hollow-bore needles are especially likely to transmit pathogens
- If there was visible contamination with blood

- The amount of blood involved
- The amount of virus in the patient's blood
- The type of body fluid (blood, spinal fluid, vomit, etc.)
- How long the mucous membrane or skin was exposed
- How much blood or body fluid was involved
- The part of the body stuck, cut, or splashed
- The health and immune status of the person who was exposed

The first thing an exposed person should do is to perform basic first aid. If the person suffered a puncture wound or a cut, the area should be washed with soap and water. Bleach or a disinfectant should not be used in an attempt to “sterilize” the wound or kill the pathogens. Squeezing the area to try and “bleed out” the pathogens is not helpful either, and antiseptic ointments or creams are not needed. If a person may have been exposed by body fluids splashed in the eye, the eye should be flushed for 15-20 minutes with tepid water or an eyewash solution. If a mucous membrane or the skin was exposed, the area should be flushed with ordinary water for 15-20 minutes.

The next step is to notify a supervisor or a person in charge of handling occupational exposures to blood-borne pathogens and/or body fluids. It cannot be stressed enough how important it is to immediately report exposures or potential exposures. Post-exposure prophylaxis (PEP) may be needed, and documentation of the incident is important for the person’s health and for medical-legal reasons. The time of the exposure, the circumstances, such as how it happened, and detailed medical information about the person’s health and medical history and of the health and medical history of the source will all be needed.

Tetanus immunization status and hepatitis B immunization status must be reviewed, and the person will need to provide information about any medical problems, prescription medications taken, and whether or not the person may be pregnant or is nursing in any hepatitis exposure incident.

Risks of Infection from Exposure

If a person has been exposed to hepatitis A, or it has been decided that there was a strong possibility of an exposure, the treating physician will order blood tests to check for the presence of hepatitis A, B, and C, and possibly HIV, if indicated. The treating physician will also order blood tests to evaluate the health of the person's liver, known as liver functions tests (LFTs). The physician will probably prescribe an injection of immune globulin, as well. This should be given within 14 days of the exposure. It is not needed if at least one dose of hepatitis A vaccine was given at ≥ 1 month before the exposure. Follow-up care to determine if an infection develops and to make sure the patient is healthy will be arranged.

If a person has been exposed to hepatitis B, or it has been decided that there was a strong possibility of an exposure, the treating physician will order blood tests that measure the amount of viral DNA, the number of anti-hepatitis B antibodies, and specific parts of the virus (antigens) that are in the blood. Liver functions tests will be done and if they have not been previously done or there is a specific need to do so, tests for the presence of hepatitis C and HIV may be performed.

If the person was vaccinated against hepatitis B and the vaccine has produced an adequate level of antibodies against the virus, the person is considered a known responder and no treatment is needed. If the person was not vaccinated or the person's antibody response was less than optimal, the patient will be given hepatitis B immune globulin and the hepatitis B vaccine. The source of the exposure will be checked, but everyone who was exposed who was not vaccinated will be treated, even if the source did not test positive for hepatitis B.

The hepatitis B immune globulin should be given within 24 hours of an exposure and the vaccination series should be started within three days of an exposure. The hepatitis B immune globulin is given a one-time injection. The hepatitis B vaccine is a series of three injections: one at the time of the exposure, the next at one month post-exposure, and the third at six months post-exposure.

If a person has been exposed to hepatitis C, or it has been decided that there is a strong possibility of an exposure, the person will be tested for the presence of hepatitis B, C, and (possibly) HIV. Liver function tests will be done.

There is no treatment that can prevent an infection with hepatitis C from developing. However, once an infection has occurred there are treatments that can eliminate the virus, so the patient will need to have close medical follow-up in the weeks and month after the exposure. If the infection is detected soon after it begins, the available medications will eliminate the virus in more than 90% of all new cases of infection. Approximately 25% of people who are infected will spontaneously clear the virus.

Case Study: Hepatitis C Treatment

The following case study was obtained from a PubMed search and discusses a case of hepatitis C treatment with complications in an elderly female. The authors reported on an 81 year old female with chronic hepatitis C virus infection who was treated with antiviral therapy with the goal to cure hepatitis C infection.

The authors reported that the patient began to complain of general malaise and appetite loss lasting a few days. Blood tests showed she had liver injury, which was evident from the liver enzyme testing seen on her blood lab draws. The patient reportedly had a history of blood transfusions when she was 36 years old, no remarkable family history, and no history of autoimmune disease or significant alcohol use. She was taking no oral medications other than the antiviral medication for the treatment of hepatitis C when she was found to have acute liver injury.

When the patient was admitted for medical evaluation, she had anemia that was apparent by simply looking at her eyelids. She had good consciousness and clear thought. Her blood count was not indicative of a gross abnormality but her chemistry testing revealed the elevated liver enzymes that indicate there is liver injury. Because the liver controls a person's blood clotting or bleeding time, that too was affected and the patient's clotting factors were abnormal and she had a longer bleeding time to clot.

The patient was tested for hepatitis A and hepatitis B and found to be negative for both. The patient's hepatitis C, Epstein-Barr virus (EBV)

and cytomegalovirus (CMV) were also negative. There was no ascites (fluid in the abdomen) noted as usually occurs with liver injury; and this was confirmed by abdominal ultrasonography and computed tomography (CT). A liver biopsy specimen however showed hepatitis with bridging necrosis (tissue death) and other complications at the liver area. Bridging fibrosis is a condition that occurs with end-stage liver disease.

Once the patient was hospitalized, *drug-induced liver injury* (from taking the hepatitis C medication treatment) was considered, however there were complications in this diagnosis because the patient's liver enzymes increased as well after stopping the antiviral therapy for hepatitis C treatment. So, the authors reported that they considered another possible diagnosis of *autoimmune hepatitis* based on the liver biopsy findings and laboratory data.

The patient was started on steroid therapy. After this treatment, the patient's liver enzymes lowered and the blood clotting time normalized. The patient was evaluated medically as having achieved a sustained viral response to hepatitis C treatment and considered cured.

Discussion

The question in this case was why did the patient develop an autoimmune form of hepatitis during treatment of hepatitis C? The authors suggested that the onset of autoimmune hepatitis is assumed to involve an autoimmune mechanism, and environmental factors, such as drug use or viral infection. These factors can trigger patients

with certain genetic backgrounds to develop an autoimmune hepatitis condition.

In this case the patient had chronic hepatitis C infection with bridging fibrosis. The patient was clear of the hepatitis C virus after treatment with the antiviral medication to cure hepatitis C, but she then developed a liver disorder with elevations in her liver enzymes. She developed hepatitis with inflammatory cell infiltrate in the liver that suggested an autoimmune hepatitis. The disease severity was severe and it worsened in correlation to the medication prescribed for hepatitis C. So, the authors stated that they diagnosed the patient with autoimmune hepatitis induced by the medication prescribed for hepatitis C treatment.

Steroid therapy helped treat the autoimmune hepatitis as immunosuppressive therapy, but because elderly females are at risk of osteoporosis, they cautioned against its use long-term. The authors suggested careful consideration of steroid therapy in elderly women diagnosed with autoimmune hepatitis.

In patients with a history of medication before the appearance of liver disorder, such as in the case of this elderly female, it can be very difficult to identify the type of liver disorder. Drug induced autoimmune hepatitis has been reported in the medical literature in a variety of cases, including antibiotic treatments. Hepatitis, focal necrosis, and inflammation of the liver were all hallmark symptoms in such cases of severe autoimmune hepatitis. Antiviral treatments are also known to cause an autoimmune hepatitis and serious injury to the

liver. Clinicians should be aware of this risk and be able to identify its occurrence in people treated for Hepatitis C with antiviral medication.

Summary

All three of the hepatitis viruses cause infection and inflammation of the liver. The signs and symptoms of an infection with hepatitis A or B happen relatively soon after an infection develops. The signs and symptoms of an infection with hepatitis C may take years or decades to develop. Hepatitis A is transmitted via the fecal-oral route. Hepatitis B and C are transmitted by contact with infected blood and to a lesser degree, sexual activity.

There are vaccines available that can prevent infection with hepatitis A and B. There is no vaccine available that prevent an infection with hepatitis C. There are specific medications available for treating an infection with hepatitis C. Infection with hepatitis A, B, and C can be prevented by conscientious use of Standard Precautions and Safe Injection Practices. All healthcare workers should be educated about these standard safety techniques, follow them and avoid taking shortcuts.

As with any medication, there are benefits and risks to antiviral medication for the treatment of hepatitis C. The case raised here elucidated the importance of being aware of the risk of a severe complication of liver injury following treatment of hepatitis C, and showed the success of reversing complications when proper identification and treatment is used.