Rocky Mountain Spotted Fever

Issue Description

Rocky Mountain spotted fever is the most lethal and most frequently reported rickettsial illness in the United States. It has been diagnosed throughout the Americas. The disease is caused by Rickettsia rickettsii, a species of bacterium that is spread to humans and dogs by ixodid (hard) ticks. Initial signs and symptoms of the disease include sudden onset of fever, headache, and muscle pain, followed by development of rash. The disease can be difficult to diagnose in the early stages, and without prompt and appropriate treatment it can be fatal.

Other Names

Febre Maculosa, Tick Typhus, Tobia Fever, Sao Paulo Fever, Fiebre Manchada

Natural history

Rocky Mountain spotted fever, like all rickettsial infections, is classified as a zoonosis. Zoonoses are diseases of animals that can be transmitted to humans. Many zoonotic diseases require a vector (e.g., a mosquito, tick, or mite) in order to be transmitted from the animal host to the human host. In the case of Rocky Mountain spotted fever, ticks are the natural hosts, serving as both reservoirs and vectors of R. rickettsii. Ticks transmit the organism to vertebrates primarily by their bite. Less commonly, infections may occur following exposure to crushed tick tissues, fluids, or tick feces.

The life cycle of Dermacentor variabilis and Dermacentor andersoni ticks (Family Ixodidae)A female tick can transmit R. rickettsii to her eggs in a process called transovarial transmission. Ticks can also become infected with R. rickettsii while feeding on blood from the host in either the larval or nymphal stage. After the tick develops into the next stage, the R. rickettsii may be transmitted to the second host during the feeding process. Furthermore, male ticks may transfer R. rickettsii to female ticks through body fluids or spermatozoa during the mating process. These types of transmission represent how generations or life stages of infected ticks are maintained. Once infected, the tick can carry the pathogen for life.

Rickettsiae are transmitted to a vertebrate host through saliva while a tick is feeding. It usually takes several hours of attachment and feeding before the rickettsiae are transmitted to the host. The risk of exposure to a tick carrying R. rickettsii is low. In general, about 1%-3% of the tick population carries R. rickettsii, even in areas where the majority of human cases are reported.

There are two major vectors of R. rickettsii in the United States, the American dog tick and the Rocky Mountain wood tick. American dog ticks (Dermacentor variabilis) are widely distributed east of the Rocky Mountains and also occur in limited areas on the Pacific Coast. Dogs and medium-sized mammals are the preferred hosts of adult D. variabilis, although it feeds readily on other large mammals, including humans. This tick is the most commonly identified species responsible for transmitting R. rickettsii to humans. Rocky Mountain wood ticks (Dermacentor andersoni) are found in the Rocky Mountain states and in southwestern Canada. The life cycle of this tick may require up to 2 to 3 years for completion. Adult ticks feed primarily on large mammals. Larvae and nymphs feed on small rodents.

Other tick species have been shown to be naturally infected with R. rickettsii or serve as experimental vectors in the laboratory. However, these species are likely to play only a minor role in the ecology of R. rickettsii.

There are only 800 cases reported in the U.S. a year and only 20% find the tick.

Signs and symptoms

Rocky Mountain spotted fever can be very difficult to diagnose in its early stages, even among experienced physicians who are familiar with the disease.

Patients infected with R. rickettsii generally visit a physician in the first week of their illness, following an incubation period of about one to two weeks after a tick bite. The early clinical presentation of Rocky Mountain spotted fever is nonspecific and may resemble a variety of other infectious and non-infectious diseases.

Initial symptoms may include:

- fever
- nausea
- emesis
- severe headache
- muscle pain
- lack of appetite

Later signs and symptoms include:

- maculopapular rash
- petechial rash
- abdominal pain
- joint pain

The classic triad of findings for this disease are fever, rash, and history of tick bite. However, this combination is often not identified when the patient initially presents for care. The rash has a centripetal,or "inward" pattern of spread, meaning it begins at the extremities and courses towards the trunk.

The rash first appears 2-5 days after the onset of fever and is often not present or may be very subtle when the patient is initially seen by a physician. Younger patients usually develop the rash earlier than older patients. Most often it begins as small, flat, pink, non-itchy spots (macules) on the wrists, forearms, and ankles. These spots turn pale when pressure is applied and eventually become raised on the skin. The characteristic red, spotted (petechial) rash of Rocky Mountain spotted fever is usually not seen until the sixth day or later after onset of symptoms, but this type of rash occurs in only 35% to 60% of patients with Rocky Mountain spotted fever. The rash involves the palms or soles in as many as 50% to 80% of patients; however, this distribution may not occur until later in the course of the disease. As many as 10% to 15% of patients may never develop a rash.

Abnormal laboratory findings seen in patients with Rocky Mountain spotted fever may include thrombocytopenia, hyponatremia, or elevated liver enzyme levels.

Rocky Mountain spotted fever can be a very severe illness and patients often require hospitalization. Because R. rickettsii infects the cells lining blood vessels throughout the body, severe manifestations of this disease may involve the respiratory system, central nervous system, gastrointestinal system, or renal system. Host factors associated with severe or fatal Rocky Mountain spotted fever include advanced age, male sex, African-American race, chronic alcohol abuse, and glucose-6-phosphate dehydrogenase (G6PD) deficiency. Deficiency of G6PD is a sex-linked genetic condition affecting approximately 12% of the U.S. African-American male population; deficiency of this enzyme is associated with a high proportion of severe cases of Rocky Mountain spotted fever. This is a rare clinical course that is often fatal within 5 days of onset of illness.

Long-term health problems following acute Rocky Mountain spotted fever infection include partial paralysis of the lower extremities, gangrene requiring amputation of fingers, toes, or arms or legs, hearing loss, loss of bowel or bladder control, movement disorders, and language disorders. These complications are most frequent in persons recovering from severe, life-threatening disease, often following lengthy hospitalizations.

Treatment

Appropriate antibiotic treatment is initiated immediately when there is a suspicion of Rocky Mountain spotted fever on the basis of clinical and epidemiological findings. Treatment should not be delayed until laboratory confirmation is obtained. In fact, failure to respond to a tetracycline antibiotic argues against a diagnosis of Rocky Mountain spotted fever. Severely ill patients may require longer periods before their fever resolves, especially if they have experienced damage to multiple organ systems. Preventive therapy in non-ill patients who have had recent tick bites is not recommended and may, in fact, only delay the onset of disease.

Doxycycline (For adults, 100 mg every 12 hours. For children under 45 kg [100 lb], 4 mg/kg body weight per day in two divided doses) is the drug of choice for patients with Rocky Mountain spotted fever. Therapy is continued for at least 3 days after fever subsides and until there is unequivocal evidence of clinical improvement, generally for a minimum total course of 5 to 10 days. Severe or complicated disease may require longer treatment courses. Doxycycline is also the preferred drug for patients with ehrlichiosis, another tick-transmitted infection with signs and symptoms that may resemble Rocky Mountain spotted fever.

Chloramphenicol is an alternative drug that can be used to treat Rocky Mountain spotted fever; however, this drug may be associated with a wide range of side effects and may require careful monitoring of blood levels (as it can cause aplastic anemia).