CHAPTER 25

Rocky Mountain Spotted Fever

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1. Introduction

Rocky Mountain spotted fever is an acute febrile illness transmitted to man by ticks infected with Rickettsia rickettsii. Usually sudden in onset, it is characterized by chills, headache, and fever lasting 2 or more weeks. A characteristic rash appears on the extremities on about the 4th febrile day and, later, on the trunk. The exanthem and other anatomical manifestations result from focal areas of endangiitis scattered throughout the body. Central nervous system manifestations of delirium and coma as well as shock and renal failure occur in the severely ill. Serum antibodies to Proteus organisms and specific rickettsial antigens appear during the 2nd and 3rd weeks of illness. Chloramphenicol and the tetracyclines are highly specific therapeutically.

2. Historical Background

Idaho physicians described a form of "black measles" in the Snake River Valley as early as 1873. In 1899, Maxcy described a febrile illness with delirium and a blotchy-skin, red-purple-black rash that appeared first on the ankles, wrists, and forehead, with rapid general body spread. This was the "spotted fever of Idaho." It was noted to be sporadic and more common in the spring, and local opinion attributed it to the drinking of water from melted snow or inhalation of sawdust. Dr. Earl Strain, a practicing physician in Great Falls, Montana, first suspected the role of ticks, having noted a relationship between death and a history of a tick bite. Wilson and Chowning concurred with this relationship and concluded that the disease was transmitted by a local wood tick and the ground squirrel (gopher) as a possible reservoir.

They proposed Piroplasma hominis, an erythrocyte parasite, as the causative agent. In a series of brilliant studies carried out from 1906 to 1909, usually during the spring and summer months, Howard Taylor Ricketts successfully transmitted the disease to guinea pigs and monkeys by inoculation of blood from patients with spotted fever, incriminated the wood tick, Dermacentor andersoni, as vector by feeding experiments on animals, and demonstrated the occurrence of naturally infected ticks. He observed bacterial-like bodies in smears prepared from tick tissues and showed the transovarial transmission of infection to offspring of infected female ticks. Ticks were shown to be infected throughout their life-span. Studies of immunity showed that blood from animals that survived the infection protected other
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animals if blood was administered several days before infection. Wilder and Ricketts showed through cross-immunity studies that spotted fever and typhus were distinct entities. Ironically, the Montana legislature in 1909 allocated for Rickett's research studies the sum of $6000, which the board of examiners failed to appropriate. In July, 1909, Ricketts proceeded to Mexico to study typhus fever; there, his life was cut short by this disease, which is closely related to Rocky Mountain spotted fever.

In 1916, Dr. da Rocha Lima, another pioneer in this field, gave the name Rickettsia to those agents that cause the typhus and spotted fever disorders. An independent study conducted by McCalla and Breerton of Boise, Idaho, in 1905, unknown to Ricketts, showed that the bite of a tick removed from one of their patients transmitted spotted fever to two human subjects, a healthy prisoner and a woman, in whom a moderate and a mild attack, respectively, of Rocky Mountain spotted fever occurred. This work was not published until 1908.

Wolbach was the first to detail the microscopic lesions of Rocky Mountain spotted fever with descriptions of the classic focal lesions of blood vessels. He distinguished between pathogenic and non-pathogenic organisms in ticks and demonstrated the intranuclear multiplication of Rickettsiae in tick tissues.

Much knowledge was added by Spencer and Parker, who showed that guinea pigs could be infected readily by intraperitoneal injection of macerated tick tissue. Ticks obtained in the Bitter Root Valley during early spring failed to cause illness in guinea pigs. Ticks fed on infected goats killed inoculated animals. These workers demonstrated "reactivation" by showing that unfed ticks immunized animals despite their inability to cause demonstrable infection and that virulence could be revived by providing ticks a blood meal (see Section 4). Also, phenolyzed tick juice effectively afforded protection in guinea pigs. Vaccinated humans developed neutralizing antibodies, and their sera protected guinea pigs from experimental infection. Inactivated infected tick-tissue vaccine for man became a reality.

Cox provided an additional milestone by showing that Rickettsiae propagated well in chick-embryo yolk sacs, particularly after death of the embryo. The yolk-sac vaccine was simpler to produce and gave fewer reactions.

Therapeutically, immune serum did not prove to be really effective in patients with Rocky Mountain spotted fever. This was principally because Rickettsiae are localized intracellularly at the time when the clinical diagnosis becomes apparent, on about the 5th or 6th day. The first effective and specific treatment was paraaminobenzoic acid, which did reduce mortality and morbidity; it proved awkward to use.

In 1948, first with chloramphenicol and later with the tetracyclines, specific treatment was placed on a firmer basis, and therapy for Rocky Mountain spotted fever became readily available.

It is quite likely that Rocky Mountain spotted fever was prevalent in the Eastern Atlantic states before its reported recognition in 1930. Zachary Taylor is said to have died of typhus on July 9, 1850, after 16 months in the presidency. The illness lasted about 5 days, and one wonders whether this was not Rocky Mountain spotted fever, which occurs on either bank of the Potomac. Most of the cases in the East probably masqueraded as endemic typhus or were called Brill's disease. Pinkerton and Maxcy reported a case in Charlottesville that was undoubtedly Rocky Mountain spotted fever. One of these patients was recognized in Maryland by Maurice C. Pincoffs; Dr. Pincoffs's case was published by Dyer et al.

3. Methodology

3.1. Sources of Mortality Data

The mortality from Rocky Mountain spotted fever has been variable, especially after the introduction of antibiotics, so that mortality data are not a reliable indicator of incidence. Prior to specific antibiotic usage, the overall mortality rate annually averaged about 20% for all ages. In the mountain and eastern states, where occupational pursuits exposed adults to infected feces, fatality exceeded 50% in those persons aged 40 or older. It was appreciably lower in children and young adults. Two developments have drastically improved treatment, reduced fatality, and shortened the clinical course of infection. The broad-spectrum antibiotics, first chloramphenicol