

Assessment of Franklin D. Roosevelt's Paralytic Illness

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Abstract

Franklin D. Roosevelt's (FDR's) paralytic illness was diagnosed as poliomyelitis. Some of his symptoms, such as fever and motor neuron infection are consistent with symptoms typical of this condition. However, recent research has led to the insight that he possibly suffered from Guillain-Barré syndrome instead. Through Bayesian analysis on his paralytic symptoms, researchers were able to argue that his condition was most likely Guillain-Barré syndrome. (Goldman et al. 2003). Criticism of this conclusion suggests that he suffered from poliomyelitis because the virus was found after performing a cerebrospinal fluid test. However, there is no apparent evidence that a lumbar puncture was performed to test his cerebrospinal fluid and accurately diagnose him. Roosevelt's bladder problems and symmetric paralysis were some of the many symptoms he had that are indicative of Guillain-Barré syndrome and uncharacteristic of poliomyelitis (Goldman et al. 2015). Through primary archival research, information investigating FDR's paralysis was obtained. Roosevelt's medical records were closely examined to understand the process behind his diagnosis of poliomyelitis and researchers' conclusion that he had Guillain-Barré syndrome. An in depth analysis of documents recording his symptoms and treatments was performed. The uncertainty of the cause of FDR's paralytic condition should be noted in the historical record. In addition, the inability to effectively diagnose FDR undermines the efficacy of current diagnostic criteria for these two illnesses.

Franklin D. Roosevelt's medical records suggest that he was diagnosed with paralytic poliomyelitis, a condition that plagued the United States during the summer of his first presidency. However, recent studies have led to the insight that FDR's illness was possibly Guillain-Barré syndrome due to an overlap in symptomatology between these two conditions. Paralytic poliomyelitis is largely characterized by muscle pain followed by muscle weakness and flaccid muscles (Kidd, Williams, and Howard 1996). Roosevelt possessed all of these symptoms. However, there was a great amount of hesitation behind his diagnosis. The first doctor to examine him, Dr. William Keen, M.D., told him he would recover due to regenerated feeling in his toes. However, his paralysis progressed and Dr. Robert W. Lovett, M.D., diagnosed him with poliomyelitis in concert with Keen (Ditunno and Herbison 2002). The uncertainty of FDR's diagnosis has led researchers to reconsider his symptoms and diagnose him with Guillain-Barré syndrome, a paralytic condition with similar symptoms of muscle pain, weakness, and paralysis (Lugg 2010, Goldman et al. 2015).

The significance of determining whether FDR had paralytic poliomyelitis or Guillain-Barré syndrome is two-fold. First, there is a piece of information in Roosevelt's historical record that needs to be validated. Second, if FDR's paralytic condition is not so easily diagnosable, then the diagnostic criteria of Guillain-Barré syndrome and paralytic poliomyelitis should be revised and made more exclusive. The commonality in symptoms between these two conditions becomes problematic when successful completion of the ongoing vaccination campaign to eradicate poliomyelitis requires that patients who have contracted the illness be successfully identified.

Poliomyelitis became endemic to the United States in the early 1900s (Mawdsley 2014). It is a seasonal virus that predominates during the summer and transmits fecal orally, mainly in areas with poor sanitation practices. Strategies to eradicate poliomyelitis have been implemented

across the globe through ring vaccination campaigns (Hull and Ward 1994). The most easily diagnosable form of poliomyelitis, paralytic poliomyelitis, is now endemic in just three countries: Afghanistan, Nigeria, and Pakistan (Ahmad et al. 2016).

Poliomyelitis is described by an array of symptoms and presentations, making it challenging to accurately diagnose. At the onset of illness, most patients remain asymptomatic. The primary symptoms of poliomyelitis at onset, occurring in fewer than 10% of patients, include weakness, fever, pharyngitis, headache, neck stiffness, limb pain, anorexia, and vomiting (Kidd, Williams, and Howard 1996). Poliomyelitis is not typically paralytic. Indeed, the paralytic form of poliomyelitis affects less than one percent of diagnosed patients (Vakili et al. 2015). The spinal presentation of paralytic poliomyelitis, attributed to FDR, is characterized by symptoms typical at the onset of illness followed by advanced symptoms of muscle pain and spasms, then muscle weakness (typically asymmetric), flaccid muscles, loss of muscle reflexes, and muscle paresthesia (Kidd, Williams, and Howard 1996).

The only definitive method of diagnosing a patient with paralytic poliomyelitis is through experimental testing (Hull and Ward 1994). A conclusive diagnosis of FDR's paralytic condition would require the testing of his cerebrospinal fluid. Since no record of a lumbar puncture procedure necessary for testing cerebrospinal fluid is evident, researchers have analyzed the symptoms of FDR's paralytic illness through Bayesian analysis and concluded that FDR's symptoms are more consistent with Guillain-Barré syndrome than paralytic poliomyelitis (Goldman et al. 2015).

Similar to poliomyelitis, Guillain-Barré syndrome was first characterized in the early 1900s. However, it may occur during both winter and summer seasons and was not as well studied until the 20th century (Lugg 2010, Ram 2013, Webb et al. 2015). Since Guillain-Barré

syndrome was not as well studied until this time period, it is plausible that FDR was misdiagnosed due to unawareness of this autoimmune disorder.

Contrary to asymmetric paralytic poliomyelitis, Guillain-Barré syndrome chiefly causes symmetric paralysis of the limbs. Paresthesia occurs at onset, but is followed by distal then symmetric muscle pain and weakness. In extreme cases, Guillain-Barré syndrome may lead to permanent muscle paralysis of the face, cranial nerves, thorax, and abdomen (Lugg 2010).

Diagnosing patients with Guillain-Barré syndrome is often challenging because it has a variety of clinical manifestations. Unlike poliomyelitis, there is no lab test to ascertain that a patient has Guillain-Barré syndrome. However, neurological symptoms and cerebrospinal fluid tests can be assessed using Brighton criteria. Brighton criteria for Guillain-Barré syndrome assert that the majority of patients with this ailment will have specific symptoms such as weakness in all limbs, a low cerebrospinal fluid cell count, and symmetric paralysis (Fokke et al. 2013).

Determination of the origin of Roosevelt's paralytic condition requires analysis of archival data describing his symptoms and treatment. There are two important letters that help to clarify his medical condition: Dr. Lovett's letter to Dr. Bennett and his own letter to Dr. Egleston (Lovett 1921, Roosevelt 1924).

Dr. Lovett's letter to Dr. Bennett was written with the intent to explain that Roosevelt's symptoms are representative of poliomyelitis and the most effective treatment that should be provided to him. In his letter, Dr. Lovett describes that "loss of power in the legs should not occur" and that it is a possible result of overworking the muscles during treatment attempts. However since this weakness is not "marked and rapid" it is described as not being a major concern. It is also mentioned that FDR dealt with temporary bladder issues. He describes the

occurrence of hyperesthesia in his legs and explains that massaging them will only worsen this symptom. Instead, Dr. Lovett suggested hot baths as a treatment.

Dr. Lovett's recommended treatment and account of FDR's symptoms are effective in aiding and identifying both paralytic poliomyelitis and Guillain-Barré syndrome. In addition to alleviating poliomyelitis, hot baths are beneficial in treating patients with Guillain-Barré syndrome (Green and T Gucker III 1949, Clark 1985). Hyperesthesia is observed in cases of both Guillain-Barré syndrome and poliomyelitis (Oh, LaGanke, and Claussen 2001, Horstmann 2006).

Other symptoms that Dr. Lovett described are more exclusive to one of these diseases. The bladder issue stated in Dr. Lovett's letter is a manifestation of Guillain-Barré syndrome (Sakakibara et al. 2009). Strenuous physical activity during the early stages of acquiring polio virus may be a factor inducing the paralytic manifestation of the disease (Kidd, Williams, and Howard 1996). Such exertion seemed to have occurred to FDR, and is confirmed by Dr. Lovett's account of overworked muscles during physical therapy.

Roosevelt's letter to Dr. Egleston was written with the intent to help Dr. Egleston treat one of his patients and is additionally a useful tool for assessing his symptoms and treatment. Roosevelt begins his letter to Dr. Egleston by describing the symptoms at the onset of his illness.

Below is his account of symptoms at onset:

First symptoms of the illness appeared in August, 1921 when I was thoroughly tired from overwork. I first had a chill in the evening which lasted practically all night. The following morning the muscles of the right knee appeared weak and by afternoon I was unable to support my weight on my right leg. That evening the left knee began to weaken also and by the following morning I was unable to stand up. This was accompanied by a continuing temperature of about 102 and I felt thoroughly achy all over. By the end of the third day practically all muscles from the chest down were involved. Above the chest the only symptoms was a weakening of the two large thumb muscles making it impossible to write. There was no special pain along the spine and no rigidity of the neck.

Again, many of these described symptoms are shared between both diseases. The time period of his initial symptoms, August 1921, matches the summer season during which either poliomyelitis or Guillain-Barré syndrome may persist. In addition, muscle weakness and soreness are characteristic of both diseases. Such symptoms make these two disorders more difficult to distinguish.

However, other symptoms are more distinctive of solely one of these illnesses. His fever is a marked onset symptom of paralytic poliomyelitis. However, fever is not a component of the Brighton criteria used to diagnose Guillain-Barré syndrome. Contrastingly, Roosevelt appeared to have suffered from symmetric paralysis, which is a trait specific to Brighton criteria (Fokke et al. 2013).

An account of his symptoms through the duration of his illness is stated below:

For the following two weeks I had to be catheterized and there was slight, though not severe, difficulty in controlling the bowels. The fever lasted for only 6 or 7 days, but all the muscles from the hips down were extremely sensitive to the touch and I had to have the knees supported by pillows. This condition of extreme discomfort lasted about three weeks. ...the leg muscles remained extremely sensitive and this sensitiveness disappeared gradually over a period of 6 months, the last remaining point being the calf muscles.

His fever and symmetric paralysis are again mentioned along with possible paresthesia in the leg muscles. Paresthesia is consistent with both Guillain-Barré syndrome and paralytic poliomyelitis (Kidd, Williams, and Howard 1996, Lugg 2010). Therefore, it is not an overruling symptom when trying to attribute FDR to only one of these illnesses. However, his “slight, though not severe difficulty in controlling the bowels” appears to be describing diarrhea, which is a symptom of Guillain-Barré syndrome in 5% of cases (Dimachkie and Barohn 2013). It is again mentioned that Roosevelt possessed issues with urination with the addition of information explaining that he was catheterized for two weeks. This explanation of catheterization makes it appear as if Roosevelt suffered from more intense bladder issues than what was described in the

account made by Dr. Lovett, thus strengthening the argument that this symptom may be caused by Guillain-Barré syndrome.

Roosevelt also lists his top treatment options, which are gentle exercising and skin rubbing of the muscles, swimming in warm water, exposure to sunlight, and constant belief of recovery. As previously mentioned, warm water is helpful in treating both conditions. Any of the treatment options suggested by Roosevelt are not specific to only one disease. The physical therapy that aided Roosevelt is not limited to treating poliomyelitis. In fact, studies have shown that there are benefits to physiotherapy practices on patients with Guillain-Barré syndrome (Dennis and Mullins 2013).

Unfortunately, FDR's medical records are incomplete, preventing an exact diagnosis from being made. However FDR's existing medical records suggest that Roosevelt suffered from increased blood pressure (Bruenn 1944). Although these issues may be independent of his paralytic condition, Guillain-Barré syndrome has been observed to lead to cardiac issues such as high blood pressure (Tuck and McLeod 1981).

The symptoms and treatment options listed in the previously mentioned archival documents makes FDR's initial diagnosis of paralytic poliomyelitis questionable. The result of statistical analysis performed by Goldman et al, a group of researchers concluding that FDR has Guillain-Barré syndrome, adds further uncertainty to the previously established origin of his paralysis (Goldman et al. 2003, Goldman et al. 2015).

However, these predictions are only speculative since there is no evidence to make an absolute determination of the cause of his paralytic illness. In order to make a definite conclusion of the presence of poliomyelitis in FDR, an experimental test would need to be performed.

Currently, there is no available documentation to suggest that such a test was performed on Roosevelt.

Regardless of this uncertainty, researching the origin of FDR's paralytic condition is insightful. Analyzing the symptoms of FDR's paralytic condition allows for a greater understanding of the underlying conditions that are predicted to be the source of his paralysis. The unavailability of lab data to confirm the presence of Guillain-Barré syndrome or poliomyelitis in Roosevelt demonstrates the urgency of creating more lab testing facilities in underdeveloped countries where poliomyelitis is still prevalent such as Afghanistan, Nigeria, and Pakistan. A patient in one of these countries possessing poliomyelitis may be misdiagnosed with Guillain-Barré syndrome due to the strong commonality in these conditions' symptoms. As a result, ring vaccination in these areas may be ineffectively performed thus causing another pandemic of the illness. The level of doubt in the cause of FDR's paralysis should be made evident in the historical record. On the whole, the question of FDR having either poliomyelitis or Guillain-Barré syndrome is perceptive because it brings a shifted viewpoint of understanding different paralytic illnesses to the medical community, and it poses the concern that other related mistakes are prevalent in historical archival data.

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