THE PROPHYLACTIC USE OF TETANUS ANTITOXIN*

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The following case is reported in order to make a plea for the use of repeated prophylactic doses of antitetanic serum in certain classes of injuries.

A number of cases have been reported in France and Germany in which tetanus has developed, notwithstanding the prophylactic use of antitetanic serum, there having been published up to 1907 24 cases,¹ but I have been unable to find in the literature the report of any such case occurring in America. I am fully convinced that the serum, properly used, will always prevent tetanus, but wish to emphasize the fact that in cases of bad mixed infections, and especially with saphrophytic organisms, the dose should be repeated at intervals as long as the infection lasts.

Patient.—T. N., aged 37, superintendent of boiler works, was admitted to my service in the Presbyterian Hospital at 11 a. m., Sept. 2, 1908, four hours after a street-car accident in which he received a compound comminuted fracture of both bones of the left leg. He stated that after the accident, before he was moved, he saw a broken end of bone protruding from his leg and in contact with the street dirt, and that when he was moved the bone returned to place.

Examination.—This showed a badly swollen leg and foot, with a lacerated wound over two inches in length, about three inches above the external malleolus. There was crepitus and false point of motion. Later an x-ray picture showed that the fibula was broken into four fragments of nearly equal length, and that the tibia was badly comminuted a little above the ankle joint.

Treatment and Clinical Course.—The patient was immediately anesthetized with ether and the leg and foot made as clean as possible; then the wound was cleansed, two loose fragments of bone removed, and the wound irrigated with a large quantity of normal salt solution, followed by a weak solution of iodine, and then hydrogen peroxid. A rubber tube drain was then inserted from the fibular side through to the tibia, and the edges of the skin wound, kept apart with iodoform gauze. The leg and foot were then placed in good position and immobilized by a molded posterior plaster-of-Paris splint, extending from the toes to the middle of the thigh, and 1,500 units of antitetanic serum, supplied by a standard firm, were administered subcutaneously five hours after the accident. Forty-eight hours later it was evident that the patient had a severe mixed pyogenic and saphrophytic infection. His pulse ran up to 140, temperature to 103.6 F. He complained of headache and nausea and pain in the leg. The leg at that time was enormously swollen, tense, cool, and brownish in color from the knee down. A dirty thin, foul pus was discharging from the drainage tube. The patient was anesthetized with nitrous oxid, and an incision on each side of the leg was made from knee to ankle down to the deep fascia. No bleeding followed these incisions for several hours. This checked the spread of infection, as shown by the improved local conditions and lowered pulse-rate and temperature. In three days the patient's pulse was 96, temperature 100 F., the swelling of leg was reduced and the wounds looked clean, except that the drainage-tube leading down to the fractures continued to freely discharge a rather foul pus. On the tenth day the patient developed a serum urticaria which lasted thirty-six hours. Apart from the rather free discharge of pus the condition ran a fairly normal course, with temperature between 99 and 100 F., good pulse and appetite, etc., until the twenty-fifth day after the accident. On that day the patient complained of a dull aching pain in the injured leg, and although nothing wrong could be found on examination he was unable to sleep that night. The next morning

he said that he must have caught cold, as his neck was stiff, and at the same time the injured leg began to twitch occasionally and the pain in it became more severe. That afternoon it was noticed that the patient could not open his mouth widely and he complained that his tongue felt stiff. The next morning he had all the symptoms of a severe tetanus, including a tonic spasm of the muscles of mastication, the neck muscles and of both legs and feet, cyanosis, very free sweating, difficulty in deglutition, rapid pulse and increased temperature. The urine contained a small amount of albumin, a few granular casts and was sufficient in amount. The appearance of the wound remained the same. The symptoms increased in severity until any slight irritation produced a severe general clonic spasm; the pulse gradually increased in rapidity and became weaker and the temperature ascended to 107.8 before death, which occurred on the fourth day after the appearance of the symptoms of tetanus. The treatment after the onset of the tetanus consisted in free irrigation of the wound with hydrogen peroxid, liberal amount of liquid diet, normal salt solution continuously per rectum, morphin enough to make the patient comparatively comfortable, and antitetanic serum subcutaneously, of which he received 18,000 units in less than four days. An autopsy was not permitted.

The unusual points about this case are the following:

1. The development of tetanus in spite of the prophylactic use of the antitetanic serum, which was given five hours after the accident.
2. The occurrence of a most acute tetanus, without any symptoms until twenty-five days after inoculation.

Because I could find no report of a similar case occurring in America, a 1,500-unit package of antitetanic serum, from the same lot as the package which was used for prophylaxis in this case, was submitted to Dr. M. J. Rosenau of the Hygienic Laboratory, Washington, who kindly made a careful examination of it, and reported that it contained over 2,000 units, or 500 units above the amount claimed.

The conclusion I reach is that, while 1,500 units of antitetanic serum will prevent tetanus when used early in cases of wounds not followed by severe infection, it may fail when used only once when there is a mixed infection present which lasts longer than ten days or two weeks. It seems that in these cases, while the tetanus bacilli have been present and active from the beginning, the symptoms of the disease have not been present because the toxins produced have been neutralized by the serum, and that when the protective bodies in the antiserum have been exhausted in combining with the tetanus toxin, the toxin which is formed afterward produces the symptoms of the disease. It is probable that in a very severe tetanus infection this exhaustion may occur in four or five days. Even in the absence of tetanus it is known that the protective bodies disappear from the blood within two or three weeks after the serum has been injected. It is suggested that the many failures of the prophylactic use of antitetanic serum in France and Germany is due to the fact that in those countries it is customary to use a smaller amount of a less potent serum than is used in this country.

It would seem, therefore, that every patient with a wound which may cause tetanus should receive as soon as possible 1,500 units of antitetanic serum for prophylaxis, and that if the wound is infected this dose should be repeated once every week while the infection lasts, and this especially if there is a mixed infection of saphrophytic bacteria, as these reduce the local resistance of the tissues to the tetanus bacilli so that the latter may continue to multiply until after the injected antitoxin has been eliminated or neutralized, and then give rise to acute tetanus, as occurred in the case reported above.

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1. Editorial, THE JOURNAL A. M. A., Aug. 17, 1907, xlix, 602.