1948

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Wayne H. Riser
North Shore Animal Hospital

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Recommended Citation
Riser, Wayne H. (1948) "Clostridium Infection In Canine Surgery," Iowa State University Veterinarian: Vol. 10 : Iss. 1 , Article 2.
Available at: https://lib.dr.iastate.edu/iowastate_veterinarian/vol10/iss1/2

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Clostridium Infection
In Canine Surgery

Wayne H. Riser, D.V.M., M.S.*

When experimental surgery on the dog became general, it was soon discovered that occasional infections occurred. Postoperative infections were not new to the veterinary surgeon, but his technic was crude, and he considered most infections the result of wound contamination. In experimental procedures, even when aseptic technic was employed, infection resulted in certain experimental work having to do with obstruction of the small intestine if circulation was inhibited. Bacterial analysis of these wound infections yielded a high percentage of organisms from the Clostridium group. There was much speculation at that time on the manner in which these organisms gained entrance to the body. Early investigators were of the opinion that the animals were eating contaminated food, and the organisms present in the lumen of the bowel found ready accessibility to the region where the experimental surgery was performed.

In 1930, this theory was upset when investigators were able to culture Clostridium spp. from the liver and blood of normal dogs.1 By 1935, Reeves,2 had isolated and classified one hundred members of the Clostridium group, of which 17 were found to be pathogenic to animals; seven were pathogenic to man. In 1934, Trusler and Reeves,3 found Clostridium welchii in the muscles, as well as in the liver of normal dogs. Under normal conditions these organisms cause no pathogenic disturbance, except when there has been trauma to the muscles, severe enough to cause death if the site of the disturbance were not adequately drained, the dead tissue resected and the subject given supportive treatment.

Trusler and Martin,4 were able to produce death from peritonitis in the dog as a result of an overwhelming toxemia after injecting Clostridia into the abdominal cavity. Late in the thirties, surgical technic in veterinary medicine had been greatly improved from an aseptic standpoint. But, occasionally, even when the strictest precautions were used, a postoperative infection was observed which could not be accounted for. In abdominal operations usually a minimum of trouble was experienced, but in operations involving the cutting and traumatizing of muscle, particularly of the extremities, an occasional wound infection resulted.

At the beginning of World War II, surgeons were called upon to accelerate their research and perform many procedures relative to repair of body wounds. It was soon noted in this work that there was a high incidence of postoperative wound infections in dogs whenever muscle tissue was crushed.5 An unknown amount of muscle tissue could be crushed under aseptic conditions without as much as breaking the skin, and in many instances the area would be grossly contaminated with Clostridia. In North Africa, 58 varieties of this organism were found in battle wounds.6 It was found that in the dog, in closed wounds that contained extravasated blood and necrotic tissue, even though the wounds were made under aseptic conditions, it was not uncommon for such parts to become contaminated with the Clostridia. It seems logical to conclude that the character of the wound is more important than the presence of bacteria.

* From the North Shore Animal Hospital.

Winter, 1948
All that is necessary for clostridial infection is the presence of devitalized tissue or a blood clot. The presence of pabulum nutritionally acceptable to bacteria is an important contributing factor to the infection of wounds with staphylococci or toxigenic clostridia. The severity of the infection in a wound is believed to be due more to the presence of a pabulum of wound protein than to any specific bacterial virulence.

It is probably fortunate that in veterinary medicine a majority of operations are performed on organs in the peritoneal cavity, instead of in muscle and other subcutaneous tissue. The peritoneum has great power of absorption and any blood or traumatized tissue is absorbed or phagocytosed before the clostridial infections have time to develop. Muscle and connective tissue do not possess this absorptive ability, and phagocytosis is not rapid enough to dissipate the media before active clostridial infection is established. Clostridium sporogenes, which is the most common offender of this group, is resistant to sulfonamide compounds, penicillin and streptomycin. No available antibacterial agent can completely sterilize such a wound and suppuration of the wound is an indication for repeated surgical toilet of the wound.

Case Reports

Case I: A nine year old Dandi Dinmont Terrier, female, with a tumor on the right fifth breast was operated. The breast, surrounding subcutaneous fat, deep vessels, and the inguinal lymph node were removed while using a satisfactory sterile technic. On the morning following the operation, the patient's temperature was normal and her condition was quite satisfactory, but it was noted that there was considerable edema of the fourth right breast. The second morning following surgery, the temperature was elevated 1 degree and there was a slight hemorrhagic serous discharge from the wound margins in the region of the fourth breast; edema had increased. The third morning the temperature was elevated 2 degrees, there was profuse hemorrhagic discharge from the wound, and the tissue in the area of the forth right breast was reddish black in color, edematous and swollen. A small incision was made for drainage, lateral to the nipple of the fourth right breast, and several c.c. of hemorrhagic serous fluid seeped from the drainage wound.

On the fourth day, it was apparent that much necrotic tissue was in evidence about the wound and it was decided to remove all the sutures and do a complete debridement of the necrotic tissue present in the wound. The patient was very toxic and the temperature was elevated to 104° F. at this time. Follow-up treatment consisted of penicillin, sulfanilamide, subcutaneous fluids and flushing the wound four times daily with hydrogen peroxide. Following this, the infection started to subside and after two or three days the wound began to granulate, temperature returned to normal and recovery was satisfactory.

Case II: A border collie, male, 1 year old, was kicked in the region of the left humerus by a horse. The skin was not broken from the injury, but there was immediate severe swelling with hemorrhagic discoloration of the skin. The case was first seen 24 hours following the injury, and at that time the dog was toxic and carrying a temperature of 104° F. Radiogram of the area revealed a fracture of the lower one-third of the shaft of the humerus. Besides the fracture, round dark areas were seen in the radiogram; these were gas pockets caused from gas infection.

A diagnosis of gas wound infection was made and the dog was prepared for immediate treatment. The hair was removed and a liberal incision was made over the area where the gas pockets were present. The incision was carried to a depth of about 2 cm. A frothy hemorrhagic serum typical of that seen in clostridium infection exuded from the wound. Then, with the aid of a syringe, and a long 18 gauge needle, 50 cc. of saturated neoprontosil solution was injected in divided doses around the area. The wound was left open to drain and the leg was placed in a Thomas splint (fig. 1) for support.

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Fig. 2.—Collie with left foreleg supported by Thomas splint. The arrow indicates incision.

Fig. 2.—Radiogram of injured area. (1) Exostosis, (2) Site of fracture.
Supplementary sulfathiazole was given orally at the rate of 1.5 gr. per pound per day. The response to the severe infection was not immediate, but at the end of five days the temperature had returned to almost normal, and the only evidence of infection was drainage from the wound. Osteomyelitis of the bone occurred as the result of the severe infection (fig. 2). No additional treatment was given the osteomyelitis except to provide continual drainage and to continue the oral medication with sulfathiazole. The fracture eventually healed and the osteomyelitis disappeared after a convalescence of five months. When healing was complete there was considerable exostosis of the bone, but there was good functional repair and the function of the elbow joint was not impaired.

Case III: A female fox terrier, three years old, was hit by a car and dragged in the cinders. Following the injury, the dog carried the right foreleg, and there was a small superficial wound about 2 inches dorsal to the elbow joint. Severe swelling appeared immediately in this region and considerable hemorrhage could be seen under the skin. Within a few hours the wound began to drain a hemorrhagic serous exudate. The hour being late, assistance was not sought for the case until the next day. Early the next morning the animal was presented and upon examination a temperature of 104.6° F. was found. The dog refused to use the leg and the owner assumed that a fracture had occurred. However, when the radiograph was studied, it was found that no fracture was present, but several large pockets of gas could be seen. The diagnosis of clostridial wound infection was made, and treatment instigated immediately.

The area was prepared by removing the hair from the site. Under general anesthesia, a liberal incision was made over the involved area and the affected tissue was infiltrated with 50 cc. of a saturated solution of neoprontosil, accompanied by oral sulfathiazole at the rate of 1.5 gr. per pound. After the incision was made in the affected area, drainage of bloody serum through the incision was excessive, but at the end of 36 hours much of the swelling had disappeared and the temperature had declined 1 degree. Response to treatment was progressive and the dog was discharged from the hospital at the end of 6 days. Repair was complete at the end of about 3 weeks.

Comment: These three cases are classical examples of clostridium infection resulting from injuries. The histories of these three cases well illustrate how these wounds occur and the explanation preceding the case reports offers an explanation of the behavior of this infection.

References

Veterinary Movies

Movies are being used more and more to help make life healthier for America’s domestic animals.

Fourteen educational films on animal health subjects are already available in the American Veterinary Medical Association’s library of veterinary movies. These films are designed to help animal owners and veterinarians deal with the problems of animal diseases.

Dr. J. R. Dinsmore, Evanston, Ill., in charge of the A.V.M.A.’s committee on motion pictures, states that requests for these movies are steadily increasing. Four new subjects have been added to the library during the past year.

Fistulous Withers

Veterinary research has now confirmed the close relationship between fistulous withers of horses and two common diseases of cattle, bovine brucellosis and actinomycosis (“lumpy jaw”).

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