NOTE


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ABSTRACT. A flexible alligator forceps was developed as a new instrument for removal of heartworms in the pulmonary arteries without conducting thoracotomy. It was 570 mm to 620 mm in overall length, and 380 mm to 430 mm in length of the insertion part. The forceps measured 3 mm in diameter, and was operated by flex-manipulation and grasping mechanisms. In nine dogs, 81.1% (90/111 worms) to 100% (9/9 worms) of heartworms were removed from the pulmonary arteries after 4 to 33 manipulations. Injuries after treatment found at autopsy were only a few petechiae in the right atrium and/or tricuspid valve and scratches in the jugular vein.—KEY WORDS: flexible alligator forceps, heartworm removal, pulmonary artery.


Heartworms in the pulmonary arteries have been killed with adulticidal agents [5, 8, 9] or removed surgically by thoracotomy [1, 6, 7]. Many problems are encountered in the treatments mentioned above. Dogs, for example, may suffer greatly. On the other hand, in dirofilarial hemoglobinuria (caval syndrome) [3], a straight and hard alligator forceps is now in use for removal of adult heartworms in the venae cavae and right atrium [2, 4]. If the forceps is flexible, and the grasping jaw of the forceps reaches the pulmonary arteries, heartworms there can be removed safely through the jugular vein without conducting thoracotomy.

With the technical cooperation of the Endoscope Production Department, Fuji Photo Optimal Co., Ltd., an instrument for heartworm removal called a “flexible alligator forceps” was developed (Fig. 1). This instrument measures from 570 mm to 620 mm in overall length. The insertion part of the forceps measures from 380 mm to 430 mm, and the special flexible axis from 190 mm to 220 mm. The outside diameter of the axis is 3 mm. The grasping jaws, consisting of 2 tips, 11 mm length of stationary with a round top and 10 mm of mobile, like those of the hard alligator forceps, are on top. These jaws can be opened 60°. The flexion axis and grasping jaws are manipulated by two nobs at the tail end, and operated by two wires in the axis. The top of the special flexible axis can be curved 180°.

Removal manipulation is performed as follows. The parasitic location of adult heartworms is determined by ultrasonic cardiotomography. The filarial worm echoes in the pulmonary arteries can be confirmed by this manipulation. Under general anesthesia, the flexible alligator forceps is inserted from a small wound at the jugular vein to the right atrium. It is then introduced into the pulmonary arteries via the right ventricle. The forceps can be inserted easily into the right and left pulmonary arteries under fluoroscopy (Fig. 2). In the pulmonary arteries, the forceps with the alligator jaw opened is moved forward and the jaw is closed. Heartworms grasped with
the jaws are removed through the jugular vein. This manipulation is repeated until no more worms are found by ultrasonic cardiotomography. For prevention of thrombus formation, it is desirable to use drip infusion of heparinized normal saline or Ringer's solution and heparinized instruments. The use of a radiation-protective screen, which is placed on the neck of dog, is also desirable to prevent the operator from X-ray exposure.

Table 1 shows the removal efficiency using the newly developed forceps. In 9 dogs weighing from 5.0 kg to 20.5 kg, 81.1% (90/111 worms) to 100% (9/9 worms) of adult heartworms were removed from the pulmonary arteries after 4 to 33 manipulations. The mean efficiency was 93.6% in 9 dogs. At autopsy immediately after treatment, a few petechiae were found in the endocardium of the right atrium and/or tricuspid valve (Fig. 3), along with scratches in the endothelium of the jugular vein. The proliferation in the pulmonary arteries was sometimes picked by the jaws. No other harm was found.

In 3 other dogs with mild dirofilariasis, which were observed several days after treatment, no abnormal findings could be obtained. In one dog with chronic serious dirofilariasis, ascites and subcutaneous edem-
ma disappeared 10 days after treatment. Detailed clinical data after treatment will be described in a separate paper.

During the manipulation, the forceps should not be opened for grasping in the right ventricle lest the jaw should hook the tricuspid chordae. There should be no forceful thrusting, because the forceps is flexible but harder than the heart muscle. Taking every possible care, the danger for patient dogs by this operation is significantly less than in thracotomy. Pneumonia is not induced as in treatment by adulticidal agents, because the worms are removed from outside of the body. The flexible alligator forceps can be used in any dog with dirofilariasis, including chronic serious dirofilariasis and caval syndrome, as long as the dog can tolerate anesthesia. Of course, the forceps may not be used for terminal-stage diseases and organic tricuspid valve dysfunction, such as knotting of a heartworm around the tricuspid cord. The diagnosis of these disorders will be another problem in connection with the clinical application of this forceps.

REFERENCES