Case Report

A case of spontaneous purulent granulomatous pericarditis in a beagle

Kyohei Kamio*, Yutaka Nakanishi, Kenta Matsue, and Minoru Sasaki

1 Drug Safety, Drug Safety and Pharmacokinetics Laboratories, Taisho Pharmaceutical Co., Ltd., 1-403 Yoshino-cho, Kita-ku, Saitama-shi, Saitama 331-9530, Japan

Abstract: The present report describes a case of spontaneous purulent granulomatous pericarditis in a 16-month-old beagle. A gross necropsy revealed pericardial effusion and multiple nodules on the surface of the heart and around the aorta adjacent to the heart. The cut surface of these nodules was solid and white in color, containing partially yellowish white regions. Microscopically, granulomatous inflammation characterized by central necrotic cellular debris surrounded by neutrophils, macrophages, lymphocytes, plasma cells, fibroblasts and collagen fibers was observed in the epicardium. In addition, degeneration or necrosis of the arterial wall with inflammation was observed in the nodules. No gross and histological findings were observed in any organs other than the heart. Bacteria and fungi were not detected by Periodic acid-Schiff staining, Gram-Hucker staining and Ziehl-Neelsen staining. Based on these findings, the dog was diagnosed as having purulent granulomatous pericarditis. Purulent pericarditis is usually caused by pyogenic bacterial or fungus infections; however, no changes indicating a possible infection were observed in this case. In cases with spontaneous vascular changes, such as idiopathic canine polyarteritis or beagle pain syndrome, epicarditis could be secondarily caused by vascular lesions. Since this case showed different pathological features from those of spontaneous vascular changes, the pathogenesis may be different and remains unclear. To the best of our knowledge, this is the first report describing purulent pericarditis in beagles. Our case report is expected to be useful information that can be used as cardiac background findings for evaluating heart lesions in preclinical toxicology studies performed in beagles. (DOI: 10.1293/tox.2017-0010; J Toxicol Pathol 2017; 30: 251–254)

Key words: purulent granulomatous pericarditis, beagle dog, heart lesion, infection, idiopathic canine polyarteritis

Spontaneous purulent pericarditis is an uncommon disease in dogs1-3. Purulent pericarditis is generally caused by pyogenic bacterial or fungus infections3-6. These infections are usually the result of hematogenous infection or extension of local infections, such as endocarditis, pleuritis or pulmonary infection, to the myocardial tissue1, 5, 7. Occasionally, trauma such as bites or intrapericardial foreign bodies are also associated with the occurrence of purulent pericarditis3, 5, 8. Furthermore, spontaneous vascular changes, such as idiopathic canine polyarteritis or beagle pain syndrome, could be associated with the occurrence of purulent pericarditis9. Such vascular changes sometimes occur in dogs9-11, especially beagles10. With this disease, arteritis characterized by various degrees of inflammatory cell infiltration and medial fibrinoid necrosis is observed histopathologically9-11. This vascular lesion can be observed in multiple organs, and the arteries of the heart are frequently affected10, 11. Occasion-
Canine Purulent Granulomatous Pericarditis

period, blood tests showed no apparent abnormalities, and a
cytoscopy for parasite eggs and routine bacteria tests for
Salmonella and Brucella were negative. Bacteria tests for
other species were not conducted. In addition, no abnormal
electrocardiography findings were observed at the ages of 5
and 10 months.

The dog was anesthetized with an intravenous injection
of pentobarbital sodium (Somnopentyl, Kyoritsu Seiyaku
Corporation, Tokyo, Japan) and euthanized by exsanguina-
tion from the femoral artery and vein prior to necropsy.

At necropsy, pericardial effusion and multiple nodules
on the surface of the heart (left and right atrium, right ven-
tricle) (10 × 8 × 4 to 15 × 10 × 10 mm) and around the aorta
(20 to 35 mm in width) adjacent to the heart were observed.
The surfaces of the nodules were mostly smooth and ac-
panied by a focal area of granular appearance. The cut
surface of these nodules was solid and white in color, con-
taining partially yellowish white regions. No gross lesions
were observed in any other organs. The heart was removed
and fixed in 10% neutral buffered formalin with other or-
gans: the aorta, liver, spleen, kidney, lung, trachea, esopha-
gus, stomach, small intestine, large intestine, pancreas, and
mesenteric lymph node. All the tissues were embedded in
paraffin and then sectioned and stained with hematoxylin
and eosin (H&E). Additionally, Periodic acid-Schiff stain-
ing, Gram-Hucker staining and Ziehl-Neelsen staining were
performed to differentiate bacterial species, and immuno-
histochemical staining for Iba1 (Wako Pure Chemical In-
dustries, Ltd., Osaka, Japan) was performed for sections of
the nodules.

The nodules in the heart were histopathologically char-
erized by suppurative granulomatous inflammation that
was composed of central necrotic cellular debris surround-
ed by neutrophils, mononuclear cells, lymphocytes, plasma
cells, fibroblasts and collagen fiber. H&E stain. Bar = 100 μm. D: Higher magnification of B. Immunohistochemically, most of the mononuclear cells were positive for Iba1. Immunohistochemical staining of Iba1. Bar = 100 μm.

Fig. 1. Histopathological features of a nodule in the right atrium. A: H&E stain. Bar = 2,000 μm. B: Immunohistochemical staining for Iba1. Bar = 2,000 μm. C: Higher magnification of A. The nodule was characterized by central necrotic cellular debris surrounded by scattered neutrophils, numerous mononuclear cells with features of epithelioid cells, a small number of lymphocytes and plasma cells, fibroblasts and collagen fiber. H&E stain. Bar = 100 μm. D: Higher magnification of B. Immunohistochemically, most of the mononuclear cells were positive for Iba1. Immunohistochemical staining of Iba1. Bar = 100 μm.

Purulent pericarditis is a relatively rare form of heart
disease in dogs1–3. Purulent pericarditis is most commonly
caused by a foreign body such as food like bone by esophag-
eal perforation, penetrating wounds, systemic infections,
or extension from local infections like endocarditis, pleu-
ritis, or pulmonary disease⁶–⁸. In cases of purulent pericarditis, the purulent exudate, which is often mixed with fibrin, fills the pericardial space, and the entire epicardium becomes covered with coagulum⁴,⁵. *Streptococcus*, *Klebsiella*, *Pasteurella*, *Staphylococcus*, *Mycoplasma*, and *Nocardia spp* are often detected in the lesions⁴. In the present case, the pericarditis was initially suspected to have been caused by a bacterial or fungal infection, since suppurative granulomatous inflammation was observed in the epicardium and subepicardium. However, bacteria and fungi were not detected using Periodic acid-Schiff staining, Gram-Hucker staining or Ziehl-Neelsen staining of the lesion. In addition, no changes indicating a possible infection were observed in any of the other organs.

Spontaneous vascular changes, such as idiopathic canine polyarteritis or beagle pain syndrome, can be associated with the occurrence of pericarditis⁹. In this disease, clinical signs such as fever, body weight loss and cervical pain manifested by a stiff gait and neck with a hunched position are often observed¹⁰. Histopathologically, acute to chronic arterial lesions can be observed in multiple organs, and the arteries of the heart are frequently affected⁹–¹¹. The acute changes range from histiocytic-lymphocytic periartrial inflammation to transmural neutrophilic inflammation with medial fibrinoid necrosis¹¹. In our case, degeneration or necrosis of the vascular wall was observed with inflammatory cell infiltration in the nodules. However, this vascular lesion was only observed focally in the nodules, and no histological vascular findings were observed in any other organs. In addition, no clinical signs were observed in the animal. Since our case showed different pathological features from cases with spontaneous vascular changes, the pathogenesis might have been different.

Spontaneous purulent pericarditis is an uncommon disease in dogs³–⁶. To the best of our knowledge, this is the first report of purulent pericarditis in beagles, although the pathogenesis of this case remains unclear. Since beagles are commonly used in preclinical toxicity studies, it is important to be familiar with spontaneous lesions so as to differentiate them from drug-related changes. We believe that this case report will provide useful information that can be used as cardiac background findings for evaluating heart lesions in preclinical toxicology studies performed using beagles.

**Acknowledgments:** We thank Mieko Ono and Tomoya Hasegawa for their laboratory assistance.

**Disclosure of Potential Conflicts of Interests:** All the authors are employees of Taisho Pharmaceutical Co., Ltd.; there are no known conflicts of interest associated with this publication.
References

1. Wagner A, MacGregor JM, Berg J, Sharkey LC, and Rush JE. Septic pericarditis in a yorkshire terrier. J Vet Emerg Crit Care. 16: 136–140. 2006. [CrossRef]

2. Fisher EW, and Thompson H. Congestive cardiac failure as a result of tuberculous pericarditis. J Small Anim Pract. 12: 629–632. 1971. [Medline] [CrossRef]

3. Fraga Veloso G, Fraga Manteiga E, Trehy M, Freeman A, McConnell JF, and Dukes McEwan J. Septic pericarditis and myocardial abscess in an English Springer spaniel. J Vet Cardiol. 16: 39–44. 2014. [Medline] [CrossRef]

4. Jones TC, Hunt RD, and King NW. Cardiovascular system. In: Veterinary Pathology, 6th ed. TC Jones, RD Hunt, and NW King (eds). Lippincott Williams & Wilkins, Baltimore, MA. 975–1008. 1997.

5. Robinson WF, and Maxie MG. The cardiovascular system. In: Pathology of Domestic Animals, 4th ed, Vol. 3. KVF Jubb, PC Kennedy, and N Palmer (eds). Academic Press, Inc., San Diego, CA. 1–100. 1993.

6. Mohri T, Takashima K, Yamane T, Sato H, and Yamane Y. Purulent pericarditis in a dog administered immune-suppressing drugs. J Vet Med Sci. 71: 669–672. 2009. [Medline] [CrossRef]

7. Yamada N, Hashimoto S, Tomonari Y, Kokoshima H, Doi T, Sato J, Wako Y, and Tsuchitani M. Bacterial pleuritis with thickened mesothelial hyperplasia in a young beagle dog. J Toxicol Pathol. 26: 313–317. 2013. [Medline] [CrossRef]

8. Kolm US, Kosztolich A, Hoegler S, and Kneissl S. Canine traumatic pericarditis by an esophageal foreign body. J Vet Cardiol. 3: 17–21. 2001. [Medline] [CrossRef]

9. Snyder PW, Kazacos EA, Scott-Moncrieff JC, HogenEsch H, Carlton WW, Glickman LT, and Felsburg PJ. Pathologic features of naturally occurring juvenile polyarteritis in beagle dogs. Vet Pathol. 32: 337–345. 1995. [Medline] [CrossRef]

10. Hayes TJ, Roberts GKS, and Halliwell WH. An idiopathic febrile necrotizing arteritis syndrome in the dog: beagle pain syndrome. Toxicol Pathol. 17: 129–137. 1989. [Medline] [CrossRef]

11. Clemo FAS, Evering WE, Snyder PW, and Albassam MA. Differentiating spontaneous from drug-induced vascular injury in the dog. Toxicol Pathol. 31(Suppl): 25–31. 2003. [Medline] [CrossRef]