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Spontaneously occurring intramural coronary arteriosclerosis in regularly slaughtered veal calves and beef cattle: a screening study about prevalence and histopathological features

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KEYWORDS
Anitschkow cells;
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Abstract *Objectives:* Intramural coronary arteriosclerosis has been reported in several species, but no systematic studies are currently available in bovine. The present study aimed to describe the arteriosclerotic changes in regularly slaughtered veal calves and beef cattle.
Animals: Twenty-five veal calves (6—9 months old) and 17 beef cattle (10—24 months old) housed in intensive livestock farming and regularly slaughtered were included in the present study.
Methods: Selected heart samples were submitted for histopathological and ultrastructural examination and the following parameters were evaluated: intimal hyperplasia, degenerative changes of the tunica media, medial hypertrophy/

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hyperplasia, myocardial fibrosis, and myocarditis. Pathological intramural coronary arteries with and without lumen narrowing were manually counted in every sample.
Results: Intramural coronary arteriosclerosis was observed in all the calves and cattle, with similar prevalence of fibromuscular/muscular intimal hyperplasia (92% vs 88%), degenerative changes of the tunica media (76% vs 71%), and medial hypertrophy/hyperplasia (44% vs 59%). The posterior papillary muscle of the left ventricle was the myocardial localization significantly more affected in both calves ($p = 0.0007$) and cattle ($p = 0.0339$). Anitschkow cells were detected in the coronary walls of both calves (60%) and cattle (76%).
Conclusions: This is the first study that systematically describes spontaneously occurring intramural coronary arteriosclerosis in bovine species. Anitschkow cells, whose ultrastructural characteristics and localization suggest their potential origin from the smooth muscle cells of the tunica media of the arteriosclerotic coronary vessels, were also identified.

Introduction

Arteriosclerosis is defined as a chronic arterial change consisting of hardening, loss of elasticity, and luminal narrowing resulting usually from proliferative and degenerative changes, rather than inflammation, of the tunica intima and media. This is a common vascular disorder in domestic animals, with extent and incidence being greater in older patients. Large arteries (especially the abdominal aorta and points of arterial branching and, to a lesser extent, the peripheral and pulmonary arteries and the thoracic aorta) are the predilection sites of arteriosclerosis development. However, another type of arteriosclerosis that involves the small coronary arteries and is described as intramural small vessel disease has also been reported in veterinary medicine [1].

Spontaneous intramural coronary arteriosclerosis has particularly been investigated in dogs [2—9] and cats [9—12]. It is generally reported as an age-related change often incidental or clinically insignificant [2,3,12], but it can also be frequently associated with heart diseases. The relationship between myxomatous mitral valve disease and intramural coronary arteriosclerosis is well-known in canine patients [7,8], whereas small vessel disease represents a typical histopathological feature in feline hypertrophic cardiomyopathy [10,11]. Arteriosclerotic changes of intramural coronary arteries have also been reported in case of sudden death in dogs [5] and *Chlamydia* spp. infection in canine and feline patients [9]. Common arteriosclerotic lesions are represented by intimal fibromuscular hyperplasia [5,7,8], vascular hyalinosis [5,7], medial dysplasia/degeneration, and medial hypertrophy/hyperplasia [8]. Myocardial alterations containing focal areas of myocardial fibrosis and necrosis can frequently be associated with arterial lesions [5,7] and likely represent ischemic disease secondary to arterial stenosis [5,6]. Previous studies about intramural coronary arteriosclerosis have also been performed in other species, such as swine [13], chicken [14], mice [15], and monkey [16], but no such investigations are currently available in bovine.

The aim of the present study was to describe the spontaneous occurrence of intramural coronary arteriosclerosis in regularly slaughtered veal calves and beef cattle, to investigate its prevalence and to characterize its histopathological features.

Materials and methods

Animals

A screening study on veal calves (6—9 months old) and beef cattle (10—24 months old) was performed at the slaughterhouse between January 2013 and March 2015. The inclusion criteria for the animals were as follows: (1) the animals were regularly slaughtered in a public abattoir of Piedmont region following authorization by an official veterinarian of the competent authority, (2) they showed no significant alterations at the routine meat inspection, (3) they belonged to Piedmont herds, (4) they were housed in intensive livestock farming, and (5) housing conditions were similar within the two animal categories: veal calves were reared in individual stalls or group pens (6—10 animals/pen) with a traditional diet of milk replacer and solid feed, whereas beef cattle were housed in tie-stalls with a concentrated diet of corn silage, corn, hay,

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