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Case Report

A Case of Bilateral Auricular Chondritis in a Heifer

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Auricular chondritis is an extremely rare condition in cattle and other domestic animals. A 13-month-old Jersey heifer was presented with cutaneous papillomatosis and bilaterally droopy ears. Histopathology revealed bilateral auricular chondritis characterized by lymphoplasmacytic infiltrate and extensive destruction and fibrosis of the auricular cartilage.

1. Introduction

Auricular chondritis, also known as auricular chondropathy, is an inflammatory condition of the cartilaginous tissues of the pinna rarely reported in human beings and animals. In human beings, it manifests as part of relapsing polychondritis complex, a rare systemic autoimmune disease characterized by episodic destructive inflammation of cartilaginous tissues throughout the body especially those of the ear, nose, joints, and respiratory tract [1–3]. In animals, auricular chondritis has been reported in rats [4–6], mice [2, 7], cats [8–10], and a horse [11]. It is extremely rare in cattle and, to the authors' knowledge, there is only a single case report involving two heifers [12]. In this report, we describe the pathological findings in a case of auricular chondritis in a Jersey heifer.

2. Case Description

A 13-month-old Jersey heifer was presented to the Ontario Veterinary College Teaching Hospital with extensive cutaneous papillomatosis and bilaterally droopy ears (Figure 1). Previously, the heifer had dermatophytosis due to *Trichophyton mentagrophytes* that responded to topical enilconazole (Elanco Animal Health, Guelph, Ontario, Canada) and terbinafine HCl (LAMISIL, Novartis Pharmaceuticals Canada Inc., Quebec, Canada), supplied as emergency drug release. The proportion of different populations of blood lymphocytes as determined by flow cytometry was within normal limits. Mild neutrophilia and lymphocytosis were present on complete blood count. Lymphocytes were of unremarkable morphology on blood smear analysis. Urinalysis and blood biochemistry findings were unremarkable. Real time PCR on ear-notch sample was negative for Bovine Viral Diarrhoea Virus type 1 and type 2. The cow was euthanized based on the extensive papillomatosis and recurrent dermatophytosis.

At necropsy, the pinnae were soft, thickened, and flabby. The skin and hair of the pinnae were unremarkable. Numerous multifocal to coalescing round to irregular exophytic hyperkeratotic nodules from 0.5 to 6 cm in diameter were present on the skin of the cranial thorax, neck, and head, including the face. The nodules were more numerous and larger on the cranial aspect of the neck. In the intervening cutaneous tissue, notably in the caudal neck region, there were occasional round pale and scaly foci (interpreted as resolving dermatophytic lesions). Some of these foci had central small (0.5 cm diameter) hyperkeratotic nodules resembling those described above. The skin nodules have grey exterior cut surfaces with adjacent light pink tissue. Macroscopic diagnoses of cutaneous papillomatosis, dermatophytosis, and auricular chondropathy were made.

Blocks of various tissues including the skin, the pinna, nasal planum, trachea, lungs, lymph nodes, and spleen

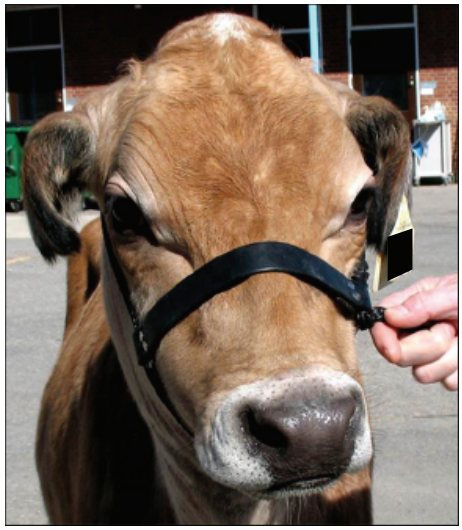

Figure 1: Jersey heifer presented with bilateral droopy ears.

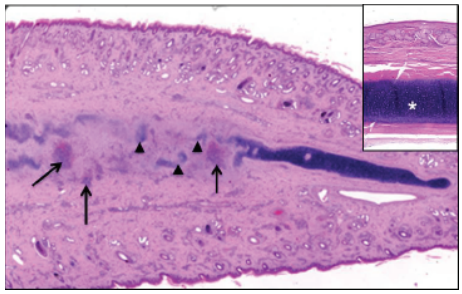

Figure 2: Histopathological features of auricular chondritis. The pinna is markedly expanded and the cartilage plate is disrupted (arrow heads) by multifocal to coalescing inflammatory infiltrates (arrows). Inset shows a section of pinna from an unaffected cow with normal cartilage plate (∗). Hematoxylin and eosin: 1.25x.

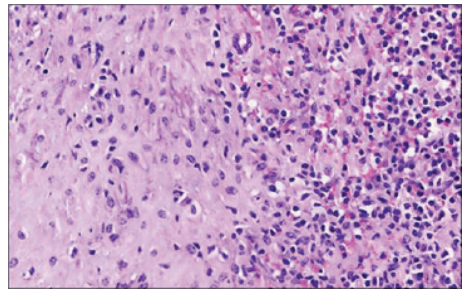

Figure 3: The auricular cartilage plate is disrupted by aggregates of lymphocytes and other mononuclear inflammatory cells. Hematoxylin and eosin: 40x.

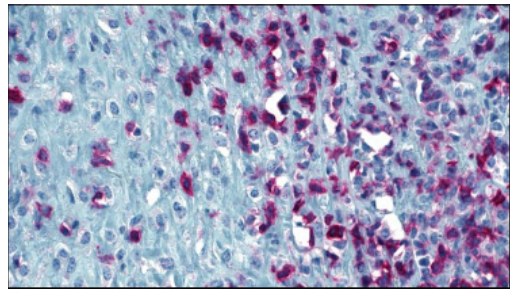

Figure 4: T-lymphocytes (red) predominate in the inflammation. Immunohistochemistry for CD3; avidin-biotin-peroxidase method with NovaRed chromogen and hematoxylin counterstain 40x.

were fixed in 10% neutral-buffered formalin and routinely processed and stained with hematoxylin and eosin (HE). Multiple longitudinal and cross sections along the entire length of the middle aspect of the pinna were made. Similar sections of the pinna, obtained from a cow with grossly normal ear, were made for comparison. Sections of the ear were also evaluated immunohistochemically to detect CD3 (T cells) and CD79a (B cells) using polyclonal rabbit anti-human CD3 and monoclonal mouse anti-human CD79a antibodies, respectively (DakoCytomation, Mississauga, ON). Primary antibodies were omitted for negative controls. Sections of the pinna were also stained with Brown and Brenn gram stain and periodic acid-Schiff (PAS) to rule out bacterial and fungal infection, respectively.

Microscopically, multifocal to coalescing aggregates of numerous lymphocytes, plasma cells, and a few macrophages were present along the whole length of the perichondrium and within the cartilaginous plate of the pinna, notably towards the base of the ear (Figures 2 and 3). The cartilaginous plate was expanded by multiple basophilic cartilaginous nodules, vascularization, and perivascular fibrosis. Chondrocytes found in the centre of the cartilaginous nodules were swollen with pale round or oval nuclei; rare clusters of chondrocytes were present within a lacuna (interpreted as proliferation). In rare foci, streams of thick dense collagen bundles were present within the disorganized cartilage; low numbers of spindle cells surrounded by lacuna were present within these dense collagenous bundles (interpreted as early osseous metaplasia). A section of the pinna from an unaffected cow showed a regular narrow band of elastic cartilage (Figure 2, inset). On IHC, 60–70% of the lymphocytes within the auricular cartilage were CD3-positive (T cells) (Figure 4) and the rest (30–40%) were CD79a-positive (B cells). Neither bacteria nor fungi were detected within the pinna by special staining (data not shown). Based on these findings, a diagnosis of bilateral auricular lymphoplasmacytic chondritis and perichondritis was made. The microscopic feature of the skin nodules was multifocal nodular hyperkeratotic and hyperplastic dermatitis, typical of bovine cutaneous papillomatosis (consistent with the gross pathology and clinical diagnosis). Other microscopic lesions included reactive lymphoid hyperplasia in multiple lymph nodes with mild depletion of medullary sinuses and protein casts within occasional medullary renal tubules with rare multifocal interstitial lymphocyte aggregates. No lesions were detected in other cartilaginous tissues.

3. Discussion

Auricular chondritis accompanied by marked loss, disorganization, and fibrosis of the cartilage plate of the pinna was presented in this heifer. The lesion would have compromised the physical strength of the pinna consistent with clinical presentation of droopy ears.

Auricular chondropathy is extremely rare in the bovine species, and, to the authors' knowledge, there is only a single case report describing a similar condition in cattle [12]. This earlier report was described in Swiss Braunvieh cattle [12]; this breed exhibits a predisposition to malformations of the pinnae, with involvement of the epiglottis and the arytenoid cartilage in some animals [13]. Other cartilaginous tissues were not affected in the current case nor in the previous case report in two heifers [12], a horse [11], and laboratory rats [5, 14]. In contrast, auricular chondritis induced experimentally by immunization with type II collagen is accompanied by arthritis in rats and mice [4, 15, 16]. Also, a recent report in a cat describes a polychondritis with involvement of the cartilage of the pinnae, costae, larynx, trachea, and limbs [10].

In the previous report of bovine auricular chondritis, a difference in the length of the long arms of the X chromosome was observed; however, the cause and pathogenesis were not determined [12]. The bilateral presentation deep within the cartilage and away from the skin makes extension from dermatitis associated with dermatophytosis or papillomatosis unlikely. Furthermore, the inflammation at the lateral edge where the ear tag was applied was minimal to absent, which makes trauma an unlikely cause. A mild trauma associated with insertion of ear tag likely happened at a very young age and there was no history of lesions of the ear/pinna before the recent presentation. These observations together with the multifocal and random T lymphocyte-dominated inflammation strongly suggest an immune-mediated etiopathogenesis. In this regard, the presence of widespread papillomatosis and previous history of dermatophytosis in this animal suggests an underlying systemic immunopathy. However, no abnormalities were detected in proportion of the different populations of lymphocytes. The mild lymphocytosis and neutrophilia were consistent with underlying fungal infection and papillomatosis. Furthermore, there were neither atrophic nor degenerative changes in the thymus and other lymphoid tissues to offer a morphological basis for immune suppression. Bovine viral diarrhea virus isolation to rule out persistent BVD infection was negative.

Auricular chondritis in human beings is part of a rare autoimmune disease complex known as relapsing polychondritis. This condition involves several cartilaginous structures including the pinnae, nose, trachea, joints, and eyes, resulting in clinical manifestations of cyclical and destructive auricular chondritis, polyarthritis, nasal chondritis, ocular inflammation, audiovestibular damage, and respiratory tract chondritis [1, 2]. A similar condition has been described in laboratory rodents, notably in rats, a species that has been proposed as a model for relapsing polychondritis in human beings. In rats, it has been reported as an idiopathic/spontaneous [5, 6] or as experimental type II collagen-induced condition [4]. Interestingly, development of bilateral auricular chondritis has been reported secondary to unilateral application of metallic ear tags in rats [6] and mice [7]. In the later report, the auricular chondritis was characterized by the predominance of CD4-positive T lymphocytes, increased expression of Th1-type cytokines, and upregulation of metallothionein- (MT-) I and MT-II. This suggests an autoimmune disease triggered by the presence of metal ions released from metal ear tags [7]. The etiology of relapsing polychondritis in human beings is unknown; however, consistent with autoimmune etiopathogenesis, antibodies to cartilage proteins were identified in the sera of patients with this condition [15]. No tests for autoantibodies to cartilage proteins were done in our case; however, the pathological findings are consistent with an autoimmune pathogenesis.

To our knowledge, this is the first report of auricular chondritis in Jersey cattle and the second report in cattle as a whole. Further cases of auricular chondritis may be found if the pinna is routinely examined in cattle with a similar clinical presentation.

Conflict of Interests

The authors have no financial or personal relationships with other people or organizations that could inappropriately influence this work.

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