

Pathomorphological investigation of spondylolisthesis led to spondylosis in commercial broiler chicken with posterior paralysis: A case study

Behrokh Marzban Abbasabadi^{1*}, Hannaneh Golshahi², Saeed Seifi³

¹ Department of Basic Sciences, Faculty of Veterinary Medicine, Amol University of Special Modern Technologies, Amol, Iran; ² Nanobiotechnology Research Center, Avicenna Research Institute, Academic Center for Education, Culture, and Research (ACECR), Tehran, Iran; ³ Department of Clinical Sciences, Faculty of Veterinary Medicine, Amol University of Special Modern Technologies, Amol, Iran.

Article Info

Article history:

Received: 22 September 2019
Accepted: 03 May 2020
Available online: 15 June 2021

Keywords:

Broiler chicken
Iran
Posterior paralysis
Spondylolisthesis
Spondylosis

Abstract

Spondylolisthesis known as kinky back syndrome is a deformity of the free sixth thoracic vertebra including enlargement and rotation resulting in posterior paralysis in broiler chicken. Genotype, feeding regimes and environment are involved in occurrence of this congenital anomaly. Spondylolisthesis may result in or happen simultaneously with two other major axial skeleton pathologies including spondylosis and spondylitis as a result of occurrence of degenerative necrobiotic lesions and inflammation of the vertebrae, respectively. This report deals with a male broiler chicken with posterior paralysis in the second week of rearing. After euthanasia, the specimen was evaluated at macroscopic and microscopic levels. Macroscopic findings showed the unilateral enlargement of body and transverse process of sixth thoracic vertebra and downward rotation of the body. The histopathological studies revealed the focal chondronecrosis and degenerative changes in articular facets and cranial process of the vertebra. In conclusion, a diagnosis of spondylolisthesis followed by spondylosis was made based on macroscopic and histopathological findings that to the authors' best knowledge, is the first report in a broiler farm in Iran.

© 2021 Urmia University. All rights reserved.

Introduction

Among the different conditions leading to posterior paralysis in chickens, spondylolisthesis (kinky back syndrome) is reportedly the most prevalent one followed by spondylosis and spondylitis.^{1,2} It is a deformity of the sixth thoracic vertebra (T6) including enlargement and distortion, causing spinal cord compression and eventually posterior paralysis in broiler chicken³. In some flocks, the incidence of affected birds can reach 2.00% with a peak at three to six weeks of age and cocks are more frequently affected.^{3,4} Genetic predispositions has been known as the main cause of this defect. Other causes of this defect include the environment and nutritional conditions which are almost equally effective, so feeding with a diet diluted with fiber during the first week of life could significantly reduce the development of subclinical spondylolisthesis.⁵ Some researchers have indicated that spondylolisthesis is resulted from increased growth, which can be reduced by

slowing down the growth rate of broiler chickens; although, others have rejected this hypothesis.^{3,4,6}

Despite the prevalence of posterior paralysis in broiler chicken flocks, to the best of our knowledge, this is the first report of spondylolisthesis led to spondylosis of broiler chicken in Iran.

Case Description

In January 2019, one case of posterior paralysis was observed in broiler research farm of Faculty of Veterinary Medicine, Amol University of Special Modern Technologies, Amol, Iran. The affected chicken was male (Ross 308; weighing 170 g) in the second week of rearing.

The chicken was rested on its abdomen and tail with legs extended forward being incapable to stand or walk (Fig. 1). The basal diet was formulated to meet the nutrient requirements of the broiler chickens as recommended by Ross 308 broiler management guide.⁷ Gross evaluations

*Correspondence:

Behrokh Marzban Abbasabadi. PhD
Department of Basic Sciences, Faculty of Veterinary Medicine, Amol University of Special Modern Technologies, Amol, Iran
E-mail: b.marzban@ausmt.ac.ir



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License which allows users to read, copy, distribute and make derivative works for non-commercial purposes from the material, as long as the author of the original work is cited properly.

were performed after euthanasia by cervical dislocation (Ethical code: Ir.ausmt.rec.1400.01). The thoracic vertebra was fixed in 10.00% neutral buffered formalin, remained in 16.00% neutral EDTA for 40 days for decalcification and then embedded in paraffin. The 5.00 μm sections were stained routinely with Hematoxylin and Eosin.

Macroscopic findings. In the area of thoracic vertebrae, enlargement of body and transverse process of T6 was observed at the left side with downward rotation of the body (Fig. 2).



Fig. 1. A two-week-old male broiler chicken with posterior paralysis sitting on abdomen and tail.

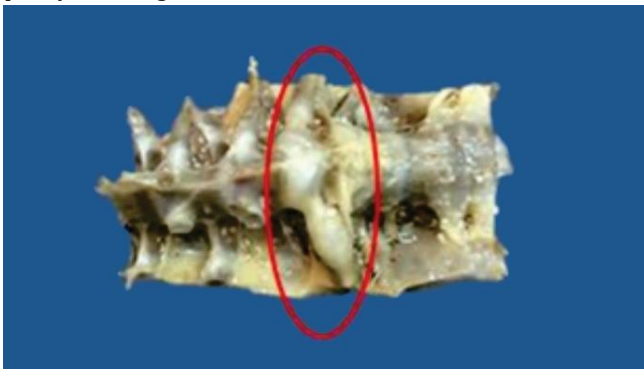


Fig. 2. Enlargement in transverse process and body of 6th thoracic vertebra (red ellipse).

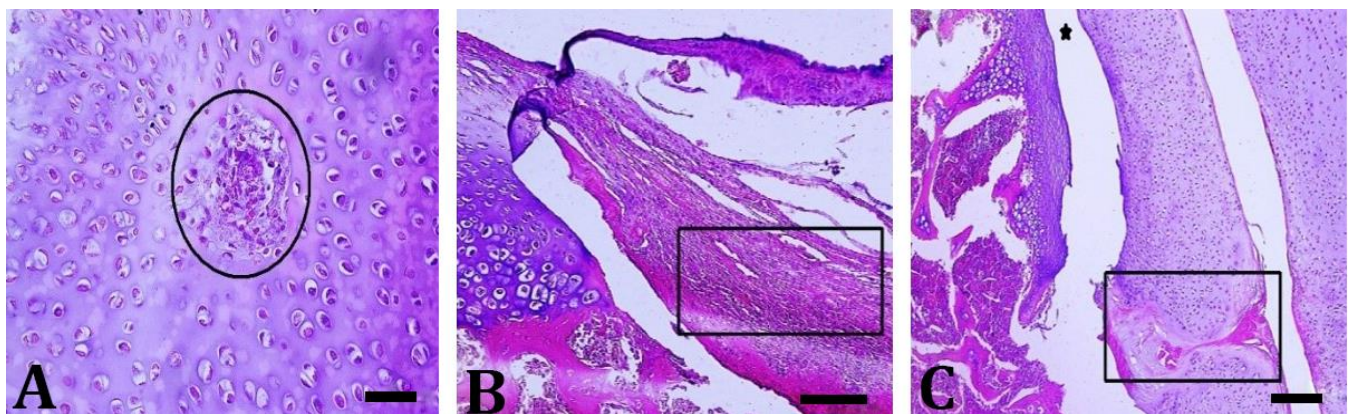


Fig. 3. Histopathological findings in free thoracic vertebra (FTV). **A)** Note the degenerative necrotic lesions in articular facet zone of FTV (ellipse), (H&E, Scale bar = 50.00 μm). **B)** Note the wound site in articular cartilage with an accumulation of fibrovascular tissue (rectangle), (H&E, Scale bar = 100 μm). **C)** Osteochondrosis dissecans lesion with marked linear cleft (asterisk) and in another part, the cleft is filled with fibrin deposition and cell debris (rectangle), (H&E, Scale bar = 200 μm).

Microscopic findings. Histological analysis revealed focal chondronecrosis and degenerative changes in articular facets and cranial process of the free thoracic vertebra. Also, noticeable large cartilaginous cleft was detected which was consistent with osteochondrosis dissecans lesions. Along with the destructive changes, there were also regenerative reparative processes containing fibrovascular tissue. There was a slight infiltration of mononuclear inflammatory cells in surrounding connective tissue and muscle fibers (Fig. 3).

Discussion

Spondylolisthesis is a congenital anomaly of chickens with a genetic basis, in which the malformation of the spinal column leads to the posterior paralysis.^{2,8} Main pathological lesion in this disease refers to displacement of T6 that could have no clinical symptoms.⁹ Disturbed bone growth of either or both vertebral arch and body being reported in these instances observed in the present case, too.⁹ The notable point in these cases is to differentiate this abnormality from two other diseases making vertebral column deformity either including spondylitis and spondylolisthesis, that are the most prevalent axial skeleton pathologies following spondylolisthesis and might occur simultaneously with it. The etiology of spondylitis is dislocation of the respective thoracic vertebra (T6) forming a precondition for occurrence of degenerative necrobiotic lesions in vertebral bodies. The process could be provoked by impaired vertebral body articulation resulting in vertebral column deformation and vertebral inflammation. Spondylitis in broiler chickens has been associated with different infectious agents including *Staphylococcus aureus*, *Enterococcus cecorum* and *Aspergillus fumigatus*.^{2,10,11}

In the present report, the dislocation of T6 caused posterior paralysis and histopathological studies revealed focal chondronecrosis and degenerative changes

in articular facets and cranial process of the free thoracic vertebra. There was no sign of active inflammatory reaction, purulent foci and intralesional bacteria in articular facets and cranial process of the free thoracic vertebra ruling out the occurrence of osteomyelitis. Therefore, it could be concluded that in the present case, the spondylosis occurred following spondylolisthesis that to the authors' best knowledge, is the first report in a broiler farm in Iran.

Acknowledgments

This research was supported by a research grant from the Amol University of Special Modern Technologies, Amol, Iran.

Conflict of interest

The authors declare that there was not any conflict of interest.

References

1. Dinev I. Pathomorphological investigations on the incidence of axial skeleton pathology associated with posterior paralysis in commercial broiler chickens. J Poult Sci 2013; 50(4): 283-289.
2. Dinev I. Axial skeleton pathology in broiler chickens. Worlds Poultry Sci J 2014; 70(02): 303-308.
3. Makrai L, Nemes C, Simon A, et al. Association of *enterococcus cecorum* with vertebral osteomyelitis and spondylolisthesis in broiler parent chicks. Acta Vet Hung 2011; 59(1): 11-21.
4. Khan MA, Olson NO, Weiss R. Spondylopathy in broilers. Case reports. Poult Sci 1973; 52(5): 1847-1852.
5. Dinev I. Pathomorphological investigations on the incidence of clinical spondylolisthesis (kinky back) in different commercial broiler strains. Revue Méd Vét 2012; 163(11): 511-515.
6. Pompeu MA, Barbosa VM, Martins NRS, et al. Nutritional aspects related to non-infectious diseases in locomotor system of broilers. Worlds Poultry Sci J 2012; 68(04): 669-678.
7. Ross 308 Broiler – Performance objectives. Available at: <https://www.winmixsoft.com/files/info/Ross-308-Broiler-PO-2014-EN.pdf>. Accessed 30 March, 2021.
8. Borst LB, Suyemoto MM, Sarsour AH, et al. Pathogenesis of enterococcal spondylitis caused by *Enterococcus cecorum* in broiler chickens. Vet Pathol 2017; 54(1): 61-73.
9. Duff SRI. Do different forms of spondylolisthesis occur in broiler fowls? Avian Pathol 1990; 19(2): 279-294.
10. Talebi A, Taifebagerlu J, Sharifi A, et al. Spondylitis in broiler breeder farms in West-Azerbaijan province, Iran: Clinical Report. Vet Res Forum 2016; 7(4): 353-355.
11. Riddell C, Topp R. Mycotic spondylitis involving the first thoracic vertebra in chickens. Avian Dis 1972; 16(5): 1118-1122.