



Diagnostic Study of *Serratospiculum spp* in Starlings

Eman G. Suleiman, Nadia S. Alhayali, Manal H. Hasan

Department of Microbiology, College of Veterinary Medicine, University of Mosul, Mosul, Iraq

Corresponding author : emanghanim73@gmail.com

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Abstract :*Serratospiculum* species was diagnosed in thoracic cavity and air sacs of 15 starlings, with a percentage of 30% out of 50 starling birds examined for the first time in Mosul city/Iraq. Numbers of adult white worms were detected in the thoracic cavity ranging from 3-20 worms with mean intensity was 7.9. Large numbers of embryonated eggs were detected in the impression smears from the respiratory tract and uterus of worms measuring 52.4x25.93 μm with ranging 50-55x25-28.5 μm . These worms were characterized by possessing cuticular orientation, particularly in the anterior end. The female's posterior end is pointy, and her uterus is packed with a huge quantity of eggs. Moreover, the male's posterior end is characterized by the presence of spicules and papillae. At gross examination air sacculitis and pneumonia were the most common lesions in infected birds. Histologically, embryonated eggs, adult worms with mild focal hemorrhage, mild myocardial degenerative changes, congestion of blood vessels and focal infiltration of lymphocytes, and plasma cells were diagnosed in the myocardium and lung tissues.

Key words: *Serratospiculum*, Diagnosis, Birds, Starling.

Introduction

Filariid nematodes of the *Serratospiculum* genera, order Spirurida, super family. Diplortiaenoidea, Family Diplorioenidae parasitize the air sac of birds as an incidental or clinically significant infection (1). *Serratospiculum* species have been recorded in several falconiformes and non-falconiformes species (2,3). Pigeons and other prey species have been proposed as possible paratenic hosts important in

spreading *Serratospiculum spp* in some populations (4).

The life cycle of *Serratospiculum spp* is indirect, birds are the final hosts, and the arthropods, especially beetles, species of wood louse, and grasshoppers, are intermediate hosts (1). After the copulation, the females of *Serratospiculum spp* deposit their embryonated eggs in the air sac and then passed to the lungs to be coughed up and swallowed by the bird. Embryonated

eggs are passed in the feces and are ingested by intermediate hosts, and developed larval stages (L1-L3) within the adipose tissue, when the birds eat the intermediate hosts, L3 penetrates the proventriculus and migrates to the air sac and lungs, and develops into adult filarial worms (5).

Serratospiculum species are considered non-pathogenic by some researchers (6), while others recorded cases of diseases and death (7,8). Pathogenicity of this parasite is still recorded; clinical cases are few, and the *Serratospiculum* does not appear to be pathogenic in light infections (9). However, clinical signs include, dyspnea, lethargy, anorexia reduced fight performance, pharyngeal plagues vomiting, and in heavy infection death may occur (1).

Starling (*Sturnus vulgaris*) of the family sturnidae, order passeriforms, are native European birds. The occurrence of parasites is high in starlings, and other species of birds, particularly during the spring to autumn and the prevalence of the parasites depends on several factors such as diet, age, habits and habitat of the birds (10-12).

The data about the occurrence of *Serratospiculum* species in different species of birds are limited, and there are no studies on the presence of this species parasitizing Iraqi birds. Therefore, this study aimed to throw more light on the prevalence of *Serratospiculum* sp. in starlings and study their pathological changes.

Materials and Methods

A total of 50 starlings were examined from March to June 2019 in Nineveh province. It was found that 15 of them were infected by

the nematode *Serratospiculum* sp. the nematodes were removed from the thoracic cavity (trachea, bronchi, lungs, air sacs, and heart) in post mortem examination, the intensity of infection was calculated according to the following equation, the number of isolated worms divided by the number of infected birds. The nematodes were collected and preserved with 70% ethanol (11). The macroscopic pathological lesions were recorded. Lactophenol was used to identify and clear these worms by adding drops of this solution to the worm on a glass slide and then examined using a light microscope.

Impression smears were done from the uterus of the worms and respiratory tract to measure the eggs of this worm; an ocular micrometer was used. Identification of the worms and eggs occurs according to (13-15).

Tissue samples (lung and heart) from infected birds were fixed in 10% neutral buffered formalin, embedded in paraffin sectioned at 5µm by using microtome, and stained with hematoxylin and eosin (16-18)

Results

When 50 starlings were looked at, it was found that white adult parasitic nematodes from the genus *Serratospiculum* had infected 30% (15/50) of them. There were worms in the thoracic cavity and air sacs, and the birds had congested pleura, pneumonia, air sacculitis, and mild serosanguinous (tan) fluid infiltrations (Fig1). The mean intensity of infection was 7.9, ranging from 3-20 worms (Fig 2).



Figure1. Presence of adult filarial worms in the thoracic cavity and air sac with congested pleura, pneumonia, air sacculitis and mild serosanguinous (tan.colored fluid) infiltrations.



Figure 2: Filarial worms which collected from one starling bird

It is preferable to mention the number of described worms and put the mean in parentheses, with a description of male than female worms and eggs. The mean length of the genus *Serratospiculum* was (13.50) cm, ranging from (12.5-14.5) cm, and this worm characterized by possessing the cuticular

ornamentation particularly the anterior end of the bosses (Fig3 A, B); the posterior end of the female is pointed (Fig4) and the uterus of this worms is filled with large numbers of eggs (fig5). The posterior end of the male of this worm is characterized by the presence of spicules and papillae.

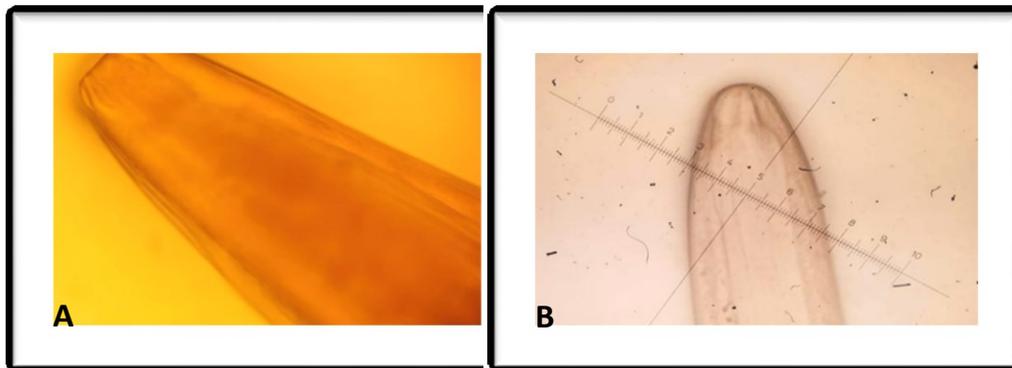


Figure 3: (A, B): Anterior end of *Serratospiculum* genus 10x by using digital camera



Figure 4: Posterior end of female of species 10x by using digital camera.



Figure 5: Uterus of worm filled with embryonated eggs 10x by using digital camera

The embryonated eggs of *Serratospiculum* spp were diagnosed in smears made from respiratory exudate and uterus of female worm, these eggs have

thick shelled measuring $52.4 \times 25.93 \mu\text{m}$ ranging from $50-55 \times 25-28.5 \mu\text{m}$ (Fig6 A, B).

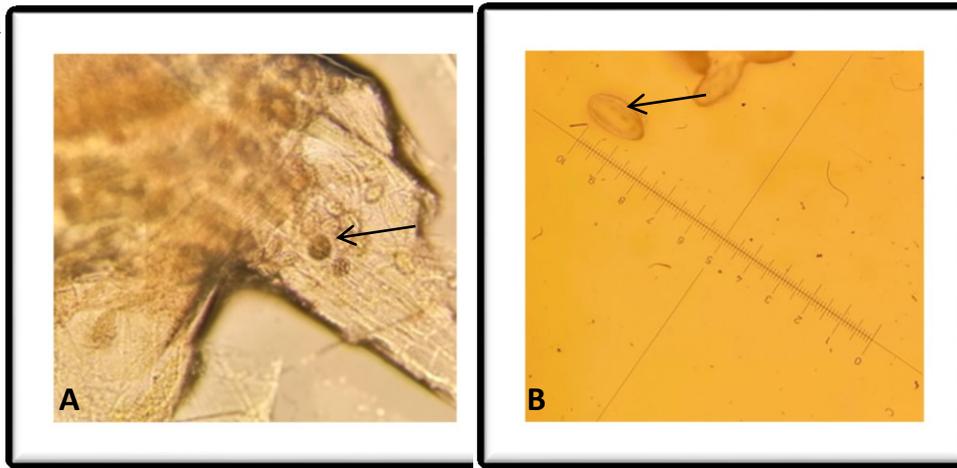
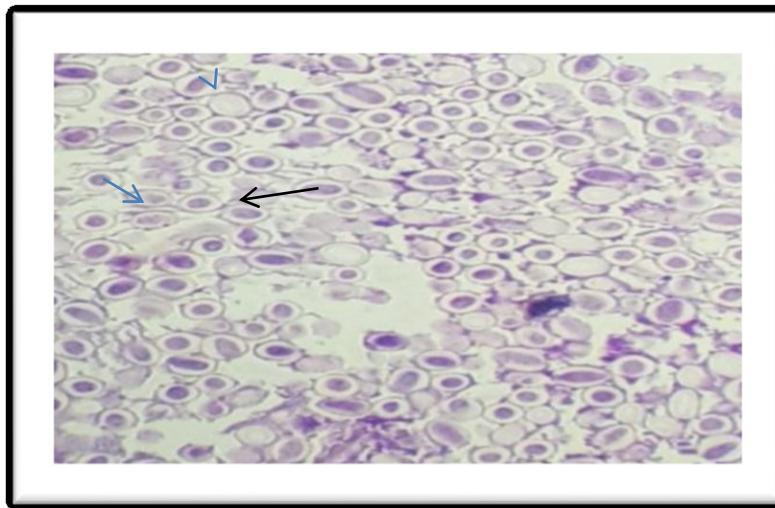


Figure 6. Embryonated eggs of *Serratospiculum* spp A- From impression smear of uterus, B-from impression smear of respiratory tract 4x by using digital camera

Air sacculitis, congested pleura, pneumonia, and adult nematodes located in the thoracic cavity and close to the heart are characteristics of the *Serratospiculum* genus' gross lesions. The histopathological examination referred diagnosed the embryonated eggs in the lung (Fig7), the presence of the adult female worm with a

uterus filled with embryonated eggs in heart tissue (Fig8), the presence of mild focal hemorrhage, mild myocardial degenerative changes, congestion of blood vessels (Fig 9,10,11) and focal infiltration of lymphocytes, plasma and macrophages cells in the myocardium and lung (Fig12).



**Figure 7 : Embryonated eggs of *Serratospiculum* species in the lung tissue staining H&E .
Magnification .265 X**

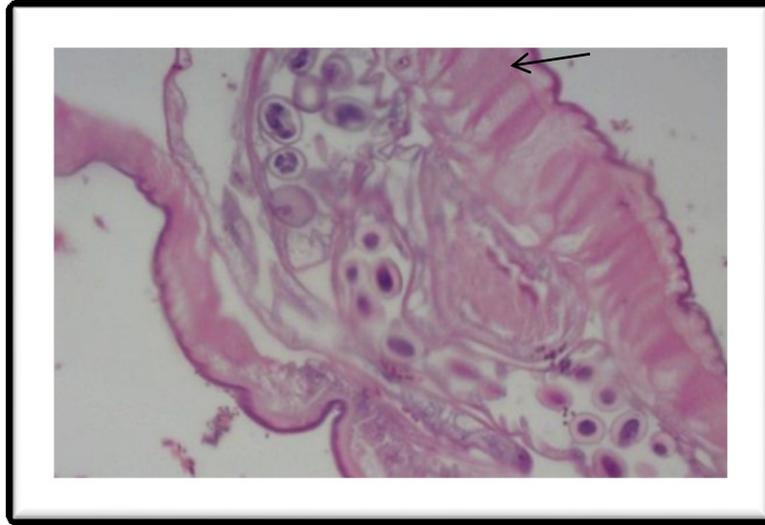


Figure 8. Adult female of worm with uterus which filled with embryonated eggs staining H&E. Magnification, 280 X

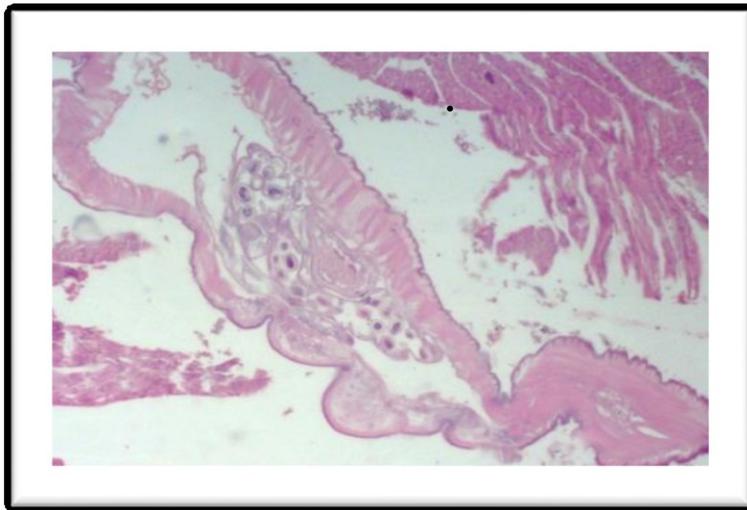


Figure 9. Adult female of *Serratospiculum* in the pericardial sac and presence of mild hemorrhage and mild myocardial degenerative changes staining H&E. Magnification. 110 X

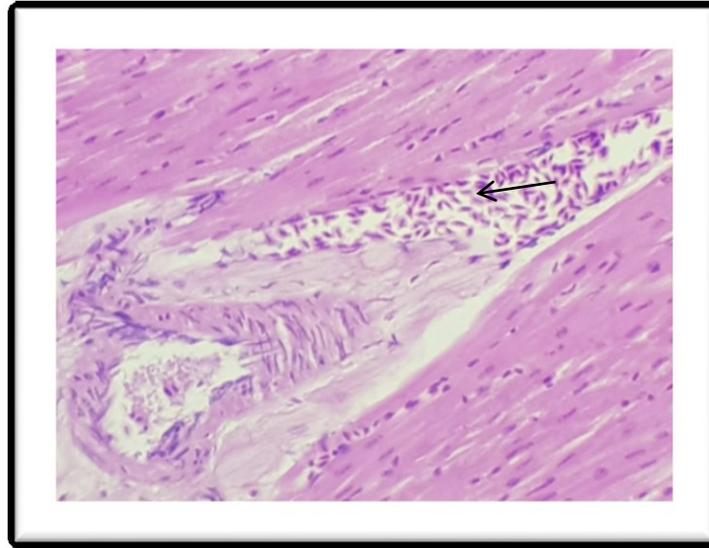


Figure 10: Mild hemorrhage in the pericardial, mild myocardial degenerative changes and congestion of blood vessels staining H&E. Magnification. 265 X

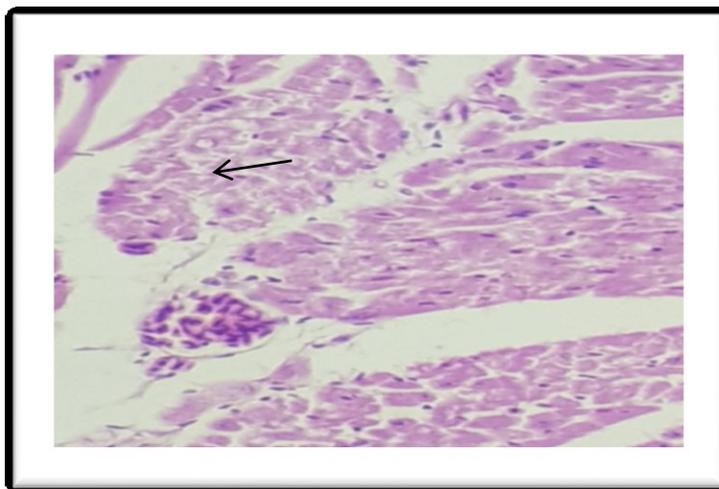


Figure 11: mild hemorrhage in the pericardial and mild myocardial degenerative changes and congestion of blood vessels staining H&E. Magnification. 265 X

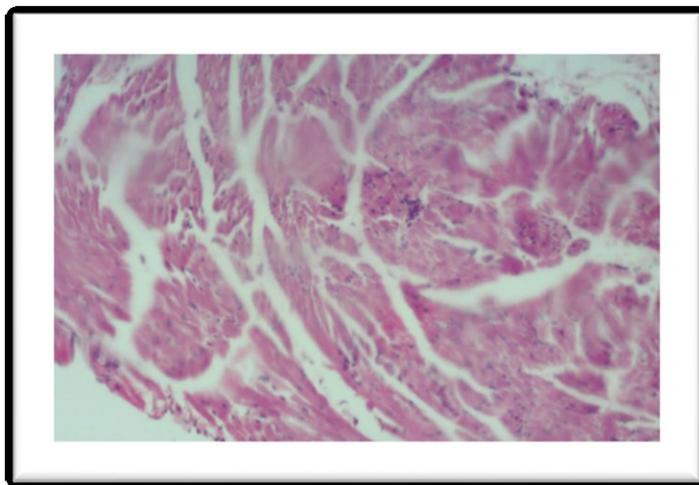


Figure 12. The myocardium of starling bird affected with *Serratospiculum* worms showing focal areas of inflammatory cells infiltration staining H&E. Magnification. 110 X

Discussion

Serratospiculum species have often been reported in falcons from many parts of the world (19). In this study, the *Serratospiculum* genus was diagnosed in Starlings birds, and this result is the first report about the presence of *Serratospiculum* species in starlings in Mosul city/Iraq. This result agrees with (15), who referred that the nematodes related to the suborder Diploriaenoidea parasitize many orders of birds. Anderson (20) showed the suborder Diploriaenoidea uses paratenic or intermediate hosts to facilitate their transmission to the definitive host via predation. The omnivores nature of starlings may lead to exposure to a wide range of parasitic organisms (10), and these birds might feed on beetles, grasshoppers, and loccasts which contain the infective larva of these worms (21,22). The mean intensity of infection was 7.9, ranging from 3-20worms,

this result agrees with (4), who found *Serratospiculum* in the thoracic cavity and abdominal sac of 25 of the 31(81.6%) peregrine falcons from the Calabria region in Italy with mean intensity was 8.7ranging from 1-35. Also, this result was the agreement with (14), and they referred that nematodes of the genus *Serratospiculum* are common and usually innocuous inhabitants of the air sac of several species of a falcon and when the heavy air sac infections of these worms are major contributing cause in the deaths of falcons. Prescott and David (19) recorded cases of prairie falcons that died of respiratory disorders were filled with hindered adult parasites.

The morphological features and measurements of *Serratospiculum* worm and its embryonated eggs were agreement with (13- 15)

The macroscopic lesions associated with infection of the genus *Serratospiculum* corresponded with (8,4,13,23), which were characterized by alveolitis, pleural congestion, and pneumonia, and the numbers of adult nematodes were present in the thoracic cavity and heart.

The histopathological examination was characterized by the presence of the embryonated eggs in the lung, the presence of the adult female worm with a uterus filled with embryonated eggs in heart tissue, the presence of mild focal hemorrhage, mild myocardial degenerative changes, congestion of blood vessels and focal infiltration of lymphocytes, plasma and

macrophages cells in the myocardium and lung, these results were agreement with (1,23,24). Sever serratospiculosis has been recorded in multiple species of wild s raptors a primary (25). These pathological changes occur due to the direct effect of these nematodes on the host's tissues.

Conclusion

Based on the results of the present study, Filariid nematodes *Serratospiculum* species were diagnosed for the first time in the thoracic cavity of starling's birds in Mosul city. They caused congested pleura, pneumonia, and air sacculitis.

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دراسة تشخيصية لجنس *Serratospiculum* في طائر الزرزور

ايمان غانم سليمان، نادية سلطان الحياي، منال حمادي حسن

فرع الاحياء المجهرية، كلية الطب البيطري، جامعة الموصل، الموصل، العراق

الخلاصة

شخصت دودة *Serratospiculum sp* في التجويف الصدري والاكياس الهوائية في 15 زرزورا اوربيا وبنسبة 30% من مجموع 50 زرزور مفحوص لأول مرة في مدينة الموصل/ العراق. تم الكشف عن أعداد الديدان البالغة في التجويف الصدري بمتوسط 7.9 وبمدى تراوح بين 3-20 دودة كما تم الكشف عن أعداد كبيرة من البيوض المجننة في طبقات المسحات المحضرة من القناة التنفسية ورحم الدودة بقياس 52.4x 25.93x 28.5-25x55-50. تميزت هذه الدودة بامتلاكها للوجه الجلدي خاصة في النهاية الأمامية اما النهاية الخلفية للأنتى فكانت مدببة ورحم هذه الديدان كان ممثلًا بأعداد كبيرة من البيوض، وتميزت النهاية الخلفية للذكر بوجود الأشواك والحليمات. كان التهاب الاكياس الهوائية والرئة من أكثر الآفات العيانية شيوعًا في الطيور المصابة. نسيجيا تم تشخيص البيوض المجننة والديدان البالغة مع نزيف بؤري خفيف وتغيرات تنكسية خفيفة في عضلة القلب واحتقان الأوعية الدموية وارتشاح للخلايا للمفاوية وخلايا البلازما في أنسجة عضلة القلب والرئة.

الكلمات المفتاحية: *Serratospiculum*، تشخيص، الطيور، الزرزور.