





## The Diagnosis of Scapulohumeral Luxation and Avulsion Fracture with 3-Dimensional Computed Tomography in a Yellow-legged gull (*Larus michahellis*)

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### Abstract

An adult yellow-legged gull (*Larus michahellis*) of unknown sex was evaluated with history of motor vehicle trauma and unable to fly. The patient, that on first examination showed no clinical sign, was diagnosed on second day with scapulohumeral luxation and avulsion fracture via 3-dimensional computed tomography. Computed tomography (CT) is a noninvasive, well-recognized diagnostic procedure in avian medicine. This is the first case report to describe use of computed tomography to diagnosis scapulohumeral luxation and avulsion fracture in a yellow-legged gull (*Larus michahellis*).

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### *Bir Gümüş Martıda (Larus michahellis) Skapulohumeral Luksasyon ve Avulsiyon Kırığının Üç Boyutlu Bilgisayarlı Tomografi ile Tanısı*

#### Özet

*Cinsiyeti bilinmeyen yetişkin bir gümüş martı, araba çarpması sonucu uçamama anamneziyle değerlendirildi. İlk muayenesinde klinik bulgu görülmeyen hastada, ikinci gün 3 boyutlu bilgisayarlı tomografi ile skapulohumeral luksasyon ve avulsiyon kırığı tanısı koyuldu. Bilgisayarlı tomografi kanatlı hekimliğinde bilinen, noninvaziv bir prosedürdür. Bu, bir gümüş martıda (Larus michahellis) skapulohumeral luksasyon ve avulsiyon kırığının bilgisayarlı tomografi ile tanısının sunulduğu ilk olgu raporudur.*

**Anahtar kelimeler:** Kuş, bilgisayarlı tomografi, luksasyon, omuz kemeri

### Introduction

Pectoral girdle consists of the clavicle, coracoid, and scapula, all of which articulate proximally and form the triosseal foramen. Distally, the scapula and coracoid also form the glenoid cavity (Beaufre, 2009). Pectoral girdle injuries commonly occur when birds crash into solid objects, such as walls, windows, or cars (Scheelings, 2014). These injuries are presented commonly coracoid fractures, scapulohumeral luxations, clavicle fractures (Azmanis et al., 2014; Scheelings, 2014). Luxation or dislocation is the abnormal displacement of a bone from a joint. A partial dislocation is called subluxation (Azmanis et al., 2014). Luxations are usually suspected based on the history and clinical signs and diagnosed following an orthopedic and neurologic examination and radiographic evaluation (Whitehead and Parker, 2015).

The radiographic assessment of the pectoral girdle is hindered by the superimposition of the wing musculature. There is superimposition of the coracoid and scapula in the VD projection of the pectoral girdle (Krautwald Junghanns et al., 2011). In a previous study, H view was used for the assessment of raptors suspected to have fractures of the thoracic girdle (Visser et al., 2015). Computed tomography and magnetic resonance imaging have been used in some avian cases (Gumpenberger and Scope 2012; Fraga Manteiga et al., 2013; Whitehead and Parker, 2015; Beaufre et al., 2019) and may be useful in specific luxations (e.g. coracoid subluxation, coxofemoral, spinal, palatofacial bones, shoulder joint). With CT examination, reconstructions and measurements of the organs and structures of the bird in different planes, as well as 3-dimensional models can be produced and evaluated in a computer environment (Krautwald Junghanns et al., 2011). The purpose of this case report is to identify the scapulohumeral luxation and

avulsion fracture of the humerus in the yellow-legged gull (*Larus michahellis*), which is diagnosed by three-dimensional computed tomography.

### Case Presentation

In this study, an adult yellow-legged gull (*Larus michahellis*) of unknown gender which could not fly due to vehicle trauma experienced 1 hour before being presented to our clinic was evaluated.

On presentation, the bird was alert and responsive. The bird was in good body condition (body score 3/5) at 820 g body weight and no observed external bleeding. Radiograph of the whole body was taken to investigate whether there was any traumatic pathology in internal organs. No other abnormalities were detected. The bird hospitalized during one day and fed with fish and chicken meat. On the following day, the patient was re-evaluated and observed left wing drooping. The wing tip was pinched to evaluate the withdrawal reflex making of any conscious perception of pain and evaluated positively and decided to perform a CT scan to assess the left shoulder.

Before, scanning the bird was sedated with medetomidine hydrochloride 100 µg/kg intravenously (Domitor®, Zoetis, UK). The patient was placed symmetrically in dorsal recumbency. A CT scan (2 mm) was completed with a 63 CT scanner (Schimadzu® Computed Tomograph System, Japan). After scanning the patient recovered uneventfully from sedation. Then, the images were converted to virtual 3-dimensional forms via OsiriX DICOM software program.

Evaluation of the CT images revealed luxation of the left scapulohumeral joint (part of the scapula, coracoid, humerus complex) (Fig. 1). Left humerus displaced completely craniodorsally with avulsion fracture in tuberculum mediale however observed no abnormality on clavicle, coracoid, and scapula.

The patient treated conservatively with analgesia and cage rest with simply bandaging. The bird was confined to a 130x120 cm cage for 3 weeks. Meloxicam 1 mg/kg, PO, q 12 h (Metacam, Boehringer Ingelheim Medicine Inc., Germany) was used for analgesia for 2 weeks. After 3 weeks of convalescence, the bird was evaluated for flying and it was observed that the bird able to perch by a bounce of about one meter however could not rise by flapping. Therefore it was not released back to nature because of an inability to fly appropriately. The bird was placed in a fishing shelter to spend the rest of its life.



**Figure 1.** Reconstructed 3-D images of the pectoral girdle of the yellow-legged gull. Figure 1A: Cranial view of pectoral girdle, craniodorsal luxation of the left humerus and displacement of crista pectoralis (white arrow). Figure 1B: Caudal view of pectoral girdle. Figure 1C: Lateral view of pectoral girdle. Figure 1D: Avulsion fracture in tuberculum mediale and bony fragment (red arrows). a) scapula, b) clavicle, c) coracoid.

### Discussion

As previously mentioned, conventional radiography is the most common method of a diagnostic evaluation for the avian shoulder joints; however, there are significant limitations such as superimposition (Krautwald-Junghanns et al., 2011; Whitehead and Parker, 2015). CT eliminates this disadvantage.

In comparison to conventional radiography, CT is the ideal modality for bone lesions, and also provides improved differentiation of soft tissue and fluid (Whitehead and Parker, 2015). Computed tomography is being more commonly incorporated into the diagnostic plan for case studies in avian medicine. As such, CT has recently been demonstrated to diagnose coxofemoral luxations in mute swan and luxations of palatofacial bones in a parrot (Gumpenberger and Scope, 2012; Beaufriere et al., 2019). In recently, new reconstruction software programs allow images to be converted to virtual 3-dimensional forms and providing a detailed examination of structures in avian medicine (Whitehead and Parker, 2015; Beaufriere et al., 2019). This study demonstrates the advantage of CT for evaluating the pectoral girdle and importance early diagnosis of shoulder injury.

The thoracic girdle is composed of the clavicle, coracoid, and scapula. These bones form a triosseal

canal where the tendon of the m. supracoracoideus lifts the wing (Beaufrere, 2009). Rupture of the tendon of the supracoracoideus muscle, leads to dorsally luxation of the humeral head (Orosz et al., 1992). According to a study that performed a supracoracoideus tenotomy in cockatiels and pigeons, did not observed a significant wing droop in birds (Degernes and Feduccia, 2001). This, similar to our study, makes clinical diagnosis difficult and requires advanced imaging techniques.

The scapulohumeral joint is generally described as a stable joint due to the supporting musculature and the coracohumeral ligaments (Orosz et al., 1992). Luxation rarely occurs, but when it happens, the prognosis is poor. The diagnosis and treatment of luxations within 24 hours can improve prognosis (Azmanis et al., 2014).

To our knowledge, this is the first report of diagnosis of shoulder luxation with avulsion fracture via 3-dimensional CT in a yellow-legged gull. Both conventional radiography and CT are useful in the diagnosis of pathology in avian medicine but CT has many advantages, as mentioned above. We recommend a detailed CT evaluation of the skeletal system for a traumatic avian patient include a complete assessment of bones.

**Conflict of interest:** *The authors do not have any conflict of interest.*

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