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Successful Treatment of Severe Bumble foot in a Northern Goshawk (*Accipiter gentilis*)

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Abstract : About 2-year old northern goshawk (*Accipiter gentilis*) which is designated as natural monument (#323-1) in Republic of Korea was rescued by a local farmer and presented with a 2-weeks history of pain, swelling, stiffness and limping. On physical examination, plantar pododermatitis and digit IV weakness were observed. Radiographic findings also showed bone lyses with soft tissue swelling in the foot. A definite diagnosis was made as stage III bumble foot after multidisciplinary approach of the patient. Bacterial culture was performed, and concurrently antibiotic susceptibility testing is determined using wound site exudates specimen. Bacterial isolates were identified as *Staphylococcus aureus,* known normal skin flora. Treatment was initiated with surgical incision and necrotized tissues removal. Lavage-drainage and ball bandage were applied with topical mupirocin ointment application. Doughnut shaped pad was attached on bottom of the ball bandage to reduce weight bearing. After three weeks of intensive care, the wound site completely healed but digit IV weakness remained permanently. The goshawk returned to nature after eight weeks after treatment.

Key words **:** *Accipiter gentilis*, bumble foot, nothern goshawk, pododermatitis.

Introduction

A type of Peregrine Falcon is known of 61 species in the world, and 6 of Peregrine species are recorded in Korea (2). A northern goshawk (*Accipiter gentilis,* order *Accipitriformes*) is distributed in Europe, North America and Korea. The northern goshawk is a medium-sized forest raptor, its length is about 48~61 cm, widely distributed from the subarctic zone to the temperate zone of the northern hemisphere (5). Cultural Heritage Administration (CHA) in Korean government actively protects this threatened species of northern goshawk designating as natural monument #323-1 by *Natural Monument Protection Act*.

Bumble foot is a general term for the inflammatory or degenerative condition of the bird's foot, which may range from a very mild redness or abrasion to chronic, deep-seated abscesses. This condition is found on the plantar aspect of the feet where it can form an abscess. It looks like callus, feel hard and occasionally affect both feet (4). Bumble foot is a progressive, granulomatous pedal disease primarily affecting a lot of raptor species. Up to now, Bumble foot is reported in *Anseriformes, Ciconiiformes, Faiconiformes, Galliformes, Passeriformes and Strigiformes,* and may develop to arthritis, osteomyelitis and septicemia and also could be most lethal condition in roseate spoonbill (*Ciconiiformes*) (3).

Generally, bumble foot in raptor is initiated by trauma to plantar skin surfaces causing devitalization and subsequent entry of pathogens, and clinical challenges in treating the condition include difficulty achieving therapeutic levels of systemic antimicrobials and poor wound healing because of the constant weight bearing. Recommendations for treatment include a combination of systemic antibiotic therapy, additional topical antibiotics or wound healing agent application, surgical debridement, and protective foot casting with reduced weigh bearing supporting vascular perfusion (1).

We were aware that there was no case report on the bumble foot in northern goshawk. This paper describes the pathological conditions, diagnosis and treatment of bumble foot in one male northern goshawk, which is protected by being designated as natural monument #323-1 in Republic of Korea.

Case

A 2-year old northern goshawk (*Accipiter gentilis*) was presented with a 2-weeks history of pain, swelling, stiffness and limping (Fig 1). Potential clinical values were quoted because the patient is one of the endangered wild animals designated as natural monument (#323-1) in Korea. On physical examination, plantar pododermatitis and digit IV weakness were observed. Granulomatous mass and inflammation were observed in the foot lesion. Plantar surface of the patient's foot demonstrating ulcerative pododermatitis, were determined as known as bumble foot (Fig 2). Lesions had started as a smooth, pink, erosive and flattened area on the

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Fig 1. Northern Goshawk which is designated as natural monument (#323-1) in Republic of Korea was admitted.

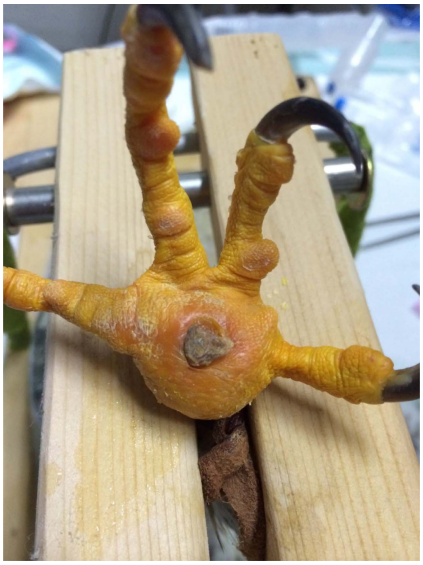

Fig 2. Foot swelling and granulomatous masses were observed.

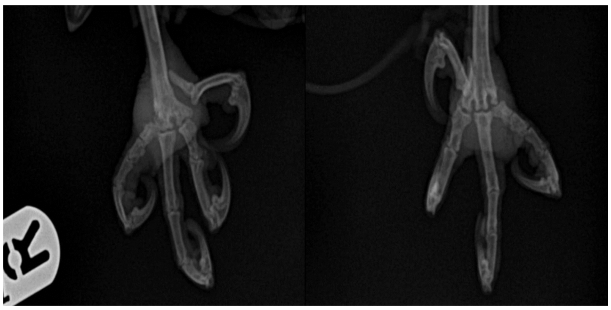

Fig 3. Radiographic findings identified soft tissue swelling and bone lysis.

plantar surface of the foot. Radiographic findings also identified bone lyses with soft tissue swelling in the foot (Fig 3). A definite diagnosis was made as stage III bumble foot after multidisciplinary approach of the patient. Bacterial culture was performed, and concurrently antibiotic susceptibility testing is determined using wound site exudates specimen. Bacterial isolates were identified as *Staphylococcus aureus,* known

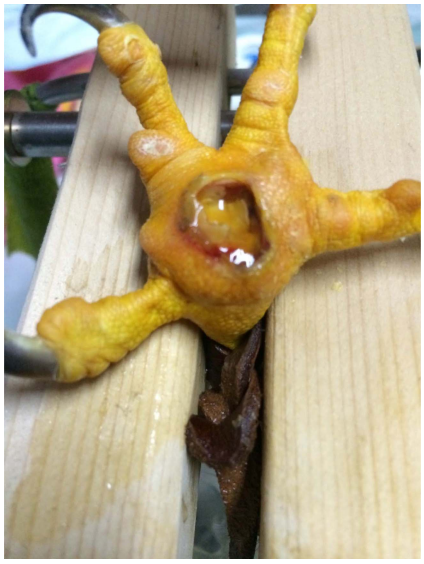

Fig 4. Wound site after resection of necrosis tissue (left foot).

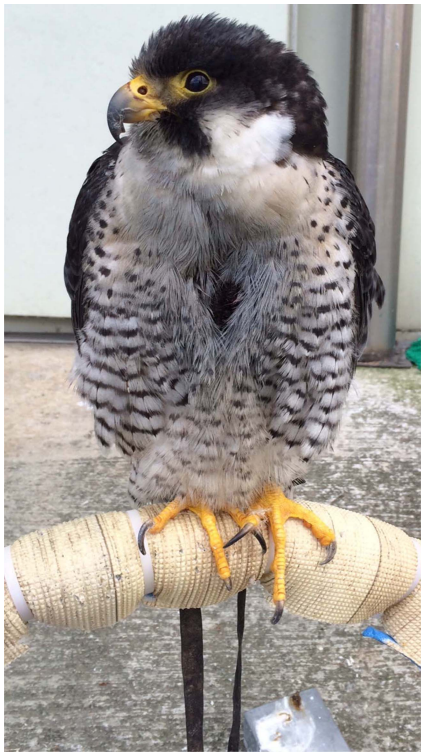

Fig 5. Various sizes of disinfected perch were provided to prevent recurrence of the disease.

normal skin flora.

After initial surgical debridement of the proliferative, crusty lesions, the wound had to be left open to secondary healing by granulation due to lack of sufficient healthy adjacent skin. Surgical incision of the lesion and necrotized tissue removal were performed (Fig 4). Drainage, lavage and bandage were applied every day. Before every bandage changing, 10% povidone iodine solution washing was used to disinfect wound site and topical mupirocin ointment application was performed for several weeks, serving to both protect the tissue and provide local broad-spectrum antibiotic delivery. A spe-

Fig 6. Wound site was completely healed except remaining scars.

cial lightweight, flexible ball bandage was applied and changed every two days under slight sedation. A wad of gauze sponges were placed in the foot and close the toes around it uniformly. Patient's foot was wrapped with self-adhering elastic wrap such as Coban. The bandaging progressed around and around the foot and ankle as though forming a ball. Doughnut shaped pad was attached on bottom of the ball bandage of the foot to reduce weight bearing and supporting posture. Systemic aminoglycoside, amikacin (IM, 20 mg/kg) was selected according to the result of antibiotic susceptibility testing. After removal of bandage, various sizes of disinfected perch were provided to prevent the recurrence of pododermatitis condition (Fig 5). After three weeks of treatment, the wound site was completely healed except remaining scar tissue (Fig 6). Unfortunately the weakness of fourth digits was remained as permanent injury. The goshawk returned to nature after eight weeks after treatment.

Discussion

There is little information about occurrence of bumble foot in free-living raptors. It is assumed that they might suffer from foot infections, but the incidence is considered to be lower than in captive or domestic birds. Probably this is because wild birds are more active, have more control over landing impact and have a choice of perching surfaces with a variety of textures (6). Therefore the time from admission to development and duration of clinical problems by pododermatitis are highly variable for the clinical practice of veterinary clinicians in wildlife rescue center. This was partly due to birds that were considered non-releasable could spent very long periods in captivity at the center before they died. Captive raptors might be euthanized or were transferred to another institution, however, the bumble foot frequently recurred and a few birds were released before their foot lesions were completely healed.

In this case, we basically followed the recommendations of a combined therapy with systemic antibiotic therapy, topical antibiotic application and frequent disinfectant washing, surgical debridement, and protective foot casting. In case of secondary healing support, using topical mupirocin ointment application for direct antibiotic delivery has the advantage of not only sealing the wound from further contamination but also preventing granulation tissue from overgrowth and allowing new layers of epithelium to grow underneath and gradually close the wound by additional pain management. Bacterial infections cause tissue damage, but it is the host response that subsequently triggers a cascade of destructive inflammation. Therefore, one of the chronic granulomatous diseases such as bumble foot in birds respond best to long-term combination of antibiotic therapy and surgical debridement as this report described. It is known that systemic antibiotic therapy alone often fails to address the disease, owing to the intracellular location of the pathogen within the granuloma and the avascular nature of the lesion itself (4).

Wound care for raptor is very similar to that of mammals, except that birds are very sensitive to steroids. Therefore, the topical or parenteral steroids already were avoided by veterinarians of wildlife rescue practice in this case. For the appropriate and prompt bandaging procedure for the birds, the veterinary practitioner in wildlife medicine needs to be prepared with the variety of pieces of bandage due to the specific anatomy of bird. Typical bandage materials need to be cut smaller. Ball or snowshoe bandages are used to protect the plantar surface of the foot and evenly distribute the bird's weight in cases of ulcerative pododermatitis, or bumble foot. The interdigitating bandage is wrapped around the entire foot between toes. The ball bandage is more ball-shaped, and the snowshoe bandage is flatter.

The treatment success in this case was undoubtedly due to systemic and topical antimicrobial combination wound management and the constant bandage changes. Changing doughnut shaped new feet pads for ball bandage every time resulted in constantly varying and supporting pressure distribution on the plantar surface alleviating pain. The advantage of using this multidisciplinary approach reported here is just only one case, and will have to be assessed in further cases for preparing measures of threatened species protecting.

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북방 참매에서 발생한 Bumble foot의 성공적인 치료 증례

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요 약 : 2년 령 수컷 북방 참매 (대한민국 천연기념물 323-1호 지정)가 지간부위 통증, 부종 및 파행을 주호소로 내원하였다. 북방 참매는 지역 농가에서 구조되어 2주정도 자가 치료를 하였으나 상태가 악화되어 본원에 내원하였다. 신체검사 상 양쪽 발에서 발바닥 지간염과 4번째 발가락의 허약 증상을 보였다. 방사선학적 검사에서 발바닥 연부조직의 부종성 병변과 뼈의 융해 소견이 관찰되었으며, 분야별 복합적인 접근을 토대로 3기 bumble foot으로 진단되었다. 창상 부위의 삼출물 배양을 실시하는 동시에 항생제 감수성 검사를 수행하였다. 배양 결과 분리 균주는 S*taphylococcus aureus*로 확인되었으며 Amikacin이 감수성이 있는 것으로 확인되었다. 우선적으로 병변 부위를 절제하여 괴사된 부분을 제거한 후 세척하고 배액한 후 국소적으로 광범위 항생제인 뮤피로신 연고제를 도포한 다음 볼붕대법으로 유지 및 소독, 배액을 실시하였다. 3주 동안의 집중적인 치료를 통해 상처 부위는 완전히 치유되었지만, 후유증으로 양쪽 발 4번째 발가락의 지지력이 약해졌다. 치료 시작 8주 후 북방 참매는 자연으로 방사되었다.

주요어 : *Accipiter gentilis*, bumble foot, 북방 참매, 지간염