Ffion Lloyd, anaesthesia intern at the Small Animal Teaching Hospital, University of Liverpool, invites Companion readers to consider the causes of peri-orbital swelling in a cat she saw while an intern at Northwest Veterinary Specialists.

Case presentation
A 2-year-old female neutered domestic shorthair presented to the primary veterinary surgeon with acute onset peri-orbital swelling and a small cutaneous wound on the right upper eyelid; injuries were presumed to be due to fighting with another cat. There was no associated injury to the right eye. Symptomatic treatment was initiated with a subcutaneous injection of a long-acting antimicrobial (cefovecin) and non-steroidal anti-inflammatory (meloxicam) medication. The cat re-presented on the following two consecutive days with anorexia and pyrexia (rectal temperature of 40°C) and on both occasions was treated with injections of buprenorphine and amoxicillin/clavulanic acid. The following 48 hours saw a lack of any appreciable clinical improvement. In addition, subcutaneous oedema of the head and left lateral cervical region had developed. A bacteriology swab was taken from the open area of the wound and submitted for culture and sensitivity testing. A biochemistry profile was unremarkable apart from raised glucose (11.8 mmol/l) which was presumed to be due to stress. Haematology was not performed. An FIV and FeLV patient-side ELISA test was negative. The cat did have free access outdoors and frequently hunted although no previous instances of fighting were reported.

The cat was hospitalized for intravenous fluid therapy, further antimicrobials (marbofloxacin and metronidazole) and furosemide, in an attempt to reduce the oedema. There was no significant clinical improvement with this treatment protocol and severe progression of the facial swelling was evident. The cat was subsequently referred for further assessment, 7-days following initial presentation.

Physical examination
On presentation at the referral centre, the cat was dull but responsive, with a normal body condition score of 5/9. Rectal temperature was 40°C. Thoracic auscultation was unremarkable with a heart rate of 160 beats per minute and a respiratory rate of 24 breaths per minute. There was marked facial swelling, predominantly of the left side, extending ventrally and dorsally to the thoracic region. A moderate serosanguinous facial discharge from the left-sided oedematous region was present, along with bilateral blepharospasm. Clipping of the facial hair under sedation revealed a focal area of skin necrosis measuring approximately 4 x 2 cm located at the lateral palpebral fissure of the right eye.

Create a problem list for this patient
- Marked subcutaneous facial oedema with associated serosanguinous discharge
- Focal necrosis of peri-orbital skin
- Bilateral blepharospasm
- Persistent pyrexia
- Anorexia

Consider differential diagnoses for this patient
The most pertinent clinical sign was the degree of facial oedema which was progressive in extent and severity. The anorexia was presumed to be secondary to the pain and discomfort associated with the facial pathology (as well as the pyrexia), as it had developed in conjunction with its appearance. Pyrexia in association with the other clinical signs could be due to pain, sterile inflammation or systemic viral/bacterial infection. Blepharospasm was suspected to be due to the swelling and discomfort of adjacent tissues; no ocular pathology was noted.

The most likely cause of the facial pathology was considered to be a traumatic injury, such as a cat bite or other penetrating wound, particularly given the initial appearance of a small, focal wound at the primary care practice. A foreign body resulting from a penetrating wound was also possible. Other differentials pertaining to the marked oedema included an allergic response, lymphoedema due to an obstructive mass lesion, neoplasia and immune-mediated disease.

Secondary infection was suspected in this cat, due to the apparent lack of response to treatment and the progressive nature of the clinical presentation. Results for bacterial culture were pending at this point. Viral infection was considered possible but less likely.

How would you proceed with this case?
A computed tomography (CT) scan of the head and neck region was performed under sedation (medetomidine 0.01 mg/kg and methadone 0.3 mg/kg i.v.) to gain additional information about the soft
tissues involved in the swelling and oedema and to search for any foreign bodies that may be present. The scan confirmed extensive facial and cervical oedema and cellulitis, regional lymphadenopathy (Figure 1) and a small pocket of fluid located caudal to the left eye (Figure 2). Pre- and post-contrast images did not indicate the presence of a foreign body, although a foreign body of organic nature could not be completely excluded. As CT exhibits poor sensitivity for this type of material. The lymphadenopathy was thought to be reactive (secondary) in nature, but a primary cause of lymphoma could not be ruled out at this stage.

While under sedation, debridement of necrotic skin from the left lateral side of the face was performed, followed by lavage with sterile saline. A soft absorptive dressing was applied and stapled to cover the left eye and debrided area. The palpebral fissure was severely reduced in size due to extensive peri-orbital swelling, preventing full visualization of the cornea.

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Provision of adequate analgesia was a significant concern in this case as the facial injuries were extensive and clearly impacting welfare. An analgesia plan consisting of methadone 0.3 mg/kg i.v. q4h and a constant rate infusion of ketamine (0.3 mg/kg/h i.v.) was initiated. In addition, antimicrobial therapy was continued with marbofloxacin (2 mg/kg i.v. q24h) and metronidazole (10 mg/kg i.v. q12h). Intravenous fluid therapy with Hartmann’s solution was administered at maintenance rate (2 ml/kg/h). The cat was regularly assessed for pain; appetite was reduced but stable. Placement of an oesophagostomy feeding tube was considered if appetite failed to improve.

On day 8, 24-hours following referral, bacterial culture results from the facial discharge were received from the primary care practice. These confirmed a growth of *Staphylococcus aureus* with a wide sensitivity profile, including penicillin, ampicillin, potentiated amoxicillin, cephalaxin, cefovecin, doxycycline, clindamycin, lincomycin, enrofloxacin, trimethoprim/sulphonamide and marbofloxacin.

How do the culture and sensitivity results impact on the management of the case?

The lack of apparent improvement despite appropriate antibiotic therapy at the primary care practice as well as at the referral centre, but the progression of the facial wounds and the development of severe cellulitis was contrary to the reported sensitivity of the cultured infection. In addition, multiple raised erythematous lesions measuring approximately 3 mm had developed and were noted on the dorsal aspect of both antebrachii when the areas were clipped for intravenous catheter placement on day 9. The facial dressing was removed under sedation (medetomidine 0.005 mg/kg i.v.), but there had been no significant improvement in the appearance of the site.

The lack of response to medical therapy, coupled with the development of additional skin lesions, raised the suspicion of systemic immune-mediated disease in this patient. Punch biopsies of the antebrachial lesions were collected under sedation and submitted for histopathological evaluation. A fine-needle aspirate was performed of the facial soft tissue swelling which yielded a serosanguinous discharge consistent with peripheral blood when examined cytologically. The treatment protocol was continued while awaiting biopsy results.
Histopathology and blood results

A haematology blood panel was performed (Table 1) revealing a mild anaemia and neutropaenia. The remainder of the haematology panel was within normal limits. A manual PCV was 24%. The anaemia was likely due to intermittent blood loss from the facial wounds, as well as the presence of chronic disease (day 10 following initial presentation at the primary care practice). A blood smear showed a moderate population of microcytic, hypochromic red blood cells, indicative of iron deficiency from chronic blood loss. An aggregate reticulocyte count performed from the smear was consistent with mild regeneration (58 x 10^9/l). The low neutrophil count was presumed to be due to excessive consumption, given the presence of infection; a blood smear confirmed the neutropenia with a left band shift, which was deemed supportive of a consumptive aetiology.

Histopathology from the antebrachial lesions confirmed the presence of a moderate necrotising, neutrophilic and eosinophilic folliculitis with intracytoplasmic eosinophilic inclusion bodies with moderate ulceration. This specific presentation was pathognomonic for a poxvirus infection.

Revised management protocol given diagnosis of poxvirus infection

Given the contagious and zoonotic potential of poxvirus infection, the cat was placed in a dedicated isolation ward. Antibiotic therapy was continued with marbofloxacin and metronidazole (both at previously stated dose rates). Analgesia was provided with gabapentin (50 mg orally q8h), as well as the continuation of methadone and ketamine constant rate infusion at the previously stated doses. Care of the facial wounds and associated cellulitis was maintained with daily dressing changes and gentle cleaning under sedation and lubrication of both eyes. Small visible improvements in swelling reduction and overall demeanour were noted, as well as significant increases in appetite (days 10–12).

Given the chronic oedema of the head and cervical regions, topical medical leech therapy was initiated on day 12 under sedation (Figure 3), in an attempt to reduce venous congestion and improve blood flow to the area. Chlorphenamine was administered prior to leech application at a total dose of 2 mg intravenously, and continued every 8 hours, to reduce the risk of anaphylactic reaction; a known complication of leech therapy. A total of three separate leech applications were performed on consecutive days, along with continuation of analgesia, antibiosis and intravenous fluid therapy. Dressing changes were performed at the time of each leech application.

By day 15 a noticeable reduction in swelling was apparent, accompanied by the presence of healthy granulation tissue over the left temporal region and overall decreased exudate. The ketamine constant rate infusion was discontinued at this point and methadone was substituted for buprenorphine at a dose of 0.02 mg/kg i.v. q8h. Intravenous antimicrobials were continued over the following 8 days.

Further management and outcome

Maintenance of a consistently good appetite facilitated a change to exclusively oral medications on day 23 and discontinuation of intravenous fluid therapy, coinciding with further significant improvements in facial appearance and demeanour. Residual skin necrosis was visible on the left side of the cervical region, as well as the ventral mandible and sternum – these areas were debrided under sedation on day 27, exposing healthy granulation tissue underneath. The cat was discharged home on day 33, following further debridement and lavage of remaining necrotic areas on the face and sternum.

Surgical treatment was performed under general anaesthesia on day 41, which included a local advancement flap from the right side of the neck to

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Table 1: Haematology results (abnormal results in bold).
close the granulating defects remaining on the left side of the neck and face. A 5 mm area was left open to heal by secondary intention ventral to the left eyelid, due to insufficient skin availability. The cat recovered well from surgery and the flap remained viable.

Final discharge home occurred on day 43, along with oral medications including potentiated amoxicillin (total dose of 50 mg q12h, prescribed due to its availability in a liquid form which was preferred by the owner), meloxicam (0.05 mg/kg q24h), and gabapentin (25 mg total dose q8h). The owner reported a consistently bright demeanour, good appetite and satisfactory progress of the surgical flap 5-days later (Figure 4). Tertiary referral was sought for ophthalmology assessment, due to residual conjunctival hyperemia and corneal ulceration, apparent once the peri-orbital swelling had reduced.

**Discussion**

This case presented a challenge in terms of attainment of a true diagnosis and the chronic nature of the pathology and its progression. At each step, a logical assessment of the available information and prioritization of the patient’s comfort and welfare facilitated gradual and cumulative improvements.

Poxvirus is a relatively rare diagnosis in domestic cats, but its presence in this case readily explains the pathology and chronic disease course witnessed. Poxviruses are endemic pathogens in Europe, that frequently result in localized skin lesions, and less commonly in systemic disease in infected cats. Infection is usually due to contact with wild rodents, which act as reservoir hosts for the virus. Initial infection with poxvirus usually presents as a focal wound that may be mistaken for a bite or sting usually on the head or forelimbs, which represents the original site of contact with the rodent host, the focal wound above the eye apparent on initial presentation is likely to represent this. Secondary skin lesions develop due to a cell-associated viraemia.

An unusual presentation of poxvirus infection is exhibited by this case, as most infected adult felines present only with focal skin lesions. Severe systemic lesions and illness are usually only seen in immunocompromised or young individuals, although mild and transient pyrexia, depression and diarrhoea have been documented in some cases. Evidence of immunosuppression was unable to be demonstrated in this cat. There are a handful of reports in the literature of similarities to the skin and soft tissue pathology exhibited by this patient, including a cat with gross swelling of a forelimb, skin necrosis and widespread erythema in a confirmed poxvirus infection. Additionally, the specific feature of facial cellulitis is mirrored in a human child with poxvirus infection contracted from domestic cats (despite cat-to-human transmission being rare).

To further strengthen the diagnosis of poxvirus infection, additional testing could have been considered; positive immunohistochemistry, electron microscopy, PCR analysis, or demonstration of a rising antibody titre would have supported the histopathological diagnosis. These supportive tests were not carried out in this case due to financial restrictions.

Utilization of relatively novel and infrequently used medical leech therapy was based on an evaluation of the persistent pathology; excessive oedema and reduced blood flow to the facial and cervical soft tissues would potentially benefit from the anti-coagulant and fluid-consumptive properties of medical leeches. The application of leeches is a long-established treatment in human medicine, utilized for the anaehgesic, anti-inflammatory and anticoagulant effects of leech saliva, which contains a variety of bioactive molecules. These molecules exert several clinical effects, including platelet inhibition, thrombin regulation and vasodilation, causes prolonged bleeding from and promotes increased blood flow to the site of application. In this particular case, the removal of excess blood from the congested facial tissue by the leeches was beneficial, as the resulting reduction in capillary filling pressure allowed for reperfusion of the arterial capillary beds, an attractive theoretical prospect that was likely to lead to quicker recovery times and tissue healing for the cat.

Reports of the therapeutic use of leeches in veterinary patients are limited, but are described singularly in cats for the treatment of polycythaemia vera and venous congestion in a forelimb caused by a constrictive injury. This case consequently presents an additional indication for this novel treatment modality.