RAPTOR MEDICINE: THE MIDDLE EAST EXPERIENCE.

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Most wild raptors are presented to veterinarians with traumatic injuries or in a severely debilitated condition. The aim is to provide veterinary care with a view to rehabilitation to the wild. Falconry is an ancient sport dating back to 2000 BC. Falconry involves the use of a trained raptor to hunt natural quarry or prey in the wild state. It has an ancient history and although practiced in Australia, some falconry related management tools are applied to captive and injured raptors. One of the issues with raptor rehabilitation is assessing long term viability or success of rehabilitated raptors. Experience gained working with trained falconry birds in relation to response to diagnosis ,intensive care treatment, prognosis and the potential of return to full flight capabilities, can be of benefit to veterinarians dealing with injured wild raptors.

This presentation will discuss points which should guide veterinarians on how to to enhance the welfare of raptors in their care either in zoo collections or undergoing treatment with a view for release to the wild.

Stress reduction

Most raptors may appear calm when initially presented for treatment but care must be taken to differentiate shock from calmness, especially in the more nervous species like sparrowhawks and goshawks. Midazolam sedation may be required as the potential for self-inflicted trauma is very high. The basic dog and cat cages are not suitable for nervous raptors. Keeping the cage dark and warm reduces stress and the practice of hooding a bird is safer for the birds than leaving it in a cage where it may damage feathers. Flying requires feathers is good condition and no raptor should be released to the wild if feathers are broken to the extent that flying is compromised. A tail guard should be applied to hospitalized raptors to prevent breakages and soiling of tail feathers. Imping should be performed prior to exercise training for fitness. Handling must be kept to a minimum and the use of hidden cameras for frequent discrete observations is advised. Birds have a higher metabolic rate than mammals. The smaller the bird the higher the rate.This difference in energy requirements is important during the intensive care period (Redig, 1996).

Triage

In raptors intended for release to the wild a full return to hunting capability is essential. A low proportion of injured raptors presented for treatment is released. Captive disabled raptors can be maintained for breeding or educational purposes. Post –traumatic assessment of falconry trained birds is a useful aid to assessing the prognosis of a variety of injuries. Shoulder dislocations, fractured coracoids and humeral fractures carry a high risk of permanent disability and carry a poor prognosis. In many fractures stability is enchanced by using intramedullary pin fixation with a tie in technique (Redig, 1986).The goals of fracture fixation is to attempt to establish no rotational or longitudinal movement. Long term bandaging may damage muscles and cause disabilityand should be avoided (Redig and Orosz, 2011). The prognosis for birds presented with fractured limbs is dependent on the species, the site of fracture, the duration of the injury, presence of infection and the degree

of soft tissue damage and ischaemia around the fracture site. Birds with fractures may also have peripheral nerve damage which may be mis-diagnosed until at later examination. Intraocular haemorrhages may lead to retinal issues at a later date. Falconry birds adapt well with one eye missing but wild raptors should have full vision otherwise they are not suitable for release to the wild.

Raptor rehabilitation may be a long process starting with the initial surgery, intensive care and then a full recovery of function with minimal loss of fitness. Physical therapy for raptor injuries is well described and a regular exercise program is essential to allow a full return to function (Martin et al., 1993). Fitness training in captive falcons is intense and fitness to hunt should be a pre- requisite for release. The fact that a raptor can fly does not mean that it can hunt and sustain itself. Releasing an unfit bird unable to hunt could be interpreted as abandonment and is unethical.

On presentation for veterinary examination all patients should be blood sampled for a minimum blood profile of packed cell volume, total protein, glucose, a white blood cell estimate and uric acid levels. Uric acid is insoluble and dehydration may result in uricaemia and renal damage or gout. In falconry birds, as in critically injured wild raptors, gout is commonly seen at necropsy. Blood gas analysis using the Istat portable chemical analyser (Abbot) is useful in assessing critical cases. Extreme blood pH values and electrolytes suggest a poor prognosis indicating complicated intensive care (McKinney, 2003). Critically ill birds should not be anaesthetized until stabilized with fluid therapy.

Raptors with leg injuries often develop contra-lateral bumblefoot and care must be taken to protect the feet during hospitalization. If a bird cannot be returned to wild and hunt it should be euthanased.

Intensive care; fluid therapy and nutrition

Many raptors are presented in a weakened debilitated condition. Birds with sepsis and trauma have much higher energy requirements than normal birds and this will influence their treatment during intensive care. Smaller species and juveniles need more frequent feeding as their metabolic rate is higher(Chitty, 2008). Starving birds often cannot digest a solid diet and should be given easily digested preparation (Redig, 1984). Re-feeding syndrome is seen in critically ill, catabolic patients of all species and is often reported in reptiles. When overfed they may develop hypokalaemia and hypophosphataemia (Donogue ,2006). Care must be taken with feeding during the initial intensive care period. Initially the smaller raptor species are tube fed electrolytes then blended quail with electrolytes ,if crop motility is adequate. Metaclopramide is useful to reduce risk of ileus and crop stasis. Raptors in poor condition often develop sour crop if fed prematurely. The crop fails to pass the meat then subsequent bacterial proliferation and endotoxaemia leads to rapid death. Ileus is often seen with severe dehydration and is a life-threatening issue. Crop stasis should be considered an emergency requiring crop emptying, antibiotics and flushing with 0.1% chlorhexidine in warm (Muller, 2009). Hydration is critical when tube feeding (Quesenberry and Hillyer, 1994). Debilitated raptors may also have trichomoniasis, aspergillosis and other concurrent diseases which may be stress induced or trauma related (Pizzi , 2008). Many birds are too frightened to feed in care and may not recognize the food item. Wild falcons may only recognize live food and require assist feeding until they eat independently. Appetite stimulation in raptors is based on the use of thiamine, anabolic steroids and lactobacillus cultures for the pharmacological management of anorexia in raptors and is of benefit in nursing weak patients (Suarez ,1993).

Fluid therapy

Fluid therapy should be monitored carefully in raptors with anaemia and hypoproteinaemia but is a critical part of the treatment in sick raptors (Huckabee, 2000). A rapid bolus of crystalloid (10ml/kg iv) given over one minute (Redig,1996) is useful but after IV only ¼ of the dose remains after half an hour in the vascular compartment so the intravenous bolus has a transient effect and needs to be continuous (Dorrestein ,2000). In severe acidosis if bicarbonate levels are low sodium bicarbonate can be given 1mmol/kg every 30 minutes to a maximum of 4mmol/kg/day (Hernandez and Aguilar,1994)

Some raptors in catabolic states have hyperkalaemia . Intravenous dextrose leads to insulin release from the pancreas which helps shift potassium from the extracellular to the intracellular compartment. This may exasperate any existing hypokalaemia highlighting the benefits of blood electrolyte analysis. (Dorrestein, 2000). 5% dextrose solution is an excellent oral rehydration treatment and is rapidly absorbed from the intestines without creating an influx of fluid into the gut which would increase clinical dehydration (Pizzi, 2008). Fluids containing glucose or dextrose should not be administered by subcutaneous injection as this may act as a focus for bacterial growth. Clinical signs of rehydration are weight gain ,return to normal skin tone and increased urinary output. Oral fluids are suitable for mild dehydration in the absence of Ileus otherwise intravenous or intraosseous fluids are indicated to expand the circulatory volume and perfuse the kidneys. Once fluid deficit is replaced and the bird is eating normally for 2-3 days the maintenance hydration therapy may be discontinued.

Analgesia

Wild raptors and non-trained falconry birds, tend to mask signs of pain. No single drug can be used to treat all pain. It is very difficult to determine if analgesia is effective in birds (Redig and Orosz ,2011). Despite the shortcomings, analgesia should be a primary concern in trauma cases. Very few pharmacokinetic studies in raptors have been carried out and plasma levels may not always correlate with analgesia. Meloxicam and butorphanol are commonly used in facilities treating injured raptors. There is considerable species variation in the absorbtion and excretion of meloxicam and species dependent studies would be useful. In Red-tailed hawks (*Buteo jamaicensis*) the elimination half life was found to be very short suggesting once daily dosing is of questionable efficacy (Lacasse et al.,2008)

In quail, doses of 2 mg/kg administered by intramuscular injection appeared not to have an adverse renal reaction but localized muscle damage post injection was noted. The injection did induce muscle necrosis so repeated intramuscular administration of meloxicam to quail may be contraindicated (Sinclair et al., 2012). Injections are avoided in birds being used for falconry and oral therapy is advised. In Hispaniolan parrots(*Amazona ventralis*) meloxicam administered at 1.0 mg/kg im every 12 hours relieved arthritic pain with no evidence of side effects (Cole et al., 2009). Further research is required to acertain the optimal dosing in raptors. Meloxicam in raptors should be used in parallel with rehydration to avoid renal issues. Anything which affects the renal blood flow and glomerular filtration eg dehydration, haemorrhage and shock may impact renal function.

Recent butorphanol research in red -tailed hawks(*Buteo jamaicensis*) demonstrated a half life of one hour (Riggs et al., 2008) suggesting that frequent dosing is required for birds compared with mammals. Butorphanol post- operatively, administered prior to recovery and maintained for 2-4 days is advised but may complicate isoflurane recovery. Many trauma cases may be receiving suboptimal analgesic therapy.

Control of infection

Anitibiotics and antifungals are indicated when dealing with stressed, debilitated raptors. Highly nervous species are susceptible to aspergillosis (Di Somma et al., 2007) and preventative therapy with itraconazole is advised. In many patients presented to the avian veterinarian there are a series of issues present. Balancing the treatment of each problem to produce a good outcome for the patient is the 'art' of veterinary science. Welfare of the patient is a priority and euthanasia should be considered if the optimal care cannot be provided or the outcome of the treatment is highly uncertain. Raptor medicine can be challenging but in selected cases very rewarding. More research is needed into avian analgesia and post-release monitoring of treated raptors but the future is exciting and veterinary input is essential.

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