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Surgical Interventions and its Management in Columbiformes

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Abstract: ***The present study was undertaken with the objective to study the incidence and surgicalmanagement of different surgical conditions including fracture and injuries in rescued columbiformes during period from 2017 to 2019. Out of twenty two soft tissue injury cases, 15 (68.18%) had wound on wings and 7 (32.31 %) had wound on the head. In fracture cases, 6 (54.54 %) had tibiotarsal bone fracture, 3 (27.27%) had wing fracture, 2(18.18 %) had dislocation of joint. The cases presented were more with wing wounds and follows head wounds, tibiotarsal bone fracture. After stabilizing the patient, in columbiformes requiring surgical intervention, all were done under the general anaesthesia using mixture of ketamine @ 30 mg/kg and diazepam @ 1 mg/kg intramuscularly along with butorphanol 0.1 mg/kg body weight as a peri-operative analgesia. The intra-medullary pinning was done for the repair of tibiotarsal bone fracture in columbiformes using k-wire. In injured birds, regular cleaning and anti-septic dressing of the wound was done with warm normal saline and 5% povidone iodine solution. All injured birds were treated with Enrofloxacin @ 10 mg/kg, Gentamicin @ 3mg/kg body weight and Meloxicam @ 0.2mg/kg intramuscularly. 33 columbiformes were completely recovered and got good flying acuity were released in the environment at different places***

Keywords: Wound, Fracture, Ketamine, Columbiformes

1. Introduction

Aves are land vertebrates that are characterized by presence of wings and feathers covering all over body and capable of flight. Feathers are an important structure for birds to fly. Subphylum aves successfully combine bipedal traits with flight (Hildebrand, 1984). With evolution aves have been adapted changes in the body shape, weight and presence of air sacs attributing to their aerodynamics and flight. Streamline nature of the body and wings accounts for the upward and downward movement against wind speed and direction. This underlies the making of plane. Pigeons are members of the order *Columbiformes* that includes pigeons and doves. They (*Columba domestica*) have resulted from domestication of *Columba livia*. In this order, there are approximately 300 members, arbitrarily divided by body size into the pigeons and the smaller doves. Pigeons and doves inhabit every land area outside the Arctic and Antarctic, and display a wide range of variation in their ecological adaptations, although their relatively conserved anatomy and morphology has obscured phylogenetic relationships within the family (Andre *et al*., 2016). The pigeon body consists of caput (head), collar (neck), truncus (body), and cauda (tail). On their beak the skin thickening called cerome functions to close nares externa while flying. A pair of anterior extremity is called alae (wings) that folded like "Z" if they are on the ground. The legs have strong thigh muscles, with the lower parts is scaly and have claws. Male Pigeon collar is shinier than the female (Jasin, 1989). The avian skeleton is much lighter than that of mammals, in fact, a large part of their bones contain air (pneumatic bones) instead of bone marrow. These cavities are communicated with the respiratory system and act to decrease weight, so flying is easier. Bones which are not pneumatised include most vertebrae, and those distal to the humerus and pelvis. Avian bones are richer in inorganic substances (calcium phosphate). Long bones have a very thin cortex and the medullary cavity contains a network of trabeculae, which increases the strength of the bone. These factors mean that avian bones are harder, but at the same time more fragile and less elastic than those of mammals and more prone to fracture and injuries. Different types of the injuries are found in pigeons. The most common injuries include wing injuries, wound on head, wing lacerations and abrasions, broken feathers, fractures of the tibiotarsus. Successful repair depends upon understanding of fracture, wound management and healing, anatomical, physiological and behavioural characteristics of Columbiformes.

2. Materials and Methods

The present clinical study entitled "Surgical interventions and their management in columbiformes" was carried out on injured columbiformes which were presented at the Charlie's Animal Rescue Centre and other Private Veterinary Clinics in Bengaluru for a period from 2017 to 2019.

1) Preoperative Stabilization

a) Body temperature regulation

All the birds were kept preoperatively on the heating pads continuously to maintain the body temperature and to prevent the hypothermia for stabilization. After surgery, the birds were shifted to the pre-heated room using room heaters till the complete recovery of the birds

b) Emergency drug administration

In cases of the shock and severe trauma, all the birds were stabilized by administering warmed Ringers lactate (RL) solution and dextrose normal saline (DNS) solution @ 10-30 ml/ kg /hour intravenous route. Inj. dexamethasone was administered @ 2 mg/kg along with

long acting Enrofloxacin@ 15 mg/kg and Inj. meloxicam was administered as a NSAID @ 0.1 mg/ kg.

c) Anaesthesia

After stabilizing the patient, in case of all the birds for any surgical intervention butorphanol was administered @ 0.1 mg/ kg, IM to provide peri-operative analgesia. Surgical Intervention was done under the general anaesthesia using mixture of Inj. ketamine @ 30 mg/kg and Inj. diazepam @ 1 mg/kg intramuscularly.

2) Operative Procedure

Feather plucking

In case of all the wounds involving the skin, minimum plucking of the feathers was done. The feathers present on the edges of the wound were only removed by gentle plucking to allow more thorough cleansing and to prevent feather matting during the healing process.

Wound lavage

The wound lavage was done using warm sterile normal saline with 0.5% povidone-iodine solution to remove debris, reduce bacterial load and rehydrate soft tissues.

Wound suturing

The simple wounds were closed by simple interrupted sutures using vicryl 3-0 absorbable suture material. Wounds are sutured in a single layer including both muscle and skin together.

Wound debridement

Wound debridement was done using Bard Parker blade No.14 to remove as much of the devitalized and necrotic tissue as possible; until viable, vascularized tissue was recognized.

Infected wound

Long-standing, infected and more complicated wounds were managed as open wounds and allowed to heal by second intention.

Head injury

In case of the head injury with skin and tissue loss, the wound was managed as open wound and allowed to heal by second intention.

Crop fistula and lacerations

The crop was sutured with a double layer of inversion sutures using vicryl 3-0 and the skin was closed with simple interrupted sutures using monofilament polyamide 3-0.

Figure 1: Wound lavage

Figure 2: Suturing of the wound

Figure 3: Infected punctured wound on the wing in pigeon

Figure 4: Dressed infected punctured wound in a pigeon

Figure 5: Infected wound on the wing of a pigeon

Figure 6: Dressing of wound on the wing a of pigeon

Figure 7: Infected wound on the head

Figure 8: Dressing the infected wound with povidone iodine

Tibiotarsus bone fracture

In case of the simple fractures involving tibiotarsus bone, retrograde intra-medullary pinning was done using small sized pin or K-wire (1.2mm) as per the size of the bone. The wound was then opposed by simple interrupted sutures using vicryl 3-0 absorbable suture material.

Wing amputation

In case of the irreparable injuries, necrosis, severe infection, tissue loss and old fracture, amputation of the wing was done as a salvage procedure to save the life of the bird. The amputation was performed at the level of the mid shaft of the humerus. The incision was made near the elbow joint, and all the bleeding vessels were ligated. The humerus was cut from the midshaft using bone cutter and the wound was closed by simple interrupted sutures using vicryl 3-0 absorbable suture material.

Foot and toes injury

The injuries involving the foot were bandaged with an interdigitating bandage that leaves the toes exposed for perching. While in case of the fractures and dislocations of the toesbandage was applied.

Post-operative care

In case of the birds with fractures were treated with Inj. Gentamycin @ 3 mg/kg IM for seven days and tablets calcium gluconate as a supplements. While rest of all the birds were treatedwith inj. Enrofloxacin @ 10 mg/kg intramuscularly for five days and Inj. Meloxicam was used as a NSAID @ 0.2 mg/kg intramuscularly for three days. To reduce the stress, multivitamin drops were given orally. In all the cases, regular cleansing and anti-septic dressing of the wound was done on every alternate day with warm normal saline, 5% povidone iodine solution and chlorhexidine spray. The bandage was applied using self-adherent wrap for ten days to protect the wound from self-mutilation.

Figure 9: Fractured left tibiotarsal bone in pigeon

Figure 10: Simple complete fracture of the left tibiotarsal bone in pigeon

Figure 11: Aseptically prepared surgical site

Figure 12: Insertion of K wire by retrograde technique at the site

Figure 13: Closure of skin

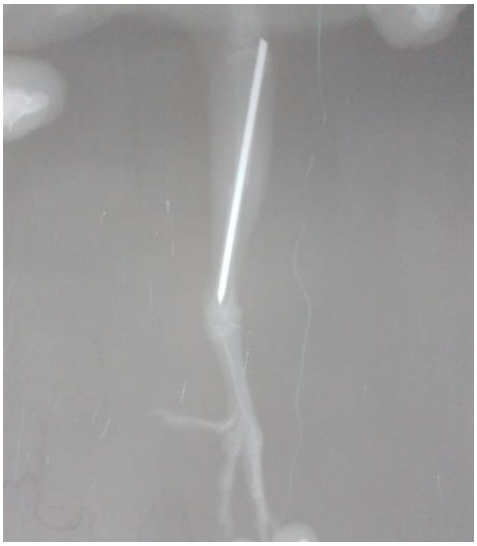

Figure 14: Post-operative radiograph showing k wire in proper position

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3. Results and Discussion

A detailed study was undertaken in 33 injured columbiformes, which were presented at the Charlie's Animal Rescue Centre and other private veterinary clinics in Bengaluru from 2017 to 2019. In all cases, the incidences of different surgical conditions were recorded and their surgical management documented. Out of twenty two soft tissue injury cases, 15 (68.18%) had wound on wings and 7 (32.31 %) had wound on the head. In fracture cases, 6 (54.54 %) had tibiotarsal bone fracture, 3 (27.27%) had wing fracture, 2(18.18 %) had dislocation of joint. Similarly, the incidence of injuries was more in blue rock pigeons (68%) observed by Tiwari *et al*., (2011). The goal of treatment is patient survival first and then assessing traumatized tissue. Traumatic injuries are common in birds. The initial protocol for injured birds includes control of haemorrhage, oxygenation, heat support, analgesics and parenteral antibiotics. External haemorrhage should be stopped immediately (Bowles *et al*., 2007). Wound contamination and secondary bacterial infection were prevented by wound lavage using normal saline with 0.5% povidone-iodine solution and antiseptic wound dressing. In all the cases, wound healed completely without complications (Fig. 15 to 22) Commonly used lavage solutions include sterile isotonic saline, dilute chlorhexidine, hydrogen peroxide, and dilute povidone iodine (Grunkemeyer, 2011) General anaesthesia administered using mixture of ketamine @ 30 mg/kg and diazepam @ 1 mg/kg intramuscularly along with butorphnol @0.1 mg/kg body weight. The combination of ketamine and diazepam provides more ideal conditions for the veterinary surgeon. It produces rapid induction of anaesthesia and increases the duration of anaesthesia. There is a good muscle relaxation without any adverse effects. Similar observations were noticed by Azizpour and Hassani, (2012). Closure of wound with simple interrupted sutures using vicryl 3-0 showed uneventful healing in all the cases within ten days of surgery without any complications (Fig. 15 to 16). Similar observations were noticed by Chaudhary *et al*. (2010) Application of intra-medullary pinning in tibiotarsal bones using small sized pin or K-wire as per the size of the bone. In all the cases, birds started weight bearing on 5th postoperative day and union of fracture fragments are also good without any complications (Fig. 22 to 28). Similar observations made by Verma*et al.* (2018). Enrofloxacin @ 10mg/kg, gentamicin@ 3mg/kg and meloxicam @ 0.2mg/kg intramuscularly proved to be satisfactory results for any surgical intervention. Enrofloxacin is currently the only veterinary-labelled fluoroquinolone. It has an excellent activity against mycoplasma, some gram-positive bacteria and most gram-negative bacteria. Enrofloxacin and ciprofloxacin have been widely used in psittacine nurseries without reports of side effects (Flammer, 1997). In this study, flying acuity was assessed by allowing the bird to fly in a large closed area. Birds with complete recovery and good flying capacity were released in the environment at different places.

4. Conclusion

Appropriate surgical technique and time of presentation ensured an uneventful recovery in without any postoperative complications.

Figure 15: Wound healing - 5thday of treatment

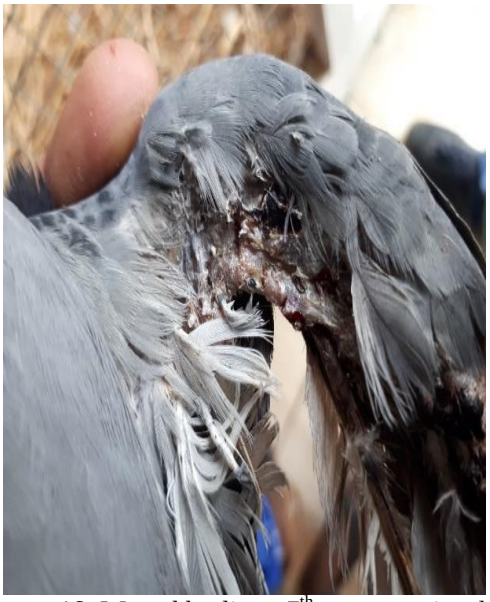

Figure 16: Wound healing - 7thpost-operative day

Figure 17: Wound healing pattern - 3rd day

Figure 18: Wound healing pattern - 10th day

Figure 19: Wound healed – 15thday

Figure 20: Wound healing - 5thday of treatment

Figure 21: Wound healing - 8thday of treatment

Figure 22: Wound healed completely

Figure 23: Weight bearing pattern - 5th post-operative day

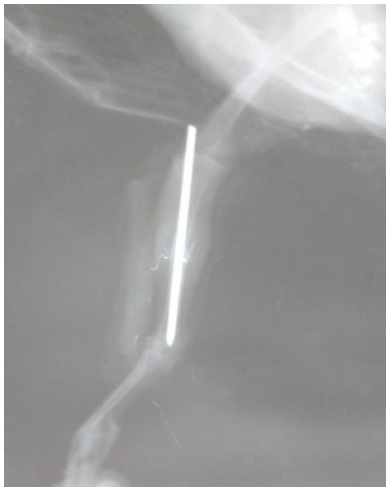

Figure 24 Bone healing pattern on 5th post-operative day

Figure 25: Weight bearing pattern on 15th post-operative day

Figure 26: Radiograph showing bone healing pattern on 15th post-operative day

Figure 27: Weight bearing pattern on 21st post-operative day

Figure 28: Radiograph showing clinical bone union on 21st post-operative day

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