



Os Metacarpale Sinistra Amputation on Moor Macaque (*Macaca maura*) in South Sulawesi, Indonesia

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ABSTRACT

A case of comminuted fracture palm of the left hand on one female moor macaque (*Macaca maura*) that was attacked by a Sun Bear (*Helarctos malayanus*) at Distrik Somba Opu Gowa and its successful surgical removal had been recorded. The female moor macaque was 2 years-old and weighing 10.5kg. Upon physical examination, the macaque was bleeding on the left hand and fractured at os metacarpale sinistra. The aim of the amputation was to save the life of the valuable animal that is protected by the law in Indonesia especially Ministry of Environment and Forestry regarding endangered species of plants and animals in addition to detracting morbidity (necrosis and gangrene) after the treatment. General anesthesia was administered to the female moor macaque and the amputation of the os metacarpale sinistra was performed. The moor macaque was completely recovered within two months after surgery. This is the first report describing the performance of comminuted fractures amputation in moor macaque which can be used further as a reference on proper urgent treatment of similar case to avoid worse condition that can be occur in the absence of immediate treatment.

Key words: Amputation, Os metacarpale sinistra, Moor macaque (*Macaca maura*).

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INTRODUCTION

Fracture is the break in the continuity of a bone which further is classified on the direction and location, the number of fracture lines and the presence or absence of an external wound. Fracture can be classified based on direction and the number of fracture lines which then classified into transverse, oblique, spiral and comminuted. Comminuted fracture characterised by presence of multiple fracture lines and range from three-piece fracture fragments to a highly comminuted fracture of five or more bone fragments (Gabriel et al. 2013; Samiullah et al. 2017).

Amputation is a surgical procedure performed to remove damaged part or all parts of the extremity that can't be repaired together as a result of unprecedented havoc or natural disasters (Sinha 2013). Amputation is a radical surgical technique that it is performed to prevent the occurrence of necrosis and gangrene in the wound. The cost involvement for amputation on the animal is apparently higher than the price of the animal. However, in animals, amputation sometimes becomes crucial for saving life under certain circumstances, where the conservation therapy is not possible (Pal et al. 2011).

Sulawesi has six types of endemic macaca species registered at The International Union for Conservation of

Nature (IUCN) one of them is the Sulawesi black macaque/moor macaque (*Macaca maura*) which is endangered (Supriatna et al. 2008). Moor macaque is protected by Indonesian law contained in the Peraturan Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia No.P.20/MENLHK/SETJEN/KUM.1/6/2018 which contains about the protected species of plants and animals. Moor macaque is a Sulawesi native black monkey with a body length around 500-690mm with a tail length of 30-35mm, and weighs between 5-6kg. Moor macaque's hair color varies from light brown to blackish brown, with a pale color on the rump patch (Supriatna and Wahyono 2000). The best of our knowledge, this is the first paper describing the action of comminuted fractures amputation from moor macaque's left hand that has been successfully carried out. This paper can be further used as a references on proper treatment on the same case in the future.

MATERIALS AND METHODS

Case History and Clinical Examination

A two years old, female Sulawesi black monkey / moor macaque (*Macaca maura*), and weighing 10.5 kg was attacked by a Kalimantan Sun Bear / Sun Bear (*Helarctos malayanus*) on November 5th 2017 at 04.00 am at Distrik

Somba Opu Gowa. The moor macaque was bleeding, tearing of the skin and muscles, comminuted fractures in the left palm (os metacarpale). Moor macaque weakened, reluctant to move and screaming.

Diagnosis

The diagnosis was based on history and physical examination that had been done. The diagnosis that can be concluded is that an open fracture comminuted from os metacarpale sinistra.

Preoperative Preparations

The operating equipment that was used must be sterilized first. A set of minor surgical equipment were prepared, absorbable (vicryl 3-0) and non-absorbable (silk 3-0) suture were also prepared. Other supporting equipment prepared was a tourniquet and hair clipper. Medicines which were prepared such as disinfectant (70% alcohol, povidone iodine, soap), premedication via intramuscular route (atropine sulphate (0.02mg/kg)), sedative via intramuscular route (xylazine (0.5-2 mg/kg)), anesthesia via intramuscular route (ketamine (5-10mg/kg)), antibiotics (amoxicillin clavulanate (20-40mg/kg)), vitamin (vitamin B complex) (Coutney 2013).

Before the operation, the moor macaque to be operated was obliged to do a physical examination which included checking the temperature, breathing frequency, pulse frequency, and heart rate. Weighting was also done to determine the nutritional condition and to calculate the amount of anesthesia needed. General conditions such as temperament, upright behavior, condition of hair, skin, mucosa and lymph nodes were also examined to complete the data. (Fossum 2013) stated that animals to be operated on must be fasted 10-12 hours before surgery so that side effects due to anesthesia can be minimized. The last moor macaque ate and drank at 09.00 pm, then the animals could immediately get surgery.

The operation site was prepared by shaving the hairs around followed by washing it with soap and water to remove all dirt and all the bacteria. Then, the skin was allowed to dry by sterile gauze. The cotton soaked with 70% alcohol was applied on the site of the operation are to destroy all the microorganisms, if any. Povidone iodine was painted on the operation site. A tourniquet was applied on the hand above the site of the incision to reduce blood loss during surgery.

Operative Procedure

Atropine sulfate and after 15 minutes, 0.8ml (intramuscular) of xylazine HCl were given as premedication and ketamine HCl as much as 0.9ml (intramuscular) were administered for induction and maintenance. The moor macaque was restrained in lateral recumbency on the operation table after the anesthesia keeping leg downward for a few minutes and the body was kept lying upward during the amputate operation.

Pre-operative Approaches:

Premedication (atropine sulfate):	at 10.10 am
Anesthetic induction (ketamine and xylazine):	at 10.20 am
Anesthetic onset:	at 10.30 am

During surgery, monitoring of the patient's condition was done every 15 minutes included monitoring the

temperature, respiratory rate, heart rate, and mucosal surfaces (Fossum 2013). When the moor macaque start to awake, anesthesia was added half dose of the initial dose.

Two elliptical incisions were made through the skin 3cm below the wrist on both medial and lateral aspects of the hand with a sharp and sterilized blade at the point of amputation to get sufficient skin flap for suture. After reflecting the skin flap, all arteries and veins were ligated using vicryl to prevent bleeding. After the skin incisions continued through the muscle tissue around. The muscle bundles were dissected away from the bone above the point where the bone was to be cut. The affected bone was cut by using a sterilized sharp blade.

Liquid penicillin-streptomycin (Penstrep-400®) was spread on the wound to prevent bacterial infection. Then at the ends of the muscle bundles were anastomosed by simple continuous suture using vicryl number 3-0 (Ethicon®). The edges of skin flaps were brought in apposition and edges were sutured finally with horizontal mattress sutures using silk.

The incision line was spread with povidone iodine and antibiotic powder (Enbatic®). Finally, the sutured area was covered by using a bandage. Bandage's functions are to pack the wound, protect the wound from environmental bacteria, minimize hemorrhage, and absorb exudate and debride a wound. The duration of operation time was 1.30 hours from 10.30 am until 12.10pm.

Postoperative Care

The moor macaque was injected by antibiotics by intramuscularly (Betamox LA®) @ 10mg/kg for 2 days and continued with oral (Amoxan 500®), 5 days after (10mg/kg) was given every 3 times a day. An antihistamine, Diphenhydramine HCl (Vetadryl®) @ 1ml/day was administered intramuscularly after the amputation and an analgesic, Carprofen (Rimadyl®) @ 2mg/kg was given orally for 7 days once day. In addition, a vitamin B complex (Livron B plex®) was also given once a day on the food. Dressing with povidone iodine and replace the bandage every 3 days interval was done until it was completely healed (Coutney 2013). The silk sutures were removed after 14 days.

DISCUSSION

On November 5th 2017 at 04.00 am, it was reported that a *Macaca maura* was attacked by a Sun Bear in Gowa Discovery Park, Distrik Somba Opu Gowa, in South Sulawesi. This is the first case found in an animal park. The exact of chronology of this incident is unknown but it is most likely caused by the enclosure of the two animals being placed next to each other and causing the Sun Bear to attack the macaca by pulling its hand.

The surgeon has to decide between amputation and recovery surgery in a short time in all major lower extremity traumas such as fractures, tissue loss, nerve and vein injury. There are several reasons why amputation needs to be done. Extremity must be medically evaluated while deciding on surgery and amputation, recovery period, possible changes in patient's daily activities and quality of life following the anatomic and functional loss should be foreseen. The most common cause is due to poor circulation where there is a damage on the blood vessels



Fig. 1: The condition of left palm before the surgical was performed.

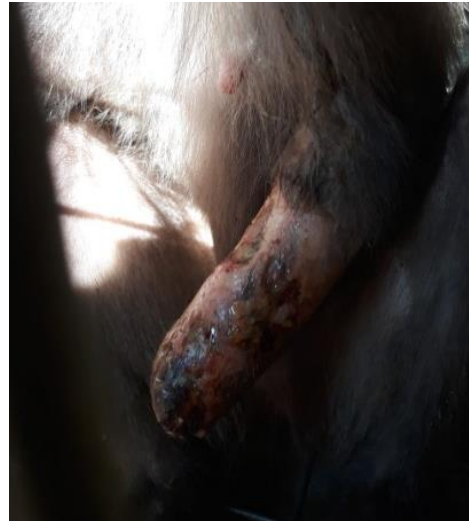


Fig. 4: The appearance of the surgical wound at days 30 after the amputation.



Fig. 2: The surgical was performed to amputate os metacarpale sinistra.

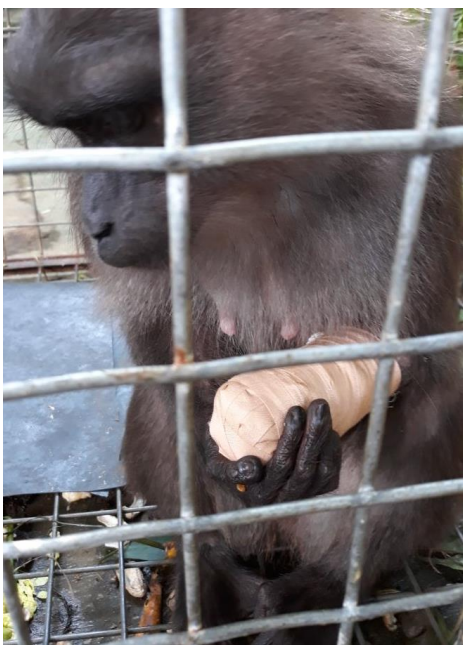


Fig. 3: The condition of macaca after the surgical was performed, and the left hand was bandaged.



Fig. 5: Moor macaque's condition at 2 months after the amputation.

(arteries) which is known as peripheral arterial disease so that there is no blood flow that supplies a tissue as a result of which the tissue will die. Other causes include severe injuries (due to accidents), tumors/cancer, deformities due to congenital or irreversible recovery, and serious infections where there is no cure with other treatments (Kılıç et al. 2014).

Amputation is a surgical procedure performed to separate part or all parts of the body/ extremity (Fossum 2013). Amputation of the lower extremity is one of the oldest known surgical procedure (Murdoch and Wilson 1996). This action is an action taken as the last choice condition when a body part that is already impossible to be cured by using another technique such as trauma, infection, and malignancy (Muhammed and Kumar 2017).

In the case report of amputations of the radius-ulna in dogs undergoing gangrene, amputation was carried out because almost all of the os radius and ulna had gangrene so it was no longer possible to be cured with medical therapy. If the os radius and ulna was left to remain, then gangrene would spread to other areas and worsen the condition of the dog. The amputation successful and can save the dog's life (Dada 2016).

In the present study, the amputation of the left palm on the female moor macaques below the wrist and subsequently saving the particular animal was very much essential. The experienced fracture is an open comminuted fracture of the os metacarpale sinistra. Such a fracture is very difficult to cure and if left unchecked it will cause a high level of pain and gangrene.

If the bone is exposed in the digit or tail consider an amputation of the exposed bone. Lesser pain is expected if the bone to the joint is removed than cutting into the bone and leaving a fragment which can cause a necrose (Courtney 2013). Reported an apparent increase in the number of amputations being performed due to non-healing white line disease (often referred to as 'wall ulcers') and toe necrosis in cattle. Severance of blood vessels and lack of blood supply to depended portion might have led to necrosis that needs an amputation. Partial foot amputation was found to be helpful in the management of malignant tumors of the canine foot (Liptak et al. 2005; Blowey 2011).

Foreleg amputation in red deer was also reported and successful (Erdikmen et al. 2012). Preventing amputations is a critical task. But it is better not to consider it as a failure of treatment because it can save the life of the patient suffering from severe trauma, vascular disease and tumors (Richard 1997). Additionally, the lack of information about this simple procedure amputation in the veterinary literature has promoted writing this case report to provide some beneficial knowledge to the other veterinarians.

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