



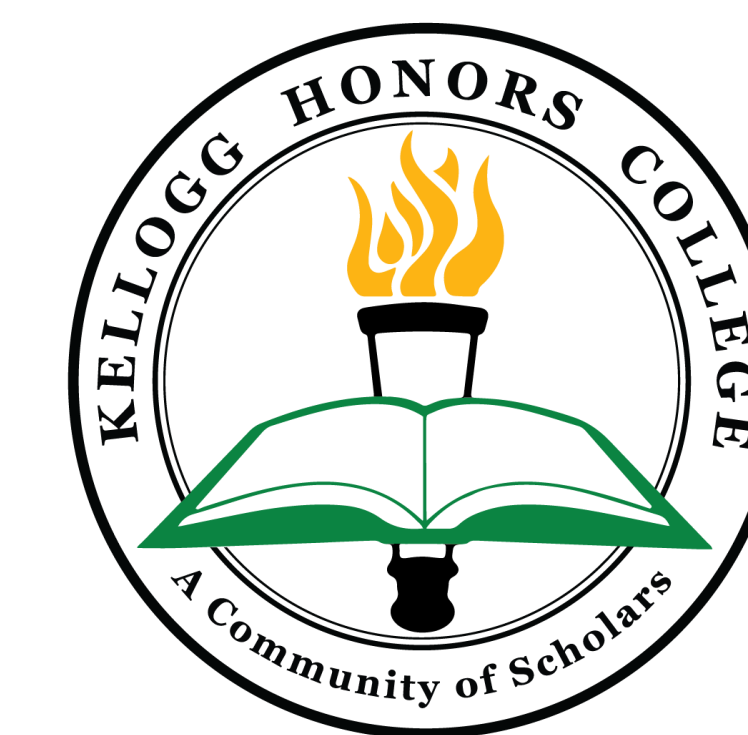
CalPolyPomona

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Skeletal Articulation of Feline with Osteosarcoma

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ABSTRACT

An articulated skeleton is a mounted representation of the skeletal anatomy of an animal or human. Skeletal models are commonly used as a teaching aid to help students visualize the skeletal framework of the body and gain insight in how the shape, placement, and function of each bone integrates into the complex functioning of the skeleton. The process of articulating a skeleton has multiple time consuming and tedious steps and therefore research in various recommended methods was completed to provide a better understanding of the full process and to aid in the selection of the best methods to utilize for the articulation of a feline's skeleton. Since felines are a popular household pet and common topic when teaching animal anatomy, the articulation of a feline skeleton provides a valuable teaching aid for the Anatomy and Physiology Laboratories in the Department of Animal and Veterinary Science at Cal Poly Pomona. In addition, the feline donated for the skeletal articulation was affected by Osteosarcoma, or bone cancer, which is considered rare in felines. This unique skeletal model is a rarity in veterinary research and will be a valuable teaching aid for students looking to pursue a career in the field of veterinary medicine.

BACKGROUND

Osteosarcoma, or bone cancer, is characterized by tumors of the extraxial, axial, or appendicular skeleton which are produced by malignant cells of mesenchymal origin (Dimopoulou et al., 2008). Although osteosarcoma is considered the most common bone cancer that affects felines, the incidence of feline osteosarcoma is extremely rare with only 3 to 5 reported cases in a population of 100,000 felines (Dimopoulou et al., 2008). Around 60% of feline osteosarcoma cases occur in the appendicular or axial skeleton (Dimopoulou et al., 2008), with a slightly higher incidence in the appendicular skeleton (Nakano et al., 2022). In felines, the femur, tibia, humerus, and digits are the bones of the appendicular skeleton most affected by osteosarcoma (Nakano et al., 2022).

Since feline osteosarcoma is such a rare condition in the veterinary field, availability of a feline skeletal model demonstrating appendicular osteosarcoma is a valuable teaching aid for anatomy and physiology laboratories. An articulated skeleton, or mounted skeletal model, is the connection of two or more bones (Articulations | SEER Training, n.d.) to demonstrate the normal functioning and skeletal framework of the body.

METHODS

1. Obtain a specimen.

Donation of feline specimen who had passed away from Osteosarcoma.

2. Remove all outer tissue.

Removal of the skin, organs, and as much muscle and connective tissue as possible surrounding the bones. This step allows for the skeleton to be acquired without the risk of breaking or losing bones.

METHODS

3. Remove any stubborn tissue on the bones.

Utilization of various recommended methods to determine which method worked best in removing stubborn tissue remaining on the bones. Each method had benefits and risks when processing the bone. The various methods included:

- Bones placed in hot, but not boiling, water.
- Steaming the bones and manually removing tissue.
- Boiling the bones until the tissue falls off.
- Soaking the bones in tap water to allow microorganisms to consume the tissue.
- Allowing the tissue on the bones to dry and manually removing the dried tissue.
- Soaking the bones in hydrogen peroxide to dissolve soft tissue.



4. Soak bones in a solution of water and dish soap.

Soaking the bones in a dish soap solution helps to remove excess oil remaining in the bones. This is an important step to prevent future decay after sealing.

5. Soak bones in peroxide.

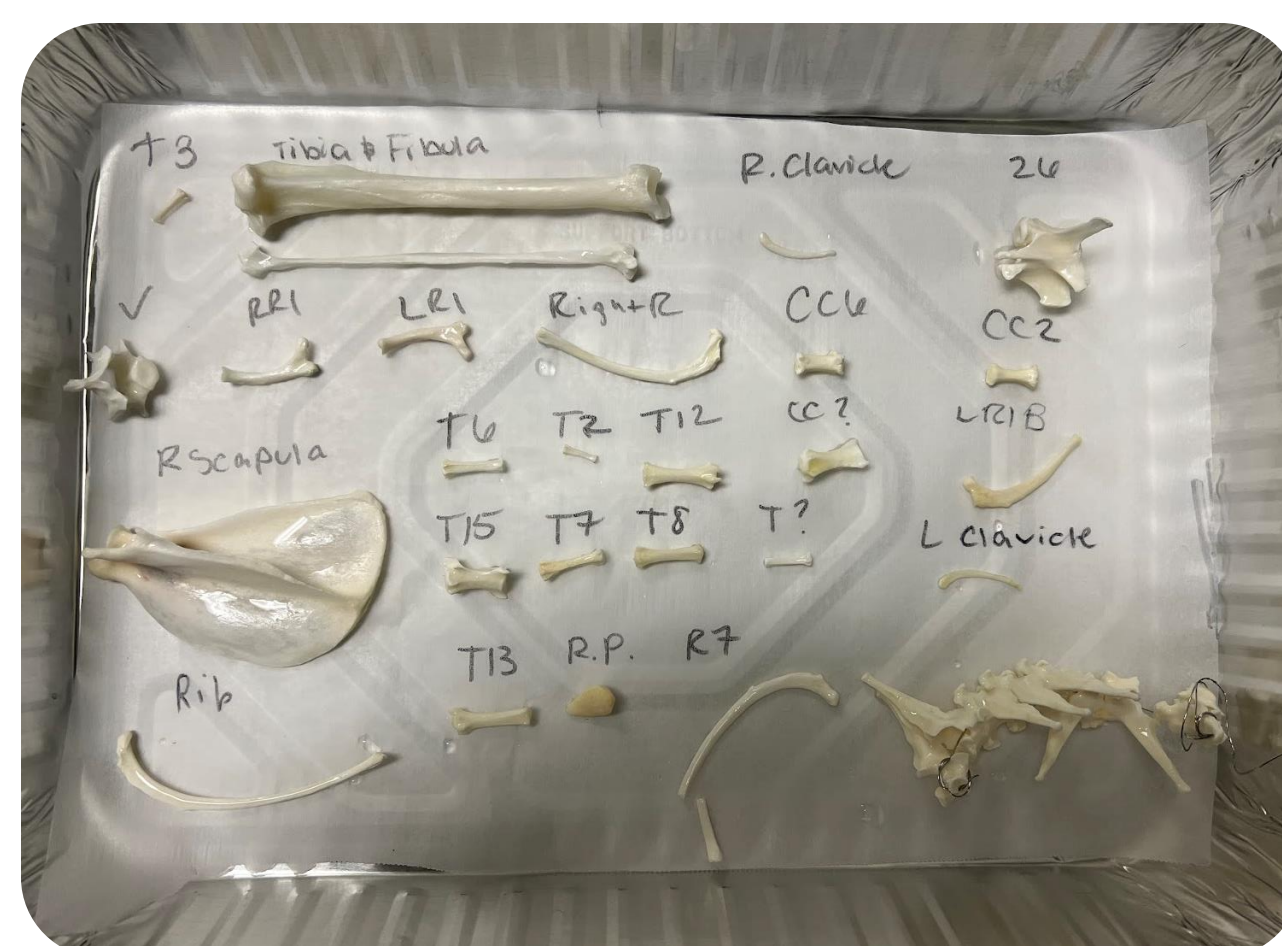
Soaking the bones in a peroxide solution is used to whiten the bones for a more appealing display model. For this step, over-the-counter 3% Hydrogen Peroxide and food grade 12% Hydrogen Peroxide were used.

6. Seal the bones.

Bones were sealed using a 1:1 solution of water and Elmer's clear glue. This step is necessary to prevent deterioration of the bones from oxygen exposure.

7. Reassemble and mount.

Bones were reassembled using super glue, epoxy, and wires. The feline specimen was positioned and mounted on a laminated wooden board for display.



RESULTS



CONCLUSIONS

The process of articulating a skeletal model consists of multiple time consuming and tedious steps with each bone needing to be cleaned, degreased, whitened, and sealed. Various recommended methods for bone processing were tested and each technique had its benefits and risks. For instance, the best method for removing tissue with ease was to boil the bones, however, if not closely monitored the bones can easily be over-boiled and become brittle. To limit the risk of damage, the bones can be steamed. Although this technique aids in tissue removal, it is significantly less effective than boiling and requires more time and manual labor to remove the tissue. Similar results were derived from using different potencies of hydrogen peroxide. The higher potency hydrogen peroxide was more effective than the lower potency hydrogen peroxide, but there is a higher risk of small bones dissolving or becoming brittle with the higher potency solution. Additionally, since processing the bones of an entire skeleton is a time-consuming process some bones can be exposed to oxygen for a long duration of time causing deterioration. This deterioration can be resolved by degreasing, re-whitening, and sealing the bones as soon as possible. Each bone processing method has its benefits and risks, the method to use is based on the available tools and time, while also considering the risks.

ACKNOWLEDGEMENT

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