

CASE REPORT

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Alligator Attacks in Southwest Florida

ABSTRACT: The American alligator inhabits bodies of fresh water in Florida and other southeastern states. Although attacks on pets are frequent, alligator attacks on humans are relatively rare because of the animal's natural fear of man. Because of the rarity of attacks on humans, the pathologic findings and pathophysiology of death in such cases have not been well characterized in the literature. We report three cases of fatal alligator attacks that occurred in southwest Florida, each with different pathologic findings and mechanisms of death. Although the cause of death in each case was attributed to the alligator attack, the mechanisms of death differed and included exsanguination because of amputation of an extremity, overwhelming sepsis, and drowning. These cases illustrate the varied pathophysiologies associated with deaths due to alligator attacks on humans and the features that distinguish alligator bites from those of other aquatic predators.

KEYWORDS: forensic science, forensic pathology, alligator attacks, autopsy, cause of death

The American alligator (*Alligator mississippiensis*) is found in the southeastern United States in fresh and sometimes brackish waters (1). The highest populations are in Florida and Louisiana. It was estimated that the Florida adult wild alligator population is in the range of 1–2 million (2). Alligator attacks are relatively rare, as alligators instinctively avoid humans. The Florida Fish and Wildlife Conservation Commission has documented 339 attacks on humans since 1948; 15 of these attacks were fatal (2). When such perdition occurs, the offending animal has frequently been desensitized to the presence of humans. Most often this is a result of the illegal feeding or discarding of food or animal scraps into nearby bodies of water (1,2). Attacks may also occur during the nesting season in late spring and summer, when alligators are most territorial.

Because of the relative rarity of fatal alligator attacks on humans, the pathologic findings in cases of such attacks have not been well characterized. We undertook the current study to detail the anatomic findings and causes of death that are associated with fatal alligator attacks.

Materials and Methods

The files of the Florida District 21 Medical Examiner's Office, encompassing Lee, Glades, and Hendry counties, were searched for cases in which death was attributed to an alligator attack. A forensic investigator from the Medical Examiner Office had initially investigated all of the cases, and the Office had performed a complete autopsy on the body of each deceased. The investigative reports, the reports of the postmortem examinations and postmortem toxicologic studies were reviewed. The autopsy reports were reviewed for cause and manner of death and for the presence and nature of the injuries as well as for evidence of pre-existing nat-

ural disease. Information pertaining to the circumstances of death was obtained from the investigators' reports.

Results

Three cases of alligator attacks resulting in death were identified. Six other cases were excluded because the autopsy or investigative findings indicated that the alligator-inflicted injuries were postmortem, i.e., subsequent to death from another cause.

Case Reports

Case #1

A 20-year-old woman visiting her grandparents in Fort Myers, Florida, was found dead floating in a nearby lake. She had expressed a desire to swim in the lake, and had been warned of the presence of alligators, but dismissed the warnings. She had last been seen alive at 02:00 hours. Upon awakening at 10:00 hours, her father discovered her nightgown by the lake. Sheriff's deputies found her body floating in the lake after a brief search. Examination of her body at the scene revealed a traumatic amputation of the right arm at the level of the mid-humerus (Fig. 1). The body also showed numerous skin tears, puncture wounds, and ecchymoses. The body was transferred to the Medical Examiner's Office for postmortem examination.

The autopsy revealed multiple patterned abrasions and perforating injuries, consistent with teeth marks, on the soft tissues surrounding the area of amputation of the right arm. The underlying tissues were extensively torn and fragmented, and the bones were fractured. The distal left arm showed two large gaping defects in addition to multiple patterned abrasions and puncture wounds. Similar wounds were noted on the left hand. Superficial wounds were identified on the chest, back, and lower extremities. There were two puncture wounds of the scalp with penetration of the underlying skull. The remainder of the autopsy was significant only for the presence of white, frothy secretions in the tracheobronchial tree, associated with pulmonary congestion and edema.

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FIG. 1—Photograph taken at the scene of death in Case #1 showing the upper extremity amputation and puncture wounds.



FIG. 2—Removal of the deceased's arm from the alligator's stomach in Case #1.

Toxicologic studies were negative. The cause of death was attributed to drowning, with multiple sharp force injuries listed as a contributing cause of death. The manner of death was accident.

Florida Fish and Wildlife Conservation Commission officers discovered an 8-ft-long alligator in the lake. The animal was the only alligator found at that location. The animal was trapped and destroyed. Dissection of the alligator led to the recovery of the right arm, in addition to separate fragments of bone and tissue, from the animal's stomach (Fig. 2). The partially digested amputated distal right arm showed patterned injuries consistent with bite marks on the hand, forearm, and elbow region.

Case #2

An 81-year-old man was walking his dog on a strip of land between two canals near his home on Sanibel Island, Florida. His wife heard him screaming, saw her husband in the water and pulled him as far out as she could before calling 911. Paramedics found the man with a traumatic amputation of his right lower leg at the level of the knee. He was transported to a local hospital where he was pronounced dead. Florida Fish and Wildlife Conservation Commission officers responded to the scene where they observed the offending alligator on the opposite bank of the canal with the amputated leg in its mouth. The 300-pound alligator was shot and killed.

Postmortem examination was remarkable for the traumatic amputation of the right lower extremity just inferior to the knee, which exposed macerated, torn fragments of muscle, vessels and nerves embedded with dirt and sand. The soft tissues at the margin of the amputation were tightly coiled into tendrils that were difficult to straighten. The separately received, decomposing lower leg revealed multiple irregular angular and linear perforations of the skin over the anterolateral aspect of the right calf as well as the medial aspect of the right foot. The skin was extensively avulsed. The majority of the right fibula was absent and the musculature of the calf area was shredded. The tibia bore multiple jagged defects corresponding to the overlying skin perforations. Other significant autopsy findings included pulmonary emphysema, nephrosclerosis, and mild cerebral cortical atrophy. The cause of death was attributed to exsanguination because of amputation of the lower extremity by an alligator, and the manner of death was accident.

Case #3

A 54-year-old woman was working as a landscaper near a lake on Sanibel Island, Florida, when an alligator attacked from the

lake and dragged her into the water. Bystanders came to the woman's aid and police officers responded to a 911 call. The officers found the victim in the water in a face-up position. They were initially unable to free her, and were uncertain as to whether she was entangled in vines or being held by an alligator. She suddenly became free and was pulled to shore. Subsequently, an alligator emerged from the water and began to move toward the group. Officers fired at the animal, which swam away, but later reappeared with signs of a gunshot wound to its head. The alligator was again fired upon and was killed. The alligator measured 12 ft 3 in.

The victim was transported to the hospital, where she was found to have a near amputation of the right forearm just proximal to the wrist, with only tendons maintaining the extremity. The gluteal regions showed deep skin and muscle avulsions. There were bilateral full thickness bite marks in the flank regions, down to the fascia. Each defect measured approximately 50 cm and was grossly contaminated with vegetation. There was a complex bite to the perineum involving the labia majora bilaterally, with massive soilage of the groin. She was taken to the operating room for revision and debridement of the near-amputated right arm. The perineal region was irrigated and debrided and a diverting colostomy were performed. Postoperatively she developed overwhelming sepsis and died 2 days after admission.

Postmortem examination revealed the presence of surgical debridement of the injuries. There was extensive disruption of the perineum, portions of the labia majora, anus, and the vaginal vault. The distal third of the right forearm had been amputated. There were numerous superficial abrasions and lacerations on the dorsal surface of the left hand. Multiple small contusions and faint superficial abrasions were present on the anterior surfaces of the lower legs. The lungs were diffusely consolidated. The cause of death was attributed to complications of an animal attack (alligator) and the manner of death was accident.

Discussion

The American alligator, voted Florida's official state reptile in 1987, is important to the economy and ecology of Florida. These carnivores aid in the maintenance of the ecological balance of the Everglades. Strict laws protect alligators in Florida. The Florida Fish and Wildlife Conservation Commission controls the harvesting of wild alligators. Although alligators are no longer classified as federal endangered species, they are protected as "a species of special concern" because of their resemblance to the endangered

crocodile (1,3). Alligators are also raised in captivity for their meat and skins.

Alligators are aquatic lizards with a life expectancy of *c.* 30 years. The largest alligator recorded in Florida was 17 ft 5 in., while a 19 ft 2 in. alligator was found in Louisiana (4). Alligators are carnivores, naturally feeding on fish, turtles, and small mammals (1). Pets, most commonly small dogs and cats, are frequently attacked while swimming in ponds, rivers or canals, or when they are near the shore.

Humans are at a relatively low risk for attack by alligators (5,6). Although most alligator attacks occur in water, alligators have been known to attack humans on land (3). The majority of alligator attacks occur in Florida. Most alligators that attack are seeking food; some having lost their fear of humans by previous feedings (2). Many times the human attacked is a secondary target. The offending alligator may initially attempt to strike a nearby pet, which escapes. The less agile human then becomes the unintended victim. Alligator attacks have also been reported when an animal was trying to protect its young.

Alligators have sharp cone-shaped teeth and powerful jaws. The adult alligator has 80 teeth, which are replaced as they wear down (6). Their teeth are good for grabbing and holding, but not for cutting prey. Most alligator attacks are characterized by a single bite and release, with resulting puncture wounds. Larger alligators may make more serious or repeated attacks (4). The wounds are often a combination of sharp and blunt force trauma because of the crushing of the target with the alligator's powerful jaws. Small prey may be swallowed whole; otherwise the alligator will bite at it repeatedly. Alligators that take large prey may grab an arm or a leg and twist it off by spinning, as was suggested by the coiling of strands of soft tissue in Case #2. They may also shake or slap large prey against the water or shore to rip off smaller pieces (4). An alligator may also roll underwater with large prey and drown it. Alligators sometimes feed on dead animals or decomposing remains (1,4).

An alligator bite may become infected and lead to sepsis in an individual who survives the initial attack. The organisms in alligators' mouths are typically Gram-negative species such as *Salmonella* and *Aeromonas hydrophilia* (7,8). Anaerobic species include *Clostridium* (5,9). Overwhelming infection is not restricted to bites by alligators, but is typical of reptile bites (8,10). For example, the Komodo Dragon of Malaysia is a predatory lizard that is known to attack and feed on man (10). The individual that survives an initial attack may succumb to infection as a result of the bacteria that inhabit the animal's mouth. Cultures grown of saliva and plasma of wild Komodo Dragons have yielded both Gram-positive and Gram-negative bacteria, with *Escherichia coli* being the most common bacterium (10).

The pathologic findings of alligator attacks have not been well characterized in the literature. Raynor et al. (8) described two alligator attacks in which both victims survived. In both cases, the upper extremities were amputated, with transection of the radius and ulna. The specimens were described as showing extensive lacerations and avulsions. Cultures of the surgically debrided wounds grew *Pseudomonas*, *Serratia* and *A. hydrophilia* in one case, and *Enterobacter* and *A. hydrophilia* in the other.

We report three cases of unprovoked fatal alligator attacks in southwest Florida. In two cases an alligator attacked an individual who was on land, while the third decedent had been swimming in a lake known to harbor alligators. These cases differentiate the varied mechanisms by which alligator attacks can result in death. The first case illustrates the alligator's typical mechanism of grabbing larger prey by an extremity, resulting in amputation and

crushing injuries to soft tissue and bones, although death was attributed to drowning based upon the presence of pulmonary edema, with multiple sharp force injuries listed as a contributing factor. Case #2 also involved the traumatic amputation of an extremity, with death resulting from exsanguination. Case #3 illustrates the overwhelming sepsis that can result from reptile bites.

The differential diagnosis of traumatic injuries to a body found in or near water in Florida includes injuries because of other aquatic species as well as trauma to the body resulting from the propellers of a boat. The propellers of a boat produce very characteristic deep sharp force injuries often having a parallel configuration. Other aquatic species that pose a danger to humans are most commonly found in salt waters, which alligators rarely inhabit.

The American crocodile (*Crocodylus acutus*), an endangered species under the Federal Endangered Species Act, inhabits mainly salt or brackish waters throughout the Florida Keys, north to Miami and to southwest Florida (11–13). They are commonly found where salt water meets fresh, such as coastal wetlands and canals. They are carnivores and predominately nocturnal. Crocodiles have 66–68 teeth, and the shape of their long triangular snouts should distinguish the puncture wounds of a crocodile bite from those of the stouter snout of an alligator (14). However, crocodiles are by nature shy and reclusive, and there have been vanishingly rare authenticated attacks on humans (14).

Sharks are also predominately marine species, although some smaller species do inhabit fresh waters. There have been an increasing number of shark attacks on humans in Florida (3). Sharks have multiple rows of sharp and sometimes serrated teeth that can cause soft tissue avulsions and bone damage, often with crescentic wounds or multiple parallel rows of lacerations as they bite off mouthfuls with a sawlike motion, a pattern of injury not seen with alligator bites (15,16). Additionally, dermal abrasions may result from contact with their toothlike scales (3). Barracudas are also found in salt water. They have razor sharp teeth that cleanly shear off portions of their prey with cleaverlike bites, producing straight or V-shaped lacerations (15,17). Moray eels, also found in the ocean, have multiple rows of sharp teeth that produce ragged wounds because of active movements after they attach to their prey (3). Only a few deaths because of the marine Portuguese man-of-war have been scientifically documented (15,17). The bites of snapping turtles and those of aquatic snakes can readily be distinguished from those of an alligator by the size of the injuries (3).

As previously stated, alligator attacks on humans are rare. However, the frequency of the reported fatalities, three in the last 4 years, may be a warning of an increasing trend. Waterfront home sites are highly prized real estate to both humans and alligators. With people moving in ever-increasing numbers to southwest Florida, the encroachment on the alligator's habitat is inevitable and the potential for tragic alligator/human interactions becomes increasingly likely.

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