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Homicide or Accident Off the Coast of Florida: Trauma Analysis of Mutilated Human Remains*

REFERENCE: Stubblefield PR. Homicide or accident off the coast of Florida: trauma analysis of mutilated human remains. J Forensic Sci 1999;44(4):716–719.

ABSTRACT: In the many years Dr. William R. Maples served as a forensic anthropologist, he saw diverse sources of trauma presented in the victims of violent crime, accident and suicide in the state of Florida. In 1996 the District 18 Medical Examiner's Office of Florida requested the assistance of Dr. Maples in the analysis of human remains recovered by the U.S. Coast Guard. The deceased was in an advanced state of decomposition characterized by skin slippage and discoloration. The torso bore multiple lacerations, including nearly parallel lacerations in the skin of the back. Specimens were carefully macerated and the fractures reconstructed. The skeletal trauma was caused by a device capable of delivering robust cuts and blunt trauma in linear paths, as is consistent with propeller trauma. Unusual in this case were blows to the ventral and dorsal surfaces of the body. Based on the anthropological analysis and interviews with the family of the deceased, the F.B.I. proceeded with the case as a homicide investigation.

KEYWORDS: forensic science, forensic anthropology, William R. Maples, boat propeller, skeletal trauma

This case study is the product of the characteristic work performed by the late forensic anthropologist Dr. William R. Maples. A traditional definition of forensic anthropology is the identification of skeletonized human remains in a medico-legal context (1), but Dr. Maples's career readily amends that definition to identification and analysis of trauma in human remains. In the relationships which Dr. Maples established with the medical examiners of Florida he was frequently called upon for his expertise in trauma analysis alone, even if the remains involved were neither well skeletonized nor unknown. This report is the result of one of the many instances where Dr. Maples's assistance was requested specifically for skeletal trauma analysis.

Case Report

In the Spring of 1996 the District 18 Medical Examiner's Office in Brevard County, Florida requested the assistance of Dr. Maples and the C.A. Pound Human Identification Laboratory. Dr. Maples was presented with human remains the Coast Guard had recovered from the ocean off the east coast of Florida. The remains were believed to be those of a caucasian female who had been reported lost-at-sea by her husband about two weeks previous. The Federal Bureau of Investigation had jurisdiction over the case and later confirmed the identity through dental records.

There was extreme distruption of the remains from decomposition, marine predator activity, and trauma. The body was in an advanced state of decomposition characterized by skin slippage and discoloration. The nasal cavity, mouth and right orbit had been exposed by small marine animal activity. All of the viscera was missing. The torso bore multiple lacerations, including nearly parallel lacerations in the skin of the back. The Coast Guard had detached the left humerus at a fracture when they recovered the body. The right femur was also fractured through the femoral neck and the entire right lower limb was nearly severed.

The degree of alteration of the remains made it difficult to determine whether the present trauma had been caused by large marine predators or human activity. Bones showing the presence of trauma, particularly the left humerus, right clavicle and scapula, several ribs and vertebrae, the bony pelvis, and left femur were retained for analysis in Gainesville. The specimens were carefully macerated in water. Dr. Maples and this author then reconstructed the fractures and articulated the bones with Duco® cement and dental wax to facilitate description of the trauma.

Fractured bone was recovered throughout the torso (Fig. 1). Three major patterns of fracture were discernible from the remains.

1. Fractures in linear paths involving a series of bones: The right clavicle and scapula were both fractured in the midline; midshaft for the former, and through the middle of the spine for the latter. In articulation the fractures were in alignment with each other and an additional fracture of the right second rib. Right ribs three through eight and left ribs two through nine were broken serially. The right ribs were fractured slightly lateral to their tubercles, while the left ribs were fractured just ventral to their angles. Left rib nine bore a green stick fracture with the compressed side on the internal surface.
2. Comminuted fractures with loss of the fragmentary bone: None of the intervening fragments from the fracture of the right femur through the femoral neck were recovered. The same was true for the fracture of the left humerus located roughly one cm distal to the surgical neck.
3. Transected bone: The fourth lumbar vertebrae, right ilium, right side of sacrum, and left superior and inferior pubic rami were completely transected (Fig. 2). The left ilium also had an oblique transection which was associated with an adjacent fracture.

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* Presented at the 50th Annual Meeting, Academy of Forensic Sciences, San Francisco, CA, February 1998.

Received 6 April 1998; and in revised form 2 July 1998; accepted 27 July 1998.

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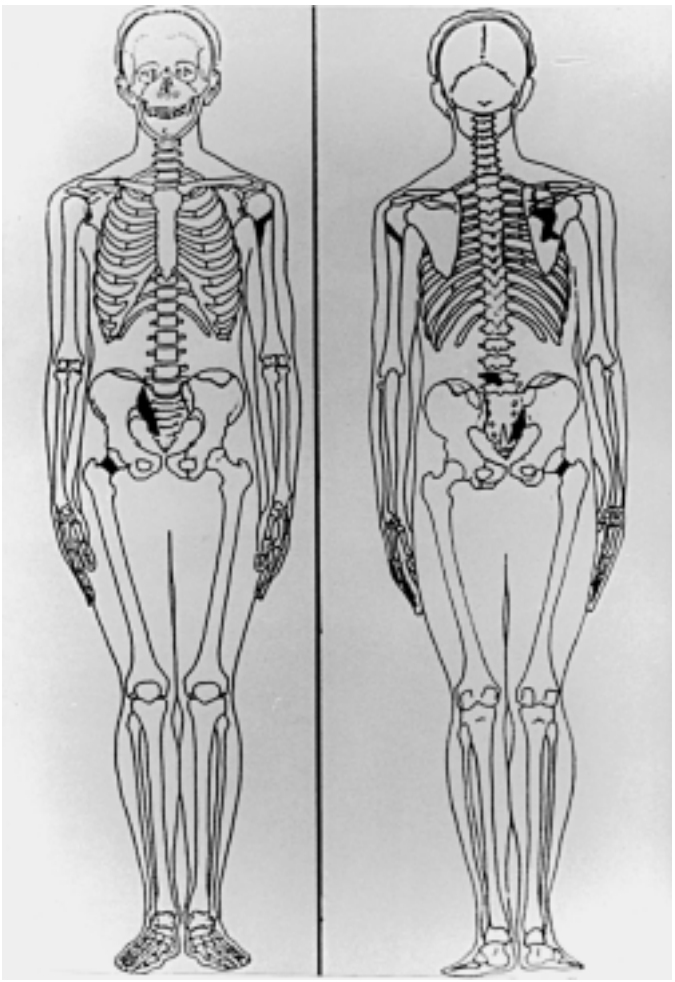

FIG. 1—*Diagram of fractures and transections in ventral and dorsal views.*

FIG. 2—*Transected fractures of the pelvis. Arrows indicate paths of individual blows. Scale: side marker is 3 cm.*

In a marine environment the options for sources of such massive trauma are limited to either a large marine predator or some kind of human activity. The aquatic predator could be reasonably excluded because there was no evidence of the gouges, punctures and scrapes associated with shark activity. Nor has there been any evidence in recent natural history of sharks or other animals large enough to neatly transect the pelvis in several locations. Review of the available medical literature indicated that contact with boat propellers results typically in parallel or nearly parallel lacerations of soft tissue (2–6), comminuted fractures of long bones (2–4,6) and transection of bones with a large cancellous component (3,8), serial fractures (6), and near or direct amputations (4,7).

The pattern of damage in the remains in this case was consistent with a mechanical device capable of delivering robust cuts and blunt trauma in linear paths. The serial rib fractures, in conjunction with the nearly parallel lacerations of the skin, are consistent with injury from a marine propeller. The damage to the pelvis, particularly visible at the right ilium and sacrum, and the fourth lumbar and left ilium, indicates that something sliced through the pelvis in these locations. These transections are consistent with the type of damage described in the literature (3,8).

It seems reasonable to conclude that the damage to these remains was caused by a marine propeller. The green stick fracture, and the plastic behavior of the damaged bone of the pelvis would place the damage in a time frame of near and around the time of death, or perimortem, although the postmortem interval cannot be ruled out. An additional factor in the trauma pattern does weigh against the damage occurring in the postmortem interval, however.

Notice in Fig. 2 that the edges of the bony defects are clearly linear, although not as sharply defined as would be expected from a knife wound. It should be kept in mind that the wings of a propeller, although called blades, are not sharpened and cannot be expected to deliver fine incised wounds. It was not surprising then to observe localized areas of compressed fractures in direct association with the areas of transection in the pelvis. The compressed fractures indicated the leading edge of the blow to the pelvis, and therefore the direction from which the blow came. One such fracture was located on the ventral surface of the left ilium, faintly visible in Fig. 2. A better illustration is shown in Fig. 3 at the fracture of the femoral neck.

Based on the paths clearly visible in the reconstruction, and the presence of compressed fractures at the leading edges of some transections, it was possible to determine that the damage to the pelvis was the result of at least four separate blows (Figs. 2 and 4). The damage to the right ilium and sacrum were the result of a blow delivered to the back of the deceased, as indicated by a compressed fracture located in the dorsal surface of the right superior pubic ramus (Fig. 5). This small compressed fracture aligns with the damage to the right ilium and sacrum. Although it is conceivable that they were not caused by the same stroke of the propeller, the fracture had to have been directed from the back to strike the dorsal surface of the pubic bone. The sign of dorsal blows to the pelvis is not surprising considering that the skin lacerations and rib fractures were also on the dorsal surface of the body.

The remaining fractures of the pelvic girdle were directed to the front of the body. The fracture of the femoral neck is associated with a scraped area on the right ischium (Fig. 4). The compressed bone on the femoral neck indicates that this blow was delivered to the front of the body. The transected fourth

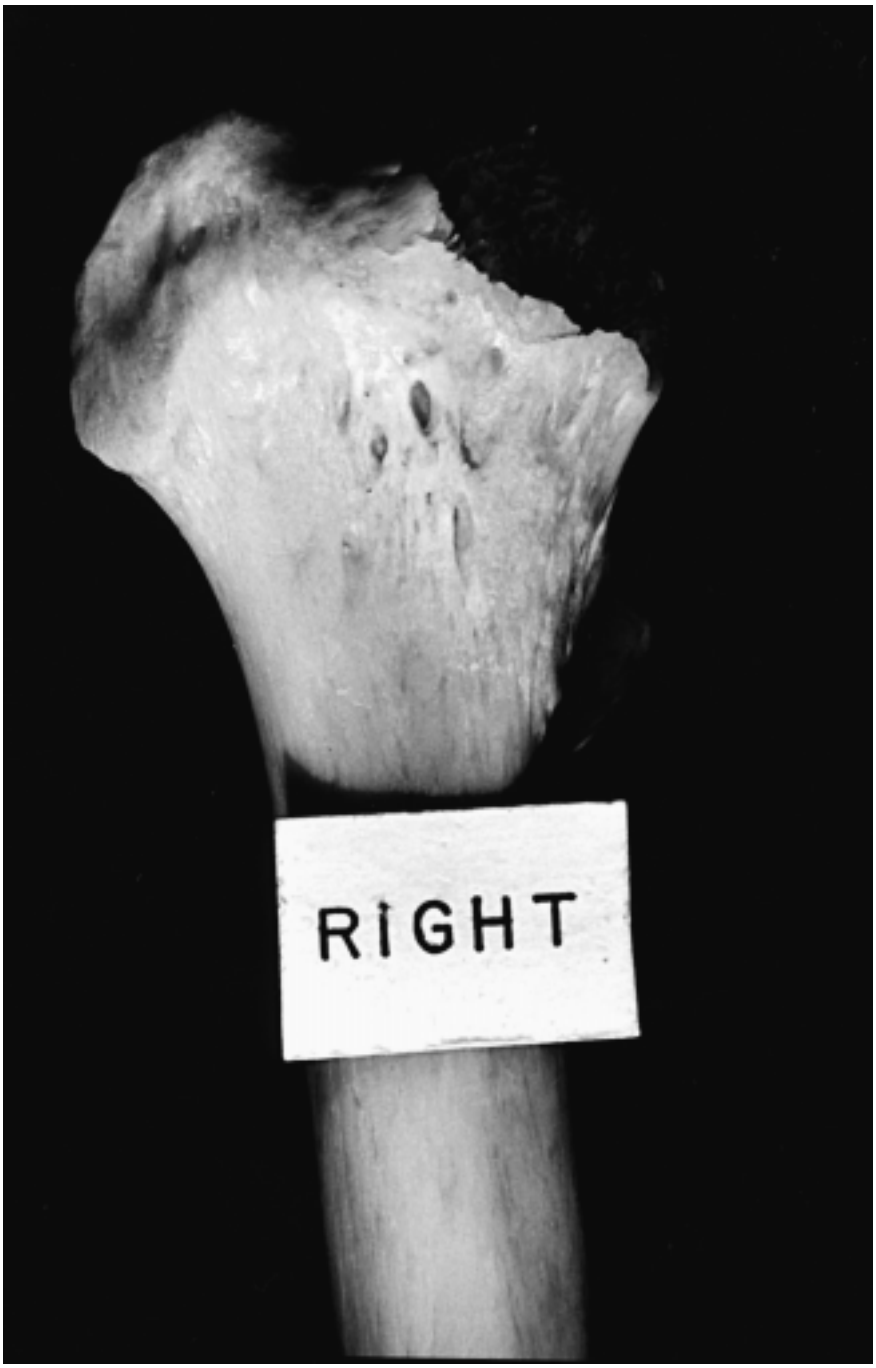

FIG. 3—*Fracture of the femoral neck. Scale as in Fig. 2.*

lumbar vertebra and left ilium were the result of a single stroke, placed on the ventral surface by compression of the ventral surface of the ilium. Finally the complete fracture of the left pubis aligns with an incomplete fracture of the left sacrum (Fig. 2). Only the ventral surface of the sacrum was affected, indicating that the blade which passed through the pubis only partially entered the sacrum.

Presence of propeller damage to different surfaces of the body was not described in the available literature. A common expectation of contact with a boat propeller is that the person will be "blenderized" or turned in the vortex of the propellers and receive many random lacerations all over the body. The literature does not support this conclusion, for the illustrations and descriptions indicate that a boat striking a person in the water literally passes over the person in one plane of contact as if he or she were stationary in the water. This pass over the victim results in the parallel lacerations associated with propeller damage. All of the available literature was for accidental contact with boat propellers, often during water skiing or attempts to re-enter a circling boat, but also in collisions of boats and personal water crafts (2–8). There is the possibility that the under-

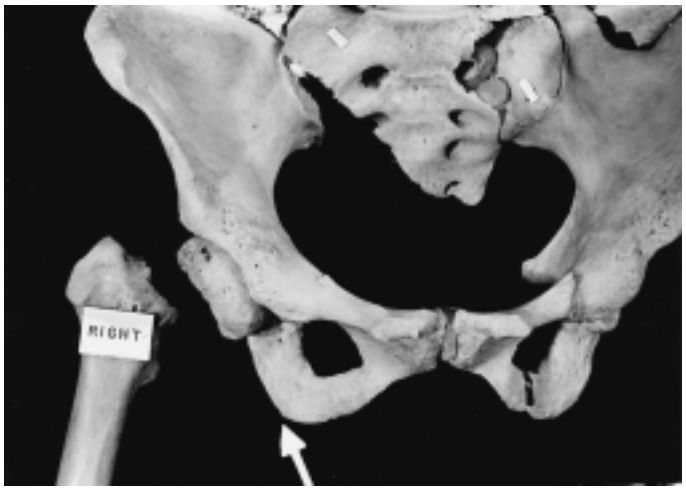

FIG. 4—*Pelvis with articulated right femur. Arrow indicates the shaved area on the ischium. Scale as in Fig. 2.*

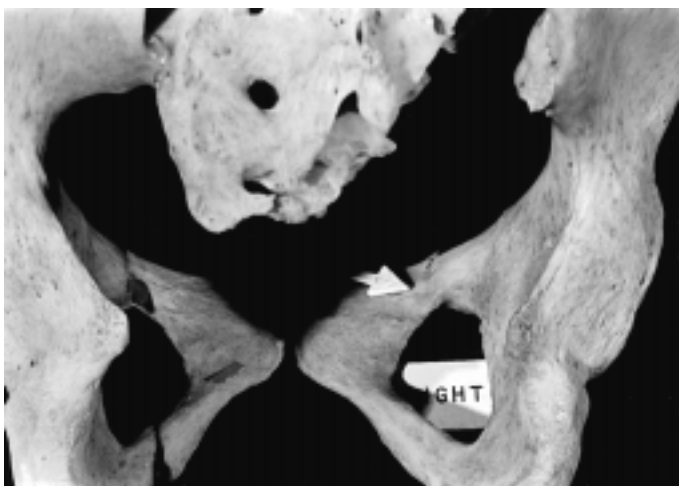

FIG. 5—*Arrow indicates compressed fracture on the dorsal surface of the pubic ramus. Scale as in Fig. 2.*

reporting[2] of marine accidents (5,9), combined with the additional filter of publication in the medical literature, has made the description of propeller damage to diverse bodily surfaces uncommon. The more parsimonious approach is to accept that the pattern of trauma in this case is not consistent with accidental contact with a boat propeller, and that a different means is indicated.

Based on interviews with the family of the deceased and the results of this analysis, the F.B.I. pursued the investigation as a homicide.

Acknowledgments

I am indebted to Dr. Maples for his contribution to my education and this report, and to Mrs. Margaret Maples for her support in producing this document. Special thanks also go to Special Agent Kevin T. Sanderson for his help and support.

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[2] The U.S. Department of Transportation requires that all boating accidents resulting in death, disappearance of any person, injury requiring treatment beyond first aid, and/or property damage exceeding $500 be reported. The Coast Guard estimates that only 5–10% of accidents are reported.