

CASE REPORT

Nunzio Di Nunno,¹ M.D. and Cosimo Di Nunno,¹ M.D.

Motorboat Propeller Injuries

REFERENCE: Di Nunno N, Di Nunno C. Motorboat propeller injuries. *J Forensic Sci* 2000;45(4):917-919.

ABSTRACT: The authors analyze the case of an Albanian refugee who was killed by the propellers of the outboard engine of a rubber dinghy while illegally attempting to reach Italy. The finding of multiple parallel, deep clear-cut injuries is uncommon, but highly characteristic of the object producing the lesions. These are typical and cannot be mistaken with those produced by sharp objects or shark bites. The description of the injuries is vital for establishing the position of the victim with regard to the propeller that struck him.

KEYWORDS: forensic science, forensic pathology, propeller, sea fatalities, amputation injuries, motorboat death

In the past few years propeller injuries in the U.S. have increased proportionately to the increase in popularity of water sports such as water skiing (1), boat racing, skin, and scuba diving (2,3). The situation in Italy has not been studied in depth, so it is difficult to establish the extent of the phenomenon in the country.

The propellers most commonly implicated in such accidents are the high-speed propellers of motorboats and outboard engines rather than those of larger vessels (4). The many motorboat-propeller-related injuries described in the literature include arterial injuries to the extremities, severe laceration of the extremities, and fracture dislocations of the cervical spine (5). The accidents are often a result of recklessness, speeding, fatigue (6), alcoholic intoxication (7), and lack of propeller guard (8). We report a case of death of an Albanian national who was attempting to reach the Italian shores on board a rubber dinghy.

Case Report

On the night of 3 March 1998, an Italian Guardia di Finanza boat patrolling the Italian coastal waters started to chase a rubber dinghy transporting illegal immigrants into Italy. The Italian patrol boat abandoned the chase to rescue the illegal immigrants who had fallen overboard. Among them they found the corpse of a man later identified as L.E., a 30-year-old Albanian national.

The corpse presented multiple parallel deep lesions on: (1) the head and neck, (2) the back, and (3) the right arm.

¹ Dipartimento di Medicina Interna e Medicina Pubblica (DI.M.I.M.P.), Sezione di Medicina Legale, Università degli Studi di Bari, Policlinico, Piazza G. Cesare n. 11, 70124 Bari, Italy.

Received 6 July 1999; and in revised form 23 Sept. 1999; accepted 27 Sept. 1999.

(1) In the left frontotemporo-occipital region: a lesion with clear-cut edges, measuring 28 cm in length and affecting both the cutaneous planes and the skullcap, with exposure of the brain. Fourteen centimeters below this, was another, measuring 25 cm in length and 11 cm in depth and affecting the cervical vertebral plane, with fracture of the atlas and the left mandible (Fig. 1). Pericranial soft tissues were infiltrated with blood.

(2) At the base of the neck: a lesion running parallel to the two described above; it was 22 cm long and 9 cm deep and involved the first cervical vertebrae without fracturing them (Fig. 2). No hemorrhagic infiltration was found. In the upper dorsal region, 2.5 cm below and parallel to the previous lesion, a solution of continuity 23 cm long and 8 cm deep, partially affecting the first thoracic vertebrae. No hemorrhagic infiltration was observed. In the left scapular region: a clear-cut solution of continuity, measuring 21 cm in length and running parallel to the other lesions, affected the scapula. No hemorrhagic infiltration was observed.

(3) Right upper limb: four clear-cut lesions, running parallel to each other, with exposure of the underlying planes and fracture presenting as a subamputation of the arm which was kept in place by a thin shred of skin (Fig. 3). Analogous subamputation at the level of the right elbow. None of these lesions showed hemorrhagic infiltrations.

These lesions were caused from a rubber dinghy (Fig. 4), length 8 m with tonnage of 600 kg with two Mercury 150-hp V-6 OptiMax Outboard marine engines (Mercury Marine, Fond du Lac, WI). These engines have a steel propeller with three blades (Fig. 5); its weight is 3.3 kg, its diameter is 36 cm and it has 2800 rpm with a gear reduction of 1.87:1.

The Italian boat was the patrol boat V1687 (Fig. 6), length 16 m with tonnage of 9000 kg with four marine engines Mercruiser 50S Magnum (Mercruiser Marine, Fond du Lac, WI). This boat has four steel propellers with three blades (Fig. 7); its weight is 6.5 kg, its diameter is 48 cm and it has 800 rpm with gear reduction of 1.5:1. All these four propellers had the propeller guard.

Discussion

Since the fall of the Albanian Communist regime in the mid-90s, there has been a constant flow of Albanian nationals illegally attempting to reach the Italian coast, 70 nautical miles away from Albania. More recently, the Kosovar refugees have been following the same route to seek asylum in Italy. Criminal organizations charge a heavy price to transport these people to Italy on 8 to 10 m rubber dinghies, mounted with powerful outboard engines. The crossings take place at night, with each dinghy carrying up to 30 to



FIG. 1—Left frontotemporo-occipital region: the extensive lesion, with exposure of the brain, is evident. Below, the deep laceration on the face and neck that caused the fracture of the left mandible and atlas (1st cervical vertebra).



FIG. 2—Cervical dorsal region: the series of parallel distinct lesions penetrating to the bone without, however, producing fractures. No hemorrhagic infiltration is visible.



FIG. 3—Right upper limb: the series of three parallel lacerations penetrating to the bone. The amputation of the arm is kept in place by a thin shred of skin at the level of the medial surface (central lesion) and forearm. The tissues do not show any hemorrhagic infiltration.



FIG. 4—Rubber dinghy with the two marine engines.

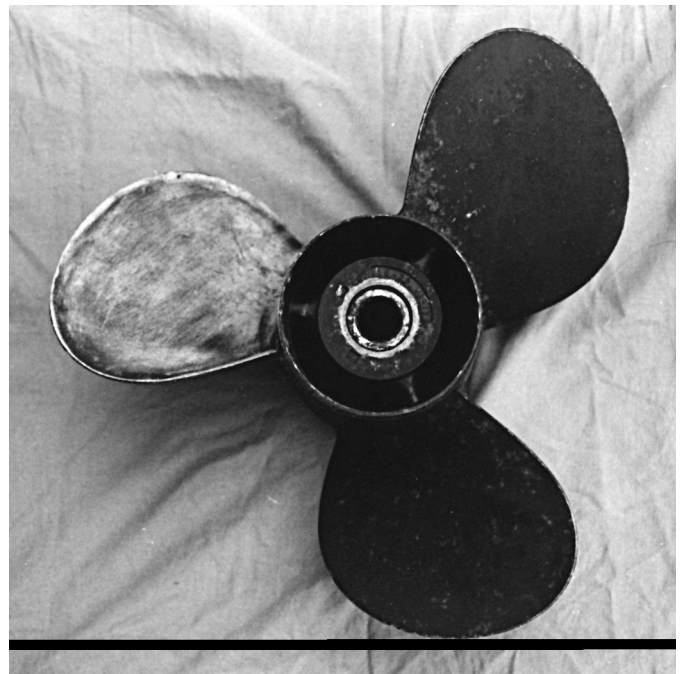


FIG. 5—Rubber dinghy's steel propeller with three blades.



FIG. 6—Guardia di Finanza patrol boat VI687.

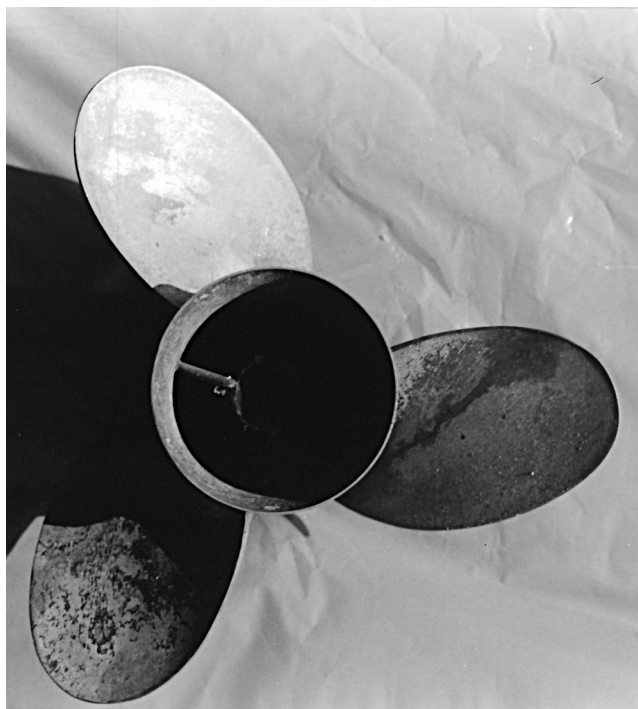


FIG. 7—One of the four steel propellers of the patrol boat with three blades.

40 illegal immigrants. Often the dinghies are forced to make abrupt maneuvers to escape the Italian Coast Guard boats that patrol the coastal waters and, during these maneuvers, the passengers are at risk of falling overboard. The lucky ones are rescued by the Italian Coast Guard.

The autopsy performed on L.E.'s corpse showed many injuries produced by the boat propeller; these are typically multiple, deep, parallel lacerations, usually on the head or back (4), that can result in permanent scarring, substantial blood loss, traumatic or surgical amputation or, as in our case, death. These injuries are so specific to propellers that they cannot be confused with those produced by side arms, blows, or sharks (9,10). Shark attacks result in major injuries that can include open femoral fracture, massive hemorrhage, and significant skin and muscle damage. In addition, shark bites, which often leave tissues in shreds, typically display features of tearing, that is, the resulting lesions have highly irregular edges—unlike those produced by propellers which have a clear outline.

In the case illustrated, it is clear that only the head, neck, and left cervical injuries had “vital reaction” since they showed hemorrhagic infiltration. This testifies to an almost immediate death due to the violent impact of the outboard-motor propeller on the victim's head with ensuing exposure of the brain. The location of the injuries allows us to assume that the victim fell from the dinghy and

was run over by the propeller along the cranio-caudal axis. This is confirmed by the fact that only the head and neck injuries presented hemorrhagic infiltration. We can rule out that the victim was run over by the propellers of the Italian patrol ship both because of the propeller guard and also because large-vessel propeller blades are much bigger and spin at a lower speed than outboard engine propellers and would therefore have produced extensive amputations and fewer injuries. The case reinforces the need for a thorough collection of circumstantial data and a meticulous description of all the injuries observed on the corpse. Only in this way will it be possible to reconstruct, to a fair degree of accuracy, the events and objects responsible for the lesions and the death being investigated.

Acknowledgments

The authors are grateful to the Chief of the Headquarters of the Guardia di Finanza of Brindisi, Lieutenant-Colonel Giuseppe Ser-rano, who allowed the permission to take pictures of the propellers, patrol boat, and the rubber dinghy implicated in this case report and to publish them. We thank also Lieutenant Paolo Soro and War-rant-Officer Domenico Trimboli, commander of the patrol boat V1687, of the Guardia di Finanza of Brindisi who gave the techni-cal data of the patrol boat and the rubber dinghy.

Our gratitude also goes to Motonautica Ruggiero, Bari, for the technical information about the Mercury marine engines and propellers.

References

1. Centers for Disease Control and Prevention. Boat-Propeller-Related Injuries—Texas, 1997. *JAMA* 1998;279(23):1858.
2. Mann RJ. Propeller injuries. *South Med J* 1976;69(5):567–9.
3. Mann RJ. Propeller injuries incurred in boating accidents. *Am J Sports Med* 1980;8(4):280–4.
4. Knight B. *Forensic Pathology*, 2nd ed. London: Arnold, 1996.
5. Jackson FE. High speed propeller injuries of the brain. *Am J Surg* 1965;110:473–6.
6. Hummel G, Gainor BJ. Waterskiing-related injuries. *Am J Sports Med* 1982;10(4):215–8.
7. Howland J, Smith GS, Mangione T, Hingson R, DeJong W, Bell N. Missing the boat on drinking and boating. *JAMA* 1993;270(1):91–2.
8. Hargarten SW, Karlson T, Vernik JS, Aprahamian C. Motorboat propeller injuries in Winsconsin: enumeration and prevention. *J Trauma* 1994;37(2):187–90.
9. Guidera KJ, Ogden JA, Highhouse K, Pugh L, Beatty E. Shark attack. *J Orthop Trauma* 1991;5(2):204–8.
10. Finland F. Shark attack victim. *Nurs Times* 1978 25;74(21):868–9.

Additional information and reprint requests:

Nunzio Di Nunno, M.D.

Dipartimento di Medicina Interna e Medicina Pubblica (DI.M.I.M.P.),
Sezione di Medicina Legale,
Università degli Studi di Bari, Policlinico, Piazza G. Cesare n. 11, 70124 Bari,
Italy.

Fax +39 080 547 8297

e-mail: forem@medicinalegale.uniba.it

<http://www.dimimp.uniba.it/medlegal/index.htm>