Penetrating injury of the maxilla by needlefish jaws

Yaniv EBNER, MD, BPharm1, Daniel GOLANI, PhD2, Dov OPHIR, MD1, Yehuda FINKELSTEIN, MD, MA1

1Department of Otolaryngology - Head and Neck Surgery (Head: Professor D. Ophir), Meir Medical Centre, Kfar Saba, Israel, affiliated to Sackler Faculty of Medicine, Tel Aviv University, Israel; 2Department of Evolution, Systematics and Ecology (Head: Professor R. Nathan), The Hebrew University of Jerusalem, Jerusalem, Israel

SUMMARY. Introduction: Needlefish penetrating injuries have become a worldwide problem, inflicting critical morbidities and even mortalities. This is the first published case of needlefish injury in the Mediterranean basin. Case report: A 29 year old man was admitted to Meir Medical Centre in Israel with a penetrating facial wound caused by elongated needlefish jaws. The severity of the wound contrasted greatly with the expected injury from collision with a fish inflicting a small penetration lesion. The rigid jaws penetrated the maxilla transversely and obliquely from the left canine-fossae, through the nasal cavity, and to the right maxillary sinus, with its tip reaching the right medial-inferior orbital wall. The needlefish jaws were completely removed using a combined endoscopic and external approach. The course of surgery and hospitalization was uneventful and the patient was discharged with no complications. Conclusions: Fish inflicted critical facial injuries might be dangerously underestimated prima facie. The impact might be energetic enough to penetrate deep facial and vital cranial structures, hence thorough examination and imaging are recommended. Needlefish species are now common in the tropical and subtropical regions of all oceans and therefore this phenomenon is of interest to worldwide trauma medical providers, fishermen, divers, and also to marine-biologists. © 2009 European Association for Cranio-Maxillofacial Surgery

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INTRODUCTION

Facial penetrating injuries caused by marine creatures are usually considered to be rare and exotic events. However, human injuries, particularly those caused by needlefish, are common in Oceania (Barss, 1982; Labbe et al., 1995) and were also reported from Hawaii (McCabe et al., 1978), India (Thakker and Usha, 2006), the Red Sea (Bendet et al., 1995) and the American (Link et al., 1999) and European (Kerkhoffs et al., 2003) coasts of the Atlantic Ocean. Such injuries can be hazardous and indeed at least 13 fatal cases have already been reported (McCabe et al., 1978; Barss, 1982).

This is the first report of a needlefish injury in the Mediterranean basin.

CASE REPORT

During the winter season, in the early hours of darkness, two amateur divers were spear fishing off the shores of Herzliya (10 km north of Tel Aviv, Israel). They were equipped with underwater flashlights and spear guns. The divers collected several specimens of needlefish (Belonidae), which they observed in large numbers. They met on the sea surface about 100 m off shore, where the water depth is about 6 m. When they switched on their head flashlights, an underwater commotion ensued and several needlefish leaped out of the water, one of them striking the patient’s face on his left side. Due to the impact, the needlefish’s jaws broke and detached from the fish and remained embedded in the patient’s face. The patient felt extreme pain but did not lose consciousness. He managed to swim ashore, albeit exhausted. He was driven to Meir Medical Centre where he arrived one and a half hours after the injury.

On admission to the emergency room, the 29 year old male was haemodynamically stable and in good general condition. He had a small penetration wound in the left nasolabial fold, with the proximal end of the fish jaws protruding and totally immobile. Even though the wound was lateral to his left nostril, clotted blood was observed coming out from both nostrils (Fig. 1). Unexpectedly, touching the proximal end of the jaws (protruding from the left side of the patient’s face) caused him pain in the right (contralateral) side of the face. There were no signs of injury to the eyes or orbits. The divers brought with them the head of another needlefish, speared from the same school, so that the basic structure of the embedded jaws could be comprehended (Fig. 2, top).

The patient was prophylactically treated with Ciprofloxacin 500 mg Per Os, directed against gram-negative marine bacteria species, mainly Vibrio species. Tetanus immunization was also given.

Computerized tomography revealed the unexpected extent of the internal injury. The elongated heavily calcified jaws penetrated diagonally from the left canine-fossa to the left nasal cavity and through the septum.
The presented case emphasizes the important fact that marine-related penetrating head injuries may be particularly hazardous and can result in unpredicted internal injuries. The needlefish has elongated, sharp and rigid jaws. The serial sections of the computed tomography demonstrated their massive calcified structure and their high penetrability even of a bony structure such as the maxilla. The life of our patient may have been saved by the casual and accidental turning of his head toward his friend, preventing a frontal, possibly lethal injury.

Two other head injuries caused by needlefish have been previously reported. One of them resulted in death due to a carotid-cavernous fistula (McCabe et al., 1978). The second report describes a retrobulbar trajectory that caused a penetrating globe injury and damaged orbital contents (Thakker and Usha, 2006).

Facial injuries from collisions with other kinds of marine animals have also been reported, including facial nerve paralysis from compression by a fish jaw in the retromandibular fossae (Morello et al., 1968; Zwisler and Beigel, 1997).

Needlefish are carnivorous and their putrid sharp teeth can cause severe marine pathogen infection (Link et al., 1999). The possibility of needlefish being inoculated with Vibrio species has been previously described (Cui et al., 2000). In Israel, twelve to twenty-four new cases of serious infection due to Vibrio vulnificus, including mortality, are reported annually (Israel Ministry of Health - Public Health Services, 2006). Although most of these cases involve Tilapia fish, which are raised in fresh water fishponds, Vibrio vulnificus is also found in marine waters off the coast of Israel and was previously isolated from Herzlya’s shore (i.e. the same shore as in our reported case) (Ghinsberg et al., 1999). Wound infection by this bacterium can result in the rapid appearance of severe pain, fever, oedema, vesicles, and subdermal inflammation. In immunocompromised patients this infection can cause sepsis and death (Bisharat et al., 1999). Secondary infection due to needlefish injury has been reported (Link et al., 1999) and prophylactic antibiotic treatment should be given as early as possible.

A Discrepancy between minor physical findings in patients with facial injuries and the actual scope of damage was previously reported (Kloss et al., 2008). The small diameter of the wound should not mislead the physician, because the narrow needlefish beak is long enough to cause significant damage to internal organs. As in our case, the damage can be inflicted at some distance from the entry point with an unexpected trajectory. Hence, Emergency Room staff, Cranio-Maxillofacial surgeons, Otolaryngologists and Ophthalmologists, should become familiar with this type of penetrating injury. Arteriography should be performed when a vascular injury is suspected. The surgical treatment should include meticulous exploration and debridement.

Identification of the injurious fish species was made possible due to another specimen from the same school that was brought by the divers and from the form and length of the remains of the jaws removed from the
The fish was identified as a 57–60 cm full length specimen belonging to the genus *Tylosorus* of the Belonidae ("Needlefish") family, which consists of 32 species worldwide. The Mediterranean Sea is occupied by only two very similar species of *Tylosorus* (*Golani* and *Levy*, 2005). The much more common *Tylosorus acus* is most likely to have been the causal species.

Needlefish are sea-surface dwelling and have a very elongated body, which is semi-cylindrical with a slightly compressed abdomen. They have extremely long and pointed jaws, almost beak-like, with many needle-like teeth. This hydrodynamic shape and fin arrangement enable the needlefish to accelerate rapidly, thus when leaping out of the water due to fright, the needlefish can reach a speed of up to 60 km/h (*Link* et al., 1999). These leaps have resulted in injury or even death to fishermen and swimmers (*McCabe* et al., 1978; *Barss*, 1982). This behaviour is not the result of intentional attack by the patient’s maxilla, as well as from comparative material from the Hebrew University Fish Specimen Collection.

**Fig. 3** — Serial sections of computed tomography show the trajectory of the needlefish’s jaw lodged within the maxilla.

**Fig. 4** — Endoscopic view of the penetrating jaw within the left nasal cavity (The left inferior turbinate on the right, the nasal septum on the left).
needlefish, but is rather their method of escaping danger (Randall, 1995).

Previous case reports have traced the spread of hazardous needlefish injuries from the endemic Oceania area to the coasts of the Pacific and Atlantic oceans, including the coasts of the United States and Europe. The present case heralds the arrival in the Mediterranean basin of this worldwide life-threatening hazard.

CONCLUSIONS

The observed needlefish behaviour near the sea-surface and the increased popularity of scuba diving either for fishing or for sport, mandate awareness and caution by swimmers, fishermen and scuba divers when near water surface in the vicinity of a school of needlefish, and most especially when using flashlights at night.

The potential hazardous infection from marine pathogen, such as *Vibrio vulnificus*, should mandate the physician who encounters an injury from marine animals to consider prophylactic antibiotic treatment.

We discovered that the severity of the internal injury could not be predicted from the small superficial wound and that the impact of collision of marine-creatures might be much higher than expected. From this we conclude that emergency room staff, even in the face of an “innocent” story or primary physical findings, should not erroneously underestimate similar injuries.

CONFLICT OF INTEREST

None of the authors has any conflict of interest, financial or otherwise.

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References


