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ABSTRACT
This article is intended to give information about different organisms which inhabit the Maltese sea and which are potentially harmful. Doctors working in the primary health setup and sometimes also in secondary care are often faced with injuries related to these organisms. The nature of the injury and its treatment is then discussed. Treatment however is not evidenced based as little if any studies have been conducted in this field of medicine. This first of two articles will review the well-known jellyfish stings and other less familiar venomous organisms such as the bristle worm and the sting ray.

KEY WORDS:
Stings, jellyfish, weever fish, bristle worm, sting rays

INTRODUCTION
Malta is an archipelago of islands in the centre of the Mediterranean. It is densely populated with many tourists visiting each year, most of them doing activities directly or indirectly related to the sea. It is no wonder that Maltese doctors are often faced with injuries caused by these activities. An important type of injury related to the sea is that caused by dangerous creatures. The most common of these are those caused by jellyfish and weever fish, but these are not the only dangerous animals which inhabit the sea and are cause of injuries. In this article some of the most common dangerous creatures are described together with the type of injury they inflict and its treatment.

ORGANISMS AND MECHANISMS OF INJURY
There are more than 300 species of fish which inhabit the central Mediterranean region (Sammut, 2001). To these one has to add the multitude of other species ranging from microscopic organisms to coelenterates and worms. Nature has devised several forms and shapes which have enabled the organisms to survive and evolve. All living creatures have to be able to find or catch food, and to defend themselves against predators and attackers. Man is not spared from these mechanisms and thus is in the same danger of being injured if the marine environment is invaded.

Marine organisms defend themselves by many mechanisms. Sea anemones and jellyfish possess venomous stings which are triggered as soon as the organism is touched, and these cause very painful injuries. Sea urchins possess spines which will penetrate and break into the offending organism. Bristle worms have hairs which contain venom, while weever fish and scorpion fish have venomous spines. The sting ray and eagle ray possess very sharp poisonous barbs in their tail.

Table 1: Dangerous creatures divided according to mechanism of injury.

<table>
<thead>
<tr>
<th>VENOMOUS</th>
<th>BITES</th>
<th>SPINES</th>
<th>ELECTRIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anemones</td>
<td>Sharks</td>
<td>Sea urchin</td>
<td>Electric ray</td>
</tr>
<tr>
<td>Jellyfish</td>
<td>Moray eel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bristle worm</td>
<td>Conger eel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater weever</td>
<td>Barracuda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesser weever</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scorpion fish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sting ray</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eagle ray</td>
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<td></td>
</tr>
</tbody>
</table>
There are fish such as sharks and the moray eel which possess powerful jaws and/or sharp teeth which will inflict painful bites. The torpedo ray is very peculiar in that it is able to produce electric shocks to stun prey or defend itself. Table 1 gives a list of the organisms which are dangerous together with their weaponry.

Information about the organism together with the injury it inflicts and its treatment will be described. The venomous injuries can all lead to anaphylaxis and shock in rare cases. Obviously, if present, treatment of shock and anaphylaxis should take priority in the management of these injuries. This is beyond the scope of this review and is not dealt with here. It should be pointed out at this stage that treatment of most of the injuries described has little evidence base, as studies are difficult to conduct.

VENOMOUS ORGANISMS

Part one of this article will discuss the venomous organisms while the other organisms will be discussed in part two. Venomous organisms are divided into four groups for easier discussion:

- The Bristle Worm
- Jelly Fish and Sea Anemones
- Weever Fish and Scorpion Fish
- Sting Ray and Eagle Ray

A short description of the organism is first given followed by the type of injury and its treatment. As marine organisms are cold blooded, excluding the mammals, their venom is thermo labile, i.e. it is deactivated by heat, and so heating the area by immersing it in hot water will minimize the trauma (Auerbach, 1999).

1. The Bristle Worm
The Organism

The bristle worm (Figure 1, Table 2) is a common bottom-dwelling organism which lives on rocky bottoms. It is a scavenger and eats any dead fish or debris which it can find. This worm has a bright red colour with rows of fine white hairs along its sides (Sultana et al., 1995). These venom-containing bristles are fired into any offending organism when it is disturbed or handled.

Nature of Injury

Injury often occurs when the worm is touched by bare hands, when curious divers pick up the organism unaware of its danger. Spear fisherman can also get hurt when they accidentally touch the organism while fishing beneath boulders or crevices. The injury is easily prevented by wearing a wet suit or vest which protects against these hairs penetrating the skin. When one touches this worm the hairs stick into the skin and cause intense itching at the site. An instinctive urge to rub the affected area ensues. One should refrain from doing so as this pushes the venom deeper into the skin. If the hairs are seen attached to the skin while diving, it is best to remove them cautiously by grasping them between the thumb and index finger and pulling them out. This greatly reduces the intense stinging pain which follows. This pain lasts for up to four hours after the contact.

Treatment

The area should be heated by either pouring or immersing it in hot water. One should be careful not to scald the skin (Auerbach, 1999). After this, the application of ice will numb the area and provide immediate relief. Applying adhesive tape followed by acetic acid (vinegar) or isopropyl alcohol is also advocated (Haines, 2006). Oral analgesia is also helpful. The injury is self limiting and does not lead to infection or scarring.

2. Jellyfish and Sea Anemones
The Organisms

The jellyfish (Figure 2, Table 3) and the anemones are coelenterates. They possess millions of venom filled nematocysts on their tentacles which fire as soon as anything touches them (Sultana et al., 1995). This is their
mechanism to capture food and to defend themselves.

The jellyfish are free swimming organisms that can occur in large numbers during times of blooming. No one is spared when the sea is full of them. Blooming is a natural phenomenon which occurs in a cyclical fashion. The thick tentacles are not more than 20 cm in length and contain the greater number of nematocysts. The narrow tentacles, which may be more than two meters in length, have fewer nematocysts and thus produce less intense injuries.

The sea anemones are related to the jellyfish but are sedentary. They live on rocky shores in very shallow water. Anemones have much more tentacles which are narrower. The tentacles are coloured yellowish-green and violet and thus often attract the attention of young children who touch them unaware of the danger. Their venom is less potent and so they only cause mild irritation to the victim, if any.

Nature of Injury

Jellyfish stings are by far the commonest of injuries which will be described in this article. Anyone who goes into the sea during times of blooming can be a victim of them. Injuries occur on any part of the body. Stings are worse where the skin is more sensitive like the flexure areas and the face, and when the thick tentacles are involved. Stings cause an immediate intense, sharp, burning pain at the site. Some people can be at risk of drowning if they panic or have multiple stings on their body. When stings affect the face, especially when somebody dives head first or when scuba divers jump in the water, they can cause difficulty with breathing. Wearing a vest protects against jellyfish stings.

Immediately after the sting there is an intense acute inflammatory response with swelling, redness, pain and warmth of the area which can last for up to a week after the contact. Some doctors wrongly assume this to be an infective process and give antibiotics. However this is rarely the case and the inflammation is a direct reaction to the venom. Intense itching develops after a few days with a scab developing along the scars left by the tentacles. If the scab is scratched it will leave a permanent scar. A delayed inflammatory reaction may develop in some people, whereby an apparently healed injury starts to itch and blister months after the contact. This is a cell mediated immune response.

Table 3: Information about the Jellyfish

<table>
<thead>
<tr>
<th>Family</th>
<th>Polagiidae</th>
<th>Actiniida</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific name</td>
<td>Pelagia noctiluca</td>
<td>Anemonia viridis</td>
</tr>
<tr>
<td>English name</td>
<td>Common Jellyfish</td>
<td>Sea Anemone</td>
</tr>
<tr>
<td>Maltese name</td>
<td>Brama Komuni</td>
<td>Artikla</td>
</tr>
<tr>
<td>Maximum length</td>
<td>20cm</td>
<td>15cm</td>
</tr>
<tr>
<td>Habitat</td>
<td>Free Swimming</td>
<td>Rocky Shore</td>
</tr>
</tbody>
</table>

Treatment

A multitude of first aid treatments has been advocated for jellyfish stings ranging from sweeping the area with a credit card, applying vinegar, hot and cold water to the area, and covering it with talcum powder. There is no evidence-based treatment for jellyfish stings, despite them being very common.

First and foremost, one should not do the following actions:

- Do not wash the area with fresh water. Through osmolarity this causes the breakdown of intact nematocysts thus spreading the venom (Drobina, 2008).
- Do not rub the area or apply any creams. Doing so will massage the venom deeper into the skin and spread it further (Drobina, 2008).

The most commonly agreed first aid treatment is the use of vinegar on the area affected. As vinegar has an acidic ph this is said to neutralize the alkaline nature of the venom. Immersing the area in hot water will denature the protein of the venom (Mayo Clinic, 2011). The use of topical anaesthetic sprays used for insect bites also relieve the pain. Applying cold compresses to the site numbs the pain.

If the immediate treatment is very varied and sometimes anecdotal, the further management is even less consensual. Several options are advocated. Analgesics are certainly an option. Antihistamines, especially the sedating type, help to decrease the inflammation and control the itching. Systemic steroids could probably have a role in treatment (Mayo Clinic, 2011). The use of topical treatment is not very effective and can actually make it worse.

The author would like to describe a case which he had treated with a transparent, hydrocellular gel dressing. A four year old girl suffered an extensive injury involving...
all her thigh causing intense itching and pain. Covering the area with this dressing greatly reduced the symptoms. The injury healed completely without leaving any scar.

3A. The Weever Fish
The Organism
The weever fish (Figures 3 and 4, Table 4) are the commonest cause of the more serious venomous injuries. They are thin-bodied fish which live on sandy bottoms, spending most of the time buried in sand waiting for smaller fish or crustaceans to pass nearby. The first three dorsal spines and two spines on the side of the head contain very potent venom which is injected into any offending organism (Sammut, 2001).

There are two species of the weever fish: the lesser and the greater weever fish. The lesser weever grows to a smaller size and lives in shallower waters, and juveniles may be found even at a few feet of depth. The greater weever lives in deeper waters down to 100m depth. As a result it is the lesser weever which causes most of the injuries as it is caught by amateur fishermen who are unaware of its danger. The greater weever is caught offshore by usually more experienced fishermen who know how to handle this fish with due respect.

Nature of Injury
There are two mechanisms by which this fish can provoke an injury. The most common is when the fish is caught and mishandled. Amateur fishermen fishing from the shore or from boats by rod or lines catch this fish and are unaware of its potential danger. While unhooking it, the fish will twist about violently stinging the fisherman on the hands. More rarely the weever fish stings bathers who step on it while swimming in sandy beaches.

After the sharp sting, an intense, excruciating pain is felt rushing from the site of the sting centrally, often described as going towards the heart, as the venom spreads via the blood stream. There is an immediate reactive inflammatory response with swelling, redness, pain and warmth at the site of the sting. If left untreated the area around the sting will form blisters which can become gangrenous. It should be noted at this stage that the venom of the weever fish remains active even after the fish is dead. There have also been accidents occurring to people handling fish which had been frozen for weeks.

To prevent injuring oneself by the weever fish it is best to cut the line to release the fish rather than unhooking it. If the fish is being kept the spines on the back and side of head should be immediately cut off with extreme care once the fish is dead. The spines should be thrown away where nobody can come in contact with them as the venom will remain active.

Table 4: Information about the Lesser and Greater Weever Fish

<table>
<thead>
<tr>
<th></th>
<th>Lesser Weever Fish</th>
<th>Greater Weever Fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>Trachinidae</td>
<td>Trachinidae</td>
</tr>
<tr>
<td>Scientific name</td>
<td>Echiichthys vipera</td>
<td>Trachinus draco</td>
</tr>
<tr>
<td>English name</td>
<td>Lesser Weever</td>
<td>Greater Weever</td>
</tr>
<tr>
<td>Maltese name</td>
<td>Sawt</td>
<td>Tracna</td>
</tr>
<tr>
<td>Maximum length</td>
<td>30 cm</td>
<td>50 cm</td>
</tr>
<tr>
<td>Habitat</td>
<td>Sandy bottom</td>
<td>Sandy bottom</td>
</tr>
</tbody>
</table>
Treatment

First aid treatment consists of bleeding the site to minimize the spread of the venom. Heating the area by immersing it in hot water denatures the protein of the venom, further decreasing the pain (Fell, 2012; Gallagher, 2011). However, medical care should be sought immediately as a local infiltration of lignocaine acts both as pain relief and as an anti-venom, neutralizing the deleterious effects (Zammit, undated). Tetanus vaccination should be given and antibiotics started if signs of infection commence.

3B. Scorpion Fish

The Organism

The scorpion fish (Figure 5, Table 5) is a bottom dwelling fish which lives in rocky bottoms. There are several species of scorpion fish, the Scorpaena porcus being the most common. The scorpion fish have a deeper body with a very large head. These fish live under rocks and crevices in depth ranging from 0.5m to 50m (Sammut, 2001). They are masters of camouflage, waiting immobile for prey to swim past which they then engulf with a sudden snap. Like the weever fish, scorpion fish have venomous spines on the back and sides of the gills. The venom of the scorpion fish is less potent than that of the weever fish but still causes intense pain and inflammation at the site.

Nature of Injury

Injury occurs when the fish is caught and mishandled. Most commonly the injury occurs when the fish is being released from nets. Due to its characteristic large head, deep body and colour it is easily recognizable and less easily confused with other fish. Moreover this fish is less slippery then the weever fish so it is easier to release from hooks. Nonetheless one has to respect this fish and exert the maximum caution while handling it. Caution has to be taken also when the fish is dead, as the venom will remain active even if the fish is frozen. Cutting off the dangerous spines immediately when the fish is dead is recommended.

Treatment

Treatment is identical to that of injuries by weaver fish. Immersing the area in hot water for about fifteen minutes is the immediate treatment. If pain persists infiltrating the area with lignocaine eases the pain and decreases the complications. Tetanus booster is indicated and any resulting infection should be treated with antibiotics (Zammit, undated; Fell, 2012; Gallagher, 2011).

4. Sting Rays and Eagle Rays

The Organisms

The rays are fish which live on the bottom (Figure 6, Table 6). They are flat with an elongated narrow tail. At the base of the tail the sting and eagle rays possess sharp, pointed venomous barbs which they use as self defence. These fish can bury themselves completely in the sand becoming invisible from above. The common sting ray has a rounded flat shape. The eagle ray has a more kite like shape with a distinct snout and long tail which is very narrow and reaches to double the fish’s length (Sammut, 2001). Both are very strong fish capable of swimming gracefully along the sea bed. The eagle ray is more graceful in its movement giving the impression of flying rather than swimming in the sea. It can also be found swimming near the surface in the open water during migration.

Adult specimens of these fish are rare and often found solitary. The common sting ray is the commoner of the two. The adult female gives rise to a litter of about 10 to 15 young rays which are identical to the adult in every way including the potentially dangerous barb. These small rays swim into shallower waters down to few meters in depth to feed and grow. They can often be found in small groups.

Nature of Injury

As already mentioned these rays have a very effective means of self defence. When attacked, caught or disturbed they will twist and swirl their tail frantically in an effort to inflict the barb into the aggressor. The barb is extremely
sharp and will lacerate skin and soft tissues easily. It also contains a potent venom which is injected into the victim often deep into the tissues. The eagle ray also uses its long, narrow tail as a whip, literally whipping its offender. Most often injury occurs when the fish are caught either with long lines or by spear fishing. The younger sting rays are the commoner culprits because they are often encountered in shallow water and are easily speared. The hands are often the part of the body injured as the fish is being released from the hook or spear. Once the barb penetrates the skin intense pain follows. This may result in hyperventilation, loss of consciousness and rarely fatality. After penetration, extensive inflammation develops at the site which may even lead to areas of gangrene. At a later stage infection may develop.

Treatment
Emergency treatment consists of stopping the bleeding and of minimizing the damage of the venom. Once again heat denatures the venom but may be difficult to apply because of the open wound which may be quite deep and jagged. The wound should be thoroughly cleaned and cared for. Analgesics are often needed to decrease the pain. Tetanus vaccine should be given and the patient should be prescribed antibiotics (DuBois, 2005).

**CONCLUSION**

Knowledge of these creatures and the injuries that they inflict is of essential importance to general practitioners and emergency doctors who need to treat such injuries during their practice.

By understanding the organism, a proper diagnosis can be reached and appropriate treatment started without delay. It should be stressed that some of these injuries may result in shock. This may result either from anaphylaxis or from hypovolaemia through bleeding (especially in severe injuries from rays). Should this be present, treatment of such a complication should take absolute priority.

*Part two of this article will deal with other organisms that may injure humans in diverse and imaginative ways.*

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**References**

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