Observation of initial clinical manifestations and repercussions from the treatment of 314 human injuries caused by black sea urchins (Echinometra lucunter) on the Southeastern Brazilian coast

Observação das manifestações clínicas iniciais e sua influência no tratamento de 314 acidentes causados por ouriços-do-mar pretos (Echinometra lucunter) na região sudeste do Brasil

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ABSTRACT

Introduction: Injuries caused by sea urchins are the most common caused by marine animals in humans in Brazil, with the black sea urchin (Echinometra lucunter) causing the most injuries to bathers. Methods: This study observed 314 human wounds with emphasis on the early observation of clinical signs and symptoms and their implications on the recommended treatment. Results: All the injuries were caused by black sea urchins and were observed in bathers. The lesions and the pain were associated with penetration of the spines; there was no early inflammation or pain without pressure on the wounded places. Complications arising from this kind on injury, including infections and foreign body granulomas, are associated with the permanence of the spines in the wounds. Conclusions: The study confirmed that this kind of injury is the most common accident caused by aquatic animals in Brazil. The main therapeutical recommendation is early removal of the spines to prevent late complications, such as infections and the formation of foreign body granulomas.

Keywords: Dangerous aquatic animals. Black sea urchin. Echinometra lucunter. Brazil.
are late complications that are difficult to resolve, such as bacterial and fungal infections and the formation of foreign body granulomas in sites where spine fragments remain.

Other sea urchin species inhabit our coast, but they are of minimal epidemiological significance. The purple or green sea urchin (*Lytechinus variegatus*) is rarely associated with injuries. In some locations along the Brazilian coast specimens of the *Diadema* genus can be found; these can cause severe envenomation by the direct action of toxins found in their hollow spines. The primary injury caused by sea urchins is due to penetration of spines. The most commonly affected areas are the feet and ankles (mainly the plantar regions, when victims step on sea urchins) and the hands, for manipulation or as a defence mechanism when divers are dragged on to rocks by wave action. Spine penetration causes pain, bleeding, and in later phases, erythema and oedema. When joints are penetrated, synovitis can occur.

Systemic symptoms are especially common when the toxin is injected in the wound from fifteen or more spines, but only in species capable of causing envenomation. These symptoms include paresthesia, radiated pain, hypotension, muscular weakness, dyspnea, aphonia, deafness, and even death. Envenomation is associated with early intense pain and inflammation. In Brazil, nearly all injuries are traumatic, provoking moderate pain on local compression with slight or no local inflammation in the first few hours after envenoming.

We can observe delayed complications such as granuloma formation, chronic arthropathy, persistent neuropathy, local bone destruction, and vesicle formation. The possible granulomatous reaction mechanism is due to foreign body reactions to various inorganic substances contained in the spines (calcium carbonate, magnesium carbonate, calcium sulphate, phosphates, and siliceous dioxide). Lesions are pink to blue papules and consist of 2-5mm nodules that later become brown. Oedema is a different process associated with plasma or water in the skin and can be observed in inflammatory diseases or after trauma. Hyperkeratosis is common.

From an observation of 314 black sea urchin accidents in humans (predominantly in bathers), the author describes the evolution of the accidents, observing clinical signs and symptoms soon after spine penetration (up to 24h) and after 72h to evaluate the effects of trauma and possible inflammatory agents inoculated by the spines. From these results first-aid measures and complementary late therapy can be established for injuries caused almost entirely by *E. lucunter* in Brazil.

### METHODS

Patients were observed by the author at the time of the accident and 72h later in the Ubatuba Emergency Room (State of São Paulo, Brazil). Patients were invited to participate in the study and to sign an authorization form with information on the experiment, which was authorized by the Ethics Committee of the local Santa Casa and Maternity Hospital. Patients were observed and questioned for signs and symptoms (pain, bleeding, oedema and erythema, local purulent secretion, and nodules) and photographed for visual comparison at the two moments. The data were analysed for initial inflammatory phenomena and correlated with proposed measures for this type of injury in Brazil.

### RESULTS

We observed 314 patients injured by sea urchins in the two-year period 2009-2010. Injuries occurred at various beaches in the municipality. Nearly 65% of the victims were male and 82% were bathers. The plantar regions were compromised in 93% of cases. Extracted spines were collected and identified by the author as all belonging to the species *E. lucunter*, the black sea urchin.

Pain was the predominant symptom, present in all cases, but only perceived when patients placed plantar regions on the ground. Spontaneous intense pain was minimal (equivalent to less than 1% of accidents). Patients complained of pain when spines were removed, stating it to be more intense than spine penetration and retention pain at the time of the accident.

On examination, performed up to 6h after the accident, there were no inflammatory phenomena at the spine penetration site. Further observations 72h after onset revealed slight inflammation with discrete erythema surrounding the spine penetration areas (including points where spines had been extracted). Inflammation was more marked with associated oedema in about 5% of patients.
FIGURE 3 - The composite image shows a group of injuries caused by black sea urchins in the first few hours after spine penetration. It is clear that there are no present inflammatory alterations. Spontaneous pain was absent. Photographs: Vidal Haddad Junior.

DISCUSSION

The observation of 314 accidents caused by the black sea urchin *E. lucunter* has revealed interesting data about the phenomena triggered by spine penetration and the therapeutic measures recommended. The recent identification of experimental inflammatory effects triggered after penetration of extracts taken from the spines can be interpreted as a possible sign of toxins in the spines, although other proteins may trigger similar processes. Apart from these findings, clinical observations demonstrate bleeding at spine entry points, but clearly no initial spontaneous inflammation or pain, while envenomation by sea urchins is associated with early severe pain and inflammation, as described in accidents by the *Diadema* genus. Although recent experimental studies are worthy of respect, it seems clear that the cases in this study did not present the severe inflammatory reactions or severe pain compatible with toxin actions. Additionally, the patients were calm and seldom complained of pain when they did not place the plantar regions on the ground. There was inflammation in some cases (always after 12-24h), but this was mild, hardly noticeable at the time of the accident (Figures 2 and 3), increasing with time, and proportional to the presence of calcium carbonate foreign body lesions (spine fragments).

It is clear that there are venomous species of sea urchins, and recent publications show that there are toxins in *E. lucunter* spines. Data from this study show, however, that these substances do not interfere with the patient’s clinical manifestations, especially in initial envenoming phases. Thus, indication of steroidal or nonsteroidal anti-inflammatory drugs is precipitous at the early stages and is doubtful at the late stages (granulomatous phase) of accidents; these drugs also cause side effects.

Current recommendations for injuries caused by black sea urchins are supported by the data from this study, which confirm predominantly traumatic aspects to the accidents. The main treatment is immediate removal of spines under local anaesthetic. The entry point should be lightly scarified with a large-calibre hypodermic needle, and the spines of larger diameter should be removed; the spines of very fine diameter are difficult to access but are spontaneously expelled after inflammatory processes triggered by their presence. Extraction is not easy but is necessary, because retained fragments can trigger infections and granulomatous nodules that can only be resolved by surgery. These guidelines are based on previous works showing a direct relationship between inflammation (including granulomas) and spines remaining in the skin.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES