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Dynamic variations in platelet counts may reflect the severity and prognosis of stingray injuries in the early phase

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ABSTRACT

There is often a delay in offering quality and prompt treatment after a stingray sting. We present 3 cases of stings and discuss the Poisoning Severity Score (PSS) and a simple tool to assess the severity of such injuries. A 34-year-old man, who worked as an aquarium keeper, presented a wound on the left fifth digit caused by a stingray. Acute myocardial injury and rhabdomyolysis were detected. After 6 weeks, the wound had almost healed. A 27-year-old man who experienced a stingray injury on the left second digit recovered without sequelae after 5 weeks. A 45-year-old man with a history of diabetes, who was accidentally stung in the right palm by a stingray, experienced rhabdomyolysis and returned to work after 2 months. We performed debridement, administered the tetanus toxoid and antibiotics, and immersed the wounded hand in warm water (about 43 °C) for all three cases. Meanwhile, patients with rhabdomyolysis were administered intravenous hydration. Upon presentation at the emergency department, we recorded the severity of the injury by using PSS. We found that relatively high PSSs were associated with lower platelet counts that happen due to various adverse events. We suggest that dynamic changes in platelet counts may be associated with the severity of the injury. Furthermore, lower platelet counts in the normal or abnormal range may indicate poor prognoses.

1. Introduction

A stingray's tail has barbed stingers that are used for self-defense [1]. Although its venom can trigger intense pain, edema, and necrosis, immersion of the affected area in warm water (42–45 °C) can soothe the pain owing to the heat-labile nature of the venom [2,3]. After a sting, wound irrigation, the tetanus toxoid, and antibiotics are necessary to remove the excess venom and prevent secondary infection [4,5]. Stingray stings are mostly benign. However, injuries to the thorax and abdomen can be severe, and sometimes, death is known to occur, although not necessarily caused by the damage to the thorax or abdomen [6-8]. Adequate first aid and early debridement may prevent pain, infection, and prolonged disability [9]. However, there is no standard for early severity and prognostic evaluation in the current literature on stingray envenomation. The severity score of the poisoning (PSS) [10] was developed jointly by the European Association of Poisons Centers and Clinical Toxicologists (EAPCCT) in 1999. It was amended in 1994 and has been adopted by many countries for assessing the condition and forming a prognosis [11]. The PSS takes into account only clinical symptoms and signs, while the early underlying risk of the disease and the concentration of toxic substances are not considered. In addition, the numerical rating scale (NRS) is used to evaluate pain scores. Herein, we present 3 cases of stings and discuss the respective PSS values. The amelioration of adverse events and symptoms, and changes in the platelet count observed during hospital stay were studied to formulate a practical and simple tool for assessing stingray injury.

1.1. Case 1

A stingray (*Potamotrygon leopoldi*) punctured the left fifth digit of a 34-year-old man (Fig. 1A) 4 h before he was presented to our unit. A painful (pain scale 10/10; PSS, 3) 1.0-cm laceration with localized swelling was observed (Fig. 1B). We performed debridement, administered the tetanus toxoid, and immersed the wounded hand in warm water (about 43 °C), upon which the patient experienced pain relief (pain scale 5/10). Atrial premature beats and cardiac troponin I (cTnI)

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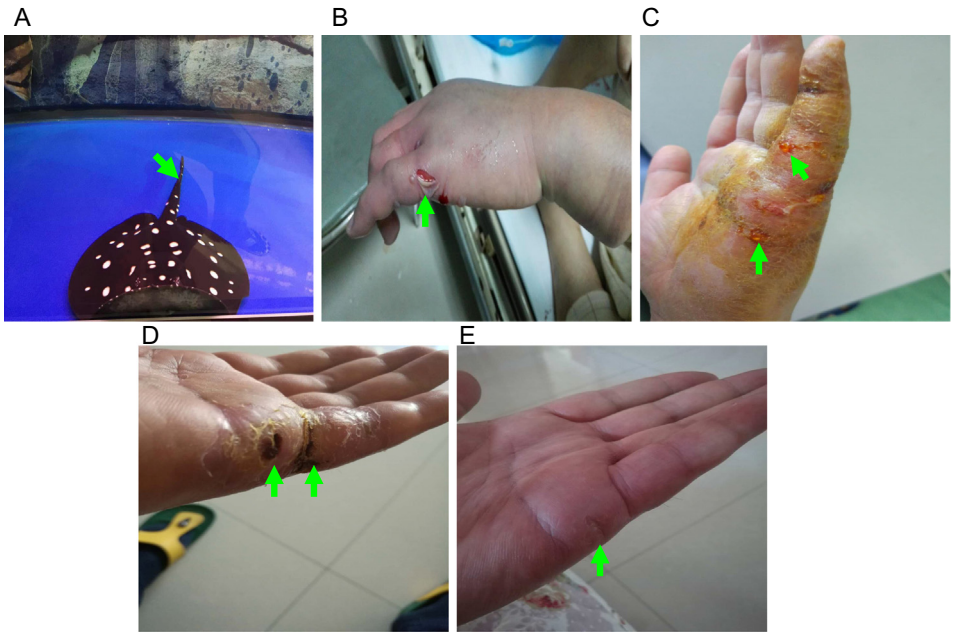

Fig. 1. A. Stingray in the patient's aquarium. B. The affected left fifth digit (4 h after the incident). C. Local tissue was swollen and exuded secretion (the first week of the incident). D. Epidermis regeneration (2 weeks since the incident). E. Local tissue healing (6 weeks since the incident).

(5.41 ng/mL; Table 1) were detected 10 h after the incident in the intensive care unit (PSS, 2). Physical examination and cardiac ultrasonography revealed normal findings. The patient presented mild pain (pain scale 2/10) and skin necrosis 13 h later. After 24 h, the creatine kinase (CK) level was found to be 24,302 U/L; pH, 7.31; and HCO_3^-, 20 mmol/L (Table 1); furthermore, blisters measuring 2 × 4 cm and mild proteinuria were detected (PSS, 3; Fig. 1C). The patient was immediately treated with intravenous hydration, piperacillin/tazobactam (3.375 g, tid), and bicarbonate solution. Three days later, the CK level reduced to 6375 U/L (Table 1), and therefore, the intravenous antibiotics were replaced by oral tablets. After epidermis regeneration, he requested to be discharged at 2 weeks (Fig 1D; PSS, 1). The wound healed completely 6 weeks later (Fig. 1E).

1.2. Case 2

A 27-year-old man was stung by a stingray (*Potamotrygon motoro*) 1 h before he presented at our unit. A painful (pain scale 10/10; PSS,

Table 1
Changes in serum markers at different time points after the stingray injury

Case 1	4 h	10 h	13 h	20 h	24 h	38 h	4 days	1 week	2 week		6 h	10 h	20 h	24 h	36 h	3 days	1 week	2 weeks
WBC	12.90	13.70	12.0	12.80	16.20	15.40	8.00	7.90	8.40	CK	2047	4454	6624	24,302	10,151	6375	2560	1617
NEUT	10.29	11.46	10.71	11.9	13.66	12.34	4.57	4.71	5.34	LDH	157	268	258	300	183	170	165	151
MONO	1.17	1.20	0.82	0.78	1.45	1.69	0.98	0.99	1.02	a-HBDH	137	228	187	208	175	138	142	156
LYM	1.36	1.00	0.62	0.62	1.10	1.31	2.41	2.04	1.85	m-AST	28	38	31	35	30	16	12	8
EOS	0.05	0.01	0.00	0.00	0.00	0.00	0.06	0.13	0.14	MB	262.5	1193	852	1291	943	532	235	178
HGB	162	161	152	155	150	147	151	160	163	CK-MB	42	230	210	203	126	36	22	19
PLT	100	120	185	125	98	102	128	187	190	cTnI	0.28	5.41	0.3	0.245	0.05	0.07	0.2	0.07

Case 2	1 h	4 h	10 h	18 h	24 h	36 h	3 days	1 week		6 h	10 h	20 h	24 h	36 h	3 days	1 week
WBC	9.8	12.7	13.9	11.8	9.8	9.2	7.8	6.9	CK	2014	2536	1669	1584	1103	849	536
NEUT	7.20	10.46	10.28	9.29	9.06	8.34	4.57	4.71	LDH	167	190	207	146	201	186	198
MONO	0.78	1.06	1.32	1.22	1.65	1.09	0.98	0.49	a-HBDH	142	138	106	160	155	142	147
LYM	1.23	1.01	0.82	0.92	1.10	1.31	2.41	2.04	m-AST	15	–	18	12	6	–	16
EOS	0.15	0.10	0.05	0.06	0.26	0.33	1.36	1.43	MB	213.00	446.40	265.90	00.00	00.00	235.50	152.50
HGB	164	162	160	164	160	165	161	160	CK-MB	27	33	30	26	22	25	19
PLT	126	144	140	204	209	208	212	210	cTnI	0.18	0.41	0.33	0.34	0.04	0.06	0.32

Case 3	1 h	6 h	12 h	22 h	32 h	3 days	7 days	10 days		2 h	6 h	12 h	22 h	32 h	3 days	7 days	10 days
WBC	10.9	14.7	15.8	17.2	14.4	8.26	7.95	8.43	CK	1427	2214	2669	12,361	11,180	5610	2436	1136
NEUT	8.29	9.46	10.71	13.86	11.24	6.47	5.71	4.64	LDH	122	138	126	163	145	132	157	141
MONO	1.07	1.12	0.82	1.25	1.09	0.92	0.69	0.58	a-HBDH	132	128	116	156	135	122	117	134
LYM	1.26	0.89	0.72	1.02	1.23	2.04	2.34	1.68	m-AST	20	19	26	32	26	19	12	14
EOS	0.04	0.02	0.01	0.012	0.013	0.05	0.11	0.17	MB	113.00	246.40	275.90	432.00	357.00	225.50	172.50	142.50
HGB	154	163	162	158	157	158	162	164	CK-MB	26	32	48	85	63	26	24	13
PLT	92	124	212	87	90	128	213	218	cTnI	0.26	0.31	0.23	0.14	0.14	0.09	0.12	0.62

Reference ranges: White blood cells (WBC) 3.5–9.5 × 10^9/L; Hemoglobin (HGB) 130–175 g/L; Neutrophils (NEUT) 1.8–6.3 × 10^9/L; Monocytes (MONO) 0.1–0.6 × 10^9/L; Platelets (PLT) 125–350 × 10^9/L; Eosinophils (EOS) 0.02–0.52 × 10^9/L; Lymphocytes (LYM) 1.1–3.2 × 10^9/L α-hydroxybutyrate dehydrogenase (a-HBDH) 72–182 U/L; Creatine kinase isoenzyme (CK-MB) 0–25 U/L; Cardiac troponin I (cTnI) 0–1.68 ng/mL; Creatine kinase (CK) 50–310 U/L; Lactate dehydrogenase (LDH) 120–250 U/L; Mitochondrial aspartate (m-AST) 0–18 U/L; Myoglobin (MB) 0–70 ng/mL.

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