Acute Renal Failure in a Child with Jellyfish Contact Dermatitis

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A 7-year-old boy suffered from jellyfish contact dermatitis and acute renal failure following a jellyfish sting. Three days before being admitted , he accidentally contacted a jellyfish on the left forearm, left thigh and trunk while wading at Pattaya beach, Eastern Thailand. Investigation revealed hemoglobinuria. Histologic findings of a renal biopsy indicated that acute tubular necrosis had caused acute renal failure in the present patient. Supportive treatments improved the dermatitis and renal function of this patient.

Keywords : *Acute renal failure, Hemoglobinuria, Jellyfish sting*

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Jellyfish envenomation is reported throughout the Indo-Pacific region, the Atlantic region, the South China sea, and the Mediterranean. The severity of the envenomation syndrome is varies from sudden cardiogenic death[1,2], anaphylaxis[3], systemic reactions and local reactions[4,5]. The authors report a case of acute renal failure in a child after a jellyfish sting.

Case Report

A 7-year-old boy was accidentally stung by tentacles of a bluish-purple colored jellyfish three days before coming to the hospital. He felt painful skin lesions on the left forearm, left thigh and trunk, which appeared along the tentacle tracks. The involved extremities had persistent pain and progressive edema. His mother noticed that he developed oligulia and dark-colored urine. He was admitted to a private hospital. His blood pressure was 113/54 mmHg and his pulse was 100/min. Generalized swelling of the left forearm was observed. Left forearm, left thigh and trunk had linear hyperpigmented patches with a crust on the erythematous skin. The rest of the physical findings were normal. His laboratories data were as follows: white blood cell count was 19,800/mm3 (N 75%, L 8%, E 1%). Hemoglobin was 13 g/dl and platelet count was 568,000/mm3. No fragmented red blood cells were noted and no other abnormal red blood cell morphology was seen. Blood urea nitrogen (BUN) was 28 mg/dl, creatinine 4.6 mg/dl, Na 133 mEq/L, K 4.6 mEq/L, Cl 98 mEq/L. Results of urinalysis were as follows: specific gravity was 1.010, protein 2+, blood 2+. The sediment of centrifuged urine revealed 0-1 red blood cell per high power field. Intravenous administration of isotonic saline followed by furosemide was associated with no change in urine volume and he was referred to King Chulalongkorn Memorial Hospital due to rising of serum creatinine from 4.6 mg/dl to 6.1 mg/dl.

On admission 72 hours following the sting, the patient appeared acutely ill. Blood pressure was 123/53 mmHg. On the left forearm, left thigh and trunk there were linear erythematous papules and blisters with scabs at peripheral in a whiplike pattern on edematous and swollen skin. Peripheral pulses were presented in all extremities. Laboratories revealed that hemoglobin was 12 g/dl, BUN 115 mg/dl, creatinine 5.7 mg/dl, Na 127 mEq/L, K 6.3 mEq/l, Cl 90 mEq/L, calcium 10 mg/dl, phosphate 7 mg/dl, uric acid 5 mg/dl, CPK 92 units/L, SGOT 148 IU and SGPT 43 IU. Urinary hemoglobin was positive with 80% saturated ammonium sulphate and urinary myoglobin was negative.

Clinical course

After admission, oliguria persisted but dialysis was not required. With supportive treatment by intravenous furosemide, dopamine and dressing to the skin lesion with normal saline, resolution of oliguria began on the seventh day following the sting. Hemoglobin level was gradually decreased to 9.2 g/dl. Serum creatinine had returned to normal (0.7 mg/dl)

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Fig. 1 Skin lesions appeared along the tentacle tracks on the left forearm following jellyfish sting

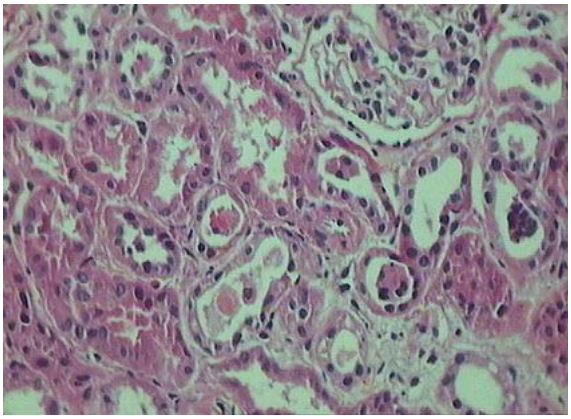

Fig. 2 Renal biopsy findings show patchy flattened and slough-of tubular epithelial lining

by day 13. Renal biopsy was performed on day 8. The renal biopsy specimen included 17 glomeruli. No apparent structural changes were observed in the glomeruli. Tubular epithelium showed patchy flattened and slough-of epithelial lining. No deposition of IgG, IgA, IgM, C3, C1q, C4, nor fibrinogen was found in glomeruli. The pathologic diagnosis was acute tubular necrosis (ATN).

Discussion

The presented patient suffered from dermatitis and developed acute renal failure (ARF) as a result of being stung by a jellyfish. Acute renal failure developed without other major organ failures. Histologic findings of the renal biopsy showed ATN and neither shock, rhabdomyolysis, nor drugs were the cause of ATN. As seen from his physical examination and laboratory data on admission, poison from the sting of jellyfish together with intravascular hemolysis is believed to be responsible for causing ATN.

Jellyfish venoms are complex mixtures of polypeptides and enzymes, including deoxyribonuclease, ribonuclease I, phospholipase, catecholamines, histamine, hyaluronidase, fibrinolysin, kinin, and various hemolytic, cardiotoxic and dermatonecrotic factors, that are toxic or antigenic to man[6,7]. Human reactions may result in either fatal, systemic, or local syndromes[4].

Envenomation occurs when skin contacts the jellyfish tentacles to trigger nematocysts by chemical or mechanical stimuli. Nematocysts eject their threads to penetrate into the upper dermis and venom is absorbed via microvascular of dermis into systemic and produce any of several envenomation syndrome[4]. Acute renal failure following jellyfish sting has rarely been rarely reported[7] and pathogenesis remains unknown[8]. In children, acute renal failure associated with intravascular hemolysis and hemoglobinuria following jellyfish sting was reported by Guess HA[8] and Spelman FJ[9]. In the presented patient, hemoglobinuria-induced ARF was the apparent cause and there were no other predisposing factors. Jellyfish venom can produce intravascular hemolysis by hemolytic toxin, and cause renal failure by hemoglobinuria. Pathogenetic mechanisms of hemoglobinuria-induced ARF are renal vasoconstriction, direct toxicity of hemoglobin and tubular cast formation[10]. Renal ischemia provoked by hemoglobin-induced vasoconstriction predisposes toward tubular injury and sloughing of epithelial cells into the urinary space. Cellular debris promote cast formation and destruction of nephrons.The other mechanism contributing to the genesis of ARF are sustained decrease in renal blood flow from irreversible increase in renal vascular resistance, presumably mediated by endogenous vasoconstrictor or by inhibition of vasodilators, or direct toxic effect to tubule[8].

Severity of jellyfish envenomation is related to several factors[11,12], the length of time in contact with the tentacles, the number of nematocysts discharged, species of jellyfish, the extent of skin surface area involved, age and sensitivity of the victim to the venom. Children are more vulnerable than adults[13] because their relatively smaller body mass results in a higher concentration of venom in their tissues and less hairy skin than men, enabling closer tentacle contact.

First-aid treatment is very important because much of the venom can be neutralized at the scene and most fatalities are prevented[12]. Tentacles should

be removed with a gloved hand or forceps and remaining nematocysts should be inactivated by pouring vinegar or 3-10% acetic acid[11-14]. The affected skin should be dusted with talcum powder, baking soda or shaving cream and scraped off with the dull back edge of a knife. Local reaction should be treated with topical steroid. If severe systemic reactions develop, the patient should be hospitalized and treated symptomatically and supportively. Secondary skin infection may develop because varieties of gram positive and gram negative organisms are present in sea water, broad spectrum antibiotics should be given[11,15].

In conclusion, physicians caring for victims of jellyfish stings should be aware of ARF although the victims may not develop severe systemic reactions or other major organ failure.

References

1. Burnett JW, Gable WD. A fatal jellyfish envenomation by the Portugese Man-o'war. Toxicon 1989; 27: 823-4.
2. Bengston K, Nichols MM, Schnadig V, et al. Sudden death in a child following jellyfish envenomation by Chiropsalmus quadrumanus: case report and autopsy findings. JAMA 1991; 266: 1404-6.
3. McGoldrick J, Marx JA. Marine envenomations: part 2: invertebrates. J Emerg Med 1992; 10: 71-7.
4. Burnett JW, Calton GJ, Burnett HW.jellyfish envenomation syndromes. J Am Acad Dermatol 1986; 14: 100-6.
5. Fenner PJ, Hadok JC.Fatal envenomation by jellyfish causing Irukandji syndrome. Med J Aust 2002; 177: 362-3.
6. Burnett JW, Calton GJ. Venomous pelagic coelenterates: chemistry, toxicology, immunology and treatment of their stings. Toxicon 1987; 25: 581-602.
7. Burnett JW, Bloom DA, Imafuku S, et al. Coelenterate venom research 1991-1995: clinical, chemical and immunologic aspects. Toxicon 1996; 34(11/12): 1377-83.
8. Guess HA, Saviteer PL, Merris CR. Hemolysis and acute renal failure following a Portugese Man-of-war sting. Pediatrics 1982; 70: 979-81.
9. Spielman FJ, Bowe EA, Watson CB, et al. Acute renal failure as a result of Physalia physalis sting. South Med J 1982; 75: 1425-6.
10. Nath KA. Hemoglobinuria. In: Molitoris BA, Finn WF.eds. Acute renal failure: a companion to Brenner & Rector's The Kidney. Philadelphia. WB Saunders 2001: 214-9.
11. Auerbach PS. Marine envenomations. N Engl J Med 1991; 15: 486-93.
12. Otten EJ. Venomous animal injuries. In: Rosen P, Barken R, Dazl DF, et al. eds. Emergency medicine: concepts and clinical practice. St Louis. Mosby 1998: 924-40.
13. Fenner PJ, Wiliamson JA. Worldwide deaths and severe envenomation from jellyfish stings. Med J Aust 1996; 165: 658-61.
14. Pearn J. The sea, stingers, and surgeons: The surgeon's role in prevention, first aid, and management of marine emvenomations. J Ped Surg 1995; 30: 105-10.
15. Kizer KW. Marine envenomations. In: Harwood-Nuss A, wolfson AB, Linden CH, et al.eds. The clinical practice of emergency medicine. Philadelphia. Lippincott 2001: 1653-7.

ภาวะไตวายเฉียบพลันจากพิษแมงกะพรุนในผู้ป่วยเด็ก

ธวัชชัย ดีขจรเดช, พรชัย กิ่งวัฒนกุล, ศิริวรรณ วนานุกูล

รายงานผู้ป่วยเด็ก 1 ราย ที่เกิดภาวะไตวายเฉียบพลัน หลังจากสัมผัสกับแมงกะพรุน ขณะว่ายน้ำทะเลที่หาดพัทยา มีผื่นแพ้สัมผัสที่แขนซ้าย ขาซ้ายและลำตัว ต่อมามีปัสสาวะออกน้อยและสีเข้ม ผลการตรวจทางพยาธิวิทยาพบเป็น acute tubular necrosis

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