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Acute Respiratory Distress Syndrome and Neurotoxicity Following Scorpion Envenomation in a Child: A Case Report

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Abstract **Case Report**

Scorpion envenomation is a major health concern in North Africa, particularly in Morocco, where children are the most affected population. While most cases are mild, severe envenomation may lead to life-threatening complications such as cardiovascular collapse, acute respiratory distress syndrome (ARDS), and neurological involvement. We report a rare and severe case of a 3-year-old girl from a rural area near Fez who developed both ARDS and neurological symptoms following a scorpion sting. Initially presenting with agitation and confusion, the patient experienced rapid neurological deterioration requiring intubation and intensive care. Despite an initial recovery and successful extubation, she developed acute hypoxemic respiratory failure within 24 hours, leading to a diagnosis of ARDS. Management included sedation, protective mechanical ventilation, prone positioning, and restrictive fluid therapy. With optimized supportive care, the patient demonstrated full recovery without sequelae. No antivenom was administered, reflecting current Moroccan practice due to concerns regarding local efficacy. This case illustrates the potential severity of pediatric scorpion envenomation and the importance of rapid, multidisciplinary intervention. It also emphasizes the need for early recognition of complications, particularly in rural settings where delayed access to care may worsen prognosis. The simultaneous occurrence of ARDS and central neurotoxicity remains rare but clinically significant, underlining the venom's potent cardiopulmonary and neurotoxic effects. Although the prognosis can be favourable with prompt intensive care, this case highlights the necessity for region-specific antivenom development and further research into early predictors of severe envenomation. Our findings contribute to the limited literature documenting combined respiratory and neurological complications of scorpion envenomation in children and advocate for improved clinical protocols and public health strategies in endemic areas. Ethical approval and parental consent were obtained for this report.

Keywords: Androctonus mauretanicus, Buthus occitanus, intensive care, neurotoxicity, pediatric ARDS, scorpion envenomation, venom complications.

INTRODUCTION

Scorpion envenomation is a major public health issue in North Africa, particularly in Morocco, where 25,000 to 40,000 stings occur annually, with children being the most affected (Achour *et al*., 2018). The most dangerous species, including *Androctonus mauretanicus* and *Buthus occitanus*, produce potent neurotoxins that may lead to severe systemic effects (Darkaoui *et al*., 2024). Although most cases are benign, a minority evolve into life-threatening syndromes with cardiovascular or respiratory failure—primary causes of mortality (Bahloul *et al*., 2013). While several reports describe severe scorpion envenomation in children, cases involving both acute respiratory distress syndrome (ARDS) and neurological complications remain rare. We present the case of a 3-year-old child in Morocco who developed both complications following a scorpion sting. This report highlights the importance of early recognition and aggressive supportive care in pediatric scorpionism, and provides an updated literature review of the pathophysiology, clinical presentation, and management of severe envenomation in endemic regions.

CASE REPORT

A previously healthy 3-year-old girl with no medical or surgical history was admitted to the emergency department at University Hospital Hassan II

in Fez, Morocco, three hours after being stung by a scorpion on her left big toe. The incident occurred at night during the summer in a rural area near Fez. Upon admission, the patient was initially conscious but rapidly progressed to extreme agitation and confusion with a Glasgow Coma Scale (GCS) of 11 (Motor 5, Verbal 3, Eye-opening 3), the patient exhibited normal pupillary reflexes, no focal deficits, and no clinical seizures. Hemodynamically, she was stable with a blood pressure of 95/68 mmHg, mean arterial pressure (MAP) of 77 mmHg, tachycardia at 160 beats per minute, normal capillary refill time, no mottling, sweating, and initial lactate level of 2.1 mmol/L. Respiratory examination revealed tachypnea at 45 breaths per minute, with normal oxygen saturation and clear lung auscultation. Initial blood gas analysis showed a pH of 7.38, PaO2 of 90 mmHg, PaCO2 of 25 mmHg, and bicarbonates of 22 mmol/L. Blood tests demonstrated no electrolyte disturbances and a normal coagulation profile (PT, aPTT, INR).

Given her neurological deterioration and severe agitation, endotracheal intubation was performed to secure airway protection. Echocardiography demonstrated good global and segmental left ventricular contractility, a normal left ventricular ejection fraction, normal right ventricular function, and a compliant, non-dilated inferior vena cava (IVC), without elevated filling pressures.

Upon admission to the pediatric intensive care unit, sedation was initiated and maintained using propofol and fentanyl. The patient remained hemodynamically stable without the need for inotropic or vasopressor support. Comprehensive neuroprotective measures were instituted, including strict control of arterial oxygenation, maintenance of normocapnia, normonatremia, glucose regulation below 1.8 g/L, and careful temperature management below 38°C. Initial neuroimaging by CT scan revealed no acute abnormalities, and subsequent cerebral MRI was similarly unremarkable, effectively ruling out vascularitis and ischemic cerebrovascular events. After 48 hours, sedation was gradually discontinued, resulting in full neurological recovery, successful extubation, and restoration of consciousness with a GCS score of 15.

Approximately 24 hours post-extubation, the patient exhibited acute respiratory deterioration characterized by significant hypoxemia. Initial management included high-concentration oxygen therapy and non-invasive ventilation (NIV). Despite temporary improvement, respiratory status rapidly deteriorated, necessitating re-intubation due to severe hypoxemia, with a PaO2/FiO2 ratio declining to 120 and an elevated oxygenation index of 10. Chest radiography revealed new bilateral alveolo-interstitial opacities, previously absent. Repeat echocardiography confirmed stable cardiac function and filling pressures.

A diagnosis of acute respiratory distress syndrome (ARDS), attributed to scorpion envenomation, was established. Management strategies included sedation with propofol and fentanyl, intermittent neuromuscular blockade using rocuronium, implementation of protective mechanical ventilation, and prone positioning for 16 hours, performed without complications and resulting in notable respiratory improvement. Restrictive fluid therapy was administered based on hemodynamic indexes such as velocity time integral (VTI) variation and delta pulse pressure, aiming for a negative fluid balance consistent with ARDS management. This therapeutic approach significantly improved respiratory function, evidenced by a PaO2/FiO2 ratio increase to 200 two hours after initiating prone positioning, which further improved to 260 by the conclusion of the prone session. Microbiological analyses of respiratory secretions obtained via protected telescoping catheter, including serial sampling before and after respiratory deterioration, returned negative.

Following three days of mechanical ventilation and successful weaning trials, the patient was extubated. Throughout her hospitalization, no additional organ dysfunctions such as renal or cardiac impairments were observed. After a further 24-hour intensive care observation and an additional day in the pediatric ward, she was discharged home. Follow-up evaluation seven days post-discharge confirmed complete clinical recovery to her baseline condition.

Ethical approval for this case report was obtained from the institutional ethics committee of University Hospital Hassan II of Fez.

DISCUSSION

This case highlights the rare and severe presentation of a 3-year-old child who developed both acute respiratory distress syndrome (ARDS) and neurological complications following a scorpion sting in Morocco. Such a combination is unusual and reflects a severe form of scorpion envenomation.

The patient presented within hours of the sting with signs of systemic envenomation, including vomiting, diaphoresis, tachycardia, and confusion. Her rapid progression to coma and respiratory failure warranted immediate airway protection and intensive care support. The presentation corresponded to Grade III envenomation, which involves life-threatening cardiovascular or neurological compromise. Similar severe cases have been described in North African pediatric populations, where pulmonary edema and central nervous system manifestations may be present in critical envenomations (Bahloul *et al*., 2010).

Children are particularly vulnerable to severe outcomes due to a higher venom-to-body-weight ratio and frequent delays in reaching medical care, especially

in rural regions (Darkaoui *et al.*, 2024). In Morocco, stings are more common during summer and at night—conditions matching the epidemiology of our case (Rebahi *et al*., 2022). The autonomic storm triggered by venom neurotoxins typically causes both sympathetic and parasympathetic hyperactivity, explaining the agitation, vomiting, and cardiovascular instability (Bahloul *et al.*, 2013).

Neurologically, the patient exhibited transient altered consciousness and agitation. Although no focal deficits or seizures were documented during hospitalization, the clinical picture aligns with central neurotoxicity caused by scorpion venom's action on neuronal ion channels and synaptic transmission (Darkaoui *et al*., 2024). Altered mental status has been recognized as a key predictor of poor prognosis in pediatric scorpionism (Rachid *et al*., 2013; Rebahi *et al*., 2022). Although rare, serious cerebrovascular complications such as strokes have been reported following scorpion stings, likely due to venom-induced disseminated intravascular coagulation or cerebral vasospasm (Godoy *et al*., 2021). In our case, cerebral imaging showed no abnormalities, and with timely, appropriate supportive care, the patient achieved full neurological recovery.

Venom-induced ARDS likely results from a combination of direct myocardial depression and systemic inflammatory response. Venom-induced catecholamine release leads to increased afterload and potential cardiac dysfunction, while inflammatory cytokines increase vascular permeability. This dual mechanism precipitates pulmonary edema and hypoxemic respiratory failure (Sofer & Gueron, 1988). In our case, echocardiographic data supported preserved cardiac function, suggesting a predominantly inflammatory pattern. The early use of prone positioning and protective mechanical ventilation contributed to rapid improvement in oxygenation and respiratory status.

Management focused on optimized supportive treatment, including respiratory support, sedation and restrictive fluid management. Antivenom was not administered, in line with current Moroccan practices, which do not routinely recommend its use due to concerns about local efficacy (Abourazzak *et al*., 2009). However, this remains a controversial point. Some international studies suggest early antivenom may prevent progression to severe complications if administered promptly, especially in children. Research into a locally effective antivenom is ongoing in Morocco (Darkaoui *et al*., 2024).

The full recovery without neurological deficit in this patient is a favorable outcome, especially considering that the mortality of severe scorpion envenomation in children can approach 8–10% even in ICU settings (Bahloul *et al*., 2010). Early, vigorous supportive treatment was likely pivotal in preventing death or long-term sequelae.

Despite its clinical relevance, this case report has inherent limitations. As a single case, it does not allow for broader generalizations about the incidence or prognosis of combined ARDS and neurological complications in pediatric scorpion envenomation. Additionally, the absence of venom antigen quantification or biomarker profiling limits the ability to correlate clinical severity with biological markers. Future research should aim to identify early predictors of severe systemic involvement, explore the role of immunomodulators or adjunctive therapies, and evaluate the efficacy of emerging region-specific antivenoms through multicenter prospective studies.

CONCLUSION

This case highlights the potential for scorpion envenomation to cause severe, yet reversible, multi-organ complications such as ARDS and neurotoxicity in children. The patient's full recovery underscores the importance of rapid recognition and aggressive supportive care, particularly in resource-limited settings. This case also emphasizes the need for improved access to care in rural areas, enhanced surveillance systems, and further development of effective antivenom therapies tailored to regional scorpion species. Continued research into predictive markers and individualized risk assessment may ultimately improve outcomes for pediatric patients exposed to this life-threatening envenomation.

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Conflict of interest

The authors declare that they have no conflict of interest.

Ethics, Informed Consent, and Data Confidentiality Statement

Written and oral informed consent was obtained from the patient's parents for the publication of this case report. All clinical data were managed in accordance with confidentiality standards, ensuring full protection of the patient's privacy and personal information.

REFERENCES

1. Abourazzak, S., Achour, S., El Arqam, L., Atmani, S., Chaouki, S., Semlali, I., Soulaymani Bencheikh, R., Bouharrou, A., & Hida, M. (2009). Epidemiological and clinical characteristics of scorpion stings in children in fez, Morocco. *Journal of Venomous Animals and Toxins Including Tropical Diseases*, *15*, 255–267. https://doi.org/10.1590/S1678-91992009000200008
2. Achour, S., Iken, I., Hoummani, H., Harandou, M., & Hida, M. (2018). Profil épidémiologique des

envenimations scorpioniques chez l'enfant: CHU Hassan II de Fès. *Toxicologie Analytique et Clinique*, *30*(3), 164. https://doi.org/10.1016/j.toxac.2018.07.092

3. Bahloul, M., Chaari, A., Dammak, H., Samet, M., Chtara, K., Chelly, H., Ben Hamida, C., Kallel, H., & Bouaziz, M. (2013). Pulmonary edema following scorpion envenomation: Mechanisms, clinical manifestations, diagnosis and treatment. *International Journal of Cardiology*, *162*(2), 86–91. https://doi.org/10.1016/j.ijcard.2011.10.013
4. Bahloul, M., Chabchoub, I., Chaari, A., Chtara, K., Kallel, H., Dammak, H., Ksibi, H., Chelly, H., Rekik, N., Hamida, C. B., & Bouaziz, M. (2010). Scorpion Envenomation Among Children: Clinical Manifestations and Outcome (Analysis of 685 Cases). *The American Journal of Tropical Medicine and Hygiene*, *83*(5), 1084–1092. https://doi.org/10.4269/ajtmh.2010.10-0036
5. Darkaoui, B., Hilal, I., Khourcha, S., Lafnoune, A., Chakir, S., Aarab, A., Moustaghfir, A., Filali, O. A., & Oukkache, N. (2024). Development and Efficacy of the Antivenom Specific to Severe Envenomations in Morocco and North Africa: Advancements in Scorpion Envenomation Management. *Toxins*, *16*(5), Article 5. https://doi.org/10.3390/toxins16050214
6. Godoy, D. A., Badenes, R., Seifi, S., Salehi, S., Seifi, A., Godoy, D. A., Badenes, R., Seifi, S., Salehi, S., & Seifi, A. (2021). Neurological and Systemic Manifestations of Severe Scorpion Envenomation. *Cureus*, *13*(4). https://doi.org/10.7759/cureus.14715
7. Rachid, M. A., Khattabi, A., Amine, M., Younous, S., Khachcha, M., & Maaroufi, A. (2013). Facteurs pronostiques du décès par envenimation scorpionique dans la région de Marrakech, Maroc. *Annales de Toxicologie Analytique*, *25*(4), Article 4. https://doi.org/10.1051/ata/2013049
8. Rebahi, H., Ba-M'hamed, S., Still, M. E., Mouaffak, Y., Younous, S., & Bennis, M. (2022). Clinical features and prognosis of severe scorpion envenomation in children. *Pediatrics International: Official Journal of the Japan Pediatric Society*, *64*(1), e14687. https://doi.org/10.1111/ped.14687
9. Sofer, S., & Gueron, M. (1988). Respiratory failure in children following envenomation by the scorpion Leiurus quinquestriatus: Hemodynamic and neurological aspects. *Toxicon: Official Journal of the International Society on Toxinology*, *26*(10), 931–939. https://doi.org/10.1016/0041-0101(88)90258-9