



Extravasation injury of balanced electrolyte solution simulates the clinical condition of necrotizing fasciitis: A case report



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ARTICLE INFO

Article history:

Received 7 June 2015

Received in revised form

10 September 2015

Accepted 12 September 2015

Key words:

Extravasation injury

Autograft skin

Balanced electrolyte solution extravasation

ABSTRACT

Extravasation injury (EI) is an iatrogenic condition that occurs preferentially in neonatal and pediatric patients when the injection of fluid substances by intravenous access is required and it accidentally leaks into the adjacent tissues or in spaces outside of vascular compartment. Different types and amount of substances once undergoing extravasation can affect the EI differently [1]. In some instances immediate measures such as saline washout, local antidotes, enzymatic debridement and surgical interventions can be required in order to prevent the occurrence of a growing injury avoiding the progression of the EI to a medical emergency [6]. Here we report an unusual case of a preterm 2-month-old male patient in which the extravasation of balanced electrolyte solution on the upper right arm resulted in the development of full-thickness skin necrosis appearing as the clinical condition of necrotizing fasciitis. The management of necrotic tissue was performed using escharectomy as well as autograft skin under conditions of general anesthesia.

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1. Case report

A 2-month-old male patient born via cesarean section after a 28 week gestation for delayed intrauterine growth, abnormal cardiotocography (CTG) and breech presentation was admitted to the Burn Centre for the swelling of the right hand and forearm. During the second month of hospitalization, an infusion of balanced electrolyte solution, used to hydrate, was performed and an estimated volume of 5 ml (evaluated considering the infusion rate and the time elapsed between checks of the infusion site corresponding to 2 h) underwent extravasation on the dorsum of the right hand with the development of an extensive edema as well as blisters that simulated the clinical condition of necrotizing fasciitis (Fig. 1). In addition, the patient was on antibiotic as well as fluid therapy for the presence of a lung infection. Thus, an ultrasound study was performed and a significant edema of subcutaneous tissues and muscles was identified. On the other hand, the integrity of the fascia was preserved and no evidence of swelling in the dorsal interosseous compartments was identified. Thus, even if the clinical case here described simulate necrotizing

fasciitis, ultrasound results excluded this condition avoiding the surgical debridement in operating room as a treatment of choice. Neurological evaluation as well as the peripheral vascularization of the hand permit us to also exclude a case of compartmental syndrome. Moreover, a conservative management such as elevation of hand and pulse checks was also performed. The intravenous access (IV) was held in place for 2 days, before the EI, without any sign of infection. Then, to monitor the clinical case, ultrasounds were then daily performed during the 7 days after injury highlighting a progressive replacement of edema with a wide necrotic area on the dorsum of the right hand as well as on wrist (Fig. 2). Thus, when eschar was well demarcated, a first treatment with a proteolytic cream (Clostridiopeptidase A) was conducted for 10 days to remove necrotic area but the poor response of the treatment led us to perform a surgical operation. In detail, the necrotic tissue was removed using escharectomy and a thin split thickness skin autograft (0.3 mm) obtained from the ipsilateral thigh was then applied on the injured area ensuring its maintenance in situ using fibrin glue and steri-strip (Fig. 3). After three weeks, a well established skin engraftment was evident on the damaged area without signs of functional deficit (Fig. 4). The clinical follow-up after one year shows the total recovery of the wound site (Fig. 5).

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Fig. 1. The extensive edema with large blisters on the dorsum of the right hand and wrist of the 2-month-old male patient after extravasation of balanced electrolyte solution.



Fig. 3. Application of autograft skin on the injured area and its maintenance in situ with fibrin glue and steri-strip.

2. Discussion

Extravasation of intravenous infusion induces injuries of different severity to the surrounding tissues with an incidence accounting for 0.1–6.5% preferentially occurring in the pediatric population [1–2]. The severity of the damaged tissue depends on the characteristics of medication injected, the amount leaked as well as the site of administration and it can be classified according to Millan's scale in four different levels [3]. In addition, the inability to draw attention by infants makes the diagnosis and the consequent treatment often delayed with the possibility of an increased damage. After the arrest of infusion as a first act to limit EI extension, several strategies are used for its treatment depending on substance characteristics. Thus, substances with cytotoxic ability are treated using washing of saline solution injected around the injured area with an a-traumatic cannula (Gault technique) [4] while topical treatments with nitroglycerin in cream formulation are used when extravasation of vasoactive drug, such as dopamine, occurred [4]. Moreover, even if few studies were carry out to demonstrate the efficacy of

hyaluronidase treatment on EI, the ability of this enzyme to hydrolyze hyaluronic acid increases the permeability of tissue inducing the systemic absorption of medication [2] and making its use suitable to facilitate the substance elimination after washing with saline solution [5]. In our case report, even if the substance injected was balanced electrolyte solution and its use is not usually associated to cytotoxic effect, it was able to induce EI after its intravenous infusion on the dorsum of the right hand through a mechanism of extravasation-induced injury not previously described. We can assume that an increase of hydrostatic pressure in subcutaneous compartment and a consequent damage of tissue could be responsible of an osmotic pressure imbalance with a release of inflammatory mediators and a consequent requirement of further fluids from the vascular compartment. As a consequence, the presence of edema as well as the inflammatory response led to a shift of fluid from subcutaneous to muscle tissue that was then monitored with ultrasound scans. Nevertheless, the neonatal elasticity of fascia does not allow to define a clinical condition of compartmental syndrome and the intake of antibiotic



Fig. 2. Replacement of edema with wide necrotic area on the dorsum of the right hand and wrist of the 2-month-old male patient.



Fig. 4. Clinical evaluation of injured area of the 2-month-old male patient after three weeks.



Fig. 5. Clinical follow-up of injured area of the 2-month-old male patient after one year.

therapy has prevented the identification of the clear clinical condition of necrotizing fasciitis. On the other hand, the increase of the hydrostatic pressure in the subcutaneous tissue induced an ischemic condition and necrosis of the overlying skin.

3. Conclusion

In conclusion, the case report here described shows that even the infusion of balanced electrolyte solution can lead to EI with a significant tissue damage simulating the clinical condition of necrotizing fasciitis. Thus, since in specific circumstances any fluid injected is able to induce an EI [6], a close cooperation between health care professionals is required to carefully follow the shared protocols on the EI management paying particular attention to the monitoring of the infusion site in order to minimize the incidence of this adverse phenomena.

Conflicts of interest

There were no conflicts of interest.

Sources of funding

There were no sources of funding.

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