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Case Report

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A Case of Acute Lung Failure: Administration of Exogenous Surfactant As A Successful Treatment

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Abstract

We are describing a case of acute lung injury associated with uraemia and haemorrhagic shock. The treatment has consisted of the administration of repeated and equal doses of exogenous surfactant for 72 hours, starting within 48 hours from the beginning of the symptoms. A rapid improvement in the lung function has been detected, with consequent weaning from mechanical ventilation. The CT scan has confirmed the enhancement of atelectasis and hypoventilation. This case highlights the pivotal role of the administration of exogenous surfactant in selected cases of acute lung injury. If an anti-inflammatory effect is needed, we suppose that a repeated treatment with fractional dose is more effective.

Keywords: Surfactant, Acute Lung Injury, Weaning from Mechanical Ventilation.

Introduction

The alveolar collapse due to the deficit of surfactant production is one of the most important causes of the serious ventilator impairment occurring in the acute lung injury [1]. The biochemical alteration in the composition of the surfactant leads to the formation of interstitial oedema, to the perpetuation of the inflammatory response and to the increase of bacterial super-infection incidence [2]. Because of the above-mentioned injuries, we have administered repeated doses of exogenous surfactant to reintegrate its physiological function, in order to contrast the inflammatory process and to recover the hypo-ventilated or un-ventilated areas.

Furthermore, we have observed that the administration of repeated and equal doses of surfactant during the first period of the disease has allowed a less aggressive use of mechanical ventilation and a shorter time for weaning in comparison with most of the data coming from literature [3, 4].

Case presentation

A 27 years old woman has been admitted for coma after cocaine overdose, ab ingestis pneumonia, rhabdomyolysis, myoglobinuria and acute kidney failure. The clinical situation has evolved into a rapid acute kidney failure, requiring a renal replacing therapy (CVVH), and into a serious impairment of the respiratory function. The chest CT scan at the beginning (day 0) showed a spotlight diffused bilaterally thickening with pleural effusion and atelectasis. A right thoracentesis has been performed, giving a temporary and partial recovery of the ventilator function. The following day, a sudden worsening of the respiratory function occurred, with a massive right hemothorax associated with haemorrhagic shock. Hence, we executed a right thoracotomy for an emergency surgical intervention and a blood transfusion (day 1). After the intervention, mechanical ventilation at high FiO_2 was necessary. On account of the aforementioned critical conditions, we have decided to start the treatment with exogenous surfactant of swine origin (Curosurf® Chiesi Pharmaceuticals) by the tracheal route. The dosage regimen was as follows: 120 mg of exogenous surfactant for both right and left main bronchial tubes every 24 hours associated with Beclometasone 100 mcg and Lidocaine 40 mg for the following 3 days (days 2,3 and 4). After the bronchial injection of exogenous surfactant, a significant improvement in gas exchange has been observed. An increase of PaO_2/FiO_2 ratio from 240 to over 400 (Fig.1), a rapid reduction of FiO_2 to 0.3, and the enhancement of the lung compliance from 25 to 40 have been detected. These ventilator parameters have allowed the exhumation (day 8), followed by subsequent cycles of non-invasive ventilation until the complete recovery of the autonomous respiratory function (day 10). The clinical improvement has been confirmed by the CT scan imaging (Fig.2).

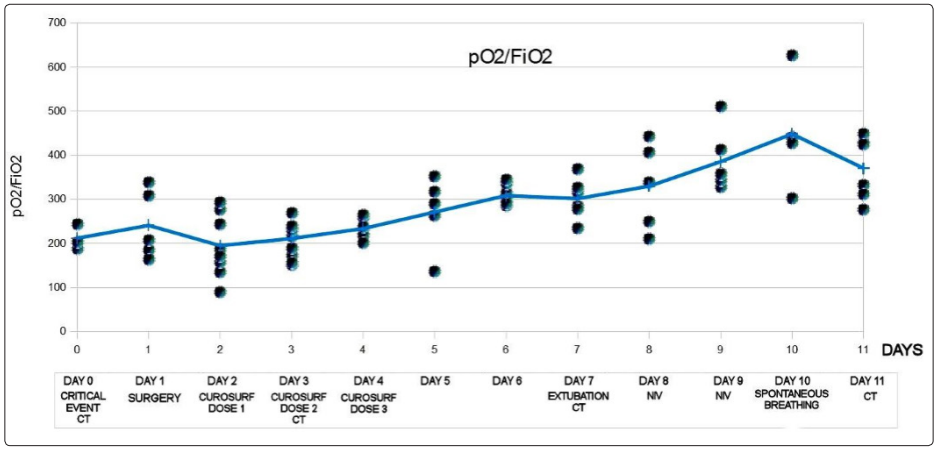

Figure 1: Trend of the PaO_2/FiO_2 ratio and the time table of the therapy

The improvement of the PaO2/FiO2 ratio after the administration of the surfactant is pointed out.

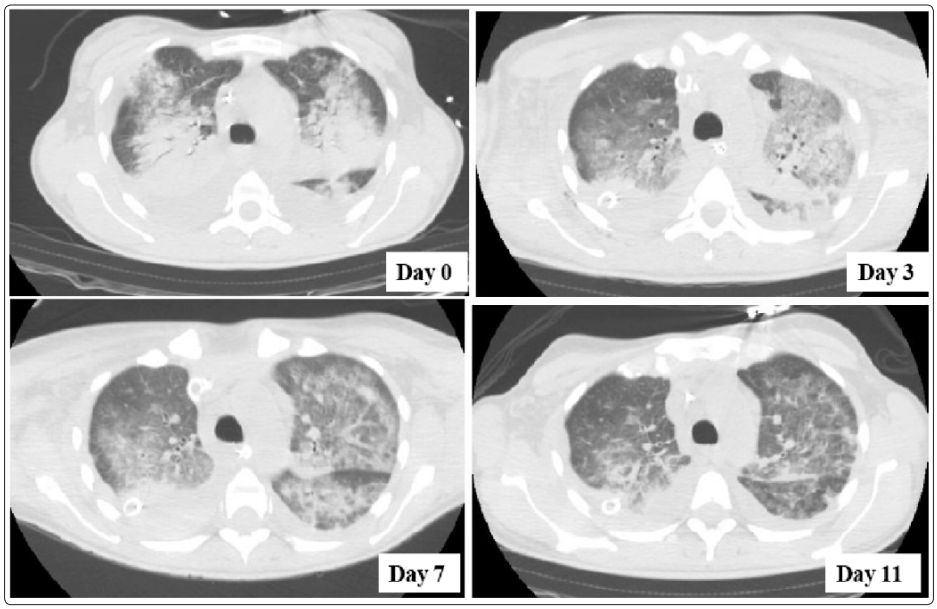

Figure 2: The CT scan has been performed before (Day 0), during (day 3) and after the surfactant treatment (day 7 and 11). At first, it highlighted a diffuse bilateral parenchimal thickening, pleural effusion and areas of consolidation. During the treatment, it has shown an evident and rapid improvement in the general clinical condition.

Discussion

In literature, as far as surfctants and other similar agents are concerned, an insufficient evidence is reported about their effectiveness in reducing mortality in people with ARDS, reducing the duration of mechanical ventilation, or increasing ventilator-free days [5]. Moreover, the use of surfactant has been considered controversial because it had shown an immediate positive response improving the PaO_2/FiO_2 ratio, but not a reduction in mortality.

The clinical context of a serious respiratory failure occurring after ab ingestis pneumonia, associated with uraemia and the need of blood transfusion, has led us to administer exogenous surfactant associated to corticosteroids and lidocaine. The early administration repeated every 24 hours for 72 hours, has contributed to a significant improvement in the PaO2/FiO2 ratio in the early stages, allowing a less aggressive ventilation treatment. Moreover, the CT scan has shown a reduction of atelectasis, proving the enhancement of the clinical condition.

Another fundamental aspect of the therapy with surfactant which we should consider is that it is a carrier for the other drugs administered, facilitating, the delivery of a compound to the remote areas of the lung, so allowing the associated costicosteroids to reach them [6].

Finally, the most important action of the described treatment is the anti-inflammatory one. Regarding this, changes in the structure and function of surfactant proteins, such as surfactant protein A (SP-A) and surfactant protein B (SP-B), increase the susceptibility to lung diseases: SP-A not only maintains the epithelial integrity by inhibiting lung cell apoptosis, but also controls inflammatory response by inhibiting inflammatory cytokines (TNF-α, IL-17 and IL-1β) [7].

In this case report the repeated administration of exogenous surfactant has led to a reduction in the time of weaning from the mechanical ventilatory support. In conclusion, our observation demonstrates that the administration of repeated doses of surfactant used as therapeutic adjuvant in conjunction with corticosteroids, has shown to be effective for the dynamic ventilation, with a recovery of the hypo ventilated areas, allowing the use of a conservative mechanical ventilation and helping to normalise the oxygenation index.

Competing Interests

The authors have no financial or non-financial competing interests to declare. This study has no industrial funding or support.

References

1. Dushianthan A, Grocott MPW, Postle AD, Cusack R (2011) acute respiratory distress syndrome and acute lung injury. Postgraduate Medical Journal 87: 612-622.
2. Haitsma JJ, Papadakos PJ, Lachmann B (2004) Surfactant therapy for acute lung injury/acute respiratory distress syndrome. Current Opinion in Critical Care 10: 18-22.
3. Kesecioglu J, Haitsma JJ (2006) Surfactant therapy in adults with acute lung injury/acute respiratory distress syndrome. Current Opinion in Critical Care 12:55-60.
4. Kesecioglu J, Beale R, Stewart TE, Findlay GP, Ruby JJ (2009) Exogenous natural surfactant for treatment of acute lung injury and the acute respiratory distress syndrome. American Journal of Respiratory and Critical Care Medicine 180: 989-994.
5. Lewis SR, Pritchard MW, Thomas CM, Smith AF (2019) Pharmacological agents for adults with acute respiratory distress syndrome. Cochrane Database of Systematic Reviews 7: CD004477.
6. Baer B, Souza LMP, Pimentel AS, Veldhuizen RAW (2019) New insights into exogenous surfactant as a carrier of pulmonary T therapeutics. Biochem Pharmacol 164: 64-73.
7. Yinong Yang, Qing Li, Feng Tan, Jun Zhang, Wu Zhu (2020) Mechanism of IL-8-induced acute lung injury through pulmonary surfactant proteins A and B. Experimental and Therapeutic Medicine 19: 287-293.